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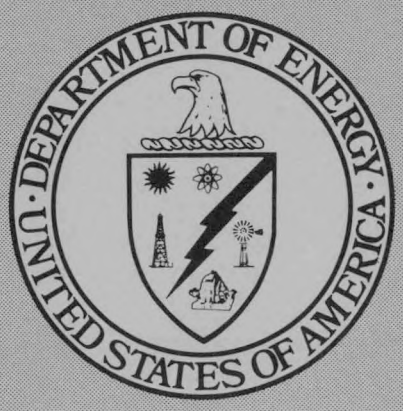

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WATER QUALITY AT THE LETC TS-1S TAR SAND STEAMFLOOD SITE

Final Report

By
John J. Ahern
Craig Goodwin

July 1982

Work Performed Under Contract No. AS20-81LC10664

University of Wyoming
Water Resources Research Institute
Laramie, Wyoming

TECHNICAL INFORMATION CENTER
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CHAPTER I

SUMMARY AND CONCLUSIONS

1. Water quality was monitored during the LETC TS-1S steamflood experiment conducted in the Northwest Asphalt Ridge tar sand deposit near Vernal, Utah. Ground-water samples were collected by personnel from the Department of Energy's Laramie Energy Technology Center (LETC) and from Western Wyoming College. Samples were analyzed for 41 water quality constituents by Western Wyoming College.

2. Samples were either analyzed in the field or preserved by one of three different methods for analysis in the laboratory. Preservation methods had no effect on the measured concentrations of calcium, magnesium, manganese, and sulfate; these results indicate refrigeration is an adequate preservation method for these five constituents. Refrigeration also seemed to provide accurate data for chemical oxygen demand (COD), total organic carbon (TOC), and total dissolved solids (TDS). Preservation methods had a significant effect on ammonia data; however, it was uncertain which preservation method produced the most accurate results.

3. The pH changed significantly between the field and the laboratory. It tended to increase in the pH 6 to pH 8 range and decrease outside this range. The large pH changes illustrated the disequilibrium conditions in the samples. They appeared to cause significant changes in bicarbonate and dissolved iron in the samples, and possibly in other constituents whose solubility is a function of pH.

4. Specific conductance data were apparently inaccurate. The data for TDS and major inorganic ions seemed to be accurate.

5. TDS and major inorganic ion concentrations peaked early in the experiment and then rapidly declined a couple of weeks later to concentrations approaching those in the injected steam. Saturation of the tar sand deposit by injected steam appeared to bring dissolvable solids into contact with water, to cause dissolution of the solids producing saline water, and to permit the movement of this saline water to the monitoring wells. Either a lack of dissolvable material or slow kinetics of dissolution prevented elevated salt concentrations later in the experiment.

6. COD and TOC typically peaked three times during the experiment. The first peak coincided with the inorganic peak; the second peak occurred with the commencement of oil production; and the third peak happened at the end of the experiment.

7. Inorganic and organic concentrations were usually highest at well 3P2, followed in descending order by well 3P3, well 3P7, and well 3P1. Lower permeability and higher oil saturation of the pore spaces appeared to cause higher concentrations in the ground water.

8. Factor analysis identified three underlying factors which could explain most of the water quality changes. The first factor explained concentrations of the major inorganic ions and was probably based on the availability of dissolvable material underground. The second factor explained concentrations of COD, TOC, and boron, and was probably based on prolonged contact of water and the crude. The third factor explained concentrations of ammonia and may be based on the volatility of ammonia.

9. The monitoring program at the tar sand site missed the rapid decrease in inorganic concentrations at all wells except 3P7 and failed to define adequately the changes in COD and TOC. These problems can be avoided in future tar sand experiments if an indicator monitoring program based on factor analysis is established.

10. Many of the Utah surface water quality standards and Wyoming ground-water standards were exceeded in samples taken during the tar sand experiment. However, degraded water quality in the tar sand deposit may have little environmental significance since the deposit is not an aquifer and is apparently isolated from underlying aquifers by shale aquitards.

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CHAPTER II

INTRODUCTION

The Department of Energy Laramie Energy Technology Center (LETC) is charged with the responsibility for conducting research in the areas of fossil fuel recovery and utilization. In partial fulfillment of this responsibility, LETC has been performing research into the recovery of oil from tar sands. LETC has conducted three field experiments aimed at determining the technical and economic feasibility of in situ thermal processing of tar sand. This report discusses water quality aspects of the third of these field experiments, LETC TS-1S, which was conducted in the spring and summer of 1980.

LETC TS-1S was a steamflood experiment conducted in the Northwest Asphalt Ridge deposit near Vernal, Utah (Figure II-1.a). Steam was injected into a tar-bearing 45-foot (14-meter) thick sandstone in the Rimrock Member of the Mesaverde Formation. Production was from eight wells located around the center injection well in two concentric inverted five-spot patterns (Figure II-1.c). Steam injection began April 23, 1980, and continued until September 29, 1980, a period of 160 days. Details of the experimental procedures used during the field experiment may be found in Johnson et al. (1981a, 1981b).

As with most energy recovery/processing techniques, steamflooding of tar sand deposits may have the potential for environmental degradation. Of particular concern is the effect upon the ground-water quality by steamflooding tar sand-bearing aquifers. To assess any potentially adverse water quality impacts due to steamflooding, LETC

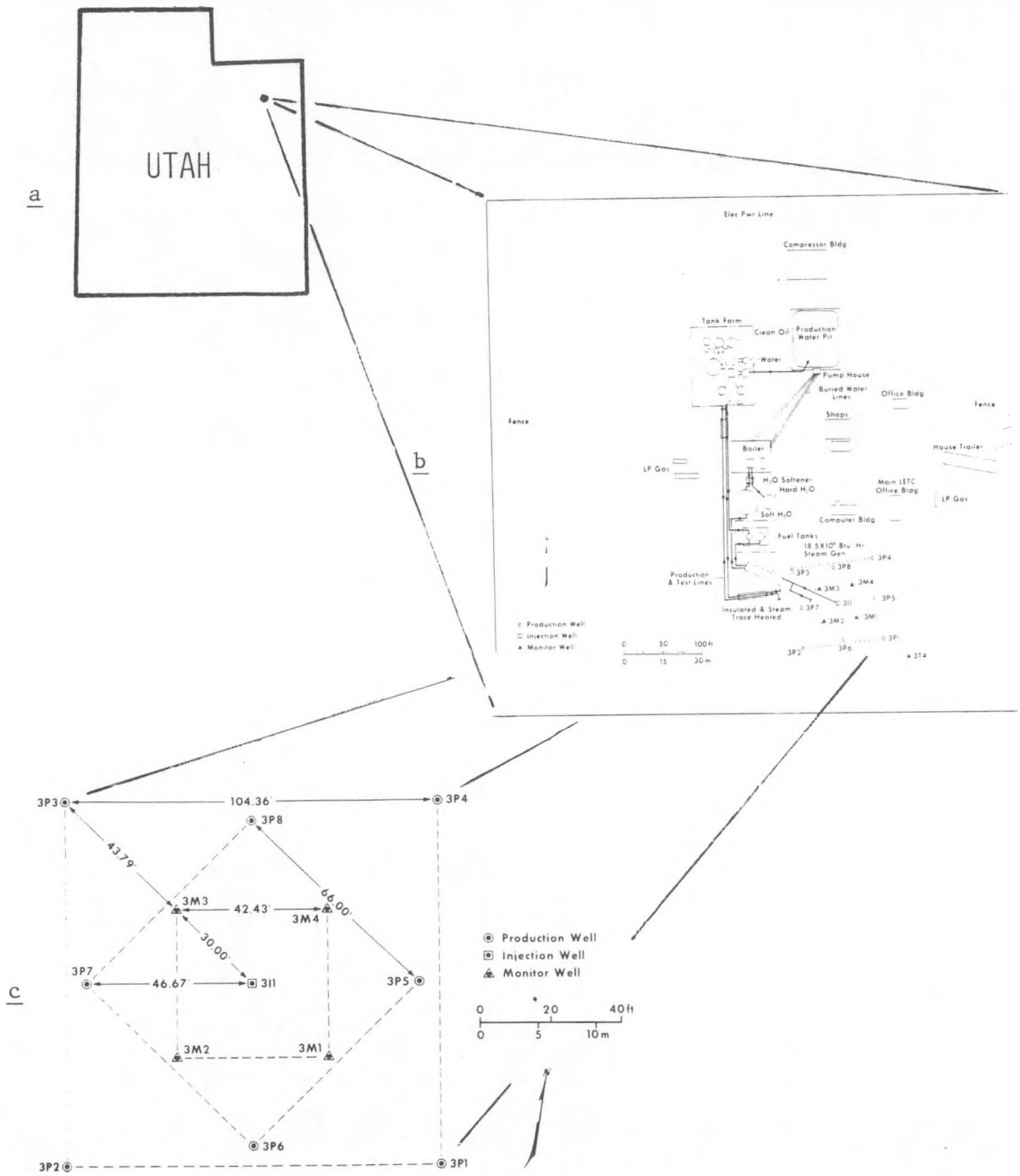

Figure II-1. a. Location of LETC TS-1S site.
b. LETC TS-1S site layout.
c. LETC TS-1S well pattern.

implemented a water quality analysis and research program to run concurrently with the tar sand technical/economic feasibility study. Western Wyoming College (WWC) was contracted to collect and analyze water quality samples during the injection. The water quality results were compiled and analyzed by the University of Wyoming Water Resources Research Institute (WRRI). The results of the WRRI study are presented here.

OBJECTIVES OF THE STUDY

WRRI was contracted by LETC to conduct a study of the water quality at the Vernal tar sand site with specific emphasis upon sampling and preservation methodology and upon water quality changes due to steamflooding. Specific objectives of the study were as follow:

Objective 1: Determine whether different preservation techniques have a significant impact on the water quality results reported on the tar sand waters.

Objective 2: Identify significant spatial and temporal trends in the water quality at the tar sand site through a statistical analysis of the water quality data.

(a) Determine whether the steam front can be defined by changes in chemical constituents.

(b) Determine whether any chemical constituents increase (particularly those of environmental concern) due to steamflooding.

Objective 3: Determine whether certain chemical constituents can be used as indicators of overall water quality so that

the number of constituents to be analyzed can be reduced.

Objective 4: Compile the Vernal tar sand water quality data onto the WRRI Water Resources Data System (WRDS) and reformat and develop computer programs so that LETC may access these data in a useful manner.

OVERVIEW

LETC TS-1S was conducted in the Northwest Asphalt Ridge deposit in northeastern Utah (Sec. 23, T. 4 S., R. 20 E.) near Vernal (Figure II-1.a). The test zone of TS-1S is an approximately 500-foot (150-meter) deep, 45-foot (14-meter) thick sandstone in the Rimrock Member of the Mesaverde Formation. Less permeable shales overlie and underlie the zone, and shale stringers intertongue with the sandstone in the zone, particularly in the vicinity of well 3P1 and to the south. Average porosity of the zone is 30 percent. Brine permeability measured in a 1-foot (0.3-meter) section in well 3P3 is about 180 md (0.2 square micrometers). Original oil saturation is about 79 percent (volume) of the pore space while water saturation is less than 7 percent of the pore volume. Since the deposit did not contain mobile water, no water samples were obtained prior to the arrival of steamflood fluids at the production wells.

During the course of the experiment, 65,700 barrels (7,800 cubic meters) of water equivalent steam were injected into well 3I1 (Figure II-1.c) at a rate ranging from 180 to 650 BPD (21 to 77 cubic meters per day). Injection began April 23, 1980, and was halted September 29, 1980. The arrival of fluid first occurred at well 3P1

on April 28. Water production began at the other wells within the next few weeks with the exceptions of well 3P8, where production did not occur until June 3, and well 3P4, which failed any type of response during the test and was abandoned. About 10 percent (6,250 barrels or 750 cubic meters) of the injected fluid was recovered from the seven wells during the test.

Water samples were collected from each well at the wellhead beginning within a few days after the first production of water. Collection continued on an irregular schedule for four of the wells until October 1. Production was suspended July 18 from well 3P6 due to a high concentration of hydrogen sulfide as a result of a steam breakthrough at the well. Well 3P8, which was the best oil producer, was sampled until June 11; a steam breakthrough occurred at this well on June 28. Table II-1 summarizes the dates when water samples were collected from each well.

Samples were initially collected by LETC personnel at the test site and later by WWC personnel. Sample collection and preservation techniques are described fully in Western Wyoming College's report (1981) and are discussed from a qualitative viewpoint in Chapter III of this report. Three preservation techniques were used (in this paper termed Treatments #3, #4, and #5) on samples to be analyzed in the lab. Dates on which each treatment type was used for the various wells are shown in Table II-1. It should be noted that Treatment #5 (sample poured through a glass wool filter and preserved according to EPA field specifications) did not begin until July 16. Additionally, temperature, pH, alkalinity, and conductivity were measured in the field on untreated samples.

TABLE II-1

SAMPLING DATES AND PRESERVATION TREATMENT METHODS[a]
FOR LETC TS-1S PRODUCTION WELL WATER SAMPLES

Sample Date (Year=1980)	Well						
	3P1	3P2	3P3	3P5	3P6	3P7	3P8
May 1	3	3	3				
May 5	3	3					
May 7	3		3				
May 9	4	4					
May 10						3,4	
May 12						3,4	
May 13	3,4	3,4					
May 15						3,4	
May 17						3,4	4
May 19	3,4					3,4	
May 21		3,4					
May 22						3,4	
May 26						3,4	
May 28					3,4	3,4	
June 4					3,4	3,4	3,4
June 11						3,4	3,4
June 18				3,4	3,4	3,4	
June 25						3,4	
July 2	3	3				3,4	
July 9	3,4					3,4	
July 16						3,5	
July 23	3,5		3,5			3,5	
July 30	3,5					3,5	
August 6	3,4,5	3,4,5	3,4,5			3,4,5	
August 14	3,4,5	3,4,5	3,4,5				
August 20	3,4,5		3,4,5				
August 27	3,4,5	4,5					
September 3	3,4,5		3,4,5	3,4,5			
September 10				4,5			
September 18			3,4,5	3,4,5			
September 25	3,4,5	3,4,5	3,4,5	3,4,5			
October 1	3,4,5	3,4,5		3,4,5		3,4	

[a]See Chapter III for an explanation of Treatments #3, #4, and #5.

Approximately 40 chemical constituents of the tar sand waters were analyzed by WWC; details of analytical techniques may be found in its report (WWC, 1981). A listing of constituents analyzed in the water samples is presented in Table II-2. Based upon preservation technique (whether or not sample filtering occurred), samples were analyzed either for the dissolved or total amount of the constituent. With soluble compounds, this distinction probably makes no difference. A listing of all analyses is presented in Appendix A.

TABLE II-2

CHEMICAL CONSTITUENTS ANALYZED IN LETC TS-1S
PRODUCTION WELL WATERS

Inorganics	Organics
Aluminum	Carbon, Dissolved, Organic
Ammonia	Carbon, Total, Organic
Arsenic	Carbon, Total
Barium	Phenols
Bicarbonate	Tetrathionate
Boron	Thiocyanate
Cadmium	Thiosulfate
Calcium	
Carbon, Dissolved, Inorganic	
Carbon, Total, Inorganic	
Carbonate	
Chloride	
Chromium	
Copper	
Cyanide	
Fluoride	
Iron	Others
Lead	
Magnesium	Biochemical Oxygen Demand
Manganese	Chemical Oxygen Demand
Mercury	Conductivity
Nickel	Kjeldahl Nitrogen
Nitrate	pH
Potassium	Temperature
Selenium	Total Dissolved Solids (ROE)
Sulfate	
Sulfide	

CHAPTER III

PRESERVATION TEST ANALYSIS

Water quality samples must be preserved to prevent changes in the samples between the time of collection and the time of laboratory analysis. The U.S. Environmental Protection Agency (EPA) has widely investigated preservation methods and adopted certain methods for the preservation of its samples (EPA, 1979). These methods are intended to retard biological action, reduce hydrolysis of chemical compounds, reduce the volatility of constituents, and reduce absorption.

The tar sands water samples differed chemically from the types of wastewater samples on which the EPA preservation methods were tested, particularly because of their high organic concentrations. Thus, standardized EPA preservation methods may not be effective or practical on these unusual samples. In order to test this hypothesis, replicate samples were preserved by different methods and the results from these replicates were compared to determine whether the preservation method had any significant effect on the concentrations measured in the samples.

Water samples were collected at first by Laramie Energy Technology Center (LETC), and later by Western Wyoming College (WWC) during the LETC tar sand steam injection project (TS-1S). Alkalinity and pH were analyzed in the field as well as in the laboratory. Other constituents were analyzed in the laboratory in samples preserved by different treatments. The laboratory analytical method used by WWC for each constituent is identified in Table III-1.

TABLE III-1

ANALYTICAL METHODS USED BY WESTERN WYOMING COLLEGE

Constituent	Analytical Method
Chemical Oxygen Demand	Colorimetric, chromic acid digestion, sealed ampules
Organic Carbon	Instrumental pyrolysis, CO_2 coulometer
pH	Electrometric
Total Dissolved Solids	Gravimetric, 105°C evaporation temperature
Total Ammonia Nitrogen	Specific ion electrode
Calcium	Atomic absorption spectrophotometry
Iron	Atomic absorption spectrophotometry
Magnesium	Atomic absorption spectrophotometry
Manganese	Atomic absorption spectrophotometry
Alkalinity	Standard acid titration, pH or methyl orange endpoint
Bicarbonate	Standard acid titration, pH or methyl orange endpoint
Sulfate	Gravimetric, barium precipitation

Preservation methods varied from considerably simpler than the EPA methods to considerably more complex. The different preservation methods are described briefly below:

Treatment #1 - Water samples were analyzed in the field for pH, temperature, alkalinity, and conductivity.

Treatment #3 - Water samples were refrigerated until analyzed in the laboratory.[1]

Treatment #4 - Water samples were poured through a glass wool column in the field to remove oil, then passed through a 0.45 micron teflon filter, and preserved according to the EPA methods described in Table III-2.

Treatment #5 - Water samples were preserved as in Treatment #4 except no filtration through a teflon filter was used.

One important deviation from the published EPA methods was that recommended holding times were occasionally exceeded because of an overload in the laboratory. Samples collected in late summer were held up to seven months before analysis, while those collected at other times were held for shorter times.

Paired observation statistics were used to define whether the preservation method had any effect on the water quality results. Replicate samples (same station, same time) were collected and preserved by different treatments. The water quality data from these replicate samples and the differences in concentrations due to treatment methods were tabulated for statistical analysis. If different

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[1]Samples were not refrigerated between the time of the first and the last analysis on a sample because of a lack of refrigerator storage space (Western Wyoming College, 1981).

TABLE III-2

EPA PRESERVATION METHODS AND HOLDING TIMES

Constituent	Preservation Method	Recommended Holding Time
Chemical Oxygen Demand	H_2SO_4 to pH <2	7 days
Organic Carbon	Cool (4°C), H_2SO_4 or HCl to pH <2	24 hours
pH	None	6 hours
Total Dissolved Solids	Cool (4°C)	7 days
Total Ammonia Nitrogen	Cool (4°C), H_2SO_4 to pH <2	24 hours
Calcium	HNO_3 to pH <2	6 months
Iron	HNO_3 to pH <2	6 months
Magnesium	HNO_3 to pH <2	6 months
Manganese	HNO_3 to pH <2	6 months
Alkalinity	Cool (4°C)	24 hours
Bicarbonate	Cool (4°C)	24 hours
Sulfate	Cool (4°C)	7 days

preservation treatments had no effect on the water quality results, the differences would vary randomly about zero, and the mean of the differences would be approximately zero.

The statistical approach to determine if the mean of the differences was significantly different from zero was to test the distribution of differences for normality, and then to apply the most powerful and efficient statistical test based on the sample distribution. The Kolmogorov-Smirnov one-sample test was used to test for normality (Daniel, 1978). This test measured how closely the actual distribution of data approximates a hypothesized normal distribution.

If the set of differences could be shown to be derived from a normally distributed population, the paired observation t test was used to determine if the mean of the differences was significantly different from zero (Walpole and Myers, 1972). However, if the set of differences was determined to be derived from a non-normal population, a paired observation Wilcoxon test was employed (Daniel, 1978). The Wilcoxon test determines if the median of the differences between different preservation methods is significantly different from zero through a ranking procedure.

RESULTS

Water quality data were collected at the tar sand site on 41 parameters (Table II-2). The analysis of preservation methods was performed on 12 chemical constituents which might exceed concentrations suitable for steam generation, the proposed use of water. These constituents include:

- chemical oxygen demand
- total organic carbon
- pH
- total dissolved solids (ROE)
- total ammonia nitrogen
- calcium
- iron
- magnesium
- manganese
- alkalinity
- bicarbonate
- sulfate

Only data from samples collected, preserved, and analyzed by WWC were used in this study. This approach eliminated any variation in the data attributable to sample handling by different collectors. In addition, only data above the detection limit were used in the analysis of preservation methods. This approach restricted the analysis to concentration levels possibly unsuitable for steam generation.

The results of the preservation method analysis are summarized in Table III-3. The variation in the number of paired samples, indicating that different data sets were used for each comparison, occasionally led to conclusions which appeared to violate the associative law of mathematics. For example, Treatments #3 and #5 and Treatments #4 and #5 produced statistically equivalent total dissolved solids (TDS) concentrations. Thus, Treatments #3 and #5 should yield statistically equal TDS concentrations. However, in a direct statistical comparison, Treatment #3 was found to yield higher concentrations than Treatment #4. This situation can be explained by the greater number of comparisons possible between Treatment #3 and Treatment #4. Treatment #5 was not initiated until July 16 (Table II-1). For most wells, the delay in using Treatment #5 meant that #3-#5 and #4-#5 comparisons were performed only on samples collected after the passage of the steam front when TDS concentrations were much lower.

TABLE III-3

PRESERVATION TEST ANALYSIS

Constituent	H_o	Number of Paired Samples	Range (mg/l except pH) Low	High	K-S Normality Normal at 0.05?	P	T-Test H_o true?	P	Wilcoxon Test H_o true?	P
Chemical Oxygen Demand	3=4	44	5	1600	No	0.037	(No, 3>4	0.005)	No, 3>4	0.000
	4=5	23	25	1100	Yes	0.315	No, 4<5	0.001	(No, 4<5	0.000)
	3=5	26	25	1100	Yes	0.369	Yes	0.501	(Yes	0.493)
Organic Carbon	3=4	41	0	5258	No	0.000	(Yes	0.137)	No, 3>4	0.004
	4=5	25	3	530	Yes	0.142	No, 4<5	0.001	(No, 4<5	0.000)
	3=5	29	10	530	Yes	0.155	Yes	0.535	(Yes	0.477)
pH	1=3	50	3.33	9.28	Yes	0.946	Yes	0.617	(Yes	0.478)
	1=4	47	3.39	9.61	Yes	0.675	Yes	0.593	(Yes	0.596)
	1=5	30	3.29	10.18	Yes	0.953	Yes	0.409	(Yes	0.245)
	3=4	44	3.39	9.61	No	0.026	(No, 3>4	0.043)	Yes	0.156
	4=5	25	3.39	10.18	Yes	0.108	Yes	0.982	(Yes	0.808)
	3=5	29	3.29	10.18	Yes	0.320	Yes	0.287	(Yes	0.593)
Total Dissolved Solids	3=4	46	10	12400	Yes	0.098	No, 3>4	0.002	(No, 3>4	0.006)
	4=5	25	28	892	Yes	0.454	Yes	0.314	(Yes	0.506)
	3=5	29	28	1060	Yes	0.346	Yes	0.844	(Yes	0.811)
Ammonia Nitrogen	3=4	28	0.10	73	No	0.013	(Yes	0.108)	Yes	0.178
	4=5	21	0.10	100	No	0.013	(Yes	0.052)	No, 4<5	0.001
	3=5	18	0.10	100	No	0.047	(No, 3<5	0.024)	No, 3<5	0.005
Calcium	3=4	45	0.20	750	No	0.000	(Yes	0.472)	Yes	0.362
	4=5	25	0.79	77	Yes	0.863	Yes	0.408	(Yes	0.322)
	3=5	29	0.20	94	No	0.014	(Yes	0.495)	Yes	0.121
Iron	3=4	20	0.1	530	No	0.018	(No, 3<4	0.024)	No, 3<4	0.023
	4=5	10	0.1	63	Yes	0.057	Yes	0.219	(No, 4<5	0.028)
	3=5	11	0.1	60	Yes	0.245	Yes	0.265	(Yes	0.398)
Magnesium	3=4	44	.04	960	No	0.000	(Yes	0.492)	Yes	0.489
	4=5	25	.20	40	Yes	0.549	Yes	0.286	(Yes	0.958)
	3=5	29	.04	52	No	0.000	(Yes	0.887)	Yes	0.086
Manganese	3=4	18	.04	38	No	0.032	(Yes	0.207)	Yes	0.158
	4=5	8	.03	2.0	Yes	0.174	Yes	0.141	(Yes	0.091)
	3=5	9	.04	3.6	Yes	0.068	Yes	0.308	(Yes	0.201)
Alkalinity as $CaCO_3$	3=4	39	3.4	355	No	0.000	(Yes	0.179)	Yes	0.742
	4=5	24	16	130	Yes	0.410	Yes	0.552	(Yes	0.603)
	3=5	25	11	130	Yes	0.114	Yes	0.797	(Yes	0.586)
Bicarbonate	1=3	47	5.3	434	Yes	0.167	Yes	0.691	(Yes	0.432)
	1=4	40	4.3	322	Yes	0.257	Yes	0.760	(Yes	0.645)
	1=5	27	13	140	Yes	0.319	No, 1<5	0.000	(No, 1<5	0.000)
	3=4	39	4.3	434	No	0.000	(Yes	0.216)	Yes	0.940
	4=5	24	20.0	150	Yes	0.449	Yes	0.475	(Yes	0.702)
	3=5	25	14	150	Yes	0.473	Yes	0.719	(Yes	0.922)
Sulfate	3=4	45	2	8015	No	0.000	(Yes	0.273)	Yes	0.815
	4=5	24	9.5	593	Yes	0.242	Yes	0.600	(Yes	0.935)
	3=5	28	9.2	729	No	0.000	(Yes	0.241)	Yes	0.990

Table III-3 also shows the results of the Kolmogorov-Smirnov test for normality. Sixteen of the 42 treatment comparisons were determined to be derived from non-normal populations. Assuming normality for these comparisons led to one Type I error (rejecting H_o when H_o is true) and two Type II errors (accepting H_o when H_o is false). Eleven of the 16 non-normal distributions resulted from comparing Treatment #3 and #4. The #3-#4 comparisons may be derived from two different populations, one for data collected before the passage of the steam front and one for data collected after passage. Combining the two populations (each possibly normal) may result in a non-normal distribution.

DISCUSSION

Preservation methods were found to have no effect on the results of five constituents--calcium, magnesium, manganese, alkalinity, and sulfate. The results of this experiment indicate refrigeration is an adequate preservation method for these five constituents.

Preservation methods affected the water quality results of the seven other constituents--chemical oxygen demand (COD), organic carbon, pH, TDS, total ammonia nitrogen, iron, and bicarbonate. Table III-3 identifies the effects of preservation method on all these constituents except pH. For pH, data from each treatment method were statistically equivalent. However, systematic bias was found by comparing pH sub-groups within the larger data sets. Possible reasons for the influence of preservation methods on pH and the six other constituents are presented below.

Chemical Oxygen Demand

Samples preserved by Treatment #3 (refrigeration) and Treatment #5 (glass wool filtration, acidification and refrigeration) yielded statistically equivalent COD concentrations; however, both treatments produced higher COD concentrations than Treatment #4 (glass wool filtration, teflon filter filtration, acidification, and refrigeration). COD concentrations from Treatment #4 averaged about 40 percent of those from Treatment #3 and Treatment #5.

The differences may be explained by the presence of particulate oxygen-demanding organics which were filtered out in Treatment #4. If this explanation is valid, Treatment #3 or Treatment #5 will yield more accurate estimates of the total COD in the tar sands samples. Treatment #3 is preferred because of its greater simplicity.

Organic Carbon

The effect of preservation treatment on organic carbon was the same as on COD. Treatment #3 (refrigeration) and Treatment #5 (glass wool filtration, acidification, and refrigeration) yielded statistically equivalent organic carbon concentrations; however, both treatments produced higher organic carbon concentrations than Treatment #4 (glass wool filtration, teflon filter filtration, acidification, and refrigeration). Organic carbon concentrations from Treatment #4 averaged about 30 percent of those from Treatment #3 and Treatment #5.

Precipitation of organics after acidification (a part of Treatment #4 and Treatment #5) has been reported as a source of error in the organic carbon test (Fox, 1978). Precipitation upon acidification

has been demonstrated for benzoic acid and [o(paradimethyl phenyl)azo] benzoic acid hydrochloride (Thompson, 1981). However, Treatment #3 (no acidification) and Treatment #5 (acidification) yielded the same organic carbon concentrations. The organic carbon differences may be better explained by particulate organics which were filtered out in Treatment #4. This explanation was also used to explain the COD differences.

If the explanation is valid, Treatment #3 or Treatment #5 will yield more accurate estimates of the total organic carbon in the tar sands samples. Treatment #3 is preferred because of its greater simplicity.

pH

Comparisons of pH values in samples preserved by different treatments showed no significant differences. However, further analysis identified significant differences between field pH (Treatment #1) and laboratory pH (Treatment #3-#5), which were a function of pH. As shown on Figure III-1, field pH tended to be lower than laboratory pH when the samples were nearly neutral (pH 6-8) and higher than laboratory pH when the samples were acidic (pH <6) or basic (pH >8). These two opposing tendencies cancelled out over the full pH range.

The pH variability between the field and laboratory may be due to different instrumentation or to chemical changes occurring in the samples between the time of collection and analysis. EPA recommends measurement of pH in the field because of its instability (EPA, 1979). Samples collected during in-situ retorting of the tar sands are likely to be in chemical disequilibrium; therefore field measurement would

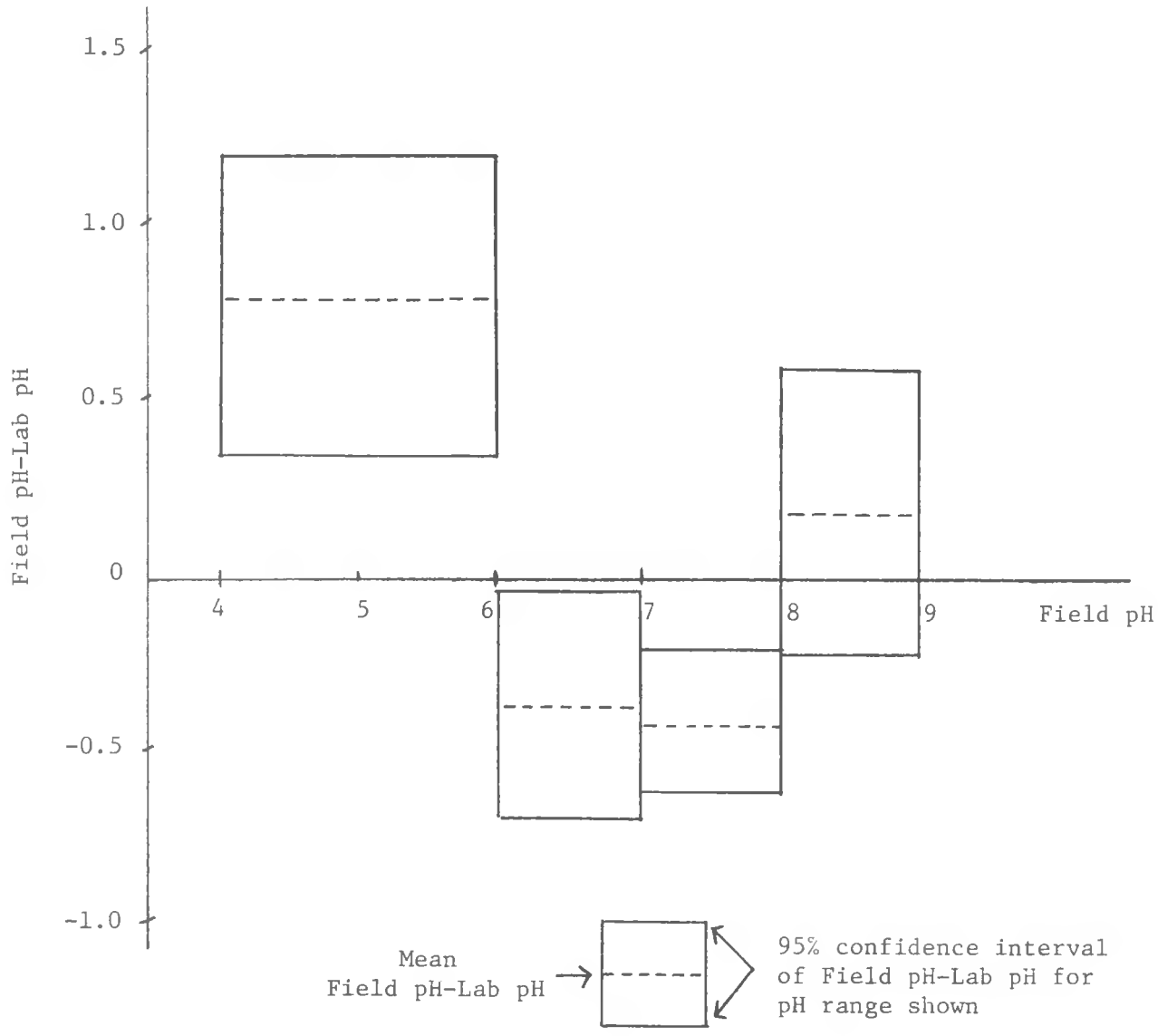

Figure III-1. pH changes from field to laboratory.

provide a better estimate of pH at the time of collection than would laboratory measurement.

Total Dissolved Solids

Treatment #3 (refrigeration) resulted in higher TDS concentrations than Treatment #4 (glass wool filtration, teflon filter filtration, and refrigeration). The differences were generally small relative to the TDS concentrations in the samples. The mean difference was 59 mg/l, equal to 3 percent of the mean TDS concentrations in the samples.

It is important to keep errors in perspective. TDS concentrations from the two treatment methods differ by only 3 percent on the average. Neither treatment method measures important dissolved and volatile species such as ammonia, and these sources of errors will be more important in many tar sand samples than errors caused by preservation method.

Total Ammonia Nitrogen

Treatment #5 (glass wool filtration, acidification, and refrigeration) yielded higher ammonia concentrations than Treatment #3 (refrigeration) or Treatment #4 (glass wool filtration, teflon filter filtration, acidification, and refrigeration). The ammonia concentrations in samples preserved by Treatment #5 averaged approximately 50 percent greater than those in samples preserved by the other two methods.

Although there is no conclusive evidence on what is causing the differences, several possible reasons can be forwarded. Ammonia

concentrations in Treatment #3 samples may be low because of the loss of ammonia and volatile amines during storage of the samples. This possibility is supported by the fact that some of the largest differences between Treatment #3 and Treatment #5 occurred in samples with a pH greater than 8.0 and with temperatures exceeding 30°C. Unionized ammonia, which is volatile, constitutes a larger percentage of total ammonia (unionized plus ionized ammonia) at high pH and temperature. The evolution of ammonia during storage would make the sample more acidic (Thompson, 1981). As shown on Figure III-1, this trend generally occurred when field pH exceeded 8.0. Treatment #4 may yield lower ammonia concentrations than Treatment #5 because of the loss of volatile amines and ammonia during teflon filter filtration.

Iron

Treatment #3 (refrigeration) yielded significantly lower iron concentrations than Treatment #4 (glass wool filtration, teflon filter filtration, acidification, and refrigeration). At low concentrations (less than 6 mg/l), the results from the two treatment methods were comparable. However, at high concentrations (more than 6 mg/l), concentrations in samples preserved by Treatment #4 were consistently higher and exceeded concentrations in samples preserved by Treatment #3 by as much as 18 times. The biggest differences occurred in acidic samples (pH 4-6) with alkalinities less than 20 mg/l as $CaCO_3$. Total dissolved solids and organic carbon concentrations varied over a wide range in samples with the biggest differences.

Precipitation of iron in the Treatment #3 samples is the most likely explanation for the lower concentrations in those samples. The

decreasing pH in acidic samples during storage (see the section on pH) could have resulted in the precipitation of iron as the sulfide (Hem, 1970; Stumm and Morgan, 1970). These reactions would only have taken place in Treatment #3 samples, because both Treatment #4 and Treatment #5 samples were acidified to a pH less than 2 as part of the preservation procedures and iron is soluble as ferrous iron at these strongly acid conditions. This explanation suggests the iron concentrations measured in Treatment #3 samples were inaccurate.

Bicarbonate

Treatment #1 (field analysis) resulted in higher bicarbonate concentrations than Treatment #5 (glass wool filtration and refrigeration). The differences were large and highly variable. Systematic bias was also found between bicarbonate measured in the field (Treatment #1) and bicarbonate measured in samples preserved by the other two methods (Treatments #3 and #4). Table III-3 does not indicate any systematic bias, however, because the differences at low pH (field bicarbonate generally greater than laboratory bicarbonate) were countered by the differences at neutral pH (laboratory bicarbonate generally greater than field bicarbonate).

Most of the differences can be explained by changes in pH between the field and laboratory. Bicarbonate converts to carbon dioxide at decreasing pH. Figure III-1 illustrates the considerable variation between field and laboratory pH. Because pH decreased in acid samples (pH 4-6) between field and laboratory, some of the bicarbonate in the samples was converted to carbon dioxide; thus, field bicarbonate was higher than laboratory bicarbonate. Because pH increased in neutral

samples (pH 6-8) between field and laboratory, some of the carbon dioxide in the samples was converted to bicarbonate; thus, laboratory bicarbonate was higher than field bicarbonate.

Although pH seems to be the most important factor causing bicarbonate differences between the field and laboratory, several other factors may also be contributing to the bicarbonate differences. Temperature differences up to 40°C between field samples and preserved samples have been suggested as a possible factor (Western Wyoming College, 1981), although no correlation could be found between the magnitudes of the temperature differences and the bicarbonate differences. Turbidity and pH endpoints versus color-indicator endpoints were also reported as possible factors (Western Wyoming College, 1981).

The field pH is probably a better estimate than laboratory pH of the conditions in the waters at the time of sampling because of the likely instability of the samples. Consequently, because the bicarbonate concentration is a function of pH, field measurement of bicarbonate (and alkalinity) should give a better estimate of the conditions at the time of sampling.

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CHAPTER IV

QUALITY OF THE DATA

In the previous chapter the effects of preservation techniques upon the outcome of water quality analyses were discussed. This chapter seeks to identify the quality of the data with regard to accuracy and precision. The accuracy of a measurement is related to its closeness to the "true" value, while precision refers to the closeness of measurements on replicate samples to one another. Measurements may be precise but inaccurate, accurate but imprecise, both inaccurate and imprecise, or both accurate and precise. The knowledge of which of the four conditions exists is needed to properly interpret analytical results.

Unfortunately, the data collected during this project are inadequate for a complete analysis of precision and accuracy. Nothing can be said about the precision of the data, because a precision analysis requires replicate data, and no replicate samples (same station, same time, same preservation method) were collected and chemically analyzed. Little can be said about accuracy either, because techniques like standard addition and method-to-method comparison were not employed. In addition, the literature is lacking in precision and accuracy information for standard analytical methods used on organically enriched samples like tar sand waters.

Several observations on the accuracy of the data are made below. The three techniques used are a check on charge balance, a comparison of TDS by direct measurement with TDS computed as the sum of

constituents, and a TDS-specific conductance ratio analysis. These techniques can provide some confidence in the data for TDS, specific conductance, and major inorganic ions. None of these three techniques addresses the accuracy of the data for minor inorganic ions and the organic species, however.

CHARGE BALANCE

Natural water quality samples have no net positive or negative charge. Thus, if analyses of the major ionic species are accurate, a charge balance between the milliequivalents of cations and anions will exist. A charge balance for each sample was calculated according to the following equation to test the accuracy of the major ion data:

$$\frac{\Sigma C_i - \Sigma A_i}{\Sigma C_i + \Sigma A_i} \times 100 = \text{Charge Balance (\%)}$$

where C_i is the concentration of each cation in milliequivalents per liter (meq/l) and A_i is the concentration of each anion in meq/l.

It was discovered that large charge imbalances existed for the majority of samples, probably because one or more major ionic species was not determined. In most cases, the missing ions appeared to be ammonium, nitrate, iron, and manganese. Therefore, the analysis of charge balance was restricted to the 12 samples in which the following 12 chemical species were measured:

Cations	Anions
Sodium	Bicarbonate
Potassium	Carbonate
Calcium	Chloride
Magnesium	Sulfate
Iron	Nitrate
Manganese	
Total Ammonia	

The data for iron and manganese were taken from samples preserved by Treatment #4 or #5, and the data for other constituents were taken from samples preserved by Treatment #3. Based upon the findings in Chapter III, these data were expected to reflect most accurately the dissolved concentrations at the time of analysis in the laboratory.

The results of the charge balance analysis are presented in Table IV-1. The charge balance in the 12 samples ranged from -10.3 percent to 7.0 percent. The mean charge balance was -2.0 percent. Although the charge balance was negative in the majority of cases, indicating an excess of anions, the 95 percent confidence interval included zero and thus the charge balance was not significantly different from zero.

Eight of the 12 charge balances exceeded the 3.0 percent limit which the authors commonly use to reject data as inaccurate. However, there are three reasons why a higher limit might be appropriate for this study. First, more ionic species made important contributions to the charge balance in the tar sand samples than in typical ground-water samples, and the greater number of constituents in the charge balance would probably lead to higher imbalances. Second, because the charge balances showed no systematic bias to the negative or positive side, the high charge imbalances may reflect imprecision rather than inaccuracy. Finally, unmeasured species may be important ionic contributors and be the source of the charge imbalances.

For the reasons stated above, it was assumed that the major ions were measured accurately in the 12 samples. This assumption was stronger for the constituents which contributed more to the charge balance. These constituents included sodium, calcium, magnesium, and

TABLE IV-1

ACCURACY DATA FOR TDS AND MAJOR IONIC SPECIES

Sampling Date	Well Number	TDS (measured) (mg/l)	Charge Balance (%)	$\frac{\text{TDS (computed) - TDS (measured)}}{\text{TDS (measured)}}$ (%)
5/10	3P7	5,390	-5.3	-3.5
5/12	3P7	5,470	-2.0	-5.4
5/13	3P1	2,690	-4.6	-2.2
5/13	3P2	11,300	-5.9	-5.5
5/22	3P7	2,410	7.0	-11.2
5/26	3P7	1,990	2.3	-11.7
5/28	3P7	1,160	3.5	-2.7
6/11	3P7	680	0.0	-3.1
6/25	3P7	1,180	-4.6	-2.3
7/9	3P1	276	-10.3	12.0
7/9	3P7	660	-1.8	3.1
9/18	3P5	88	-3.3	0.7
Mean			-2.0%	-2.7%
95% Confidence Interval			-4.9% to 0.9%	-6.7% to 1.3%

sulfate. It was further assumed that the results found for the 12 samples were applicable to the other 51 tar sand water samples.

TDS (COMPUTED) VS. TDS (MEASURED)

The accuracy of data for TDS and major ions was also checked by comparing TDS computed from the individual dissolved species to TDS measured directly in the laboratory. TDS was computed according to a method presented in Hem (1970) and was measured directly in the laboratory by evaporating a filtered sample at 105°C. The 12 samples used in the charge balance analysis were also used in this analysis because of their more complete coverage of the major ions.

The results of the analysis are presented in Table IV-1. TDS (computed) ranged from 11.7 percent less than TDS (measured) to 12.0 percent greater than TDS (measured). The mean was 2.7 percent less than TDS (measured). Although TDS (computed) was less than TDS (measured) in the majority of the cases, the 95 percent confidence interval for the differences included zero and thus TDS (computed) was not significantly different from TDS (measured). These results provided confidence in the reported TDS concentrations as well as the concentrations of dissolved species making major contributions to TDS.

TDS-SPECIFIC CONDUCTANCE RATIO

The ratio of TDS to specific conductance provided an accuracy check on those two constituents. This ratio should be between 0.54 and 0.96 for natural waters with TDS up to a few thousand milligrams per liter (Hem, 1970). Bicarbonate-chloride waters are usually near the lower figure while sulfate waters may achieve the upper bound.

TDS-specific conductance ratios ranged widely from almost zero to 11.0. Half of the 52 ratios were below the lower limit of 0.54, even though the waters examined were primarily sulfate waters. Conversely, almost one-quarter of the ratios exceeded the upper limit of 0.96. Thus, the TDS-specific conductance ratios suggested analytical error. The error is probably in the specific conductance values, because the analysis in the previous section indicated reasonably accurate TDS concentrations.

CONCLUSIONS

Only 12 of the 63 samples had complete analyses of the major ionic species. Charge balances and TDS accuracy analyses were conducted on these samples. The data for TDS and major ions appeared to be accurate enough for evaluating water quality trends at the tar sands site.

The specific conductance readings frequently appeared to be in error. Possible reasons for inaccurate readings included electrode fouling, inadequate circulation of solutions being measured, and possibly no temperature compensation of the meter.

No judgment could be made on the accuracy of data for minor inorganic species or organic indicators like COD and TOC. In addition, no information could be gained on precision because of the lack of replicate measurements.

