TEHNICAL REPORT GH 3628

AN ASSESSMENT OF HYDROCHEMICAL CHANGES OF GROUNDWATER AROUND DE AAR

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ABSTRACT

Hydrochemical data presented in previous reports on De Aar and data abstracted from the National Hydrochemical Databank were used to determine if any change in groundwater hydrochemistry had occurred. The analysis of the data showed that in the long term, the degree of mineralization had increased but the percentage of major ions present remained constant. It appeared as though climatic conditions were the chief cause of the change and large scale groundwater abstaction may have been a contributing factor. The quality of water however is still fit for human consumption as the mixing of water in the De Aar reservoir dilutes the poor quality water. A scientifically designed water quality monitoring network is required to evaluate further changes and also to study the effect of large scale groundwater abstraction on water quality.

SAMEVATTING

Hidrochemiese data van vorige verslae sowel as data van die Nasionale Hidrochemiese Databank is verwerk om te bepaal of daar enige verandering plaasgevind het in die grondwater-hidrochemie van die De Aargebied. Analise hiervan toon dat die graad van mineralisasie toegeneem het oor die lang termyn, alhoewel die persentasie van primêre ione konstant gebly het. Dit wil voorkom asof klimatiese omstandighede die hoofrede is vir die verandering sowel as grootskaalse grondwateronttrekking. Vermenging met water in die De Aar-reservoir verdun die konsentrasie van die relatiewe swak gehalte grondwater en bly dit gevolglik steeds geskik vir menslike verbruik. 'n Wetenskaplike monitor en beheerprogram word benodig om verdere grondwaterveranderings te evalueer en ook om die effek van grootskaalse grondwateronttrekking te bestudeer.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

LIST OF ENCLOSURES

1. INTRODUCTION

Since De Aar was founded in 1902, the town has relied solely on groundwater sources for a water supply. The steady growth of the town as a result of the development of a major railway junction has led to a continual increase in water demand. A great deal of geohydrological work has been undertaken in the area (section 3.1) but little attention has been paid to water quality. In order to facilitate planning and management of De Aar's water supply scheme, the Directorate of Planning requested that a study be undertaken to investigate if any change to the groundwater's hydrochemistry had occurred with time.

For the purpose of this study, the region around De Aar has been divided into three areas - the Northern area, the Western area and the Eastern area (encl. 1). This demarcation is based on previous work conducted in the area and the present water supply scheme. The Burgerville-Zewefontein area and the South-eastern area, as defined by Von Hoyer (1976) and Von Hoyer (undated), are included in the Eastern area. The South-western area, as defined by Von Hoyer and Rinkel (1976), is included in the Western area.

The earliest hydrochemical data presented in this report was sampled during 1974. All other data presented therefore only included post-1970 records.

2. HISTORICAL REVIEW OF DE AAR'S WATER SUPPLY

The De Aar Municipality bought two farms (Burgerville and Zewefontein) situated approximately 35 km south-west of the town in 1934 (De Villiers, 1945). Water obtained from springs and boreholes was pumped to the town's reservoirs by means of a pipeline. The SA Railways obtained water from these sources as well as from a number of boreholes and pits at Caroluspoort. By 1965 the municipal water supply scheme had been steadily increased to include groundwater bought from the owners of the farms Sipershof, Leeufontein and Kaffersdam which are situated in the South-eastern area.

A large scale geohydrological investigation by the Geological Survey for the Department of Water Affairs in the early seventies resulted in the development of the South-western water supply scheme in 1978. Water is obtained from the farms Vaalbank, Vaalkop and Rhenosterpoort. Additional boreholes at Caroluspoort, Wag 'n Bietjie and Rietfontein were added to the South-eastern supply scheme in 1985. To date, no water is abstracted from the Northern area for municpal water supply purposes.

The municipal water consumption for the period 1970-1988 is shown in figure 1. An increase in water consumption is evident. Even though a slight decrease in water useage was recorded in 1987 and 1988 and the demand for water by the South African Transport Services should decrease as the railway lines are electrified, the Department of Water Affairs has estimated that water demand will increase at an

average rate of 3,8% per annum (Anon, 1986). The assured yield of the present water supply scheme is approximately 2,6 x $10^6 m^3/a$ while the water demand in the year 2010 is estimated to be in the order of 7,4 x $10^6 m^3/a$ (Anon, 1986). The Directorate of Geohydrology is at present conducting a detailed geohydrological investigation in the Northern and South-eastern areas in an effort to develop further groundwater resources which can be incorporated in the present supply scheme. The report on the work is expected to be completed by early 1990.

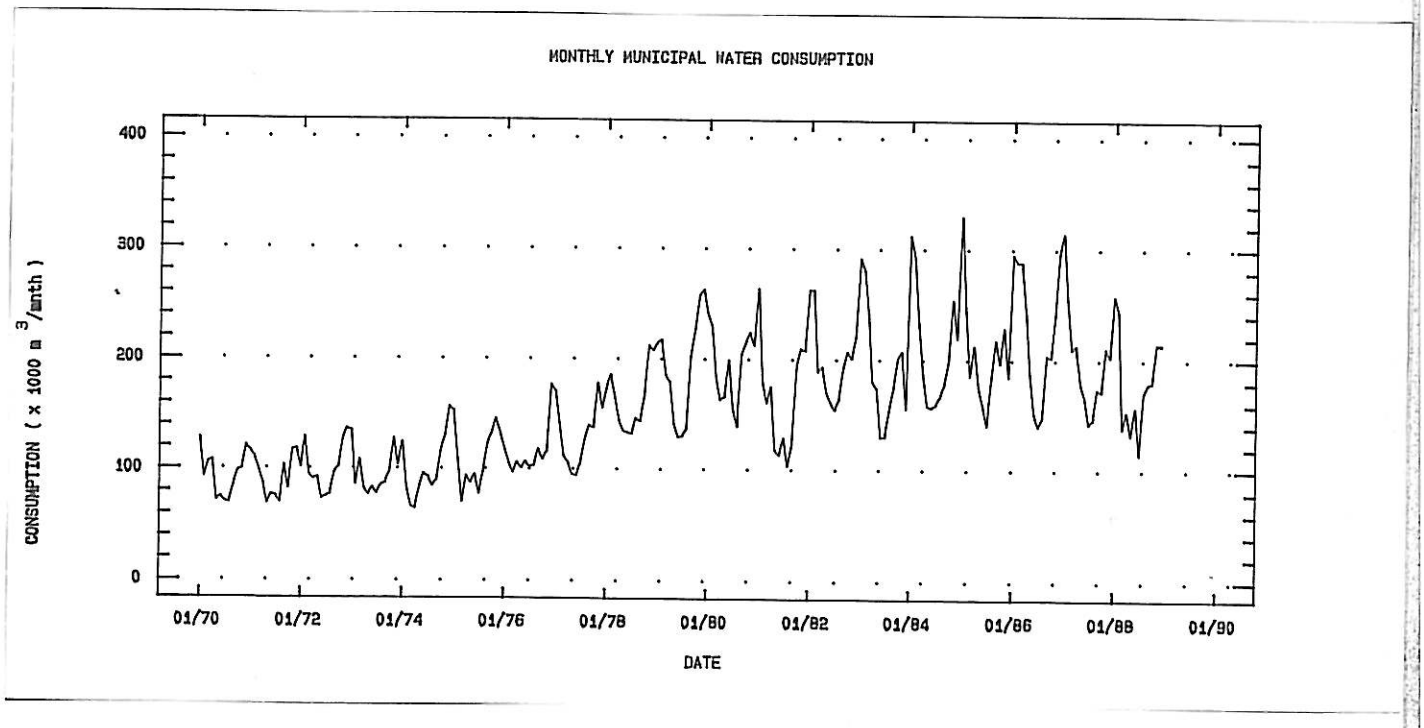

Figure 1: Monthly municipal water consumption, 1970 - 1988

3. BACKGROUND INFORMATION

3.1 Previous work

Gh 553: Underground Water, Burgerville and Sewefontein (De Villiers, 1945).

Three borehole sites were identified. De Villiers estimated that the Zewefontein springs were flowing at a rate of 970m^3/day and that 730m^3/day could be abstracted from boreholes at Burgerville.

Gh 910: De Aar Waterworks: Reports on Proposed Alterations and Improvements. (Van Eetvledt and Gibbons, 1947)

The water demand by the municipality and SA Railways was estimated to be 2 430m^3/day. The report recommends that a water supply of 3 400m^3/day be developed by means of:

(a) further exploration drilling at Burgerville and Zewefontein

(b) the construction of a dam at Zewefontein

(c) the enlargement of the erosion dam at Poplar Bush (Burgerville) such that spring flow would be enhanced.

The report proposes that water be obtained from the dam during rainy periods and from boreholes during dry periods. The effect of overpumping boreholes is also discussed.

Gh 1043: Verslag oor Verkenningsopname van Grondwaterbronne in die Omgewing van De Aar (Vegter, 1958).

Drought necessitated that additional water sources be identified. The report states that the best place to obtain groundwater is where thick alluvial deposits overlay fractured Karoo sediments and recommends that a complete survey of the Zewefontein area be undertaken. The author strongly recommended that water levels be measured in observation boreholes once a week.

Gh 1145: A Geohydrological Investigation at Caroluspoort, De Aar for the SA Railways. (Vegter, 1961)

A detailed investigation of the Caroluspoort area was undertaken to determine alluvial thickness and extent, alluvial permeability and storage coefficient and to define the quantity of water stored in the alluvial aquifer. The author made the following estimates:
(a) water stored in the alluvium at the poort is $0{,}100 \times 10^6 m^3$
(b) water stored in alluvium east of the poort is $1{,}100 \times 10^6 m^3$
It was also estimated that $1\ 362 m^3$/day could be abstracted from the alluvium at Caroluspoort.

Gh 1419: Voorlopige Verslag oor Watervoorsiening vir die Munisipaliteit De Aar (Erasmus, 1969).

Seven borehole sites were selected, three near Burgerville and four north-west of De Aar along the Brak River. The sites selection was based on electical and magnetic work undertaken in the area.

Gh 1586: Ondersoek na Grondwaterbronne, De Aar-omgewing (De Bruin and Vegter, 1971).

A hydrocensus was conducted within a 35 km radius of De Aar. The aim of the work was to identify sites for detailed geohydrological investigation. A number of areas were identified to have a high groundwater potential. Nine hydrochemical samples were taken and the water was classified according to dominant ions present.

Gh 1592: 'n Ontleding van Hoeveelhede Water Gepomp en Watervlakskommelings 1960-1971, en die moontlikheid van Verdere Putte te Caroluspoort, De Aar (Dziembowski, 1971).

The report investigates the possibility of further pits being developed at Caroluspoort. A drop in water levels was reported after heavy pumping. The performance of the Caroluspoort alluvial aquifer was re-evaluated and it was estimated that the aquifer could yield 1970m^3/day as opposed to the 1 362m^3/day proposed by Vegter (1961).

Gh 2828: Caroluspoort, De Aar - Evaluation of an Alluvial Aquifer (Vegter, 1975).

The geohydrological work done at Caroluspoort is discussed in detail. The yield of the alluvial aquifer is re-estimated to be in the order of 1 600m^3/day.

Gh 2831: De Aar - Groundwater Investigation (Smit, 1975).

The report provides on overview of the results of fieldwork conducted by Von Hoyer around De Aar between 1971 and 1975. Four areas were studied, namely the Burgerville-Zewefontein area, the South-eastern area, the South-western area and the Northern area. A total of 479 boreholes were drilled of which 47 yielded more than 5,5P/s. The long term abstraction from all areas was estimated to be $3,8 \times 10^6 m^3/a$.

Gh 2895: Groundwater Development in the area South-west of De Aar (Von Hoyer and Rinkel, 1976).

A complete geohydrological investigation was undertaken in the area south-west of De Aar. Three aquifer types were identified, namely alluvial aquifers, weathered and jointed sedimentary aquifers and dolerite related aquifers. A number of production boreholes were drilled and tested. Water samples were taken from all production boreholes and analysed for bacteria. The groundwater was classified as class B type water with a TDS ranging between 550 and 1 100 mg/P. No changes in hydrochemistry were evident during pumping.

Gh 2886: A Groundwater Survey of the Burgerville - Zewefontein area. (Von Hoyer, 1976).

The geohydrology of the area is discussed in detail. The author states that many of the boreholes being used as production boreholes were situated too close together which resulted in hydraulic interference. No reference to water quality is made.

Gh report: South-eastern area, De Aar (Von Hoyer, undated incomplete report).

After it become evident that the South-western scheme would not satisfy De Aar's water demand, the geohydrological investigation was extented to be South-eastern area. Three aquifer types were identified (see summary of Gh 2895). It was noted that joints were often filled with clay or precipitation minerals. Production boreholes were drilled and tested. Two types of water were classified according to TDS content. Alluvial waters had a TDS ranging between 1 500 and 1 800 mg/ℓ and the TDS of "dyke" waters ranged between 500 and 770 mg/ℓ.

Gh report: Northern Area, De Aar (Von Hoyer, 1975, incomplete report).

The reports discusses the results of fieldwork conducted in the area in a similar fashion to the three previous reports. The results of the hydrochemical analyses conducted on water samples from 14 boreholes are not presented. The TDS range for aquifers in the Northern area is 500 to 1 400 mg/ℓ.

3.2 Climate, physiography and drainage

The climate in the De Aar region is semi-arid with most of the rainfall occurring in the summer months as heavy downpours (fig. 2). The mean annual rainfall for the period 1970-1987 was 298 mm per annum. Heavy rainfall occurred during 1974, 1976, 1981 and 1988.

However, little rain fell during thh periods 1972-1973, 1979-1980 and 1981-1987 (fig. 3). The average monthly evaporation measured at De Aar using a Class A evaporation pan for the period 1970-1987 is presented in figure 4. The least evaporation occurs in the cooler winter months but increases to approximately 350 mm per month during December and January.

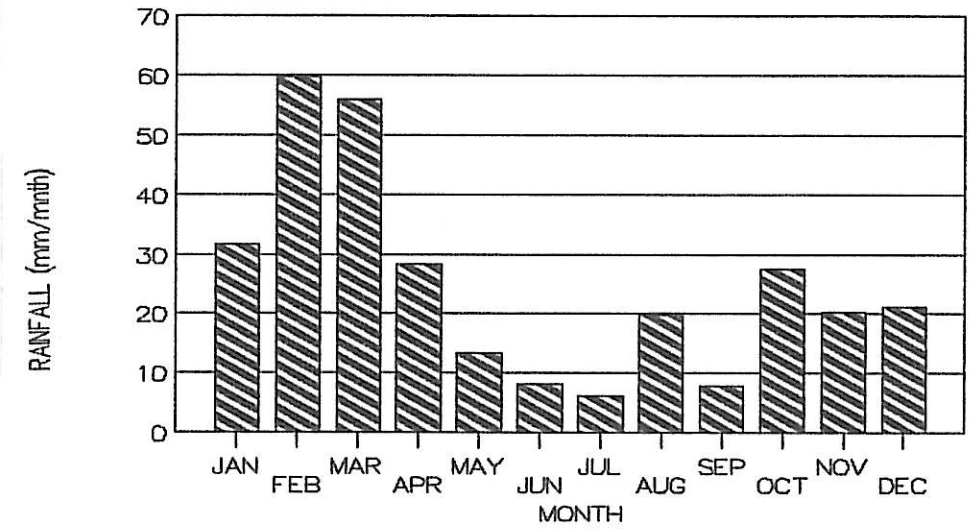

Figure 2: Average monthly rainfall, 1970 - 1987

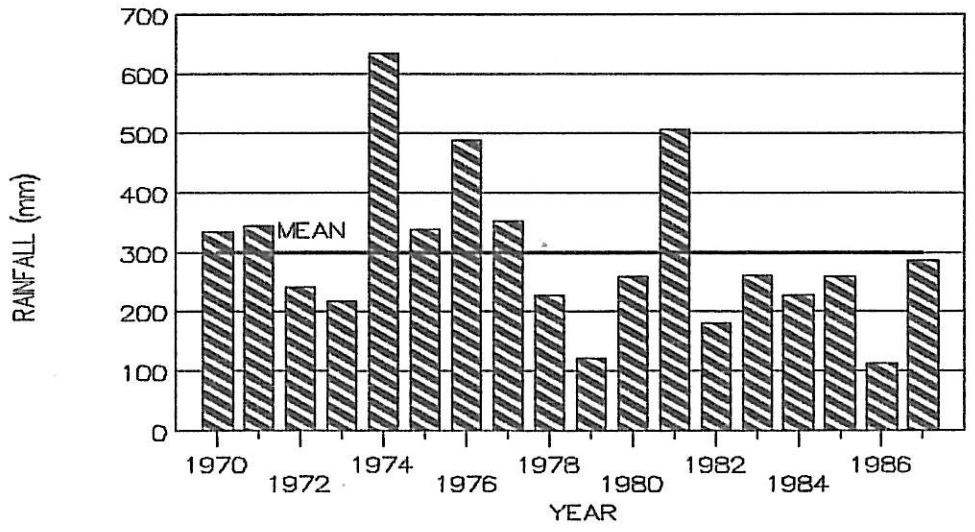

Figure 3: Annual rainfall, 1970 - 1987

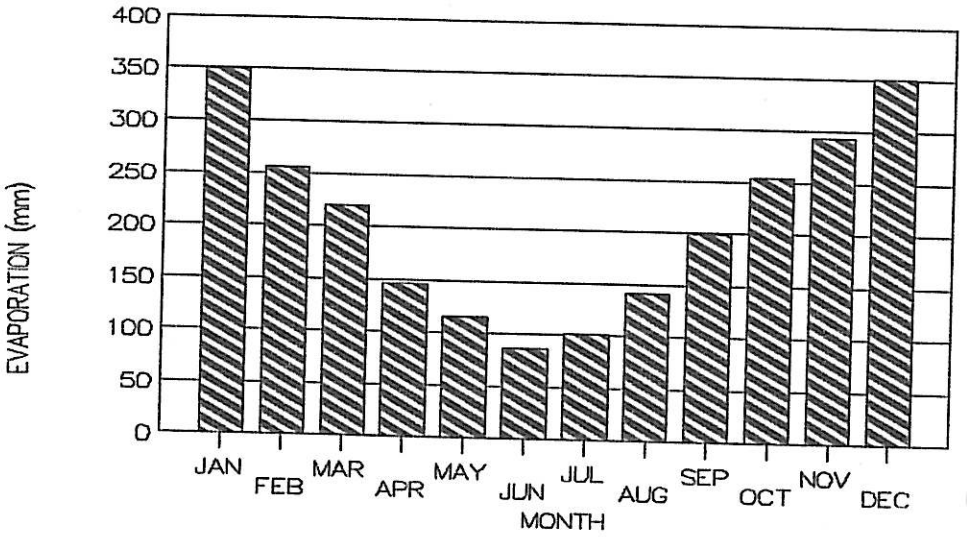

Figure 4: Average monthly evaporation, 1970 - 1987

The study area can simplistically be classified into three morphological types, namely the river valley areas, the intermediate valley areas and the hilly areas. The river valleys have an altitude ranging between 1 150 and 1 300 m.a.m.s.l while Renosterberg in the north, Grootberg in the south-west and Pienaarskloof in the east attain altitudes in excess of 1 600 m.a.m.s.l The intermediate valley areas are often dissected by a number of dolerite hillocks.

The Brak River (East) and Brakrivier (West) and minor tributaries drain the area. The confluence of the two rivers is situated 17 km north-west of De Aar. Both rivers are emphemeral and only flow after heavy rainfalls. Von Hoyer and Rinkel (1976) note that in places the river beds are below the water table, resulting in standing pools of water. The study area is situated in drainage region 0460.

3.3 Geology

The geology of the area consists of Ecca and Beaufort Group sediments, Jurasic dolerite and kimberlite intrusives, alluvial deposits and surface limestones. Ecca Group sediments consist essentially of shales which are generally dark grey in colour and carboraceous (S.A.C.S. 1980) The Beaufort Group sediments outcrop in the southern and south-eastern part of the investigation area. This group consists of grey, fine grained sandstones and mudstones (Von Hoyer and Rinkel, 1976). Where the sediments have been fractured by intrusives, the rocks may have important water bearing properties.

Dolerite intruded in the form of dykes, sheets and sills of varying thickness. Ring structures are common (De Bruin and Vegter, 1971). Kimberlite is usually found in the form of pipes or dykes but is not widespread in the area. The intrusive nature of these bodies and subsequent erosion has resulted in an extremely complex and varied geological and morphological settings.

The alluvial deposits are confined to the river valleys. The deposits are extremely hetrogeneous both laterally and vertically (Von Hoyer and Rinkel, 1976). The maximum thickness of the alluvium is in the order of 15m (Vegter, 1961; Von Hoyer, 1975). The surface limestone deposits, which resulted from a build up of salts in the soil layers after evaporation in areas with a shallow water table, is widespread albeit thin. A detailed geological map will be included in the geohydrological report that is expected to be completed by early 1990.

4. DATA COLLECTION

In order to satisfy the study objective, namely to assess whether any hydrochemical changes to groundwater have occurred with time, all geohydrological reports pertaining to the De Aar area were read (section 3.1). The hydrochemical data presented in the reports were added to that data abstracted from the National Hydrochemical Data Bank. Only 22 boreholes had been sampled on three or more occasions during different years between 1974 and 1989.

When analysing the data, three factors must be considered:

(i) the depth and method of sampling is unknown

(ii) the time span between sampling and analysis is often not known

(iii) different laboratories conducted the analyses.

Variations in the results of the hydrochemical analyses could be attributed to one of the above considerations. However, as no formal sampling programme has been followed, the data from ad hoc sampling exercises must be used. The data collected from the literature and the Database is presented in appendix A. The source of data is indicated.

5. HYDROCHEMISTRY

5.1 Durov diagrams

Three Durov diagrams (figs. 5, 6, 7) were drawn using hydrochemical data sampled from 33 boreholes spread throughout the study area. Two criteria were used to select the data:

(i) the geology of the main water-bearing zone had to be known such that it could be determined whether the water was obained from alluvium or sedimentary aquifers or from composite dolerite related aquifers.

(ii) data from at least two hydrochemical samples from the same boreholes, collected in different years, had to be available.

The salient hydrochemical features obtained from the three diagrams are summarised in table 1.

TABLE 1: SUMMARY OF THE HYDROCHEMICAL NATURE OF WATER ABSTRACTED FROM ALLUVIAL, SEDIMENTARY AND DOLERITE RELATED AQUIFERS

HYDROCHEMICAL CHARACTERISTIC	ALLUVIAL AQUIFERS	SEDIMENTARY AQUIFERS	DOLERITE RELATED AQUIFERS
Conductivity Range (mS/m)	80–500	70–600	100–400
pH Range	7.3–8.3	7.5–8.2	7.4–8.0
Na Range (% meq/l)	30–80	20–70	15–95
Mg Range (% meq/l)	15–50	25–50	5–55
Ca Range (% meq/l)	0–40	20–50	5–45
Cl Range (% meq/l)	20–90	5–80	35–80
SO_4 Range (% meq/l)	10–40	15–40	5–30
HCO_3 Range (% meq/l)	5–70	5–80	10–40

It is clear that the aquifers do not yield water with a characteristic hydrochemistry. However a number of features are common to all three cases:

(i) Na tends to be the dominant cation

(ii) Mg and Ca have a maximum percentage present of 50%

(iii) SO_4 has a maximum percentage present of 40%

(iv) The range of HCO_3 and Cl is great with neither element being dominant, except in the case of dolerite related aquifers where Cl is dominant.

The data plotted on figures 5, 6 and 7 were further subdivided according to sampling data, namely October 1984, February 1987 and December 1988. Minor hydrochemical shifts are evident. The data collected during 1984 and 1988 tend to reflect a similar hydrochemical nature while the 1987 data have a greater percentage present of both Na and Cl. The minor changes could be the result of either analytical error or seasonality.

5.2 Hydrochemical bar graphs

In order to investigate the hydrochemical changes with time more fully, chemistry data from sixteen boreholes were plotted on time series bar graphs. The selection of the data was based solely on the number of times that the borehole had been sampled. At least three data sets were required. Eight of the graphs include data obtained during 1974. The graphs are presented in Appendix B.

5.2.1 Northern area

If it is assumed that groundwater flow directions roughly conform with surface flow patterns near the river channel, the downstream sampling order is as follows (encl.1):

G29617-->G29618-->G29619/G29644-->G29639-->G29636-->G29641-->G29642

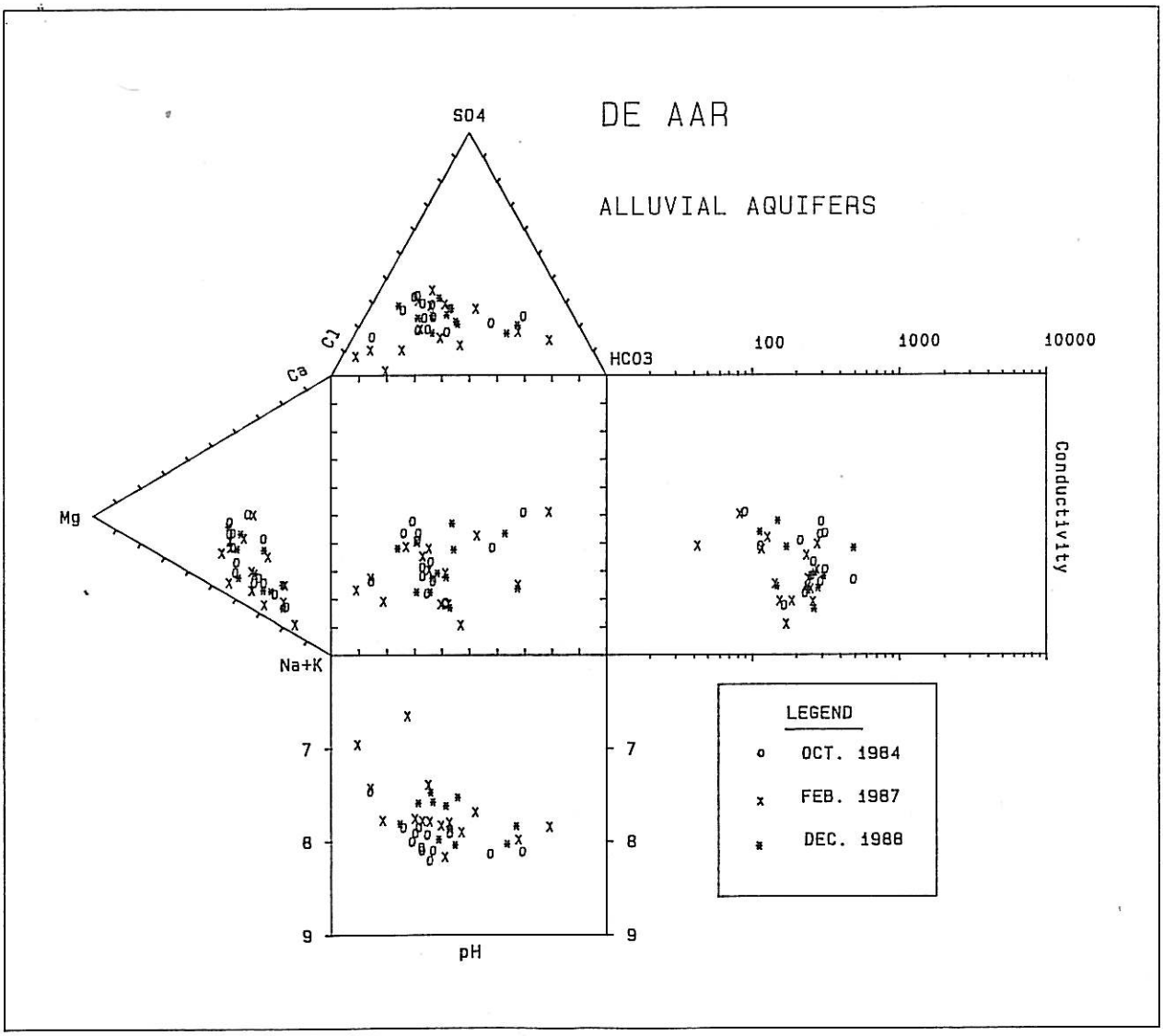

Figure 5: Hydrochemistry of groundwater sampled from alluvial aquifers

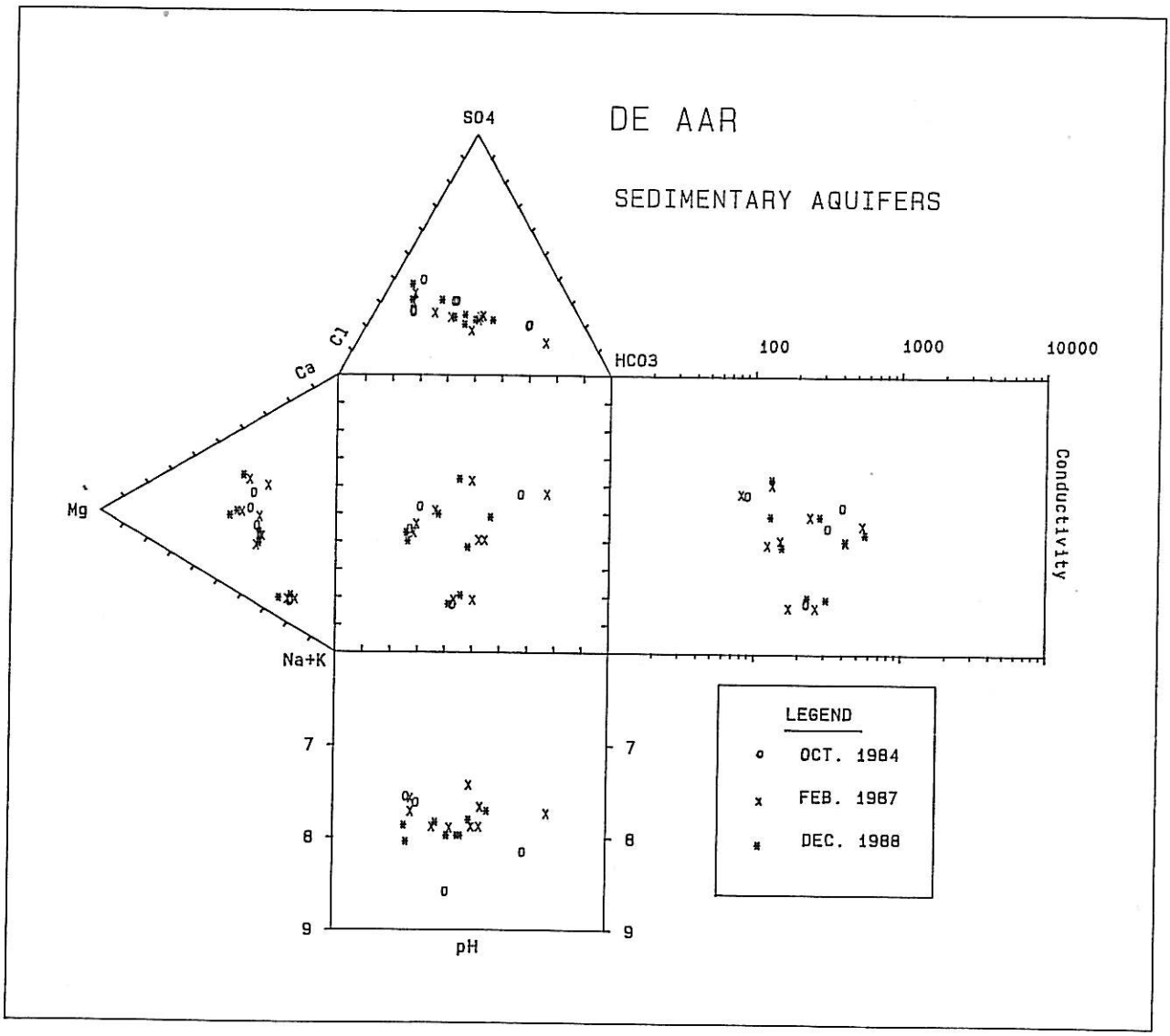

Figure 7: Hydrochemistry of groundwater sampled from sedimentary aquifers.