CHAPTER V

WATER QUALITY CHANGES RESULTING FROM STEAMFLOODING

Of great environmental concern in a steamflooding operation is the possible detrimental effect upon the quality of the waters in the area. In the particular sandstone unit steamflooded in LETC TS-1S, there was little water (less than 7 percent by volume) in the unit prior to the steam injection. Realistically, the unit at this location cannot be considered an aquifer. However, the introduction of steam into the unit might lead to the mobilization of toxic compounds which could be transported by leakage to nearby aquifers. A major part of the study was therefore devoted to the analysis of water quality changes resulting from steam injection.

DATA UTILIZED

Large quantities of water quality data were collected during the tar sand experiment. The data base was pared as described below to illustrate important temporal and spatial trends in water quality.

Fifteen constituents, listed in Table V-1, were frequently below detection limits, and thus yielded little information on spatial and temporal water quality trends. These constituents were not considered in the spatial and temporal trend analysis conducted in this chapter or in the factor analysis conducted in the following chapter. However, some of these constituents reached environmentally significant concentrations during the tar sand experiment, and thus are discussed in the final chapter of this report.

TABLE V-1

CONSTITUENTS BELOW DETECTION LIMITS

Constituent	Number of Samples Analyzed	Detection Limit (mg/l)	Percentage of Samples Below Detection Limit
Aluminum	75	.5-2.	87
Barium	72	.5	99
Cadmium	83	.01-.1[a]	59
Carbonate	152	.1	91
Field Carbonate	42	.1-1.[a]	100
Copper	75	.03-.1[a]	99
Chromium	75	.05-.1[a]	99
Cyanide	69	.1	67
Lead	75	.1-.5[a]	92
Mercury	69	.001-.05[a]	100
Nickel	77	.1-.5[a]	62
Sulfide	119	.1	96
Tetrathionate	56	.1	96
Thiocyanate	63	.1	94
Thiosulfate	63	.1	95

[a]The detection limit changed during the experiment.

The specific conductance values were suspected of being inaccurate, and therefore were not considered in subsequent water quality discussions. In addition, the preservation test analysis showed that certain preservation methods provided inaccurate data. Treatment #3 appeared to yield accurate data for COD, TOC, TDS, calcium, magnesium, and sulfate. Treatment #4 or #5 provided more accurate data for iron and probably manganese because of its similar chemistry to iron. Field analysis was preferable for pH and alkalinity or bicarbonate. The results on preservation methods for ammonia were not conclusive, and therefore Treatment #3 was selected because of the greater number of ammonia data in samples preserved by that method. Treatment #3 data were also used for other constituents not analyzed in Chapter III because of their greater abundance.

The 16 constituents covered in the discussion of temporal, spatial, and factor analyses are listed in Table V-2. The data used for these analyses are also presented in that table. Well 3P7 had the best water quality record with 19 sample dates. Wells 3P1, 3P2, and 3P3 had 16, 9, and 9 sample dates, respectively. The other three wells (3P5, 3P6, and 3P8) had only two to five sampling dates and did not provide much water quality information on temporal and spatial variation.

TEMPORAL VARIATION IN WATER QUALITY

Water quality changes over time are illustrated on graphs included in Appendix B. Graphs were constructed for 12 constituents at four wells--3P1, 3P2, 3P3, and 3P7. The changes over time were

TABLE V-2

DATA USED IN TEMPORAL, SPATIAL, AND FACTOR ANALYSIS[a]

Well	Date	COD	TOC	pH	TDS	Na	Ca	Mg	Fe	Mn	Ammonia	Bicarb.	SO_4	Cl	NO_3	F	B
3P1	5-1	-1	-1	-1	1150	180	140.00	67.00	-1	-1	-1	-1	-1	190.0	-1	1.10	-1
	5-5	250	50	-1	2780	110	370.00	96.00	-1	-1	7.90	-1	1640.0	85.0	55.0	4.20	-1
	5-7	20	23	-1	2930	110	340.00	90.00	-1	-1	7.20	-1	1390.0	89.0	84.0	3.60	500
	5-13	-1	8	5.2	2690	77	250.00	110.00	250.0	6.30	3.30	250.0	1500.0	51.0	120.0	2.60	500
	5-19	54	21	6.2	2900	110	750.00	130.00	-1	-1	6.00	260.0	1760.0	57.0	11.4	2.50	500
	7-2	130	64	6.8	220	34	27.00	3.20	-1	-1	0.36	36.0	61.6	19.0	-1	.43	1000
	7-9	-1	36	5.6	276	31	27.00	13.00	8.5	8.70	0.42	9.0	174.0	11.0	73.0	.14	960
	7-23	35	17	5.7	76	15	3.70	0.58	1.5	0.20	-1	30.0	25.9	5.8	1.2	-1	500
	7-30	500	130	8.2	556	140	3.40	1.80	-1	-1	-1	56.0	248.0	2.6	-1	.14	-1
	8-6	60	15	7.2	96	22	0.68	0.15	2.1	0.04	0.20	20.0	30.6	2.4	0.8	-1	-1
	8-14	175	46	8.0	84	21	0.20	0.04	-1	-1	0.10	33.0	19.1	4.0	-1	.13	-1
	8-20	140	51	7.4	104	28	1.70	0.31	0.7	0.04	0.70	20.0	9.2	14.0	-1	-1	-1
	8-27	160	60	6.5	188	41	0.44	0.11	-1	-1	0.20	20.0	38.9	14.0	-1	-1	-1
	9-3	270	82	6.7	84	30	0.78	0.23	1.4	0.05	0.10	25.0	34.8	5.7	0.4	-1	600
	9-25	95	38	6.7	120	48	3.40	2.20	-1	-1	0.30	33.0	39.5	12.0	-1	.13	500
	10-1	-1	440	6.8	176	32	1.00	0.26	-1	-1	13.00	36.0	35.4	4.2	-1	-1	2200
3P2	5-1	-1	0	-1	2380	220	440.00	170.00	-1	-1	0.40	-1	1130.0	220.0	-1	.74	400
	5-5	1150	6290	-1	9010	370	630.00	62.00	1700.0	93.00	6.50	-1	6170.0	140.0	1.7	3.20	3800
	5-13	68	5	5.4	11300	370	510.00	950.00	530.0	42.00	6.80	240.0	7250.0	120.0	11.1	14.00	700
	5-21	480	53	5.1	-1	430	470.00	960.00	-1	-1	5.80	270.0	6560.0	92.0	126.0	2.90	-1
	7-2	1300	2110	-1	1420	35	17.00	3.20	-1	-1	1.40	-1	-1	-1	-1	2.50	-1
	8-6	890	240	7.1	544	42	7.80	2.40	1.4	0.18	13.50	36.0	-1	2.7	-1	3.90	3500
	8-14	600	150	7.1	492	51	9.40	3.30	-1	-1	4.50	27.0	98.8	11.0	-1	4.60	4000
	9-25	1600	440	6.5	628	57	9.00	2.30	-1	-1	10.00	43.0	96.9	-1	-1	3.20	6100
	10-1	1000	270	6.6	240	23	3.80	0.62	-1	-1	60.00	53.0	44.8	13.0	-1	1.40	2400
3P3	5-1	-1	-1	-1	1650	300	-1	97.00	-1	-1	1.10	-1	624.0	220.0	11.0	-1	-1
	5-7	980	200	-1	10200	370	-1	59.00	-1	-1	8.70	-1	7090.0	130.0	3.4	6.50	4400
	7-23	205	70	8.1	240	22	14.00	0.32	-1	-1	-1	35.0	36.2	4.0	8.5	.27	-1
	8-6	215	57	8.0	256	19	6.00	2.00	0.3	-1	0.20	26.0	29.2	2.3	-1	.13	-1
	8-14	320	100	8.1	204	52	0.84	0.28	-1	-1	0.20	44.0	56.8	4.5	-1	.25	-1
	8-20	330	100	8.7	248	71	0.90	0.38	0.4	-1	-1	23.0	25.0	25.0	0.9	-1	-1
	9-3	330	94	7.3	72	13	3.50	1.40	0.1	-1	-1	32.0	12.3	4.4	1.0	-1	600
	9-18	490	130	8.1	116	27	2.80	0.68	0.1	-1	-1	24.0	27.9	16.0	0.7	-1	700
	9-25	300	110	7.1	136	15	2.30	1.10	-1	-1	0.40	36.0	17.5	4.8	-1	.10	500
3P5	6-18	100	34	6.6	880	91	139.00	4.20	-1	-1	0.30	120.0	548.0	42.0	-1	1.70	1200
	9-3	-1	10	7.1	160	10	26.00	6.20	0.6	0.56	-1	68.0	27.6	6.6	0.2	.20	-1
	9-18	280	27	7.0	88	15	12.00	2.10	-1	0.17	0.20	43.0	12.1	15.0	0.2	-1	-1
	9-25	550	26	7.1	144	20	13.00	1.30	-1	-1	0.70	13.0	22.1	5.6	-1	-1	500
	10-1	780	220	7.2	64	16	4.40	0.97	-1	-1	-1	20.0	16.3	3.7	-1	.10	600
3P6	5-28	1020	-1	-1	2310	60	170.00	130.00	496.0	11.00	0.10	-1	1210.0	14.0	61.0	1.40	2700
	6-4	1460	5258	-1	400	8	17.00	4.80	-1	-1	-1	200.0	130.0	8.6	-1	-1	8000
	6-18	490	934	6.0	20	0	1.10	0.60	-1	-1	-1	50.0	2.0	95.0	-1	.06	-1
3P7	5-10	100	26	5.3	5390	180	320.00	380.00	400.0	19.00	10.00	410.0	3370.0	76.0	85.0	4.90	-1
	5-12	68	7	5.3	5420	180	290.00	390.00	410.0	19.00	10.00	280.0	3200.0	75.0	54.0	5.00	900
	5-15	83	0	5.8	5950	190	360.00	440.00	-1	-1	10.00	130.0	3980.0	78.0	54.0	1.10	1100
	5-17	160	0	5.8	5730	180	370.00	400.00	-1	-1	9.00	250.0	3870.0	66.0	25.0	1.00	1000
	5-19	120	11	6.0	5020	106	370.00	350.00	-1	-1	8.00	-1	3400.0	55.0	29.0	.90	900
	5-22	-1	-1	6.2	2410	59	220.00	170.00	89.0	8.80	4.30	160.0	1310.0	10.0	12.0	1.20	2100
	5-26	-1	-1	6.2	1990	62	180.00	97.00	80.0	5.00	3.40	210.0	975.0	12.0	106.0	1.10	3800
	5-28	-1	-1	6.2	1160	52	130.00	64.00	52.0	3.80	2.50	190.0	650.0	11.0	84.0	.87	3000
	6-4	250	54	6.8	570	72	55.00	14.00	-1	-1	-1	150.0	267.0	26.0	-1	-1	1500
	6-11	420	22	6.2	680	46	78.90	28.00	6.0	1.90	2.70	240.0	356.0	11.0	36.0	3.40	2000
	6-18	250	75	6.6	1040	58	18.00	-1	-1	-1	-1	49.0	660.0	10.0	-1	2.80	3000
	6-25	130	30	5.2	1180	100	130.00	36.00	5.2	3.10	4.20	62.0	732.0	9.5	55.0	2.40	2900
	7-2	110	-1	5.9	736	45	71.00	34.00	-1	-1	-1	9.0	443.0	8.7	-1	1.80	3800
	7-9	180	81	5.0	660	39	72.00	26.00	59.0	3.80	1.70	6.8	441.0	7.1	67.0	1.70	3300
	7-16	100	35	5.4	790	46	56.00	40.00	-1	-1	-1	24.0	538.0	7.6	-1	2.10	1500
	7-23	80	32	4.2	1028	55	94.00	50.00	63.0	3.60	-1	6.0	709.0	4.4	0.7	1.80	1400
	7-30	-1	30	5.9	1060	68	89.00	52.00	-1	-1	0.30	13.0	729.0	8.2	-1	1.30	1700
	8-6	110	29	5.1	856	35	75.00	40.00	56.0	2.00	-1	36.0	890.0	3.1	-1	1.15	500
	10-1	560	160	6.7	100	16	6.50	1.90	-1	-1	36.00	30.0	33.0	4.6	-1	.20	1100
3P8	6-4	83	75	6.9	2400	170	260.00	27.00	-1	-1	-1	150.0	1240.0	170.0	-1	-1	1400
	6-11	130	164	6.5	240	20	37.50	1.00	0.7	0.18	-1	62.0	61.7	12.0	33.0	.18	900

[a]All values mg/l except pH (no units) and boron (µg/l).

similar at all four wells. The general trends were (1) a rapid increase and then rapid decrease in inorganic salt concentrations and (2) organic concentrations which peaked with the inorganic salt concentrations, peaked again with the arrival of producible quantities of crude at the wells, and then peaked a third time at the end of the experiment.

Salinity concentrations increased soon after the first production of water from about 1,000-2,000 mg/l to 2,500-11,000 mg/l. The rapid increase was primarily caused by higher concentrations of calcium, magnesium, and sulfate. About two to four weeks later, salinity concentrations dropped dramatically to less than 1,000 mg/l and remained at low levels through the remainder of the tar sand experiment. Well 3P7 was sampled most frequently during May and June and thus illustrates best the rapid decline in inorganic salt concentrations. The other wells were not sampled during the two-week period of rapidly declining concentrations.

Figure V-1 illustrates the change in inorganic composition over time. The water is predominantly a saline calcium-magnesium sulfate composition before the arrival of the crude. After crude production commences, the water becomes less saline and increasingly enriched in sodium and bicarbonate.

The trend in the concentrations of major inorganic species can be explained by the following theory. The composition of the water produced early in the experiment was dictated primarily by the dissolution of salts underground. Water saturation before injection was less than 7 percent of the pore volume. The injection of steam and water saturated the pores underground and brought rock into contact

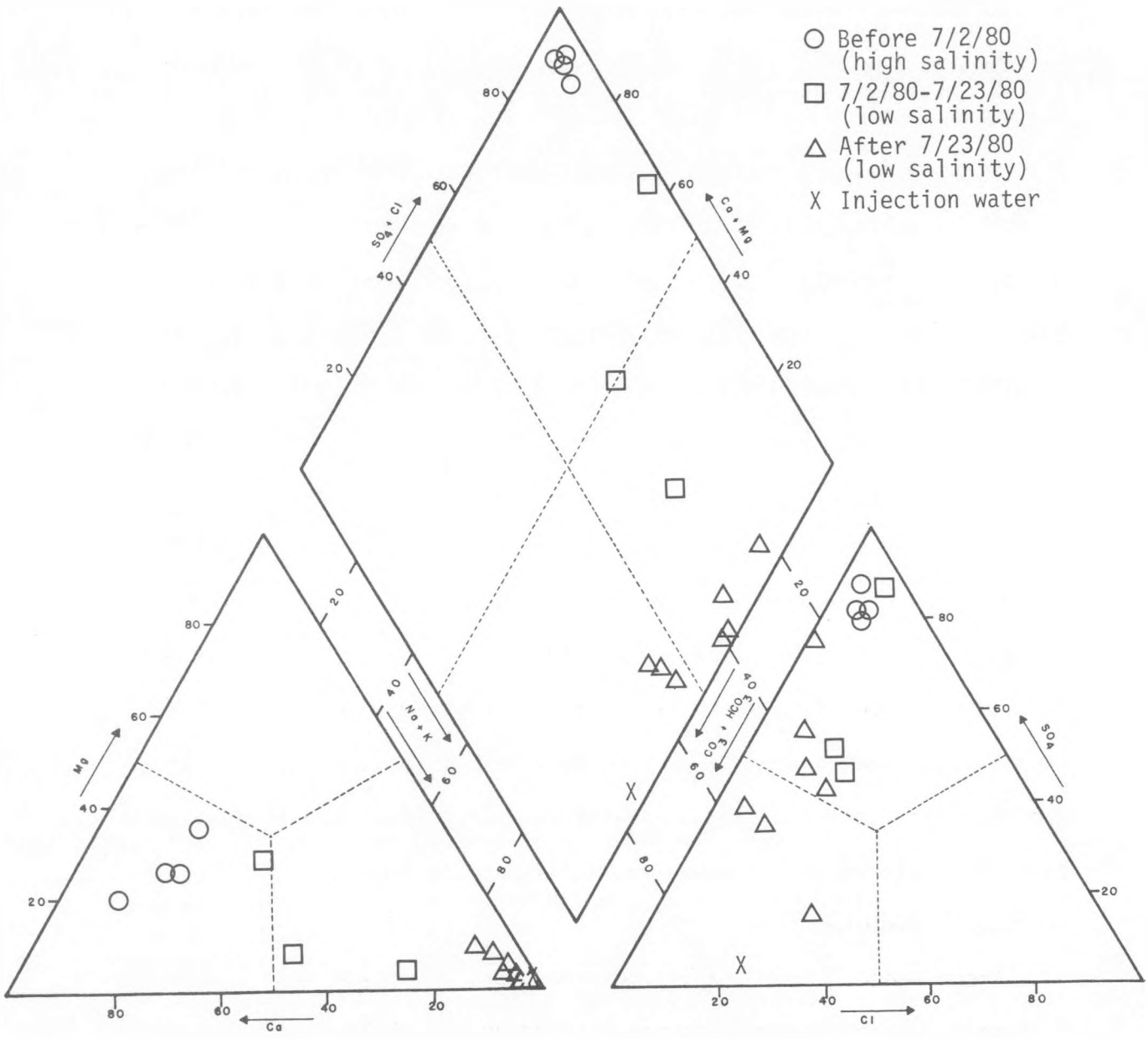

Figure V-1. Major ion composition of well 3P1 waters and their variation over time.

with water (Figure V-2). It appears that solubility limits of calcium sulfate were quickly reached, and that further salinity increases depended on the availability of magnesium and sodium in the rocks.

As the experiment continued, general inorganic composition was dictated more by the quality of the injected steam than by chemical reactions underground. As the trilinear diagram (Figure V-1) illustrates, the water produced at well 3P1 trended toward the composition of the injected steam. The salinity of the water produced at the well from August until the conclusion of the experiment averaged 121 mg/l, which was not much higher than the salinity of the injected water, which averaged 113 mg/l. Inorganic salt increases in the ground water later in the experiment may have been prevented by a lack of dissolvable material or by slow kinetics of dissolution.

The behavior of the organic species, as indicated by COD and TOC, was more erratic than the behavior of the inorganic species. However, concentrations of COD and TOC typically peaked three times during the experiment. The first peak coincided with the inorganic peak and the second peak occurred about the time that crude production commenced. The third peak occurred in the last or second-to-last sample taken in late September or early October. No differences could be discerned in the magnitudes of the three peaks.

The average COD/TOC ratio decreased from 4.6 during the first peak to 4.1 during the second and 3.6 during the third. Although the data are few, this trend indicates an increasing percentage of more oxidized organics. It is important to note the exceptions at well 3P2, where TOC exceeded COD during the first two peaks.

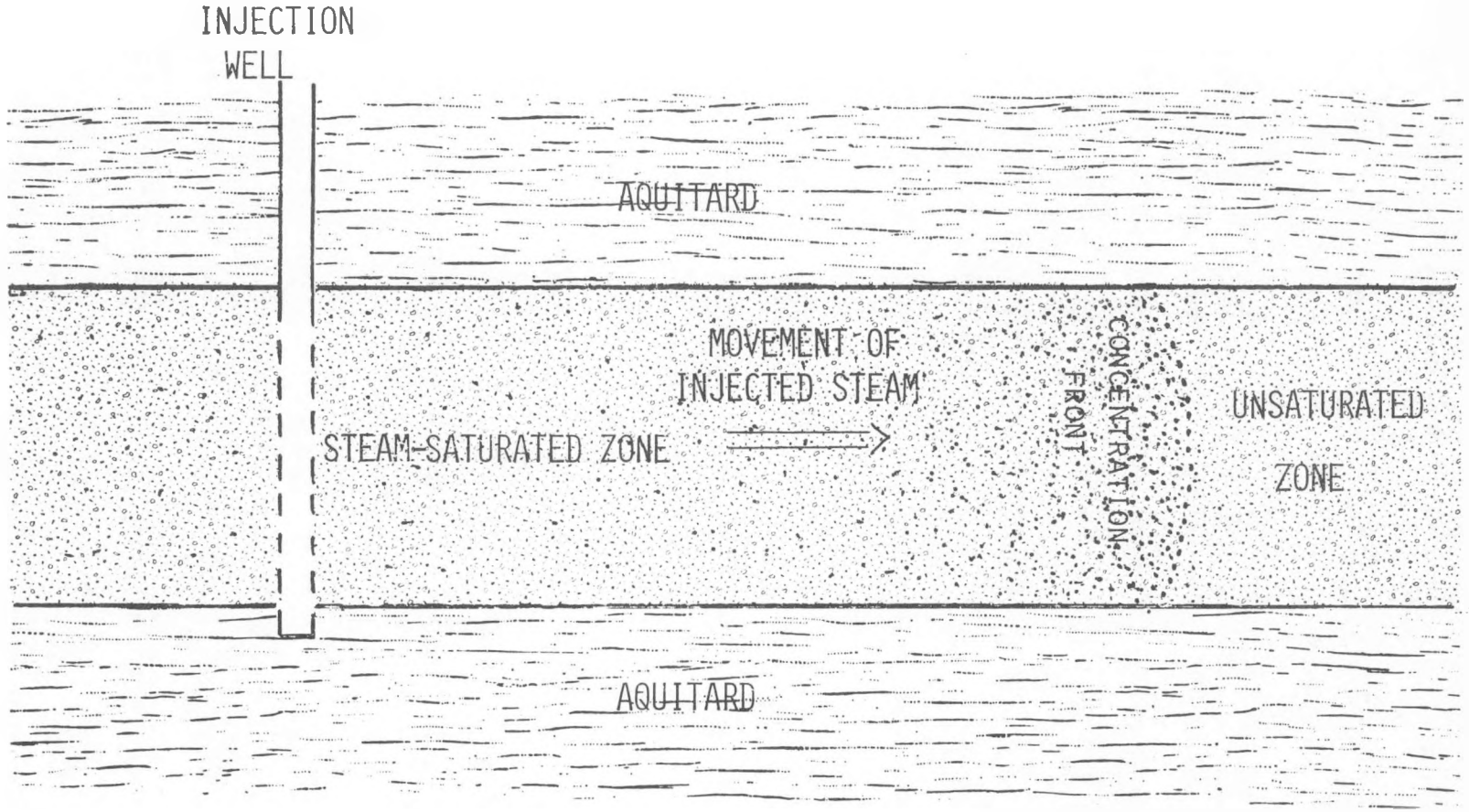

Figure V-2. Conceptualization of the concentration front in a tar sand.

The first organic peak might be attributed to high organic concentrations in water within the unsaturated zone, which was moved to the wells by the injected water and steam. The second peak might be attributed to the transfer of soluble organic species from the crude to the water as the crude was being forced toward the production wells by the steam. The reason for the third peak is unknown.

An attempt was made to correlate COD and TOC concentrations in the water samples with oil production histories of the wells. There may be some correlation between oil production and organics levels, but it is weak. At well 3P7, COD concentrations rose in early June prior to the production of oil on June 13. However, although oil production remained at a fairly constant level at this well, COD concentrations dropped (Figure B-4.i, Appendix B). TOC at well 3P7 fluctuated widely and inexplicably during this time (Figure B-4.j, Appendix B). Likewise, well 3P2 showed a rise of COD and TOC concentrations between May and July (unfortunately based upon two points) (Figures B-2.i and B-2.j, Appendix B); oil production began July 8, after the increase in the COD and TOC concentrations. Well 3P3, which produced only minor amounts of fluid during the test (Johnson et al., 1981a, 1981b), did not exhibit a COD and TOC peak during the summer (Figures B-3.g and B-3.h, Appendix B). Well 3P1, considered a sporadic producer, showed several increases and decreases in COD and TOC concentrations during the duration of the test (Figures B-2.i and B-2.j, Appendix B).

SPATIAL VARIATION IN WATER QUALITY

The production wells monitored for water quality were clustered within 75 feet (23 meters) of the injection well. Despite their proximity to the injection well and to each other, some important differences among the wells were observed both in the timing of the peaks and in the maximum concentrations attained during the experiment.

The initial peak, characterized by high salinity and high organic concentrations, occurred in early May at all wells. The second peak, characterized by high organic concentrations and boron concentrations, was associated with the arrival of crude at each well. The peak occurred in June at well 3P7, in July at well 3P2, and not at all at well 3P3, which was a poor producer. The third peak occurred in the last two samples taken during the experiment.

Table V-3 presents the maximum concentrations of four constituents at the four wells with the most complete water quality records. Highest concentrations were attained at well 3P2, followed in descending order by well 3P3, well 3P7, and well 3P1. It is not known what conditions caused the differences in maximum concentrations. However, coring at well 3P3 and near well 3P1 indicated that permeability was higher and oil saturation lower near well 3P1. A longer contact time due to lower permeability and a higher oil-to-water ratio underground may have caused the higher inorganic and organic concentrations in water moving westward from the injection well to well 3P3 and well 3P2.

Well 3P7 is in the same direction as well 3P3 and well 3P2, but is about 40 percent closer to the injection well. The maximum TDS

TABLE V-3

MAXIMUM CONCENTRATIONS
FOR TDS, COD, TOC, AND BORON

Well	TDS (mg/l)	COD (mg/l)	TOC (mg/l)	Boron (mg/l)
3P1	2,900	1,000	440	2.2
3P2	12,400	1,600	6,300	7.3
3P3	10,200	1,000	200	4.4
3P7	6,000	600	160	3.8

concentration was 47 percent less in well 3P7, the maximum COD concentration was 54 percent less, and the maximum boron concentration was 35 percent less. The shorter flow path between the injection well and well 3P7 resulted in a shorter contact time and probably less crude and rock contacted by the injected steam. These factors may have been important causes of lower concentrations at well 3P7.

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CHAPTER VI

FACTORS CONTROLLING TAR SAND WATER QUALITY

As is readily apparent in the figures in Appendix B, many of the water quality parameters that were monitored varied in unison over time. The question arises: Would it be possible to monitor just a few parameters but still have an adequate understanding of the chemical changes occurring during the injection process? The cost factor cannot be overlooked either. To test for the more than 40 parameters listed in Table II-2 on each sample is an expensive proposition. If only a few parameters are necessary to totally define water quality conditions at a site, then substantial financial savings may be possible.

Factor analysis was undertaken to determine whether certain chemical constituents can be used as indicators of overall water quality. Factor analysis is one of a set of lesser-known multivariate analytic techniques. Whereas multiple regression attempts to discern the relationship between a dependent variable and a number of independent variables, factor analysis allows one to examine the relationships among a number of correlative variables simultaneously. This chapter begins with an explanation of the concepts behind factor analysis, and then presents the results of the factor analysis of tar sand water quality.

THE CONCEPT OF FACTOR ANALYSIS

Assume that we have a beaker of water. Into that beaker we add a couple of very soluble salts--sodium chloride (common table salt) and potassium nitrate (used in fertilizers and explosives). After dissolution, there are four ionic species in the beaker water--Na^+, K^+, Cl^-, and NO_3^-.

Suppose that we place the beaker on a hotplate and evaporate some of the water. As we evaporate water from the beaker, the concentrations of the ionic constituents will increase. If concentrations of these various constituents are measured at various water volumes, we find that the ionic concentrations vary similarly. A correlation matrix developed from data collected on the constituents at various water volumes might look like this:

Na	1.00			
K	.97	1.00		
Cl	.99	.96	1.00	
NO_3	.98	.98	.99	1.00
	Na	K	Cl	NO_3

All of the constituents are very highly correlated with each other, not because one influences the others, but because they are all related to the volume of water in the beaker. Therefore, the volume of water in the beaker is the underlying factor affecting concentration levels of all the ions. Because all the components vary almost identically with water volume, it should be possible to measure only one variable but still describe the chemistry of the beaker. Obviously, we could measure the water volume of the beaker since it is

the underlying factor impacting water quality in the beaker. If that is too difficult to measure, however, we could measure one of the chemical constituents, for example, chloride. We can calculate what the concentrations of the other constituents would be by measuring just the chloride concentration.

We can complicate our beaker system by occasionally dropping a few crystals of silver nitrate into it at the same time the water volume is decreasing. The presence of Ag^+ in the system results in the immediate precipitation of silver chloride, which has an extremely low solubility product. Collecting data on the ionic constituents while the water volume is changing and silver nitrate is being added will produce a correlation matrix with lower correlations:

Na	1.00			
K	.97	1.00		
Cl	.82	.80	1.00	
NO_3	.78	.84	.65	1.00
	Na	K	Cl	NO_3

The beaker system as it is now set up is controlled by two underlying factors, a water volume factor and a silver factor, which must be understood to explain the system.

Factor analysis is a mathematical technique that extracts eigenvectors (factors) and eigenvalues from a data correlation matrix. The mathematical theory of factor analysis is left for the reader to ferret from the texts given in the references.

The particular factor analysis programs used in this study are a standard package written by SPSS (Statistical Package for the Social Sciences, 1975). Utilized in this study was the particular SPSS factor method of principal factoring without iteration (PA1). This method is in many respects simple principal components analysis, with the exception that the factors are extracted from a correlation matrix rather than from a variance-covariance matrix. The factor method chosen for use here does not replace the main diagonal of the correlation matrix with estimates of communality, as most factor methods do. By adopting this simplest of factor procedures, the factors that are extracted are exact mathematical transformations of the original variables. No assumptions about the general structure of the data are necessary using this method.

FACTOR ANALYSIS OF DATA FROM INDIVIDUAL WELLS

Factor analysis was initially run on the 16 constituents which were listed in Table V-2 and used in the discussion of temporal and spatial trends in the previous chapter. It was found that iron, manganese, and nitrate had fewer data than the other 13 constituents, and that these three smaller data sets produced inconsistent results from factor analysis. Therefore, factor analysis was eventually conducted on 13 constituents.

As noted in the previous chapter, many of the constituents had parallel histories. By subjecting the water quality data to factor analysis, factors are extracted which contain the water quality information of the 13 constituents but which are linearly independent. The factors are selected by the mathematical operations so that the

first factor contains as much of the variable variance information as possible. The second factor contains the next greatest amount of information, and so on with the rest of the factors. While each of the 13 constituents would be expected to explain only 1/13 or 8 percent of the variance information in the data set, in fact the first factor contains much more of the variance information and in addition is linearly independent from the other factors.

The percentage of the total data variance explained by each factor is presented for well 3P1 in Table VI-1.a. The first factor explains 7.61/13 = 58.6 percent of the variance in the water quality data. In fact, the first three factors explain 93 percent of the total variance of the sample data. If these factors can be interpreted, in the same manner that the water volume and silver nitrate factors were interpreted for the beaker system, it may be possible to reduce the number of parameters sampled.

Interpreting the significance of the factors is done by analysis of the factor matrix (Table VI-1.b). This is often a complex and fruitless task, but usable results are derived in this example. The numbers in the rows and columns of the factor matrix may be thought of in two ways: as correlation coefficients between variables and factors and as weights to reconstruct variables from factor scores. In well 3P1, the correlation coefficient between factor 1 and calcium is 0.851, while between factor 2 and calcium it is -0.033. The first three factors, which explain 93 percent of the total data variance, explain $(.85)^2 + (.03)^2 + (.17)^2 = .75$, or 75 percent of the variance of calcium. The use of factor matrix values as weights to generate variables is not discussed here and was not utilized in this study.

TABLE VI-1

A. PERCENTAGE OF VARIANCE EXPLAINED BY EACH FACTOR FOR WELL 3P1

FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
1	7.61324	58.6	58.6
2	2.86295	22.0	80.6
3	1.62729	12.5	93.1
4	.82264	6.3	99.4
5	.65629	5.0	104.5
6	.50819	3.9	108.4
7	.20721	1.6	110.0
8	.07232	.6	110.5
9	.01230	.1	110.6
10	-.02496	-.2	110.4
11	-.23225	-1.8	108.7
12	-.30997	-2.4	106.3
13	-.81524	-6.3	100.0

B. VARIABLE LOADINGS ONTO THE THREE PRINCIPAL FACTORS FOR WELL 3P1

	FACTOR 1	FACTOR 2	FACTOR 3
CALCIUM	.85138	-.03265	-.17987
MAGNESI	.94250	-.06349	-.19357
SODIUM	.80811	-.07722	.52072
SULFATE	1.01005	-.06268	-.10046
CHLORIDE	.81307	-.11619	-.06659
BICARB	.97379	-.06919	-.12688
TDS	.94818	-.02253	-.16378
FLUORIDE	.88295	.03510	-.45327
BORON	-.38282	.91895	.15902
COD	-.04470	.27982	.95016
TOCARBON	-.16237	.92017	.44927
AMMONIA	.58694	.85354	-.19384
PH	-.35724	.06214	.75754

Examining the factor matrix for the well 3P1 water quality data, it is apparent that each variable except pH is highly correlated or loaded onto only one factor. All the major ions are loaded most heavily onto factor 1; boron, TOC, and ammonia are loaded heavily onto factor two; and only COD is loaded highly onto factor 3. The pH is loaded most heavily onto factor 3, but is also loaded onto factor 1.

Factor 1 for well 3P1 corresponds to the process described in the previous chapter, in which pore volumes are filled with water which then dissolves some of the materials in the surrounding rock. After this initial dissolution, concentrations of all inorganic constituents heavily loaded onto factor 1 decrease rapidly to levels approaching those in the injected steam. The very high correlation between this factor and inorganic chemical constituents suggests that measurement of a few constituents may yield an overall summary of the general inorganic water quality of the zone.

Not loading onto the first factor are the organic compounds and boron. This separation of constituents seems reasonable since it was suggested in the prior chapter that the organics react differently to injection than do the inorganic constituents. The loading of TOC and COD onto different factors is thought to be a fluke of this particular well. As will be shown, these two constituents normally will load onto the same factor, since they are usually very highly correlated. The reason boron is associated with the organic compounds is not known, but the relationship appears consistently from well to well.

Examination of the eigenvalues and factor matrix for well 3P7 water quality data reveals the same basic structure as for well 3P1 (Table VI-2). Once again, three factors explain almost 90 percent of

TABLE VI-2

A. PERCENTAGE OF VARIANCE EXPLAINED BY EACH FACTOR FOR WELL 3P7

FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
1	7.30530	56.2	56.2
2	2.44219	18.8	75.0
3	1.31482	10.1	85.1
4	.97915	7.5	92.6
5	.53600	4.1	96.7
6	.28279	2.2	98.9
7	.11378	.9	99.8
8	.07335	.6	100.4
9	.02721	.2	100.6
10	.01134	.1	100.7
11	.00230	.0	100.7
12	-.01669	-.1	100.5
13	-.06954	-.5	100.0

B. VARIABLE LOADINGS ONTO THE THREE PRINCIPAL FACTORS FOR WELL 3P7

	FACTOR 1	FACTOR 2	FACTOR 3
CALCIUM	.92461	-.21492	.04028
MAGNESI	.97906	-.10935	.00930
SODIUM	.92768	-.19444	.10918
SULFATE	.96679	-.18816	-.05980
CHLORIDE	.97122	-.04941	.04544
BICARB	.73821	.16082	.55110
TDS	.97523	-.15560	.01728
FLOURIDE	.32038	-.10909	.61265
BORON	-.52552	-.02082	.66990
COD	-.31553	.88114	-.06186
TOCARBON	-.54818	.69566	-.20324
AMMONIA	.14674	.76157	-.55263
PH	-.01637	.80611	.13422

the variance information of the data set. The first factor, which is loaded very heavily with all the major ions, explains 57 percent of the variation of the data. Factor 2 loads heavily with COD, TOC, ammonia, and pH. Unexplainable is factor 3 which is loaded onto by fluoride.

FACTOR ANALYSIS OF DATA FROM ALL WELLS

If the physical processes occurring at each well are characteristic of the entire tar sand site, factors derived from an analysis of all well data simultaneously should yield factors similar to those already described. Sixty-three samples from seven wells were subjected to factor analysis. The factor matrix and associated eigenvalues are presented in Table VI-3.

With this enlarged data set, three principal factors were extracted, but these three factors explain only 74 percent of the variance of the data set. This lower percentage is indicative of an interwell variation in water quality. One factor is loaded highly by major inorganic ions; boron, COD, and TOC load highly onto a second factor; and ammonia loads highly onto the third factor (Table VI-3.b).

The first two factors are similar to those found at well 3P1 and well 3P7. The third factor has only ammonia loaded heavily onto it. In the earlier examples where one well at a time was tested, ammonia loaded onto the organic factor. The rationale of why ammonia loads onto its own factor and not the organic factor is unclear. It could be that ammonia moves not with the water or with the oil, but as a volatile compound. This different transport mechanism would cause

TABLE VI-3

A. PERCENTAGE OF VARIANCE EXPLAINED BY EACH FACTOR FOR ALL WELLS

FACTOR	EIGENVALUE	PCT OF VAR	CUM PCT
1	6.08525	46.8	46.8
2	2.45269	18.9	65.7
3	1.09772	8.4	74.1
4	.86327	6.6	80.8
5	.71771	5.5	86.3
6	.53366	4.1	90.4
7	.43239	3.3	93.7
8	.33178	2.6	96.3
9	.21069	1.6	97.9
10	.16257	1.3	99.1
11	.09068	.7	99.8
12	.02581	.2	100.0
13	-.00423	-.0	100.0

B. VARIABLE LOADINGS ONTO THE FOUR PRINCIPAL FACTORS FOR ALL WELLS

	FACTOR 1	FACTOR 2	FACTOR 3
CALCIUM	.89776	-.07055	-.14300
MAGNESI	.81376	-.23316	.16892
SODIUM	.91469	.10873	-.09795
SULFATE	.95125	.09772	.08505
CHLORIDE	.71548	.07360	-.30424
BICARB	.80705	.00826	-.04300
TDS	.94902	.09084	.07035
FLOURIDE	.69119	.09139	.24443
BORON	-.02862	.85220	.18636
COD	-.06014	.90030	.19814
TOCARBON	.15329	.83995	-.22037
AMMONIA	.02028	.15585	.82878
PH	-.54914	.24554	-.30071

ammonia to be loaded onto a different factor from the nonvolatile inorganic and organic species.

CONCLUDING REMARKS

Three factors explain most of the water quality variation during a steam injection into a tar sand deposit. One factor characterizes the concentration of the major inorganic constituents of the waters. A second factor has the most substantial impact upon the organic parameters and boron. The third factor describes the behavior of ammonia.

With the above understanding of water quality of a tar sand deposit, it is simple to devise a sampling scheme that characterizes tar sand water quality. As with the beaker where one ionic specie could indicate water volume and the concentrations of other ionic species, one or two select parameters may be used to describe each tar sand factor. Changes in major inorganic constituents could be identified by monitoring sulfate or chloride, and could also be approximately quantified for each constituent through information gained by factor analysis. Since chloride can be monitored by an ion selective electrode, the behavior of major inorganic species could be closely monitored in the field by the chloride electrode at greatly reduced laboratory costs. Laboratory samples could be taken when the chloride electrode indicated major chemical changes. COD, TOC, or perhaps even boron could be monitored more frequently to provide better information on the movement of organics. Finally, ammonia appeared to behave uniquely and could be monitored in the field with an ammonia specific electrode.

The importance of an indicator water quality monitoring program is clearly emphasized by the problems that occurred during the TS-1S experiment. Major water quality changes took place over very short periods of a few days to a few weeks. Only well 3P7 had an adequate record of changes in major inorganic species, and none of the wells had an adequate record of organic changes. An indicator monitoring program, particularly one based on field rather than laboratory analytical techniques, could be established for future tar sand projects and result in intensified sampling during periods of major chemical changes. The data base derived from such a sampling program could provide a clearer picture of water quality changes as well as possibly assist in optimizing the recovery of oil from tar sand deposits.

CHAPTER VII

ENVIRONMENTAL SIGNIFICANCE OF TAR SAND WATER QUALITY

The quality of the waters produced through the underground injection of steam into a tar sand deposit during the TS-1S experiment must be examined with reference to three facts: (1) the tar-bearing sandstone at the TS-1S site is not an aquifer; (2) the State of Utah presently has no defined standards for ground-water quality; and (3) standards are set for surface water quality in Utah based upon the type of beneficial use (domestic, agricultural, etc.). Because of these three facts, it is difficult to assess how water quality at the TS-1S tar sand site would be regulated.

The tar sand deposit is not an aquifer. It is not being used as a water supply in the region and has no water-bearing properties at the site of the TS-1S experiment. The chief water quality concern would probably be the invasion of tar sand waters into underlying aquifers. Underlying aquifers were not monitored during the tar sand experiment. However, since the tar sand deposit appears to be isolated from the aquifers by impermeable shales (Johnson, 1981a), it is unlikely that any contamination of the aquifers occurred.

Utah has no ground-water standards to regulate ground-water quality. One way to measure the environmental significance of the changes in water quality during the experiment is to compare the concentrations of constituents to the Utah surface-water quality standards, which are presented in Table VII-1. These standards would

TABLE VII-1

UTAH SURFACE-WATER STANDARDS

Constitutent	CLASSES											
	Domestic Source			Recreation & Aesthetics		Aquatic Wildlife				Agri-culture	Indus-try	Special
	1A	1B	1C	2A	2B	3A	3B	3C	3D	4	5	6
Bacteriological (No./100 ml)												
(30-day Geometric Mean)												
Maximum Total Coliforms	1	50	5,000	1,000	5,000	*	*		*	*		
Maximum Fecal Coliforms	*	*	2,000	200	2,000	*	*		*	*		
Physical												
Total Dissolved Gasses	*	*	*	*	*	(b)	(b)		*	*		
Minimum DO (mg/l) (a)	*	*	5.5	5.5	5.5	6.0	5.5		5.5	*		
Maximum Temperature	*	*	*	*	*	20°C	27°C		*	*		
Maximum Temp. Change	*	*	*	*	*	2°C	4°C		*	*		
pH	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0	6.5-9.0		6.5-9.0	6.5-9.0		
Turbidity increase (c)	*	*	*	10 NTU	10 NTU	10 NTU	10 NTU		15 NTU	*		
Chemical (Maximum mg/l)												
Arsenic, dissolved	.05	.05	.05	*	*	*	*		*	.1		
Barium, dissolved	1	1	1	*	*	*	*		*	*		
Cadmium, dissolved	.010	.010	.010	*	*	.0004(d)	.004(d)		*	.01		
Chromium, dissolved	.05	.05	.05	*	*	.10	.10		.10	.10		
Copper, dissolved	*	*	*	*	*	.01	.01		*	.2		
Cyanide	*	*	*	*	*	.005	.005		*	*		
Iron, dissolved	*	*	*	*	*	1.0	1.0		1.0	*		
Lead, dissolved	.05	.05	.05	*	*	.05	.05		*	.1		
Mercury, total	.002	.002	.002	*	*	.00005	.00005		.00005	*		
Phenol	*	*	*	*	*	.01	.01		*	*		
Selenium, dissolved	.01	.01	.01	*	*	.05	.05		*	.05		
Silver, dissolved	.05	.05	.05	*	*	.01	.01		*	*		
Zinc, dissolved	*	*	*	*	*	.05	.05		*	*		
NH_3 as N (un-ionized)	*	*	*	*	*	.02	.02		*	*		
Chlorine	*	*	*	*	*	.002	.01		*	*		
Fluoride, dissolved (e)	1.4-2.4	1.4-2.4	1.4-2.4	*	*	*	*		*	*		
NO_3 as N	10	10	10									
Boron, dissolved	*	*	*	*	*	*	*		*	.75		
H_2S	*	*	*	*	*	.002	.002		*	*		
TDS (f)	*	*	*	*	*	*	*		*	1200		
Radiological (Maximum pCi/l)												
Gross Alpha	15	15	15	*	*	15(g)	15(g)		15(g)	15(g)		
Radium 226, 228 combined	5	5	5	*	*	*	*		*	*		
Strontium 90	8	8	8	*	*	*	*		*	*		
Tritium	20,000	20,000	20,000	*	*	*	*		*	*		
Pesticides (Maximum ug/l)												
Endrin	.2	.2	.2	*	*	.004	.004		.004	*		
Lindane	4	4	4	*	*	.01	.01		.01	*		
Methoxychlor	100	100	100	*	*	.03	.03		.03	*		
Toxaphene	5	5	5	*	*	.005	.005		.005	*		
2, 4-D	100	100	100	*	*	*	*		*	*		
2, 4, 5-TP	10	10	10	*	*	*	*		*	*		
Pollution Indicators (g)												
Gross Beta (pCi/l)	50	50	50	*	*	50	50		50	50		
BOD (mg/l)	*	*	5	5	5	5	5		5	5		
NO_3 as N (mg/l)				4	4	4	4		*	*		
PO_4 as P (mg/l)(h)	*	*	*	.05	.05	.05	.05		*	*		

STANDARDS WILL BE DETERMINED ON A CASE-BY-CASE BASIS (SEE APPENDIX D)

STANDARDS WILL BE DETERMINED ON A CASE-BY-CASE BASIS

STANDARDS WILL BE DETERMINED ON A CASE-BY-CASE BASIS

* Insufficient evidence to warrant the establishment of numerical standard. Limits assigned on case-by-case basis.

(a) These limits are not applicable to lower water levels in deep impoundments.

(b) Not to exceed 110% of saturation.