All of these boreholes are situated close to the Brak River. The hydrochemical nature and quality of groundwater change in the direction of flow, as indicated by the 1984 and 1988 data. The percentage present of Na and Cl increase while the remaining ions (Mg, Ca, SO_4, TAL) decrease. The TDS content of the water also showed an increase downstream.

The hydrochemical bar graphs clearly show a deterioration in groundwater quality with time, especially when the 1974 and 1987/1988 data are considered. However, the nature of the water does not necessarily change. In the case of G29636 and G29642, the percentage present of Cl increases while that of TAL and Ca decreases. The phenomena is indicative of dissolution and mixing (Johnson, 1975). The remaining six data sets do not show any major change of percentage ions present.

The data from the Northern area presented in Appendix B does show one important anomaly, namely, the quality of water during 1987 was sometimes better than both the 1984 and 1988 sampled waters. Tordiffe et al (1985) studied the effect of a single flood event on the hydrochemistry of groundwater sampled from a borehole at Baroda near Cradock. The Cradock and De Aar areas have similar geologic conditions and experience similar climatic conditions. They found that after approximately 1½ months the water quality deteriorated, as a result of an increase in Na, Cl, SO_4 and Mg concentrations, and then improved. The phenomena was ascribed to the flushing out of accumulated salts in the soils into the aquifer by the early infiltrating water. The later recharge water, which was relatively

free of salts, resulted in a dilution of the mineralised water in the aquifer. Little rainfall occurred at De Aar during 1986 and early 1987 (Fig. 8) and the water levels in G29632 and G29645 (Appendix C) do not show any effective recharge during this period. On the contrary the rainfall and water level data indicate that the water sampled during 1988 should be less mineralised than waters sampled in 1987. The difference in the expected and actual change in hydrochemistry as a result of recharge cannot be explained without further research which, is beyond the scope of the present investigation.

5.2.2 Western area

Using the same argument presented in section 5.2.1, the downstream sampling order is as follows:

G27704 --> G27707 --> G27723 --> G28405 --> G28402

The 1984 and 1987 data sets indicate that groundwater is mineralised in the direction of flow. The Cl content increased from 19% to 26%, while HCO_3 decreased by 4%.

However, the hydrochemical data collected during 1988 show that the salinity is similar throughout the profile, probably as a result of recharge (see Appendix C, G27720 and G27708).

The sequential hydrochemical data presented in Appendix B reflects a deterioration of groundwater quality with time. The total ions present increase while the relative percentage present of each ion

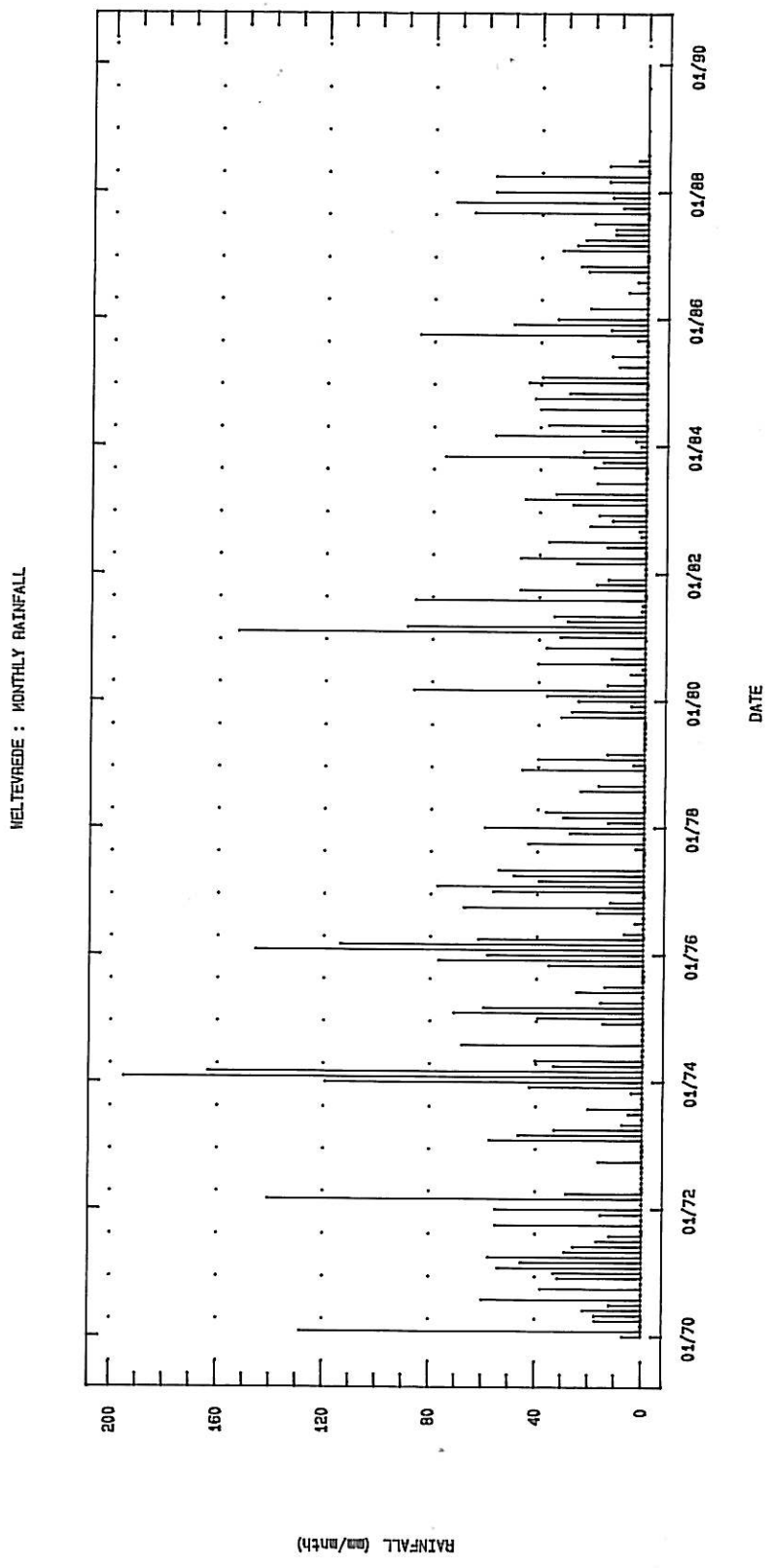

Figure 8: Monthly rainfall data, 1979-1987

remains constant. An anomaly similar to that discussed above is seen on the graph of G28405. The quality of water sampled at G28402 during 1988 showed a marked improvement when compared to the earlier data. The percentage present of HCO_3 increased from 9% to 19% while the Cl content dropped by 7%. This is probably the result of recent recharge.

5.2.3 Eastern area

The data collected from the Eastern area presents the clearest picture of hydrochemical changes that have taken place. Mineralization increases in the direction of flow (G27918 --> G27917 --> G27927). The percentage present of Na and Cl increased while that of the remaining ions decreased. The time series data clearly indicates a deterioration of water quality. In all three cases, the relative HCO_3 content decreased. Minor reductions of Mg and Ca are also suggested. The relative content of Na and SO_4 increased but the Cl present remains constant. These changes indicate that the waters are shifting from "stagnant" type to NaCl type water (Johnson, 1975).

It is interesting to note that the hydrochemical bar graph (appendix B) and water level graph (appendix C) of G27927 show a similar trends. Where the water levels showed a gradual decline of approximately 37% over a ten year period (1974 - 1984) the water quality deteriorated by 12%, in terms of total ions present, over the same period. Between 1984 and 1987, the water level declined by 110% while the water quality deteriorated by 87%. This could indicate

that excessive pumping, which resulted in a drop of water levels, yields poorer quality water. The hydochemical changes that occur as a result of large scale groundwater abstraction could be caused by:

(i) water quality stratification with depth

(ii) a changing geohydrochemical environment owing to a change of temperatures and pressures during abstraction

(iii) the drawing in laterally of surrounding poorer quality water.

Further detailed work is required to accurately assess the impact of groundwater abstraction on hydrochemistry in Karoo geohydrological settings.

5.3 Discussion of hydrochemical changes

Characteristic waters could not be determined for each aquifer type (section 5.1). The geohydrological nature of the area suggests that the aquifers are of a composite nature rather than individual aquifers. Thus the hydrochemical nature of the groundwater would be influenced by all three geological aquifers.

The time span used to divide the data presented on the Durov diagrams (Figs. 5,6 and 7) was too short, hence no changes could be dectected. The hydrochemical bar graphs, which include some data obtained during 1974, show in section 5.2 that a general deterioration of groundwater quality has occurred with time. Even though the data presented in this report is not suited to such a study, the percentage of change between 1974 and 1987/1988 implies that the changes are real and not the effects of varied sampling procedures, different analytical procedures or seasonality. The hydrochemical nature of the water has remained fairly constant

but the degree of mineralisation has increased. The chief cause of the change appears to be rainfall. Periods of low rainfall result in an accumulation of salts in the soil layers. Heavy downpours, which are typical of the Karoo, flush the salts into the aquifer. Dilution of the water occurs with subsequent recharge. The water level data (used as an indicator of municipal abstraction) and hydrochemical data tend to show similar trends (section 5.2). It is possible that large scale abstraction may result in a long-term deterioration of water quality. However the data was not suited to investigating the effects of abstraction. As no similar investigation has been conducted elsewhere in a Karoo geohydrological setting, further investigation into abstraction-water quality interaction is requied.

5.4 Suitability of groundwater for domestic consumption

As the quality of groundwater had changed since the last geohydrological investigation (1972-1975), it is pertinent to re-evaluate the suitability of the groundwater for domestic consumption. Hydrochemical data obtained during ad hoc sampling exercises between 1987 and 1988 were used to determine the statistics presented in Table 2. The three drinking standards are based on the work of Kempster and Smith (1984). Besides TAL, K and NH_4, all the ions exceed the maximum allowable limit. However the mixing of good and poor quality water in De Aar's main water supply reservoir results in the dilution of poor quality water. Figure 9 is a plot of EC measured at the two inlet pipes into the reservoir. The maximum allowable EC limit was not exceeded between February 1988 and February 1989.

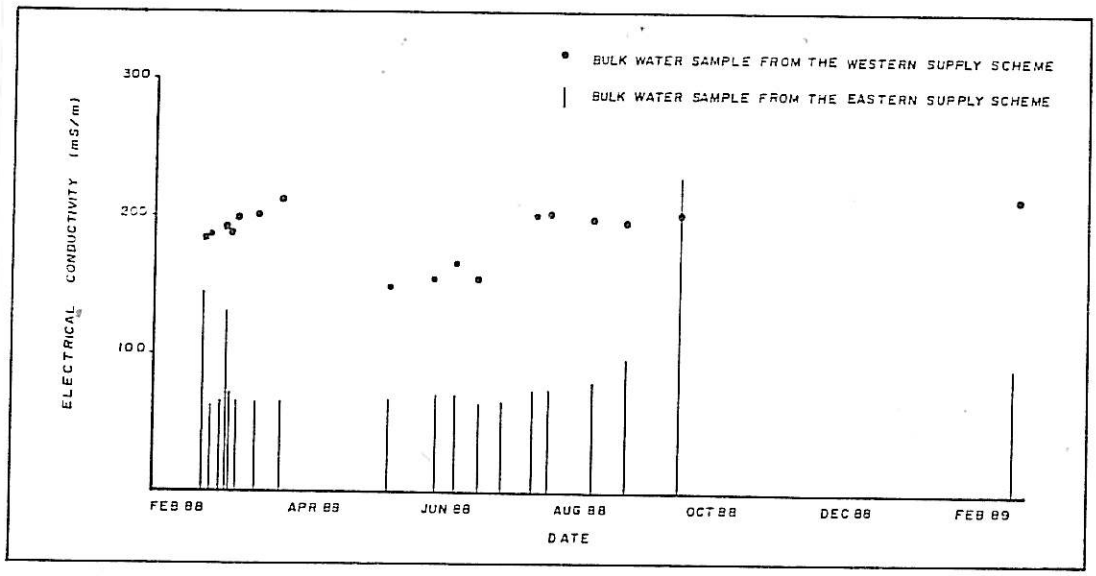

Figure 9: Electrical conductivity measurements taken at De Aar's main reservoir, February 1988 - February 1989

The bulk water obtained from the Eastern area ranges between 65 and 237 m ^{s}/m. The large variation of water quality appears to be a function of which boreholes are being pumped at that time. The quality of water obtained from the west has a smaller range (150 - 216 m^{s}/m). Cognizance must be taken of which areas yield poor quality water when the De Aar water supply management scheme is developed. Careful planning with regard to water quality and the mixing of different quality waters will yield a less mineralized end product. It is recommended that the De Aar Municipality take bulk hydrochemical samples for full analysis on a quarterly basis to ensure that the water supply is within the required drinking standards.

TABLE 2: Domestic water drinking standards and percentage of data exceeding the limit (1987 - 1988)

Ion	Min. allowable limit (mg/l)	% data less than	Recommended limit (mg/l)	% data exceeding	Max. allowable limit (mg/l)	% data exceeding	Crisis limit (mg/l)	% data exceeding
EC			70 *	93	300 *	14	400 *	8
Na			100	66	400	16	800	4
Mg			70	33	100	22	200	5
Ca			150	10	200	4	400	2
F			1,0	47	1,5	15	3,0	7
Cl			250	44	600	15	1 200	5
NO_3			6	21	10	7	20	1
SO_4			200	37	600	8	1 200	3
TAL	20	0	300	33	650	0	1 300	0
K			200	0	400	0	800	0
NH_4			1,0	0	2,0	0	4,0	0

* measured in mS/m

6. CONCLUSIONS AND RECOMMENDATIONS

6.1 Conclusions

(i) The groundwater quality has deteriorated over the period 1974 - 1988.

(ii) The degree of mineralisation has increased but the hydrochemical nature of the water has remained constant.

(iii) The chief cause of the deterioration appears to be related to climatic conditions.

(iv) Large scale groundwater abstraction may be a contributing factor to water quality deterioration.

(v) The water is fit for human consumption as the mixing of water in the municipal reservoir results in the water falling within required domestic standards.

6.2 Recommendations

(i) A scientifically designed water quality monitoring network should be employed to investigate the hydrochemical changes more fully as well as to investigate the impact of large scale groundwater abstractions on water quality. Such an investigation would provide insight into the geohydrochemical processes prevailing at De Aar and in other similar geohydrological environments.

(ii) The De Aar Municipality should take bulk hydrochemical samples at the main reservoir to ensure that the water supply remains within the domestic drinking standards outlined by Kempster and Smith (1984).

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APPENDIX A

HYDROCHEMISTRY DATA

Units of measurement

Depth	:	m
TDS	:	mg/l
EC	:	mS/m
Ionic concentration:		mg/l

HYDROCHEMICAL DATA : DE AAR

SOURCE OF DATA : DE BRUIN AND VEGTER,1971

Bh. No.	H No.	DATE	LATITUDE	LONGITUDE	DEPTH	GEOLOGY	pH	TDS	EC	Na+K*	Mg	Ca	F	Cl	NO3	SO4	PO4	TAL	Si	NH4
BR 391		01/01/71	30-33-54	24-01-45	10	alluvium	7.80	667	105.0	131.0	63.0	36.0	0.80	128.0	12.00	72.0		451.0		
PV 429		01/01/71	30-33-54	24-03-34	31	dol cont	8.00	718	115.0	127.0	73.0	44.0	0.80	197.0	0.00	67.0		397.0		
EN 1048		01/01/71	30-52-45	24-02-43	150	sediments	8.20	896	140.0	117.0	105.0	88.0	1.50	114.0	68.00	38.0		732.0		
ZS 207		01/01/71	30-44-34	23-54-39	30	sediments	8.10	559	95.0	100.0	54.0	42.0	0.30	85.0	16.00	24.0		476.0		
HL 2040		01/01/71	30-21-57	24-02-47	9	alluvium	8.60	455	75.0	73.0	43.0	44.0	0.70	94.0	22.00	0.0		299.0		
BK 125		01/01/71	30-33-52	23-58-30	5	alluvium	7.80	961	150.0	163.0	96.0	56.0	1.00	270.0	31.00	144.0		403.0		
CT ?		01/01/71	30-39-00	24-10-00		alluvium	7.80	846	140.0	124.0	24.0	160.0	0.70	241.0	0.00	96.0		403.0		
WB 294		01/01/71	30-42-40	24-06-25	30	dol cont	7.90	541	85.0	92.0	10.0	110.0	0.30	57.0	0.00	19.0		506.0		
RN 2045		01/01/71	30-44-40	24-12-00	30	dol cont	7.90	577	95.0	69.0	22.0	126.0	0.20	142.0	0.00	5.0		427.0		

HYDROCHEMICAL DATA : DE AAR

SOURCE OF DATA : VON HOYER AND RINKELEL,1976:Gh2895

Bh.No.	H No.	DATE	LATITUDE	LONGITUDE	DEPTH	GEOLOGY	pH	TDS	EC	Na+K*	Mg	Ca	F	Cl	NO3	SO4	PO4	TAL	Si	K	NH4
G 27702G	3023DB118	21/11/73	30-43-24	23-54-11	26	sediments	7.40	563	75.0	91.0	47.0	55.0	0.40	65.0	0.00	102.0		406.0			
G 27702G		13/12/73	30-43-24	23-54-11	26	sediments	7.60	661	95.0	90.0	61.0	72.0	0.05	118.0	0.00	106.0		427.0			
G 23206A	3023DB379	05/02/73	30-41-00	23-54-09	23	sediments	7.50	663	90.0	201.0	25.0	13.0	1.90	106.0	0.00	82.0		412.0			
G 23206A		08/02/73	30-41-00	23-54-09	23	sediments	7.60	743	105.0	229.0	29.0	21.0	1.80	142.0	0.00	94.0		451.0			
G 27703	3024DB33	18/08/72	30-43-21	23-54-36	23	alluvium	7.75	1080	150.0	286.0	46.0	56.0	0.45	213.0	0.00	226.0		507.0			
G 27703		18/08/72	30-43-21	23-54-36	23	alluvium	7.80	1088	150.0	286.0	46.0	60.0	0.55	213.0	0.00	216.0		534.0			
G 23202	3024DB32	31/08/73	30-43-27	23-54-43	20	alluvium	7.60	1055	145.0	308.0	12.0	80.0	0.70	213.0	0.00	173.0		537.0			
G 23202		30/08/73	30-43-27	23-54-43	20	alluvium	7.70	1058	145.0	306.0	7.0	90.0	0.70	213.0	0.00	173.0		537.0			
G 23204D	3023DB100	21/07/72	30-42-19	23-54-05	23	alluvium	7.60	945	135.0	299.0	33.0	18.0	1.28	204.0	0.00	163.0		455.0			
G 23205F	3023DB95	30/30/73	30-42-06	23-53-43	23	dol cont	7.60	708	110.0	146.0	50.0	55.0	0.40	163.0	3.00	85.0		412.0			
G 27715G	3023DB79	21/05/73	30-41-52	23-53-39	24	dol cont	7.80	601	85.0	83.0	53.0	67.0	0.50	96.0	19.00	82.0		403.0			
G 27704	3023DB52	23/01/73	30-40-21	23-52-37	46	sediments	8.10	853	130.0	294.0	24.0	18.0	1.80	204.0	0.00	111.0		403.0			
G 23203A	3023DB109	29/08/72	30-43-19	23-54-13	23	alluvium	7.55	635	95.0	98.0	53.0	66.0	0.15	96.0	0.00	110.0		424.0			
G 27707	3023DB428	06/03/73	30-40-03	23-52-11	29	sediments	7.60	645	110.0	84.0	60.0	76.0	0.40	188.0	9.00	48.0		360.0			
G 27719I	3023DB48	16/07/73	30-40-14	23-52-26	42	dol cont	7.50	830	135.0	144.0	79.0	88.0		240.0	0.00	168.0		421.0			
G 27719I		19/07/73	30-40-14	23-52-26	42	dol cont	7.50	834	135.0	124.0	75.0	84.0	0.20	249.0	0.00	91.0		421.0			
G 23205B	3023DB84	06/07/72	30-42-00	23-53-58	22	alluvium	7.60	915	135.0	270.0	30.0	24.0	1.24	195.0	0.00	163.0		467.0			
G 23205B		06/07/72	30-42-00	23-53-58	22	alluvium	7.60	901	135.0	250.0	39.0	38.0	0.80	186.0	0.00	168.0		440.0			
G 27708D	3023DB116	11/09/73	30-43-24	23-54-20	21	alluvium	7.60	1295	160.0	370.0	54.0	44.0	0.10	248.0	0.00	271.0		616.0			
G 27708D		14/09/73	30-43-24	23-54-20	21	alluvium	7.70	1196	170.0	333.0	6.0	128.0	0.60	248.0	0.00	173.0		615.0			

HYDROCHEMICAL DATA : DE AAR

SOURCE OF DATA : VON HOYER ,1976:incomplete NORTHERN AREA report

Bh.No	H No.	DATE	LATITUDE	LONGITUDE	DEPTH	GEOLOGY	pH	TDS	EC	Na	Mg	Ca	F	Cl	NO3	SO4	PO4	TAL	Si	K	NH4
G 29618	3024CA 85	20/02/74	30-36-09	24-03-36	18	dol.cont	7.70	1380	190.0	368.0	61.0	52.0	1.10	256.0	0.00	350.0		480.0			
G 29619	3024CA 17	08/03/74			22	alluvium	7.90	860	115.0	105.0	89.0	78.0	0.30	183.0	8.40	173.0		290.0			
G 28420D	3024CA 12	00/04/74	30-35-24	24-04-56	26	dol.cont	7.80	988	135.0	152.0	96.0	98.0	1.00	142.0	0.00	173.0		56.0			
G 29617	3024 CA 87	19/02/74	30-36-18	24-03-30	22	dol.cont	7.70	536	105.0	46.0	51.0	74.0	0.20	36.0	6.30	48.0		300.0			
G 29617		22/02/74	30-36-18	24-03-30	22	dol.cont	7.50	1151	190.0	106.0	99.0	160.0	0.60	451.0	0.00	243.0		150.0			
G 29642		31/10/74	30-33-26	23-56-45	22	alluvium	7.80	805	80.5	257.0	28.0	20.0	1.40	159.0	0.00	96.0		400.0			
G 29641		12/07/74	30-33-52	23-57-01	34	alluvium	8.30	613	110.0	174.0	27.0	22.0	1.30	190.0	0.00	86.0		165.0			
G 29633	3023 DB 117	20/06/74	30-34-23	23-58-30	22	alluvium	7.60	777	110.0	208.0	32.0	40.0	1.20	130.0	5.60	130.0		348.0			
G 29630B	3023 DB 208	17/05/74	30-35-18	24-00-51	34	alluvium	7.50	1193	165.0	214.0	78.0	110.0	0.60	366.0	0.00	250.0		285.0			
G 29630B		22/10/74	30-35-18	24-00-51	34	alluvium	7.80	1110	111.0	212.0	70.0	96.0	0.80	364.0	0.00	209.0		260.0			
G 29632	3023 DB 131	12/06/74	30-34-13	23-58-17	25	alluvium	7.80	590	81.0	94.0	49.0	58.0	1.60	101.0	6.30	153.0		335.0			
G 29632		10/10/74	30-34-13	23-58-17	25	alluvium	8.00	543	54.0	65.0	64.0	47.0	0.60	108.0	5.00	58.0		293.0			
G 29637A	3023 DB 197	02/07/74	30-34-14	23-57-51	40	dolerite	7.90	416	62.0	53.0	38.0	49.0	0.40	56.0	5.60	35.0		262.0			
G 29637A		30/09/74	30-34-14	23-57-51	40	dolerite	8.10	387	60.0	56.0	40.0	32.0	0.30	60.0	4.30	46.0		220.0			
G 29637A		04/10/74	30-34-14	23-57-51	40	dolerite	7.80	430	65.0	54.0	44.0	44.0	0.30	66.0	4.30	50.0		250.0			
G 29636		02/07/74	30-34-00	23-57-41	34	alluvium	8.10	754	115.0	156.0	53.0	56.0	0.80	206.0	0.00	70.0		348.0			
G 29647A	3023 DB 229	07/11/74	30-33-16	23-56-13	22	alluvium	7.70	506	50.6	134.0	33.0	21.0	1.00	67.0	0.00			418.0			
G 29648		01/08/74	30-33-02	23-56-24	35	alluvium	7.70	783	120.0	137.0	63.0	66.0	1.00	181.0	0.00			372.0			
G 29652	3023 DB 233	13/02/74	30-33-03	23-55-11	22	alluvium	7.50	764	115.0	158.0	63.0	44.0	1.10	232.0	0.00	83.0		366.0			
G 29652		15/08/74	30-33-03	23-55-11	22	alluvium	7.30	747	112.0	154.0	60.0	46.0	1.20	7.0	7.00	80.0		372.0			

HYDROCHEMICAL DATA : DE AAR

SOURCE OF DATA : VON HOYER ,1976:incomplete SOUTH-EASTERN AREA,DE AAR report

Bh.No.	H No.	DATE	LATITUDE	LONGITUDE	DEPTH	GEOLOGY	pH	TDS	EC	Na+K	Mg	Ca	F	Cl	NO3	SO4	PO4	TAL	Si	NH4
G 27927	3024CA321	01/01/74	30-40-11	24-10-09	22.1	alluvium	7.50	1503	230.0	370.0	98.0	66.0	0.50	728.0	0.00	76.0		329.0		
G 27927		01/01/74	30-40-11	24-10-09	22.1	alluvium	7.30	1505	230.0	377.0	95.0	68.0	0.50	721.0	0.00	82.0		341.0		
G 27933A	3024CA287	01/01/74	30-41-57	24-11-13	19.8	alluvium	8.20	1786	250.0	389.0	147.0	65.0	1.20	358.0	9.00	485.0		665.0		
G 27917E	3024CB78	01/01/74	30-42-28	24-10-56	23	sediments	7.80	767		111.0	61.0	82.0	0.40	230.0	0.00	152.0		262.0		
G 27918C	3024CA183	01/01/74	30-45-50	24-13-11	24.4	sediments	7.90	688		139.0	43.0	48.0	0.80	110.0	74.00	104.0		338.0		
G 28303	3024CC30	01/01/74	30-46-03	24-12-39	21.3	dol cont	7.40	501	65.0	40.0	41.0	76.0	0.50	44.0	102.00	36.0		323.0		
G 28304	3024CA248	01/01/74	30-45-20	24-12-32	25	sediments	7.40	569	75.0	61.0	43.0	79.0	0.60	64.0	87.00	60.0		348.0		
G 28301	3024CC29	01/01/74	30-44-59	24-12-33	24.4	dolerite	7.60	636		108.0	52.0	50.0	0.40	140.0	65.00	62.0		317.0		
G 28301		01/01/74	30-44-59	24-12-33	24.4	dolerite	7.80	765		83.0	69.0	88.0	0.40	202.0	59.00	130.0		268.0		
G 28396	3024CB56	05/11/73					7.40	515	75.0	93.0	44.0	41.0	0.90	51.0	0.00	94.0		384.0		
G 28397	3024CB46	07/11/73					7.40	409	70.0	37.0	38.0	79.0	0.90	46.0	0.00	38.0		437.0		
G 28397		10/11/73					7.30	444	70.0	39.0	37.0	80.0	0.90	43.0	0.00	39.0		412.0		

HYDROCHEMIICAL DATA : DE AAR

SOURCE OF DATA : NATIONAL HYDROCHEMICAL DATABANK (Eastern area,1970-1974)

Bh.No.	H No.	DATE	LATITUDE	LONGITUDE	pH	TDS	EC	Na	Mg	Ca	F	Cl	NO3	SO4	PO4	TAL	Si	K	NH4
	72011742	15/09/72	30-49-00	24-10-00	8.39	397	48.4	29.0	32.0	31.0	1.35	27.0	7.31	28.0	0.00	172.2		6.00	

HYDROCHEMICAL DATA : DE AAR

SOURCE OF DATA : NATIONAL HYDROCHEMICAL DATABANK (Eastern area,1984-1985)

	Bh.No.	H No.	DATE	LATITUDE	LONGITUDE	pH	TDS	EC	Na	Mg	Ca	F	Cl	NO3	SO4	PO4	TAL	Si	K	NH4
	CL 1	84407844	31/10/84	30-43-58	24-17-37	8.19	523	72.8	42.6	27.6	55.7	0.80	43.4	6.49	67.9	0.00	207.3	14.62	3.17	0.03
		84408191	30/10/84	30-43-39	24-18-27	8.31	497	67.8	65.3	23.1	35.2	1.38	53.3	3.27	79.8	0.00	182.8	11.51	1.50	0.05
24CB119	G 23229	84408183	30/10/84	30-43-22	24-19-35	8.60	454	60.0	32.3	28.6	59.4	0.88	24.9	6.07	33.8	0.03	201.3	14.70	1.79	0.05
	G 03783	84408141	30/10/84	30-43-49	24-20-21	8.10	545	65.7	50.5	31.3	42.1	0.94	38.6	4.90	74.9	0.00	231.7	13.92	2.63	0.03
	BE 1	84408167	30/10/84	30-43-37	24-20-37	8.22	502	67.0	55.0	29.3	49.2	1.12	38.3	3.39	59.1	0.00	208.1	13.06	1.37	0.02
24CB116	G 23232	84408175	30/10/84	30-43-26	24-20-05	8.31	638	88.0	84.9	34.8	51.9	1.26	48.0	2.96	94.9	0.00	252.5	15.13	1.65	0.05
	LE 20	84408125	30/10/84	30-43-50	24-22-23	8.10	568	71.2	47.4	35.9	50.3	0.89	39.3	7.42	83.5	0.01	226.3	14.21	1.67	0.03
	RT 3	84408298	05/11/84	30-44-04	24-11-40	8.63	628	97.8	107.7	52.1	20.5	1.11	109.1	14.96	82.6	0.00	150.4	165.65	4.74	0.04
	RN 6	84408028	03/11/84	30-44-42	24-12-28	7.96	588	96.0	64.3	53.9	50.3	0.68	141.2	13.77	85.8	0.00	105.1	198.75	2.67	0.03
24CC29	G 28301	84405444	03/07/84	30-44-59	24-12-31	7.53	787	116.9	52.4	54.1	100.1	0.79	165.9	12.58	90.0	0.01	216.7	15.88	3.19	0.06
	WP 1	84405452	03/07/84	30-44-41	24-12-28	7.61	759	105.6	59.0	47.9	84.0	0.79	134.2	13.26	95.1	0.00	226.8	17.30	2.65	0.04
	S 17	84407828	31/10/84	30-44-23	24-21-30	8.34	624	84.0	56.2	43.6	62.0	0.93	47.5	7.12	98.5	0.01	230.3	13.46	3.14	0.02
	G 06785	84408159	30/10/84	30-44-08	24-21-09	8.45	580	76.0	63.9	31.2	59.4	1.06	34.3	4.13	81.4	0.00	236.3	11.97	2.21	0.02
	SI 6	84435473	30/10/84	30-44-34	24-21-47	8.16	603	88.0	49.8	37.1	67.0	0.96	49.3	11.10	76.3	0.00	221.9	7.41	2.37	0.02
	RN 5	84408010	03/11/84	30-45-10	24-11-21	8.34	524	81.4	75.7	46.9	23.5	0.79	87.3	14.93	87.8	0.01	107.7	156.92	4.55	0.03
	WP 2	84405460	03/07/84	30-45-44	24-12-36	7.72	775	120.4	56.8	54.1	90.3	0.76	165.3	13.66	102.7	0.00	198.7	17.54	2.65	0.04
24CA279	G 28312	84435693	02/11/84	30-45-32	24-13-45	7.79	1512	257.0	252.6	98.6	126.7	1.30	451.6	2.87	285.0	0.00	231.4	13.91	1.24	0.05
24CC27	G 28307	84408044	02/11/84	30-45-30	24-13-51	8.10	571	72.0	44.3	40.7	53.7	0.95	47.4	11.78	68.5	0.00	214.1	18.46	2.52	0.08
	G 27918	84405486	03/07/84	30-45-49	24-13-12	7.58	1832	305.7	258.1	128.1	169.1	0.92	629.8	9.78	350.0	0.00	202.4	14.23	5.68	0.04
4CC27	G 28307	84405494	03/07/84	30-45-30	24-13-52	7.36	389	52.1	39.9	25.6	24.0	0.74	50.3	0.06	39.6	0.00	168.5	3.62	2.92	0.04
	RL 3	84407959	02/11/84	30-45-58	24-14-40	8.48	551	67.2	60.7	36.4	29.2	0.86	47.7	5.24	91.2	0.00	211.9	13.66	3.28	0.03
24CA242	G 28303A	84435708	03/11/84	30-46-04	24-12-35	8.07	636	92.2	39.3	54.3	60.0	0.51	147.6	12.52	76.5	0.01	164.0	13.27	2.67	0.07
24CC30	G 28303	84405478	03/07/84	30-46-03	24-12-36	6.80	389	63.3	29.0	30.5	37.7	0.54	89.3	0.16	58.6	0.01	115.6	2.42	1.97	0.03

HYDROCHEMICAL DATA : DE AAR

SOURCE OF DATA : NATIONAL HYDROCHEMICAL DATABANK (Eastern area,1984-1985)

	Bh.No.	H No.	DATE	LATITUDE	LONGITUDE	pH	TDS	EC	Na	Mg	Ca	F	Cl	NO3	SO4	PO4	TAL	Si	K	NH4
	G 06778	84435847	25/10/84	30-38-01	24-09-10	7.93	1001	153.0	119.0	79.0	92.6	0.62	232.9	0.59	231.0	0.01	199.3	22.65	0.12	0.02
		84435855	25/10/84	30-38-23	24-09-32	8.11	681	103.1	96.9	46.9	46.4	1.28	107.9	3.02	89.0	0.01	229.1	22.24	0.24	0.02
D24CA92	G 18884	84435863	25/10/84	30-38-58	24-09-51	7.93	2241	355.4	351.9	175.4	146.3	0.90	856.6	0.39	508.1	0.01	162.8	24.81	1.80	0.01
D24CA93	G 18880	84435889	25/10/84	30-38-34	24-09-44	7.99	756	116.2	78.8	56.0	80.7	0.90	142.4	1.80	154.3	0.02	191.9	22.87	0.47	0.03
D24CA315	G 18882	84435897	25/10/84	30-38-46	24-09-46	7.87	2253	351.9	299.7	190.7	170.3	0.65	739.8	1.37	635.4	0.01	171.5	25.11	1.70	0.02
D24CA317	G 18886	84435902	25/10/84	30-39-10	24-09-59	8.17	2402	373.0	529.5	119.8	112.2	1.03	809.0	0.05	605.3	0.01	184.0	23.57	1.03	0.01
	CT 3	84407909	31/10/84	30-40-19	24-09-29	8.16	819	123.9	46.3	78.2	87.2	0.21	225.9	6.16	139.2	0.00	175.1	21.80	1.60	0.03
D24CA114	G 27927D	84435685	01/11/84	30-40-05	24-10-13	7.70	2700	462.8	521.2	208.0	159.8	0.93	1248.5	0.39	365.5	0.01	157.0	18.67	2.78	0.02
	CT 2	84407894	31/10/84	30-40-57	24-10-24	8.51	594	78.6	59.4	47.5	39.6	0.59	66.9	6.35	67.2	0.00	232.3	18.65	1.61	0.03
	CT 4	84407917	31/10/84	30-40-25	24-10-52	8.40	698	109.1	50.8	59.2	78.5	0.35	105.4	2.91	126.6	0.00	217.0	22.00	0.00	0.03
D24CA321	G 27927	84405517	03/07/84	30-40-04	24-10-13	7.81	1865	339.3	454.6	102.8	56.6	0.85	884.5	0.00	172.4	0.00	156.3	6.71	2.86	0.04
	G 27927	84405525	03/07/84	30-40-07	24-10-08	7.47	2808	476.1	618.5	179.6	96.0	0.97	1367.9	0.00	345.8	0.06	156.2	2.52	8.54	0.09
	LE 5	84408094	30/10/84	30-40-47	24-20-35	8.05	541	72.0	34.6	34.7	70.2	1.20	35.1	5.69	47.4	0.01	238.6	21.38	1.68	0.03
		84435910	25/10/84	30-40-20	24-21-40	8.02	599	86.0	59.2	37.5	64.7	0.75	59.0	4.00	82.4	0.01	227.0	16.84	0.96	0.01
	LE 11	84408109	30/10/84	30-40-24	24-21-23	7.99	614	83.6	64.8	40.7	58.8	0.89	60.7	3.50	91.4	0.00	229.5	16.17	1.12	0.03
	CT 1	84407860	31/10/84	30-41-04	24-09-39	8.72	452	67.5	23.3	31.0	53.6	0.53	23.0	8.14	49.1	0.00	191.3	21.04	1.69	0.02
	RN 2	84407925	31/10/84	30-41-48	24-09-57	8.10	643	93.3	47.9	45.3	81.1	0.53	92.8	6.27	101.7	0.01	199.6	15.42	2.74	0.03
	RN 1	84408036	03/11/84	30-41-45	24-09-57	8.42	423	51.2	23.2	37.5	25.5	0.43	24.6	11.51	36.8	0.00	181.4	22.53	2.53	0.15
	WP 3	84405541	30/07/84	30-41-04	24-09-25	7.59	541	67.3	22.1	35.8	70.1	0.62	26.3	8.57	32.7	0.00	257.0	20.39	1.68	0.03
	RN 3	84407933	31/10/84	30-41-48	24-10-02	8.25	625	88.3	46.3	46.8	65.3	0.37	106.0	6.22	97.0	0.01	191.1	15.52	2.43	0.02
	LE 9	84435928	25/10/84	30-41-25	24-21-34	8.14	631	86.5	68.3	39.7	59.1	0.77	56.6	3.84	94.2	0.03	241.1	17.10	1.09	0.02
D24CA324	G 27917	84405509	03/07/84	30-42-22	24-10-57	7.64	2496	394.8	265.3	177.8	273.6	0.60	726.9	5.89	779.2	0.00	198.4	14.23	4.27	0.04
		84408002	01/11/84	30-42-17	24-15-58	8.57	664	102.0	74.4	46.4	50.8	0.78	76.7	2.26	106.6	0.00	243.5	16.56	1.76	0.03
		84407975	01/11/84	30-42-34	24-16-42	8.45	697	97.8	116.1	46.4	31.9	0.00	69.5	0.85	117.4	0.00	254.6	15.43	1.74	0.03
		84407991	01/11/84	30-42-34	24-16-05	8.40	692	99.8	91.7	43.7	50.2	0.80	84.3	2.43	118.0	0.00	238.0	14.52	2.13	0.02
	CL 6	84407852	31/10/84	30-42-37	24-17-24	8.51	964	136.5	175.0	57.2	41.8	0.93	141.2	0.56	184.3	0.01	294.4	13.49	2.29	0.02
		84407967	01/11/84	30-42-43	24-17-29	8.80	816	119.6	121.9	51.7	50.5	0.85	111.4	1.99	183.7	0.01	233.1	12.90	2.75	0.03
		84407983	01/11/84	30-42-42	24-17-00	8.28	808	121.1	119.5	47.7	47.9	0.90	120.1	1.21	164.9	0.00	245.6	13.94	2.14	0.02
D24CB56	G 28396	84407836	31/10/84	30-42-50	24-18-35	8.66	855	127.9	121.9	59.8	60.2	0.79	120.4	3.49	164.7	0.01	253.6	14.09	2.29	0.02
		84408133	30/10/84	30-42-19	24-20-06	8.48	428	60.0	21.3	30.8	52.7	0.42	17.2	3.07	45.1	0.00	202.2	24.08	0.68	0.03
	ZN 1	84408206	30/10/84	30-42-32	24-20-54	8.28	584	82.6	65.3	36.6	52.3	0.62	47.9	4.75	74.9	0.00	233.0	17.53	1.08	0.04
	ZN 2	84408214	30/10/84	30-42-43	24-20-54	8.34	562	70.4	60.0	34.8	36.2	0.45	34.2	4.53	72.0	0.01	248.3	17.96	1.47	0.05
	G 06787	84408086	30/10/84	30-42-19	24-21-18	8.10	550	79.0	50.2	37.4	57.7	0.70	48.7	4.53	73.7	0.00	213.5	17.92	0.84	0.02
	LE 18	84408117	30/10/84	30-42-45	24-22-30	8.16	404	49.9	25.5	24.9	38.3	0.75	19.8	6.13	47.8	0.00	178.6	16.16	2.09	0.03

HYDROCHEMICAL DATA : DE AAR

SOURCE OF DATA : NATIONAL HYDROCHEMICAL DATABANK (Eastern area,1987-1989)

	Bh.No.	H No.	DATE	LATITUDE	LONGITUDE	pH	TDS	EC	Na	Mg	Ca	F	Cl	NO3	SO4	PO4	TAL	Si	K	NH4
		87433746	07/02/87	30-47-54	24-23-43	7.75	579	76.0	35.7	30.7	78.1	1.17	30.8	7.70	36.8	0.01	270.6	12.45	1.88	0.02
	SL 2	87443156	18/08/87	30-48-31	24-11-07	7.70	648	82.0	43.2	37.4	76.5	1.04	36.9	19.18	29.5	0.01	272.1	13.09	7.01	0.04
	LN 41	87439827	31/07/87	30-48-56	24-16-51	7.42	775	107.6	63.1	41.9	106.2	1.41	90.3	4.98	121.7	0.02	266.6	15.53	3.39	0.03
	G 38477	88409314	09/08/88	30-48-45	24-17-12	7.61	301	51.2	90.1	1.7	10.1	7.60	90.6	0.11	0.0	0.06	80.5	10.70	1.92	0.06
24CD5	G 38478	88409326	10/08/88	30-48-45	24-17-02	7.55	653	93.5	94.7	22.2	65.9	2.95	77.7	4.96	77.5	0.05	235.4	13.29	3.02	0.04
	G 38478	88409338	10/08/88	30-48-45	24-17-02	7.69	592	82.9	105.7	14.3	43.7	1.46	63.1	3.90	59.8	0.04	226.9	10.22	9.80	0.04
24CD10	G 38492	88409363	17/08/88	30-48-32	24-17-15	7.83	774	104.7	114.2	33.0	57.3	1.96	77.8	6.06	111.1	0.04	274.4	8.79	17.57	0.04
24CD12	G 38494	88409375	17/08/88	30-48-32	24-17-15	7.75	830	115.6	120.4	43.9	60.9	1.54	97.5	5.57	150.9	0.02	261.6	11.12	10.85	0.04
	G 38476	88409764	08/08/88	30-48-45	24-17-02	8.23	605	89.8	73.5	32.3	51.6	1.47	75.8	7.08	91.8	0.04	193.0	9.99	11.31	0.09
	RD X	87433760	07/02/87	30-48-50	24-18-09	7.70	713	95.0	62.4	40.5	82.3	1.21	63.0	5.28	75.9	0.01	296.2	14.19	2.86	0.03
	LN X	87433722	07/02/87	30-48-50	24-20-41	7.60	375	50.3	20.1	19.6	51.1	1.08	6.3	4.10	11.6	0.03	200.1	10.40	2.54	0.02
		87433758	07/02/87	30-48-34	24-22-15	7.80	609	81.0	46.9	29.6	80.6	1.03	42.3	6.71	45.7	0.01	271.5	12.23	2.54	0.04
		87433734	07/02/87	30-48-18	24-25-05	7.70	454	61.1	22.5	25.7	61.9	1.19	14.2	9.94	17.6	0.01	215.9	11.26	3.30	0.03
24CC14	G 38451	88408425	15/07/88	30-49-33	24-11-02	7.11	3266	524.0	1023.5	66.8	38.6	1.57	1036.5	1.81	825.9	0.03	202.5	6.82	18.26	0.05
	CF 48	87439876	19/07/87	30-49-42	24-16-48	7.58	653	85.2	37.7	37.5	92.3	1.24	45.8	6.69	75.3	0.01	271.0	13.35	3.23	0.03
	RE 20	87439840	05/08/87	30-49-50	24-17-50	7.70	625	78.4	43.4	39.6	74.7	1.26	30.8	5.11	49.1	0.01	296.8	17.55	1.21	0.04
	RE 16	87439864	05/08/87	30-49-57	24-18-25	7.50	609	78.8	44.7	35.4	76.4	1.22	38.9	5.55	60.3	0.02	266.5	17.13	2.20	0.07
	LN 2	87439918	23/07/87	30-49-17	24-19-45	7.28	507	66.4	32.0	25.2	71.6	1.42	27.9	5.48	30.8	0.01	235.6	10.35	5.38	0.88
	BN 5	87439852	05/08/87	30-50-51	24-14-36	7.74	660	88.0	38.2	39.4	91.7	1.16	56.9	14.07	52.3	0.01	257.8	15.21	3.49	0.03
	BN 3	87439906	31/07/87	30-50-49	24-14-11	7.50	768	106.0	121.3	44.3	44.0	1.40	69.8	1.86	133.6	0.01	281.4	10.81	2.14	0.03
	BN 1	87439815	05/08/87	30-50-28	24-16-16	7.60	4595	684.0	551.2	318.5	601.2	0.78	1847.4	3.88	1067.9	0.01	146.2	10.82	12.38	0.04
	RE 1	87439888	30/07/87	30-50-55	24-16-25	7.57	4870	708.0	741.5	313.3	498.3	0.95	1855.0	0.19	1237.8	0.01	178.8	8.30	4.67	0.02
	CP 5	87434908	24/03/87	30-38-04	24-05-55	7.68	1319	204.8	101.1	95.6	176.1	0.56	300.1	2.57	314.9	0.01	258.5	19.02	4.19	0.03
	HK 4	87443144	24/08/87	30-46-35	24-04-50	7.80	470	62.7	24.4	29.8	60.2	0.62	19.1	5.33	25.8	0.01	234.0	23.55	1.52	0.04

HYDROCHEMICAL DATA : DE AAR

SOURCE OF DATA : NATIONAL HYDROCHEMICAL DATABANK (Eastern area,1987-1989)

	Bh.No.	H No.	DATE	LATITUDE	LONGITUDE	pH	TDS	EC	Na	Mg	Ca	F	Cl	NO3	SO4	PO4	TAL	Si	K	NH4
	G 38226	87446303	18/12/87	30-45-37	24-13-53	7.72	695	110.5	214.2	2.3	9.7	3.67	167.1	0.08	89.7	0.07	162.3	7.00	9.74	0.02
	G 38224	87446315	14/12/87	30-45-37	24-13-53	7.86	873	133.4	220.0	17.5	35.4	2.33	201.7	0.04	124.9	0.02	218.2	8.81	4.38	0.01
	G 38233	88401704	13/01/88	30-45-32	24-13-41	7.65	715	108.5	153.2	12.1	40.1	3.81	145.9	0.05	68.0	0.02	220.0	12.32	22.94	0.03
	G 38227	88401728	06/01/88	30-45-37	24-13-53	7.79	1097	167.3	290.4	9.8	35.5	1.64	256.1	0.14	191.0	0.02	226.3	5.21	35.67	0.03
	RN 1	87439773	24/07/87	30-45-17	24-14-13	7.53	860	116.0	60.4	58.6	106.3	1.19	95.9	5.00	88.2	0.01	348.1	19.91	2.40	0.05
	G 38230	88401716	11/01/88	30-45-47	24-14-04	7.62	937	143.0	148.3	38.9	80.5	1.16	206.4	3.50	175.1	0.04	203.9	7.59	21.94	0.02
	G 38229	88401730	08/01/88	30-45-47	24-14-04	7.59	968	154.0	242.6	18.4	53.9	0.80	248.6	0.09	216.3	0.01	151.6	8.20	2.24	0.19
	RL 23	87443090	20/08/87	30-46-02	24-08-57	7.60	543	67.0	33.1	32.1	68.2	0.66	30.3	10.04	33.1	0.01	244.6	17.18	2.95	0.03
		87433783	08/02/87	30-46-20	24-10-53	7.70	632	83.4	34.1	39.0	79.1	0.81	37.7	16.17	36.6	0.01	269.3	15.61	4.45	0.04
	RN 21	87443132	20/08/87	30-46-18	24-10-52	7.80	655	83.0	41.1	39.3	80.9	0.97	42.3	15.27	42.3	0.00	275.0	15.62	4.69	0.04
	G 38234	88401686	19/01/88	30-46-07	24-12-32	7.62	707	115.5	45.4	52.3	95.0	0.94	160.8	5.54	103.3	0.01	175.9	15.11	10.27	0.02
	G 38234	88401698	19/01/88	30-46-07	24-12-32	7.34	613	100.8	56.2	36.0	72.9	2.32	138.3	3.51	84.5	0.01	153.3	12.01	20.28	0.02
	RL 2	87433631	06/02/87	30-46-04	24-13-26	7.70	3000	455.0	563.1	189.0	185.3	1.07	888.3	5.48	811.6	0.01	272.3	13.97	5.10	0.04
	G 27918	87433643	06/02/87	30-46-49	24-13-11	7.70	2777	435.2	448.7	188.4	232.7	0.95	910.8	5.05	671.5	0.01	241.9	13.75	6.45	0.03
	G 27918	88402721	19/01/88	30-46-04	24-13-26	8.04	2594	415.3	415.5	166.9	205.9	0.96	865.8	4.56	637.6	0.01	226.9	14.89	4.54	0.10
D24CC 19	G 38505	88411862	06/09/88	30-46-09	24-14-47	7.40	514	63.0	43.9	31.3	46.5	1.08	36.4	4.11	46.0	0.02	235.0	13.11	3.95	0.04
	G 38509	88411874	08/09/88	30-46-09	24-14-47	7.60	692	87.0	119.1	26.8	33.9	1.22	62.0	0.71	70.8	0.03	291.9	9.32	18.75	0.03
024CD15	G 38497	88409387	18/08/88	30-46-27	24-15-21	7.80	996	149.4	109.0	71.0	94.0	0.80	189.8	1.74	233.9	0.02	230.6	11.20	8.10	0.04
024CD16	G 38498	88409399	20/08/88	30-46-35	24-15-25	7.69	1094	160.7	114.2	82.7	105.9	0.69	276.1	1.64	238.6	0.03	215.9	16.23	5.27	0.04
024CD20	G 38502	88409417	23/08/88	30-46-50	24-15-32	7.72	2709	395.4	506.8	111.3	186.5	1.29	772.8	3.61	892.6	0.06	131.4	7.42	60.77	0.06
24CD 21	G 38503	88409429	23/08/88	30-46-50	24-15-32	7.75	4952	730.2	954.3	315.7	243.3	1.55	1538.4	0.11	1592.9	0.06	233.8	9.11	19.73	0.06
024CD22	G 38270	88402708	02/02/88	30-46-11	24-21-43	8.01	553	75.8	50.4	23.9	59.6	0.92	27.1	4.54	25.1	0.02	272.8	10.00	12.86	0.05
024CB 111	G 38272	88408528	29/03/88	30-46-11	24-21-43	7.72	445	64.4	61.1	22.4	20.2	1.30	22.4	6.28	35.2	0.01	196.8	9.56	15.01	0.02
	HK 17	87443168	24/08/87	30-47-33	24-08-38	7.90	724	97.0	60.8	46.1	80.1	0.86	84.9	10.01	68.5	0.00	274.7	17.45	3.79	0.04
	LN 33	87439920	24/07/87	30-47-30	24-14-48	7.59	3966	597.8	478.0	272.4	478.3	0.87	1255.0	4.54	1215.4	0.01	194.2	11.78	9.28	0.05
	G 38501	88409405	22/08/88	30-47-00	24-15-35	7.80	3060	450.7	818.4	84.5	100.3	1.78	756.7	0.52	1011.2	0.06	227.9	7.90	7.07	0.05
	BH 738	87435020	24/03/87	30-47-45	24-17-13	7.77	1180	176.0	164.7	73.4	86.9	1.06	192.9	1.50	227.5	0.01	348.9	16.23	1.02	0.03
024CD 9	G 38491	88409340	16/08/88	30-47-45	24-17-11	7.69	855	125.0	116.0	55.1	60.8	1.20	137.0	3.06	152.9	0.03	255.2	13.09	6.68	0.04
	G 38491	88409351	16/08/88	30-47-45	24-17-11	7.91	883	121.6	112.1	51.6	68.1	1.36	109.4	0.31	118.6	0.04	334.6	10.39	12.56	0.08
		87433710	07/02/87	30-47-54	24-19-49	7.70	651	88.4	59.3	36.2	70.3	0.99	45.9	8.02	49.8	0.01	287.2	15.18	2.49	0.02

HYDROCHEMICAL DATA : DE AAR

SOURCE OF DATA : NATIONAL HYDROCHEMICAL DATABANK (Eastern area,1987-1989)