(c) For Classes 2A, 2B, 3A, and 3B at background levels of 100 NTUs or greater, a 10% increase limit will be used instead of the numeric values listed. For Class 3D at background levels of 150 NTUs or greater, a 10% increase limit will be used instead of the numeric value listed. Short term variances may be considered on a case-by-case basis.

(d) Limit shall be increased threefold if $CaCO_3$ hardness in water exceeds 150 mg/l.

(e) Maximum concentration varies according to the daily maximum mean air temperature.

Temp. °C	mg/l
12.0 and below	2.4
12.1 to 14.6	2.2
14.7 to 17.6	2.0
17.7 to 21.4	1.8
21.5 to 26.2	1.6
26.3 to 32.5	1.4

(f) Total dissolved solids (TDS) limit may be adjusted on a case-by-case basis.

(g) Investigations should be conducted to develop more information where these pollution indicator levels are exceeded.

(h) PO_4 as P(mg/l) limit for lakes and reservoirs shall be .025.

be applicable if ground water were produced and discharged to a surface water.

The bacteriological and radiological constituents, pesticides, and many of the physical constituents and pollution indicators in the standards were not monitored during the tar sand experiment. However, most of those constituents with standards which were monitored during the experiment exceeded the values in the standards.

The only physical constituent with data was pH. The pH commonly fell below 6.5, the level set in the standards, during the early and middle stages of the experiment. The minimum recorded pH was 4.2 on July 23 at well 3P7. Although no data for temperature were included in the data base for this study, it is also certain that the standards for maximum temperature and maximum temperature change were exceeded.

Chemical constituents which exceeded Utah standards are listed in Table VII-2. Domestic use would have been impaired by high concentrations of arsenic, cadmium, chromium, lead, selenium, fluoride, and nitrate. Aquatic wildlife would have been stressed by high concentrations of cadmium, chromium, cyanide, iron, lead, phenol, selenium, zinc, and H_2S. Agriculture would have been impaired by high concentrations of arsenic, cadmium, chromium, lead, selenium, boron, and TDS.

Another assessment of the environmental significance of the water quality was made by comparing the water quality to the Wyoming ground-water standards. The results of this comparison are presented in Appendix C. The constituents which exceeded Wyoming ground-water standards are listed in Table VII-3. The dates and locations of these exceedences are indicated on the figures in Appendix C.

TABLE VII-2

MAXIMUM CONCENTRATIONS FOR CONSTITUENTS EXCEEDING
UTAH SURFACE-WATER STANDARDS

Constituent	Maximum Value	Date	Location
pH	4.2[a]	July 23	3P7
Arsenic	0.42 mg/l	Aug 6	3P2
Cadmium	0.07 mg/l	May 21	3P2
Chromium	0.11 mg/l	May 7	3P3
Cyanide	80 mg/l	May 9	3P2
Iron	510 mg/l	May 13	3P2
Lead	1.3 mg/l	July 9	3P7
Phenol	4.9 mg/l	July 16	3P7
Selenium	0.44 mg/l	July 23	3P1
Zinc	13 mg/l	May 9	3P2
Fluoride	6.5 mg/l	May 7	3P2
Nitrate as N	150 mg/l	May 9	3P2
Boron	7.3 mg/l	Sept 25	3P2
H_2S	3.2 mg/l	June 11	3P7
TDS	12,400 mg/l	May 21	3P2

[a]Minimum value.

TABLE VII-3

CONSTITUENTS EXCEEDING WYOMING GROUND-WATER STANDARDS

Domestic Use	Agriculture	Livestock	Fish and Aquatic Life
Arsenic	Arsenic	Arsenic	Aluminum
Boron	Boron	Boron	Arsenic
Cadmium	Cadmium	Cadmium	Cadmium
Chromium	Chloride	Chromium	Chromium
Cyanide	Iron	Lead	Copper
Fluoride	Lead	Selenium	Cyanide
Hydrogen Sulfide	Manganese	Sulfate	Hydrogen Sulfide
Iron	Nickel	TDS	Iron
Lead	Selenium	pH	Lead
Manganese	Sulfate		Manganese
Nitrate	TDS		Nickel
Phenol	Zinc		Phenol
Selenium	pH		Selenium
Sulfate	SAR		TDS
TDS			Zinc
pH			pH

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APPENDIX A

WATER QUALITY DATA

**STATION NO. 7840 TS-1S 3P1
LATITUDE 40-25-00 LONGITUDE 109-40-00 IN UTAH ELEVATION 5959.0C FT.
NE1/4-SW1/4 SECTION 29 TOWNSHIP 4S RANGE 20E SALT LAKE P.M. DRAINAGE BASIN CODE 16100000
SITE TYPE WELL USE MONITORING OR OBSERVATION (P) ERDA # 0
AQUIFER 0 DRAINAGE AREA C.00 SQ. MI. NONCONTRIBUTING 0.00 SQ. MI. DISCHARGE PERMIT NO. 0
WELL DEPTH 565.0 FT. WELL PERMIT NO. 0

\- AFTER A VALUE TAGS IT AS LESS THAN
\+ AFTER A VALUE TAGS IT AS GREATER THAN

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	5 NO. USED IN SAMP ACCOUNT PROCEDURE	7 WATER TEMPERATURE DEG. C	35 SAMPLE TREATMENT	39 BIOCHEMICAL OXYGEN DEMND 5-DAY MG/L	42 CHEM OXYGEN DEMAND .25 NK2CR07 MG/L	43 FIELD PH STAND. UNITS	45 TOTAL ALKALINITY PG/L	49 BICARBONATE ION MG/L	50 CARBONATE ION MG/L
1 MAY 80	1300	1.00	**	3.00	**	**	**	157.00	191.00	.10-
COLLECTED BY :			ERDA							
5 MAY 80	800	4.00	**	3.00	**	250.00	**	209.00	255.00	.10-
COLLECTED BY :		WEST. WYO COLLEGE								
7 MAY 80	1305	7.00	**	3.00	**	20.00	**	229.00	279.00	.10-
9 MAY 80	1306	8.00	**	4.00	**	151.00	5.10	.10-	.10-	.10-
13 MAY 80	1300	14.00	**	4.00	**	180.00	**	.10-	.10-	.10-
13 MAY 80	1305	15.00	**	3.00	**	5.00-	5.20	233.00	284.00	.10-
19 MAY 80	1310	25.00	**	4.00	**	250.00	**	.10-	.10-	.10-
19 MAY 80	1315	26.00	**	3.00	**	54.00	6.20	166.00	202.00	.10-
2 JUL 80	1310	4.00	37.00	3.00	**	130.00	6.80	4.50	55.00	.10-
9 JUL 80	1305	11.00	63.00	3.00	**	25.00-	5.60	6.90	8.50	.10-
9 JUL 80	1306	12.00	**	4.00	**	30.00	**	6.90	8.50	3.10
23 JUL 80	1100	26.00	63.00	**	20.00	725.00	5.70	8.10	9.90	.10-
23 JUL 80	1101	27.00	**	5.00	18.00	250.00	**	.10-	.10-	.10-
23 JUL 80	1102	28.00	**	3.00	1.50-	35.00	**	16.00	20.00	.10-
30 JUL 80	1130	41.00	62.00	**	**	1000.00	8.20	110.00	130.00	.10-
30 JUL 80	1131	42.00	**	5.00	**	930.00	**	110.00	130.00	.10-
30 JUL 80	1132	43.00	**	3.00	**	300.00	**	81.00	99.00	.10-
TREATMENT :		UNKNOWN								
6 AUG 80	1100	1.00	62.00	14.00	**	60.00	7.20	16.00	20.00	.10-
6 AUG 80	1101	2.00	**	5.00	**	80.00	**	20.00	25.00	.10-
6 AUG 80	1102	3.00	**	4.00	**	50.00	**	16.00	20.00	.10-
14 AUG 80	1115	28.00	**	4.00	**	40.00	**	16.00	20.00	.10-
14 AUG 80	1116	29.00	**	5.00	**	96.00	**	20.00	25.00	.10-
14 AUG 80	1117	30.00	58.00	3.00	**	175.00	8.00	16.00	20.00	.10
14 AUG 80	1118	31.00	58.00	3.00	**	175.00	8.00	16.00	20.00	.10
20 AUG 80	1120	46.00	**	4.00	3.00	75.00	**	45.00	54.00	.10-
20 AUG 80	1121	47.00	**	5.00	3.00-	120.00	**	41.00	50.00	.10-
20 AUG 80	1122	48.00	52.00	3.00	5.40	140.00	7.40	37.00	45.00	.10-
27 AUG 80	1120	57.00	**	4.00	**	80.00	**	41.00	50.00	.10-
27 AUG 80	1121	58.00	**	5.00	**	140.00	**	32.00	40.00	.10-
27 AUG 80	1122	59.00	64.00	3.00	**	160.00	6.50	37.00	45.00	.10-
3 SEP 80	1130	15.00	**	4.00	**	65.00	**	24.00	30.00	.10-
3 SEP 80	1131	16.00	**	5.00	**	260.00	**	49.00	59.00	.10-
3 SEP 80	1132	17.00	38.00	3.00	**	270.00	6.70	24.00	30.00	.10-
29 SEP 80	1100	42.00	51.00	3.00	**	95.00	6.70	65.00	79.00	.10-
29 SEP 80	1101	43.00	**	5.00	**	75.00	**	69.00	84.00	.10-
29 SEP 80	1102	44.00	**	4.00	**	25.00	**	69.00	84.00	.10-
1 OCT 80	1100	1.00	52.00	3.00	**	**	6.80	130.00	64.00	44.00
1 OCT 80	1101	2.00	**	5.00	**	720.00	**	89.00	20.00	44.00
1 OCT 80	1102	3.00	**	4.00	**	450.00	**	93.00	34.00	39.00

SAMPLE SIZE	39.00	12.00	37.00	6.00	37.00	15.00	39.00	39.00	39.00
MAXIMUM	59.00	64.00	14.00	20.00	1000.00	8.20	233.00	284.00	44.00
MINIMUM	1.00	37.00	3.00	1.50-	5.00-	5.10	.10-	.10-	.10-
MEAN	24.51	55.00	4.08	8.48	213.14	6.67	59.05	66.42	3.43
STANDARD DEV	18.31	9.40	1.86	8.27	251.78	.99	64.86	76.80	11.41
RATIO VALUE	.66	1.93	2.10	1.00	1.33	.93	1.55	1.54	.41
TREND TEST	POS	NEG	NEG	POS	POS	POS	NEG	NEG	POS
COEF OF SKEWNESS	.28	-.92	4.14	.60	1.88	-.04	1.38	1.68	3.14
COEF OF VAR (%)	74.69	17.09	45.61	97.43	118.13	14.82	109.84	115.63	333.01

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	53 TOT. RESIDUE ROE 105C MG/L	69 DISSOLVED AMMONIA MG/L (N)	70 TOTAL AMMONIA MG/L (N)	80 TOTAL KJELDAHL NITROGEN MG/L	101 TOT. ORGANIC CARBON MG/L	102 DISS ORGANIC CARBON MG/L	104 TOTAL INORGANIC CARBON MG/L	109 TOTAL CARBON MG/L	110 DISSOLVED INORGANIC CARBON MG/L
1 MAY 80	1300	1150.00	**	**	**	**	**	**	**	**
COLLECTED BY : ERDA										
5 MAY 80	800	2780.00	**	7.90	**	50.00	**	55.00	105.00	**
COLLECTED BY : WEST. WYO COLLEGE										
7 MAY 80	1305	2930.00	**	7.20	**	23.00	**	61.00	84.00	**
9 MAY 80	1306	**	2.70	**	**	**	82.00	**	**	9.00
13 MAY 80	1300	**	5.00	**	**	**	76.00	**	**	7.00
13 MAY 80	1305	2690.00	**	3.30	**	8.00	**	48.00	56.00	**
19 MAY 80	1310	**	4.60	**	**	**	79.00	**	**	.30
19 MAY 80	1315	2900.00	**	6.00	**	21.00	**	68.00	89.00	**
2 JUL 80	1310	220.00	**	.36	**	64.00	**	9.00	73.00	**
9 JUL 80	1305	276.00	**	.42	**	36.00	**	.50-	36.00	**
9 JUL 80	1306	**	.40	**	**	**	25.00	**	**	5.00
23 JUL 80	1100	96.00	**	.10-	0.00	220.00	**	4.00	220.00	**
23 JUL 80	1101	184.00	**	.20	**	79.00	**	2.00	81.00	**
23 JUL 80	1102	76.00	**	.10-	**	17.00	**	2.00	19.00	**
30 JUL 80	1130	798.00	**	.20	4.60	250.00	**	10.00	260.00	**
30 JUL 80	1131	780.00	**	.50	**	230.00	**	14.00	240.00	**
30 JUL 80	1132	556.00	**	.10-	**	130.00	**	14.00	140.00	**
TREATMENT : UNKNOWN										
6 AUG 80	1100	96.00	**	.20	2.00	15.00	**	9.00	24.00	**
6 AUG 80	1101	112.00	**	.30	**	14.00	**	8.00	22.00	**
6 AUG 80	1102	**	.20	**	**	**	18.00	**	**	10.00
14 AUG 80	1115	**	.20	**	**	**	11.00	**	**	1.00
14 AUG 80	1116	28.00	**	.30	**	21.00	**	1.00	22.00	**
14 AUG 80	1117	84.00	**	.10	.80	46.00	**	2.00	48.00	**
14 AUG 80	1118	84.00	**	.20	**	46.00	**	2.00	48.00	**
20 AUG 80	1120	**	.30	**	**	**	13.00	**	**	10.00
20 AUG 80	1121	116.00	**	.60	**	43.00	**	9.00	52.00	**
20 AUG 80	1122	104.00	**	.70	1.60	51.00	**	8.00	59.00	**
27 AUG 80	1120	**	.20	**	**	**	24.00	**	**	4.00
27 AUG 80	1121	152.00	**	.30	**	47.00	**	8.00	55.00	**
27 AUG 80	1122	188.00	**	.20	1.70-	60.00	**	6.00	66.00	**
3 SEP 80	1130	**	.10	**	**	**	18.00	**	**	4.00
3 SEP 80	1131	68.00	**	.20	**	70.00	**	4.00	74.00	**
3 SEP 80	1132	84.00	**	.10	**	82.00	**	3.00	85.00	**
25 SEP 80	1100	120.00	**	.30	**	38.00	**	14.00	52.00	**
25 SEP 80	1101	132.00	**	.40	**	22.00	**	16.00	38.00	**
25 SEP 80	1102	**	.30	**	**	**	30.00	**	**	15.00
1 OCT 80	1100	176.00	**	13.00	**	440.00	**	17.00	460.00	**
1 OCT 80	1101	160.00	**	28.00	**	230.00	**	6.00	240.00	**
1 OCT 80	1102	**	12.00	**	**	**	130.00	**	**	8.00
SAMPLE SIZE		28.00	11.00	27.00	6.00	27.00	11.00	27.00	27.00	11.00
MAXIMUM		2930.00	12.00	28.00	4.60	440.00	130.00	68.00	460.00	15.00
MINIMUM		28.00	.10	.10-	0.00	8.00	11.00	.50-	19.00	.30
MEAN		612.14	2.38	2.64	1.78	87.15	45.82	14.83	101.78	6.66
STANDARD DEV		957.18	3.71	5.97	1.56	101.24	39.39	19.15	100.38	4.34
RATIO VALUE		.45	1.29	.49	2.96	1.41	.95	.51	1.47	2.71
TREND TEST		POS	NEG	POS	NEG	POS	POS	POS	NEG	NEG
COEF OF SKEWNESS		1.75	1.67	3.14	.83	1.97	.91	1.80	2.03	.23
COEF OF VAR (%)		156.36	155.62	226.32	87.48	116.17	85.98	129.08	98.62	65.16

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	112 CYANIDE UG/L	115 TOTAL SULFIDE MG/L	116 DISSOLVED SULFIDE MG/L	120 DISSOLVED CALCIUM MG/L	121 TOTAL CALCIUM MG/L	122 DISSOLVED MAGNESIUM MG/L	124 TOTAL MAGNESIUM MG/L	125 TOTAL SODIUM MG/L	126 DISSOLVED SODIUM MG/L
1 MAY 80	1300	**	.10-	**	**	140.00	**	67.00	180.00	**
COLLECTED BY : ERDA										
5 MAY 80	800	8000.00	.10-	**	**	370.00	**	96.00	110.00	**
COLLECTED BY : WEST. WYO COLLEGE										
7 MAY 80	1305	4000.00	.10-	**	**	340.00	**	90.00	110.00	**
9 MAY 80	1306	1000.00	**	.10-	240.00	**	91.00	**	**	97.00
13 MAY 80	1300	900.00	**	.10-	250.00	**	110.00	**	**	85.00
13 MAY 80	1305	2500.00	.10-	**	**	250.00	**	110.00	77.00	**
19 MAY 80	1310	**	**	**	250.00	**	130.00	**	**	110.00
19 MAY 80	1315	**	**	**	**	750.00	**	130.00	110.00	**
2 JUL 80	1310	**	**	**	**	27.00	**	3.20	34.00	**
9 JUL 80	1305	**	**	**	**	27.00	**	13.00	31.00	**
9 JUL 80	1306	**	**	.80	**	**	**	**	**	33.00
23 JUL 80	1100	100.00-	.10-	**	**	1.30	**	.19	13.00	**
23 JUL 80	1101	100.00-	.10-	**	**	13.00	**	6.90	20.00	**
23 JUL 80	1102	100.00-	.10-	**	**	3.70	**	.58	15.00	**
30 JUL 80	1130	**	.10-	**	**	1.00	**	.45	160.00	**
30 JUL 80	1131	**	.10-	**	**	1.00	**	.54	170.00	**
30 JUL 80	1132	**	.10-	**	**	3.40	**	1.80	140.00	**
TREATMENT : UNKNOWN										
6 AUG 80	1100	100.00-	.10-	**	**	.68	**	.15	22.00	**
6 AUG 80	1101	100.00-	.10-	**	**	1.70	**	.31	24.00	**
6 AUG 80	1102	100.00-	**	.10-	2.10	**	.27	**	**	21.00
14 AUG 80	1115	**	**	.10-	2.80	**	.74	**	**	17.00
14 AUG 80	1116	**	.10-	**	**	1.50	**	.27	20.00	**
14 AUG 80	1117	**	.10-	**	**	.20	**	.04	21.00	**
14 AUG 80	1118	**	.10-	**	**	.20	**	.04	21.00	**
20 AUG 80	1120	100.00-	**	.01-	2.20	**	.38	**	**	30.00
20 AUG 80	1121	100.00-	.10-	**	**	2.00	**	.34	28.00	**
20 AUG 80	1122	100.00-	.10-	**	**	1.70	**	.31	28.00	**
27 AUG 80	1120	**	**	.10-	1.50	**	.43	**	**	46.00
27 AUG 80	1121	**	.10-	**	**	.84	**	.25	42.00	**
27 AUG 80	1122	**	.10-	**	**	.44	**	.11	41.00	**
3 SEP 80	1130	100.00-	**	.10-	.91	**	.29	**	**	30.00
3 SEP 80	1131	100.00-	.10-	**	**	1.30	**	.40	32.00	**
3 SEP 80	1132	100.00-	.10-	**	**	.78	**	.23	30.00	**
25 SEP 80	1100	**	.10-	**	**	3.40	**	2.20	48.00	**
25 SEP 80	1101	**	.10-	**	**	4.00	**	2.40	45.00	**
25 SEP 80	1102	**	**	.10-	5.40	**	2.60	**	**	39.00
1 OCT 80	1100	**	.10-	**	**	1.00	**	.26	32.00	**
1 OCT 80	1101	**	.10-	**	**	1.20	**	.51	21.00	**
1 OCT 80	1102	**	**	.10-	1.00	**	.38	**	**	21.00
SAMPLE SIZE		17.00	25.00	10.00	10.00	28.00	10.00	28.00	28.00	11.00
MAXIMUM		8000.00	.10-	.80	250.00	750.00	130.00	130.00	180.00	110.00
MINIMUM		100.00-	.10-	.01-	.91	.20	.27	.04	13.00	17.00
MEAN		1035.29	.10	.16	75.59	69.58	33.61	18.84	58.04	48.09
STANDARD DEV		2091.03	.00	.23	118.09	168.13	53.74	39.02	51.78	33.15
RATIO VALUE		.51	0.00	2.40	.55	1.14	.75	.46	.72	.80
TREND TEST		POS	POS	NEG	POS	POS	POS	POS	POS	POS
COEF OF SKEWNESS		2.44	.00	2.45	.83	2.82	.92	1.83	1.22	.87
COEF OF VAR (%)		201.97	.00	140.56	156.22	241.62	159.90	207.15	89.23	68.94

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	127 SODIUM ADSORPTION RATIO	128 PERCENT SODIUM	130 DISSOLVED POTASSIUM MG/L	131 TOTAL POTASSIUM MG/L	132 DISSOLVED CHLORIDE MG/L	133 DISSOLVED SULFATE MG/L	134 DISSOLVED FLUORIDE MG/L	135 TOTAL FLUORIDE MG/L	137 DISSOLVED ARSENIC UG/L
1 MAY 80	1300	**	**	**	54.00	190.00	**	**	1.10	**
COLLECTED BY :			ERDA							
5 MAY 80	800	**	**	**	52.00	85.00	**	**	4.20	**
COLLECTED BY :		WEST. WYO COLLEGE								
7 MAY 80	1305	**	**	**	55.00	89.00	**	**	3.60	**
9 MAY 80	1306	1.35	17.82	57.00	**	41.00	1480.00	2.50	**	**
13 MAY 80	1300	1.13	14.66	58.00	**	28.00	1450.00	2.00	**	**
13 MAY 80	1305	**	**	**	59.00	51.00	**	**	2.60	**
19 MAY 80	1310	1.41	17.12	52.00	**	29.00	1750.00	.50	**	**
19 MAY 80	1315	**	**	**	52.00	57.00	**	**	2.50	**
2 JUL 80	1310	**	**	**	4.30	19.00	**	**	.43	**
9 JUL 80	1305	**	**	**	3.80	11.00	**	**	.14	**
9 JUL 80	1306	**	**	4.20	**	6.30	190.00	.15	**	80.00
23 JUL 80	1100	**	**	**	.30	8.70	**	**	.10-	**
23 JUL 80	1101	**	**	**	3.00	7.50	**	**	.34	**
23 JUL 80	1102	**	**	**	.50	5.80	**	**	.10-	**
30 JUL 80	1130	**	**	**	.63	23.00	**	**	.10	**
30 JUL 80	1131	**	**	**	.70	4.80	**	**	.12	**
30 JUL 80	1132	**	**	**	1.10	2.60	**	**	.14	**
TREATMENT : UNKNOWN										
6 AUG 80	1100	**	**	**	.22	2.40	**	**	.10-	**
6 AUG 80	1101	**	**	**	.38	2.00	**	**	.10-	**
6 AUG 80	1102	3.63	87.79	.32	**	1.90	30.30	.10-	**	4.00-
14 AUG 80	1115	2.34	78.66	.44	**	2.00	27.20	.07	**	**
14 AUG 80	1116	**	**	**	.53	3.70	**	**	.08	**
14 AUG 80	1117	**	**	**	.09	4.00	**	**	.13	**
14 AUG 80	1118	**	**	**	.09	4.00	**	**	.13	**
20 AUG 80	1120	4.91	90.25	.86	**	15.00	12.30	.10-	**	4.00-
20 AUG 80	1121	**	**	**	.58	14.00	**	**	.10-	**
20 AUG 80	1122	**	**	**	.55	14.00	**	**	.10-	**
27 AUG 80	1120	8.52	94.78	.33	**	15.00	39.90	.10-	**	**
27 AUG 80	1121	**	**	**	.44	15.00	**	**	.10-	**
27 AUG 80	1122	**	**	**	.25	14.00	**	**	.10-	**
3 SEP 80	1130	7.01	94.96	.60	**	5.80	36.20	.10-	**	4.00-
3 SEP 80	1131	**	**	**	.70	6.60	**	**	.10-	**
3 SEP 80	1132	**	**	**	.37	5.70	**	**	.10-	**
25 SEP 80	1100	**	**	**	2.40	12.00	**	**	.13	**
25 SEP 80	1101	**	**	**	2.70	12.00	**	**	.15	**
25 SEP 80	1102	3.45	77.83	2.40	**	11.00	35.40	.15	**	**
1 OCT 80	1100	**	**	**	.80	4.20	**	**	.10-	**
1 OCT 80	1101	**	**	**	1.60	5.00	**	**	.10-	**
1 OCT 80	1102	4.53	91.84	1.60	**	4.20	22.40	.10-	**	**
SAMPLE SIZE		10.00	10.00	11.00	28.00	39.00	11.00	11.00	28.00	4.00
MAXIMUM		8.52	94.96	58.00	59.00	190.00	1750.00	2.50	4.20	80.00
MINIMUM		1.13	14.66	.32	.09	1.90	12.30	.07	.08	4.00-
MEAN		3.83	66.57	16.16	10.64	21.32	461.25	.53	.61	23.00
STANDARD DEV		2.48	35.03	25.44	20.83	34.73	711.18	.86	1.14	38.00
RATIO VALUE		.85	.58	.40	.21	.40	.55	.39	.46	1.78
TREND TEST		POS	POS	POS	POS	POS	POS	POS	POS	NEG
COEF OF SKEWNESS		.62	-.75	.98	1.65	3.36	.99	1.57	2.14	1.00
COEF OF VAR (%)		64.91	52.61	157.44	195.74	162.89	154.19	161.94	186.41	165.22

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	139 TOTAL ARSENIC UG/L	141 DISSOLVED BARIUM UG/L	143 TOTAL BARIUM UG/L	152 DISSOLVED BORON UG/L	154 TOTAL BORON UG/L	156 DISSOLVED CADMIUM UG/L	158 TOTAL CADMIUM UG/L	161 DISSOLVED CHROMIUM UG/L	164 TOTAL CHROMIUM UG/L
1 MAY 80	1300	**	**	**	1100.00	**	**	**	**	100.00-
COLLECTED BY :			ERDA							
5 MAY 80	800	**	**	500.00-	700.00	**	**	40.00	**	100.00-
COLLECTED BY :			WEST. WYO COLLEGE							
7 MAY 80	1305	**	**	500.00-	**	500.00	**	60.00	**	100.00-
9 MAY 80	1306	**	500.00-	**	500.00	**	30.00	**	100.00-	**
13 MAY 80	1300	**	500.00-	**	300.00	**	30.00	**	100.00-	**
13 MAY 80	1305	**	**	500.00-	**	500.00	**	10.00	**	100.00-
19 MAY 80	1310	**	**	**	900.00	**	20.00	**	**	**
19 MAY 80	1315	**	**	**	**	500.00	**	30.00	**	**
2 JUL 80	1310	**	**	**	**	1000.00	**	**	**	**
9 JUL 80	1305	10.00-	**	500.00-	**	960.00	**	100.00-	**	100.00-
9 JUL 80	1306	**	500.00-	**	1400.00	**	100.00-	**	100.00-	**
23 JUL 80	1100	4.00	**	1000.00-	**	1000.00	**	100.00-	**	100.00-
23 JUL 80	1101	8.00	**	1000.00-	**	890.00	**	100.00-	**	100.00-
23 JUL 80	1102	8.00	**	100.00-	**	500.00-	**	100.00-	**	100.00-
30 JUL 80	1130	**	**	**	**	1500.00	**	**	**	**
30 JUL 80	1131	**	**	**	**	1700.00	**	**	**	**
30 JUL 80	1132	**	**	**	**	500.00-	**	**	**	**
TREATMENT : UNKNOWN										
6 AUG 80	1100	4.00-	**	500.00-	**	500.00-	**	10.00-	**	50.00-
6 AUG 80	1101	4.00-	**	500.00-	**	500.00-	**	10.00-	**	50.00-
6 AUG 80	1102	**	500.00-	**	500.00-	**	10.00-	**	50.00-	**
14 AUG 80	1115	**	**	**	500.00-	**	**	**	**	**
14 AUG 80	1116	**	**	**	**	500.00	**	**	**	**
14 AUG 80	1117	**	**	**	**	500.00-	**	**	**	**
14 AUG 80	1118	**	**	**	**	500.00-	**	**	**	**
20 AUG 80	1120	**	500.00-	**	500.00-	**	20.00-	**	50.00-	**
20 AUG 80	1121	4.00-	**	500.00-	**	500.00-	**	20.00-	**	50.00-
20 AUG 80	1122	4.00-	**	500.00-	**	500.00-	**	20.00-	**	50.00-
27 AUG 80	1120	**	**	**	500.00-	**	**	**	**	**
27 AUG 80	1121	**	**	**	**	500.00-	**	**	**	**
27 AUG 80	1122	**	**	**	**	500.00-	**	**	**	**
3 SEP 80	1130	**	500.00-	**	500.00-	**	20.00-	**	50.00-	**
3 SEP 80	1131	4.00-	**	500.00-	**	600.00	**	20.00	**	50.00-
3 SEP 80	1132	4.00-	**	500.00-	**	600.00	**	20.00	**	50.00-
25 SEP 80	1100	**	**	**	**	500.00	**	**	**	**
25 SEP 80	1101	**	**	**	**	700.00	**	**	**	**
25 SEP 80	1102	**	**	**	500.00-	**	**	**	**	**
1 OCT 80	1100	**	**	**	**	2200.00	**	**	**	**
1 OCT 80	1101	**	**	**	**	900.00	**	**	**	**
1 OCT 80	1102	**	**	**	500.00-	**	**	**	**	**
SAMPLE SIZE		10.00	6.00	13.00	13.00	26.00	7.00	14.00	6.00	14.00
MAXIMUM		10.00-	500.00-	1000.00-	1400.00	2200.00	100.00-	100.00-	100.00-	100.00-
MINIMUM		4.00-	500.00-	100.00-	300.00	500.00-	10.00-	10.00-	50.00-	50.00-
MEAN		5.40	500.00	546.15	615.38	750.38	32.86	45.71	75.00	78.57
STANDARD DEV		2.32	0.00	229.55	299.57	436.08	30.39	37.97	27.39	25.68
RATIO VALUE		1.56	UNDEF	2.09	1.91	1.50	3.09	.94	.80	.31
TREND TEST		NEG	NULL	NEG	NEG	NEG	NEG	POS	POS	POS
COEF OF SKEWNESS		1.01	.00	.67	1.71	1.99	1.69	.61	0.00	-.28
COEF OF VAR (%)		42.94	0.00	42.03	48.68	58.11	92.50	83.06	36.51	32.68

COLLECTED BY : WEST. WYO.COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	169 DISSOLVED COPPER UG/L	171 TOTAL COPPER UG/L	174 TOTAL IRON UG/L	175 DISSOLVED IRON UG/L	176 DISSOLVED LEAD UG/L	180 TOTAL LEAD UG/L	184 TOTAL MANGANESE UG/L	185 DISSOLVED MANGANESE UG/L	190 DISSOLVED NICKEL UG/L
1 MAY 80	1300	**	100.00-	1100.00	**	**	500.00-	130.00	**	**
COLLECTED BY : ERDA										
5 MAY 80	800	**	100.00-	230000.00	**	**	500.00-	9200.00	**	**
COLLECTED BY : WEST. WYO COLLEGE										
7 MAY 80	1305	**	100.00-	250000.00	**	**	500.00-	8500.00	**	**
9 MAY 80	1306	100.00-	**	**	300000.00	100.00-	**	**	7700.00	1800.00
13 MAY 80	1300	100.00-	**	**	250000.00	100.00-	**	**	8300.00	1800.00
13 MAY 80	1305	**	100.00-	250000.00	**	**	100.00-	9500.00	**	**
9 JUL 80	1305	**	100.00-	2800.00	**	**	900.00	1380.00	**	**
9 JUL 80	1306	100.00-	**	**	8500.00	1100.00	**	**	1700.00	100.00-
23 JUL 80	1100	**	100.00-	1000.00	**	**	100.00-	100.00-	**	**
23 JUL 80	1101	**	100.00-	1900.00	**	**	100.00-	200.00	**	**
23 JUL 80	1102	**	100.00-	2900.00	**	**	100.00-	200.00	**	**
TREATMENT : UNKNOWN										
6 AUG 80	1100	**	30.00-	2400.00	**	**	200.00-	40.00	**	**
6 AUG 80	1101	**	30.00-	2300.00	**	**	200.00-	30.00	**	**
6 AUG 80	1102	30.00-	**	**	1100.00	200.00-	**	**	40.00	100.00-
20 AUG 80	1120	30.00-	**	**	700.00	100.00-	**	**	40.00	100.00-
20 AUG 80	1121	**	300.00-	1600.00	**	**	200.00-	30.00	**	**
20 AUG 80	1122	**	30.00-	600.00	**	**	200.00-	40.00	**	**
3 SEP 80	1130	30.00-	**	**	1100.00	200.00-	**	**	90.00	100.00-
3 SEP 80	1131	**	30.00-	1400.00	**	**	200.00-	40.00	**	**
3 SEP 80	1132	**	30.00-	1.70	**	**	200.00-	30.00	**	**
SAMPLE SIZE		6.00	14.00	14.00	6.00	6.00	14.00	14.00	6.00	6.00
MAXIMUM		100.00-	300.00-	250000.00	300000.00	1100.00	900.00	9200.00	7700.00	1800.00
MINIMUM		30.00-	30.00-	1.70	700.00	100.00-	100.00-	40.00	40.00	100.00-
MEAN		65.00	89.29	53480.12	93783.33	316.67	285.71	1810.57	2638.33	666.67
STANDARD DEV		38.34	69.56	103036.45	141284.98	386.87	231.57	3314.40	3467.30	877.88
RATIO VALUE		.80	2.58	.89	.73	2.90	2.24	.83	.52	.90
TREND TEST		POS	NEG	POS	POS	NEG	NEG	POS	POS	POS
COEF OF SKEWNESS		0.00	1.90	1.35	.68	1.57	1.44	1.48	.60	.65
COEF OF VAR (%)		58.99	77.90	192.95	150.65	122.17	81.05	182.29	131.42	131.68

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	192 TOTAL NICKEL UG/L	206 DISSOLVED ZINC UG/L	208 TOTAL ZINC UG/L	217 TOTAL ALUMINUM UG/L	218 DISSOLVED ALUMINUM UG/L	233 DISSOLVED SELENIUM UG/L	235 TOTAL SELENIUM UG/L	467 DISSOLVED SOLIDS 180C	467 ROE MG/L	501 TOTAL AMMONIA NH4 MG/L
1 MAY 80	1300	200.00-	**	100.00-	**	**	**	**		**	**
COLLECTED BY :			ERDA								
5 MAY 80	800	3100.00	**	2700.00	1100.00	**	**	10.00-		**	7.90
COLLECTED BY :		WEST. WYO COLLEGE									
7 MAY 80	1305	2600.00	**	400.00	1100.00	**	**	10.00-		**	9.20
9 MAY 80	1306	**	410.00	**	**	100.00-	10.00	**	2380.00		**
13 MAY 80	1300	**	210.00	**	**	1000.00-	10.00	**	2480.00		**
13 MAY 80	1305	1300.00	**	100.00	1000.00-	**	**	10.00		**	4.20
19 MAY 80	1310	**	**	**	**	**	**	**	2500.00		**
19 MAY 80	1315	**	**	**	**	**	**	**		**	7.70
2 JUL 80	1310	**	**	**	**	**	**	**		**	.50
9 JUL 80	1305	100.00-	**	30.00	500.00-	**	**	67.00		**	.94
9 JUL 80	1306	**	30.00	**	**	500.00-	44.00	**	308.00		**
23 JUL 80	1100	500.00-	**	50.00-	2000.00-	**	**	220.00		**	.10-
23 JUL 80	1101	500.00-	**	120.00	2000.00-	**	**	440.00		**	.26
23 JUL 80	1102	300.00-	**	160.00	1000.00-	**	**	15.00		**	.10-
30 JUL 80	1130	**	**	**	**	**	**	**		**	.26
30 JUL 80	1131	**	**	**	**	**	**	**		**	.64
30 JUL 80	1132	**	**	**	**	**	**	**		**	.10-
TREATMENT :		UNKNOWN									
6 AUG 80	1100	100.00-	**	10.00-	1000.00-	**	**	10.00		**	.26
6 AUG 80	1101	100.00-	**	**	1000.00-	**	**	10.00		**	.39
6 AUG 80	1102	**	10.00	**	**	1000.00-	10.00-	**	88.00		**
14 AUG 80	1115	**	**	**	**	**	**	**	56.00		**
14 AUG 80	1116	**	**	**	**	**	**	**		**	.39
14 AUG 80	1117	**	**	**	**	**	**	**		**	.26
14 AUG 80	1118	**	**	**	**	**	**	**		**	.26
20 AUG 80	1120	**	10.00	**	**	1000.00-	.50-	**	116.00		**
20 AUG 80	1121	100.00-	**	20.00	1000.00-	**	**	.50-		**	.77
20 AUG 80	1122	100.00-	**	10.00-	1000.00-	**	**	.50-		**	.90
27 AUG 80	1120	**	**	**	**	**	**	**	148.00		**
27 AUG 80	1121	**	**	**	**	**	**	**		**	.39
27 AUG 80	1122	**	**	**	**	**	**	**		**	.26
3 SEP 80	1130	**	10.00	**	**	1000.00-	.50-	**	104.00		**
3 SEP 80	1131	100.00-	**	10.00	1000.00-	**	**	.50-		**	.26
3 SEP 80	1132	100.00-	**	10.00	1000.00-	**	**	.50-		**	.13
25 SEP 80	1100	**	**	**	**	**	**	**		**	.39
25 SEP 80	1101	**	**	**	**	**	**	**		**	.51
25 SEP 80	1102	**	**	**	**	**	**	**	136.00		**
1 OCT 80	1100	**	**	**	**	**	**	**		**	17.00
1 OCT 80	1101	**	**	**	**	**	**	**		**	36.00
1 OCT 80	1102	**	**	**	**	**	**	**	100.00		**
SAMPLE SIZE		14.00	6.00	13.00	13.00	6.00	6.00	13.00	11.00		27.00
MAXIMUM		3100.00	410.00	2700.00	2000.00-	1000.00-	44.00	440.00	2500.00		36.00
MINIMUM		100.00-	10.00	10.00-	500.00-	100.00-	.50-	.50-	56.00		.10-
MEAN		657.14	113.33	286.15	1130.77	766.67	12.50	69.54	765.09		3.32
STANDARD DEV		988.95	165.13	733.13	413.09	382.97	16.12	141.02	1086.56		7.63
RATIO VALUE		1.02	.64	2.04	1.86	2.14	2.22	1.19	.45		.50
TREND TEST		POS	POS	NEG	NEG	NEG	NEG	POS	POS		POS
COEF OF SKEWNESS		1.66	1.03	2.94	1.23	-.94	1.33	1.90	.96		3.22
COEF OF VAR (%)		150.49	145.70	256.20	36.53	49.95	128.95	202.80	142.02		229.84

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	502 DISSOLVED AMMONIA NH4 MG/L	503 TOTAL NITRATE NO3 MG/L	504 DISSOLVED NITRATE NO3 MG/L	510 DISSOLVED MERCURY UG/L	520 TOTAL MERCURY UG/L	612 LABORATORY PH	614 DISSOLVED THIOSULFATE MG/L	628 TOTAL CO3 MG/L	661 FIELD CONDUCTIVITY MICROMHOS
1 MAY 80	1300	**	**	**	**	50.00-	8.18	**	**	**
COLLECTED BY :			ERDA							
5 MAY 80	800	**	55.00	**	**	50.00-	8.28	**	**	**
COLLECTED BY :		WEST. WYO COLLEGE								
7 MAY 80	1305	**	**	84.00	**	50.00-	6.26	**	**	**
9 MAY 80	1306	3.50	**	380.00	50.00-	**	4.41	.10-	**	3000.00
13 MAY 80	1300	6.40	**	370.00	50.00-	**	4.40	.10-	**	**
13 MAY 80	1305	**	120.00	**	**	50.00-	6.36	**	**	75000.00
19 MAY 80	1310	6.10	**	110.00	**	**	4.37	.10-	**	**
19 MAY 80	1315	**	11.40	**	**	**	6.10	**	**	3200.00
2 JUL 80	1310	**	**	**	**	**	7.68	**	**	300.00
9 JUL 80	1305	**	73.00	**	**	1.00-	4.31	**	**	340.00
9 JUL 80	1306	.51	**	70.00	1.00-	**	4.06	.90	7.23	**
23 JUL 80	1100	**	**	1.00	**	1.00-	5.96	**	**	250.00
23 JUL 80	1101	**	**	**	**	1.00-	4.10	**	**	**
23 JUL 80	1102	**	**	1.20	**	1.00-	6.38	**	**	**
30 JUL 80	1130	**	**	**	**	**	7.93	**	**	1520.00
30 JUL 80	1131	**	**	**	**	**	7.87	**	**	**
30 JUL 80	1132	**	**	**	**	**	7.76	**	**	**
TREATMENT :		UNKNOWN								
6 AUG 80	1100	**	**	.80	**	.50-	7.56	**	**	1470.00
6 AUG 80	1101	**	**	1.50	**	.50-	7.29	**	**	**
6 AUG 80	1102	.26	**	1.30	.50-	**	7.58	**	**	**
14 AUG 80	1115	.26	**	**	**	**	7.46	**	**	**
14 AUG 80	1116	**	**	**	**	**	7.34	**	**	**
14 AUG 80	1117	**	**	**	**	**	7.46	**	9.93	190.00
14 AUG 80	1118	**	**	**	**	**	7.46	**	9.93	190.00
20 AUG 80	1120	.39	**	.00-	.50-	**	7.92	**	**	**
20 AUG 80	1121	**	**	**	**	.50-	6.75	**	**	**
20 AUG 80	1122	**	**	**	**	.50-	7.89	**	**	255.00
27 AUG 80	1120	.26	**	**	**	**	7.08	**	**	**
27 AUG 80	1121	**	**	**	**	**	7.20	**	**	**
27 AUG 80	1122	**	**	**	**	**	7.75	**	**	340.00
3 SEP 80	1130	.13	**	.40	.50-	**	7.52	**	**	**
3 SEP 80	1131	**	**	.30	**	.50-	7.72	**	**	**
3 SEP 80	1132	**	**	.40	**	.50-	7.55	**	**	200.00
25 SEP 80	1100	**	**	**	**	**	8.05	**	**	350.00
25 SEP 80	1101	**	**	**	**	**	6.82	**	**	**
25 SEP 80	1102	.39	**	**	**	**	7.58	**	**	**
1 OCT 80	1100	**	**	**	**	**	9.28	**	74.74	380.00
1 OCT 80	1101	**	**	**	**	**	9.61	**	53.10	**
1 OCT 80	1102	15.00	**	**	**	**	9.39	**	55.07	**
SAMPLE SIZE		11.00	4.00	14.00	6.00	14.00	39.00	4.00	6.00	15.00
MAXIMUM		15.00	120.00	380.00	50.00-	50.00-	9.61	.90	74.74	75000.00
MINIMUM		.13	11.40	.00-	.50-	.50-	4.06	.10-	7.23	190.00
MEAN		3.02	64.85	72.92	17.08	14.79	6.99	.30	35.00	5799.00
STANDARD DEV		4.65	44.95	133.28	25.50	23.11	1.42	.40	29.45	19170.50
RATIO VALUE		1.29	4.36	.75	.89	.37	.75	1.78	1.29	2.16
TREND TEST		NEG	POS	POS	POS	POS	POS	NEG	NEG	NEG
COEF OF SKEWNESS		1.64	.05	1.68	.65	.91	-.66	1.00	.19	3.34
COEF OF VAR (%)		153.99	69.32	182.77	149.26	156.32	20.30	133.33	84.15	330.58

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	672 TOTAL SULFATE MG/L (SO4)	674 DISSOLVED BORON MG/L AS B	676 DISSOLVED THIOCYANATE MG/L	677 DISS TETRA THIONATE MG/L	679 DISS CARBON (ORG+INORG) MG/L	685 TOTAL PHENOLS UG/L	736 FIELD BICARBONATE ION MG/L AS HCO3	737 FIELD CARBONATE ION MG/L AS CO3	738 TOTAL THIOCYANATE MG/L
1 MAY 80	1300	**	1.10	**	**	**	**	**	**	**
COLLECTED BY :			ERDA							
5 MAY 80	800	1640.00	.70	**	**	**	**	**	**	.10-
COLLECTED BY :		WEST. WYO COLLEGE								
7 MAY 80	1305	1390.00	.50	**	**	**	**	**	**	.10-
9 MAY 80	1306	**	.50	.10-	.10-	91.00	**	250.00	0.00	**
13 MAY 80	1300	**	.30	.10-	.10-	83.00	**	**	**	**
13 MAY 80	1305	1500.00	.50	**	**	**	**	250.00	0.00	.10-
19 MAY 80	1310	**	.50	.10-	.10-	79.00	**	**	**	**
19 MAY 80	1315	1760.00	.50	**	**	**	**	260.00	0.00	.10-
2 JUL 80	1310	61.60	1.00	**	**	**	**	36.00	1.00-	.10-
9 JUL 80	1305	174.00	.90	**	**	**	**	8.90	1.00-	.10-
9 JUL 80	1306	**	1.40	.30	.10-	50.00	**	**	**	**
23 JUL 80	1100	22.40	1.00	**	**	**	.35	30.00	.10-	**
23 JUL 80	1101	113.00	.85	**	**	**	**	**	**	**
23 JUL 80	1102	25.90	.50-	**	**	**	**	**	**	**
30 JUL 80	1130	325.00	1.50	**	**	**	.15	56.00	.10-	**
30 JUL 80	1131	317.00	1.70	**	**	**	**	**	**	**
30 JUL 80	1132	248.00	.50-	**	**	**	**	**	**	**
TREATMENT :		UNKNOWN								
6 AUG 80	1100	30.60	.50-	**	**	**	.20	20.00	.10-	**
6 AUG 80	1101	30.90	.50-	**	**	**	**	**	**	**
6 AUG 80	1102	**	.50-	**	**	26.00	**	**	**	**
14 AUG 80	1115	**	.50-	**	**	12.00	**	**	**	**
14 AUG 80	1116	22.20	.50	**	**	**	**	**	**	**
14 AUG 80	1117	19.10	.50-	**	**	**	.10-	33.00	.10-	**
14 AUG 80	1118	19.10	.50-	**	**	**	**	33.00	.10-	**
20 AUG 80	1120	**	.50-	**	**	23.00	**	**	**	**
20 AUG 80	1121	12.30	.50-	**	**	**	**	**	**	**
20 AUG 80	1122	9.20	.50-	**	**	**	**	20.00	.10-	**
27 AUG 80	1120	**	.50-	**	**	28.00	**	**	**	**
27 AUG 80	1121	16.10	.50-	**	**	**	**	**	**	**
27 AUG 80	1122	38.90	.50-	**	**	**	.18	20.00	.10-	**
3 SEP 80	1130	**	.50-	**	**	22.00	**	**	**	**
3 SEP 80	1131	35.40	.60	**	**	**	**	**	**	**
3 SEP 80	1132	34.80	.60	**	**	**	**	25.00	.10-	**
25 SEP 80	1100	39.50	.50	**	**	**	**	33.00	.10-	**
25 SEP 80	1101	37.40	.70	**	**	**	**	**	**	**
25 SEP 80	1102	**	.50-	**	**	30.00	**	**	**	**
1 OCT 80	1100	35.40	2.20	**	**	**	**	36.00	.10-	**
1 OCT 80	1101	22.20	.90	**	**	**	**	**	**	**
1 OCT 80	1102	**	.50-	**	**	140.00	**	**	**	**
SAMPLE SIZE		27.00	39.00	4.00	4.00	11.00	5.00	15.00	15.00	6.00
MAXIMUM		1760.00	2.20	.30	.10-	140.00	.35	260.00	1.00-	.10-
MINIMUM		9.20	.30	.10-	.10-	12.00	.10-	8.90	0.00	.10-
MEAN		295.56	.71	.15	.10	51.27	.20	74.06	.20	.10
STANDARD DEV		552.57	.40	.10	.00	40.63	.09	93.40	.33	.00
RATIO VALUE		.42	1.43	1.78	0.00	1.00	2.08	.47	1.29	0.00
TREND TEST		POS	POS	NEG	POS	POS	NEG	POS	NEG	POS
COEF OF SKEWNESS		1.89	2.11	1.00	.00	.98	.80	1.41	2.02	.00
COEF OF VAR (%)		186.96	56.28	66.67	.00	79.25	47.94	126.11	163.66	.00

COLLECTED BY : ERDA
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	739 TOTAL TETRA-THIONATE MG/L	740 TOTAL THIOSULFATE MG/L
5 MAY 80	800	.10-	.10-
COLLECTED BY :		WEST. WYO COLLEGE	
7 MAY 80	1305	.10-	.10-
13 MAY 80	1305	.10-	.10-
19 MAY 80	1315	.10-	.10-
2 JUL 80	1310	.10-	.10-
9 JUL 80	1305	.10-	.10-
SAMPLE SIZE		6.00	6.00
MAXIMUM		.10-	.10-
MINIMUM		.10-	.10-
MEAN		.10	.10
STANDARD DEV		.00	.00
RATIO VALUE		0.00	0.00
TREND TEST		POS	POS
COEF OF SKEWNESS		.00	.00
COEF OF VAR (%)		.00	.00

**STATION NO. 7841 TS-1S 3P2
LATITUDE 40-25-00 LONGITUDE 109-40-00 IN UTAH ELEVATION 5960.00 FT.
NE1/4-SW1/4 SECTION 23 TOWNSHIP 4S RANGE 20E SALT LAKE P.M. DRAINAGE BASIN CODE 16100000
SITE TYPE WELL USE MONITORING OR OBSERVATION (P) ERDA # 0
AQUIFER C DRAINAGE AREA 0.00 SQ. MI. NONCONTRIBUTING 0.00 SQ. MI. DISCHARGE PERMIT NO. 0
WELL DEPTH 580.0 FT. WELL PERMIT NO. 0

\- AFTER A VALUE TAGS IT AS LESS THAN
\+ AFTER A VALUE TAGS IT AS GREATER THAN

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	5 NO. USED IN SAMP ACCOUNT PROCEDURE	7 WATER TEMPERATURE DEG. C	35 SAMPLE TREATMENT	42 CHEM OXYGEN DEMAND .25 NK2CR07 MG/L	43 FIELD PH STAND. UNITS	45 TOTAL ALKALINITY MG/L	49 BICARBONATE ION MG/L	50 CARBONATE ION MG/L	53 TOT. RESIDUE ROE 105C MG/L
1 MAY 80	1306	3.00	**	3.00	**	**	408.00	500.00	.10-	2380.00
COLLECTED BY :			ERDA							
5 MAY 80	805	5.00	**	3.00	1150.00	**	464.00	566.00	.10-	9010.00
9 MAY 80	800	9.00	**	4.00	480.00	4.60	.10-	.10-	.10-	**
COLLECTED BY :		WEST. WYO COLLEGE								
13 MAY 80	1310	16.00	**	4.00	800.00	**	113.00	138.00	.10-	**
13 MAY 80	1315	17.00	**	3.00	68.00	5.40	332.00	406.00	.10-	11300.00
21 MAY 80	1300	27.00	**	3.00	480.00	5.90	.10-	.10-	.10-	12400.00
21 MAY 80	1305	28.00	**	4.00	320.00	**	.10-	.10-	.10-	**
21 MAY 80	1306	29.00	**	4.00	390.00	**	1.00-	.10-	.10-	**
2 JUL 80	1305	3.00	69.00	3.00	1300.00	**	56.00	68.00	.10-	1420.00
TREATMENT :		UNKNOWN								
6 AUG 80	1105	4.00	50.00	3.00	890.00	7.10	45.00	54.00	.10-	544.00
6 AUG 80	1106	5.00	**	5.00	1100.00	**	57.00	69.00	.10-	472.00
6 AUG 80	1107	6.00	**	4.00	210.00	**	49.00	59.00	.10-	**
14 AUG 80	1110	25.00	**	4.00	300.00	**	85.00	100.00	.10-	**
14 AUG 80	1111	26.00	**	5.00	500.00	**	85.00	100.00	.10-	508.00
14 AUG 80	1112	27.00	59.00	3.00	600.00	7.10	85.00	100.00	.10-	492.00
27 AUG 80	1115	55.00	**	4.00	300.00	**	73.00	90.00	.10-	**
27 AUG 80	1116	56.00	58.00	5.00	900.00	6.90	81.00	99.00	.10-	428.00
25 SEP 80	1105	45.00	51.00	3.00	1600.00	6.50	77.00	94.00	.10-	628.00
25 SEP 80	1106	46.00	**	5.00	**	**	61.00	74.00	.10-	604.00
25 SEP 80	1107	47.00	**	4.00	580.00	**	57.00	69.00	.10-	**
1 OCT 80	1105	4.00	51.00	3.00	1000.00	6.60	110.00	140.00	.10-	240.00
1 OCT 80	1106	5.00	**	5.00	**	**	110.00	130.00	.10-	304.00
1 OCT 80	1107	6.00	**	4.00	700.00	**	110.00	130.00	.10-	**
SAMPLE SIZE		23.00	6.00	23.00	20.00	8.00	23.00	23.00	23.00	14.00
MAXIMUM		56.00	69.00	5.00	1600.00	7.10	464.00	566.00	.10-	12400.00
MINIMUM		3.00	50.00	3.00	68.00	4.60	.10-	.10-	.10-	240.00
MEAN		21.48	56.33	3.83	683.40	6.26	106.93	129.84	.10	2909.29
STANDARD DEV		17.97	7.31	.78	401.60	.90	123.47	151.15	.00	4419.60
RATIO VALUE		.58	2.21	2.44	1.86	.52	1.24	1.23	0.00	.73
TREND TEST		POS	NEG	NEG	NEG	POS	POS	POS	POS	POS
COEF OF SKEWNESS		.61	.77	.30	.55	-.75	1.89	1.90	.00	1.37
COEF OF VAR (%)		83.69	12.98	20.33	58.76	14.31	115.47	116.41	.00	151.91

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	69 DISSOLVED AMMONIA MG/L (N)	70 TOTAL AMMONIA MG/L (N)	80 TOTAL KJELDAHL NITRGEN MG/L	101 TOT. ORGANIC CARBON MG/L	102 DISS ORGANIC CARBON MG/L	104 TOTAL INORGANIC CARBON MG/L	105 TOTAL CARBON MG/L	110 DISSOLVED INORGANIC CARBON MG/L	112 CYANIDE UG/L
1 MAY 80	1306	**	.40	**	0.00	**	102.00	102.00	**	**
COLLECTED BY :			EPDA							
5 MAY 80	805	**	6.50	**	6290.00	**	199.00	6490.00	**	1250.00
9 MAY 80	800	5.20	**	**	**	100.00	**	**	7.00	80000.00
COLLECTED BY :		WEST. WYO COLLEGE								
13 MAY 80	1310	7.50	**	**	**	106.00	**	**	10.00	31000.00
13 MAY 80	1315	**	6.80	**	5.00	**	73.00	78.00	**	900.00
21 MAY 80	1300	**	5.80	**	53.00	**	11.00	64.00	**	**
21 MAY 80	1305	7.50	**	**	**	73.00	**	**	1.00	**
21 MAY 80	1306	8.00	**	**	**	**	**	**	**	**
2 JUL 80	1305	**	1.40	**	2110.00	**	1.00	2110.00	**	**
TREATMENT : UNKNOWN										
6 AUG 80	1105	**	13.50	12.30	240.00	**	12.00	250.00	**	100.00
6 AUG 80	1106	**	17.00	**	320.00	**	11.00	330.00	**	200.00
6 AUG 80	1107	7.30	**	**	**	76.00	**	**	10.00	120.00
14 AUG 80	1110	4.50	**	**	**	100.00	**	**	15.00	**
14 AUG 80	1111	**	6.00	**	170.00	**	17.00	190.00	**	**
14 AUG 80	1112	**	4.50	9.20	150.00	**	17.00	170.00	**	**
27 AUG 80	1115	4.20	**	**	**	100.00	**	**	14.00	**
27 AUG 80	1116	**	10.00	**	260.00	**	20.00	280.00	**	**
25 SEP 80	1105	**	10.00	**	440.00	**	14.00	450.00	**	**
25 SEP 80	1106	**	16.00	**	530.00	**	5.00	540.00	**	**
25 SEP 80	1107	11.00	**	**	**	190.00	**	**	10.00	**
1 OCT 80	1105	**	60.00	**	270.00	**	23.00	290.00	**	**
1 OCT 80	1106	**	100.00	**	340.00	**	18.00	360.00	**	**
1 OCT 80	1107	73.00	**	**	**	190.00	**	**	16.00	**
SAMPLE SIZE		9.00	14.00	2.00	14.00	8.00	14.00	14.00	8.00	7.00
MAXIMUM		73.00	100.00	12.30	6290.00	190.00	199.00	6490.00	16.00	80000.00
MINIMUM		4.20	.40	9.20	0.00	73.00	1.00	64.00	1.00	100.00
MEAN		14.24	18.42	10.75	798.43	116.88	37.36	836.00	10.38	16224.29
STANDARD DEV		22.13	27.68	2.19	1664.94	46.69	54.23	1705.89	4.87	30333.82
RATIO VALUE		1.12	.43	4.00	2.60	.73	.84	2.55	1.72	2.01
TREND TEST		POS	POS	NULL	NEG	POS	POS	NEG	NEG	NEG
COEF OF SKEWNESS		2.29	2.15	.00	2.75	.86	2.10	2.79	-.67	1.45
COEF OF VAR (%)		155.37	150.23	20.39	208.53	39.95	145.17	204.05	46.92	186.97

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	115 TOTAL SULFIDE MG/L	116 DISSOLVED SULFIDE MG/L	120 DISSOLVED CALCIUM MG/L	121 TOTAL CALCIUM MG/L	122 DISSOLVED MAGNESIUM MG/L	124 TOTAL MAGNESIUM MG/L	125 TOTAL SODIUM MG/L	126 DISSOLVED SODIUM MG/L	127 SODIUM ADSORPTION RATIO
1 MAY 80	1306	.10-	**	**	440.00	**	170.00	220.00	**	**
COLLECTED BY :			ERDA							
5 MAY 80	805	.10-	**	**	630.00	**	62.00	370.00	**	**
9 MAY 80	800	**	.10-	510.00	**	1100.00	**	**	380.00	2.17
COLLECTED BY :		WEST. WYO COLLEGE								
13 MAY 80	1310	**	.10-	590.00	**	930.00	**	**	390.00	2.33
13 MAY 80	1315	.10-	**	**	510.00	**	950.00	370.00	**	**
21 MAY 80	1300	**	**	**	470.00	**	960.00	430.00	**	**
21 MAY 80	1305	**	**	490.00	**	970.00	**	**	420.00	2.53
21 MAY 80	1306	**	**	490.00	**	940.00	**	**	420.00	2.56
2 JUL 80	1305	**	**	**	17.00	**	3.20	35.00	**	**
TREATMENT : UNKNOWN										
6 AUG 80	1105	.10-	**	**	7.80	**	2.40	42.00	**	**
6 AUG 80	1106	.10-	**	**	7.80	**	2.30	39.00	**	**
6 AUG 80	1107	**	.10-	6.30	**	1.60	**	**	33.00	3.04
14 AUG 80	1110	**	.10-	9.00	**	3.20	**	**	54.00	3.94
14 AUG 80	1111	.10-	**	**	9.60	**	3.40	50.00	**	**
14 AUG 80	1112	.10-	**	**	9.40	**	3.30	51.00	**	**
27 AUG 80	1115	**	.10-	7.50	**	3.70	**	**	55.00	4.11
27 AUG 80	1116	.10-	**	**	7.50	**	3.60	55.00	**	**
25 SEP 80	1105	.10-	**	**	9.00	**	2.30	57.00	**	**
25 SEP 80	1106	.10-	**	**	8.90	**	2.40	59.00	**	**
25 SEP 80	1107	**	.10-	11.00	**	2.10	**	**	48.00	3.48
1 OCT 80	1105	.10-	**	**	3.80	**	.62	23.00	**	**
1 OCT 80	1106	.10-	**	**	4.00	**	.66	23.00	**	**
1 OCT 80	1107	**	.10-	4.40	**	.71	**	**	21.00	2.45
SAMPLE SIZE		12.00	7.00	9.00	14.00	9.00	14.00	14.00	9.00	9.00
MAXIMUM		.10-	.10-	590.00	630.00	1100.00	960.00	430.00	420.00	4.11
MINIMUM		.10-	.10-	4.40	3.80	.71	.62	23.00	21.00	2.17
MEAN		.10	.10	235.36	152.49	439.03	154.73	130.29	202.33	2.96
STANDARD DEV		.00	.00	271.61	239.68	520.18	342.14	149.33	190.60	.72
RATIO VALUE		0.00	0.00	.48	.37	.47	1.21	.68	.59	.70
TREND TEST		POS	POS	POS	POS	POS	POS	POS	POS	POS
COEF OF SKEWNESS		.00	.00	.25	1.01	.24	1.90	1.11	.21	.54
COEF OF VAR (%)		.00	.00	115.41	157.18	118.48	221.12	114.62	94.20	24.40

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	128 PERCENT SODIUM	130 DISSOLVED POTASSIUM MG/L	131 TOTAL POTASSIUM MG/L	132 DISSOLVED CHLORIDE MG/L	133 DISSOLVED SULFATE MG/L	134 DISSOLVED FLUORIDE MG/L	135 TOTAL FLUORIDE MG/L	137 DISSOLVED ARSENIC UG/L	139 TOTAL ARSENIC UG/L
1 MAY 80	1306	**	**	76.00	220.00	**	**	.74	**	200.00
COLLECTED BY :			ERDA							
5 MAY 80	805	**	**	100.00	140.00	**	**	3.20	**	**
9 MAY 80	800	12.48	78.00	**	77.00	11400.00	3.80	**	**	**
COLLECTED BY :		WEST. WYO COLLEGE								
13 MAY 80	1310	13.80	120.00	**	140.00	7340.00	9.50	**	**	**
13 MAY 80	1315	**	**	110.00	120.00	**	**	14.00	**	**
21 MAY 80	1300	**	**	81.00	92.00	**	**	2.90	**	**
21 MAY 80	1305	14.91	87.00	**	78.00	8650.00	4.10	**	**	**
21 MAY 80	1306	15.22	84.00	**	76.00	7380.00	3.80	**	**	**
2 JUL 80	1305	**	**	18.00	**	**	**	2.50	**	**
TREATMENT : UNKNOWN										
6 AUG 80	1105	**	**	36.00	2.70	**	**	3.90	**	12.00
6 AUG 80	1106	**	**	36.00	2.90	**	**	3.80	**	420.00
6 AUG 80	1107	76.30	25.00	**	2.40	61.30	2.70	**	120.00	**
14 AUG 80	1110	76.73	33.00	**	10.00	88.90	4.40	**	**	**
14 AUG 80	1111	**	**	37.00	11.00	**	**	4.80	**	**
14 AUG 80	1112	**	**	36.00	11.00	**	**	4.60	**	**
27 AUG 80	1115	77.90	35.00	**	15.00	93.00	5.00	**	**	**
27 AUG 80	1116	**	**	34.00	15.00	**	**	5.00	**	**
25 SEP 80	1105	**	**	41.00	**	**	**	3.20	**	**
25 SEP 80	1106	**	**	40.00	**	**	**	3.20	**	**
25 SEP 80	1107	74.32	32.00	**	**	79.00	2.40	**	**	**
1 OCT 80	1105	**	**	18.00	13.00	**	**	1.40	**	**
1 OCT 80	1106	**	**	18.00	13.00	**	**	1.40	**	**
1 OCT 80	1107	76.67	18.00	**	16.00	56.00	1.40	**	**	**
SAMPLE SIZE		9.00	9.00	14.00	19.00	9.00	9.00	14.00	1.00	3.00
MAXIMUM		77.90	120.00	110.00	220.00	11400.00	9.50	14.00	120.00	420.00
MINIMUM		12.48	18.00	18.00	2.40	56.00	1.40	.74	120.00	12.00
MEAN		48.70	56.89	48.64	55.53	3905.36	4.12	3.90	120.00	210.67
STANDARD DEV		32.85	35.83	30.35	62.84	4688.90	2.30	3.18	UNDEF	204.21
RATIO VALUE		.49	.72	.57	.31	.47	1.96	2.10	UNDEF	3.63
TREND TEST		POS	POS	POS	POS	POS	NEG	NEG	NULL	NULL
COEF OF SKEWNESS		-.21	.48	.89	1.11	.40	1.31	2.31	UNDEF	.08
COEF OF VAR (%)		67.44	62.98	62.40	113.17	120.06	55.83	81.47	UNDEF	96.93

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	141 DISSOLVED BARIUM UG/L	143 TOTAL BARIUM UG/L	152 DISSOLVED BORON UG/L	154 TOTAL BORON UG/L	156 DISSOLVED CADMIUM UG/L	158 TOTAL CADMIUM UG/L	161 DISSOLVED CHROMIUM UG/L	164 TOTAL CHROMIUM UG/L	169 DISSOLVED COPPER UG/L
1 MAY 80	1306	**	**	**	400.00	**	**	**	100.00-	**
COLLECTED BY :			ERDA							
5 MAY 80	805	**	500.00-	**	3800.00	**	40.00	**	100.00-	**
9 MAY 80	800	500.00-	**	1900.00	**	80.00	**	100.00-	**	100.00-
COLLECTED BY :		WEST. WYO COLLEGE								
13 MAY 80	1310	500.00-	**	700.00	**	70.00	**	100.00-	**	100.00-
13 MAY 80	1315	**	500.00-	**	700.00	**	50.00	**	100.00-	**
21 MAY 80	1300	**	**	**	100.00-	**	70.00	**	**	**
21 MAY 80	1305	**	**	1300.00	**	50.00	**	**	**	**
21 MAY 80	1306	**	**	**	**	60.00	**	**	**	**
TREATMENT	: UNKNOWN									
6 AUG 80	1105	**	500.00-	**	3500.00	**	10.00-	**	50.00-	**
6 AUG 80	1106	**	500.00-	**	3500.00	**	10.00-	**	50.00-	**
6 AUG 80	1107	500.00-	**	2000.00	**	10.00-	**	50.00-	**	30.00-
14 AUG 80	1110	**	**	3400.00	**	**	**	**	**	**
14 AUG 80	1111	**	**	**	3800.00	**	**	**	**	**
14 AUG 80	1112	**	**	**	4000.00	**	**	**	**	**
27 AUG 80	1115	**	**	3200.00	**	**	**	**	**	**
27 AUG 80	1116	**	**	**	3900.00	**	**	**	**	**
25 SEP 80	1105	**	**	**	6100.00	**	**	**	**	**
25 SEP 80	1106	**	**	**	7300.00	**	**	**	**	**
25 SEP 80	1107	**	**	4400.00	**	**	**	**	**	**
1 OCT 80	1105	**	**	**	2400.00	**	**	**	**	**
1 OCT 80	1106	**	**	**	2200.00	**	**	**	**	**
1 OCT 80	1107	**	**	2000.00	**	**	**	**	**	**
SAMPLE SIZE		3.00	4.00	8.00	13.00	5.00	5.00	3.00	5.00	3.00
MAXIMUM		500.00-	500.00-	4400.00	7300.00	80.00	70.00	100.00-	100.00-	100.00-
MINIMUM		500.00-	500.00-	700.00	100.00-	10.00-	10.00-	50.00-	50.00-	30.00-
MEAN		500.00	500.00	2362.50	3207.69	54.00	36.00	83.33	80.00	76.67
STANDARD DEV		0.00	0.00	1212.95	2093.43	27.02	26.08	28.87	27.39	40.41
RATIO VALUE		UNDEF	UNDEF	1.28	1.31	1.33	1.88	2.25	1.04	2.25
TREND TEST		NULL	NULL	NEG	NEG	NEG	NEG	NULL	NEG	NULL
COEF OF SKEWNESS		.00	.00	.33	.22	-.80	.10	-.58	-.37	-.58
COEF OF VAR (%)		0.00	0.00	51.34	65.26	50.03	72.44	34.64	34.23	52.71

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	171 TOTAL COPPER UG/L	174 TOTAL IRON UG/L	175 DISSOLVED IRON UG/L	178 DISSOLVED LEAD UG/L	180 TOTAL LEAD UG/L	184 TOTAL MANGANESE UG/L	185 DISSOLVED MANGANESE UG/L	190 DISSOLVED NICKEL UG/L	192 TOTAL NICKEL UG/L
1 MAY 80	1306	100.00-	1320.00	**	**	900.00-	1660.00	**	**	360.00
COLLECTED BY :			ERDA							
9 MAY 80	805	100.00-	129000.00	**	**	1000.00-	91000.00	**	**	350.00
9 MAY 80	800	**	**	1700000.00	100.00-	**	**	93000.00	38000.00	**
COLLECTED BY :		WEST. WYO COLLEGE								
13 MAY 80	1310	**	**	530000.00	100.00-	**	**	42000.00	4800.00-	**
13 MAY 80	1315	100.00-	510000.00	**	**	100.00-	38000.00	**	**	2300.00
TREATMENT : UNKNOWN										
6 AUG 80	1105	30.00-	950.00	**	**	200.00-	180.00	**	**	100.00-
6 AUG 80	1106	30.00-	1300.00	**	**	200.00-	190.00	**	**	100.00-
6 AUG 80	1107	**	**	1400.00	200.00-	**	**	180.00	100.00-	**
SAMPLE SIZE		5.00	5.00	3.00	3.00	5.00	5.00	3.00	3.00	5.00
MAXIMUM		100.00-	510000.00	1700000.00	200.00-	1000.00-	91000.00	93000.00	38000.00	2300.00
MINIMUM		30.00-	950.00	1400.00	100.00-	100.00-	180.00	180.00	100.00-	100.00-
MEAN		72.00	128514.00	743800.00	133.33	400.00	18194.00	43060.00	14300.00	642.00
STANDARD DEV		38.34	220321.41	869248.71	57.74	367.42	24456.70	46485.60	20658.90	935.59
RATIO VALUE		1.04	2.71	1.64	2.25	2.48	2.11	1.51	1.98	3.09
TREND TEST		NEG	NEG	NULL	NULL	NEG	NEG	NULL	NULL	NEG
COEF OF SKEWNESS		-.37	1.15	.35	.58	.88	.46	.10	.54	1.28
COEF OF VAR (%)		53.25	171.44	116.87	43.30	91.86	134.42	103.16	144.47	145.73

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	206 DISSOLVED ZINC UG/L	208 TOTAL ZINC UG/L	217 TOTAL ALUMINUM UG/L	218 DISSOLVED ALUMINUM UG/L	233 DISSOLVED SELENIUM UG/L	235 TOTAL SELENIUM UG/L	467 DISSOLVED SOLIDS 180C MG/L	ROE	501 TOTAL AMMONIA NH4 MG/L	502 DISSOLVED AMMONIA NH4 MG/L
1 MAY 80	1306	**	100.00-	1300.00	**	**	10.00-	**		.50	**
COLLECTED BY :			ERDA								
5 MAY 80	805	**	110.00	500.00-	**	**	20.00	**		8.40	**
9 MAY 80	800	13000.00	**	**	56000.00	30.00	**	17900.00		**	6.70
COLLECTED BY :		WEST. WYO COLLEGE									
13 MAY 80	1310	300.00	**	**	1700.00	10.00	**	10900.00		**	9.60
13 MAY 80	1315	**	130.00	100.00-	**	**	10.00	**		8.70	**
21 MAY 80	1300	**	**	**	**	**	**	**		7.40	**
21 MAY 80	1305	**	**	**	**	**	**	12300.00		**	9.60
21 MAY 80	1306	**	**	**	**	**	**	12300.00		**	10.00
2 JUL 80	1305	**	**	**	**	**	**	**		1.80	**
TREATMENT :		UNKNOWN									
6 AUG 80	1105	**	10.00-	1000.00-	**	**	60.00	**		17.40	**
6 AUG 80	1106	**	10.00-	1000.00-	**	**	60.00	**		21.90	**
6 AUG 80	1107	10.00-	**	**	1000.00-	20.00	**	604.00		**	9.40
14 AUG 80	1110	**	**	**	**	**	**	480.00		**	5.80
14 AUG 80	1111	**	**	**	**	**	**	**		7.70	**
14 AUG 80	1112	**	**	**	**	**	**	**		5.80	**
27 AUG 80	1115	**	**	**	**	**	**	524.00		**	5.40
27 AUG 80	1116	**	**	**	**	**	**	**		13.00	**
25 SEP 80	1105	**	**	**	**	**	**	**		13.00	**
25 SEP 80	1106	**	**	**	**	**	**	**		21.00	**
25 SEP 80	1107	**	**	**	**	**	**	520.00		**	14.00
1 OCT 80	1105	**	**	**	**	**	**	**		77.00	**
1 OCT 80	1106	**	**	**	**	**	**	**		130.00	**
1 OCT 80	1107	**	**	**	**	**	**	300.00		**	94.00
SAMPLE SIZE		8.00	8.00	8.00	8.00	8.00	5.00	9.00		14.00	9.00
MAXIMUM		13000.00	130.00	1300.00	56000.00	30.00	60.00	17900.00		130.00	94.00
MINIMUM		10.00-	10.00-	100.00-	1000.00-	10.00	10.00-	300.00		.50	5.40
MEAN		6436.67	72.00	780.00	19566.67	20.00	32.00	6203.11		23.83	18.28
STANDARD DEV		7417.48	57.62	476.45	31954.13	10.00	28.88	7042.04		35.88	28.52
RATIO VALUE		2.20	1.40	2.22	2.22	3.73	1.26	.53		.43	1.12
TREND TEST		NULL	NEG	NEG	NULL	NULL	NEG	POS		POS	POS
COEF OF SKEWNESS		.58	-.27	-.40	.58	0.00	.30	.44		2.16	2.30
COEF OF VAR (%)		167.19	80.03	61.08	161.26	50.00	88.89	113.52		150.59	156.02

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	504 DISSOLVED NITRATE NO3 MG/L	518 DISSOLVED MERCURY UG/L	520 TOTAL MERCURY UG/L	612 LABORATORY PH	614 DISSOLVED THIOSULFATE MG/L	661 FIELD CONDUCTIVITY MICROMHOS	672 TOTAL SULFATE MG/L (SO4)	674 DISSOLVED BORON MG/L AS B	676 DISSOLVED THIOCYANATE MG/L
1 MAY 80	1306	9.80	**	50.00-	7.31	**	**	1130.00	.40	**
COLLECTED BY :			ERDA							
5 MAY 80	805	1.70	**	50.00-	6.68	**	**	6170.00	3.80	**
9 MAY 80	800	650.00	50.00-	**	3.86	.10-	75000.00	**	1.90	.10-
COLLECTED BY :		WEST. WYO COLLEGE								
13 MAY 80	1310	108.00	50.00-	**	605.00	.10-	**	**	.70	.10-
13 MAY 80	1315	11.10	**	50.00-	6.67	**	2900.00	7250.00	.70	**
21 MAY 80	1300	126.00	**	**	4.45	**	7000.00	6560.00	.10-	**
21 MAY 80	1305	125.00	**	**	4.20	.10-	**	**	1.30	.10-
21 MAY 80	1306	600.00	**	**	4.22	.10-	**	**	**	.10-
2 JUL 80	1305	**	**	**	6.92	**	280.00	**	**	**
TREATMENT :		UNKNOWN								
6 AUG 80	1105	**	**	.50-	7.91	**	550.00	**	3.50	**
6 AUG 80	1106	**	**	.50-	7.32	**	**	**	3.50	**
6 AUG 80	1107	**	.50-	**	6.85	**	**	**	2.00	**
14 AUG 80	1110	**	**	**	6.83	**	**	**	3.40	**
14 AUG 80	1111	**	**	**	7.04	**	**	99.20	3.80	**
14 AUG 80	1112	**	**	**	7.72	**	580.00	98.80	4.00	**
27 AUG 80	1115	**	**	**	7.52	**	**	**	3.20	**
27 AUG 80	1116	**	**	**	7.57	**	700.00	95.90	3.90	**
25 SEP 80	1105	**	**	**	7.95	**	880.00	96.90	6.10	**
25 SEP 80	1106	**	**	**	6.71	**	**	95.50	7.30	**
25 SEP 80	1107	**	**	**	6.87	**	**	**	4.40	**
1 OCT 80	1105	**	**	**	7.67	**	840.00	44.80	2.40	**
1 OCT 80	1106	**	**	**	7.51	**	**	51.40	2.20	**
1 OCT 80	1107	**	**	**	7.88	**	**	**	2.00	**
SAMPLE SIZE		8.00	8.00	5.00	23.00	4.00	9.00	11.00	21.00	4.00
MAXIMUM		650.00	50.00-	50.00-	605.00	.10-	75000.00	7250.00	7.30	.10-
MINIMUM		1.70	.50-	.50-	3.86	.10-	280.00	44.80	.10-	.10-
MEAN		178.95	33.50	30.20	32.65	.10	9858.89	1972.05	2.89	.10
STANDARD DEV		229.81	28.58	27.11	124.77	.00	24521.21	3036.70	1.82	.00
RATIO VALUE		2.51	2.25	1.04	2.20	0.00	1.23	.82	.75	0.00
TREND TEST		NEG	NULL	NEG	NEG	POS	NEG	POS	POS	POS
COEF OF SKEWNESS		1.17	-.58	-.37	4.38	.00	2.30	.96	.52	.00
COEF OF VAR (%)		128.42	85.31	89.78	382.15	.00	248.72	153.99	63.15	.00

COLLECTED BY : ERDA
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	677 DISS TETRA-THIONATE MG/L	679 DISS CARBON (ORG+INORG) MG/L	685 TOTAL PHENOLS UG/L	736 FIELD BICAR-BONATE ION MG/L AS HCO3	737 FIELD CAR-BONATE ION MG/L AS CO3	738 TOTAL THIOCYANATE MG/L	739 TOTAL TETRA-THIONATE MG/L	740 TOTAL THIOSULFATE MG/L
5 MAY 80	805	**	**	**	**	**	.10-	.10-	.10-
9 MAY 80	800	.10-	107.00	**	250.00	0.00	**	**	**
COLLECTED BY :		WEST, WYO COLLEGE							
13 MAY 80	1310	.10-	116.00	**	**	**	**	**	**
13 MAY 80	1315	**	**	**	240.00	0.00	.10-	.10-	.10-
21 MAY 80	1300	**	**	**	270.00	0.00	.10-	.10-	.10-
21 MAY 80	1305	.10-	74.00	**	**	**	**	**	**
21 MAY 80	1306	.10-	**	**	**	**	**	**	**
2 JUL 80	1305	**	**	**	**	**	.10-	.10-	.10-
TREATMENT :		UNKNOWN							
6 AUG 80	1105	**	**	1.65	36.00	.10-	**	**	**
6 AUG 80	1107	**	86.00	**	**	**	**	**	**
14 AUG 80	1110	**	120.00	**	**	**	**	**	**
14 AUG 80	1112	**	**	2.15	27.00	.10-	**	**	**
27 AUG 80	1115	**	110.00	**	**	**	**	**	**
27 AUG 80	1116	**	**	**	36.00	.10-	**	**	**
25 SEP 80	1105	**	**	**	43.00	.10-	**	**	**
25 SEP 80	1107	**	200.00	**	**	**	**	**	**
1 OCT 80	1105	**	**	**	53.00	.10-	**	**	**
1 OCT 80	1107	**	210.00	**	**	**	**	**	**
SAMPLE SIZE		4.00	8.00	2.00	8.00	8.00	4.00	4.00	4.00
MAXIMUM		.10-	210.00	2.15	270.00	.10-	.10-	.10-	.10-
MINIMUM		.10-	74.00	1.65	27.00	0.00	.10-	.10-	.10-
MEAN		.10	127.88	1.90	119.38	.06	.10	.10	.10
STANDARD DEV		.00	50.09	.35	111.47	.05	.00	.00	.00
RATIO VALUE		0.00	.74	4.00	.74	.61	0.00	0.00	0.00
TREND TEST		POS	POS	NULL	POS	POS	POS	POS	POS
COEF OF SKEWNESS		.00	.78	-.00	.49	-.48	.00	.00	.00
COEF OF VAR (%)		.00	39.17	18.61	93.38	82.81	.00	.00	.00

**STATION NO. 7842 TS-1S 3P3
LATITUDE 40-25-00 LONGITUDE 109-40-00 IN UTAH ELEVATION 5962.00 FT.
NE1/4-SW1/4 SECTION 23 TOWNSHIP 4S RANGE 20E SALT LAKE P.M. DRAINAGE BASIN CODE 16100000
SITE TYPE WELL USE MONITORING OR OBSERVATION (P) ERDA # 0
AQUIFER 0 DRAINAGE AREA 0.00 SQ. MI. NONCONTRIBUTING 0.00 SQ. MI. DISCHARGE PERMIT NO. 0
WELL DEPTH 597.0 FT. WELL PERMIT NO. 0

- AFTER A VALUE TAGS IT AS LESS THAN
+ AFTER A VALUE TAGS IT AS GREATER THAN

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	6 NO. USED IN SAMP ACCOUNT PROCEDURE	7 WATER TEMPERATURE DEG. C	35 SAMPLE TREATMENT	39 BIOCHEMICAL OXYGEN DEMND 5-DAY MG/L	42 CHEM OXYGEN DEMAND .25 NK2CRO7 MG/L	43 FIELD PH STAND. UNITS	45 TOTAL ALKALINITY MG/L	49 BICARBONATE ION MG/L	50 CARBONATE ION MG/L
1 MAY 80	1305	2.00	**	3.00	**	**	**	404.00	493.00	.10-
7 MAY 80	1300	6.00	**	3.00	**	980.00	**	277.00	338.00	.10-
23 JUL 80	1105	29.00	49.00	**	9.00	220.00	8.10	36.00	44.00	.10-
23 JUL 80	1106	30.00	**	5.00	6.00	275.00	**	32.00	40.00	.10-
23 JUL 80	1107	31.00	**	3.00	9.00	205.00	**	28.00	35.00	.10-
TREATMENT	: UNKNOWN									
6 AUG 80	1110	7.00	50.00	3.00	**	215.00	8.00	40.00	32.00	.10-
6 AUG 80	1111	8.00	**	5.00	**	220.00	**	28.00	35.00	.10-
6 AUG 80	1112	9.00	**	4.00	**	120.00	**	32.00	40.00	.10-
14 AUG 80	1105	22.00	**	4.00	**	140.00	**	57.00	63.00	4.90
14 AUG 80	1106	23.00	**	5.00	**	530.00	**	49.00	59.00	.10-
14 AUG 80	1107	24.00	57.00	3.00	**	320.00	8.10	61.00	74.00	.10-
20 AUG 80	1115	43.00	**	4.00	.60-	110.00	**	77.00	94.00	.10-
20 AUG 80	1116	44.00	**	5.00	3.00	380.00	**	81.00	39.00	29.00
20 AUG 80	1117	45.00	47.00	3.00	1.20	330.00	8.70	81.00	80.00	9.70
3 SEP 80	1125	12.00	**	4.00	**	160.00	**	20.00	25.00	.10-
3 SEP 80	1126	13.00	**	5.00	**	680.00	**	20.00	25.00	.10-
3 SEP 80	1127	14.00	38.00	3.00	**	330.00	7.30	20.00	25.00	.10-
18 SEP 80	1105	32.00	49.00	3.00	1.80	490.00	8.10	20.00	25.00	.10-
18 SEP 80	1106	33.00	**	5.00	3.00	360.00	**	24.00	30.00	.10-
18 SEP 80	1107	34.00	**	4.00	1.50-	280.00	**	24.00	30.00	.10-
25 SEP 80	1110	48.00	40.00	3.00	**	300.00	7.10	24.00	30.00	.10-
25 SEP 80	1111	49.00	**	5.00	**	380.00	**	24.00	30.00	.10-
25 SEP 80	1112	50.00	**	4.00	**	210.00	**	41.00	50.00	.10-
SAMPLE SIZE		23.00	7.00	22.00	9.00	22.00	7.00	23.00	23.00	23.00
MAXIMUM		50.00	57.00	5.00	9.00	980.00	8.70	404.00	493.00	29.00
MINIMUM		2.00	38.00	3.00	.60-	110.00	7.10	20.00	25.00	.10-
MEAN		26.43	47.14	3.91	3.90	328.86	7.91	65.22	75.48	1.98
STANDARD DEV		15.44	6.41	.87	3.29	200.94	.54	91.11	111.43	6.28
RATIO VALUE		.65	2.05	2.72	1.32	1.75	2.63	.46	.46	1.62
TREND TEST		POS	NEG	NEG	NEG	NEG	NEG	POS	POS	NEE
COEF OF SKEWNESS		.03	-.09	.17	.68	1.72	-.28	2.85	2.94	3.68
COEF OF VAR (%)		58.41	13.61	22.20	84.27	61.10	6.86	139.71	147.63	316.98

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	53 TOT. RESIDUE ROE 105C MG/L	69 DISSOLVED AMMONIA MG/L (N)	70 TOTAL AMMONIA MG/L (N)	80 TOTAL KJELDAHL NITRGEN MG/L	101 TOT. ORGANIC CARBON MG/L	102 DISS ORGANIC CARBON MG/L	104 TOTAL INORGANIC CARBON MG/L	109 TOTAL CARBON MG/L	110 DISSOLVED INORGANIC CARBON MG/L
1 MAY 80	1305	1650.00	**	1.10	**	**	**	81.00	**	**
7 MAY 80	1300	10200.00	**	8.70	**	200.00	**	157.00	357.00	**
23 JUL 80	1105	204.00	**	.10-	0.00	81.00	**	14.00	95.00	**
23 JUL 80	1106	172.00	**	.20	**	84.00	**	10.00	94.00	**
23 JUL 80	1107	240.00	**	.10-	**	70.00	**	8.00	78.00	**
TREATMENT	: UNKNOWN									
6 AUG 80	1110	296.00	**	.20	2.40	57.00	**	4.00	61.00	**
6 AUG 80	1111	108.00	**	.20	**	52.00	**	8.00	60.00	**
6 AUG 80	1112	**	.15	**	**	**	35.00	**	**	11.00
14 AUG 80	1105	**	.10	**	**	**	40.00	**	**	10.00
14 AUG 80	1106	188.00	**	.20	**	90.00	**	10.00	100.00	**
14 AUG 80	1107	204.00	**	.20	2.00	100.00	**	10.00	110.00	**
20 AUG 80	1115	**	.10	**	**	**	28.00	**	**	17.00
20 AUG 80	1116	224.00	**	.10	**	100.00	**	15.00	110.00	**
20 AUG 80	1117	248.00	**	.10-	1.80	100.00	**	18.00	120.00	**
3 SEP 80	1125	**	.10	**	**	**	25.00	**	**	4.00
3 SEP 80	1126	118.00	**	.01-	**	200.00	**	4.00	200.00	**
3 SEP 80	1127	72.00	**	.10-	**	94.00	**	4.00	98.00	**
18 SEP 80	1105	116.00	**	.10-	**	130.00	**	4.00	130.00	**
18 SEP 80	1106	128.00	**	.10	**	100.00	**	4.00	100.00	**
18 SEP 80	1107	**	.10-	**	**	**	46.00	**	**	4.00
25 SEP 80	1110	136.00	**	.40	**	110.00	**	3.00	110.00	**
25 SEP 80	1111	136.00	**	.20	**	130.00	**	3.00	130.00	**
25 SEP 80	1112	**	.20	**	**	**	82.00	**	**	3.00
SAMPLE SIZE		17.00	6.00	17.00	4.00	16.00	6.00	17.00	16.00	6.00
MAXIMUM		10200.00	.20	8.70	2.40	200.00	82.00	157.00	357.00	17.00
MINIMUM		72.00	.10-	.01-	0.00	52.00	25.00	3.00	60.00	3.00
MEAN		846.71	.13	.71	1.55	106.13	42.67	21.00	122.06	8.17
STANDARD DEV		2437.39	.04	2.07	1.06	42.51	20.74	39.52	70.44	5.49
RATIO VALUE		1.93	1.71	2.04	2.36	1.58	1.07	1.13	1.29	1.75
TREND TEST		NEG	NEG	NEG	NEG	NEG	POS	POS	POS	NEG
COEF OF SKEWNESS		3.51	1.02	3.56	-.83	1.15	1.16	2.72	2.44	.53
COEF OF VAR (%)		287.87	33.47	290.98	68.58	40.05	48.62	188.17	57.71	67.25

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	112 CYANIDE UG/L	115 TOTAL SULFIDE MG/L	116 DISSOLVED SULFIDE MG/L	120 DISSOLVED CALCIUM MG/L	121 TOTAL CALCIUM MG/L	122 DISSOLVED MAGNESIUM MG/L	124 TOTAL MAGNESIUM MG/L	125 TOTAL SODIUM MG/L	126 DISSOLVED SODIUM MG/L
1 MAY 80	1305	**	.10-	**	140.00	**	**	97.00	300.00	**
7 MAY 80	1300	2700.00	.10-	**	640.00	**	**	59.00	370.00	**
23 JUL 80	1105	100.00-	.10-	**	**	14.00	**	.29	24.00	**
23 JUL 80	1106	100.00-	.10-	**	**	10.00	**	.25	22.00	**
23 JUL 80	1107	100.00-	.10-	**	**	14.00	**	.32	22.00	**
TREATMENT : UNKNOWN										
6 AUG 80	1110	100.00-	.10-	**	**	6.00	**	2.00	19.00	**
6 AUG 80	1111	100.00-	.10-	**	**	5.90	**	2.00	20.00	**
6 AUG 80	1112	100.00-	**	.10-	6.40	**	2.00	**	**	24.00
14 AUG 80	1105	**	**	.10-	1.20	**	.29	**	**	52.00
14 AUG 80	1106	**	.10-	**	**	.70	**	.20	46.00	**
14 AUG 80	1107	**	.10-	**	**	.84	**	.28	52.00	**
20 AUG 80	1115	100.00-	**	.10-	1.40	**	.33	**	**	61.00
20 AUG 80	1116	100.00-	.10-	**	**	.90	**	.37	71.00	**
20 AUG 80	1117	100.00-	.10-	**	**	.90	**	.38	71.00	**
3 SEP 80	1125	100.00-	**	.10-	3.70	**	1.20	**	**	13.00
3 SEP 80	1126	100.00-	.10-	**	**	3.50	**	1.20	13.00	**
3 SEP 80	1127	100.00-	.10-	**	**	3.50	**	1.40	13.00	**
18 SEP 80	1105	100.00-	.10-	**	**	2.80	**	.68	27.00	**
18 SEP 80	1106	100.00-	.10-	**	**	3.00	**	.73	24.00	**
18 SEP 80	1107	100.00-	**	.10-	3.30	**	.77	**	**	24.00
25 SEP 80	1110	**	.10-	**	**	2.30	**	1.10	15.00	**
25 SEP 80	1111	**	.10-	**	**	2.30	**	1.00	14.00	**
25 SEP 80	1112	**	**	.10-	3.90	**	1.30	**	**	23.00
SAMPLE SIZE		16.00	17.00	6.00	8.00	15.00	6.00	17.00	17.00	6.00
MAXIMUM		2700.00	.10-	.10-	640.00	14.00	2.00	97.00	370.00	61.00
MINIMUM		100.00-	.10-	.10-	1.20	.70	.29	.20	13.00	13.00
MEAN		262.50	.10	.10	99.99	4.72	.98	9.89	66.06	32.83
STANDARD DEV		650.00	.00	.00	223.38	4.51	.65	26.51	103.68	19.01
RATIO VALUE		1.14	0.00	0.00	2.15	.49	2.33	.46	.80	2.19
TREND TEST		POS	POS	POS	NEG	POS	NEG	POS	POS	NEG
COEF OF SKEWNESS		3.50	.00	.00	1.95	1.15	.35	2.58	2.23	.56
COEF OF VAR (%)		247.62	.00	.00	223.41	95.55	66.55	267.90	156.95	57.90