	Bh.No.	H No.	DATE	LATITUDE	LONGITUDE	pH	TDS	EC	Na	Mg	Ca	F	Cl	NO3	SO4	PO4	TAL	Si	K	NH4
024CA398	G 38471	88409788	03/08/88	30-43-35	24-13-10	8.48	1015	153.3	113.7	69.0	100.0	1.05	224.0	3.56	178.3	0.04	246.5	10.83	12.72	0.07
024CA395	G 38468	88409790	27/07/88	30-43-32	24-13-08	8.09	1485	239.6	163.9	116.6	140.8	0.96	384.9	3.20	399.9	0.05	211.7	10.75	5.60	0.06
	KF 3	87433291	04/02/87	30-43-45	24-17-26	7.79	766	102.8	119.4	40.1	45.6	1.02	66.0	0.27	74.8	0.01	341.2	14.02	1.99	0.01
024CB 119	G 23229	87433230	04/02/87	30-43-21	24-19-35	7.68	838	108.0	107.1	50.4	54.4	0.94	54.2	2.00	161.1	0.01	326.4	13.66	2.49	0.01
	G 6783	87433205	04/02/87	30-43-49	24-20-23	7.85	595	74.2	46.4	29.8	70.2	1.07	29.9	3.93	53.0	0.01	282.3	12.38	2.73	0.20
024CB 116	G 23232	87433229	04/02/87	30-43-24	24-20-04	7.91	873	111.4	105.0	51.9	64.5	1.12	50.5	1.59	170.5	0.07	344.6	14.29	1.92	0.21
	RT 3	87433849	06/02/87	30-44-56	24-11-41	7.70	853	118.0	107.6	51.2	66.0	1.16	115.6	12.31	87.3	0.01	299.5	12.99	4.39	0.01
	RT 3	87435019	24/03/87	30-44-02	24-11-39	7.42	781	122.0	127.7	42.2	45.8	1.35	143.8	2.00	113.9	0.13	235.9	6.51	9.37	0.02
	RN 6	87433813	06/02/87	30-44-15	24-12-32	7.70	964	138.0	84.4	62.8	115.3	0.63	158.9	8.95	131.0	0.01	302.6	16.93	2.75	0.02
	G 38235	88401674	20/01/88	30-44-41	24-12-28	7.31	413	68.7	106.3	2.8	17.6	4.71	109.3	0.02	13.4	0.01	123.2	6.69	8.83	0.00
	RNT	88402745	19/01/88	30-44-48	24-12-34	8.61	341	67.5	119.4	0.3	3.7	6.91	135.6	0.22	11.6	0.01	50.8	15.20	0.27	0.45
024CC 29	G 28301	88402770	19/01/88	30-44-57	24-12-32	7.79	851	132.7	58.7	58.7	112.1	0.68	190.2	11.36	118.1	0.01	212.5	17.27	3.08	0.04
	G 38263	88401741	28/01/88	30-44-32	24-14-34	7.54	3231	511.8	650.2	156.5	214.0	1.62	1223.1	0.13	798.5	0.02	119.4	9.22	39.61	0.88
	SI 6	87433187	04/02/87	30-44-29	24-21-49	7.79	656	84.0	51.7	33.8	77.6	0.97	42.2	8.02	63.0	0.01	286.0	11.53	2.86	0.01
	SI 7	87433199	04/02/87	30-44-41	24-21-34	7.82	798	103.6	63.7	45.5	90.4	1.13	61.6	5.10	86.8	0.02	347.3	11.73	3.20	0.01
	G 6785	87433217	04/02/87	30-44-06	24-21-13	7.88	833	111.8	78.9	44.2	92.5	1.01	83.3	5.87	113.5	0.01	319.9	11.12	3.07	0.01
	G 28267	88401753	02/02/88	30-44-52	24-22-02	7.82	563	76.4	47.3	30.6	50.9	1.04	36.5	8.52	48.8	0.01	238.9	11.49	18.64	0.04
	G 38269	88401765	03/02/88	30-44-52	24-22-02	7.82	572	78.3	48.8	29.7	67.1	1.21	32.4	6.36	60.8	0.01	244.4	11.70	6.25	0.01
024CB 110	G 38267	88402691	20/01/88	30-44-52	24-22-02	7.74	460	66.0	50.4	20.2	44.6	0.91	32.4	7.16	45.9	0.02	188.7	9.31	3.98	0.06
	HK 23	87443107	24/08/87	30-45-51	24-06-23	7.60	547	67.0	32.5	35.2	65.8	0.63	26.3	1.82	38.0	0.00	278.1	21.83	1.60	0.03
	RT B	87433795	08/02/87	30-45-08	24-10-23	7.70	807	111.0	78.1	47.6	85.2	0.77	98.9	11.06	85.6	0.01	294.1	13.86	3.03	0.01
	RN 28	87443170	20/08/87	30-45-16	24-10-40	8.55	705	85.0	77.5	48.9	56.8	0.56	103.0	12.08	89.4	0.01	222.9	16.43	3.74	0.08
024CA 248	G 28304	87433620	06/02/87	30-45-25	24-12-24	7.50	867	134.0	57.3	62.9	115.3	0.68	175.4	12.36	111.3	0.04	234.5	16.71	2.97	0.08
	BK 2	87433801	09/02/87	30-45-55	24-12-32	7.50	522	67.6	35.2	31.0	61.9	0.52	22.5	5.20	31.5	0.06	257.8	19.33	1.40	0.02
	G 28304	88402710	19/01/88	30-45-25	24-12-24	7.98	859	134.2	51.8	60.0	117.8	0.63	188.0	11.13	124.1	0.01	217.0	17.49	3.00	0.01
	G 36428	87446250	03/12/87	30-45-42	24-13-24	7.81	942	148.3	277.7	10.7	19.6	4.27	280.9	1.97	75.4	0.04	213.3	8.12	4.78	0.03
	G 36428	87446261	03/12/87	30-45-42	24-13-24	7.58	1253	207.1	337.7	18.2	53.0	3.56	359.7	0.17	123.2	0.04	286.4	11.43	7.28	0.06
	G 38223	87446273	08/12/87	30-45-42	24-13-24	7.72	1583	259.1	452.1	29.3	35.8	3.25	471.4	0.08	232.3	0.06	289.3	8.80	5.98	0.04
	G 38224	87446285	10/12/87	30-45-37	24-13-53	7.72	932	142.3	205.5	30.4	47.0	2.15	208.1	0.00	199.3	0.00	190.7	7.65	6.53	0.03
	G 38224	87446297	10/12/87	30-45-37	24-13-53	7.86	871	132.8	216.0	19.2	38.9	2.43	193.8	0.08	124.6	0.02	224.6	9.09	1.55	0.04

HYDROCHEMICAL DATA : DE AAR

SOURCE OF DATA : NATIONAL HYDROCHEMICAL DATABANK (Eastern area,1987-1989)

	Bh.No.	H No.	DATE	LATITUDE	LONGITUDE	pH	TDS	EC	Na	Mg	Ca	F	Cl	NO3	SO4	PO4	TAL	Si	K	NH4
3024CA 377	G 38445	88408449	13/07/88	30-41-18	24-10-43	7.00	4915	760.0	1231.8	263.6	90.4	1.90	1560.6	0.13	1326.1	0.06	358.8	12.48	2.00	0.02
	G 38445	88408462	13/07/88	30-41-18	24-10-43	7.33	4823	734.6	1168.5	277.8	84.8	2.36	1461.9	0.64	1454.4	0.04	283.5	6.09	24.93	0.03
	G 38444	88408486	12/07/88	30-41-18	24-10-43	7.30	5713	878.1	1746.2	162.2	57.4	2.52	1925.6	0.08	1208.5	0.18	496.4	11.11	4.53	0.01
	RD 15	87435007	24/03/87	30-41-18	24-12-57	7.48	1049	154.0	116.5	74.0	91.2	0.79	156.8	0.67	170.3	0.01	356.5	23.77	1.74	0.02
	LE 9	87433278	04/02/87	30-41-18	24-21-38	7.85	639	82.0	66.3	34.9	59.6	0.59	42.8	3.24	56.7	0.01	297.2	15.07	1.19	0.03
3024CA324	G 27917	87433825	06/02/87	30-42-23	24-10-42	7.60	3509	522.9	486.1	235.7	358.2	0.67	1109.7	3.53	927.9	0.01	300.6	13.54	8.04	0.02
	RT 4	87433837	06/02/87	30-42-29	24-10-18	7.70	737	101.6	41.4	46.8	101.3	0.43	98.0	6.15	78.2	0.03	280.4	14.85	1.56	0.01
	G 27917	88402733	19/01/88	30-42-23	24-10-42	7.87	3634	582.8	554.4	229.4	324.9	0.75	1177.5	2.74	1051.6	0.01	226.9	14.38	6.54	0.06
	BF 14	87439797	24/07/87	30-42-55	24-12-25	7.81	1651	226.6	277.3	105.8	90.6	1.37	303.3	1.69	320.8	0.01	445.9	20.10	0.86	0.04
	G 38454	88408413	19/07/88	30-42-55	24-12-53	6.94	1614	255.6	277.9	106.1	94.3	0.98	412.0	2.07	332.6	0.02	310.3	15.60	2.30	0.02
3024CA406	G 38518	88411886	13/09/88	30-42-18	24-12-24	7.60	2072	284.8	472.6	89.2	62.8	1.34	457.8	1.18	502.1	0.06	377.4	8.22	20.21	0.05
	G 38518	88411898	13/09/88	30-42-18	24-12-24	7.20	1905	275.2	480.0	77.3	42.9	1.46	457.7	0.97	510.0	0.06	265.4	9.22	7.71	0.07
	BF 6	88411965	29/09/88	30-42-20	24-13-53	7.50	1501	217.6	218.2	102.3	97.5	1.40	378.5	0.03	478.5	0.07	153.8	9.32	36.95	0.08
3024CA408	G 38520	88411904	27/09/88	30-42-53	24-14-08	7.50	1119	174.0	274.5	15.2	57.7	1.04	273.7	0.03	297.9	0.04	146.5	6.44	19.69	0.10
3024CA409	G 38521	88411916	28/09/88	30-42-53	24-14-08	7.70	1786	243.2	295.7	91.1	110.3	1.10	439.4	0.02	538.8	0.03	215.9	11.32	46.54	0.04
3024CA 412	G 38524	88411928	29/09/88	30-42-53	24-14-08	7.05	1498	211.2	199.4	113.4	106.8	0.86	387.6	1.22	467.7	0.04	169.8	8.12	10.07	0.09
	G 38425	88411930	30/09/88	30-42-53	24-14-08	7.70	619	87.0	172.7	2.8	15.1	1.29	125.0	0.02	109.4	0.10	152.3	6.83	6.21	0.07
3024CA 416	G 38528	88411941	04/10/88	30-42-27	24-14-21	7.65	568	70.0	137.1	7.0	11.5	1.00	61.2	0.02	53.5	0.10	224.2	8.92	23.06	0.06
	G 38528	88411953	05/10/88	30-42-27	24-14-21	7.40	1193	172.8	258.4	28.1	57.4	0.97	309.3	0.03	325.0	0.11	127.1	5.65	58.53	0.10
	ZN 1	87439890	22/07/87	30-42-47	24-18-10	7.38	951	128.8	129.8	63.7	65.0	1.17	103.1	0.03	153.6	0.02	354.5	14.57	2.03	0.05
	ZN 1	87433266	04/02/87	30-42-32	24-20-54	7.82	733	97.0	69.6	41.6	74.7	0.56	64.2	10.68	75.4	0.01	293.5	15.06	1.55	0.02
	ZN 10	87433242	04/02/87	30-42-16	24-21-24	7.79	615	80.0	60.4	34.8	60.4	0.62	46.3	3.94	50.9	0.01	281.5	14.95	1.33	0.02
	G 67870	87433254	04/02/87	30-42-21	24-21-19	7.73	620	80.0	58.5	36.2	61.2	0.54	45.8	1.88	56.3	0.02	288.0	16.89	1.67	0.02
		87433618	06/02/87	30-43-34	24-10-49	7.00	301	43.8	54.7	7.1	18.8	4.18	36.1	0.10	4.7	0.01	141.1	7.46	0.59	2.02
3024 CA76	G 38459	88408504	21/07/88	30-43-27	24-11-54	7.16	757	114.4	192.3	20.8	21.6	3.16	156.7	0.26	108.4	0.02	206.5	10.04	1.24	0.01
	G 38459	88408516	21/07/88	30-43-27	24-11-54	7.19	632	99.2	160.6	16.2	22.8	3.72	163.7	0.08	28.7	0.02	192.4	10.62	0.79	0.08
	G 38263	88409752	26/07/88	30-43-27	24-11-54	8.12	1078	160.5	222.6	41.5	62.1	2.85	237.6	0.12	132.5	0.05	305.8	12.21	4.95	0.04
	G 38274	88409739	04/08/88	30-43-35	24-13-10	8.25	1290	219.6	191.4	63.8	125.6	0.84	353.8	1.81	308.5	0.05	166.4	6.75	34.56	0.10
	G 38466	88409740	26/07/88	30-43-32	24-13-08	8.31	1102	157.7	135.1	68.0	83.2	1.07	186.0	4.72	226.3	0.05	295.1	10.26	21.27	0.09
024CA394	G 38467	88409776	27/07/88	30-43-32	24-13-08	8.28	1339	215.1	150.9	102.0	121.7	1.05	297.7	2.71	333.5	0.05	254.9	12.87	9.18	0.11

HYDROCHEMICAL DATA : DE AAR

SOURCE OF DATA : NATIONAL HYDROCHEMICAL DATABANK (Eastern area,1987-1989)

Bh.No.	H No.	DATE	LATITUDE	LONGITUDE	pH	TDS	EC	Na	Mg	Ca	F	Cl	NO3	SO4	PO4	TAL	Si	K	NH4
CP 1	87434880	24/03/87	30-37-36	24-07-28	7.80	3508	553.6	826.2	165.0	135.1	0.98	1108.5	0.20	782.0	0.07	396.0	15.49	5.90	0.28
CP 3	87434891	24/03/87	30-37-31	24-07-39	7.62	584	76.0	46.4	32.7	67.3	0.72	30.7	1.26	32.7	0.01	300.0	16.75	1.65	0.02
	87433709	07/02/87	30-37-20	24-22-08	7.70	472	62.1	45.8	22.1	49.9	0.53	15.9	2.71	10.8	0.01	257.5	10.94	0.91	0.03
CP 8	87434866	24/03/87	30-38-11	24-09-44	7.80	1349	208.0	138.1	115.3	123.9	0.59	312.8	2.03	296.9	0.01	288.2	25.00	1.19	0.02
BH 3	87434910	24/03/87	30-38-01	24-09-50	7.68	1113	176.0	125.6	84.8	98.8	0.59	243.4	0.09	236.4	0.01	264.3	21.72	0.70	0.04
BH 9	87434921	24/03/87	30-38-56	24-09-50	7.77	2056	326.4	347.6	136.1	135.4	0.64	615.1	0.14	440.1	0.01	310.0	23.77	2.89	0.02
BH 2	87434933	24/03/87	30-38-07	24-09-40	7.68	768	115.0	99.7	49.0	57.9	1.16	125.9	1.08	86.1	0.00	280.9	21.60	0.46	0.02
BH 8	87434945	24/03/87	30-38-44	24-09-44	7.80	2266	352.0	381.2	147.9	150.1	0.44	611.3	0.61	554.1	0.00	342.0	23.80	1.67	0.03
BH 4	87434957	24/03/87	30-38-26	24-09-21	7.08	213	34.2	29.6	8.8	19.1	0.23	24.2	0.10	35.7	0.31	74.6	5.30	3.15	0.02
BH 5	87434969	24/03/87	30-38-24	24-09-19	7.54	1030	160.0	118.7	72.7	91.7	0.76	214.6	0.40	157.4	0.02	304.7	23.44	0.68	0.02
G 06779	88412714	02/12/88	30-38-23	24-09-34	7.40	776	103.0	96.6	50.0	59.2	1.26	94.7	2.54	92.7	0.05	303.4	21.50	0.50	0.04
3024CA93 G 18880	88412726	02/12/88	30-38-33	24-09-47	7.40	1161	174.0	97.3	85.8	132.1	0.77	274.0	2.16	208.3	0.07	289.2	22.02	0.49	0.02
3024CA315 G 18882	88412738	02/12/88	30-38-45	24-09-49	7.40	3134	467.2	397.1	261.7	270.9	0.36	954.0	0.31	807.7	0.03	359.2	24.48	2.70	0.02
3024CA92 G 18884	88412740	02/12/88	30-38-57	24-09-54	7.40	2158	313.6	378.5	143.6	129.5	0.67	598.2	0.51	454.5	0.03	368.9	24.08	1.31	0.02
G 18881	88412763	02/12/88	30-38-40	24-09-34	7.80	3919	550.0	888.5	256.4	104.2	0.46	1306.9	0.08	960.5	0.05	327.8	24.77	1.43	0.01
G 06778	88412775	02/12/88	30-38-01	24-09-50	7.50	958	134.0	111.0	69.9	78.8	0.68	155.7	0.34	150.2	0.02	319.8	21.72	0.24	0.01
NO 4	88412787	02/12/88	30-38-29	24-09-20	7.60	973	130.0	122.8	65.3	69.0	1.11	146.0	0.12	90.7	0.07	390.5	17.99	1.20	0.01
NO 5	88412799	02/12/88	30-38-25	24-09-21	7.30	1637	256.0	185.5	144.9	139.0	0.75	474.5	0.54	360.0	0.06	270.0	23.81	0.41	0.02
	87433680	07/02/87	30-38-37	24-20-00	7.75	608	82.2	24.7	48.3	76.0	0.35	46.5	0.74	53.8	0.01	291.0	25.73	0.27	0.03
	87433692	07/02/87	30-38-11	24-21-51	7.60	562	73.0	45.2	33.5	59.8	0.56	24.4	4.05	34.0	0.01	283.3	15.61	0.97	0.02
3024CA317 G 18886	88412751	02/12/88	30-39-08	24-10-01	7.70	1503	188.8	333.0	51.4	53.8	1.16	189.8	0.77	313.1	0.05	456.4	23.02	0.79	0.01
RD 13	87434994	24/03/87	30-39-54	24-13-23	7.65	743	105.0	24.4	58.9	101.2	0.41	71.1	3.31	82.9	0.01	316.8	25.91	3.25	0.02
	87433679	07/02/87	30-39-45	24-20-24	7.80	672	86.0	83.0	38.0	49.6	0.61	33.9	2.62	58.3	0.02	324.7	16.16	0.70	0.03
CT 3	87434982	24/03/87	30-40-22	24-09-32	7.60	1068	184.0	43.0	90.9	168.2	0.33	324.6	3.40	186.1	0.01	195.0	21.29	1.86	0.03
CT 2	87433412	06/02/87	30-40-57	24-10-24	7.82	649	84.0	49.4	38.5	67.3	0.77	52.5	6.86	50.8	0.01	293.0	17.21	1.68	0.01
CT 4	87433667	07/02/87	30-40-28	24-10-57	7.60	795	117.8	45.5	62.2	99.0	0.41	136.5	3.92	108.7	0.08	265.4	21.59	1.40	0.04
3024CA 321 G 27927	88402757	19/01/88	30-40-00	24-10-11	7.85	3560	611.3	764.2	240.9	124.9	1.19	1474.9	0.22	631.4	0.02	259.2	19.84	5.17	0.09
3024CA321 G 27927	88402769	19/01/88	30-40-07	24-10-04	7.82	3047	484.8	486.1	237.1	183.5	0.76	1128.0	0.22	685.8	0.01	266.5	21.03	0.13	0.05
G 38274	88408450	06/07/88	30-40-56	24-10-59	7.08	4117	619.3	1081.2	147.4	90.2	1.93	1072.9	0.17	1088.3	0.03	517.7	9.46	3.31	0.02
3024CA373 G 38441	88408474	12/07/88	30-40-56	24-10-59	6.94	1891	312.6	442.2	48.0	142.2	1.71	649.5	0.13	383.6	0.06	180.9	10.52	2.76	0.02
G 38274	88408498	06/07/88	30-40-56	24-10-59	7.25	3921	606.6	1065.1	147.4	65.9	2.26	1043.9	0.03	1039.1	0.03	456.6	9.94	0.00	0.01
CT 1	87433655	07/02/87	30-41-02	24-09-36	7.65	512	68.0	22.2	34.8	63.9	0.57	22.0	8.82	25.9	0.01	247.5	19.44	1.51	0.01
RF 20	87434970	24/03/87	30-41-45	24-10-45	7.71	4037	600.0	805.6	274.8	170.7	1.32	1258.5	1.01	1035.2	0.02	395.9	18.83	3.21	0.02
G 38446	88408437	14/07/88	30-41-18	24-10-43	7.08	4890	743.8	1186.9	270.9	118.4	1.50	1601.3	0.50	1251.2	0.04	366.3	11.79	11.10	0.02

HYDROCHEMICAL DATA : DE AAR

SOURCE OF DATA : NATIONAL HYDROCHEMICAL DATABANKANK (Western area,1980-1983)

Bh.No.	H No.	DATE	LATITUDE	LONGITUDE	pH	TDS	EC	Na	Mg	Ca	F	Cl	NO3	SO4	PO4	TAL	Si	K	NH4
SPF	81407382	24/03/81	30-35-00	23-47-30	8.40	350	68.6	120.6	0.8	0.4	10.22	138.3	0.41	18.1	0.01	48.6	13.77	0.41	0.19

HYDROCHEMISTRY DATA : DE AAR

SOURCE OF DATA : NATIONAL HYDROCHEMISTRY DATABANK (Western area,1984-1985)

	Bh.No.	H No.	DATE	LATITUDE	LONGITUDE	pH	TDS	EC	Na	Mg	Ca	F	Cl	NO3	SO4	PO4	TAL	Si	K	NH4
3023DB151	G 36515	85406435	01/04/85	30-42-00	23-52-39	8.09	640	94.5	65.0	57.9	25.9	0.66	115.0	0.02	95.6	0.02	227.9	18.27	2.18	0.04
3023DB95	G 23205F	84407721	31/10/84	30-42-04	23-53-44	8.31	939	148.8	140.1	61.9	63.6	0.45	193.8	2.55	187.6	0.01	228.5	24.04	1.82	0.03
3023DB130	G 23202A	84407810	01/11/84	30-43-23	23-54-39	8.57	834	120.7	203.5	18.3	23.8	0.80	86.6	4.24	117.4	0.01	298.8	21.71	0.54	0.02
3023DB118	G 27702G	84408353	06/11/84	30-43-19	23-54-13	8.28	1050	146.0	184.5	62.2	43.2	0.50	193.4	30.57	169.2	0.00	213.6	23.71	1.06	0.04
	G 36482	85406126	04/03/85	30-39-45	23-55-53	7.70	242	35.8	61.3	3.3	8.8	6.71	26.6	0.45	7.8	0.00	95.7	4.76	8.43	0.05
3023DB167	G 36483	85406134	07/03/85	30-39-43	23-55-45	8.00	512	73.5	32.2	40.6	54.0	0.72	49.9	9.63	69.9	0.00	174.3	16.07	8.90	0.30
	G 36483	85406142	07/03/85	30-39-43	23-55-45	8.00	528	75.8	34.8	37.5	64.8	0.78	46.4	7.01	51.4	0.00	209.5	15.76	6.07	0.05
	G 36483	85406150	08/03/85	30-39-43	23-55-44	8.00	510	71.9	34.8	41.5	55.2	0.66	56.4	9.19	65.4	0.00	171.9	15.87	5.47	0.12
3023DB172	G 36484	85406168	08/03/85	30-39-43	23-55-34	8.00	462	68.6	42.5	32.3	36.9	0.88	57.9	8.29	54.7	0.00	148.1	13.15	19.06	0.05
	G 36485	85406176	08/03/85	30-39-49+	23-55-35	8.00	491	68.9	32.2	39.8	53.2	0.49	49.2	7.91	61.6	0.00	176.7	17.31	3.69	0.08
3023DB109	G 23203A	84435520	26/10/84	30-43-14	23-45-10	8.07	1323	190.2	273.2	69.8	47.7	0.45	236.1	0.00	283.8	0.01	337.4	22.73	0.39	0.01
	ZS 1	84408222	31/10/84	30-43-53	23-55-24	8.13	683	89.3	57.8	44.2	61.8	0.47	83.0	9.79	87.7	0.00	248.3	22.27	1.63	0.03

HYDROCHEMISTRY DATA : DE AAR

SOURCE OF DATA : NATIONAL HYDROCHEMISTRY DATABANK (Western area,1984-1985)

	Bh.No.	H No.	DATE	LATITUDE	LONGITUDE	pH	TDS	EC	Na	Mg	Ca	F	Cl	NO3	SO4	PO4	TAL	Si	K	NH4
	BN 2	84408078	30/10/84	30-37-28	23-52-57	6.88	270	39.0	70.0	1.3	8.4	0.00	73.1	1.05	14.8	0.00	78.3	10.14	2.38	0.03
3023DB161	G 36477	85406100	27/02/85	30-37-34	23-53-37	7.90	556	79.3	45.9	36.0	62.4	0.88	55.6	5.60	57.1	0.00	217.8	10.41	7.25	0.06
	BN 1	84408450	30/10/84	30-38-54	23-50-57	8.31	569	77.8	46.0	48.1	41.3	0.41	106.5	9.12	59.1	0.01	185.1	21.62	1.68	0.01
3023DB67	G 28402	84435546	30/10/84	30-38-13	23-51-24	8.17	1635	272.3	366.2	101.8	57.4	1.30	470.8	1.93	283.1	0.01	282.3	22.36	1.39	0.00
3023DB2	G 28405	84408442	30/10/84	30-38-40	23-51-23	8.10	1968	307.4	375.6	162.0	55.0	1.07	601.4	0.39	430.2	0.00	276.3	25.34	3.79	0.02
3023DB163	G 36479	85406118	27/02/85	30-38-48	23-53-22	8.09	473	70.6	58.6	35.3	30.6	0.76	60.9	7.29	41.4	0.00	170.4	11.77	5.83	0.05
3023DB103	G 27723	84435554	30/10/84	30-39-34	23-51-10	8.14	1762	291.0	400.3	99.9	62.4	1.92	499.3	0.09	292.4	0.01	330.8	24.31	2.08	0.01
3023DB148	G 36512	85406427	30/03/85	30-39-55	23-51-49	7.77	2440	375.7	405.0	210.0	95.3	0.49	789.4	0.00	727.1	0.01	170.9	22.24	4.33	0.04
3023DB140	G 36504	85406320	29/03/85	30-40-46	23-51-46	8.00	879	136.0	92.3	82.2	45.2	0.78	215.3	2.43	148.6	0.00	230.4	17.81	2.44	0.03
3023DB141	G 36505	85406338	29/03/85	30-40-40	23-51-55	7.90	940	147.1	106.5	83.9	72.7	0.88	266.5	2.69	168.3	0.00	185.4	16.58	3.56	0.04
	G 36505	85406346	29/03/85	30-40-40	23-51-55	8.00	1025	149.1	106.6	84.8	110.1	0.85	286.1	2.32	179.9	0.01	199.0	17.04	3.68	0.04
3023DB143	G 36507	85406354	29/03/85	30-40-51	23-51-36	7.90	744	106.8	63.4	56.7	87.4	0.54	165.7	2.20	125.8	0.01	188.1	17.29	5.51	0.05
	G 36507	85406362	29/03/85	30-40-51	23-51-36	6.90	707	105.3	68.3	53.0	80.3	0.54	157.2	3.15	115.7	0.03	172.9	15.26	6.58	0.04
	G 36508	85406370	29/03/85	30-40-45	23-51-35	6.85	791	125.5	91.5	71.9	40.2	0.57	153.2	1.01	142.0	0.02	229.6	15.75	7.06	0.05
	G 36508	85406388	29/03/85	30-40-45	23-51-35	8.00	816	123.4	82.9	71.0	70.0	0.54	187.2	2.89	126.5	0.02	212.4	16.35	6.22	0.04
	G 36509	85406396	30/03/85	30-40-47	23-51-57	8.00	862	137.1	102.6	76.7	67.8	0.78	258.8	2.41	164.5	0.02	143.7	18.29	4.85	0.04
	G 36509	85406401	30/03/85	30-40-47	23-51-57	8.00	891	144.7	100.3	78.7	54.5	0.83	237.0	2.68	165.9	0.02	195.5	17.77	3.25	0.09
3023DB147	G 36511	85406419	30/03/85	30-40-06	23-51-42	8.00	590	87.5	100.8	23.8	39.8	4.17	160.6	0.08	26.3	0.02	182.0	11.06	12.23	0.05
3023DB58	G 27704	84407755	31/10/84	30-40-24	23-52-38	8.60	1422	226.9	372.2	48.7	37.9	1.11	312.2	4.64	294.5	0.01	274.2	19.97	0.77	0.02
3023DB50	G 27719E	84407763	31/10/84	30-40-11	23-52-27	8.42	988	147.7	150.5	66.3	60.3	0.51	211.6	5.24	196.3	0.01	227.3	21.41	1.76	0.02
	RT 1	84407789	01/11/84	30-40-07	23-52-35	8.45	730	109.0	73.1	59.8	58.6	0.45	124.3	7.35	98.7	0.01	227.5	21.55	5.41	0.03
	RT 2	84407797	01/11/84	30-40-05	23-53-14	8.28	717	101.9	66.3	54.7	54.1	0.35	122.1	9.73	115.1	0.01	211.1	20.85	3.46	0.03
3023DB138	G 36499	85406249	27/03/85	30-41-26	23-52-14	7.70	383	64.6	119.8	2.3	6.2	8.06	148.6	0.03	9.0	0.00	67.6	4.30	6.76	0.03
	G 36499	85406257	27/03/85	30-41-26	23-52-14	7.40	343	61.2	119.0	0.4	3.7	7.95	140.5	0.03	12.1	0.00	48.0	9.68	1.04	0.01
	G 36499	85406265	27/03/85	30-41-26	23-52-14	7.60	361	62.6	110.2	2.5	9.0	1.47	150.7	0.02	5.6	0.00	59.4	6.14	8.59	0.03
	G 36499	85406273	27/03/85	30-41-25	23-52-15	7.80	760	103.0	142.2	29.0	30.1	3.37	170.8	0.06	126.8	0.05	194.3	4.00	19.85	0.04
	G 36499	85406281	27/03/85	30-41-25	23-52-15	7.20	427	62.5	111.8	5.6	10.0	7.40	149.8	0.20	6.0	0.03	97.7	2.37	16.49	0.04
3023DB134	G 36501	85406299	25/03/85	30-41-34	23-52-08	7.90	727	115.0	111.8	41.2	38.5	1.33	224.5	1.15	93.3	0.02	153.1	7.06	24.29	0.03
3023DB#39	G 36502	85406304	25/03/85	30-41-22	23-52-23	7.90	492	81.9	113.4	11.1	24.3	5.00	171.9	0.25	24.1	0.01	100.3	4.74	18.27	0.42
	G 36502	85406312	25/03/85	30-41-32	23-52-23	7.80	510	85.2	115.8	10.0	25.7	5.01	179.6	0.04	33.0	0.01	96.1	3.98	23.52	0.03
3023DB79	G 27715G	84407739	31/04/84	30-41-49	23-53-37	8.45	919	143.0	117.6	67.6	84.9	0.40	199.2	3.81	176.7	0.01	206.9	25.93	3.54	0.03
	VP 1	84407747	31/10/84	30-41-43	23-53-15	8.45	587	90.8	36.6	52.6	66.6	0.43	96.3	8.57	59.6	0.01	192.0	29.11	2.49	0.02
3023DB151	G 36515	85406443	01/04/85	30-42-00	23-52-39	8.20	590	87.7	62.2	58.5	15.2	0.57	110.4	0.68	93.0	0.01	199.2	19.73	4.42	0.04
3023DB152	G 36516	85406451	01/04/85	30-42-07	23-52-32	7.86	750	113.9	46.6	47.9	37.7	0.47	118.2	0.89	108.1	0.01	226.0	8.98	111.30	0.04

HYDROCHEMICAL DATA : DE AAR

SOURCE OF DATA : NATIONAL HYDROCHEMICAL DATABANK (Western area,1987-1989)