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	127 SODIUM ADSORPTION RATIO	128 PERCENT SODIUM	130 DISSOLVED POTASSIUM MG/L	131 TOTAL POTASSIUM MG/L	132 DISSOLVED CHLORIDE MG/L	133 DISSOLVED SULFATE MG/L	134 DISSOLVED FLUORIDE MG/L	135 TOTAL FLUORIDE MG/L	137 DISSOLVED ARSENIC UG/L
1 MAY 80	1305	**	**	**	65.00	220.00	**	**	.10-	**
7 MAY 80	1300	**	**	**	100.00	130.00	**	**	6.50	**
23 JUL 80	1105	**	**	**	4.50	5.80	**	**	.26	**
23 JUL 80	1106	**	**	**	3.70	4.60	**	**	.25	**
23 JUL 80	1107	**	**	**	4.50	4.00	**	**	.27	**
TREATMENT : UNKNOWN										
6 AUG 80	1110	**	**	**	3.80	2.30	**	**	.13	**
6 AUG 80	1111	**	**	**	3.70	2.30	**	**	.17	**
6 AUG 80	1112	2.12	68.33	9.70	**	2.30	40.70	.87	**	8.00-
14 AUG 80	1105	11.05	96.43	1.30	**	5.30	58.00	.16	**	**
14 AUG 80	1106	**	**	**	1.10	4.80	**	**	.14-	**
14 AUG 80	1107	**	**	**	1.30	4.50	**	**	.25	**
20 AUG 80	1115	12.05	96.47	1.20	**	24.00	25.90	.10-	**	4.00-
20 AUG 80	1116	**	**	**	1.30	25.00	**	**	.10	**
20 AUG 80	1117	**	**	**	1.30	25.00	**	**	.10-	**
3 SEP 80	1125	1.50	66.62	2.90	**	4.60	14.00	.20	**	4.00-
3 SEP 80	1126	**	**	**	2.70	4.50	**	**	.20	**
3 SEP 80	1127	**	**	**	1.80	4.40	**	**	.10-	**
18 SEP 80	1105	**	**	**	1.60	16.00	**	**	.10-	**
18 SEP 80	1106	**	**	**	1.60	16.00	**	**	.10-	**
18 SEP 80	1107	3.09	82.07	1.60	**	15.00	23.00	.10-	**	3.00
25 SEP 80	1110	**	**	**	2.00	4.80	**	**	.10	**
25 SEP 80	1111	**	**	**	1.80	4.80	**	**	.10	**
25 SEP 80	1112	2.58	76.84	9.20	**	12.00	26.70	.70	**	**
SAMPLE SIZE		6.00	6.00	6.00	17.00	23.00	6.00	6.00	17.00	4.00
MAXIMUM		12.05	96.47	9.70	100.00	220.00	58.00	.87	6.50	8.00-
MINIMUM		1.50	66.62	1.20	1.10	2.30	14.00	.10-	.10-	3.00
MEAN		5.40	81.13	4.32	11.86	23.57	31.38	.36	.53	4.75
STANDARD DEV		4.80	13.14	4.03	27.32	50.23	15.62	.34	1.54	2.22
RATIO VALUE		2.03	2.71	1.97	.92	.46	1.54	1.85	2.24	1.54
TREND TEST		NEG	NEG	NEG	POS	POS	NEG	NEG	NEG	NEG
COEF OF SKEWNESS		.62	.17	.59	2.52	3.11	.71	.68	3.63	.86
COEF OF VAR (%)		88.98	16.20	93.26	230.27	213.14	49.77	95.64	291.95	46.68

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	139 TOTAL ARSENIC UG/L	141 DISSOLVED BARIUM UG/L	143 TOTAL BARIUM UG/L	152 DISSOLVED BORON UG/L	154 TOTAL BORON UG/L	156 DISSOLVED CADMIUM UG/L	158 TOTAL CADMIUM UG/L	161 DISSOLVED CHROMIUM UG/L	164 TOTAL CHROMIUM UG/L
1 MAY 80	1305	20.00	**	**	**	100.00-	**	**	**	100.00-
7 MAY 80	1300	**	**	500.00-	**	4400.00	**	40.00	**	110.00
23 JUL 80	1105	20.00	**	1000.00-	**	500.00-	**	100.00-	**	100.00-
23 JUL 80	1106	4.00	**	1000.00-	**	500.00-	**	100.00-	**	100.00-
23 JUL 80	1107	26.00	**	1000.00-	**	500.00-	**	100.00-	**	100.00-
TREATMENT : UNKNOWN										
6 AUG 80	1110	4.00-	**	500.00-	**	500.00-	**	10.00-	**	50.00-
6 AUG 80	1111	4.00-	**	500.00-	**	500.00-	**	10.00-	**	50.00-
6 AUG 80	1112	**	500.00-	**	500.00-	**	10.00-	**	50.00-	**
14 AUG 80	1105	**	**	**	500.00-	**	**	**	**	**
14 AUG 80	1106	**	**	**	**	500.00-	**	**	**	**
14 AUG 80	1107	**	**	**	**	500.00-	**	**	**	**
20 AUG 80	1115	**	500.00-	**	500.00-	**	20.00-	**	50.00-	**
20 AUG 80	1116	4.00-	**	500.00-	**	500.00-	**	20.00	**	50.00-
20 AUG 80	1117	4.00-	**	500.00-	**	500.00-	**	20.00-	**	50.00-
3 SEP 80	1125	**	500.00-	**	500.00-	**	20.00	**	50.00-	**
3 SEP 80	1126	4.00-	**	500.00-	**	1000.00	**	20.00-	**	50.00-
3 SEP 80	1127	4.00-	**	500.00-	**	600.00	**	20.00-	**	50.00-
18 SEP 80	1105	1.00	**	500.00-	**	700.00	**	20.00-	**	50.00-
18 SEP 80	1106	.50	**	500.00-	**	500.00-	**	20.00	**	50.00-
18 SEP 80	1107	**	500.00-	**	500.00-	**	30.00	**	50.00-	**
25 SEP 80	1110	**	**	**	**	500.00	**	**	**	**
25 SEP 80	1111	**	**	**	**	500.00	**	**	**	**
25 SEP 80	1112	**	**	**	1000.00	**	**	**	**	**
SAMPLE SIZE		12.00	4.00	12.00	6.00	17.00	4.00	12.00	4.00	13.00
MAXIMUM		26.00	500.00-	1000.00-	1000.00	4400.00	30.00	100.00-	50.00-	110.00
MINIMUM		.50	500.00-	500.00-	500.00-	100.00-	10.00-	10.00-	50.00-	50.00-
MEAN		7.96	500.00	625.00	583.33	752.94	20.00	40.00	50.00	70.00
STANDARD DEV		8.68	0.00	226.13	204.12	954.67	8.16	36.93	0.00	26.46
RATIO VALUE		1.62	UNDEF	.97	1.44	2.49	1.33	.86	UNDEF	.35
TREND TEST		NEG	NULL	POS	NEG	NEG	NEG	POS	NULL	POS
COEF OF SKEWNESS		1.14	.00	1.11	1.63	3.45	0.00	.99	.00	.49
COEF OF VAR (%)		109.10	0.00	36.18	34.99	126.79	40.82	92.32	0.00	37.80

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	169 DISSOLVED COPPER UG/L	171 TOTAL COPPER UG/L	174 TOTAL IRON UG/L	175 DISSOLVED IRON UG/L	178 DISSOLVED LEAD UG/L	180 TOTAL LEAD UG/L	184 TOTAL MANGANESE UG/L	185 DISSOLVED MANGANESE UG/L	190 DISSOLVED NICKEL UG/L
1 MAY 80	1305	**	100.00-	100.00-	**	**	500.00-	660.00	**	**
7 MAY 80	1300	**	100.00-	394000.00	**	**	1000.00-	93000.00	**	**
23 JUL 80	1105	**	100.00-	300.00	**	**	100.00-	100.00-	**	**
23 JUL 80	1106	**	100.00-	600.00	**	**	100.00-	100.00-	**	**
23 JUL 80	1107	**	100.00-	100.00-	**	**	100.00-	100.00-	**	**
TREATMENT : UNKNOWN										
6 AUG 80	1110	**	30.00-	460.00	**	**	200.00-	10.00-	**	**
6 AUG 80	1111	**	30.00-	530.00	**	**	200.00-	10.00-	**	**
6 AUG 80	1112	30.00-	**	**	320.00	200.00-	**	**	10.00-	100.00-
20 AUG 80	1115	30.00-	**	**	400.00	200.00-	**	**	10.00-	100.00-
20 AUG 80	1116	**	30.00-	300.00	**	**	200.00-	10.00-	**	**
20 AUG 80	1117	**	30.00-	1100.00	**	**	200.00-	10.00-	**	**
3 SEP 80	1125	30.00-	**	**	100.00	200.00-	**	**	10.00-	100.00-
3 SEP 80	1126	**	30.00-	200.00	**	**	200.00-	10.00-	**	**
3 SEP 80	1127	**	30.00-	100.00	**	**	200.00-	10.00-	**	**
18 SEP 80	1105	**	30.00-	100.00	**	**	200.00-	10.00-	**	**
18 SEP 80	1106	**	30.00-	300.00	**	**	200.00-	60.00	**	**
18 SEP 80	1107	30.00-	**	**	100.00	200.00-	**	**	30.00	100.00-
SAMPLE SIZE		4.00	13.00	13.00	4.00	4.00	13.00	13.00	4.00	4.00
MAXIMUM		30.00-	100.00-	394000.00	400.00	200.00-	1000.00-	93000.00	30.00	100.00-
MINIMUM		30.00-	30.00-	100.00-	100.00	200.00-	100.00-	10.00-	10.00-	100.00-
MEAN		30.00	56.92	30630.00	230.00	200.00	261.54	7237.69	15.00	100.00
STANDARD DEV		0.00	35.45	109179.46	153.62	0.00	243.37	25768.97	10.00	0.00
RATIO VALUE		UNDEF	.35	2.35	1.82	UNDEF	1.63	2.33	1.78	UNDEF
TREND TEST		NULL	POS	NEG	NEG	NULL	NEG	NEG	NEG	NULL
COEF OF SKEWNESS		.00	.46	3.09	.11	.00	2.32	3.05	1.00	.00
COEF OF VAR (%)		0.00	62.27	356.45	66.79	0.00	93.05	356.04	66.67	0.00

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	192 TOTAL NICKEL UG/L	206 DISSOLVED ZINC UG/L	208 TOTAL ZINC UG/L	217 TOTAL ALUMINUM UG/L	218 DISSOLVED ALUMINUM UG/L	233 DISSOLVED SELENIUM UG/L	235 TOTAL SELENIUM UG/L	467 DISSOLVED SOLIDS RDE 180C MG/L	501 TOTAL AMMONIA NH4 MG/L
1 MAY 80	1305	200.00-	**	100.00-	**	**	**	10.00-	**	1.40
7 MAY 80	1300	2300.00	**	140.00	500.00-	**	**	10.00-	**	11.20
23 JUL 80	1105	500.00-	**	50.00	2000.00-	**	**	140.00	**	.10-
23 JUL 80	1106	500.00-	**	50.00	2000.00-	**	**	190.00	**	.26
23 JUL 80	1107	500.00-	**	50.00	2000.00-	**	**	10.00-	**	.10-
TREATMENT : UNKNOWN										
6 AUG 80	1110	100.00-	**	10.00	1000.00-	**	**	90.00	**	.26
6 AUG 80	1111	100.00-	**	10.00	1000.00-	**	**	170.00	**	.26
6 AUG 80	1112	**	10.00-	**	**	1000.00-	20.00	**	180.00	**
14 AUG 80	1105	**	**	**	**	**	**	**	188.00	**
14 AUG 80	1106	**	**	**	**	**	**	**	**	.26
14 AUG 80	1107	**	**	**	**	**	**	**	**	.26
20 AUG 80	1115	**	10.00	**	**	1000.00-	.50-	**	220.00	**
20 AUG 80	1116	100.00-	**	10.00	1000.00-	**	**	.50-	**	.13
20 AUG 80	1117	100.00-	**	10.00-	1000.00-	**	**	.50-	**	.10-
3 SEP 80	1125	**	10.00	**	**	1000.00-	.50-	**	140.00	**
3 SEP 80	1126	100.00-	**	10.00	100.00-	**	**	.50-	**	.10-
3 SEP 80	1127	100.00-	**	10.00-	1000.00-	**	**	.50-	**	.10-
18 SEP 80	1105	100.00-	**	10.00-	1000.00-	**	**	.50-	**	.10-
18 SEP 80	1106	100.00-	**	20.00	1000.00-	**	**	.50-	**	.13
18 SEP 80	1107	**	10.00	**	**	1000.00-	.50-	**	100.00	**
25 SEP 80	1110	**	**	**	**	**	**	**	**	.51
25 SEP 80	1111	**	**	**	**	**	**	**	**	.26
25 SEP 80	1112	**	**	**	**	**	**	**	264.00	**
SAMPLE SIZE		13.00	4.00	13.00	12.00	4.00	4.00	13.00	6.00	17.00
MAXIMUM		2300.00	10.00	140.00	2000.00-	1000.00-	20.00	190.00	264.00	11.20
MINIMUM		100.00-	10.00-	10.00-	100.00-	1000.00-	.50-	.50-	100.00	.10-
MEAN		369.23	10.00	36.92	1133.33	1000.00	5.38	47.92	182.00	.91
STANDARD DEV		604.68	0.00	41.31	591.35	0.00	9.75	72.54	57.79	2.67
RATIO VALUE		1.93	UNDEF	.60	1.38	UNDEF	1.78	1.60	2.59	2.05
TREND TEST		NEG	NULL	POS	NEG	NULL	NEG	NEG	NEG	NEG
COEF OF SKEWNESS		2.65	.00	1.43	.25	.00	1.00	1.03	-.02	3.56
COEF OF VAR (%)		163.77	0.00	111.88	52.18	0.00	181.40	151.37	31.75	292.16

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	502 DISSOLVED AMMONIA NH4 MG/L	504 DISSOLVED NITRATE NO3 MG/L	518 DISSOLVED MERCURY UG/L	520 TOTAL MERCURY UG/L	612 LABORATORY PH	626 TOTAL CO3 MG/L	661 FIELD CONDUCTIVITY MICROMHOS	672 TOTAL SULFATE MG/L (SO4)	674 DISSOLVED BORON MG/L AS B
1 MAY 80	1305	**	11.00	**	50.00-	7.45	**	**	624.00	.10-
7 MAY 80	1300	**	3.40	**	50.00-	6.28	**	**	7090.00	4.40
23 JUL 80	1105	**	9.00	**	1.00-	8.37	**	650.00	35.40	.50-
23 JUL 80	1106	**	8.50	**	1.00-	7.03	**	**	34.60	.50-
23 JUL 80	1107	**	8.50	**	1.00-	7.41	**	**	36.20	**
TREATMENT : UNKNOWN										
6 AUG 80	1110	**	**	**	.50-	7.83	**	720.00	29.20	.50-
6 AUG 80	1111	**	**	**	.50-	7.59	**	**	29.20	.50-
6 AUG 80	1112	.19	**	.50-	**	7.59	**	**	**	.50-
14 AUG 80	1105	.13	**	**	**	9.61	35.80	**	**	.50-
14 AUG 80	1106	**	**	**	**	8.16	**	**	51.40	.50-
14 AUG 80	1107	**	**	**	**	7.86	**	390.00	56.80	.50-
20 AUG 80	1115	.13	**	.50-	**	8.17	**	**	**	.50-
20 AUG 80	1116	**	.90	**	.50-	10.18	47.69	**	30.90	.50-
20 AUG 80	1117	**	.90	**	.50-	9.20	48.87	560.00	25.00	.50-
3 SEP 80	1125	.13	1.00	.50-	**	7.48	**	**	**	.50-
3 SEP 80	1126	**	**	**	.50-	7.39	**	**	14.00	1.00
3 SEP 80	1127	**	**	**	.50-	7.34	**	138.00	12.30	.60
18 SEP 80	1105	**	**	**	.50-	7.46	**	240.00	27.90	.70
18 SEP 80	1106	**	**	**	.50-	7.25	**	**	22.60	.50-
18 SEP 80	1107	.10-	.70	.50-	**	7.29	**	**	**	.50-
25 SEP 80	1110	**	**	**	**	7.40	**	160.00	17.50	.50
25 SEP 80	1111	**	**	**	**	7.44	**	**	16.00	.50
25 SEP 80	1112	.26	**	**	**	6.67	**	**	**	1.00
SAMPLE SIZE		6.00	9.00	4.00	13.00	23.00	3.00	7.00	17.00	22.00
MAXIMUM		.26	11.00	.50-	50.00-	10.18	48.87	720.00	7090.00	4.40
MINIMUM		.10-	.70	.50-	.50-	6.28	35.80	138.00	12.30	.10-
MEAN		.16	4.88	.50	8.23	7.76	44.12	408.29	479.59	.72
STANDARD DEV		.06	4.29	0.00	18.54	.89	7.23	238.73	1709.58	.84
RATIO VALUE		2.11	1.13	UNDEF	.63	1.37	2.05	1.15	2.08	2.42
TREND TEST		NEG	POS	NULL	POS	POS	NULL	NEG	NEG	NEG
COEF OF SKEWNESS		.90	.21	.00	1.84	1.19	-.56	.10	3.60	3.96
COEF OF VAR (%)		37.36	87.89	0.00	225.24	11.48	16.40	58.47	356.47	117.18

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	679 DISS CARBON (ORG+INORG) MG/L	684 DISSOLVED PHENOLS UG/L	685 TOTAL PHENOLS UG/L	736 FIELD BICARBONATE ION MG/L AS HCO3	737 FIELD CARBONATE ION MG/L AS CO3	738 TOTAL THIOCYANATE MG/L	739 TOTAL TETRATHIONATE MG/L	740 TOTAL THIOSULFATE MG/L
7 MAY 80	1300	**	**	**	**	**	.10-	.10-	.10-
23 JUL 80	1105	**	**	.10-	42.00	.10-	**	**	**
23 JUL 80	1107	**	.50-	**	**	**	**	**	**
TREATMENT : UNKNOWN									
6 AUG 80	1110	**	**	.10-	26.00	.10-	**	**	**
6 AUG 80	1112	46.00	**	**	**	**	**	**	**
14 AUG 80	1105	50.00	**	**	**	**	**	**	**
14 AUG 80	1107	**	**	.10-	44.00	.10-	**	**	**
20 AUG 80	1115	45.00	**	**	**	**	**	**	**
20 AUG 80	1117	**	**	.10-	.23	.10-	**	**	**
3 SEP 80	1125	29.00	**	**	**	**	**	**	**
3 SEP 80	1127	**	**	**	32.00	.10-	**	**	**
16 SEP 80	1105	**	**	**	24.00	.10-	**	**	**
18 SEP 80	1107	50.00	**	**	**	**	**	**	**
25 SEP 80	1110	**	**	**	36.00	.10-	**	**	**
25 SEP 80	1112	85.00	**	**	**	**	**	**	**
SAMPLE SIZE		6.00	1.00	4.00	7.00	7.00	1.00	1.00	1.00
MAXIMUM		85.00	.50-	.10-	44.00	.10-	.10-	.10-	.10-
MINIMUM		29.00	.50-	.10-	.23	.10-	.10-	.10-	.10-
MEAN		50.83	.50	.10	29.18	.10	.10	.10	.10
STANDARD DEV		18.45	UNDEF	.00	14.80	.00	UNDEF	UNDEF	UNDEF
RATIO VALUE		1.38	UNDEF	0.00	3.30	0.00	UNDEF	UNDEF	UNDEF
TREND TEST		NEG	NULL	POS	NEG	POS	NULL	NULL	NULL
COEF OF SKEWNESS		.93	UNDEF	.00	-.96	.00	UNDEF	UNDEF	UNDEF
COEF OF VAR (%)		36.30	UNDEF	.00	50.71	.00	UNDEF	UNDEF	UNDEF

**STATION NO. 7844 TS-1S 3P5
LATITUDE 40-25-00 LONGITUDE 109-40-00 IN UTAH ELEVATION 5959.0C FT.
NE1/4-SE1/4 SECTION 23 TOWNSHIP 4S RANGE 20E SALT LAKE P.M. DRAINAGE BASIN CODE 16100000
SITE TYPE WELL USE MONITORING OR OBSERVATION (P) ERCA # 0
AQUIFER 0 DRAINAGE AREA 0.00 SQ. MI. NONCONTRIBUTING 0.00 SQ. MI. DISCHARGE PERMIT NO. 0
WELL DEPTH 550.0 FT. WELL PERMIT NO. 0

- AFTER A VALUE TAGS IT AS LESS THAN
+ AFTER A VALUE TAGS IT AS GREATER THAN

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	5 NO. USED IN SAMP ACCOUNT PROCEDURE	7 WATER TEMPERATURE DEG. C	35 SAMPLE TREATMENT	39 BIOCHEMICAL OXYGEN DEMND 5-DAY MG/L	42 CHEM OXYGEN DEMAND .25 NK2CR07 MG/L	43 FIELD PH STAND. UNITS	45 TOTAL ALKALINITY MG/L	49 BICARBONATE ION MG/L	50 CARBONATE ION MG/L
18 JUN 80	1300	11.00	24.00	3.00	**	100.00	6.60	58.00	71.00	1.00-
18 JUN 80	1301	12.00	**	4.00	**	110.00	**	54.00	65.00	1.00-
TREATMENT : UNKNOWN										
3 SEP 80	1120	9.00	**	4.00	**	40.00	**	69.00	84.00	.10-
3 SEP 80	1121	10.00	**	5.00	**	80.00	**	73.00	89.00	.10-
3 SEP 80	1122	11.00	23.00	3.00	**	25.00-	7.10	77.00	94.00	.10-
10 SEP 80	1100	18.00	63.00	5.00	**	40.00	6.90	53.00	64.00	.10-
10 SEP 80	1101	19.00	**	4.00	**	40.00	**	45.00	54.00	.10-
18 SEP 80	1100	29.00	47.00	3.00	2.40	280.00	7.00	53.00	64.00	.10-
18 SEP 80	1101	30.00	**	5.00	6.60	80.00	**	61.00	74.00	.10-
18 SEP 80	1102	31.00	**	4.00	8.00	130.00	**	57.00	69.00	.10-
25 SEP 80	1115	51.00	45.00	3.00	**	550.00	7.10	57.00	69.00	.10-
25 SEP 80	1116	52.00	**	4.00	**	25.00+	**	69.00	84.00	.10-
25 SEP 80	1117	53.00	**	5.00	**	70.00	**	65.00	79.00	.10-
1 OCT 80	1110	7.00	44.00	3.00	**	780.00	7.20	130.00	150.00	.10-
1 OCT 80	1111	8.00	**	5.00	**	720.00	**	130.00	140.00	4.90
1 OCT 80	1112	9.00	**	4.00	**	580.00	**	130.00	150.00	4.90
SAMPLE SIZE		16.00	6.00	16.00	3.00	16.00	6.00	16.00	16.00	16.00
MAXIMUM		53.00	63.00	5.00	8.00	780.00	7.20	130.00	150.00	4.90
MINIMUM		7.00	23.00	3.00	2.40	25.00-	6.60	45.00	54.00	.10-
MEAN		22.50	41.00	4.00	5.67	228.13	6.98	73.81	87.50	.81
STANDARD DEV		16.66	15.22	.82	2.91	267.61	.21	29.07	31.18	1.62
RATIO VALUE		.69	1.93	3.09	1.73	1.08	1.68	.46	.52	.64
TREND TEST		POS	NEG	POS	NULL	POS	NEG	POS	POS	POS
COEF OF SKEWNESS		.87	.01	0.00	-.43	1.09	-.89	1.26	1.18	2.06
COEF OF VAR (%)		74.03	37.12	20.41	51.43	117.31	3.06	39.38	35.63	199.92

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	53 TOT. RESIDUE ROE 105C MG/L	69 DISSOLVED AMMONIA MG/L (N)	70 TOTAL AMMONIA MG/L (N)	101 TOT. ORGANIC CARBON MG/L	102 DISS ORGANIC CARBON MG/L	104 TOTAL INORGANIC CARBON MG/L	105 TOTAL CARBON MG/L	110 DISSOLVED INORGANIC CARBON MG/L	112 CYANIDE UG/L
18 JUN 80	1300	880.00	**	.30	34.00	**	15.00	49.00	**	**
18 JUN 80	1301	**	.10-	**	**	27.00	**	**	22.00	**
TREATMENT : UNKNOWN										
3 SEP 80	1120	**	.90	**	**	6.00	**	**	19.00	100.00-
3 SEP 80	1121	152.00	**	.40	10.00	**	17.00	27.00	**	100.00-
3 SEP 80	1122	160.00	**	.10-	10.00	**	18.00	28.00	**	100.00-
10 SEP 80	1100	136.00	**	**	3.00	**	22.00	25.00	**	**
10 SEP 80	1101	**	.10-	**	**	7.00	**	**	15.00	**
18 SEP 80	1100	88.00	**	.20	27.00	**	13.00	40.00	**	100.00-
18 SEP 80	1101	120.00	**	.30	18.00	**	13.00	31.00	**	100.00-
18 SEP 80	1102	**	.20	**	**	12.00	**	**	14.00	100.00-
25 SEP 80	1115	144.00	**	.70	26.00	**	24.00	50.00	**	**
25 SEP 80	1116	**	.80	**	**	19.00	**	**	17.00	**
25 SEP 80	1117	108.00	**	1.40	52.00	**	15.00	67.00	**	**
1 OCT 80	1110	64.00	**	.10-	220.00	**	25.00	250.00	**	**
1 OCT 80	1111	72.00	**	35.00	160.00	**	25.00	190.00	**	**
1 OCT 80	1112	**	35.00	**	**	160.00	**	**	24.00	**
SAMPLE SIZE		10.00	6.00	9.00	10.00	6.00	10.00	10.00	6.00	6.00
MAXIMUM		880.00	35.00	35.00	220.00	160.00	25.00	250.00	24.00	100.00-
MINIMUM		64.00	.10-	.10-	3.00	6.00	13.00	25.00	14.00	100.00-
MEAN		192.40	6.18	4.28	56.00	38.50	18.70	75.70	18.50	100.00
STANDARD DEV		243.87	14.12	11.53	73.36	60.04	4.88	78.45	3.94	0.00
RATIO VALUE		1.12	1.41	1.29	.78	1.36	2.10	.77	1.30	UNDEF
TREND TEST		POS	NEG	NEG	POS	NEG	NEG	POS	NEG	NULL
COEF OF SKEWNESS		2.44	1.63	2.33	1.43	1.57	.20	1.44	.24	.00
COEF OF VAR (%)		126.75	228.38	269.49	131.00	155.95	26.08	103.63	21.28	0.00

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	115 TOTAL SULFIDE MG/L	116 DISSOLVED SULFIDE MG/L	120 DISSOLVED CALCIUM MG/L	121 TOTAL CALCIUM MG/L	122 DISSOLVED MAGNESIUM MG/L	124 TOTAL MAGNESIUM MG/L	125 TOTAL SODIUM MG/L	126 DISSOLVED SODIUM MG/L	127 SODIUM ADSORPTION RATIO
18 JUN 80	1300	**	**	**	139.00	**	4.20	91.00	**	**
18 JUN 80	1301	**	**	110.00	**	20.00	**	**	96.00	2.21
TREATMENT : UNKNOWN										
3 SEP 80	1120	**	.10-	24.00	**	6.20	**	**	10.00	.47
3 SEP 80	1121	.10-	**	**	24.00	**	6.00	11.00	**	**
3 SEP 80	1122	.10-	**	**	26.00	**	6.20	10.00	**	**
10 SEP 80	1100	.10-	**	**	15.00	**	1.20	17.00	**	**
10 SEP 80	1101	**	.10-	14.00	**	1.00	**	**	14.00	.97
18 SEP 80	1100	.10-	**	**	12.00	**	2.10	18.00	**	**
18 SEP 80	1101	.10-	**	**	13.00	**	2.30	24.00	**	**
18 SEP 80	1102	**	.10-	12.00	**	2.10	**	**	20.00	1.40
25 SEP 80	1115	.10-	**	**	13.00	**	1.30	20.00	**	**
25 SEP 80	1116	**	.10-	14.00	**	1.50	**	**	22.00	1.49
25 SEP 80	1117	.10-	**	**	13.00	**	1.40	20.00	**	**
1 OCT 80	1110	.10-	**	**	4.40	**	.97	16.00	**	**
1 OCT 80	1111	.10-	**	**	9.70	**	1.00	16.00	**	**
1 OCT 80	1112	**	.10-	4.40	**	.99	**	**	16.00	1.79
SAMPLE SIZE		9.00	9.00	6.00	10.00	6.00	10.00	10.00	6.00	6.00
MAXIMUM		.10-	.10-	110.00	139.00	20.00	6.20	91.00	96.00	2.21
MINIMUM		.10-	.10-	4.40	4.40	.99	.97	10.00	10.00	.47
MEAN		.10	.10	29.73	26.41	5.30	2.67	24.30	29.67	1.39
STANDARD DEV		.00	.00	39.82	40.16	7.47	2.05	23.80	32.78	.61
RATIO VALUE		0.00	0.00	1.15	1.03	.94	.89	1.42	1.67	2.29
TREND TEST		POS	POS	NEG	POS	POS	POS	NEG	NEG	NEG
COEF OF SKEWNESS		.00	.00	1.54	2.89	1.41	.87	2.39	1.57	-.20
COEF OF VAR (%)		.00	.00	133.91	152.06	140.90	76.72	97.94	110.48	43.92

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	128 PERCENT SODIUM	130 DISSOLVED POTASSIUM MG/L	131 TOTAL POTASSIUM MG/L	132 DISSOLVED CHLORIDE MG/L	133 DISSOLVED SULFATE MG/L	134 DISSOLVED FLUORIDE MG/L	135 TOTAL FLUORIDE MG/L	137 DISSOLVED ARSENIC UG/L	139 TOTAL ARSENIC UG/L
18 JUN 80	1300	**	**	33.00	42.00	**	**	1.70	**	**
18 JUN 80	1301	36.92	29.00	**	45.00	554.00	1.70	**	**	**
TREATMENT : UNKNOWN										
3 SEP 80	1120	20.30	3.40	**	6.70	23.00	.20	**	4.00-	**
3 SEP 80	1121	**	**	3.30	6.60	**	**	.20	**	4.00-
3 SEP 80	1122	**	**	3.40	6.60	**	**	.20	**	4.00-
10 SEP 80	1100	**	**	3.50	12.00	**	**	.13	**	**
10 SEP 80	1101	43.82	2.20	**	12.00	9.50	.11	**	**	**
18 SEP 80	1100	**	**	1.50	15.00	**	**	.10-	**	.50-
18 SEP 80	1101	**	**	2.20	17.00	**	**	.10-	**	.50-
18 SEP 80	1102	53.00	1.70	**	15.00	12.80	.10-	**	.50-	**
25 SEP 80	1115	**	**	1.50	5.60	**	**	.10-	**	**
25 SEP 80	1116	53.79	1.50	**	6.20	18.90	.10-	**	**	**
25 SEP 80	1117	**	**	1.60	5.80	**	**	.10-	**	**
1 OCT 80	1110	**	**	1.60	3.70	**	**	.10	**	**
1 OCT 80	1111	**	**	2.00	5.00	**	**	.10-	**	**
1 OCT 80	1112	69.81	2.00	**	5.00	13.00	.10-	**	**	**
SAMPLE SIZE		6.00	6.00	10.00	16.00	6.00	6.00	10.00	2.00	4.00
MAXIMUM		69.81	29.00	33.00	45.00	554.00	1.70	1.70	4.00-	4.00-
MINIMUM		20.30	1.50	1.50	3.70	9.50	.10-	.10-	.50-	.50-
MEAN		46.27	6.63	5.36	13.08	105.20	.39	.28	2.25	2.25
STANDARD DEV		16.87	10.98	9.75	12.60	219.92	.65	.50	2.47	2.02
RATIO VALUE		.99	1.31	1.15	.72	1.40	1.30	1.12	4.00	1.33
TREND TEST		POS	NEG	POS	POS	NEG	NEG	POS	NULL	NEG
COEF OF SKEWNESS		-.19	1.62	2.50	1.77	1.63	1.62	2.50	0.00	0.00
COEF OF VAR (%)		36.47	165.49	181.83	96.34	209.05	167.64	176.52	109.99	89.81

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	141 DISSOLVED BARIUM UG/L	143 TOTAL BARIUM UG/L	152 DISSOLVED BORON UG/L	154 TOTAL BORON UG/L	156 DISSOLVED CADMIUM UG/L	158 TOTAL CADMIUM UG/L	161 DISSOLVED CHROMIUM UG/L	164 TOTAL CHROMIUM UG/L	169 DISSOLVED COPPER UG/L
18 JUN 80	1300	**	**	**	1200.00	**	**	**	**	**
18 JUN 80	1301	**	**	400.00	**	**	**	**	**	**
TREATMENT : UNKNOWN										
3 SEP 80	1120	500.00-	**	500.00-	**	20.00-	**	50.00-	**	30.00-
3 SEP 80	1121	**	500.00	**	500.00-	**	20.00-	**	50.00-	**
3 SEP 80	1122	**	500.00-	**	500.00-	**	20.00-	**	50.00-	**
10 SEP 80	1100	**	**	**	500.00	**	**	**	**	**
10 SEP 80	1101	**	**	500.00-	**	**	**	**	**	**
18 SEP 80	1100	**	500.00-	**	500.00-	**	40.00	**	50.00-	**
18 SEP 80	1101	**	500.00-	**	500.00-	**	20.00	**	50.00-	**
18 SEP 80	1102	500.00-	**	500.00-	**	20.00	**	50.00-	**	30.00-
25 SEP 80	1115	**	**	**	500.00	**	**	**	**	**
25 SEP 80	1116	**	**	500.00-	**	**	**	**	**	**
25 SEP 80	1117	**	**	**	500.00-	**	**	**	**	**
1 OCT 80	1110	**	**	**	600.00	**	**	**	**	**
1 OCT 80	1111	**	**	**	500.00-	**	**	**	**	**
1 OCT 80	1112	**	**	500.00-	**	**	**	**	**	**
SAMPLE SIZE		2.00	4.00	6.00	10.00	2.00	4.00	2.00	4.00	2.00
MAXIMUM		500.00-	500.00	500.00-	1200.00	20.00	40.00	50.00-	50.00-	30.00-
MINIMUM		500.00-	500.00-	400.00	500.00-	20.00-	20.00-	50.00-	50.00-	30.00-
MEAN		500.00	500.00	483.33	580.00	20.00	25.00	50.00	50.00	30.00
STANDARD DEV		0.00	0.00	40.82	220.10	0.00	10.00	0.00	0.00	0.00
RATIO VALUE		UNDEF	UNDEF	1.44	1.30	UNDEF	3.56	UNDEF	UNDEF	UNDEF
TREND TEST		NULL	NULL	NEG	NEG	NULL	NEG	NULL	NULL	NULL
COEF OF SKEWNESS		.00	.00	-1.63	2.06	.00	1.00	.00	.00	.00
COEF OF VAR (%)		0.00	0.00	8.45	37.93	0.00	40.00	0.00	0.00	0.00

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNKNOWN

DATE	TIME	171 TOTAL COPPER UG/L	174 TOTAL IRON UG/L	175 DISSOLVED IRON UG/L	178 DISSOLVED LEAD UG/L	180 TOTAL LEAD UG/L	184 TOTAL MANGANESE UG/L	185 DISSOLVED MANGANESE UG/L	190 DISSOLVED NICKEL UG/L	192 TOTAL NICKEL UG/L
8 SEP 80	1120	**	**	600.00	200.00-	**	**	560.00	100.00-	**
8 SEP 80	1121	170.00	270.00	**	**	200.00	840.00	**	**	100.00-
8 SEP 80	1122	30.00-	100.00-	**	**	200.00-	660.00	**	**	100.00-
10 SEP 80	1100	30.00-	600.00	**	**	200.00-	160.00	**	**	100.00-
10 SEP 80	1101	30.00-	100.00-	**	**	200.00-	160.00	**	**	100.00-
10 SEP 80	1102	**	**	100.00-	200.00-	**	**	170.00	100.00-	**
SAMPLE SIZE		4.00	4.00	2.00	2.00	4.00	4.00	2.00	2.00	4.00
MAXIMUM		170.00	600.00	600.00	200.00-	200.00	840.00	560.00	100.00-	100.00-
MINIMUM		30.00-	100.00-	100.00-	200.00-	200.00-	160.00	170.00	100.00-	100.00-
MEAN		65.00	267.50	350.00	200.00	200.00	440.00	365.00	100.00	100.00
STANDARD DEV		70.00	235.71	353.55	0.00	0.00	337.84	275.77	0.00	0.00
RATIO VALUE		1.78	4.23	4.00	UNDEF	UNDEF	.98	4.00	UNDEF	UNDEF
TREND TEST		NEG	NEG	NULL	NULL	NULL	POS	NULL	NULL	NULL
COEF OF SKEWNESS		1.00	.70	0.00	.00	.00	.21	0.00	.00	.00
COEF OF VAR (%)		107.69	88.12	101.02	0.00	0.00	76.78	75.55	0.00	0.00

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	206 DISSOLVED ZINC UG/L	208 TOTAL ZINC UG/L	217 TOTAL ALUMINUM UG/L	218 DISSOLVED ALUMINUM UG/L	233 DISSOLVED SELENIUM UG/L	235 TOTAL SELENIUM UG/L	467 DISSOLVED SOLIDS RDE 180C MG/L	501 TOTAL AMMONIA NH4 MG/L	502 DISSOLVED AMMONIA NH4 MG/L
18 JUN 80	1300	**	**	**	**	**	**	**	.40	**
18 JUN 80	1301	**	**	**	**	**	**	900.00	**	.10-
TREATMENT : UNKNOWN										
3 SEP 80	1120	20.00	**	**	1000.00-	.50-	**	136.00	**	1.20
3 SEP 80	1121	**	330.00	1000.00-	**	**	.50-	**	.51	**
3 SEP 80	1122	**	30.00	1000.00-	**	**	.50-	**	.10-	**
10 SEP 80	1101	**	**	**	**	**	**	124.00	**	.10-
18 SEP 80	1100	**	60.00	1000.00-	**	**	.50-	**	.26	**
18 SEP 80	1101	**	10.00	1000.00-	**	**	.50-	**	.39	**
18 SEP 80	1102	10.00	**	**	1000.00-	.50-	**	132.00	**	.26
25 SEP 80	1115	**	**	**	**	**	**	**	.90	**
25 SEP 80	1116	**	**	**	**	**	**	116.00	**	1.00
25 SEP 80	1117	**	**	**	**	**	**	**	1.80	**
1 OCT 80	1110	**	**	**	**	**	**	**	.10-	**
1 OCT 80	1111	**	**	**	**	**	**	**	45.00	**
1 OCT 80	1112	**	**	**	**	**	**	72.00	**	45.00
SAMPLE SIZE		2.00	4.00	4.00	2.00	2.00	4.00	6.00	9.00	6.00
MAXIMUM		20.00	330.00	1000.00-	1000.00-	.50-	.50-	900.00	45.00	45.00
MINIMUM		10.00	10.00	1000.00-	1000.00-	.50-	.50-	72.00	.10-	.10-
MEAN		15.00	107.50	1000.00	1000.00	.50	.50	246.67	5.50	7.94
STANDARD DEV		7.07	149.75	0.00	0.00	0.00	0.00	320.90	14.82	18.16
RATIO VALUE		4.00	1.85	UNDEF	UNDEF	UNDEF	UNDEF	1.37	1.29	1.41
TREND TEST		NULL	NEG	NULL	NULL	NULL	NULL	NEG	NEG	NEG
COEF OF SKEWNESS		0.00	.94	.00	.00	.00	.00	1.61	2.33	1.63
COEF OF VAR (%)		47.14	139.30	0.00	0.00	0.00	0.00	130.09	269.74	228.62

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	504 DISSOLVED NITRATE NO3 MG/L	518 DISSOLVED MERCURY UG/L	520 TOTAL MERCURY UG/L	612 LABORATORY PH	614 DISSOLVED THIOSULFATE MG/L	628 TOTAL CO3 MG/L	661 FIELD CONDUCTIVITY MICROMHOS	672 TOTAL SULFATE MG/L (SO4)	674 DISSOLVED BORON MG/L AS B
18 JUN 80	1300	**	**	**	7.59	**	**	80.00	548.00	1.20
18 JUN 80	1301	**	**	**	7.35	.10-	**	**	**	.40
TREATMENT : UNKNOWN										
3 SEP 80	1120	.70	.50-	**	8.13	**	**	**	**	.50-
3 SEP 80	1121	.20	**	.50-	8.03	**	**	**	25.10	.50-
3 SEP 80	1122	.20	**	.50-	7.79	**	**	245.00	27.60	.50-
10 SEP 80	1100	**	**	**	7.85	**	**	290.00	10.30	.50
10 SEP 80	1101	**	**	**	7.70	**	**	**	**	.50-
10 SEP 80	1100	.20	**	.50-	7.86	**	**	310.00	12.10	.50-
10 SEP 80	1101	.20	**	.50-	8.09	**	**	**	14.00	.50-
10 SEP 80	1102	.30	.50-	**	7.95	**	**	**	**	.50-
25 SEP 80	1115	**	**	**	6.92	**	**	255.00	22.10	.50
25 SEP 80	1116	**	**	**	7.74	**	**	**	**	.50-
25 SEP 80	1117	**	**	**	7.87	**	**	**	17.30	.50-
1 OCT 80	1110	**	**	**	8.24	**	**	280.00	16.30	.60
1 OCT 80	1111	**	**	**	8.49	**	73.66	**	16.30	.50-
1 OCT 80	1112	**	**	**	8.47	**	78.57	**	**	.50-
SAMPLE SIZE		6.00	2.00	4.00	14.00	1.00	2.00	6.00	10.00	16.00
MAXIMUM		.70	.50-	.50-	8.47	.10-	78.57	310.00	548.00	1.20
MINIMUM		.20	.50-	.50-	6.92	.10-	73.66	80.00	10.30	.40
MEAN		.30	.50	.50	7.88	.10	76.12	243.33	70.91	.54
STANDARD DEV		.20	0.00	0.00	.39	UNDEF	3.48	83.41	167.72	.18
RATIO VALUE		1.56	UNDEF	UNDEF	1.32	UNDEF	4.00	1.15	1.20	1.49
TREND TEST		NEG	NULL	NULL	NEG	NULL	NULL	NEG	NEG	NEG
COEF OF SKEWNESS		1.50	.00	.00	2.46	UNDEF	-.00	-1.35	2.52	3.25
COEF OF VAR (%)		66.67	0.00	0.00	4.95	UNDEF	4.57	34.28	236.53	32.88

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	676 DISSOLVED THIOCYANATE MG/L	677 DISS TETRA-THIONATE MG/L	679 DISS CARBON (ORG+INORG) MG/L	736 FIELD BICARBONATE ION MG/L AS HCO3	737 FIELD CARBONATE ION MG/L AS CO3	738 TOTAL THIOCYANATE MG/L	739 TOTAL TETRA-THIONATE MG/L	740 TOTAL THIOSULFATE MG/L
18 JUN 80	1300	**	**	**	120.00	1.00-	.10-	.10-	.10-
18 JUN 80	1301	.10-	.10-	49.00	**	**	**	**	**
TREATMENT : UNKNOWN									
3 SEP 80	1120	**	**	25.00	**	**	**	**	**
3 SEP 80	1122	**	**	**	68.00	.10-	**	**	**
10 SEP 80	1100	**	**	**	31.00	.10-	**	**	**
10 SEP 80	1101	**	**	22.00	**	**	**	**	**
18 SEP 80	1100	**	**	**	43.00	.10-	**	**	**
18 SEP 80	1102	**	**	26.00	**	**	**	**	**
25 SEP 80	1115	**	**	**	13.00	.10-	**	**	**
25 SEP 80	1116	**	**	36.00	**	**	**	**	**
1 OCT 80	1110	**	**	**	20.00	.10-	**	**	**
1 OCT 80	1112	**	**	180.00	**	**	**	**	**
SAMPLE SIZE		1.00	1.00	6.00	6.00	6.00	1.00	1.00	1.00
MAXIMUM		.10-	.10-	180.00	120.00	1.00-	.10-	.10-	.10-
MINIMUM		.10-	.10-	22.00	13.00	.10-	.10-	.10-	.10-
MEAN		.10	.10	56.33	49.17	.25	.10	.10	.10
STANDARD DEV		UNDEF	UNDEF	61.39	39.75	.37	UNDEF	UNDEF	UNDEF
RATIO VALUE		UNDEF	UNDEF	1.37	.78	1.44	UNDEF	UNDEF	UNDEF
TREND TEST		NULL	NULL	NEG	POS	NEG	NULL	NULL	NULL
COEF OF SKEWNESS		UNDEF	UNDEF	1.54	.90	1.63	UNDEF	UNDEF	UNDEF
COEF OF VAR (%)		UNDEF	UNDEF	108.97	80.84	146.97	UNDEF	UNDEF	UNDEF

**STATION NO. 7845 TS-15 3P6
LATITUDE 40-25-00 LONGITUDE 109-40-00 IN UTAH ELEVATION 5959.00 FT.
NE1/4-SE1/4 SECTION 23 TOWNSHIP 4S RANGE 20E SALT LAKE P.M. DRAINAGE BASIN CODE 16100000
SITE TYPE WELL USE MONITORING OR OBSERVATION (P) ERCA # 0
AQUIFER 0 DRAINAGE AREA 0.00 SQ. MI. NONCONTRIBUTING 0.00 SQ. MI. DISCHARGE PERMIT NO. C
WELL DEPTH 580.C FT. WELL PERMIT NO. 0

- AFTER A VALUE TAGS IT AS LESS THAN
+ AFTER A VALUE TAGS IT AS GREATER THAN

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	5 NO. USED IN SAMP ACCOUNT PROCEDURE	7 WATER TEMPERATURE DEG. C	35 SAMPLE TREATMENT	42 CHEM OXYGEN DEMAND .25 NK2CR07 MG/L	43 FIELD PH STAND. UNITS	45 TOTAL ALKALINITY MG/L	46 BICARBONATE ION MG/L	50 CARBONATE ION MG/L	53 TOT. RESIDUE ROE 105C MG/L
28 MAY 80	1305	36.00	**	4.00	980.00	**	7.60	9.30	.10-	**
28 MAY 80	1306	37.00	**	3.00	1020.00	**	8.00	9.70	.10-	2310.00
4 JUN 80	1300	1.00	**	3.00	1460.00	**	30.00	36.50	.10-	400.00
4 JUN 80	1301	2.00	**	4.00	430.00	**	36.00	43.80	.10-	**
18 JUN 80	1305	13.00	78.00	3.00	490.00	6.00	14.00	17.00	1.00-	20.00
18 JUN 80	1306	14.00	**	4.00	50.00-	**	5.00	6.10	1.00-	**
SAMPLE SIZE		6.00	1.00	6.00	6.00	1.00	6.00	6.00	6.00	3.00
MAXIMUM		37.00	78.00	4.00	1460.00	6.00	36.00	43.80	1.00-	2310.00
MINIMUM		1.00	78.00	3.00	50.00-	6.00	5.00	6.10	.10-	20.00
MEAN		17.17	78.00	3.50	738.33	6.00	16.77	20.40	.40	910.00
STANDARD DEV		15.92	UNDEF	.55	507.76	UNDEF	13.05	15.88	.46	1227.23
RATIO VALUE		1.35	UNDEF	3.20	1.35	UNDEF	1.53	1.53	.90	1.89
TREND TEST		NEG	NULL	NEG	NEG	NULL	NEG	NEG	POS	NULL
COEF OF SKEWNESS		.33	UNDEF	0.00	.06	UNDEF	.57	.57	.65	.52
COEF OF VAR (%)		92.72	UNDEF	15.65	68.77	UNDEF	77.86	77.83	116.19	134.86

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	69 DISSOLVED AMMONIA MG/L (N)	70 TOTAL AMMONIA MG/L (N)	101 TOT. ORGANIC CARBON MG/L	102 DISS ORGANIC CARBON MG/L	104 TOTAL INORGANIC CARBON MG/L	109 TOTAL CARBON MG/L	110 DISSOLVED INORGANIC CARBON MG/L	115 TOTAL SULFIDE MG/L	116 DISSOLVED SULFIDE MG/L
28 MAY 80	1305	.10-	**	**	**	**	**	**	**	.10-
28 MAY 80	1306	**	.10	**	**	**	**	**	.10-	**
4 JUN 80	1300	**	**	5258.00	**	7.00	5265.00	**	**	**
4 JUN 80	1301	**	**	**	1402.00	**	**	8.00	**	**
18 JUN 80	1305	**	.10-	934.00	**	2.00	936.00	**	**	**
18 JUN 80	1306	.10-	**	**	41.00	**	**	4.00	**	**
SAMPLE SIZE		2.00	2.00	2.00	2.00	2.00	2.00	2.00	1.00	1.00
MAXIMUM		.10-	.10	5258.00	1402.00	7.00	5265.00	8.00	.10-	.10-
MINIMUM		.10-	.10-	934.00	41.00	2.00	936.00	4.00	.10-	.10-
MEAN		.10	.10	3096.00	721.50	4.50	3100.50	6.00	.10	.10
STANDARD DEV		0.00	0.00	3057.53	962.37	3.54	3061.07	2.83	UNDEF	UNDEF
RATIO VALUE		UNDEF	UNDEF	4.00	4.00	4.00	4.00	4.00	UNDEF	UNDEF
TREND TEST		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
COEF OF SKEWNESS		.00	.00	0.00	0.00	0.00	0.00	0.00	UNDEF	UNDEF
COEF OF VAR (%)		0.00	0.00	98.76	133.38	78.57	98.73	47.14	UNDEF	UNDEF

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	120 DISSOLVED CALCIUM MG/L	121 TOTAL CALCIUM MG/L	122 DISSOLVED MAGNESIUM MG/L	124 TOTAL MAGNESIUM MG/L	125 TOTAL SODIUM MG/L	126 DISSOLVED SODIUM MG/L	127 SODIUM ADSORPTION RATIO	128 PERCENT SODIUM	130 DISSOLVED POTASSIUM MG/L
28 MAY 80	1305	170.00	**	170.00	**	**	60.00	.78	10.41	25.00
28 MAY 80	1306	**	170.00	**	130.00	60.00	**	**	**	**
4 JUN 80	1300	**	17.00	**	4.80	8.10	**	**	**	**
4 JUN 80	1301	26.00	**	11.00	**	**	13.00	.54	20.43	3.80
18 JUN 80	1305	**	1.10	**	.60	.10-	**	**	**	**
18 JUN 80	1306	8.80	**	.30	**	**	6.40	.58	37.51	.50
SAMPLE SIZE		3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00	3.00
MAXIMUM		170.00	170.00	170.00	130.00	60.00	60.00	.78	37.51	25.00
MINIMUM		8.80	1.10	.30	.60	.10-	6.40	.54	10.41	.50
MEAN		68.27	62.70	60.43	45.13	22.73	26.47	.63	22.78	9.77
STANDARD DEV		88.52	93.26	95.04	73.53	32.52	29.23	.13	13.70	13.30
RATIO VALUE		2.01	2.04	2.11	2.18	1.96	1.98	2.68	1.57	1.95
TREND TEST		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
COEF OF SKEWNESS		.55	.56	.57	.58	.54	.54	.52	.25	.54
COEF OF VAR (%)		129.67	148.75	157.26	162.91	143.05	110.43	20.36	60.15	136.13

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	131 TOTAL POTASSIUM MG/L	132 DISSOLVED CHLORIDE MG/L	133 DISSOLVED SULFATE MG/L	134 DISSOLVED FLUORIDE MG/L	135 TOTAL FLUORIDE MG/L	141 DISSOLVED BARIUM UG/L	143 TOTAL BARIUM UG/L	152 DISSOLVED BORON UG/L	154 TOTAL BORON UG/L
28 MAY 80	1305	**	13.00	1210.00	1.30	**	500.00-	**	1900.00	**
28 MAY 80	1306	25.00	14.00	**	**	1.40	**	500.00-	**	2700.00
4 JUN 80	1300	10.00	8.60	**	**	**	**	**	**	8400.00
4 JUN 80	1301	**	8.50	307.00	**	**	**	**	500.00	**
18 JUN 80	1305	.10-	95.00	**	**	.06	**	**	**	**
18 JUN 80	1306	**	30.00	4.00	.07	**	**	**	3100.00	**
SAMPLE SIZE		3.00	6.00	3.00	2.00	2.00	1.00	1.00	3.00	2.00
MAXIMUM		25.00	95.00	1210.00	1.30	1.40	500.00-	500.00-	3100.00	8400.00
MINIMUM		.10-	8.50	4.00	.07	.06	500.00-	500.00-	500.00	2700.00
MEAN		11.70	28.18	507.00	.69	.73	500.00	500.00	1833.33	5550.00
STANDARD DEV		12.54	33.68	627.38	.87	.95	UNDEF	UNDEF	1301.28	4030.51
RATIO VALUE		1.54	2.48	1.73	4.00	4.00	UNDEF	UNDEF	3.86	4.00
TREND TEST		NULL	NEG	NULL	NULL	NULL	NULL	NULL	NULL	NULL
COEF OF SKEWNESS		.20	1.45	.43	-.00	-.00	UNDEF	UNDEF	-.08	0.00
COEF OF VAR (%)		107.15	119.49	123.74	126.97	129.80	UNDEF	UNDEF	70.98	72.62

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	156 DISSOLVED CADMIUM UG/L	158 TOTAL CADMIUM UG/L	161 DISSOLVED CHROMIUM UG/L	164 TOTAL CHROMIUM UG/L	169 DISSOLVED COPPER UG/L	171 TOTAL COPPER UG/L	174 TOTAL IRON UG/L	175 DISSOLVED IRON UG/L	178 DISSOLVED LEAD UG/L
28 MAY 80	1305	100.00-	**	100.00-	**	100.00-	**	**	496000.00	800.00
28 MAY 80	1306	**	100.00-	**	100.00-	**	100.00-	28400.00-	**	**
SAMPLE SIZE		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MAXIMUM		100.00-	100.00-	100.00-	100.00-	100.00-	100.00-	28400.00-	496000.00	800.00
MINIMUM		100.00-	100.00-	100.00-	100.00-	100.00-	100.00-	28400.00-	496000.00	800.00
MEAN		100.00	100.00	100.00	100.00	100.00	100.00	28400.00	496000.00	800.00
STANDARD DEV		UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF
RATIO VALUE		UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF
TREND TEST		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
COEF OF SKEWNESS		UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF
COEF OF VAR (%)		UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	180 TOTAL LEAD UG/L	184 TOTAL MANGANESE UG/L	185 DISSOLVED MANGANESE UG/L	190 DISSOLVED NICKEL UG/L	192 TOTAL NICKEL UG/L	206 DISSOLVED ZINC UG/L	208 TOTAL ZINC UG/L	217 TOTAL ALUMINUM UG/L	218 DISSOLVED ALUMINUM UG/L
28 MAY 80	1305	**	**	11000.00	180.00	**	1600.00	**	**	500.00-
28 MAY 80	1306	2400.00	11000.00	**	**	240.00	**	1800.00	500.00-	**
SAMPLE SIZE		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MAXIMUM		2400.00	11000.00	11000.00	180.00	240.00	1600.00	1800.00	500.00-	500.00-
MINIMUM		2400.00	11000.00	11000.00	180.00	240.00	1600.00	1800.00	500.00-	500.00-
MEAN		2400.00	11000.00	11000.00	180.00	240.00	1600.00	1800.00	500.00	500.00
STANDARD DEV		UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF
RATIO VALUE		UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF
TREND TEST		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
COEF OF SKEWNESS		UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF
COEF OF VAR (%)		UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	235 TOTAL SELENIUM UG/L	467 DISSOLVED SOLIDS 180C MG/L	501 TOTAL AMMONIA NH4 MG/L	502 DISSOLVED AMMONIA NH4 MG/L	504 DISSOLVED NITRATE NO3 MG/L	518 DISSOLVED MERCURY UG/L	520 TOTAL MERCURY UG/L	612 LABORATORY PH	614 DISSOLVED THIOSULFATE MG/L
28 MAY 80	1305	**	2110.00	**	.10-	990.00	50.00-	**	5.10	.10-
28 MAY 80	1306	30.00	**	.10	**	61.00	**	50.00-	5.12	**
4 JUN 80	1301	**	250.00	**	**	**	**	**	**	.10-
18 JUN 80	1305	**	**	.10-	**	**	**	**	6.80	**
18 JUN 80	1306	**	10.00	**	.10-	**	**	**	5.22	.10-
SAMPLE SIZE		1.00	3.00	2.00	2.00	2.00	1.00	1.00	4.00	3.00
MAXIMUM		30.00	2110.00	.10	.10-	990.00	50.00-	50.00-	6.80	.10-
MINIMUM		30.00	10.00	.10-	.10-	61.00	50.00-	50.00-	5.10	.10-
MEAN		30.00	790.00	.10	.10	525.50	50.00	50.00	5.56	.10
STANDARD DEV		UNDEF	1149.43	0.00	0.00	656.90	UNDEF	UNDEF	.83	.00
RATIO VALUE		UNDEF	2.00	UNDEF	UNDEF	4.00	UNDEF	UNDEF	3.45	0.00
TREND TEST		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NEG	NULL
COEF OF SKEWNESS		UNDEF	.55	.00	.00	0.00	UNDEF	UNDEF	.99	.00
COEF OF VAR (%)		UNDEF	145.50	0.00	0.00	125.01	UNDEF	UNDEF	14.90	.00

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	661 FIELD CONDUCTIVITY MICROMHOS	672 TOTAL SULFATE MG/L (SO4)	674 DISSOLVED BORON MG/L AS B	676 DISSOLVED THIOCYANATE MG/L	677 DISS TETRA-THIONATE MG/L	679 DISS CARBON (ORG+INORG) MG/L	736 FIELD BICAR-BONATE ION MG/L AS HCO3	737 FIELD CAR-BONATE ION MG/L AS CO3	738 TOTAL THIOCYANATE MG/L
28 MAY 80	1305	**	**	1.90	.10-	.10-	**	**	**	**
28 MAY 80	1306	**	1210.00	2.70	**	**	**	**	**	.10-
4 JUN 80	1300	**	130.00	8.40	**	**	**	200.00	0.00	.10-
4 JUN 80	1301	**	**	.50	.10-	.10-	1410.00	**	**	**
18 JUN 80	1305	1700.00	2.00	**	**	**	**	50.00	1.00-	.10-
18 JUN 80	1306	**	**	3.10	.10-	.10-	45.00	**	**	**
SAMPLE SIZE		1.00	3.00	5.00	3.00	3.00	2.00	2.00	2.00	3.00
MAXIMUM		1700.00	1210.00	8.40	.10-	.10-	1410.00	200.00	1.00-	.10-
MINIMUM		1700.00	2.00	.50	.10-	.10-	45.00	50.00	0.00	.10-
MEAN		1700.00	447.33	3.32	.10	.10	727.50	125.00	.50	.10
STANDARD DEV		UNDEF	663.58	3.01	.00	.00	965.20	106.07	.71	.00
RATIO VALUE		UNDEF	2.01	3.53	0.00	0.00	4.00	4.00	4.00	0.00
TREND TEST		NULL	NULL	NEG	NULL	NULL	NULL	NULL	NULL	NULL
COEF OF SKEWNESS		UNDEF	.55	.97	.00	.00	0.00	0.00	0.00	.00
COEF OF VAR (%)		UNDEF	148.34	90.62	.00	.00	132.67	84.85	141.42	.00

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	739 TOTAL TETRA-THIONATE MG/L	740 TOTAL THIOSULFATE MG/L
28 MAY 80	1306	.10-	.10-
4 JUN 80	1300	.10-	.10-
18 JUN 80	1305	.10-	.10-
SAMPLE SIZE		3.00	3.00
MAXIMUM		.10-	.10-
MINIMUM		.10-	.10-
MEAN		.10	.10
STANDARD DEV		.00	.00
RATIO VALLE		0.00	0.00
TREND TEST		NULL	NULL
COEF OF SKEWNESS		.00	.00
COEF OF VAR (%)		.00	.00

**STATION NO. 7846 TS-1S 3P7
LATITUDE 40-25-00 LONGITUDE 109-40-00 IN UTAH ELEVATION 5960.00 FT.
NE1/4-SW1/4 SECTION 23 TOWNSHIP 4S RANGE 20E SALT LAKE P.M. DRAINAGE BASIN CODE 16100000
SITE TYPE WELL USE MONITORING OR OBSERVATION (P) ERDA # 0
AQUIFER 0 DRAINAGE AREA 0.00 SQ. MI. NONCONTRIBUTING 0.00 SQ. MI. DISCHARGE PERMIT NO. 0
WELL DEPTH 571.0 FT. WELL PERMIT NO. 0

- AFTER A VALUE TAGS IT AS LESS THAN
+ AFTER A VALUE TAGS IT AS GREATER THAN

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNKNOWN

DATE	TIME	5 NO. USED IN SAMP ACCOUNT PROCEDURE	7 WATER TEMPERATURE DEG. C	35 SAMPLE TREATMENT	39 BIOCHEMICAL OXYGEN DEMND 5-DAY MG/L	42 CHEM OXYGEN DEMAND .25 NK2CRO7 MG/L	43 FIELD PH STAND. UNITS	45 TOTAL ALKALINITY MG/L	49 BICARBONATE ION MG/L	50 CARBONATE ION MG/L
1 OCT 10	1116	11.00	**	5.00	**	590.00	**	130.0	140.00	4.90
COLLECTED BY : ERDA										
TREATMENT : UNTREATED										
10 MAY 80	800	10.00	**	4.00	**	54.00	**	33.30	40.60	.10-
10 MAY 80	805	11.00	**	3.00	**	100.00	5.30	162.00	233.00	.10-
12 MAY 80	1300	12.00	**	4.00	**	36.00	**	17.50	21.30	.10-
COLLECTED BY : WEST. WYO COLLEGE										
12 MAY 80	1305	13.00	**	3.00	**	68.00	5.30	273.00	334.00	.10-
15 MAY 80	1300	18.00	**	4.00	**	5.00-	**	.10-	.10-	.10-
15 MAY 80	1305	19.00	**	3.00	**	83.00	5.80	182.00	222.00	.10-
17 MAY 80	1300	20.00	**	4.00	**	83.00	**	.10-	.10-	.10-
17 MAY 80	1305	21.00	**	3.00	**	160.00	5.80	149.00	182.00	.10-
19 MAY 80	1300	23.00	**	4.00	**	250.00	**	.10-	.10-	.10-
19 MAY 80	1305	24.00	**	3.00	**	120.00	6.00	66.10	80.60	.10-
22 MAY 80	1300	30.00	**	3.00	**	5.00-	6.20	5.60	6.80	.10-
22 MAY 80	1301	31.00	**	4.00	**	5.00-	**	3.40	4.30	.10-
26 MAY 80	1305	32.00	**	4.00	**	5.00-	**	10.00	12.20	.10-
26 MAY 80	1306	33.00	**	4.00	**	5.00-	6.20	8.40	10.20	.10-
28 MAY 80	1300	34.00	**	4.00	**	5.00-	**	25.60	31.70	.10-
28 MAY 80	1301	35.00	**	3.00	**	5.00-	6.20	18.80	22.90	.10-
4 JUN 80	1305	3.00	**	3.00	**	250.00	6.80	79.90	97.40	.10-
4 JUN 80	1306	4.00	**	4.00	**	180.00	**	80.10	97.70	.10-
11 JUN 80	1300	7.00	**	3.00	**	420.00	6.20	51.90	63.30	.10-
11 JUN 80	1301	8.00	**	4.00	**	380.00	**	48.20	58.70	.10-
18 JUN 80	1310	15.00	58.00	3.00	**	250.00	6.60	8.00	9.40	1.00-
18 JUN 80	1311	16.00	**	4.00	**	95.00	**	14.00	17.00	1.00-
25 JUN 80	1300	23.00	55.00	3.00	**	130.00	5.20	8.40	10.20	.10-
25 JUN 80	1301	24.00	25.00	4.00	**	50.00	**	4.20	5.10	.10-
2 JUL 80	1300	1.00	60.00	3.00	**	110.00	5.90	4.40	5.30	.10-
2 JUL 80	1301	2.00	**	4.00	**	140.00	**	7.90	9.70	.10-
9 JUL 80	1300	9.00	68.00	3.00	**	180.00	5.00	5.60	6.80	.10-
9 JUL 80	1301	10.00	**	4.00	**	120.00	**	10.00	12.00	.10-
16 JUL 80	1105	19.00	63.00	**	**	280.00	5.40	12.00	15.00	.10-
16 JUL 80	1106	20.00	**	5.00	**	115.00	**	12.00	15.00	.10-
16 JUL 80	1107	21.00	**	3.00	**	100.00	**	11.00	14.00	.10-
23 JUL 80	1110	32.00	64.00	**	21.00	370.00	4.20	.10-	.10-	.10-
23 JUL 80	1111	33.00	**	5.00	15.00	100.00	**	.10-	.10-	.10-
23 JUL 80	1112	34.00	**	3.00	12.00	80.00	**	.10-	.10-	.10-
30 JUL 80	1140	44.00	48.00	**	**	50.00	5.90	.10-	.10-	.10-
30 JUL 80	1141	65.00	**	5.00	**	50.00	**	.10-	.10-	.10-

30 JUL 80 1142	46.00	**	3.00	**	50.00-	**	.10-	.10-	.10-
TREATMENT : UNKNOWN									
6 AUG 80 1115	10.00	55.00	3.00	**	110.00	5.10	.10-	.10-	.10-
6 AUG 80 1116	11.00	**	5.00	**	75.00	**	.10-	.10-	.10-
6 AUG 80 1117	12.00	**	4.00	**	80.00	**	.10-	.10-	.10-
1 OCT 80 1115	10.00	62.00	3.00	**	560.00	6.70	130.00	150.00	4.90
1 OCT 80 1117	12.00	**	4.00	**	600.00	**	130.00	149.00	4.90
SAMPLE SIZE	43.00	10.00	40.00	3.00	43.00	19.00	43.00	43.00	43.00
MAXIMUM	46.00	68.00	5.00	21.00	600.00	6.80	273.00	334.00	4.90
MINIMUM	1.00	25.00	3.00	12.00	5.00-	4.20	.10-	.10-	.10-
MEAN	19.72	55.80	3.68	16.00	151.26	5.78	40.31	48.33	.46
STANDARD DEV	11.94	12.20	.69	4.58	157.73	.66	64.24	77.23	1.24
RATIO VALUE	.58	2.14	2.79	1.61	.95	1.63	2.05	2.09	.76
TREND TEST	POS	NEG	POS	NULL	POS	NEG	NEG	NEG	POS
COEF OF SKEWNESS	.50	-1.63	.51	.31	1.57	-.48	1.91	1.97	3.22
COEF OF VAR (%)	60.53	21.86	18.88	28.64	104.28	11.43	159.35	159.78	260.21

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNKNOWN

DATE	TIME	53 TOT. RESIDUE ROE 105C MG/L	69 DISSOLVED AMMONIA MG/L (N)	70 TOTAL AMMONIA MG/L (N)	80 TOTAL KJELDAHL NITROGEN MG/L	101 TOT. ORGANIC CARBON MG/L	102 DISS ORGANIC CARBON MG/L	104 TOTAL INORGANIC CARBON MG/L	109 TOTAL CARBON MG/L	110 DISSOLVED INORGANIC CARBON MG/L
1 OCT 10	1116	140.00	**	65.00	**	160.00	**	27.00	190.00	**
COLLECTED BY : ERDA										
TREATMENT : UNTREATED										
10 MAY 80	800	**	44.00	**	**	**	69.00	**	**	5.00
10 MAY 80	805	5390.00	**	10.00	**	26.00	**	38.00	64.00	**
12 MAY 80	1300	**	13.00	**	**	**	90.00	**	**	5.00
COLLECTED BY : WEST. WYO COLLEGE										
12 MAY 80	1305	5420.00	**	10.00	**	7.00	**	54.00	61.00	**
15 MAY 80	1300	**	13.00	**	**	**	51.00	**	**	8.00
15 MAY 80	1305	5950.00	**	10.00	**	0.00	**	100.00	100.00	**
17 MAY 80	1300	**	11.00	**	**	**	86.00	**	**	4.00
17 MAY 80	1305	5730.00	**	9.00	**	0.00	**	92.00	92.00	**
19 MAY 80	1300	**	7.50	**	**	**	65.00	**	**	5.00
19 MAY 80	1305	5020.00	**	8.00	**	11.00	**	88.00	99.00	**
22 MAY 80	1300	2410.00	**	4.30	**	**	**	**	**	**
22 MAY 80	1301	**	.10-	**	**	**	**	**	**	**
26 MAY 80	1305	**	.10-	**	**	**	**	**	**	**
26 MAY 80	1306	1990.00	**	3.40	**	**	**	**	**	**
28 MAY 80	1300	**	.10-	**	**	**	**	**	**	**
28 MAY 80	1301	1160.00	**	2.50	**	**	**	**	**	**
4 JUN 80	1305	570.00	**	**	**	54.00	**	30.00	84.00	**
4 JUN 80	1306	**	**	**	**	**	47.00	**	**	24.00
11 JUN 80	1300	680.00	**	2.70	**	22.00	**	47.00	69.00	**
11 JUN 80	1301	**	19.00	**	**	**	43.00	**	**	27.00
18 JUN 80	1310	1040.00	**	.10-	**	75.00	**	6.00	81.00	**
18 JUN 80	1311	**	.10-	**	**	**	63.00	**	**	5.00
25 JUN 80	1300	1180.00	**	4.20	**	30.00	**	14.00	44.00	**
25 JUN 80	1301	**	3.80	**	**	**	38.00	**	**	10.00
2 JUL 80	1300	736.00	**	.10-	**	**	**	3.00	69.00	**
2 JUL 80	1301	**	1.70	**	**	**	47.00	**	**	4.00
9 JUL 80	1300	660.00	**	1.70	**	81.00	**	.50-	81.00	**
9 JUL 80	1301	**	2.20	**	**	**	42.00	**	**	1.00
16 JUL 80	1105	820.00	**	.10-	.10-	89.00	**	4.00	93.00	**
16 JUL 80	1106	810.00	**	.10-	**	39.00	**	.50-	39.00	**
16 JUL 80	1107	790.00	**	.10-	**	35.00	**	.50-	35.00	**
23 JUL 80	1110	984.00	**	.10-	5.40	120.00	**	2.00	120.00	**
23 JUL 80	1111	996.00	**	.30	**	36.00	**	2.00	38.00	**
23 JUL 80	1112	1028.00	**	.10-	**	32.00	**	1.00	33.00	**
30 JUL 80	1140	1000.00	**	.50	5.80	51.00	**	1.00-	51.00	**
30 JUL 80	1141	1040.00	**	4.60	**	36.00	**	1.00-	36.00	**
30 JUL 80	1142	1060.00	**	.30	**	30.00	**	1.00-	30.00	**
TREATMENT : UNKNOWN										
6 AUG 80	1115	856.00	**	.10-	3.90	29.00	**	1.00-	29.00	**
6 AUG 80	1116	892.00	**	.10	**	23.00	**	1.00-	23.00	**
6 AUG 80	1117	**	.10-	**	**	**	23.00	**	**	1.00-
1 OCT 80	1115	100.00	**	36.00	**	160.00	**	27.00	190.00	**
1 OCT 80	1117	**	44.00	**	**	**	160.00	**	**	26.00
SAMPLE SIZE		27.00	15.00	26.00	6.00	27.00	13.00	24.00	24.00	13.00
MAXIMUM		5950.00	44.00	65.00	9.80	160.00	160.00	100.00	190.00	27.00
MINIMUM		100.00	.10-	.10-	.10-	0.00	23.00	.50-	23.00	1.00-
MEAN		1794.52	10.65	6.67	3.70	49.83	63.38	22.56	72.96	9.62
STANDARD DEV		1860.54	14.81	13.99	2.60	45.22	34.67	31.75	45.04	9.47
RATIO VALUE		.43	1.29	.94	2.20	1.91	1.82	.40	1.47	1.58
TREND TEST		POS	POS	POS	NEG	NEG	NEG	POS	NEG	NEG
COEF OF SKEWNESS		1.42	1.48	3.21	-.62	1.30	1.64	1.36	1.33	1.04
COEF OF VAR (%)		103.68	139.09	209.82	70.30	90.75	54.70	140.73	61.74	98.53

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNKNOWN

DATE	TIME	112 CYANIDE UG/L	115 TOTAL SULFIDE MG/L	116 DISSOLVED SULFIDE MG/L	120 DISSOLVED CALCIUM MG/L	121 TOTAL CALCIUM MG/L	122 DISSOLVED MAGNESIUM MG/L	124 TOTAL MAGNESIUM MG/L	125 TOTAL SODIUM MG/L	126 DISSOLVED SODIUM MG/L
1 OCT 10	1116	**	.10-	**	**	6.70	**	1.90	16.00	**
COLLECTED BY :			ERDA							
TREATMENT : UNTREATED										
10 MAY 80	800	1700.00	**	.10-	320.00	**	380.00	**	**	180.00
10 MAY 80	805	3400.00	.10-	**	**	320.00	**	380.00	180.00	**
12 MAY 80	1300	1500.00	**	1.00-	290.00	**	380.00	**	**	180.00
COLLECTED BY :		WEST. WYO COLLEGE								
12 MAY 80	1305	17000.00	.10-	**	**	290.00	**	390.00	180.00	**
15 MAY 80	1300	**	**	**	350.00	**	420.00	**	**	190.00
15 MAY 80	1305	**	**	**	**	360.00	**	440.00	190.00	**
17 MAY 80	1300	**	**	**	300.00	**	390.00	**	**	180.00
17 MAY 80	1305	**	**	**	**	370.00	**	400.00	180.00	**
19 MAY 80	1300	**	**	**	370.00	**	360.00	**	**	160.00
19 MAY 80	1305	**	**	**	**	370.00	**	350.00	160.00	**
22 MAY 80	1300	70.00	.10-	**	**	220.00	**	170.00	59.00	**
22 MAY 80	1301	90.00	**	.10-	220.00	**	166.00	**	**	59.00
26 MAY 80	1305	120.00	**	.10-	190.00	**	102.00	**	**	61.00
26 MAY 80	1306	200.00	.10-	**	**	190.00	**	97.00	62.00	**
28 MAY 80	1300	130.00	**	.10-	130.00	**	62.00	**	**	51.00
28 MAY 80	1301	80.00	.10-	**	**	130.00	**	64.00	52.00	**
4 JUN 80	1305	**	**	**	**	93.00	**	44.00	72.00	**
4 JUN 80	1306	**	**	**	88.00	**	46.00	**	**	69.00
11 JUN 80	1300	110.00	.10	**	**	78.00	**	28.00	46.00	**
11 JUN 80	1301	100.00	**	**	80.00	**	55.00	**	**	41.00
18 JUN 80	1310	**	**	**	**	18.00	**	.10-	58.00	**
18 JUN 80	1311	**	**	**	143.00	**	117.00	**	**	50.00
25 JUN 80	1300	100.00	**	**	**	130.00	**	36.00	100.00	**
25 JUN 80	1301	100.00-	**	2.70	119.00	**	39.00	**	**	95.00
2 JUL 80	1300	**	**	**	**	71.00	**	34.00	45.00	**
2 JUL 80	1301	**	**	**	58.00	**	42.00	**	**	45.00
9 JUL 80	1300	100.00-	3.20	**	**	72.00	**	26.00	39.00	**
9 JUL 80	1301	**	**	.40	67.00	**	33.00	**	**	46.00
16 JUL 80	1105	**	**	**	**	55.00	**	40.00	46.00	**
16 JUL 80	1106	**	**	**	**	58.00	**	41.00	48.00	**
16 JUL 80	1107	**	**	**	**	56.00	**	40.00	50.00	**
23 JUL 80	1110	100.00-	.10-	**	**	91.00	**	49.00	42.00	**
23 JUL 80	1111	100.00-	.10-	**	**	94.00	**	50.00	50.00	**
23 JUL 80	1112	1000.00-	.10-	**	**	94.00	**	50.00	55.00	**
30 JUL 80	1140	**	.10-	**	**	86.00	**	52.00	70.00	**
30 JUL 80	1141	**	.10-	**	**	86.00	**	52.00	65.00	**
30 JUL 80	1142	**	.10-	**	**	89.00	**	52.00	68.00	**
TREATMENT : UNKNOWN										
6 AUG 80	1115	100.00-	.10-	**	**	75.00	**	40.00	35.00	**
6 AUG 80	1116	100.00-	.10-	**	**	77.00	**	40.00	34.00	**
6 AUG 80	1117	100.00-	**	.10-	75.00	**	40.00	**	**	34.00
1 OCT 80	1115	**	.10-	**	**	6.50	**	1.90	16.00	**
1 OCT 80	1117	**	**	.10-	6.70	**	1.90	**	**	16.00
SAMPLE SIZE		21.00	17.00	9.00	14.00	27.00	16.00	27.00	27.00	16.00
MAXIMUM		17000.00	3.60	2.70	380.00	370.00	420.00	440.00	190.00	190.00
MINIMUM		70.00	.10-	.10-	6.70	6.50	1.90	.10-	16.00	16.00
MEAN		1252.38	.49	.52	178.67	131.08	161.49	108.85	74.74	91.06
STANDARD DEV		3701.05	1.10	.87	126.25	112.70	159.24	141.80	53.05	63.01
RATIO VALUE		2.05	1.21	2.56	.23	.51	.16	.39	.65	.31
TREND TEST		NEG	POS	NEG	POS	POS	POS	POS	POS	POS
COEF OF SKEWNESS		3.84	2.32	1.90	.40	1.14	.64	1.46	1.26	.61
COEF OF VAR (%)		295.52	224.94	166.60	70.66	85.98	98.61	130.28	70.97	69.19

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNKNOWN

DATE	TIME	127 SODIUM ADSORPTION RATIO	128 PERCENT SODIUM	130 DISSOLVED POTASSIUM MG/L	131 TOTAL POTASSIUM MG/L	132 DISSOLVED CHLORIDE MG/L	133 DISSOLVED SULFATE MG/L	134 DISSOLVED FLUORIDE MG/L	135 TOTAL FLUORIDE MG/L	137 DISSOLVED ARSENIC UG/L
1 OCT 10	1116	**	**	**	4.30	5.40	**	**	.20	**
COLLECTED BY :			ERDA							
TREATMENT : UNTREATED										
10 MAY 80	800	1.61	14.22	68.00	**	74.00	3340.00	3.80	**	**
10 MAY 80	805	**	**	**	69.00	76.00	**	**	4.90	**
12 MAY 80	1300	1.64	14.62	68.00	**	8.70	3290.00	4.17	**	**
COLLECTED BY :			WEST. WYO COLLEGE							
12 MAY 80	1305	**	**	**	67.00	75.00	**	**	5.00	**
15 MAY 80	1300	1.62	13.71	65.00	**	39.00	3890.00	.90	**	**
15 MAY 80	1305	**	**	**	65.00	78.00	**	**	1.10	**
17 MAY 80	1300	1.85	13.30	66.00	**	36.00	3800.00	.90	**	**
17 MAY 80	1305	**	**	**	67.00	66.00	**	**	1.00	**
19 MAY 80	1300	1.66	13.04	64.00	**	28.00	3150.00	.70	**	**
19 MAY 80	1305	**	**	**	67.00	55.00	**	**	.90	**
22 MAY 80	1300	**	**	**	26.00	10.00	**	**	1.20	**
22 MAY 80	1301	.73	9.44	26.00	**	9.70	1320.00	1.10	**	**
26 MAY 80	1305	.89	12.93	25.00	**	13.00	961.00	1.00	**	**
26 MAY 80	1306	**	**	**	28.00	12.00	**	**	1.10	**
28 MAY 80	1300	.92	14.07	20.00	**	13.00	646.00	.90	**	**
28 MAY 80	1301	**	**	**	20.00	11.00	**	**	.87	**
4 JUN 80	1305	**	**	**	11.00	26.00	**	**	**	**
4 JUN 80	1306	2.06	41.05	6.60	**	15.00	276.00	**	**	**
11 JUN 80	1300	**	**	**	26.00	11.00	**	**	3.40	**
11 JUN 80	1301	.86	17.32	26.00	**	8.60	350.00	3.50	**	10.00-
18 JUN 80	1310	**	**	**	28.00	10.00	**	**	2.80	**
18 JUN 80	1311	.75	11.69	28.00	**	10.00	621.00	3.00	**	**
25 JUN 80	1300	**	**	**	28.00	9.50	**	**	2.40	**
25 JUN 80	1301	1.93	31.12	28.00	**	9.10	730.00	2.40	**	**
2 JUL 80	1300	**	**	**	18.00	8.70	**	**	1.80	**
2 JUL 80	1301	1.10	23.57	18.00	**	7.60	450.00	1.90	**	**
9 JUL 80	1300	**	**	**	16.00	7.10	**	**	1.70	**
9 JUL 80	1301	1.15	26.03	18.00	**	8.60	494.00	2.00	**	190.00
16 JUL 80	1105	**	**	**	18.00	9.00	**	**	2.30	**
16 JUL 80	1106	**	**	**	18.00	7.80	**	**	2.10	**
16 JUL 80	1107	**	**	**	18.00	7.60	**	**	2.10	**
23 JUL 80	1110	**	**	**	19.00	8.30	**	**	1.90	**
23 JUL 80	1111	**	**	**	19.00	9.60	**	**	1.80	**
23 JUL 80	1112	**	**	**	19.00	9.40	**	**	1.80	**
30 JUL 80	1140	**	**	**	18.00	8.20	**	**	1.30	**
30 JUL 80	1141	**	**	**	17.00	8.20	**	**	1.30	**
30 JUL 80	1142	**	**	**	17.00	8.20	**	**	1.30	**
TREATMENT : UNKNOWN										
6 AUG 80	1115	**	**	**	13.00	3.10	**	**	1.15	**
6 AUG 80	1116	**	**	**	14.00	2.90	**	**	1.15	**
6 AUG 80	1117	.79	17.38	14.00	**	3.00	593.00	1.10	**	100.00
1 OCT 80	1115	**	**	**	4.70	4.60	**	**	.20	**
1 OCT 80	1117	1.41	58.65	4.30	**	4.60	32.40	.20	**	**
SAMPLE SIZE		16.00	16.00	16.00	27.00	43.00	16.00	15.00	26.00	3.00
MAXIMUM		2.04	58.65	68.00	69.00	78.00	3890.00	4.17	5.00	190.00
MINIMUM		.73	9.44	4.30	4.30	2.90	32.40	.20	.20	10.00-
MEAN		1.28	20.80	34.12	27.22	19.07	1496.46	1.84	1.80	100.00
STANDARD DEV		.43	13.03	23.39	20.18	22.59	1429.30	1.26	1.18	90.00
RATIO VALUE		2.21	1.45	.30	.63	1.13	.17	.98	1.40	3.75
TREND TEST		NEG	NEG	POS	POS	POS	POS	POS	POS	NULL
COEF OF SKEWNESS		.23	1.76	.51	1.28	1.74	.71	.60	1.38	0.00
COEF OF VAR (%)		33.86	62.65	68.56	74.12	118.43	95.51	68.44	65.39	90.00

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNKNOWN

DATE	TIME	139 TOTAL ARSENIC UG/L	141 DISSOLVED BARIUM UG/L	143 TOTAL BARIUM UG/L	152 DISSOLVED BORON UG/L	154 TOTAL BORON UG/L	156 DISSOLVED CADMIUM UG/L	158 TOTAL CADMIUM UG/L	161 DISSOLVED CHROMIUM UG/L	164 TOTAL CHROMIUM UG/L
1 OCT 80	1116	**	**	**	**	1100.00	**	**	**	**
COLLECTED BY : ERDA										
TREATMENT : UNTREATED										
10 MAY 80	800	**	500.00-	**	700.00	**	50.00	**	100.00-	**
10 MAY 80	805	**	**	500.00-	700.00	**	**	20.00	**	100.00-
12 MAY 80	1300	**	500.00-	**	700.00	**	20.00	**	100.00-	**
COLLECTED BY : WEST. WYO COLLEGE										
12 MAY 80	1305	**	**	500.00-	**	900.00	**	40.00	**	100.00-
19 MAY 80	1300	**	**	**	900.00	**	30.00	**	**	**
19 MAY 80	1305	**	**	**	**	1100.00	**	40.00	**	**
17 MAY 80	1300	**	**	**	900.00	**	40.00	**	**	**
17 MAY 80	1305	**	**	**	**	1000.00	**	40.00	**	**
19 MAY 80	1300	**	**	**	700.00	**	20.00	**	**	**
19 MAY 80	1305	**	**	**	**	900.00	**	40.00	**	**
22 MAY 80	1300	**	**	900.00-	**	2100.00	**	100.00-	**	100.00-
22 MAY 80	1301	**	500.00-	**	2600.00	**	100.00-	**	100.00-	**
26 MAY 80	1305	**	500.00-	**	3600.00	**	100.00-	**	100.00-	**
26 MAY 80	1306	**	**	900.00-	**	3900.00	**	100.00-	**	**
28 MAY 80	1300	**	500.00-	**	3900.00	**	100.00-	**	100.00-	**
28 MAY 80	1301	**	**	900.00-	**	3000.00	**	100.00-	**	100.00-
4 JUN 80	1305	**	**	**	**	1500.00	**	**	**	**
4 JUN 80	1306	**	**	**	1600.00	**	**	**	**	**
11 JUN 80	1300	10.00-	**	800.00-	**	2000.00	**	100.00-	**	100.00-
11 JUN 80	1301	**	500.00-	**	2800.00	**	100.00-	**	100.00-	**
18 JUN 80	1310	**	**	**	**	3000.00	**	**	**	**
18 JUN 80	1311	**	**	**	200.00	**	**	**	**	**
25 JUN 80	1300	**	**	900.00-	**	2900.00	**	100.00-	**	100.00-
25 JUN 80	1301	**	500.00-	**	2300.00	**	100.00-	**	100.00-	**
2 JUL 80	1300	**	**	**	**	3800.00	**	**	**	**
2 JUL 80	1301	**	**	**	3800.00	**	**	**	**	**
9 JUL 80	1300	10.00-	**	900.00-	**	3300.00	**	100.00-	**	100.00-
9 JUL 80	1301	**	500.00-	**	1900.00	**	100.00-	**	100.00-	**
16 JUL 80	1105	**	**	**	**	2000.00	**	**	**	**
16 JUL 80	1106	**	**	**	**	1900.00	**	**	**	**
16 JUL 80	1107	**	**	**	**	1500.00	**	**	**	**
23 JUL 80	1110	24.00	**	1000.00-	**	1900.00	**	100.00-	**	100.00-
23 JUL 80	1111	24.00	**	1000.00-	**	1200.00	**	100.00-	**	100.00-
23 JUL 80	1112	22.00	**	1000.00-	**	1400.00	**	100.00-	**	100.00-
30 JUL 80	1140	**	**	**	**	1400.00	**	**	**	**
30 JUL 80	1141	**	**	**	**	1500.00	**	**	**	**
30 JUL 80	1142	**	**	**	**	1700.00	**	**	**	**
TREATMENT : UNKNOWN										
6 AUG 80	1115	16.00-	**	500.00-	**	500.00	**	10.00-	**	50.00-
6 AUG 80	1116	14.00	**	500.00-	**	700.00	**	10.00-	**	50.00-
6 AUG 80	1117	**	500.00-	**	500.00	**	10.00-	**	50.00-	**
1 OCT 80	1115	**	**	**	**	1100.00	**	**	**	**
1 OCT 80	1117	**	**	**	1100.00	**	**	**	**	**
SAMPLE SIZE		7.00	9.00	18.00	17.00	28.00	12.00	16.00	9.00	12.00
MAXIMUM		24.00	500.00-	1000.00-	3800.00	3900.00	100.00-	100.00-	100.00-	100.00-
MINIMUM		10.00-	500.00-	500.00-	200.00	500.00	10.00-	10.00-	50.00-	50.00-
MEAN		17.14	500.00	615.38	1629.41	1800.00	64.17	68.75	94.44	91.67
STANDARD DEV		6.20	0.00	219.26	1140.59	942.34	38.72	37.75	16.67	19.46
RATIO VALUE		1.21	UNDEF	.94	1.40	.65	1.06	.60	1.27	.65
TREND TEST		NEG	NULL	POS	NEG	POS	POS	POS	NEG	POS
COEF OF SKEWNESS		-.00	.00	1.23	.58	.82	-.18	-.42	-2.33	-1.71
COEF OF VAR (%)		36.18	0.00	35.63	70.00	52.35	60.34	54.91	17.65	21.23