	Bh.No.	H No.	DATE	LATITUDE	LONGITUDE	pH	TDS	EC	Na	Mg	Ca	F	Cl	NO3	SO4	PO4	TAL	Si	K	NH4
3023DB55	G 27719	88402599	20/01/88	30-40-10	23-52-28	7.82	1086	160.6	169.0	64.0	75.1	0.66	216.8	4.93	172.1	0.02	298.5	20.42	1.99	0.09
3023DB58	G 27704	88402617	20/01/88	30-40-28	23-52-41	7.98	1507	234.9	357.4	49.3	52.2	1.19	324.0	3.39	256.6	0.02	368.4	19.01	2.09	0.03
3023DB64	G 23206	87433369	05/02/87	30-40-54	23-53-08	7.96	1868	275.2	450.1	77.7	38.3	1.42	458.5	1.17	347.0	0.02	400.1	23.14	1.66	0.01
	G 23206	88402678	20/01/88	30-40-54	23-53-08	7.98	2019	310.4	499.2	90.8	44.0	1.29	493.9	0.82	337.1	0.02	449.0	24.06	0.95	0.20
	BN 22	88412532	30/11/88	30-41-26	23-49-51	7.40	1812	281.6	208.5	190.6	111.7	0.91	652.8	8.20	162.7	0.04	365.8	23.74	2.23	0.05
3023DB80	G 23205	87433321	05/02/87	30-41-57	23-53-58	7.82	1804	272.0	349.3	114.1	75.5	0.87	503.3	1.24	387.3	0.05	297.3	21.55	5.25	0.13
	G 27715	87433345	05/02/87	30-41-47	23-53-41	7.82	1050	156.0	134.7	71.3	88.0	0.54	246.9	1.45	172.9	0.01	268.1	24.81	2.70	0.01
3023DB80	G 23205	88402654	20/01/88	30-41-57	23-53-58	8.01	1612	262.5	320.1	99.8	67.8	0.79	413.5	0.99	358.7	0.02	281.9	22.54	2.93	0.11
	G 27715	88402666	20/01/88	30-41-47	23-53-41	7.96	1046	160.6	138.0	70.0	91.8	0.48	253.2	1.90	176.5	0.01	250.2	24.77	2.79	0.03
3023DB80	G 23205	87433333	05/02/87	30-42-11	23-53-45	7.91	1118	164.0	181.0	65.1	67.3	0.61	230.0	2.84	187.8	0.05	304.8	23.00	2.04	0.02
	G 23205	88402630	20/01/88	30-42-11	23-53-45	8.01	1113	166.1	186.2	63.9	68.7	0.55	230.7	3.21	190.0	0.02	292.0	23.52	2.20	0.10
3023DB105	G 23204	87433310	05/02/87	30-42-21	23-54-05	7.82	1772	256.0	436.8	67.8	42.4	1.13	424.4	0.19	343.6	0.01	372.3	18.34	0.83	0.01
	VK 1	87433394	05/02/87	30-42-50	23-54-11	8.13	1501	211.2	343.9	55.4	46.6	0.94	291.4	2.77	275.1	0.03	388.7	16.44	1.65	0.01
3023DB105	G 23204	88402629	20/01/88	30-42-21	23-54-05	7.87	1687	263.3	428.6	59.1	36.8	1.10	390.6	0.52	326.1	0.01	360.5	19.66	3.02	0.07
	G 23203	87433308	05/02/87	30-43-18	23-54-11	7.99	1075	143.2	220.5	35.8	45.2	0.73	126.8	0.19	122.4	0.01	428.0	22.20	0.83	0.01
3023DB123	G 27702	87433400	05/02/88	30-43-16	23-54-17	7.91	1064	141.9	180.8	43.1	60.0	0.65	156.7	2.16	133.2	0.01	392.4	20.93	1.23	0.02
3023DB32	G 23202	87434878	24/03/87	30-43-22	23-54-17	7.70	1288	184.0	329.5	33.3	31.5	0.34	243.1	3.15	167.3	0.01	383.7	21.31	0.79	0.02
	G 23203	88402605	20/01/88	30-43-18	23-54-11	7.85	1096	145.8	230.4	37.7	45.3	0.71	121.6	0.22	149.3	0.02	417.2	22.21	0.89	0.05
2023DB123	G 27702	88402642	20/01/88	30-43-16	23-54-17	8.01	973	135.2	161.6	50.9	64.5	0.53	126.5	2.06	116.0	0.02	363.0	22.77	1.09	0.02
	G 27703	88402680	20/01/88	30-43-30	23-54-34	8.07	1196	165.6	276.2	34.8	38.6	1.07	173.5	1.01	196.3	0.01	385.6	21.82	0.57	0.09

HYDROCHEMICAL DATA : DE AAR

SOURCE OF DATA : NATIONAL HYDROCHEMICAL DATABANK (Western area,1987-1989)

	Bh.No.	H No.	DATE	LATITUDE	LONGITUDE	pH	TDS	EC	Na	Mg	Ca	F	Cl	NO3	SO4	PO4	TAL	Si	K	NH4
	BN 31	88412672	02/12/88	30-36-05	23-49-50	7.30	536	66.0	15.9	43.5	66.1	0.46	36.9	18.72	32.6	0.02	209.9	29.47	1.62	0.02
	BN 30	88412660	02/12/88	30-36-31	23-50-53	7.30	538	65.0	28.8	34.7	66.1	0.83	30.7	15.00	31.4	0.01	226.9	18.95	2.06	0.02
	BN 29	88412659	02/12/88	30-36-50	23-51-08	7.30	533	65.0	22.3	39.2	64.1	0.82	33.1	13.62	34.5	0.02	227.0	21.37	2.29	0.01
	G 28398	88412490	30/11/88	30-37-50	23-51-28	7.70	1723	246.4	424.9	73.7	38.3	1.73	440.7	2.24	295.3	0.04	358.5	16.85	1.46	0.02
	BN 32	88412684	02/12/88	30-37-37	23-52-53	7.45	719	83.0	57.7	48.1	62.9	1.24	55.8	1.66	41.5	0.04	357.4	16.19	8.82	0.01
	BN 23	88412544	01/12/88	30-37-35	23-53-17	7.20	642	79.0	37.2	37.1	84.0	1.02	46.7	8.30	41.4	0.02	291.8	15.60	1.62	0.02
	BN 33	88412696	02/12/88	30-37-00	23-53-46	7.20	558	66.0	26.3	36.5	70.2	0.76	23.1	7.69	35.0	0.01	270.7	21.87	1.93	0.01
	BH 61	87435044	24/03/87	30-37-57	23-54-21	8.05	619	87.0	43.4	37.6	78.6	0.75	52.9	3.34	49.1	0.01	278.3	14.30	2.19	0.02
	BN 24	88412593	02/12/88	30-37-58	23-54-21	7.20	649	83.0	40.9	39.7	82.8	1.17	64.2	6.21	52.2	0.01	277.9	14.03	1.80	0.02
	BN 25	88412600	02/12/88	30-37-59	23-54-38	7.20	690	90.0	43.4	42.7	88.7	0.94	81.4	7.27	58.9	0.01	277.8	15.25	2.56	0.02
	BN 1	87435070	24/03/87	30-38-52	23-50-56	7.82	688	108.0	56.9	50.7	76.7	0.50	119.8	4.74	61.3	0.00	245.1	21.29	2.06	0.01
	BN 1	88412477	29/11/88	30-38-58	23-50-58	7.30	724	100.0	55.8	52.8	78.8	0.81	119.9	9.08	61.7	0.03	256.2	21.05	1.80	0.02
	BN 27	88412647	02/12/88	30-38-09	23-50-16	7.30	568	71.0	27.7	37.1	71.0	1.00	37.5	14.72	29.7	0.02	242.6	20.28	2.73	0.02
	G 28400	88412441	29/11/88	30-38-08	23-51-32	8.05	1201	168.0	346.7	13.1	4.4	1.39	225.7	0.21	84.0	0.05	428.4	3.02	1.61	0.77
3023DB 67	G 28402	88412453	29/11/88	30-38-20	23-51-26	7.60	1230	174.0	251.6	57.0	35.9	1.44	236.8	3.46	154.0	0.04	391.4	23.79	0.84	0.04
3023DB 37	G 28405	88412465	29/11/88	30-38-45	23-51-24	7.60	2067	300.8	409.6	159.1	51.9	1.50	594.9	0.62	370.0	0.04	389.5	25.56	2.55	0.02
	G 28404	88412507	30/11/88	30-38-51	23-51-31	7.60	2786	425.6	580.5	210.7	65.2	1.49	920.6	0.44	539.0	0.03	380.7	21.30	2.39	0.02
	BH 72	87435056	24/03/87	30-38-51	23-52-06	7.77	688	92.0	47.8	43.0	79.5	0.73	45.9	1.38	38.5	0.01	347.6	16.49	2.65	0.02
	BN 20	88412519	30/11/88	30-38-52	23-52-08	7.40	742	87.0	48.3	45.9	84.4	0.97	45.3	4.29	41.0	0.01	372.6	17.13	2.53	0.02
	BN 26	88412611	02/12/88	30-38-13	23-53-12	7.25	797	104.0	61.4	45.9	94.6	0.79	97.1	7.97	53.7	0.01	330.2	16.85	5.64	0.02
	G 23210	88412623	02/12/88	30-39-50	23-50-50	7.60	1821	243.2	314.1	134.2	53.0	1.23	390.7	0.48	249.2	0.06	553.5	17.82	1.01	0.05
	BN 21	87435081	24/03/87	30-39-37	23-51-21	8.02	2397	384.0	641.3	87.5	32.3	2.05	714.6	0.99	343.3	0.07	466.1	14.47	2.62	0.02
	G 28406	88412489	29/11/88	30-39-00	23-51-40	7.60	3659	500.0	825.9	246.6	100.1	1.51	1342.4	1.02	445.0	0.05	564.3	21.76	4.26	0.03
	G 28408	88412556	01/12/88	30-39-22	23-51-15	7.60	1846	256.0	362.3	126.6	54.7	1.36	439.9	0.93	334.8	0.03	426.9	21.44	1.18	0.02
	BN 28	88412568	01/12/88	30-39-41	23-51-21	7.70	2720	426.2	743.6	100.9	33.1	2.29	746.7	2.15	434.6	0.14	530.3	14.57	2.65	0.02
	G 27724	88412570	01/12/88	30-39-41	23-51-13	7.40	1855	268.8	349.7	115.8	98.1	1.23	512.4	2.80	385.3	0.03	307.8	17.96	4.22	0.03
3023 DB 103	G 27723	88412581	01/12/88	30-39-36	23-51-12	7.60	1795	272.6	419.2	97.3	54.0	3.41	579.6	0.29	306.9	0.02	273.0	17.37	0.04	0.18
	BH 71	87435068	24/03/87	30-40-00	23-49-44	7.77	448	67.0	30.5	32.5	51.5	0.42	35.7	5.62	33.5	0.01	194.5	23.48	1.72	0.02
	BN 21	88412520	30/11/88	30-40-02	23-49-43	7.30	533	65.0	33.0	37.1	59.6	0.65	40.5	7.21	34.4	0.03	240.0	23.10	3.07	0.01
	RT 3	87435032	24/03/87	30-40-13	23-51-36	7.50	1069	178.0	103.9	101.9	101.4	2.16	337.7	9.37	201.3	0.02	144.9	21.50	1.88	0.05
3023 DB 52	G 27704	87433357	05/02/87	30-40-28	23-52-41	7.93	1377	192.0	335.7	43.1	34.5	1.28	260.8	4.13	222.5	0.01	377.5	19.02	0.88	0.01
3023 DB 55	G 27719	87433370	05/02/87	30-40-10	23-52-28	7.96	1052	152.0	152.5	63.9	73.6	0.72	198.6	5.11	172.4	0.01	300.1	19.37	1.86	0.03
3023 DB 428	G 27707	87433382	05/02/87	30-40-08	23-52-21	7.91	1496	231.7	155.1	120.3	138.5	0.59	427.1	2.61	312.4	0.01	269.4	21.92	1.70	0.01
	G 27707	88402587	20/01/88	30-40-08	23-52-21	7.85	1775	277.2	184.2	155.0	157.6	0.50	469.0	2.29	424.4	0.01	304.1	20.59	3.18	0.05

HYDROCHEMICAL DATA : DE AAR

SOURCE OF DATA : NATIONAL HYDROCHEMICAL DATABANK (Northern area,1970-1974)

Bh.No.	H No.	DATE	LATITUDE	LONGITUDE	pH	TDS	EC	Na	Mg	Ca	F	Cl	NO3	SO4	PO4	TAL	Si	K	NH4
	70002640	29/09/70	30-22-00	24-02-00	8.60	636	83.3	73.0	43.0	44.0	0.70	94.0	4.97	0.0		294.5			
	70002632	15/09/70	30-34-00	23-58-30	7.80	1164	166.7	163.0	96.0	56.0	1.00	270.0	7.00	144.0		330.5			
	72012366	15/09/70	30-40-00	24-01-00	8.38	329	39.0	29.0	26.0	17.0	1.00	13.0	5.87	25.0	0.00	156.7		0.80	

HYDROCHEMICAL DATA : DE AAR

SOURCE OF DATA : NATIONAL HYDROCHEMICAL DATABANK (Northern area,1980-1983)

Bh.No.	H No.	DATE	LATITUDE	LONGITUDE	pH	TDS	EC	Na	Mg	Ca	F	Cl	NO3	SO4	PO4	TAL	Si	K	NH4
HL 19	82406842	26/05/82	30-21-08	24-05-38	7.66	697	87.8	41.1	44.2	80.5	1.09	43.8	15.50	53.0	0.01	296.6	19.40	2.60	0.04
HEL 1	82406915	26/05/82	30-22-00	24-04-00	7.92	451	63.6	100.6	13.2	17.3	0.00	76.5	1.55	15.8	0.00	180.4	11.98	0.92	0.01
HL 9	82406826	25/05/82	30-22-44	24-05-40	7.98	614	77.0	44.1	38.5	62.8	0.90	41.8	12.59	43.4	0.00	265.5	19.66	3.23	0.03
HC 11	82406834	25/05/82	30-22-28	24-05-32	7.90	512	67.6	85.5	18.4	37.2	3.62	57.7	0.66	45.4	0.00	213.7	8.55	0.69	0.03
HL 20	82406850	25/05/82	30-22-52	24-06-20	7.58	603	75.3	28.1	36.7	71.2	0.87	32.5	14.54	32.8	0.01	272.8	20.17	4.03	0.03
HL 1	82406779	25/05/82	30-23-32	24-05-36	6.10	942	131.6	69.0	62.7	124.3	0.64	152.6	11.92	135.3	0.02	280.0	19.63	2.70	0.03
HL 2	82406787	25/05/82	30-23-11	24-05-42	7.90	1167	203.0	124.0	100.7	100.0	0.61	339.9	15.61	212.6	0.02	177.2	16.87	3.60	0.01
HL 3	82406795	25/05/82	30-23-32	24-05-46	7.66	757	101.7	64.9	46.5	82.7	0.72	94.4	8.40	81.6	0.00	284.1	20.17	2.11	0.02
HL 5	82406800	25/05/82	30-23-30	24-05-44	7.90	651	89.1	54.8	46.3	62.6	0.92	93.7	6.36	54.6	0.00	251.5	20.57	3.11	0.03
HL 7	82406818	25/05/82	30-23-03	24-05-53	7.75	623	79.2	49.4	36.6	65.5	0.74	47.0	8.68	38.0	0.00	282.2	17.08	3.24	0.03
HL 1	82406923	25/05/82	30-23-32	24-05-38	8.10	963	133.2	69.1	64.3	127.5	0.59	154.8	12.92	145.4	0.01	280.2	19.38	2.81	0.01
RL 1	82406868	25/05/82	30-23-26	24-06-20	7.63	594	76.3	33.5	36.1	72.3	0.71	43.3	8.75	37.1	0.00	270.9	21.10	1.70	0.03
RL 2	82406876	25/05/82	30-23-14	24-06-23	7.72	616	79.1	44.6	37.0	67.5	0.69	50.0	8.45	37.1	0.00	278.2	19.02	2.84	0.02
RL 3	82406884	26/05/82	30-23-32	24-07-53	7.78	925	118.7	113.5	54.9	71.2	0.71	106.1	4.45	73.5	0.00	393.3	20.04	5.33	0.01
BK 2	82406907	26/05/82	30-24-55	24-05-48	7.72	747	95.6	78.1	40.4	71.4	0.97	74.7	3.68	54.2	0.00	334.9	14.24	2.14	0.02
BK 1	82406892	26/05/82	30-25-29	24-05-16	7.58	617	76.9	30.2	41.4	71.9	1.05	35.8	4.74	59.4	0.00	291.0	24.08	1.50	0.00

HYDROCHEMICAL DATA : DE AAR

SOURCE OF DATA : NATIONAL HYDROCHEMICAL DATABANK (Northern area,1984-1985)

	Bh.No.	H No.	DATE	LATITUDE	LONGITUDE	pH	TDS	EC	Na	Mg	Ca	F	Cl	NO3	SO4	PO4	TAL	Si	K	NH4
		84435871	25/10/84	30-28-25	24-09-18	8.05	1109	201.8	134.4	101.8	96.2	0.93	361.0	0.46	223.2	0.01	154.7	24.73	0.35	0.02
	B 54	84409024	21/10/84	30-30-48	24-01-00	7.99	1308	205.4	183.4	83.3	111.7	1.00	225.2	4.74	374.4	0.01	250.6	14.88	2.02	0.00
	BS 2	84408523	21/10/84	30-33-54	24-00-31	8.37	492	58.5	44.3	35.0	28.6	0.43	32.9	6.03	28.7	0.01	240.8	16.88	1.35	0.01
	G 29641	84435627	24/10/84	30-34-22	23-59-57	7.96	1310	226.3	335.7	63.1	40.5	1.44	400.1	0.09	169.1	0.01	244.4	15.63	1.24	0.01
3023DB384	G 29649	84435538	29/10/84	30-34-02	23-59-19	7.93	1721	286.2	240.9	156.6	120.2	1.22	532.8	1.72	418.9	0.01	196.8	21.86	2.77	0.03
	G 29642	84435635	24/10/84	30-34-19	23-59-52	7.93	1011	162.5	274.6	38.6	23.0	1.66	264.6	0.15	115.8	0.01	239.5	16.16	0.14	0.02
	G 29648	84435643	25/10/84	30-34-05	23-59-42	8.02	1737	287.8	216.8	157.4	150.7	0.99	555.7	1.50	420.5	0.01	186.1	17.46	1.39	0.02
3023DB229	G 29647A	84435651	25/10/84	30-34-12	23-59-36	7.70	822	137.1	164.7	57.2	34.8	1.30	217.3	0.45	90.4	0.01	207.9	19.37	0.97	0.01
3023DB415	G 29650	84435669	25/10/84	30-34-03	23-59-29	7.87	1810	307.3	260.4	163.0	135.4	1.21	656.1	1.43	361.4	0.00	184.7	20.07	1.39	0.02
3023DB197	G 29637A	84435570	23/10/84	30-34-41	24-00-57	7.87	553	89.5	52.6	46.6	55.5	0.80	80.0	7.12	64.1	0.02	180.3	19.31	2.18	0.02
3023DB117	G 29633	84435588	23/10/84	30-34-46	24-00-44	7.90	1173	208.0	199.9	68.3	96.6	1.03	370.4	13.20	150.3	0.01	185.6	21.08	1.65	0.02
3023DB225	G 29639	84435619	24/10/84	30-34-32	24-00-08	8.14	1491	253.6	334.5	93.5	58.3	1.31	460.6	0.39	244.3	0.03	242.3	16.60	1.10	0.01
	G 29636	84435562	23/10/84	30-34-34	24-00-23	8.22	1681	256.0	295.9	135.9	63.7	0.89	476.1	0.28	360.3	0.04	283.7	17.66	0.77	0.04
	B 51	84435596	24/10/84	30-34-36	24-00-42	8.10	588	84.3	51.9	50.8	49.7	0.65	80.1	4.49	84.7	0.00	203.4	17.17	1.90	0.02
3023DB131	G 29632	84435601	24/10/84	30-34-40	24-00-29	8.16	813	112.2	111.6	61.1	39.7	0.83	121.2	13.53	108.3	0.00	253.2	15.18	1.65	0.02
	B 53	84409032	23/10/84	30-34-44	24-01-56	7.99	994	158.6	99.3	91.7	93.3	0.80	214.2	3.34	204.8	0.01	225.1	22.66	0.75	0.02
	PY 5	84408426	29/10/84	30-34-56	24-03-29	7.99	508	70.0	33.3	39.1	52.5	0.55	59.2	7.90	65.8	0.00	180.7	23.18	2.72	0.02
	PY 4	84408434	29/10/84	30-34-48	24-03-12	8.19	437	49.4	30.1	32.7	36.2	0.42	32.9	8.95	36.6	0.00	185.8	18.62	2.34	0.01
3024CA88	G 29644	84435499	26/10/84	30-35-25	24-02-55	7.87	1058	182.8	353.9	8.4	21.5	5.37	403.2	0.30	93.8	0.01	138.8	8.72	1.10	0.14
	PY 6	84435512	26/10/84	30-35-17	24-02-51	7.93	1212	211.4	159.7	122.6	75.1	0.99	341.7	1.97	267.3	0.00	193.4	23.54	0.14	0.02
3024CA85	G 29618	84435481	26/10/84	30-35-33	24-03-15	7.84	1955	321.8	380.7	128.4	110.1	1.03	581.9	3.89	433.8	0.01	244.9	15.18	3.46	0.02
3024CA12	G 28420D	84435504	26/10/84	30-35-13	24-03-47	7.82	888	145.9	139.1	63.0	67.4	1.20	213.0	3.17	154.0	0.00	193.3	22.38	0.83	0.02
3024CA87	G 29617	84435677	25/10/84	30-35-39	24-03-12	7.67	964	155.1	92.7	66.7	124.2	0.88	226.8	12.73	160.3	0.00	190.7	16.13	3.37	0.02
	PY 9	84408361	26/10/84	30-35-54	24-03-27	7.99	649	85.2	43.2	49.1	57.7	1.29	88.9	20.73	60.2	0.00	208.1	19.92	3.14	0.09
	PY 10	84408379	26/10/84	30-35-51	24-03-18	8.16	590	96.2	57.4	56.2	50.9	0.62	133.4	18.33	91.5	0.00	94.2	196.61	3.81	0.03
	PY 8	84408387	26/10/84	30-35-31	24-03-46	8.22	557	84.2	72.7	53.0	37.8	0.84	73.0	3.57	66.7	0.00	194.0	240.72	0.77	0.03
	G 06778	84435847	25/10/84	30-38-01	24-09-10	7.93	1001	153.0	119.0	79.0	92.6	0.62	232.9	0.59	231.0	0.01	199.3	22.65	0.12	0.02
		84435855	25/10/84	30-38-23	24-09-32	8.11	681	103.1	96.9	46.9	46.4	1.28	107.9	3.02	89.0	0.01	229.1	22.24	0.24	0.02
3024CA92	G 18884	84435863	25/10/84	30-38-58	24-09-51	7.93	2241	355.4	351.9	175.4	146.3	0.90	856.6	0.39	508.1	0.01	162.8	24.81	1.80	0.01
3024CA93	G 18880	84435889	25/10/84	30-38-34	24-09-44	7.99	756	116.2	78.8	56.0	80.7	0.90	142.4	1.80	154.3	0.02	191.9	22.87	0.47	0.03
3024CA315	G 18882	84435897	25/10/84	30-38-46	24-09-46	7.87	2253	351.9	299.7	190.7	170.3	0.65	739.8	1.37	635.4	0.01	171.5	25.11	1.70	0.02
3024CA317	G 18886	84435902	25/10/84	30-39-10	24-09-59	8.17	2402	373.0	529.5	119.8	112.2	1.03	809.0	0.05	605.3	0.01	184.0	23.57	1.03	0.01
	G 36491	85406184	12/03/85	30-40-25	23-56-14	7.90	509	76.7	40.9	36.4	46.0	0.78	55.1	0.00	71.5	0.01	203.9	13.89	9.81	0.03
	G 36491	85406192	12/03/85	30-40-25	23-56-14	8.09	462	65.7	39.6	38.3	25.1	0.49	53.1	9.71	79.6	0.00	145.8	16.61	4.88	0.03

HYDROCHEMICAL DATA : DE AAR

SOURCE OF DATA : NATIONAL HYDROCHEMICAL DATABANK (Northern area,1984-1985)

	Bh.No.	H No.	DATE	LATITUDE	LONGITUDE	pH	TDS	EC	Na	Mg	Ca	F	Cl	NO3	SO4	PO4	TAL	Si	K	NH4
3023DB 180	G 36492	85406207	12/03/85	30-40-25	23-56-18	8.00	510	71.6	44.9	38.1	31.6	0.96	55.3	9.73	80.7	0.00	167.1	13.19	11.91	0.04
	CT 3	84407909	31/10/84	30-40-19	24-09-29	8.16	819	123.9	46.3	78.2	87.2	0.21	225.9	6.16	139.2	0.00	175.1	21.80	1.60	0.03
	G 36482	85406126	04/03/85	30-39-45	23-55-53	7.70	242	35.8	61.3	3.3	8.8	6.71	26.6	0.45	7.8	0.00	95.7	4.76	8.43	
3023DB167	G 36483	85406134	07/03/85	30-39-43	23-55-45	8.00	512	73.5	32.2	40.6	54.0	0.72	49.9	9.68	69.9	0.00	174.3	16.07	8.90	
	G 36483	85406142	07/03/85	30-39-43	23-55-45	8.00	528	75.8	34.8	37.5	64.8	0.78	46.4	7.01	51.4	0.00	209.5	15.76	6.07	
	G 36483	85406150	08/03/85	30-39-43	23-55-44	8.00	510	71.9	34.8	41.5	55.2	0.66	56.4	9.19	65.4	0.00	171.9	15.87	5.47	
3023DB172	G 36484	85406168	08/03/85	30-39-43	23-55-34	8.00	462	68.6	42.5	32.3	36.9	0.88	57.9	8.29	54.7	0.00	148.1	13.15	19.06	
	G 36485	85406176	08/03/85	30-39-49	23-55-35	8.00	491	68.9	32.2	39.8	53.2	0.49	49.2	7.91	61.6	0.00	176.7	17.31	3.69	
3024CA114	G 27927D		01/11/84	30-40-05	24-10-13	7.70	2700	462.8	521.2	208.0	159.8	0.93	1248.5	0.39	365.5	0.10	157.0	18.67	2.78	
	CT 2	84407894	31/10/84	30-40-57	24-10-24	8.51	594	78.6	59.4	47.5	39.6	0.59	66.9	6.35	67.2	0.00	232.3	18.65	1.61	
	CT 4	84407917	31/10/84	30-40-25	24-10-52	8.40	698	109.1	50.8	59.2	78.5	0.35	105.4	2.91	126.6	0.00	217.0	22.00	0.00	
3024CA321	G 27927	84405517	03/07/84	30-40-04	24-10-13	7.81	1865	339.3	454.6	102.8	56.6	0.85	884.5	0.00	172.4	0.00	156.3	6.71	2.86	
	G 27927	84405525	03/07/84	30-40-07	24-10-08	7.47	2808	476.1	618.5	179.6	96.0	0.97	1367.9	0.00	345.8	0.06	156.2	2.52	8.54	

HYDROCHEMICAL DATA : DE AAR

SOURCE OF DATA : NATOINAL HYDROCHEMICAL DATABANK (Northern area,1987-1989)