COLLECTED BY : ERDA
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	169 DISSOLVED COPPER UG/L	171 TOTAL COPPER UG/L	174 TOTAL IRON UG/L	175 DISSOLVED IRON UG/L	178 DISSOLVED LEAD UG/L	180 TOTAL LEAD UG/L	184 TOTAL MANGANESE UG/L	185 DISSOLVED MANGANESE UG/L	190 DISSOLVED NICKEL UG/L
10 MAY 80	800	100.00-	**	**	400000.00	100.00-	**	**	19000.00	6000.00
10 MAY 80	805	**	100.00-	360000.00	**	**	100.00-	18000.00	**	**
12 MAY 80	1300	100.00-	**	**	410000.00	100.00-	**	**	19000.00	7000.00
COLLECTED BY :		WEST. WYO COLLEGE								
12 MAY 80	1305	**	100.00-	400000.00	**	**	100.00-	14000.00	**	**
22 MAY 80	1300	**	100.00-	30600.00	**	**	100.00-	8400.00	**	**
22 MAY 80	1301	100.00-	**	**	89300.00	100.00-	**	**	8800.00	1800.00
26 MAY 80	1305	100.00-	**	**	79600.00	100.00-	**	**	5000.00	1300.00
26 MAY 80	1306	**	100.00-	4300.00	**	**	100.00-	5000.00	**	**
28 MAY 80	1300	100.00-	**	**	51600.00	100.00-	**	**	3800.00	1800.00
28 MAY 80	1301	**	100.00-	3700.00	**	**	100.00-	4200.00	**	**
11 JUN 80	1300	**	100.00-	5200.00	**	**	100.00-	2000.00	**	**
11 JUN 80	1301	100.00-	**	**	6000.00-	100.00-	**	**	1900.00	610.00
25 JUN 80	1300	**	100.00-	51000.00	**	**	100.00-	2900.00	**	**
25 JUN 80	1301	100.00-	**	**	5200.00	100.00-	**	**	3100.00	670.00
9 JUL 80	1300	**	100.00-	39900.00	**	**	1300.00	3420.00	**	**
9 JUL 80	1301	100.00-	**	**	58800.00	1200.00	**	**	3840.00	400.00
23 JUL 80	1110	**	100.00-	52000.00	**	**	100.00-	3600.00	**	**
23 JUL 80	1111	**	100.00-	63000.00	**	**	100.00-	3600.00	**	**
23 JUL 80	1112	**	100.00-	60000.00	**	**	100.00-	3600.00	**	**
TREATMENT :		UNKNOWN								
6 AUG 80	1115	**	30.00-	56000.00	**	**	200.00-	2300.00	**	**
6 AUG 80	1116	**	30.00-	63000.00	**	**	200.00-	2300.00	**	**
6 AUG 80	1117	30.00-	**	**	56000.00	200.00-	**	**	2000.00	200.00
SAMPLE SIZE		9.00	13.00	13.00	9.00	9.00	13.00	13.00	9.00	9.00
MAXIMUM		100.00-	100.00-	400000.00	410000.00	1200.00	1300.00	18000.00	19000.00	7000.00
MINIMUM		30.00-	30.00-	3700.00	5200.00	100.00-	100.00-	2000.00	1900.00	200.00
MEAN		92.22	89.23	91438.46	128800.00	233.33	207.69	5640.00	7382.22	2197.78
STANDARD DEV		23.33	26.29	130215.75	159342.18	364.01	330.31	4943.36	6895.39	2517.91
RATIO VALUE		1.27	.64	.75	.60	2.35	2.36	.25	.38	.67
TREND TEST		NEG	POS	POS	POS	NEG	NEG	POS	POS	POS
COEF OF SKEWNESS		-2.33	-1.84	1.74	1.15	2.30	2.98	1.59	1.00	1.12
COEF OF VAR (%)		25.30	29.46	142.41	124.00	156.00	159.04	87.65	93.41	114.57

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNKNOWN

DATE	TIME	192 TOTAL NICKEL UG/L	206 DISSOLVED ZINC UG/L	208 TOTAL ZINC UG/L	217 TOTAL ALUMINUM UG/L	218 DISSOLVED ALUMINUM UG/L	233 DISSOLVED SELENIUM UG/L	235 TOTAL SELENIUM UG/L	467 DISSOLVED SOLIDS 180C	467 ROE MG/L	501 TOTAL AMMONIA NH4 MG/L
3 OCT 80	1116	**	**	**	**	**	**	**		**	84.00
COLLECTED BY :			ERDA								
TREATMENT : UNTREATED											
10 MAY 80	800	**	400.00	**	**	1600.00	40.00	**	4820.00		**
10 MAY 80	805	6500.00	**	850.00	1000.00-	**	**	20.00	**		13.00
12 MAY 80	1300	**	150.00	**	**	1500.00	40.00	**	5000.00		**
COLLECTED BY :		WEST. WYO COLLEGE									
12 MAY 80	1305	1500.00	**	210.00	1000.00-	**	**	10.00-	**		13.00
15 MAY 80	1300	**	**	**	**	**	**	**	5690.00		**
15 MAY 80	1305	**	**	**	**	**	**	**	**		13.00
17 MAY 80	1300	**	**	**	**	**	**	**	8500.00		**
17 MAY 80	1305	**	**	**	**	**	**	**	**		11.00
19 MAY 80	1300	**	**	**	**	**	**	**	4720.00		**
19 MAY 80	1305	**	**	**	**	**	**	**	**		10.00
22 MAY 80	1300	2300.00	**	1300.00	600.00	**	**	10.00	**		5.50
22 MAY 80	1301	**	120.00	**	**	600.00	10.00	**	2310.00		**
26 MAY 80	1305	**	100.00	**	**	500.00-	20.00	**	1730.00		**
26 MAY 80	1306	1700.00	**	290.00	500.00-	**	**	10.00	**		4.40
28 MAY 80	1300	**	100.00-	**	**	500.00-	10.00-	**	1170.00		**
28 MAY 80	1301	2800.00	**	260.00	500.00-	**	**	10.00-	**		3.20
4 JUN 80	1305	**	**	**	**	**	**	**	**		1.40
4 JUN 80	1306	**	**	**	**	**	**	**	600.00		**
11 JUN 80	1300	950.00	**	100.00-	500.00-	**	**	15.00	**		3.50
11 JUN 80	1301	**	100.00	**	**	500.00-	17.00	**	590.00		**
18 JUN 80	1310	**	**	**	**	**	**	**	**		.10-
18 JUN 80	1311	**	**	**	**	**	**	**	960.00		**
25 JUN 80	1300	680.00	**	100.00-	500.00-	**	**	240.00	**		5.10
25 JUN 80	1301	**	100.00	**	**	500.00-	27.00	**	1150.00		**
2 JUL 80	1300	**	**	**	**	**	**	**	**		.10-
2 JUL 80	1301	**	**	**	**	**	**	**	764.00		**
9 JUL 80	1300	400.00	**	70.00	500.00-	**	**	75.00	**		2.20
9 JUL 80	1301	**	50.00	**	**	500.00-	**	**	788.00		**
16 JUL 80	1105	**	**	**	**	**	**	**	**		.10-
16 JUL 80	1106	**	**	**	**	**	**	**	**		.10-
16 JUL 80	1107	**	**	**	**	**	**	**	**		.10-
23 JUL 80	1110	500.00-	**	50.00-	2000.00-	**	**	34.00	**		.10-
23 JUL 80	1111	500.00-	**	100.00	2000.00-	**	**	38.00	**		.39
23 JUL 80	1112	500.00-	**	80.00	3600.00	**	**	12.00	**		.10-
30 JUL 80	1140	**	**	**	**	**	**	**	**		.64
30 JUL 80	1141	**	**	**	**	**	**	**	**		5.90
30 JUL 80	1142	**	**	**	**	**	**	**	**		.39
TREATMENT : UNKNOWN											
6 AUG 80	1115	200.00	**	10.00	1000.00-	**	**	50.00	**		.10-
6 AUG 80	1116	200.00	**	20.00	1000.00-	**	**	20.00	**		.13
6 AUG 80	1117	**	10.00	**	**	1000.00-	20.00	**	836.00		**
1 OCT 80	1115	**	**	**	**	**	**	**	**		46.00
1 OCT 80	1117	**	**	**	**	**	**	**	188.00		**
SAMPLE SIZE		13.00	9.00	13.00	13.00	9.00	8.00	13.00	16.00		27.00
MAXIMUM		6500.00	400.00	1300.00	3600.00	1600.00	40.00	240.00	8690.00		84.00
MINIMUM		200.00	10.00	10.00	500.00-	500.00-	10.00-	10.00-	188.00		.10-
MEAN		1440.77	125.56	264.62	1130.77	800.00	23.00	41.85	2301.00		8.28
STANDARD DEV		1729.39	110.47	381.04	910.48	455.52	11.87	62.67	2049.59		17.75
RATIO VALUE		.93	.78	1.65	1.28	.73	1.50	1.90	.15		.93
TREND TEST		POS	POS	NEG	NEG	POS	NEG	NEG	POS		POS
COEF OF SKEWNESS		2.01	1.73	1.87	1.65	.95	.45	2.58	.67		3.31
COEF OF VAR (%)		120.03	87.98	144.00	80.52	56.94	51.60	149.76	89.07		214.36

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNKNOWN

DATE	TIME	502 DISSOLVED AMMONIA NH4 MG/L	504 DISSOLVED NITRATE NO3 MG/L	518 DISSOLVED MERCURY UG/L	520 TOTAL MERCURY UG/L	612 LABORATORY PH	614 DISSOLVED THIOSULFATE MG/L	628 TOTAL CO3 MG/L	661 FIELD CONDUCTIVITY MICROMHOS	672 TOTAL SULFATE MG/L (SO4)
1 OCT 10	1116	**	**	**	**	8.47	**	73.66	**	34.10
COLLECTED BY :			ERDA							
TREATMENT : UNTREATED										
10 MAY 80	800	57.00	5.20	50.00-	**	4.54	.10-	**	**	**
10 MAY 80	805	**	85.00	**	50.00-	6.37	**	**	75000.00	3370.00
12 MAY 80	1300	17.00	120.00	50.00-	**	4.85	.10-	**	**	**
COLLECTED BY :		WEST. WYO COLLEGE								
12 MAY 80	1305	**	54.00	**	50.00-	6.41	**	**	75000.00	3200.00
15 MAY 80	1300	17.00	108.00	**	**	4.25	.10-	**	**	**
15 MAY 80	1305	**	54.00	**	**	5.78	**	**	5800.00	3980.00
17 MAY 80	1300	14.00	107.00	**	**	4.10	.10-	**	**	**
17 MAY 80	1305	**	25.00	**	**	6.00	**	**	5700.00	3870.00
19 MAY 80	1300	9.60	105.00	**	**	4.16	.10-	**	**	**
19 MAY 80	1305	**	29.00	**	**	5.96	**	**	5400.00	3400.00
22 MAY 80	1300	**	12.00	**	50.00-	5.50	**	**	2300.00	1310.00
22 MAY 80	1301	.10-	11.00	50.00-	**	5.55	.10-	**	**	**
26 MAY 80	1305	.10-	85.00	50.00-	**	5.99	.10-	**	**	**
26 MAY 80	1306	**	106.00	**	50.00-	5.85	**	**	1900.00	975.00
28 MAY 80	1300	.10-	62.00	50.00-	**	6.20	.10-	**	**	**
28 MAY 80	1301	**	84.00	**	50.00-	6.00	**	**	1400.00	650.00
4 JUN 80	1305	**	**	**	**	6.45	**	**	1700.00	267.00
4 JUN 80	1306	1.60	**	**	**	6.98	.10-	**	**	**
11 JUN 80	1300	**	36.00	**	50.00-	6.11	**	**	1400.00	356.00
11 JUN 80	1301	24.00	70.00	50.00-	**	6.32	.10-	**	**	**
18 JUN 80	1310	**	**	**	**	5.28	**	**	1400.00	660.00
18 JUN 80	1311	.10-	**	**	**	5.04	.10-	**	**	**
25 JUN 80	1300	**	55.00	**	1.00-	4.21	**	**	2000.00	732.00
25 JUN 80	1301	4.60	55.00	1.00-	**	4.19	.10-	**	**	**
2 JUL 80	1300	**	**	**	**	4.10	**	**	920.00	443.00
2 JUL 80	1301	2.20	**	**	**	4.32	.10-	**	**	**
9 JUL 80	1300	**	67.00	**	1.00-	4.43	**	**	920.00	441.00
9 JUL 80	1301	2.80	70.00	1.00-	**	4.52	1.00	**	**	**
16 JUL 80	1105	**	**	**	**	4.45	**	**	1600.00	542.00
16 JUL 80	1106	**	**	**	**	4.08	**	**	**	537.00
16 JUL 80	1107	**	**	**	**	4.04	**	**	**	538.00
23 JUL 80	1110	**	2.40	**	1.00-	4.59	**	**	950.00	706.00
23 JUL 80	1111	**	.10-	**	1.00-	3.99	**	**	**	706.00
23 JUL 80	1112	**	.70	**	1.00-	3.95	**	**	**	709.00
30 JUL 80	1140	**	**	**	**	3.39	**	**	1920.00	717.00
30 JUL 80	1141	**	**	**	**	3.29	**	**	**	724.00
30 JUL 80	1142	**	**	**	**	3.33	**	**	**	729.00
TREATMENT : UNKNOWN										
6 AUG 80	1115	**	**	**	.50-	3.45	**	**	1800.00	89.00
6 AUG 80	1116	**	**	**	.50-	3.45	**	**	**	592.00
6 AUG 80	1117	.10-	**	.50-	**	3.39	**	**	**	**
1 OCT 80	1115	**	**	**	**	8.40	**	78.57	210.00	33.00
1 OCT 80	1117	57.00	**	**	**	8.48	**	78.08	**	**
SAMPLE SIZE		16.00	25.00	9.00	13.00	43.00	14.00	3.00	19.00	27.00
MAXIMUM		57.00	120.00	50.00-	50.00-	8.48	1.00	78.57	75000.00	3980.00
MINIMUM		.10-	.10-	.50-	.50-	3.29	.10-	73.66	210.00	33.00
MEAN		12.96	56.34	33.61	23.54	5.12	.16	76.77	9858.95	1122.60
STANDARD DEV		18.78	38.19	24.58	25.50	1.39	.24	2.71	23012.45	1223.16
RATIO VALUE		1.22	1.68	.56	.33	.93	1.16	2.50	.53	.48
TREND TEST		POS	NEG	POS	POS	POS	POS	NULL	POS	POS
COEF OF SKEWNESS		1.58	-.03	-.67	.15	.78	3.21	-.56	2.48	1.46
COEF OF VAR (%)		144.96	67.80	73.14	108.33	27.07	146.41	3.53	233.42	108.96

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNKNOWN

DATE	TIME	674 DISSOLVED BORON MG/L AS B	676 DISSOLVED THIOCYANATE MG/L	677 DISS TETRA-THIONATE MG/L	679 DISS CARBON (ORG+INORG) MG/L	685 TOTAL PHENOLS UG/L	736 FIELD BICARBONATE ION MG/L AS HCO3	737 FIELD CARBONATE ION MG/L AS CO3	738 TOTAL THIOCYANATE MG/L	739 TOTAL TETRA-THIONATE MG/L
1 OCT 10	1116	1.10	**	**	**	**	**	**	**	**
COLLECTED BY :			ERDA							
TREATMENT : UNTREATED										
10 MAY 80	800	.70	.10-	.10-	74.00	**	**	**	**	**
10 MAY 80	805	.70	**	**	**	**	410.00	0.00	.10-	.10-
12 MAY 80	1300	.70	.10-	.10-	95.00	**	**	**	**	**
COLLECTED BY :		WEST. WYO COLLEGE								
12 MAY 80	1305	.90	**	**	**	**	280.00	0.00	.10-	.10-
15 MAY 80	1300	.90	.10-	.10-	59.00	**	**	**	**	**
15 MAY 80	1305	1.10	**	**	**	**	130.00	0.00	.10-	.10-
17 MAY 80	1300	.90	.10-	.10-	90.00	**	**	**	**	**
17 MAY 80	1305	1.00	**	**	**	**	250.00	0.00	.10-	.10-
19 MAY 80	1300	.70	.10-	.10-	70.00	**	**	**	**	**
19 MAY 80	1305	.90	**	**	**	**	**	**	.10-	.10-
22 MAY 80	1300	2.10	**	**	**	**	160.00	0.00	.10-	.10-
22 MAY 80	1301	2.40	.10-	.10-	**	**	**	**	**	**
26 MAY 80	1305	3.60	.10-	.10-	**	**	**	**	**	**
26 MAY 80	1306	3.80	**	**	**	**	210.00	0.00	.10-	.10-
28 MAY 80	1300	2.90	.10-	.10-	**	**	**	**	**	**
28 MAY 80	1301	3.00	**	**	**	**	190.00	0.00	.10-	.10-
4 JUN 80	1305	1.50	**	**	**	**	150.00	**	.10-	.10-
4 JUN 80	1306	1.60	.10-	.10-	71.00	**	**	**	**	**
11 JUN 80	1300	2.00	**	**	**	**	240.00	1.00-	.10-	.10-
11 JUN 80	1301	2.80	.10-	.10-	70.00	**	**	**	**	**
18 JUN 80	1310	3.00	**	**	**	**	49.00	1.00-	.10-	.10-
18 JUN 80	1311	.20	.10-	.10-	68.00	**	**	**	**	**
25 JUN 80	1300	2.90	**	**	**	**	62.00	1.00-	1.20	.10-
25 JUN 80	1301	2.30	.10-	.10-	48.00	**	**	**	**	**
2 JUL 80	1300	3.80	**	**	**	**	8.70	1.00-	1.60	.10-
2 JUL 80	1301	3.80	.10-	.10-	51.00	**	**	**	**	**
9 JUL 80	1300	3.30	**	**	**	**	7.40	1.00-	.10-	.10-
9 JUL 80	1301	1.90	.30	.50	43.00	**	**	**	**	**
16 JUL 80	1105	2.00	**	**	**	4.90	24.00	.10-	.10-	1.60
16 JUL 80	1106	1.50	**	**	**	**	**	**	.10-	.10-
16 JUL 80	1107	1.50	**	**	**	**	**	**	.10-	.10-
23 JUL 80	1110	1.90	**	**	**	.20	5.50	.10-	**	**
23 JUL 80	1111	1.20	**	**	**	**	**	**	**	**
23 JUL 80	1112	1.40	**	**	**	**	**	**	**	**
30 JUL 80	1140	1.40	**	**	**	.20	13.00	.10-	**	**
30 JUL 80	1141	1.50	**	**	**	**	**	**	**	**
30 JUL 80	1142	1.70	**	**	**	**	**	**	**	**
TREATMENT : UNKNOWN										
6 AUG 80	1115	.50	**	**	**	.10-	36.00	.10-	**	**
6 AUG 80	1116	.70	**	**	**	**	**	**	**	**
6 AUG 80	1117	.50	**	**	23.00	**	**	**	**	**
1 OCT 80	1115	1.10	**	**	**	**	30.00	.10-	**	**
1 OCT 80	1117	1.10	**	**	190.00	**	**	**	**	**
SAMPLE SIZE		43.00	14.00	14.00	13.00	4.00	18.00	17.00	17.00	17.00
MAXIMUM		3.80	.30	.50	190.00	4.90	410.00	1.00-	1.60	1.60
MINIMUM		.20	.10-	.10-	23.00	.10-	5.50	0.00	.10-	.10-
MEAN		1.73	.11	.13	73.23	1.35	125.31	.32	.25	.19
STANDARD DEV		1.02	.05	.11	40.01	2.37	118.44	.45	.44	.36
RATIO VALUE		.71	1.16	1.16	1.80	1.75	.51	.59	1.26	2.26
TREND TEST		POS	POS	POS	NEG	NEG	POS	POS	POS	NEG
COEF OF SKEWNESS		.66	3.21	3.21	1.85	1.00	.76	.85	2.42	3.64
COEF OF VAR (%)		58.61	46.77	83.15	54.64	175.34	94.52	139.75	172.96	193.27

COLLECTED BY : ERDA
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	740 TOTAL THIOSULFATE MG/L
10 MAY 80	805	.10-
COLLECTED BY :		WEST. WYO COLLEGE
12 MAY 80	1305	.10-
15 MAY 80	1305	.10-
17 MAY 80	1305	.10-
19 MAY 80	1305	.10-
22 MAY 80	1300	.10-
26 MAY 80	1306	.10-
28 MAY 80	1301	.10-
4 JUN 80	1305	.10-
11 JUN 80	1300	.10-
18 JUN 80	1310	.10-
25 JUN 80	1300	.06
2 JUL 80	1300	1.20
9 JUL 80	1300	.10-
16 JUL 80	1105	.10-
16 JUL 80	1106	.10-
16 JUL 80	1107	.10-
SAMPLE SIZE		17.00
MAXIMUM		1.20
MINIMUM		.06
MEAN		.16
STANDARD DEV		.27
RATIO VALUE		2.33
TREND TEST		NEG
COEF OF SKEWNESS		3.63
COEF OF VAR (%)		164.81

**STATION NO. 7847 TS-1S 3P8
LATITUDE 40-25-00 LONGITUDE 109-40-00 IN UTAH ELEVATION 5960.00 FT.
NE1/4-SW1/4 SECTION 23 TOWNSHIP 4S RANGE 20E SALT LAKE P.M. DRAINAGE BASIN CODE 14100000
SITE TYPE WELL USF MONITORING OR OBSERVATION (P) ERDA # 0
AQUIFER C DRAINAGE AREA 0.00 SQ. MI. NONCONTRIBUTING 0.00 SQ. MI. DISCHARGE PERMIT NO. 0
WELL DEPTH 542.0 FT. WELL PERMIT NO. 0

- AFTER A VALUE TAGS IT AS LESS THAN
+ AFTER A VALUE TAGS IT AS GREATER THAN

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	5 NO. USED IN SAMP ACCOUNT PROCEDURE	35 SAMPLE TREATMENT	42 CHEM OXYGEN DEMAND .25 NK2CRC7 MG/L	43 FIELD PH STAND. UNITS	45 TOTAL ALKALINITY MG/L	49 BICARBONATE ION MG/L	50 CARBONATE ION MG/L	53 TOT. RESIDUE ROE 105C MG/L	69 DISSOLVED AMMONIA MG/L (N)
17 MAY 80	1310	22.00	4.00	570.00	6.40	23.20	28.30	.10-	**	1.10
4 JUN 80	1310	5.00	3.00	83.00	6.90	355.00	434.00	.10-	2400.00	**
4 JUN 80	1311	6.00	4.00	150.00	**	264.00	322.00	.10-	**	**
11 JUN 80	1305	9.00	3.00	130.00	6.50	20.20	24.60	.10-	240.00	**
11 JUN 80	1306	10.00	4.00	80.00	**	20.00	24.40	.10-	**	7.00
SAMPLE SIZE		5.00	5.00	5.00	3.00	5.00	5.00	5.00	2.00	2.00
MAXIMUM		22.00	4.00	570.00	6.90	355.00	434.00	.10-	2400.00	7.00
MINIMUM		5.00	3.00	80.00	6.40	20.00	24.40	.10-	240.00	1.10
MEAN		10.40	3.60	202.60	6.60	136.48	166.66	.10	1320.00	4.05
STANDARD DEV		6.80	.55	207.58	.26	161.19	196.95	.00	1527.35	4.17
RATIO VALUE		2.02	4.17	1.77	4.39	2.14	2.14	0.00	4.00	4.00
TREND TEST		NEG	POS	NEG	NULL	NEG	NEG	POS	NULL	NULL
COEF OF SKEWNESS		1.04	-.37	1.27	.49	.47	.47	.00	0.00	-.00
COEF OF VAR (%)		65.43	15.21	102.46	4.01	118.11	118.18	.00	115.71	103.01

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	70 TOTAL AMMONIA MG/L (N)	101 TOT. ORGANIC CARBON MG/L	102 DISS ORGANIC CARBON MG/L	104 TOTAL INORGANIC CARBON MG/L	109 TOTAL CARBON MG/L	110 DISSOLVED INORGANIC CARBON MG/L	112 CYANIDE LG/L	115 TOTAL SULFIDE MG/L	116 DISSOLVED SULFIDE MG/L
17 MAY 80	1310	**	**	8.00	**	**	9.00	**	**	**
4 JUN 80	1310	**	75.00	**	95.00	160.00	**	**	**	**
4 JUN 80	1311	**	**	45.00	**	**	78.00	**	**	**
11 JUN 80	1305	.10-	164.00	**	4.00	168.00	**	50.00-	4.60	**
11 JUN 80	1306	**	**	41.00	**	**	4.00	50.00-	**	3.60
SAMPLE SIZE		1.00	2.00	3.00	2.00	2.00	3.00	2.00	1.00	1.00
MAXIMUM		.10-	164.00	45.00	95.00	168.00	78.00	50.00-	4.60	3.60
MINIMUM		.10-	75.00	8.00	4.00	160.00	4.00	50.00-	4.60	3.60
MEAN		.10	119.50	31.33	49.50	164.00	30.33	50.00	4.60	3.60
STANDARD DEV		UNDEF	62.93	20.31	64.35	5.66	41.36	0.00	UNDEF	UNDEF
RATIO VALUE		UNDEF	4.00	2.52	4.00	4.00	4.49	UNDEF	UNDEF	UNDEF
TREND TEST		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
COEF OF SKEWNESS		UNDEF	0.00	-.55	0.00	0.00	.57	.00	UNDEF	UNDEF
COEF OF VAR (%)		UNDEF	52.66	64.81	129.99	3.45	136.34	0.00	UNDEF	UNDEF

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	120 DISSOLVED CALCIUM MG/L	121 TOTAL CALCIUM MG/L	122 DISSOLVED MAGNESIUM MG/L	124 TOTAL MAGNESIUM MG/L	125 TOTAL SODIUM MG/L	126 DISSOLVED SODIUM MG/L	127 SODIUM ADSORPTION RATIO	128 PERCENT SODIUM	130 DISSOLVED POTASSIUM MG/L
17 MAY 80	1310	36.00	**	24.00	**	**	34.00	1.08	28.17	12.00
4 JUN 80	1310	**	260.00	**	27.00	170.00	**	**	**	**
4 JUN 80	1311	180.00	**	27.00	**	**	150.00	2.76	36.81	86.00
11 JUN 80	1305	**	37.50	**	1.00	20.00	**	**	**	**
11 JUN 80	1306	19.70	**	.30	**	**	150.00	9.19	86.62	7.70
SAMPLE SIZE		3.00	2.00	3.00	2.00	2.00	3.00	3.00	3.00	3.00
MAXIMUM		180.00	260.00	27.00	27.00	170.00	150.00	9.19	86.62	86.00
MINIMUM		19.70	37.50	.30	1.00	20.00	34.00	1.08	28.17	7.70
MEAN		78.57	148.75	17.10	14.00	95.00	111.33	4.34	50.53	35.23
STANDARD DEV		88.22	157.33	14.63	18.38	106.07	66.97	4.28	31.55	44.02
RATIO VALUE		4.47	4.00	2.53	4.00	4.00	2.25	1.81	1.93	4.49
TREND TEST		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
COEF OF SKEWNESS		.56	0.00	-.55	0.00	0.00	-.58	.48	.53	.57
COEF OF VAR (%)		112.29	105.77	85.53	131.32	111.65	60.16	98.65	62.43	124.93

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	131 TOTAL POTASSIUM MG/L	132 DISSOLVED CHLORIDE MG/L	133 DISSOLVED SULFATE MG/L	134 DISSOLVED FLUORIDE MG/L	135 TOTAL FLUORIDE MG/L	137 DISSOLVED ARSENIC UG/L	139 TOTAL ARSENIC UG/L	141 DISSOLVED BARIUM UG/L	143 TOTAL BARIUM UG/L
17 MAY 80	1310	**	36.00	228.00	.10-	**	**	**	**	**
4 JUN 80	1310	110.00	170.00	**	**	**	**	**	**	**
4 JUN 80	1311	**	120.00	1220.00	**	**	**	**	**	**
11 JUN 80	1305	7.60	12.00	**	**	.18	**	10.00-	**	500.00-
11 JUN 80	1306	**	9.90	48.60	.85	**	10.00-	**	500.00-	**
SAMPLE SIZE		2.00	5.00	3.00	2.00	1.00	1.00	1.00	1.00	1.00
MAXIMUM		110.00	170.00	1220.00	.85	.18	10.00-	10.00-	500.00-	500.00-
MINIMUM		7.60	9.90	48.60	.10-	.18	10.00-	10.00-	500.00-	500.00-
MEAN		58.80	69.58	498.87	.48	.18	10.00	10.00	500.00	500.00
STANDARD DEV		72.41	71.82	630.93	.53	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF
RATIO VALUE		4.00	1.95	4.44	4.00	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF
TREND TEST		NULL	NEG	NULL	NULL	NULL	NULL	NULL	NULL	NULL
COEF OF SKEWNESS		-.00	.47	.53	-.00	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF
COEF OF VAR (%)		123.14	103.22	126.47	111.65	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	152 DISSOLVED BORON UG/L	154 TOTAL BORON UG/L	156 DISSOLVED CADMIUM UG/L	158 TOTAL CADMIUM UG/L	161 DISSOLVED CHROMIUM UG/L	164 TOTAL CHROMIUM UG/L	165 DISSOLVED COPPER UG/L	171 TOTAL COPPER UG/L	174 TOTAL IRON UG/L
17 MAY 80	1310	100.00-	**	20.00	**	**	**	**	**	**
4 JUN 80	1310	**	1400.00	**	**	**	**	**	**	**
4 JUN 80	1311	500.00	**	**	**	**	**	**	**	**
11 JUN 80	1305	**	900.00	**	100.00-	**	100.00-	**	100.00-	1900.00
11 JUN 80	1306	200.00	**	100.00-	**	100.00-	**	100.00-	**	**
SAMPLE SIZE		3.00	2.00	2.00	1.00	1.00	1.00	1.00	1.00	1.00
MAXIMUM		500.00	1400.00	100.00-	100.00-	100.00-	100.00-	100.00-	100.00-	1900.00
MINIMUM		100.00-	900.00	20.00	100.00-	100.00-	100.00-	100.00-	100.00-	1900.00
MEAN		266.67	1150.00	60.00	100.00	100.00	100.00	100.00	100.00	1900.00
STANDARD DEV		208.17	353.55	56.57	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF
RATIO VALUE		4.33	4.00	4.00	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF
TREND TEST		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
COEF OF SKEWNESS		.43	0.00	0.00	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF
COEF OF VAR (%)		78.06	30.74	94.28	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	175 DISSOLVED IRON UG/L	178 DISSOLVED LEAD UG/L	180 TOTAL LEAD UG/L	184 TOTAL MANGANESE UG/L	185 DISSOLVED MANGANESE UG/L	190 DISSOLVED NICKEL UG/L	192 TOTAL NICKEL UG/L	206 DISSOLVED ZINC UG/L	208 TOTAL ZINC UG/L
11 JUN 80	1305	**	**	100.00-	140.00	**	**	100.00-	**	100.00-
11 JUN 80	1306	650.00	100.00-	**	**	180.00	100.00-	**	100.00-	**
SAMPLE SIZE		1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
MAXIMUM		650.00	100.00-	100.00-	140.00	180.00	100.00-	100.00-	100.00-	100.00-
MINIMUM		650.00	100.00-	100.00-	140.00	180.00	100.00-	100.00-	100.00-	100.00-
MEAN		650.00	100.00	100.00	140.00	180.00	100.00	100.00	100.00	100.00
STANDARD DEV		UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF
RATIO VALUE		UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF
TREND TEST		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
COEF OF SKEWNESS		UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF
COEF OF VAR (%)		UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF	UNDEF

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	217 TOTAL ALUMINUM UG/L	218 DISSOLVED ALUMINUM UG/L	233 DISSOLVED SELENIUM UG/L	235 TOTAL SELENIUM UG/L	467 DISSOLVED SOLIDS 180C MG/L	501 TOTAL AMMONIA NH4 MG/L	502 DISSOLVED AMMONIA NH4 MG/L	504 DISSOLVED NITRATE NO3 MG/L	518 DISSOLVED MERCURY UG/L
17 MAY 80	1310	**	**	**	**	330.00	**	1.40	13.00	**
4 JUN 80	1310	**	**	**	**	**	8.50	**	**	**
4 JUN 80	1311	**	**	**	**	2310.00	**	10.00	**	**
11 JUN 80	1305	500.00-	**	**	390.00	**	.10-	**	33.00	**
11 JUN 80	1306	**	500.00-	34.00-	**	148.00	**	9.00	32.00	50.00-
SAMPLE SIZE		1.00	1.00	1.00	1.00	3.00	2.00	3.00	3.00	1.00
MAXIMUM		500.00-	500.00-	34.00-	390.00	2310.00	8.50	10.00	33.00	50.00-
MINIMUM		500.00-	500.00-	34.00-	390.00	148.00	.10-	1.40	13.00	50.00-
MEAN		500.00	500.00	34.00	390.00	929.33	4.30	6.80	26.00	50.00
STANDARD DEV		UNDEF	UNDEF	UNDEF	UNDEF	1199.15	5.94	4.70	11.27	UNDEF
RATIO VALUE		UNDEF	UNDEF	UNDEF	UNDEF	4.48	4.00	2.54	2.37	UNDEF
TREND TEST		NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL	NULL
COEF OF SKEWNESS		UNDEF	UNDEF	UNDEF	UNDEF	.56	-.00	-.55	-.57	UNDEF
COEF OF VAR (%)		UNDEF	UNDEF	UNDEF	UNDEF	129.03	138.13	69.16	43.34	UNDEF

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	520 TOTAL MERCURY UG/L	612 LABORATORY PH	614 DISSOLVED THIOSULFATE MG/L	661 FIELD CONDUCTIVITY MICROMHOS	672 TOTAL SULFATE MG/L (SO4)	674 DISSOLVED BORON MG/L AS B	676 DISSOLVED THIOCYANATE MG/L	677 DISS TETRA-THIONATE MG/L	679 DISS CARBON (ORG+INORG) MG/L
17 MAY 80	1310	**	6.67	.10-	620.00	**	.10-	.10-	.10-	17.00
4 JUN 80	1310	**	7.05	**	350.00	1240.00	1.40	**	**	**
4 JUN 80	1311	**	7.52	.10-	**	**	.50	.10-	.10-	123.00
11 JUN 80	1305	50.00-	6.88	**	340.00	61.70	.90	**	**	**
11 JUN 80	1306	**	6.93	.10-	**	**	.20	.10-	.10-	45.00
SAMPLE SIZE		1.00	5.00	3.00	3.00	2.00	5.00	3.00	3.00	3.00
MAXIMUM		50.00-	7.52	.10-	620.00	1240.00	1.40	.10-	.10-	123.00
MINIMUM		50.00-	6.67	.10-	340.00	61.70	.10-	.10-	.10-	17.00
MEAN		50.00	7.01	.10	436.67	650.85	.62	.10	.10	61.67
STANDARD DEV		UNDEF	.32	.00	158.85	833.10	.54	.00	.00	54.93
RATIO VALUE		UNDEF	2.43	0.00	2.17	4.00	3.43	0.00	0.00	4.31
TREND TEST		NULL	NEG	NULL	NULL	NULL	NEG	NULL	NULL	NULL
COEF OF SKEWNESS		UNDEF	.72	.00	.57	-.00	.46	.00	.00	.41
COEF OF VAR (%)		UNDEF	4.51	.00	36.38	128.01	86.41	.00	.00	89.08

COLLECTED BY : WEST. WYO COLLEGE
TESTING LAB : WESTERN WYO COLLEGE
TREATMENT : UNTREATED

DATE	TIME	736 FIELD BICARBONATE ION MG/L AS HCO3	737 FIELD CARBONATE ION MG/L AS CO3	738 TOTAL THIOCYANATE MG/L	739 TOTAL TETRATHIONATE MG/L	740 TOTAL THIOSULFATE MG/L
17 MAY 80	1310	50.00	0.00	**	**	**
4 JUN 80	1310	150.00	0.00	.10-	.10-	.10-
11 JUN 80	1305	62.00	1.00-	.10-	.10-	.10-
SAMPLE SIZE		3.00	3.00	2.00	2.00	2.00
MAXIMUM		150.00	1.00-	.10-	.10-	.10-
MINIMUM		50.00	0.00	.10-	.10-	.10-
MEAN		87.33	.33	.10	.10	.10
STANDARD DEV		54.60	.58	0.00	0.00	0.00
RATIO VALUE		4.46	2.25	UNDEF	UNDEF	UNDEF
TREND TEST		NULL	NULL	NULL	NULL	NULL
COEF OF SKEWNESS		.55	.58	.00	.00	.00
COEF OF VAR (%)		62.52	173.21	0.00	0.00	0.00

APPENDIX B

WATER QUALITY CHANGES OVER TIME

Figure B-1. Water Quality at Well 3P1
- a. Total Dissolved Solids
- b. Field Conductance
- c. Calcium
- d. Magnesium
- e. Sodium
- f. Chloride
- g. Sulfate
- h. Bicarbonate
- i. Chemical Oxygen Demand
- j. Total Organic Carbon
- k. Total Ammonia
- l. pH

Figure B-2. Water Quality at Well 3P2
- a. Total Dissolved Solids
- b. Field Conductance
- c. Calcium
- d. Magnesium
- e. Sodium
- f. Chloride
- g. Sulfate
- h. Bicarbonate
- i. Total Organic Carbon
- j. Chemical Oxygen Demand
- k. Total Ammonia
- l. pH

Figure B-3. Water Quality at Well 3P3
- a. Total Dissolved Solids
- b. Magnesium
- c. Sodium
- d. Chloride
- e. Sulfate
- f. Bicarbonate
- g. Chemical Oxygen Demand
- h. Total Organic Carbon
- i. pH

Figure B-4. Water Quality at Well 3P7
- a. Total Dissolved Solids
- b. Field Conductance
- c. Calcium
- d. Magnesium
- e. Sodium
- f. Chloride
- g. Sulfate
- h. Bicarbonate
- i. Chemical Oxygen Demand
- j. Total Organic Carbon
- k. Total Ammonia
- l. pH