	Bh.No.	H No.	DATE	LATITUDE	LONGITUDE	pH	TDS	EC	Na	Mg	Ca	F	Cl	NO3	SO4	PO4	TAL	Si	K	NH4
3023DB234	G 29654	87445682	14/12/87	30-34-12	23-58-57	7.79	849	154.4	217.1	49.4	10.6	0.56	409.4	0.02	10.1	0.02	123.9	1.04	0.86	0.01
	G 29642	87445633	14/12/87	30-34-19	23-59-52	7.85	1209	186.7	299.6	47.2	30.8	1.42	343.7	0.03	135.5	0.03	286.9	16.35	1.00	0.01
	G 29641	87445645	14/12/87	30-34-22	23-59-57	7.93	1142	169.8	312.5	34.0	8.3	1.07	279.7	0.03	103.9	0.01	327.9	2.90	2.61	0.01
3023DB384	G 29649	87445669	14/12/87	30-34-02	23-59-19	7.76	1638	271.5	237.9	147.1	100.0	1.04	520.3	0.02	390.1	0.02	197.5	14.34	1.03	0.01
3023DB233	G 29652	87445670	14/12/87	30-34-05	23-59-05	7.82	1023	169.5	200.4	75.9	29.1	0.78	348.6	0.03	144.4	0.02	182.5	5.55	0.84	0.01
	G 29648	87445694	15/12/87	30-34-05	23-59-42	6.68	218	42.8	32.8	19.2	12.9	0.16	87.7	0.02	16.5	0.01	38.0	0.89	2.47	0.01
3023DB407	G 29647	87445700	15/12/87	30-34-12	23-59-36	7.73	952	146.3	179.4	60.6	39.1	1.07	224.2	0.02	140.3	0.01	251.6	20.04	0.89	0.00
3023DB415	G 29650	87445712	15/12/87	30-34-03	23-59-29	7.45	1188	236.4	245.4	110.1	20.8	0.42	596.5	0.02	105.3	0.01	88.8	1.69	0.73	0.01
	G 29641	88413548	30/11/88	30-34-22	23-59-57	7.50	1608	236.8	372.3	77.8	51.7	1.32	496.9	0.14	198.7	0.15	333.1	16.00	1.61	0.05
	G 29641	88413550	30/11/88	30-34-22	23-59-57	7.50	1592	235.5	372.3	76.2	49.6	1.32	488.4	0.14	200.6	0.05	328.5	15.90	2.10	0.01
	G 29641	88413561	01/12/88	30-34-22	23-59-57	7.64	1610	236.8	378.8	77.2	52.6	1.40	492.2	0.04	213.1	0.03	321.8	16.20	2.10	0.04
	G 29641	88413573	01/12/88	30-34-22	23-59-57	7.53	1613	236.8	377.4	76.8	53.1	1.37	491.0	0.58	213.9	0.04	323.8	16.09	1.73	0.07
	G 29641	88413585	02/12/88	30-34-22	23-59-57	7.53	1615	236.8	376.1	77.1	52.2	1.42	489.5	0.16	214.9	0.04	329.2	16.09	1.73	0.02
	G 29637	87445591	14/12/87	30-34-31	24-00-57	7.87	604	88.9	52.9	46.4	58.9	0.53	88.4	4.97	70.2	0.01	214.5	17.64	2.74	0.02
	G 29636	87445608	14/12/87	30-34-34	24-00-23	7.00	1205	245.8	290.5	86.6	26.5	0.45	664.5	0.14	72.9	0.02	50.0	2.40	1.51	0.02
3023DB117	G 29633	87445610	14/12/87	30-34-46	24-00-44	7.79	1349	230.8	257.0	71.9	92.3	0.87	432.5	3.42	193.6	0.01	232.8	19.01	1.98	0.02
3023DB131	G 29632	87445621	14/12/87	30-34-40	24-00-29	7.70	863	127.7	118.7	59.8	61.3	1.40	159.4	0.11	164.7	0.01	241.9	10.08	2.34	0.00
3023DB225	G 29639	87445657	14/12/87	30-34-32	24-00-08	8.19	1734	268.5	339.4	105.0	68.9	1.16	431.6	0.00	362.1	0.04	348.2	16.92	0.69	0.00
	G 29630	88413305	29/10/88	30-34-50	24-00-00	7.28	1716	263.7	209.9	132.9	166.5	0.55	575.4	5.09	350.9	0.01	207.8	10.25	3.79	0.05
	G 29630	88413317	29/10/88	30-34-50	24-00-00	7.67	1355	198.4	250.1	72.1	90.5	0.98	403.2	2.05	253.7	0.01	223.6	8.39	2.10	0.11
	G 29630	88413329	30/10/88	30-34-50	24-00-00	8.01	1365	195.8	255.7	65.3	97.6	1.23	389.9	2.06	229.8	0.02	257.3	8.48	2.22	0.05
	G 29630	88413330	30/10/88	30-34-50	24-00-00	7.90	1281	185.6	252.3	62.1	79.5	1.34	391.8	2.11	208.2	0.01	225.1	8.48	2.22	0.11
	G 29630	88413342	30/10/88	30-34-50	24-00-00	7.62	1310	189.4	250.0	62.1	90.5	1.45	395.5	2.21	200.8	0.01	243.9	8.17	2.22	0.09
3023DB131	G 29632	88413354	30/11/88	30-34-40	24-00-29	8.04	822	111.0	104.1	55.7	59.6	0.95	109.0	7.67	94.0	0.02	297.9	19.34	1.86	0.02
	G 29632	88413366	03/11/88	30-34-40	24-00-29	7.95	792	115.0	107.1	59.2	46.1	0.88	124.4	8.93	104.7	0.01	252.6	19.34	2.21	0.04
	G 29632	88413378	04/11/88	30-34-40	24-00-29	7.59	910	120.4	105.6	59.8	78.6	0.98	128.0	8.83	101.4	0.01	322.9	19.34	2.22	0.06
	G 29632	88413380	05/11/88	30-34-40	24-00-29	7.56	901	122.0	106.2	61.0	73.3	0.99	135.0	8.56	106.3	0.02	310.4	19.52	2.15	0.04
3023DB117	G 29633	88413391	03/11/88	30-34-46	24-00-44	7.39	1172	177.0	199.7	59.5	81.7	0.99	276.5	5.13	177.7	0.04	288.5	21.17	1.61	0.06
	G 29633	88413408	03/11/88	30-34-46	24-00-44	7.53	1143	170.0	190.7	59.1	81.7	0.96	266.6	5.49	166.7	0.02	288.4	21.53	1.61	0.05
	G 29633	88413410	09/11/88	30-34-46	24-00-44	7.47	1137	170.0	188.2	60.6	83.0	0.95	265.4	5.32	165.2	0.02	285.4	21.52	1.98	0.03
	G 29633	88413421	09/11/88	30-34-46	24-00-44	7.50	1135	169.6	183.2	60.9	84.7	0.95	265.6	5.50	167.4	0.11	283.4	21.34	1.49	0.05

HYDROCHEMICAL DATA : DE AAR

SOURCE OF DATA : NATOINAL HYDROCHEMICAL DATABANK (Northern area,1987-1989)

	Bh.No.	H No.	DATE	LATITUDE	LONGITUDE	pH	TDS	EC	Na	Mg	Ca	F	Cl	NO3	SO4	PO4	TAL	Si	K	NH4
3023DB 1176	G 29633	88413433	10/11/88	30-34-46	24-00-44	7.62	1131	169.6	184.0	61.8	83.0	0.96	264.4	4.93	160.4	0.03	289.1	21.87	1.98	0.08
	G 29637	88413445	21/11/88	30-34-31	24-00-57	7.47	634	83.8	58.3	46.1	57.6	0.58	82.7	6.93	67.4	0.02	236.0	18.54	2.83	0.03
	G 29637	88413457	21/11/88	30-34-31	24-00-57	7.50	651	86.2	58.3	48.8	60.7	0.58	89.8	6.94	70.8	0.02	235.9	19.31	3.08	0.06
	G 29637	88413469	22/11/88	30-34-31	24-00-57	7.50	650	86.0	57.6	48.8	60.2	0.54	90.8	7.18	71.0	0.02	235.0	19.69	3.08	0.04
	G 29637	88413482	23/11/88	30-34-31	24-00-57	7.50	655	88.0	55.4	48.4	63.7	0.62	91.9	6.72	69.9	0.03	239.9	19.49	2.71	0.09
3023DB225	G 29639	88413494	25/11/88	30-34-32	24-00-08	7.70	1705	239.4	341.6	102.2	65.1	1.19	429.1	0.69	311.7	0.37	368.1	16.73	1.12	0.05
	G 29639	88413500	25/11/88	30-34-32	24-00-08	7.62	1716	241.3	344.1	102.2	63.8	1.25	431.1	0.12	311.6	0.12	376.9	17.03	1.37	0.05
	G 29639	88413512	26/11/88	30-34-32	24-00-08	7.62	1741	241.9	353.0	103.3	64.2	1.25	438.3	0.12	316.6	0.09	379.4	17.33	1.37	0.05
	G 29639	88413524	26/11/88	30-34-32	24-00-08	7.67	1741	243.2	358.1	101.7	64.7	1.23	440.3	0.18	315.2	0.07	375.4	16.92	1.37	0.05
	G 29639	88413536	27/11/88	30-34-32	24-00-08	7.67	1732	241.9	355.5	101.7	64.2	1.24	435.4	0.13	313.8	0.09	375.3	16.92	1.37	0.05
	G 29637	88413470	22/11/88	30-34-31	24-00-57	7.40	648	86.4	56.8	48.8	59.8	0.55	90.1	6.52	71.8	0.02	236.7	19.30	2.96	0.04
	G 29630	88411850	07/10/88	30-35-16	24-00-41	7.30	1393	230.4	191.6	120.0	121.2	0.81	525.6	1.91	293.1	0.02	106.5	9.82	2.51	0.03
3024CA88	G 29644	87445542	14/12/87	30-35-25	24-02-55	7.45	901	154.0	307.2	3.9	7.8	4.93	364.8	0.02	45.6	0.04	135.7	9.45	1.06	0.05
3024CA87	G 29617	87445554	14/12/87	30-35-39	24-03-12	7.68	1406	213.3	136.3	93.5	181.2	0.76	381.9	4.50	285.4	0.02	248.7	16.59	3.90	0.02
3024CA85	G 29618	87445566	14/12/87	30-35-33	24-03-15	7.93	2090	329.8	384.8	134.0	121.0	0.97	619.7	1.33	435.3	0.02	316.1	14.70	3.16	0.02
3024CA 17	G 29619	87445578	14/12/87	30-35-19	24-03-33	7.39	668	115.3	98.1	61.2	31.3	0.40	184.2	0.05	170.7	0.02	99.4	2.27	1.00	0.01
3024CA318	G 28420	87445580	14/12/87	30-35-13	24-03-47	7.70	845	125.5	126.6	52.7	58.4	0.76	155.4	2.18	144.7	0.02	242.1	20.51	1.13	0.01
3024CA17	G 29619	88409430	22/08/88	30-35-19	24-03-33	7.97	1053	148.2	112.0	84.8	82.8	0.97	259.3	2.93	168.1	0.04	271.5	22.88	0.57	0.02
	G 29619	88409442	22/08/88	30-35-19	24-03-33	8.19	1058	148.8	115.9	84.4	82.8	0.86	259.9	3.22	167.7	0.04	271.5	22.88	0.57	0.04
	G 29619	88409454	22/08/88	30-35-19	24-03-33	8.05	1059	149.8	112.8	85.1	83.6	0.86	261.3	2.93	169.8	0.04	272.5	22.35	0.57	0.03
	G 29619	88409466	22/08/88	30-35-19	24-03-33	7.80	1026	146.7	119.8	79.1	78.2	1.28	258.6	2.00	152.6	0.30	267.5	21.43	0.57	0.04
3024CA318	G 28420	88411709	26/09/88	30-35-13	24-03-47	7.73	916	131.6	90.7	68.7	78.6	0.66	151.8	1.93	149.1	0.04	300.8	24.18	0.94	0.04
	G 28420	88411710	27/09/88	30-35-13	24-03-47	7.79	895	130.2	89.4	67.5	77.8	0.79	151.8	2.43	142.0	0.03	290.8	24.43	0.71	0.02
	G 28420	88411722	27/09/88	30-35-13	24-03-47	7.70	890	129.1	88.7	66.6	76.9	0.73	152.9	2.48	137.8	0.03	290.3	24.35	0.83	0.11
	G 28420	88411734	28/09/88	30-35-13	24-03-47	7.73	883	129.7	90.2	66.6	76.9	0.75	150.7	2.48	135.3	0.03	287.5	24.54	0.96	0.01
3024CA88	G 29644	88411795	09/10/88	30-35-54	24-03-47	8.09	1251	179.2	393.6	9.6	11.9	3.89	404.4	0.96	99.5	0.02	264.0	10.52	1.53	0.01
	G 29644	88411801	09/10/88	30-35-54	24-03-47	7.70	1021	170.0	328.6	8.3	8.8	5.40	383.9	0.10	64.9	0.01	180.4	9.12	0.98	0.07
	G 29644	88411813	10/10/88	30-35-54	24-03-47	7.70	1038	173.0	329.9	9.1	8.7	5.89	388.8	0.05	67.4	0.02	186.3	9.32	1.09	0.03
3024CA87	G 29617	88411746	03/10/88	30-36-12	24-03-34	7.40	1212	179.2	148.9	87.6	108.8	0.58	362.5	7.19	268.4	0.02	163.8	15.59	3.84	0.01
	G 29617	88411758	03/10/88	30-36-12	24-03-34	7.50	1509	211.2	166.7	94.7	171.9	0.82	397.8	6.83	293.8	0.03	286.2	15.39	4.16	0.03

HYDROCHEMICAL DATA : DE AAR

SOURCE OF DATA : NATOINAL HYDROCHEMICAL DATABANK (Northern area,1987-1989)

	Bh.No.	H No.	DATE	LATITUDE	LONGITUDE	pH	TDS	EC	Na	Mg	Ca	F	Cl	NO3	SO4	PO4	TAL	Si	K	NH4
3024CA87	G 29617	88411760	04/10/88	30-36-12	24-03-34	7.60	1479	217.6	176.4	100.1	158.0	0.75	421.0	6.28	304.7	0.02	234.4	15.59	4.05	0.14
	G 29617	88411771	04/10/88	30-36-12	24-03-34	7.50	1716	230.4	190.1	104.5	196.2	0.89	460.4	6.23	324.0	0.02	334.4	15.29	4.59	0.06
	G 29617	88411783	05/10/88	30-36-12	24-03-34	7.60	1508	224.0	194.1	106.1	137.7	0.74	478.4	6.03	341.3	0.03	178.9	15.29	4.36	0.05
3024CA 85	G 29618	88411825	12/10/88	30-36-10	24-03-30	7.60	2202	361.6	439.9	141.1	110.8	1.41	742.5	0.63	467.7	0.02	238.8	15.00	4.34	0.03
	G 29618	88411837	13/10/88	30-36-10	24-03-30	7.45	2261	332.8	410.5	145.2	119.3	1.20	719.4	1.92	466.7	0.03	317.3	15.49	3.20	0.07
	G 29618	88411849	13/10/88	30-36-10	24-03-30	7.60	2093	318.7	417.7	146.6	82.5	1.04	719.3	1.71	458.1	0.02	209.9	15.49	4.21	0.04
	G 36423	87446182	11/11/87	30-37-33	24-01-34	7.44	329	46.6	61.2	3.4	20.0	4.59	39.0	1.34	13.7	0.01	133.9	8.20	18.15	0.01
	G 36424	87446194	12/11/87	30-37-33	24-01-34	7.28	1426	241.7	102.5	77.3	188.4	1.64	424.6	41.07	264.9	0.03	84.8	8.49	81.26	0.05
	G 36425	87446200	18/11/87	30-37-33	24-01-34	7.64	1448	231.2	78.5	93.3	183.6	0.53	354.8	16.17	224.1	0.07	314.7	10.24	57.46	0.32
	G 36427	87446212	25/11/87	30-37-29	24-01-40	7.50	1378	238.1	106.3	109.2	180.5	0.67	447.8	19.39	293.0	0.02	117.8	14.98	11.36	0.04
	G 36427	87446224	23/11/87	30-37-29	24-01-40	7.33	1326	216.6	71.6	96.2	168.5	0.53	348.8	35.49	242.8	0.01	156.5	12.11	49.54	0.06
	CP 1	87434880	24/03/87	30-37-36	24-07-28	7.80	3508	553.6	826.2	165.0	135.1	0.98	1108.5	0.20	782.0	0.07	396.0	15.49	5.90	0.28
	CP 3	87434891	24/03/87	30-37-31	24-07-39	7.62	584	76.0	46.4	32.7	67.3	0.72	30.7	1.26	32.7	0.01	300.0	16.75	1.65	0.02
	DR 13	88403427	15/02/88	30-38-36	24-00-41	7.73	2076	338.3	227.5	138.0	255.5	0.51	664.8	10.75	487.8	0.01	204.3	16.79	4.80	0.02
	CP 5	87434908	24/03/87	30-38-04	24-05-55	7.68	1319	204.8	101.1	95.6	176.1	0.56	300.1	2.57	314.9	0.01	258.5	19.02	4.19	0.03
	CP 8	87434866	24/03/87	30-38-11	24-09-44	7.80	1349	208.0	138.1	115.3	123.9	0.59	312.8	2.03	296.9	0.01	288.2	25.00	1.19	0.02
	BH 3	87434910	24/03/87	30-38-01	24-09-50	7.68	1113	176.0	125.6	84.8	98.8	0.59	243.4	0.09	236.4	0.01	264.3	21.72	0.70	0.04
	BH 9	87434921	24/03/87	30-38-56	24-09-50	7.77	2056	326.4	347.6	136.1	135.4	0.64	615.1	0.14	440.1	0.01	310.0	23.77	2.89	0.02
	BH 2	87434933	24/03/87	30-38-07	24-09-40	7.68	768	115.0	99.7	49.0	57.9	1.16	125.9	1.08	86.1	0.00	280.9	21.60	0.46	0.02
	BH 8	87434945	24/03/87	30-38-44	24-09-44	7.80	2266	352.0	381.2	147.9	150.1	0.44	611.3	0.61	554.1	0.00	342.0	23.80	1.67	0.03
	BH 4	87434957	24/03/87	30-38-26	24-09-21	7.08	213	34.2	29.6	8.8	19.1	0.23	24.2	0.10	35.7	0.31	74.6	5.30	3.15	0.02
	BH 5	87434969	24/03/87	30-38-24	24-09-19	7.54	1030	160.0	118.7	72.7	91.7	0.76	214.6	0.40	157.4	0.02	304.7	23.44	0.68	0.02
	G 06779	88412714	02/12/88	30-38-23	24-09-34	7.40	776	103.0	96.6	50.0	59.2	1.26	94.7	2.54	92.7	0.05	303.4	21.50	0.50	0.04
3024CA93	G 18880	88412726	02/12/88	30-38-33	24-09-47	7.40	1161	174.0	97.3	85.8	132.1	0.77	274.0	2.16	208.3	0.07	289.2	22.02	0.49	0.02
3024 CA 315	G 18882	88412738	02/12/88	30-38-45	24-09-49	7.40	3134	467.2	397.1	261.7	270.9	0.36	954.0	0.31	807.7	0.03	359.2	24.48	2.70	0.02
3024CA 92	G 18884	88412740	02/12/88	30-38-57	24-09-54	7.40	2158	313.6	378.5	143.6	129.5	0.67	598.2	0.51	454.5	0.03	368.9	24.08	1.31	0.02
	G 18881	88412763	02/12/88	30-38-40	24-09-34	7.80	3919	550.0	888.5	256.4	104.2	0.46	1306.9	0.08	960.5	0.05	327.8	24.77	1.43	0.01
	G 06778	88412775	02/12/88	30-38-01	24-09-50	7.50	958	134.0	111.0	69.9	78.8	0.68	155.7	0.34	150.2	0.02	319.8	21.72	0.24	0.01
	NO 4	88412787	02/12/88	30-38-29	24-09-20	7.60	973	130.0	122.8	65.3	69.0	1.11	146.0	0.12	90.7	0.07	390.5	17.99	1.20	0.01
	NO 5	88412799	02/12/88	30-38-25	24-09-21	7.30	1637	256.0	185.5	144.9	139.0	0.75	474.5	0.54	360.0	0.06	270.0	23.81	0.41	0.02

HYDROCHEMICAL DATA : DE AAR

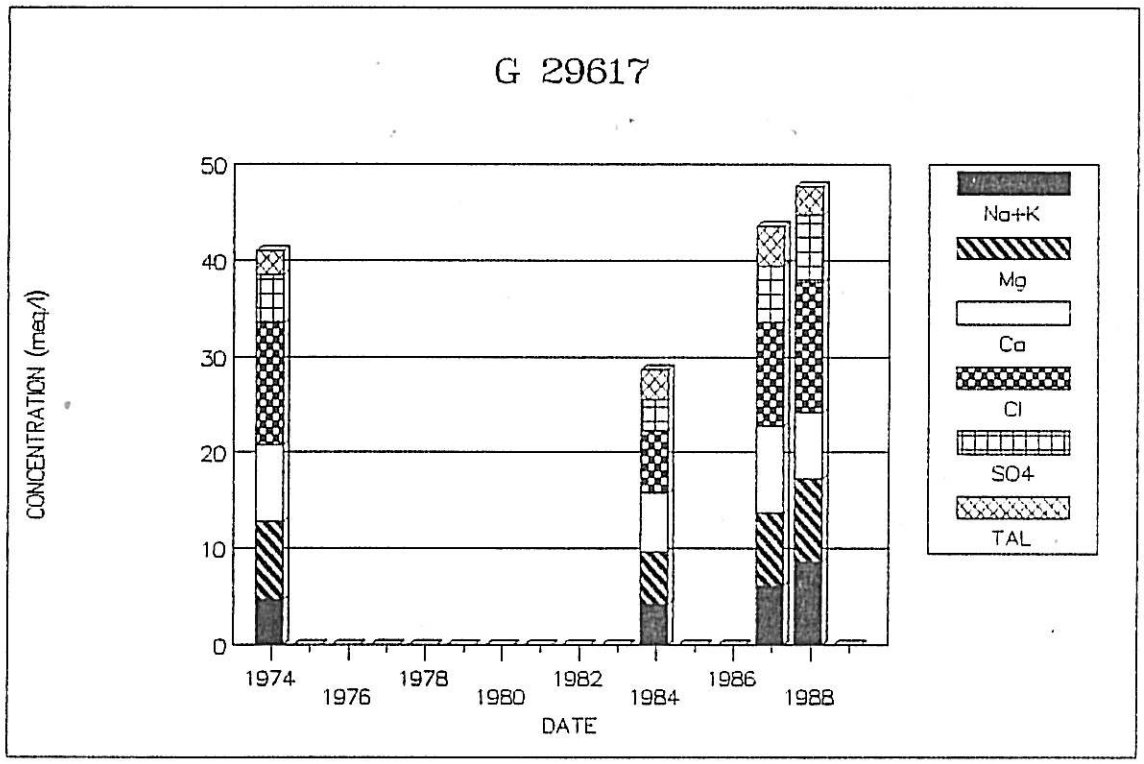
SOURCE OF DATA : NATOINAL HYDROCHEMICAL DATABANK (Northern area,1987-1989)

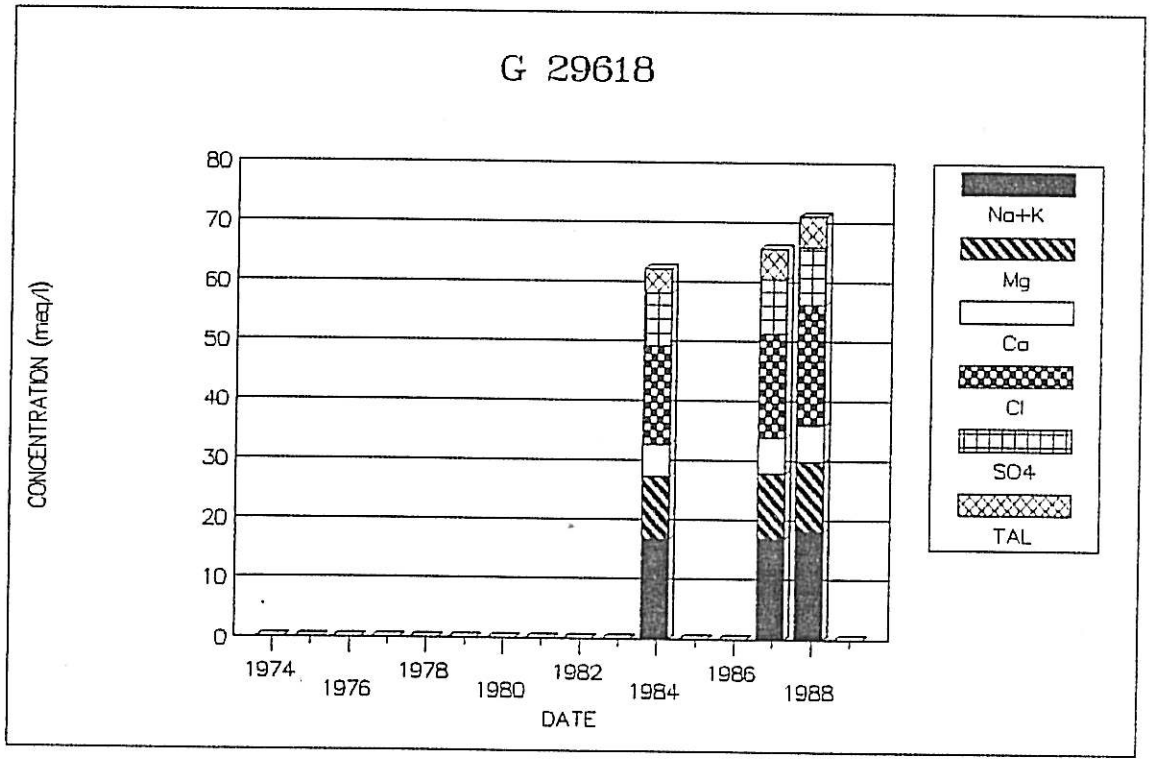
	Bh.No.	H No.	DATE	LATITUDE	LONGITUDE	pH	TDS	EC	Na	Mg	Ca	F	Cl	NO3	SO4	PO4	TAL	Si	K	NH4
	DR 2	87446248	10/11/87	30-40-55	23-58-44	7.28	2128	357.8	146.1	170.1	316.8	0.26	832.5	38.44	420.9	0.03	54.4	17.82	5.08	0.04
	CT 3	87434982	24/03/87	30-40-22	24-09-32	7.60	1068	184.0	43.0	90.9	168.2	0.33	324.6	3.40	186.1	0.01	195.0	21.29	1.86	0.03
	BH 61	87435044	24/03/87	30-37-57	23-54-21	8.05	619	87.0	43.4	37.6	78.6	0.75	52.9	3.34	49.1	0.01	278.3	14.30	2.19	0.02
	BN 24	88412593	02/12/88	30-37-58	23-54-21	7.20	649	83.0	40.9	39.7	82.8	1.17	64.2	6.21	52.2	0.01	277.9	14.03	1.80	0.02
	BN 25	88412600	02/12/88	30-37-59	23-54-38	7.20	690	90.0	43.4	42.7	88.7	0.94	81.4	7.27	58.9	0.01	277.8	15.25	2.56	0.02
3024CA 317	G 18886	88412751	02/12/88	30-39-08	24-10-01	7.70	1503	188.8	333.0	51.4	53.8	1.16	189.8	0.77	313.1	0.05	456.4	23.02	0.79	0.01
	CT 2	87433412	06/02/87	30-40-57	24-10-24	7.82	649	84.0	49.4	38.5	67.3	0.77	52.5	6.86	50.8	0.01	293.0	17.21	1.68	0.01
	CT 4	87433667	07/02/87	30-40-28	24-10-57	7.60	795	117.8	45.5	62.2	99.0	0.41	136.5	3.92	108.7	0.08	265.4	21.59	1.40	0.04
3024CA 321	G 27927	88402757	19/01/88	30-40-00	24-10-11	7.85	3560	611.3	764.2	240.9	124.9	1.19	1474.9	0.22	631.4	0.02	259.2	19.84	5.17	0.09
	G 38274	88408450	06/07/88	30-40-56	24-10-59	7.08	4117	619.3	1081.2	147.4	90.2	1.93	1072.9	0.17	1088.3	0.03	517.7	9.46	3.31	0.02
3024CA 373	G 38441	88408474	12/07/88	30-40-56	24-10-59	6.94	1891	312.6	442.2	48.0	142.2	1.71	649.5	0.13	383.6	0.06	180.9	10.52	2.76	0.02
	G 38274	88408498	06/07/88	30-40-56	24-10-59	7.25	3921	606.6	1065.1	147.4	65.9	2.26	1043.9	0.03	1039.1	0.03	456.6	9.94	0.00	0.01

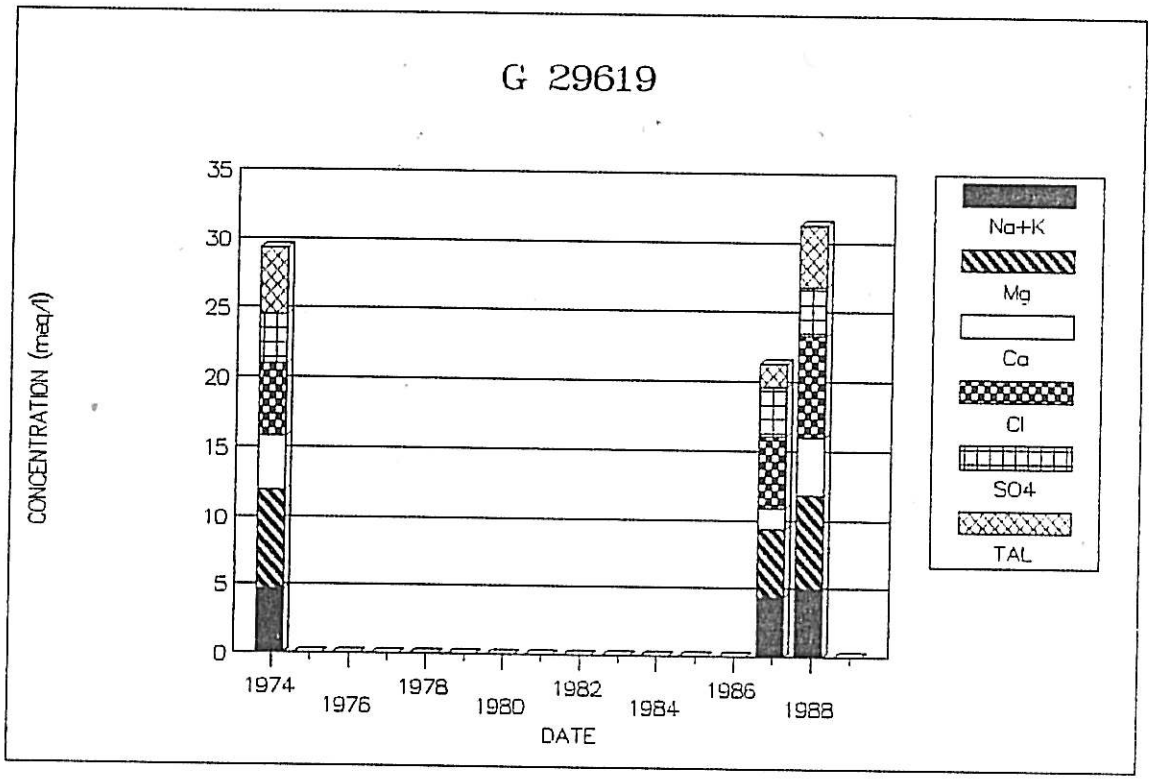
APPENDIX B

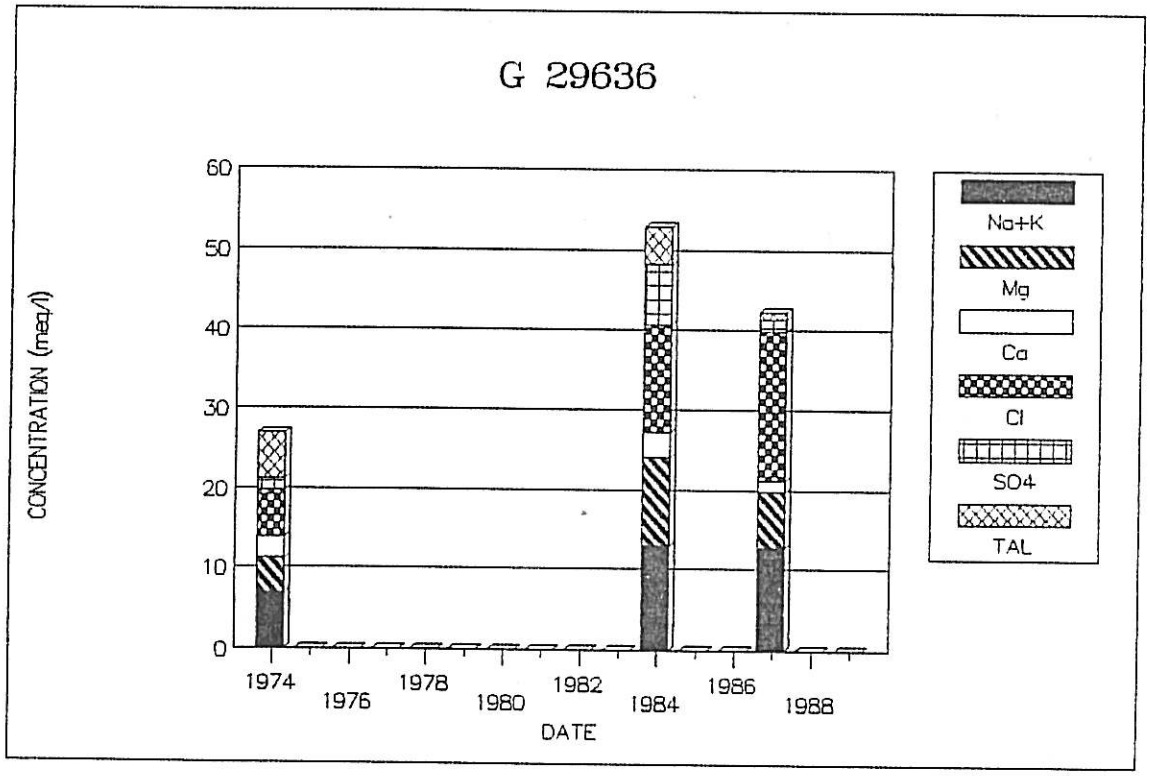
HYDROCHEMICAL BAR GRAPHS

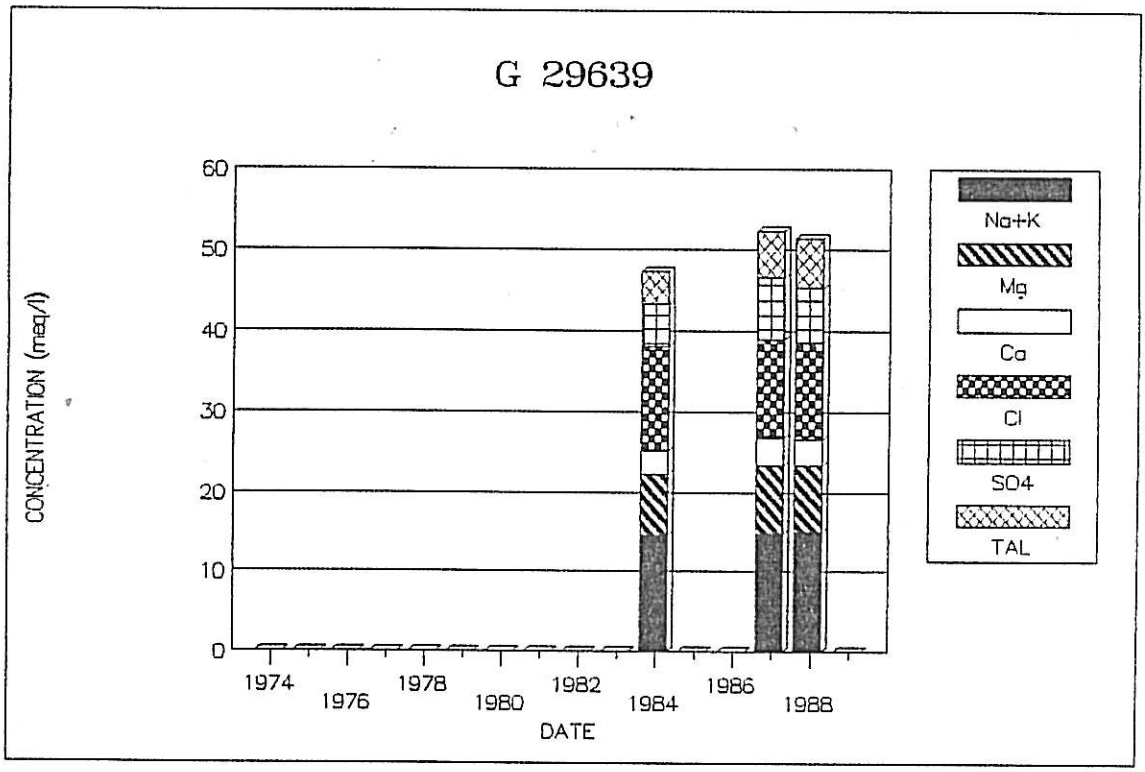
Northern area	Western area	Eastern area
G29617 3024CA87	G27704	G27917
G29618 3024CA85	G27707	G27918
G29619 3024CA17	G27723	G27927
G29639	G28402	
G29636	G28405	
G29641		
G29642		
G29644		

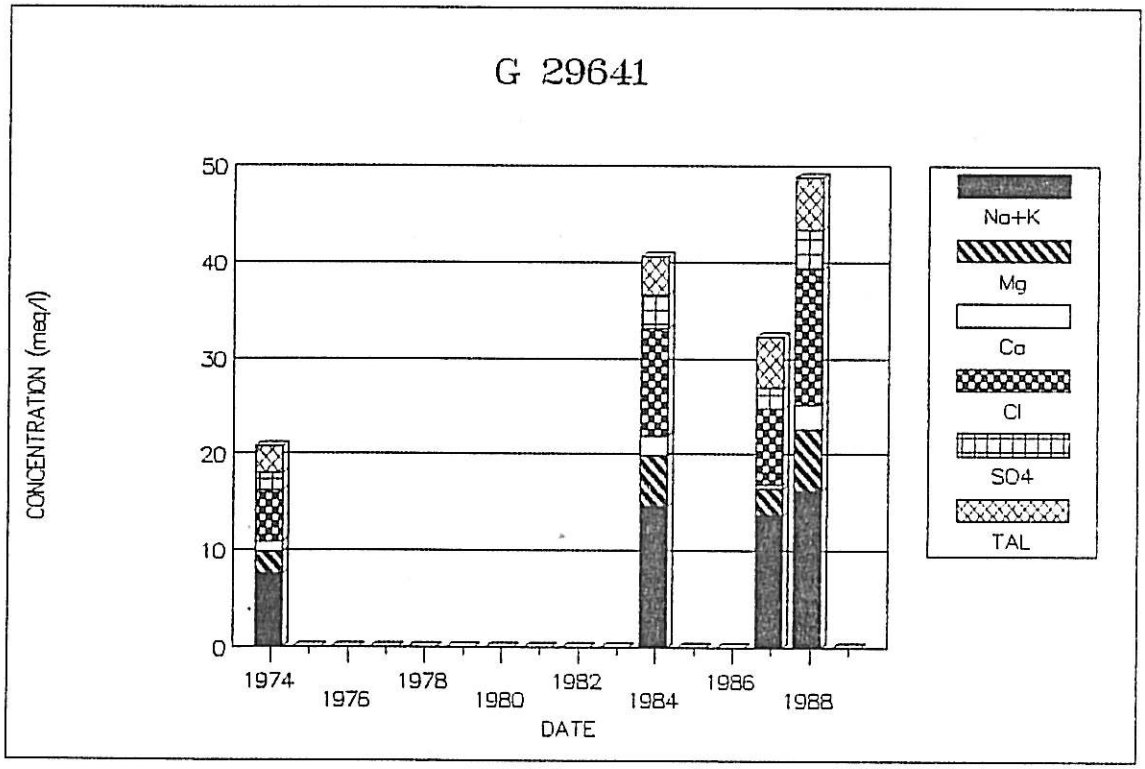

G 29617
CONCENTRATION (meq/l)
50
40
30
20
10
0
1974
1976
1978
1980
1982
1984
1986
1988
DATE
Na+K
Mg
Ca
Cl
SO4
TAL

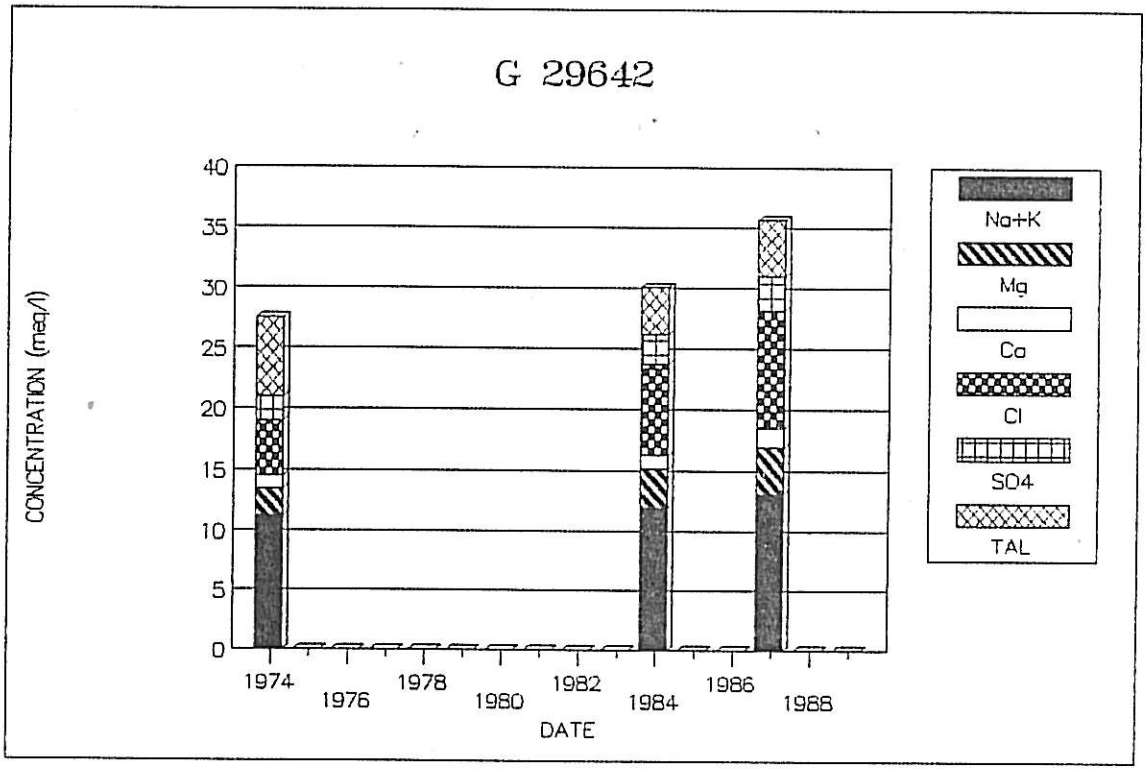

G 29618
CONCENTRATION (meq/l)
80
70
60
50
40
30
20
10
0
1974
1976
1978
1980
1982
1984
1986
1988
DATE
Na+K
Mg
Ca
Cl
SO4
TAL

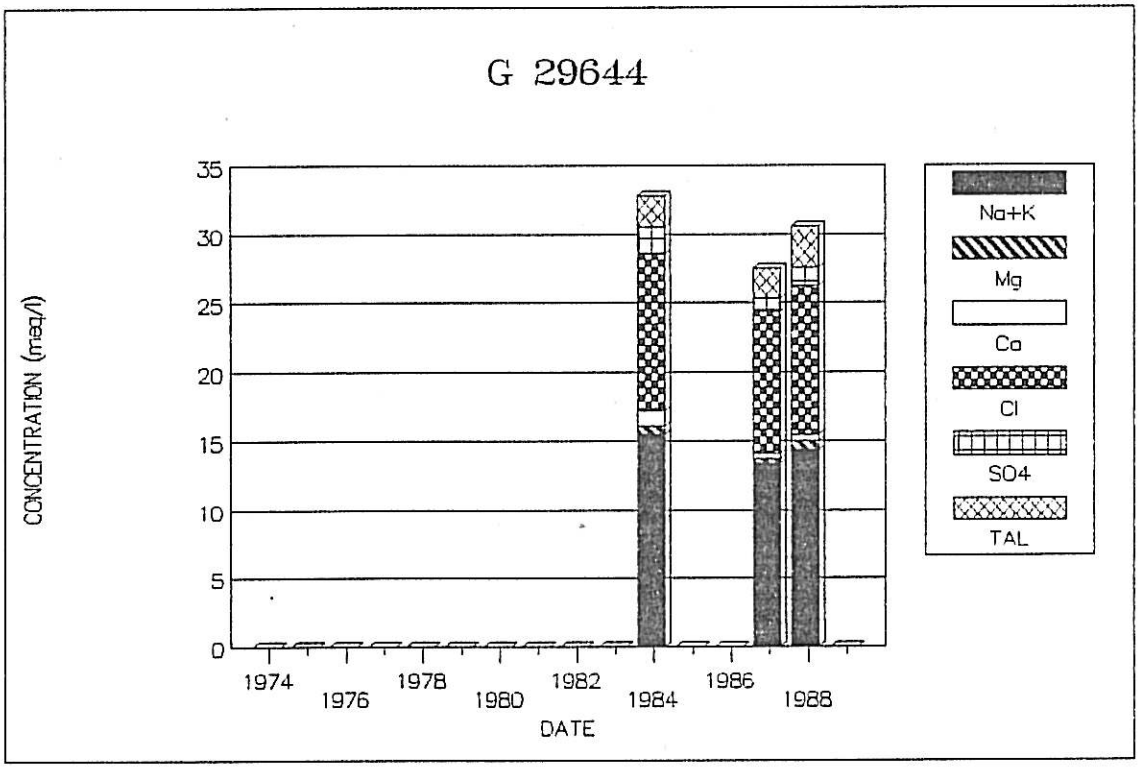

G 29619
CONCENTRATION (meq/l)
35
30
25
20
15
10
5
0
1974
1976
1978
1980
1982
1984
1986
1988
DATE
Na+K
Mg
Ca
Cl
SO4
TAL

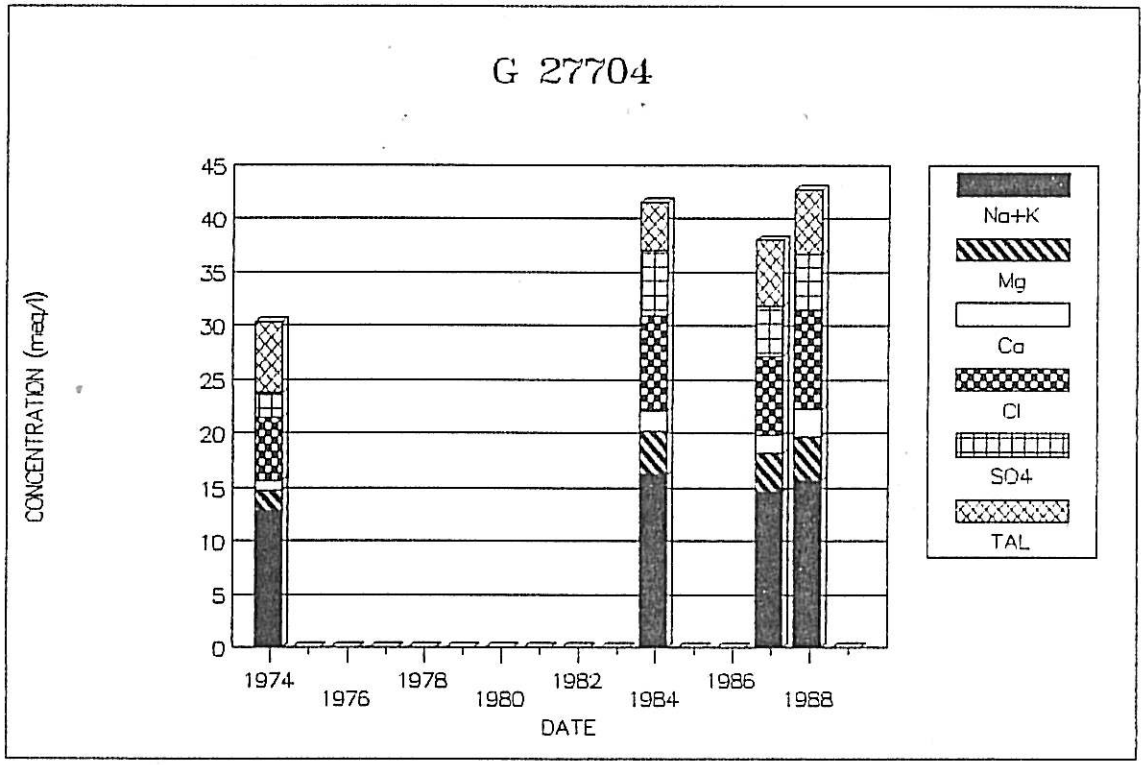

G 29636
CONCENTRATION (meq/l)
60
50
40
30
20
10
0
1974
1976
1978
1980
1982
1984
1986
1988
DATE
Na+K
Mg
Ca
Cl
SO4
TAL

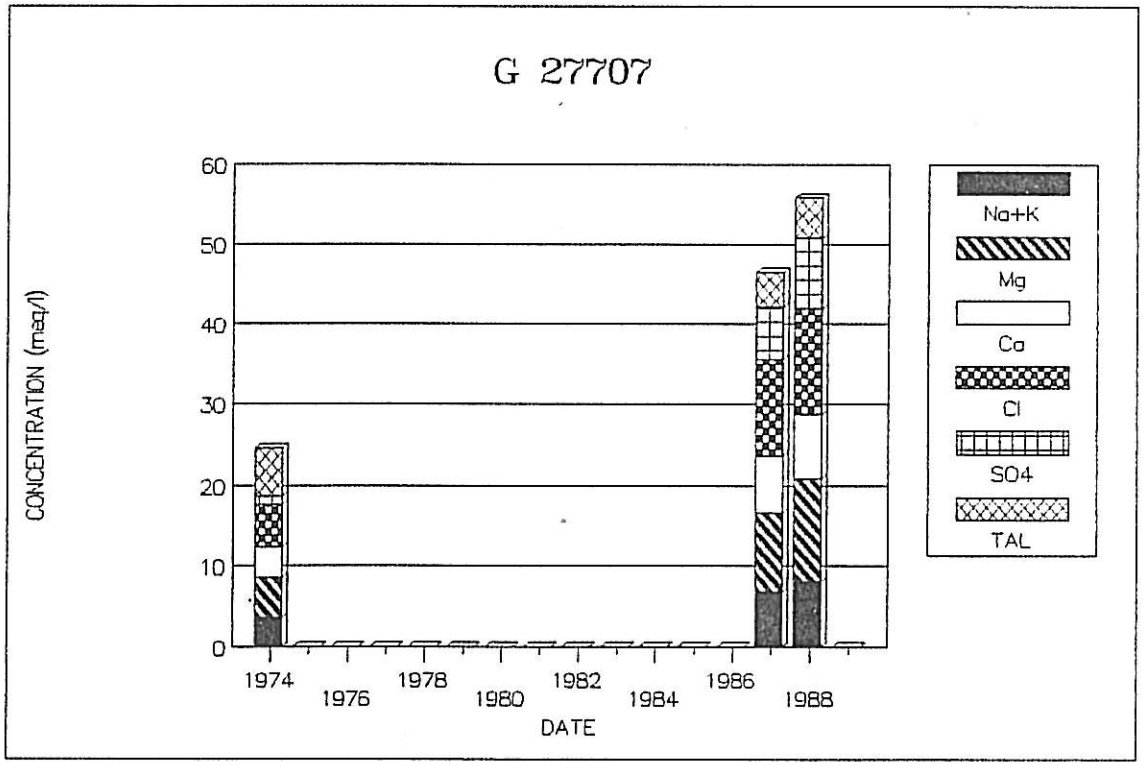

G 29639
CONCENTRATION (meq/l)
60
50
40
30
20
10
0
1974
1976
1978
1980
1982
1984
1986
1988
DATE
Na+K
Mg
Ca
Cl
SO4
TAL

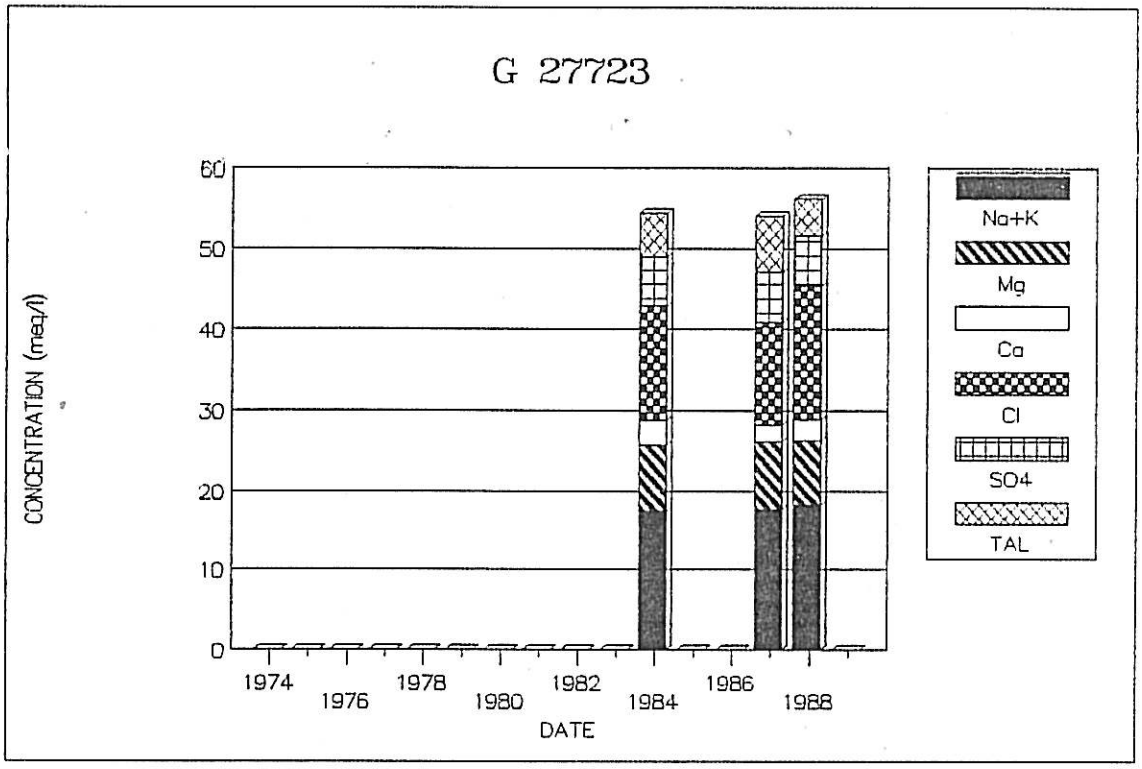

G 29641
CONCENTRATION (meq/l)
50
40
30
20
10
0
1974
1976
1978
1980
1982
1984
1986
1988
DATE
Na+K
Mg
Ca
Cl
SO4
TAL

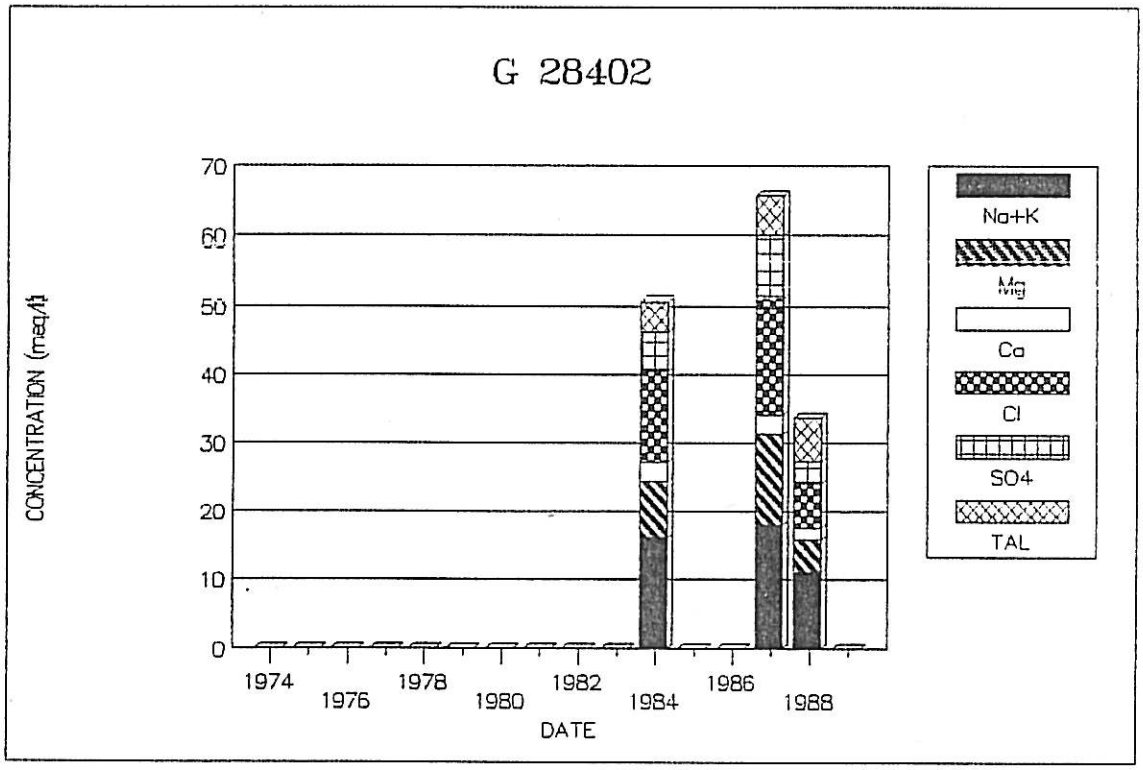

G 29642
CONCENTRATION (meq/l)
40
35
30
25
20
15
10
5
0
1974
1976
1978
1980
1982
1984
1986
1988
DATE
Na+K
Mg
Ca
Cl
SO4
TAL

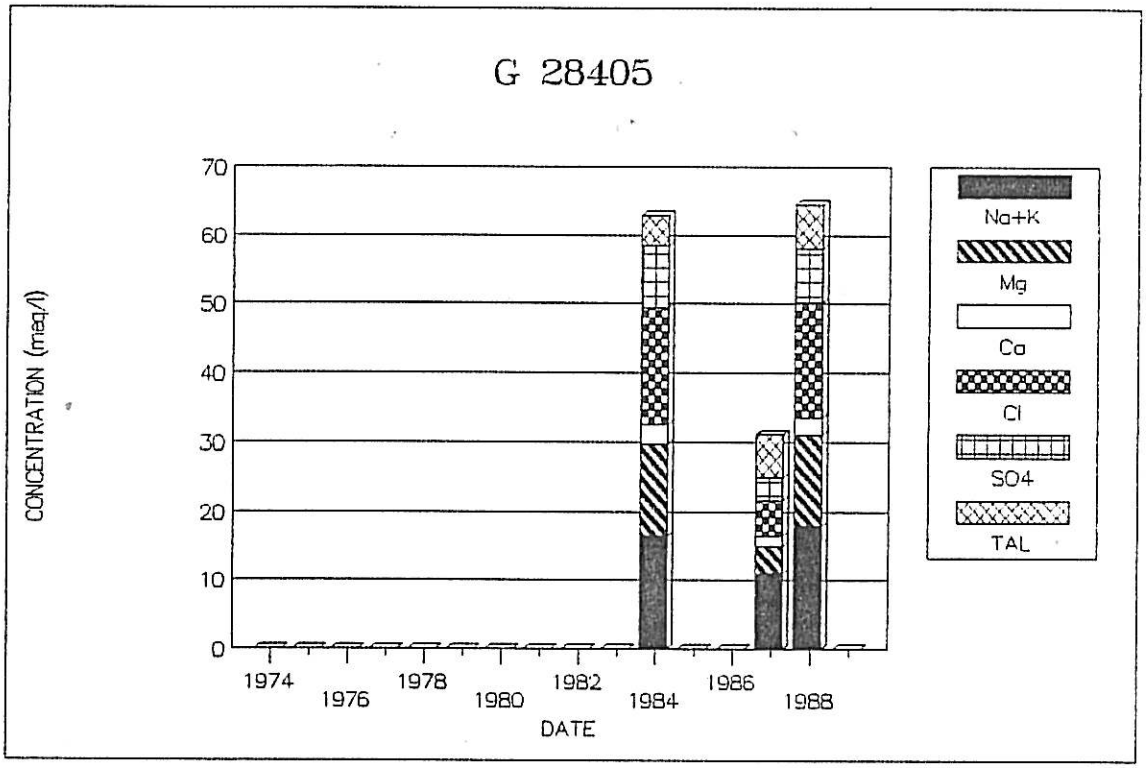

G 29644
CONCENTRATION (meq/l)
35
30
25
20
15
10
5
0
1974
1976
1978
1980
1982
1984
1986
1988
DATE
Na+K
Mg
Ca
Cl
SO4
TAL

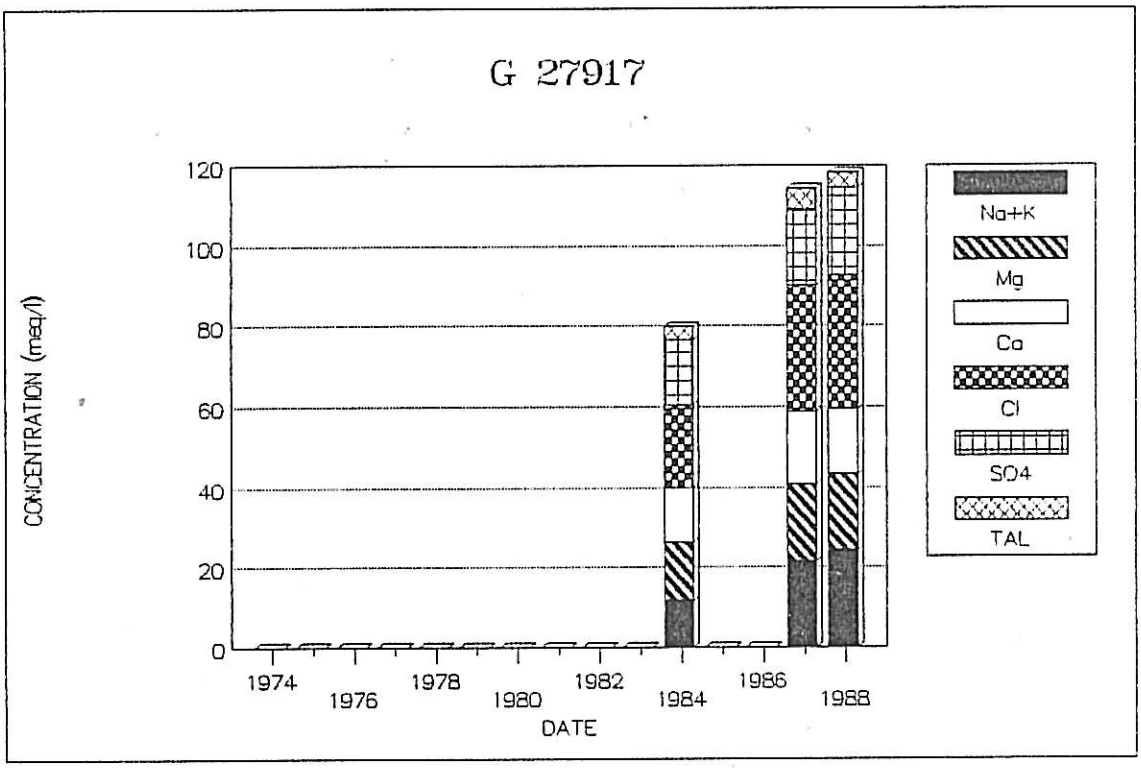

G 27704
CONCENTRATION (meq/l)
45
40
35
30
25
20
15
10
5
0
1974
1976
1978
1980
1982
1984
1986
1988
DATE
Na+K
Mg
Ca
Cl
SO4
TAL

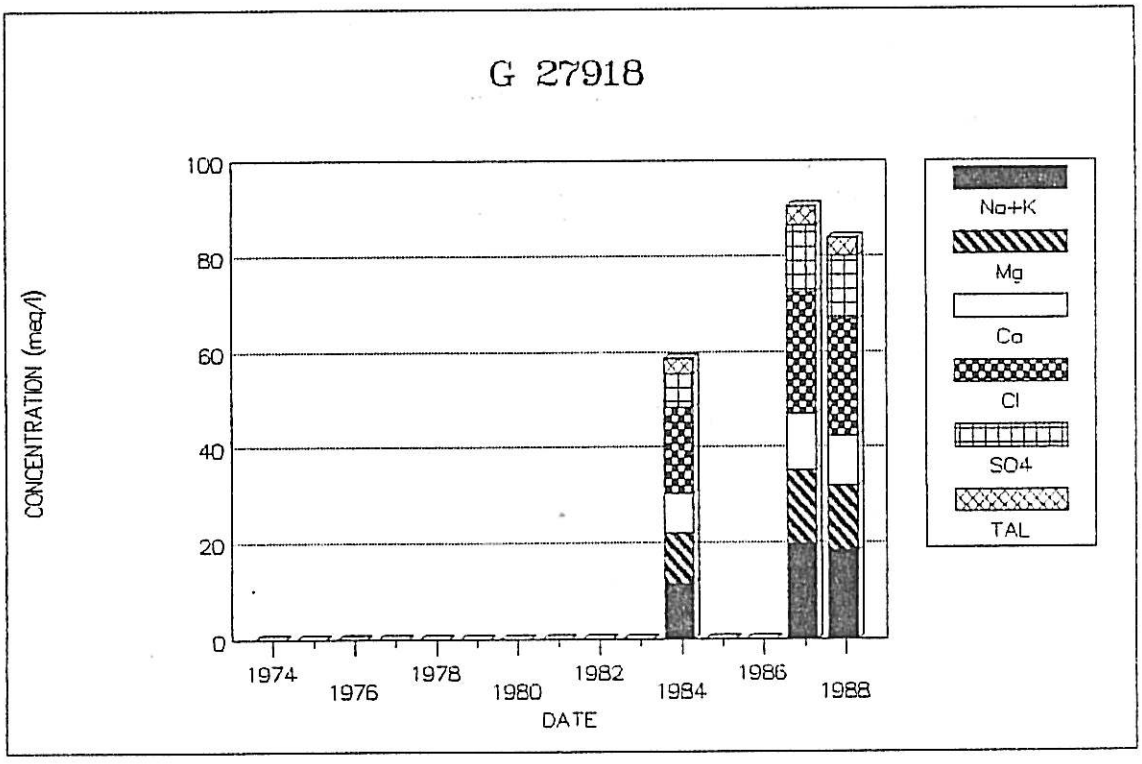

G 27707
CONCENTRATION (meq/l)
60
50
40
30
20
10
0
1974
1976
1978
1980
1982
1984
1986
1988
DATE
Na+K
Mg
Ca
Cl
SO4
TAL

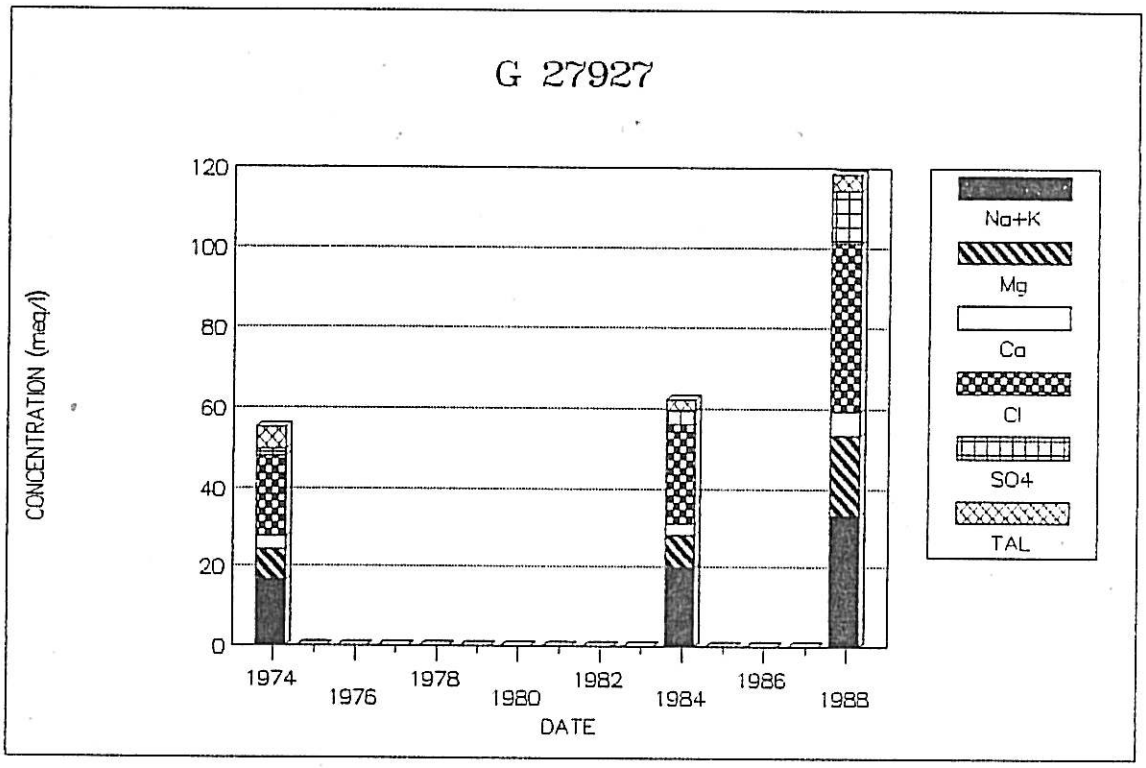

G 27723
CONCENTRATION (meq/l)
60
50
40
30
20
10
0
1974
1976
1978
1980
1982
1984
1986
1988
DATE
Na+K
Mg
Ca
Cl
SO4
TAL


G 28402
CONCENTRATION (meq/l)
70
60
50
40
30
20
10
0
1974
1976
1978
1980
1982
1984
1986
1988
DATE
Na+K
Mg
Ca
Cl
SO4
TAL


G 28405
CONCENTRATION (meq/l)
70
60
50
40
30
20
10
0
1974
1976
1978
1980
1982
1984
1986
1988
DATE
Na+K
Mg
Ca
Cl
SO4
TAL


G 27917
CONCENTRATION (meq/l)
120
100
80
60
40
20
0
1974
1976
1978
1980
1982
1984
1986
1988
DATE
Na+K
Mg
Ca
Cl
SO4
TAL


G 27918
CONCENTRATION (meq/l)
100
80
60
40
20
0
1974
1976
1978
1980
1982
1984
1986
1988
DATE
Na+K
Mg
Ca
Cl
SO4
TAL


G 27927
CONCENTRATION (meq/l)
120
100
80
60
40
20
0
1974
1976
1978
1980
1982
1984
1986
1988
DATE
Na+K
Mg
Ca
Cl
SO4
TAL

APPENDIX C

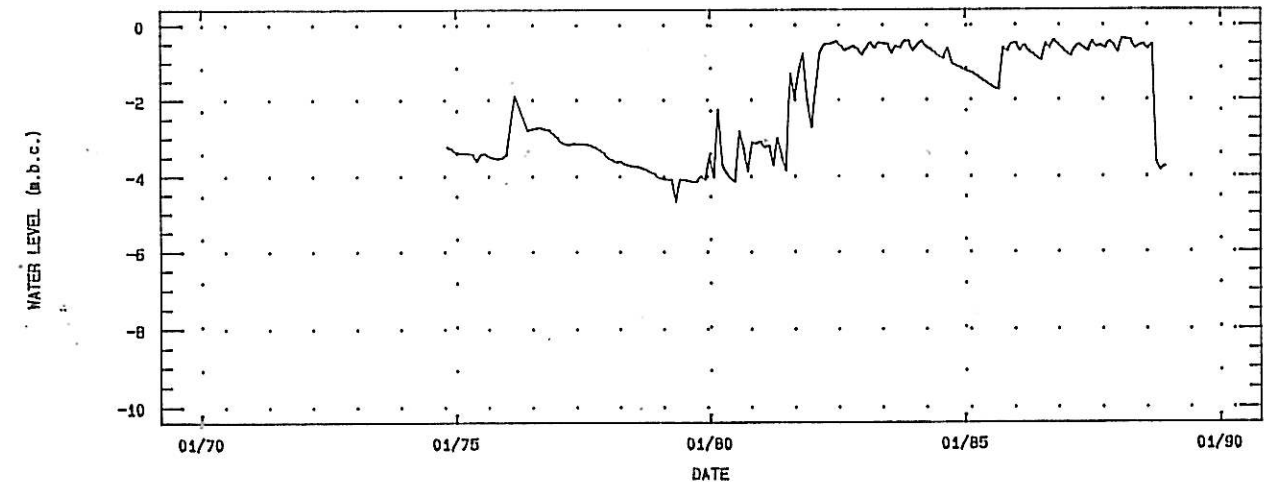
WATER LEVEL GRAPHS

Norther area - G29632
- G29645

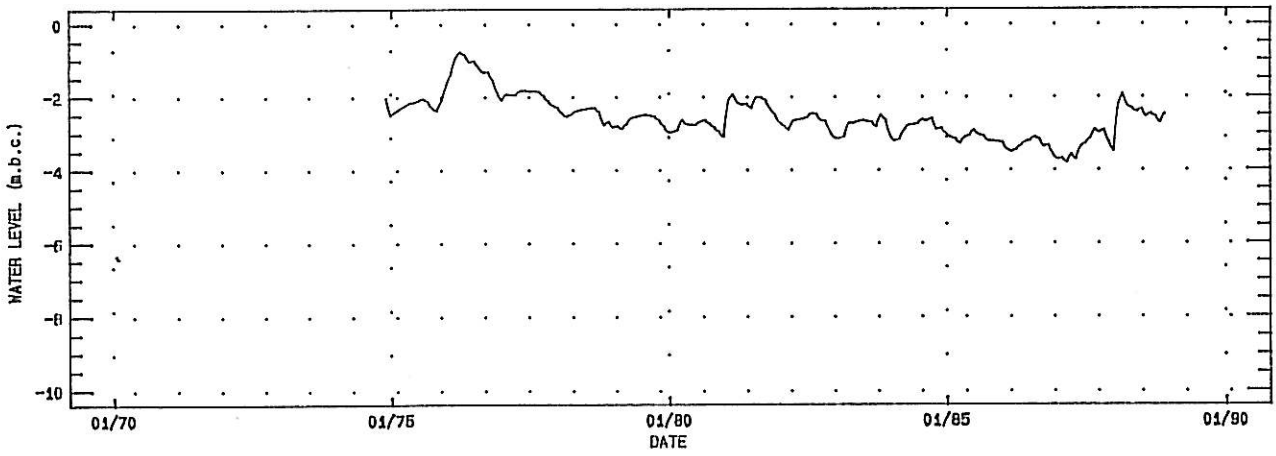
Western area - G27720
- G27708

Eastern area - BG1
- G18891
- G27927
- G28304F
- B2
- G28413

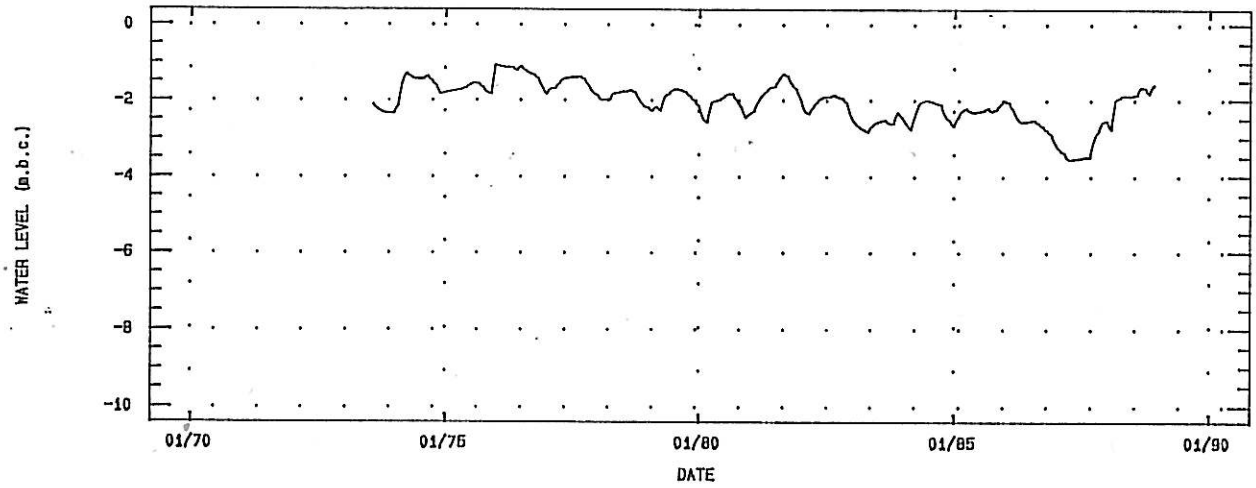
G 29632



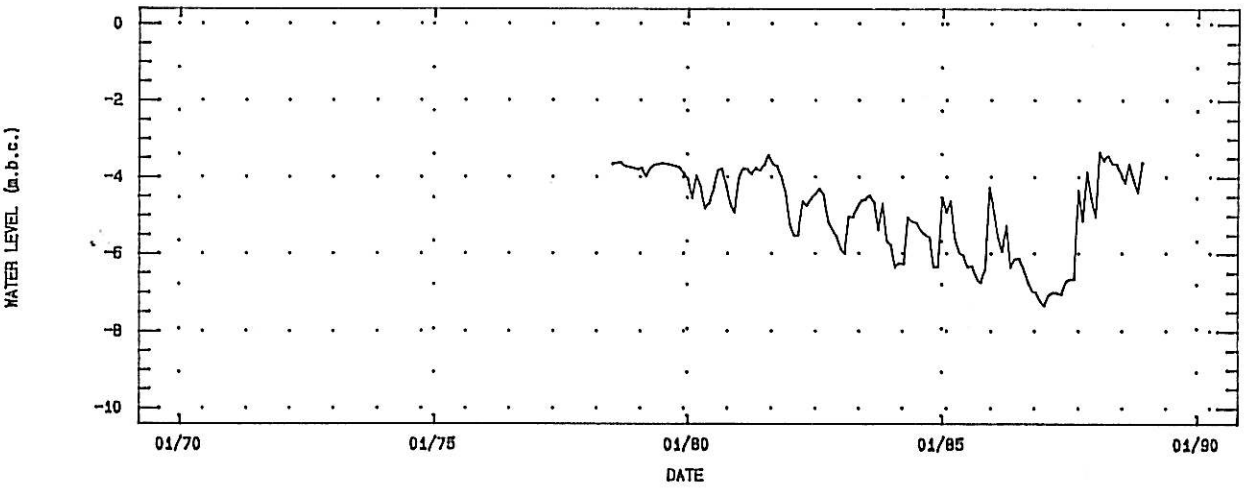
G 29645



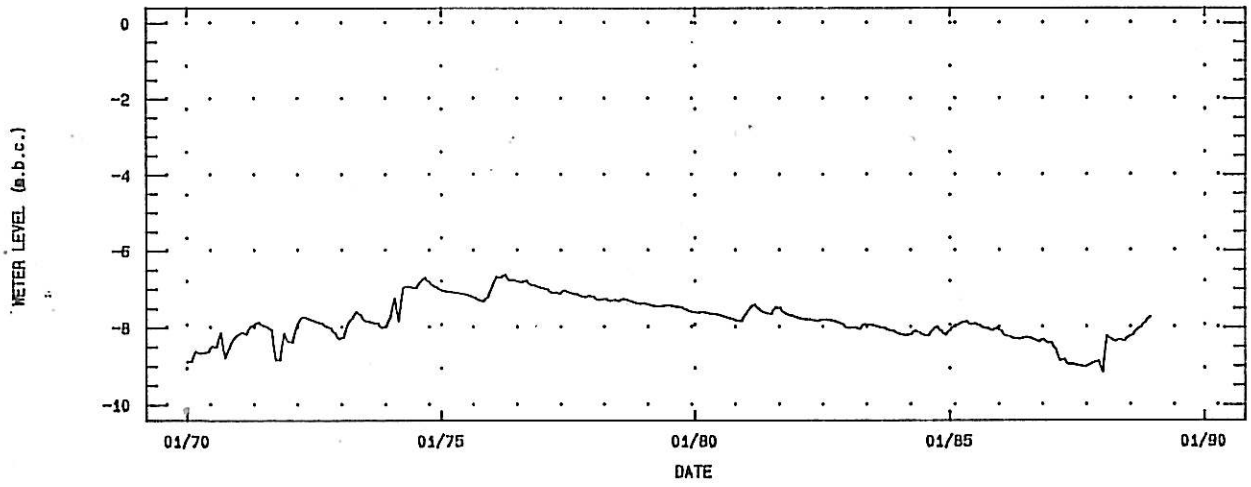
B 27720



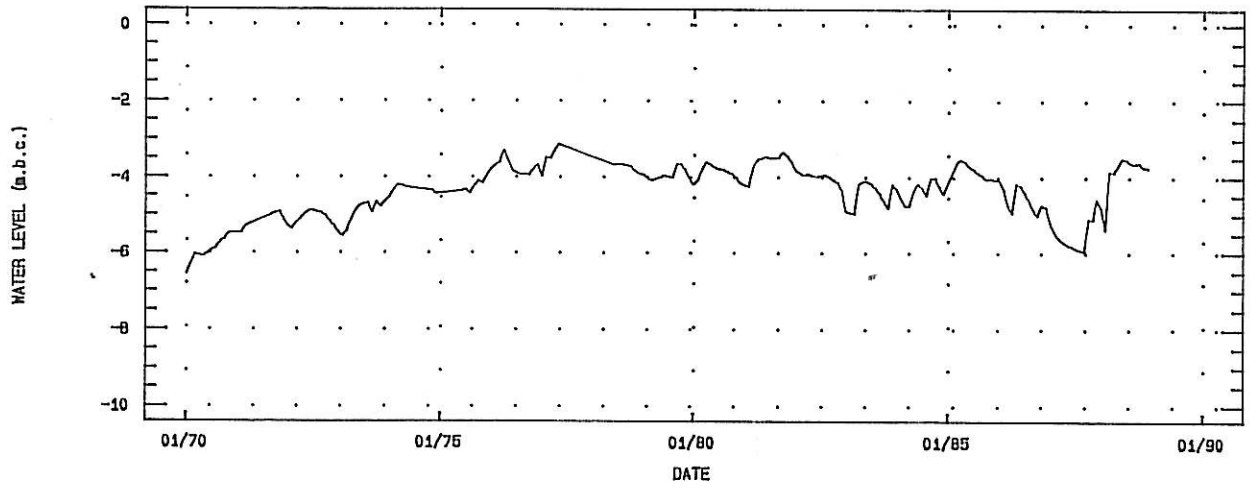
B 27708



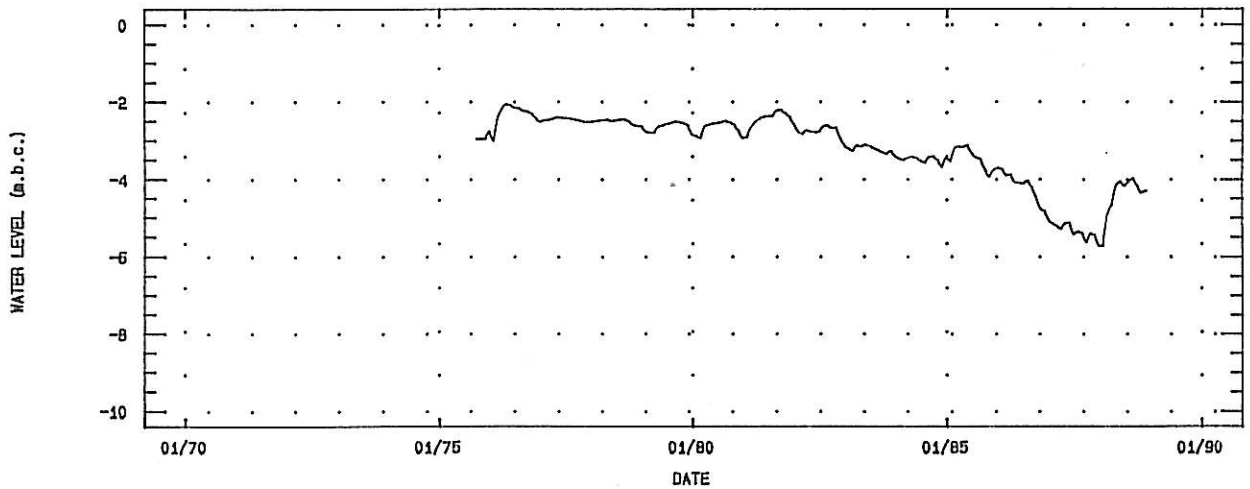
BG 1



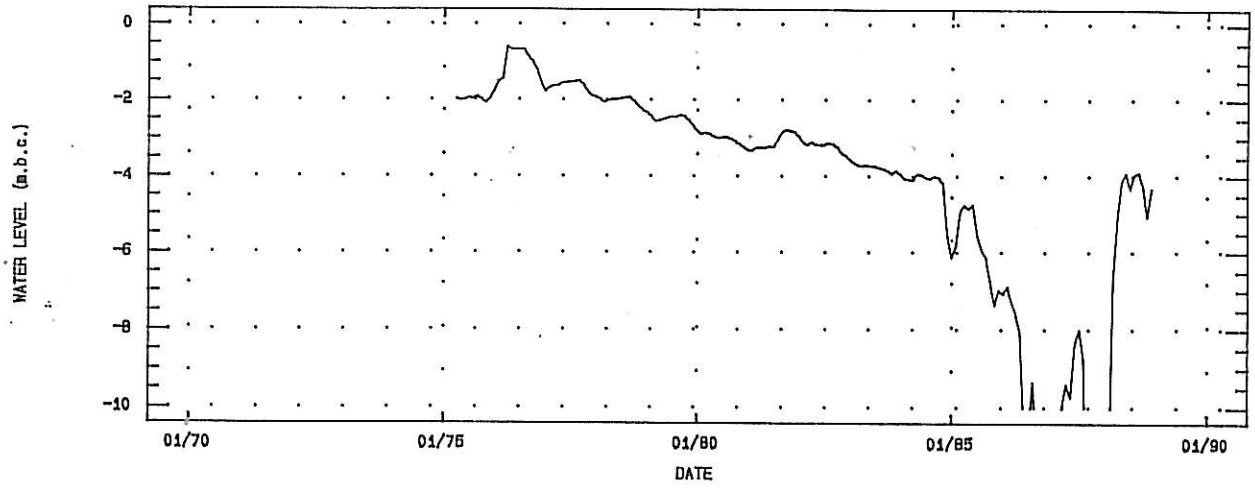
G 18891



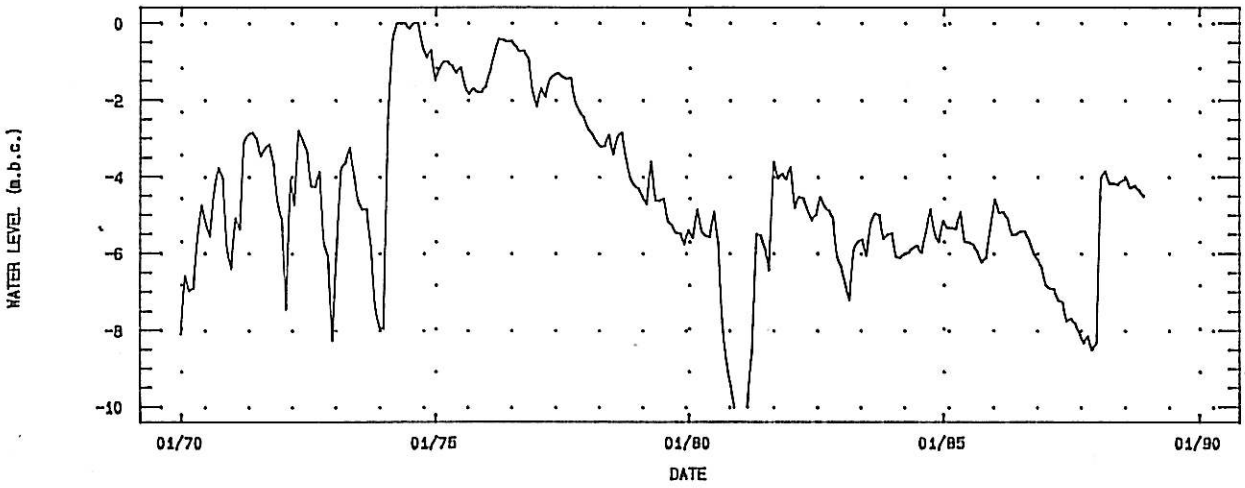
G 27927



G 28304F



B 2



G 28413