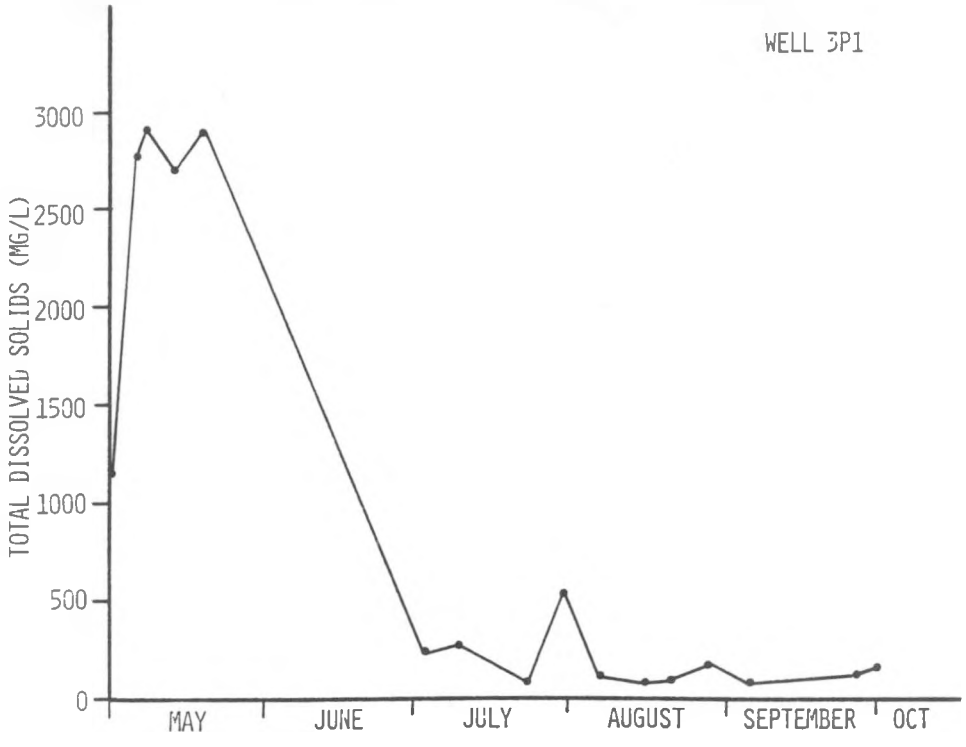

Figure B-1.a

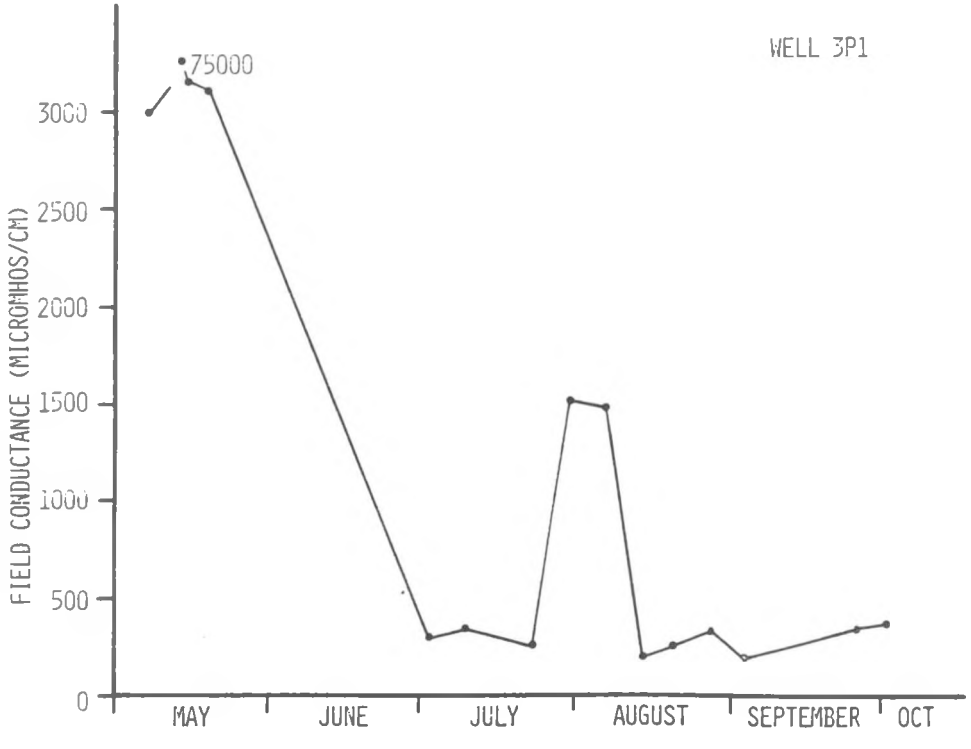

Figure B-1.b

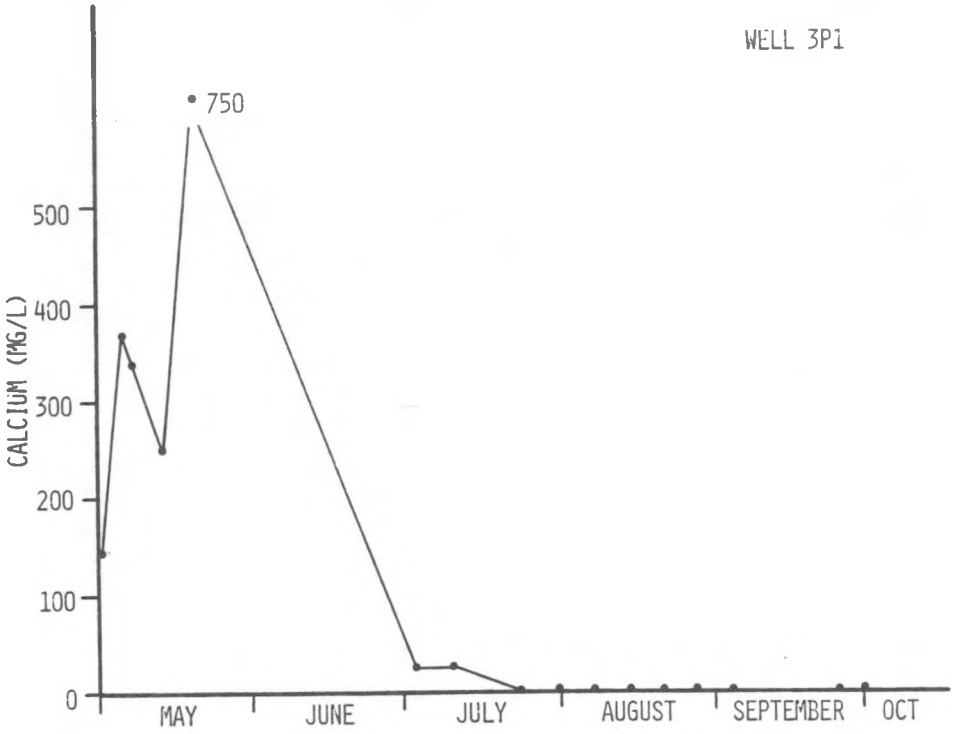

Figure B-1.c

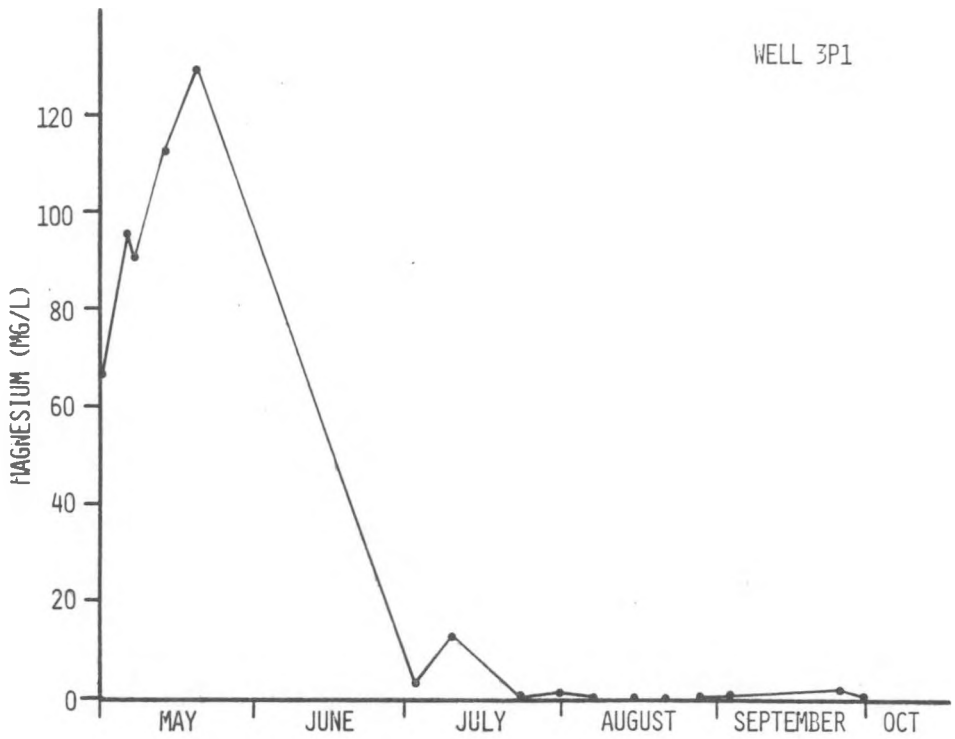

Figure B-1.d

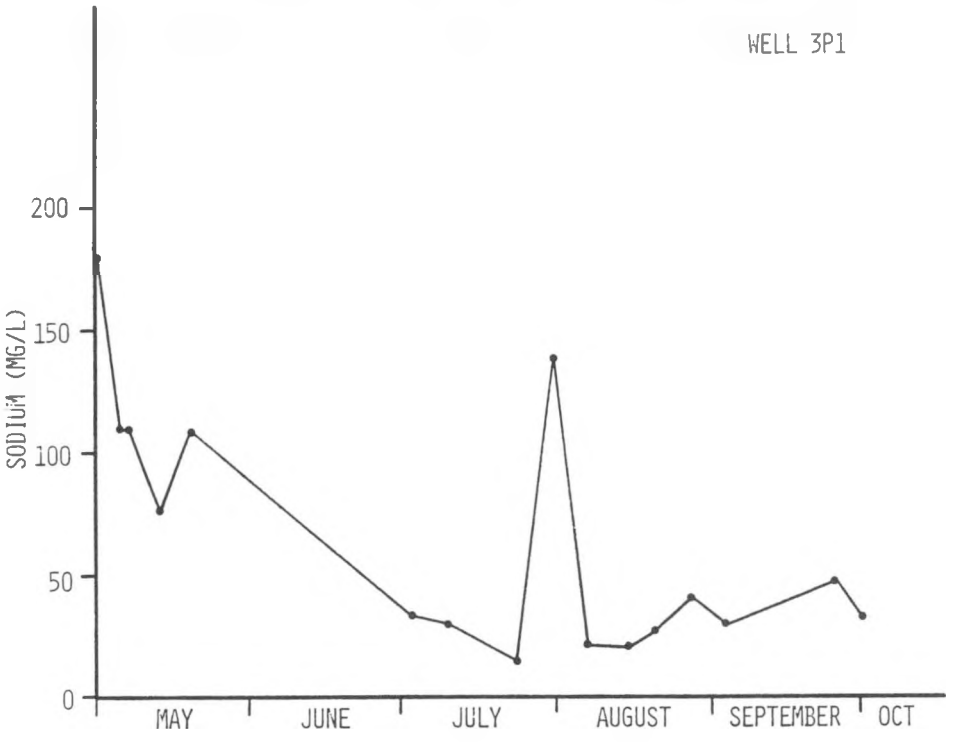

Figure B-1.e

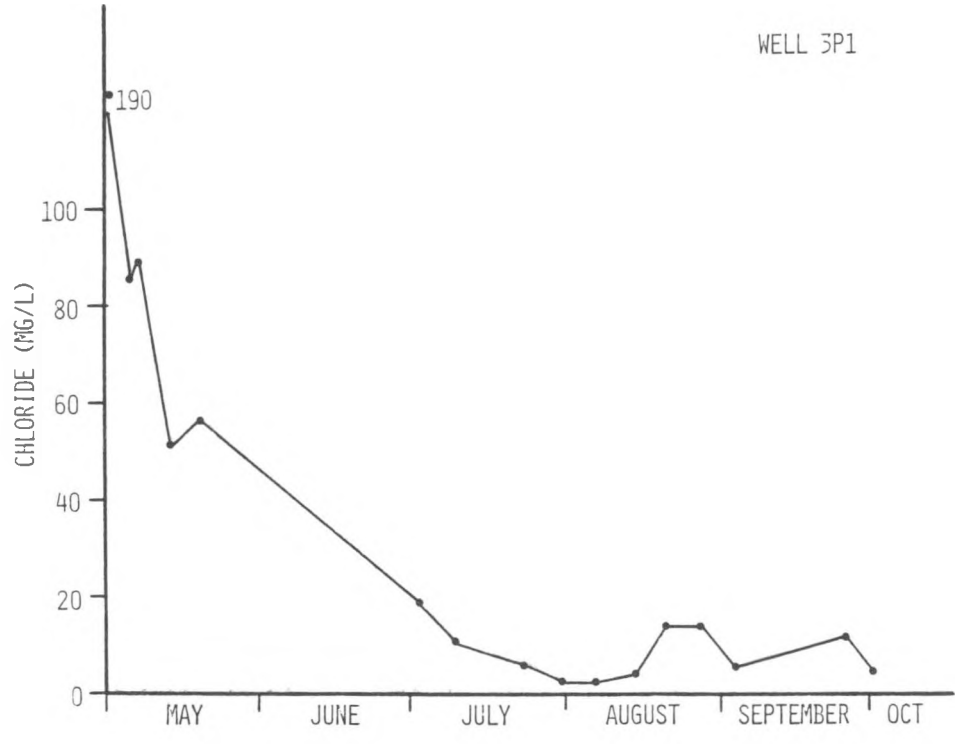

Figure B-1.f

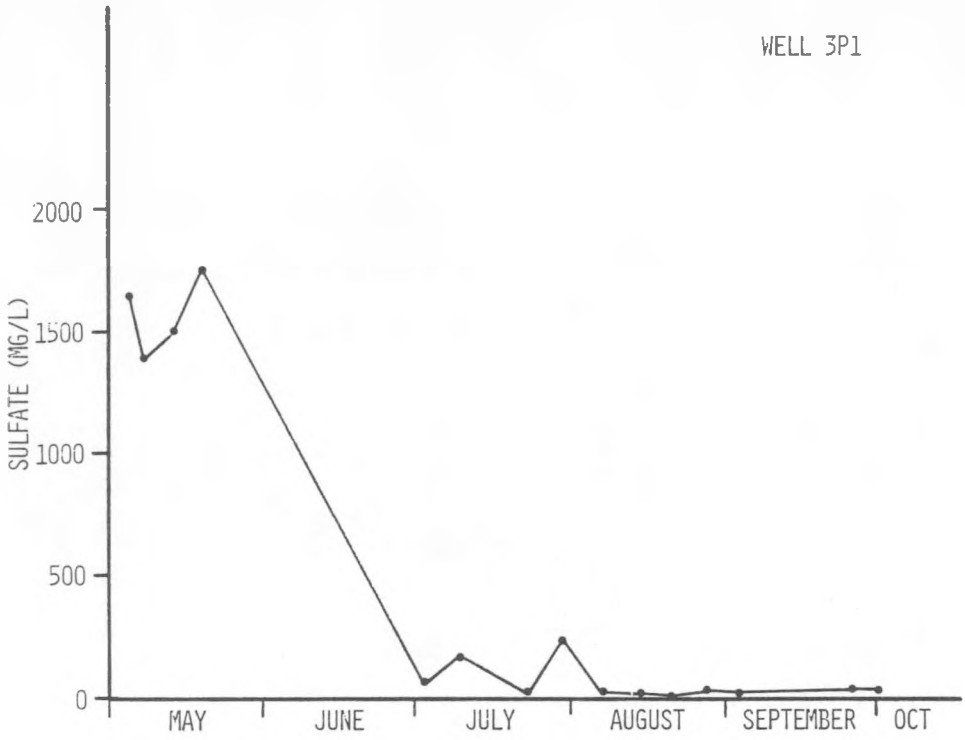

Figure B-1.g

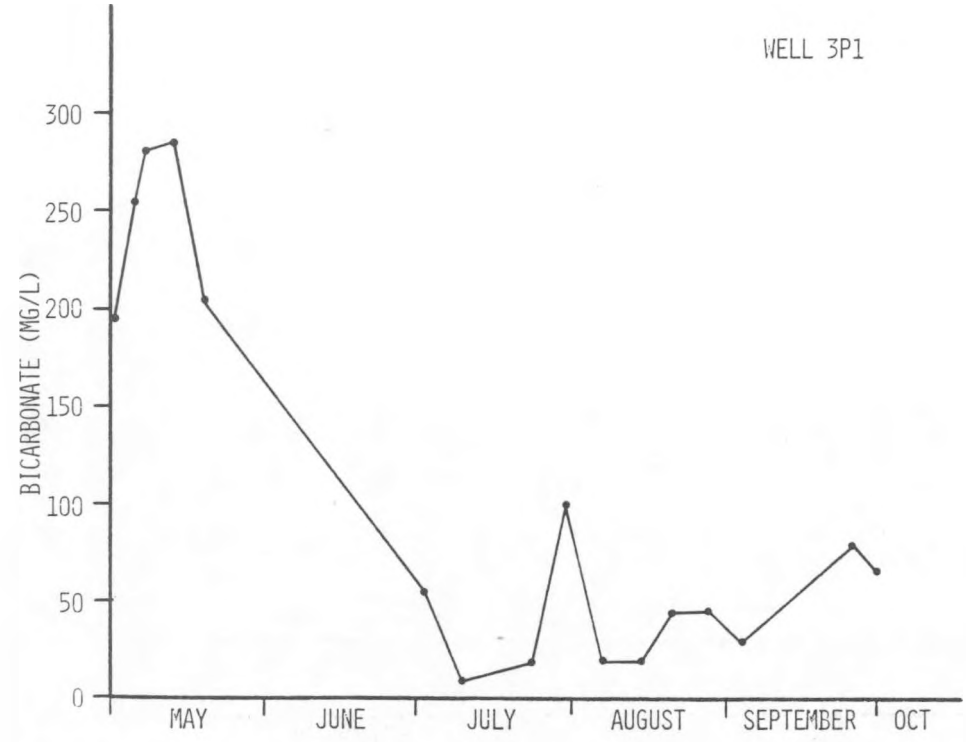

Figure B-1.h

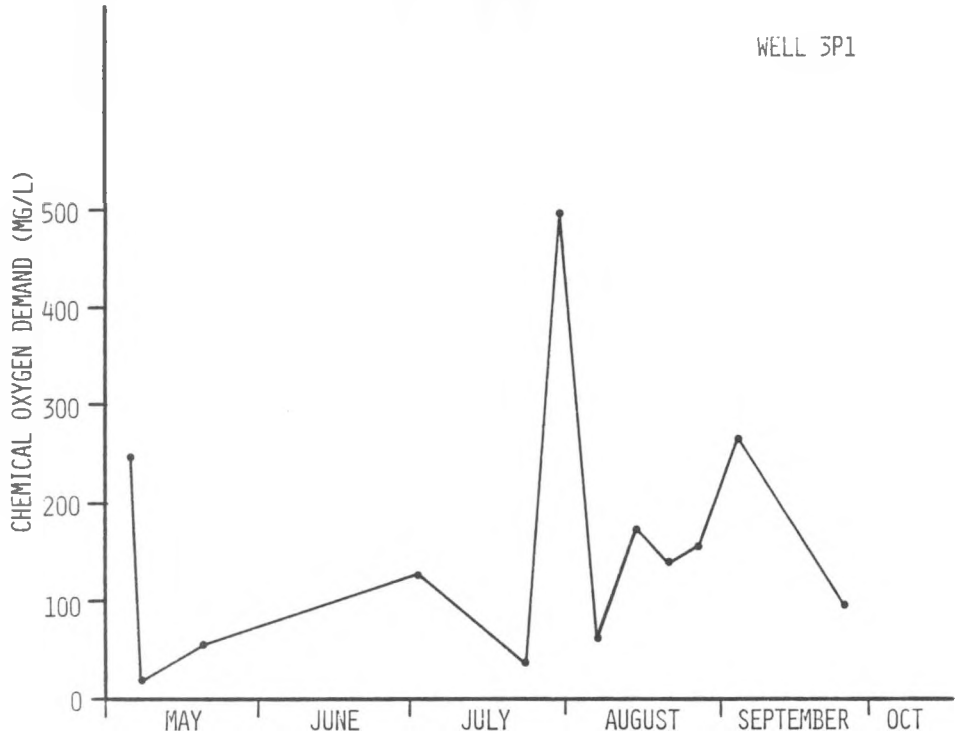

Figure B-1.i

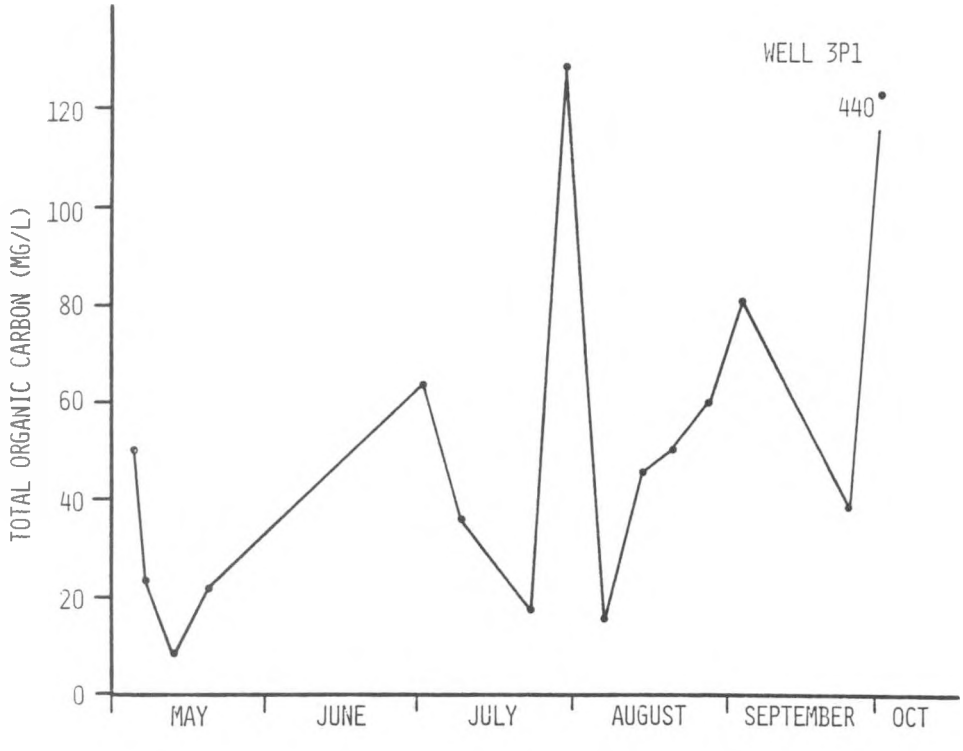

Figure B-1.j

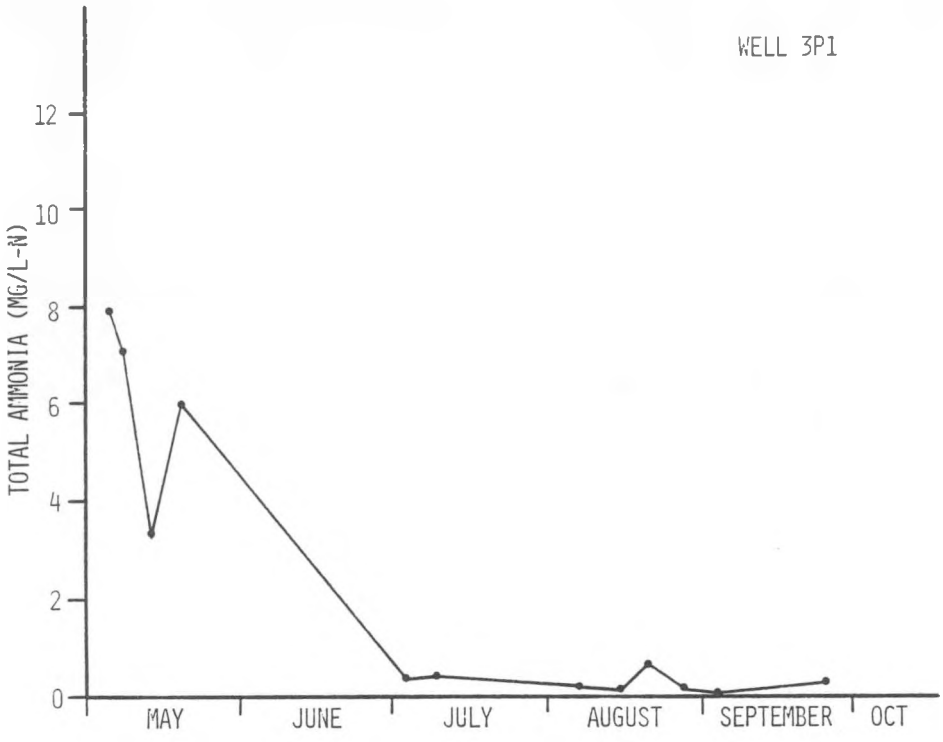

Figure B-1.k

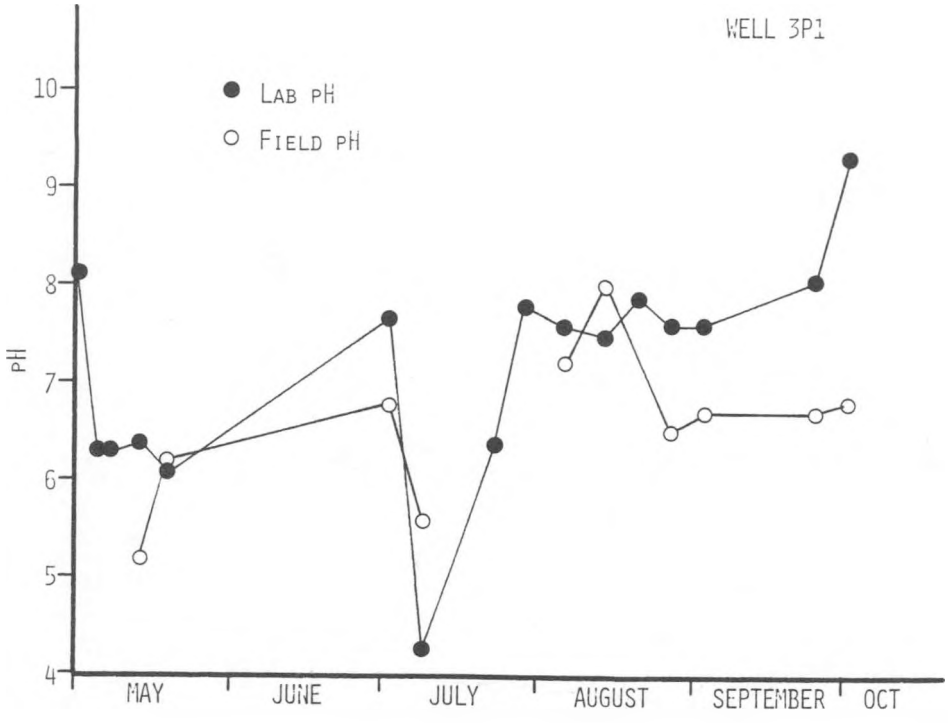

Figure B-1.l

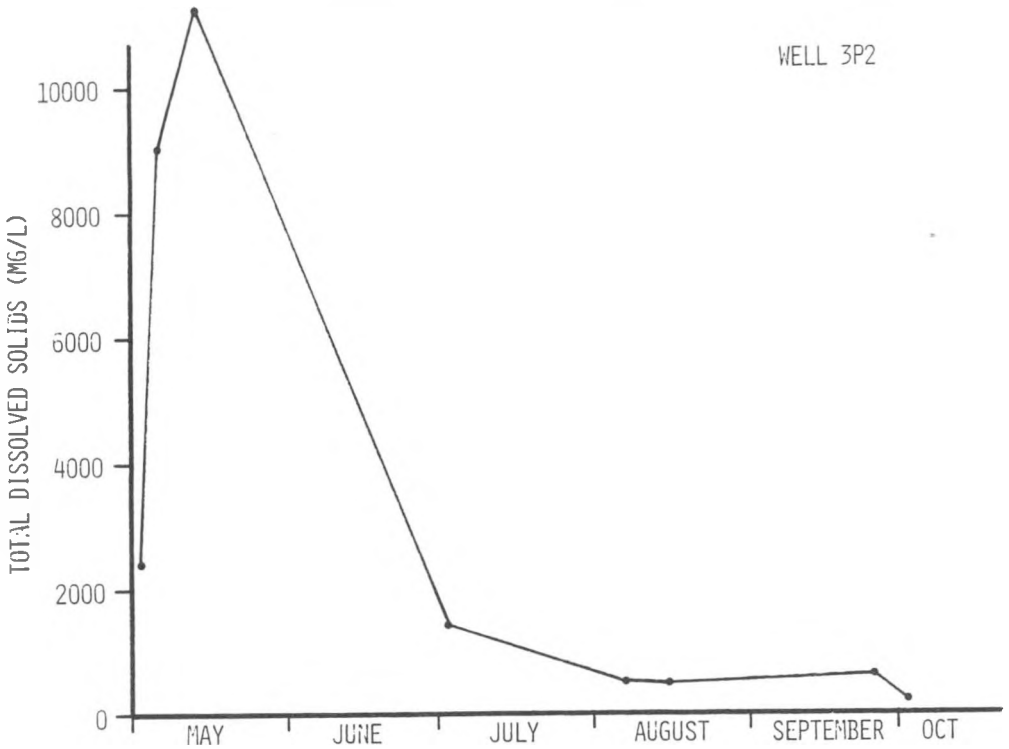

Figure B-2.a

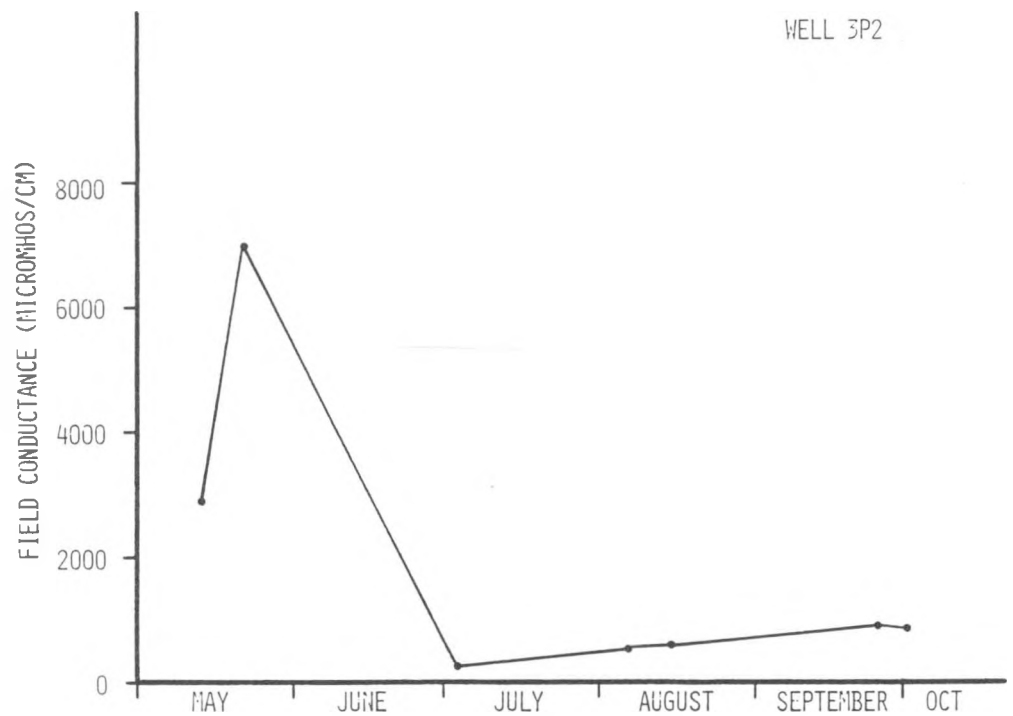

Figure B-2.b

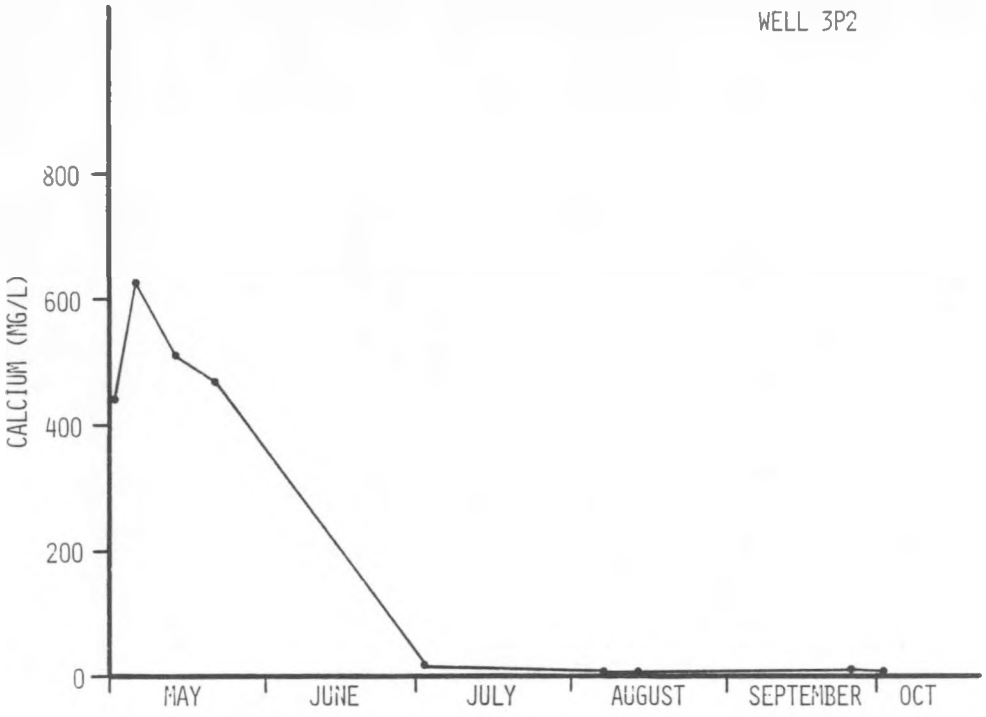

Figure B-2.c

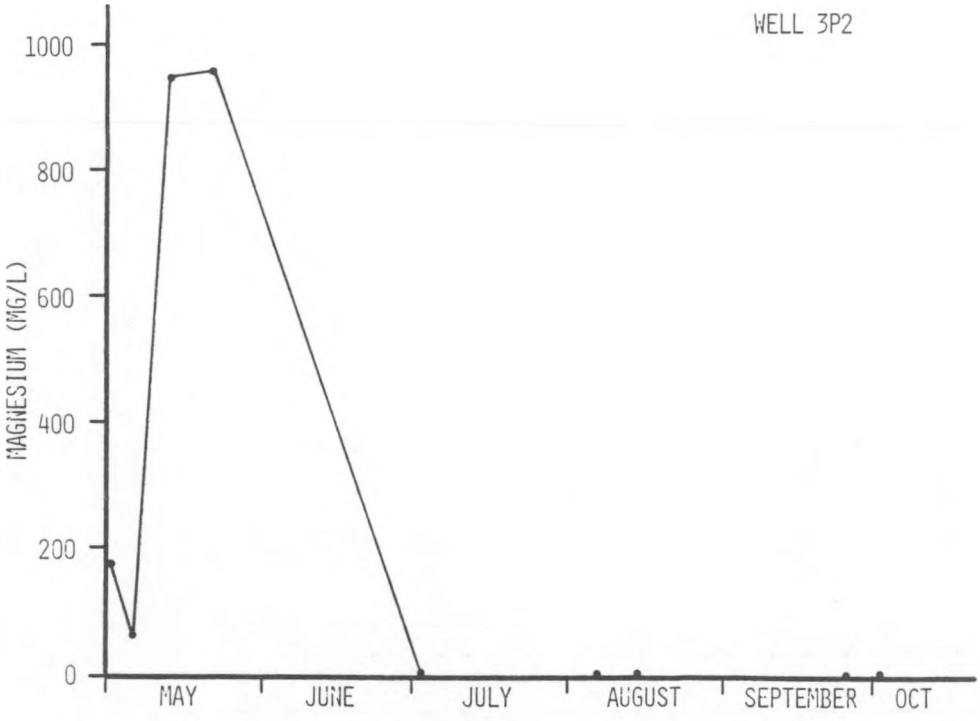

Figure B-2.d

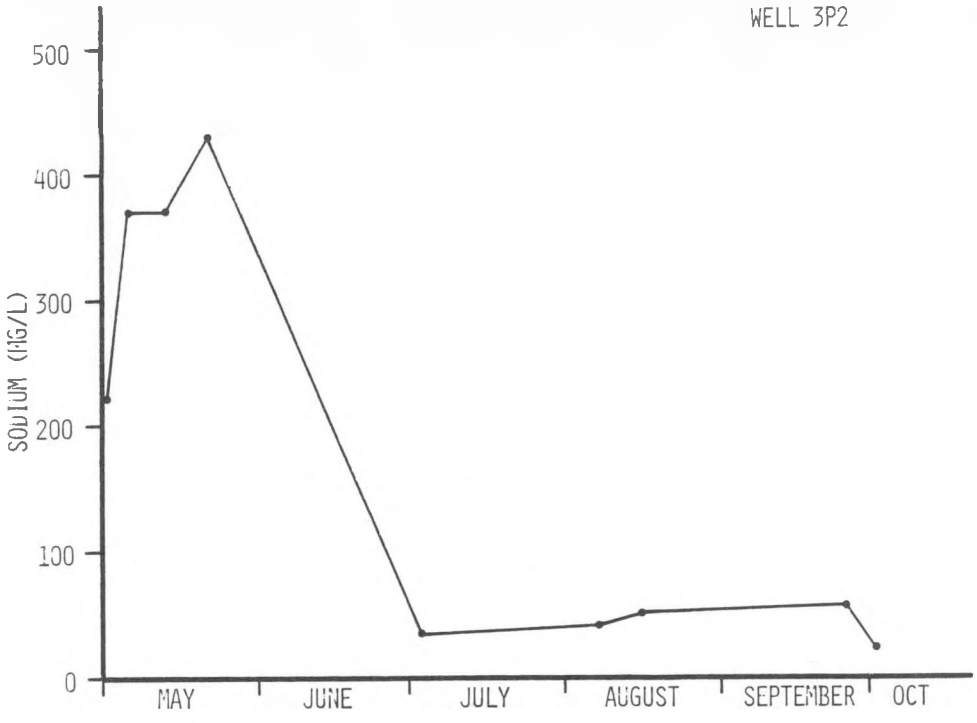

Figure B-2.e

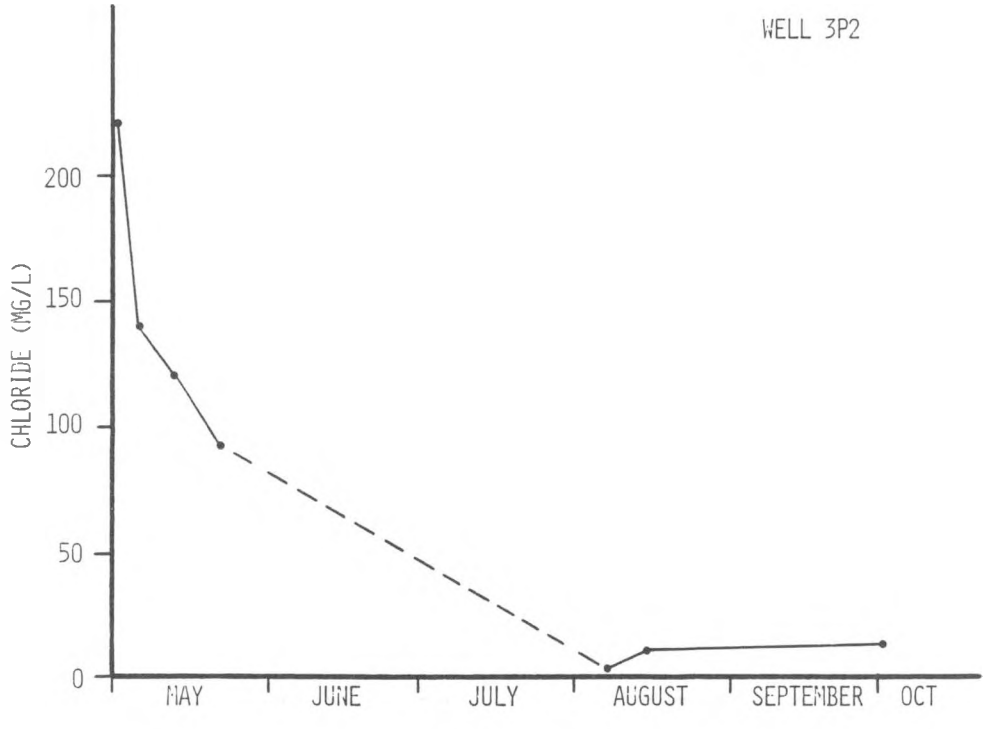

Figure B-2.f

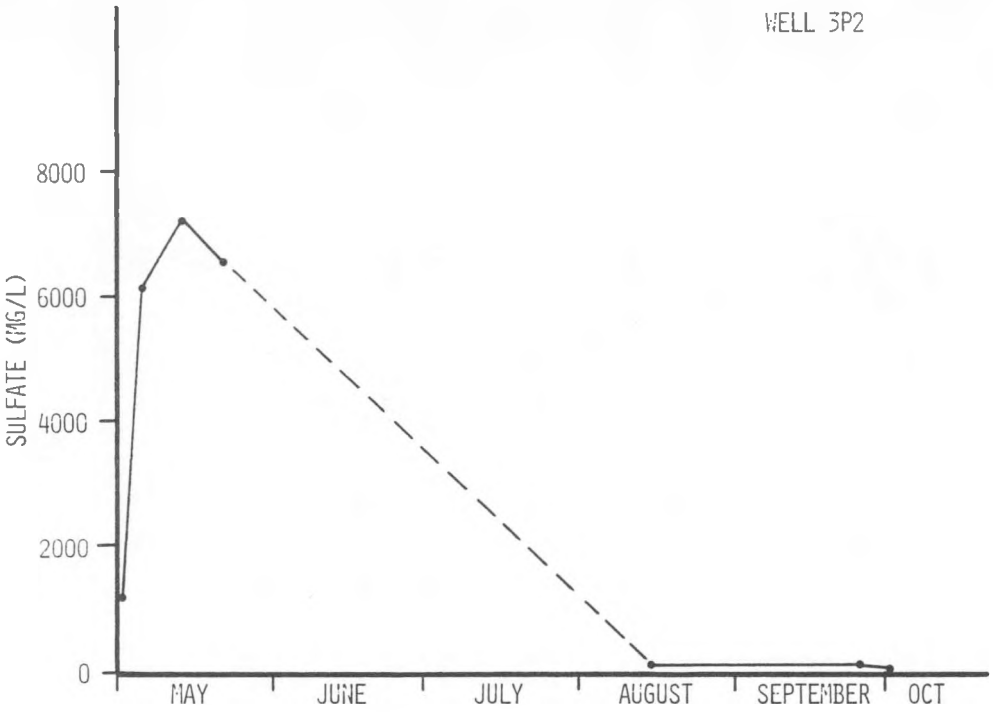

Figure B-2.g

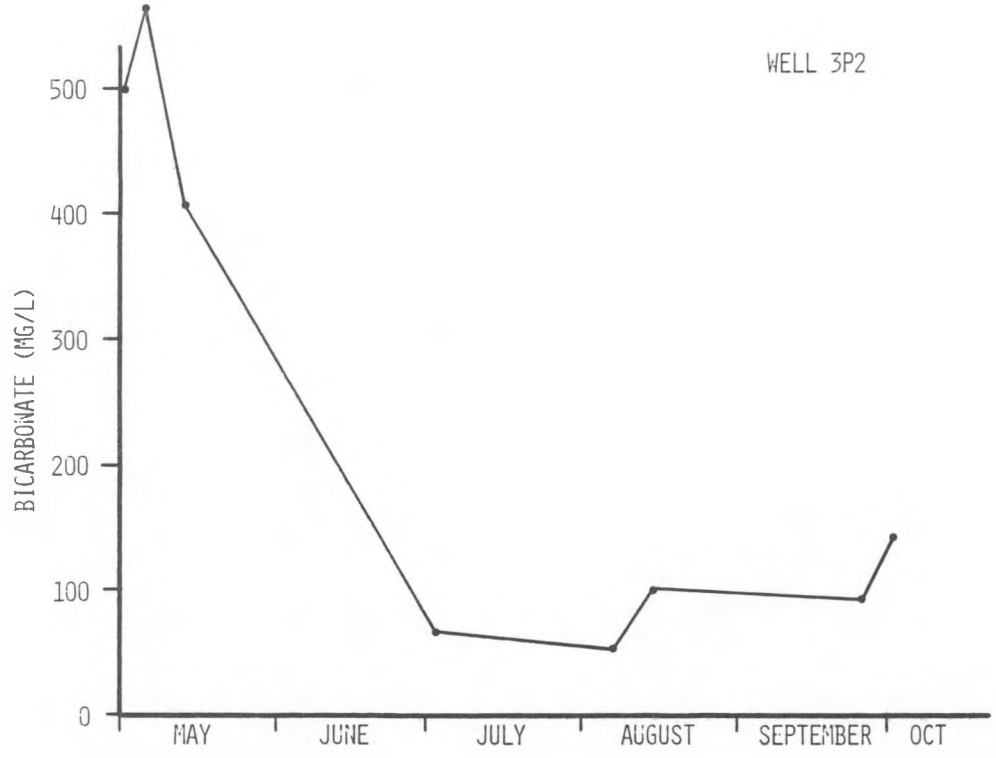

Figure B-2.h

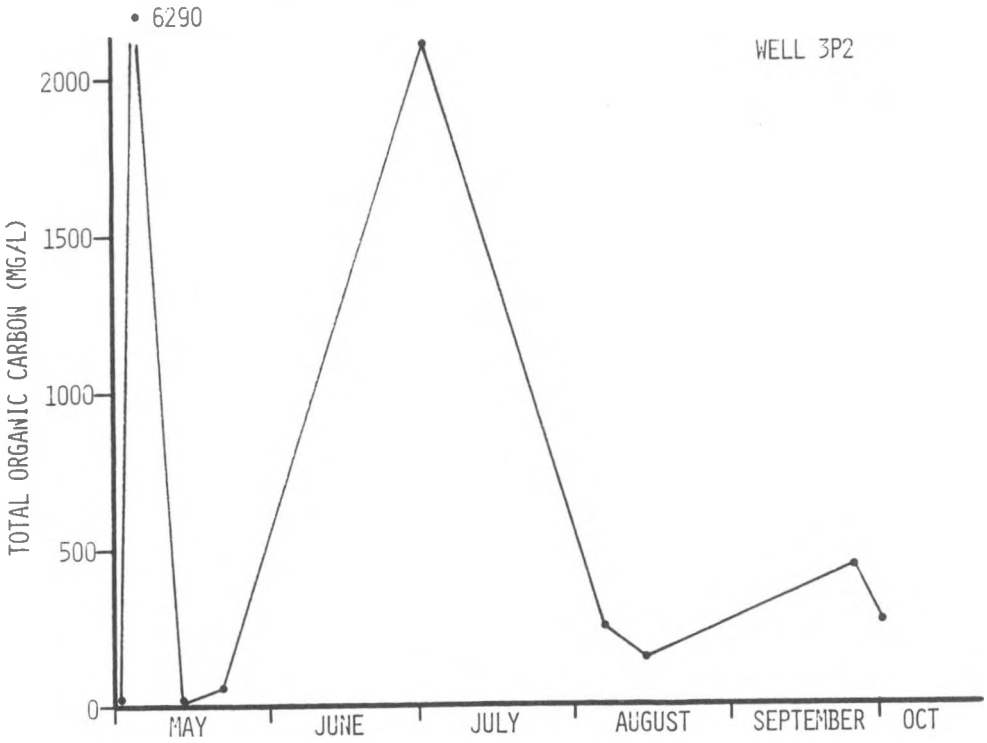

Figure B-2.i

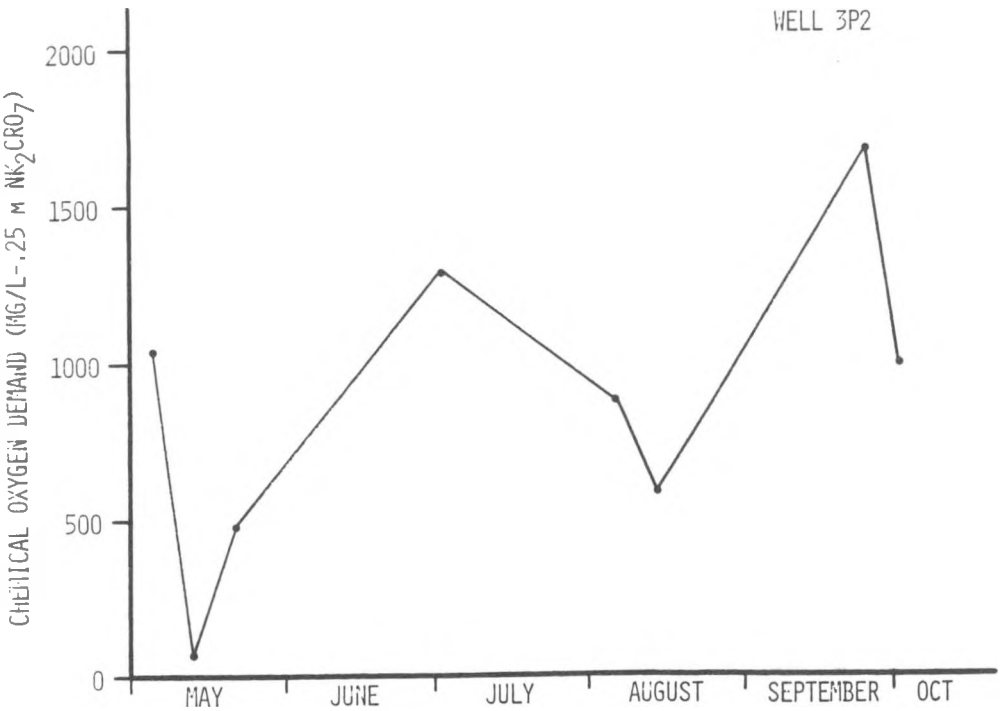

Figure B-2.j

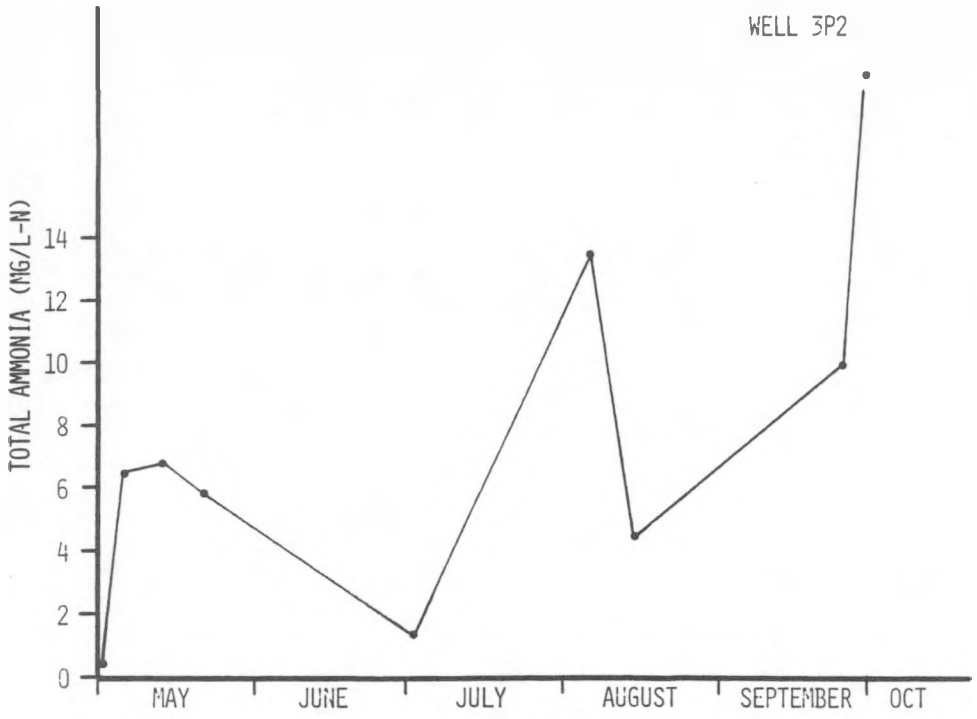

Figure B-2.k

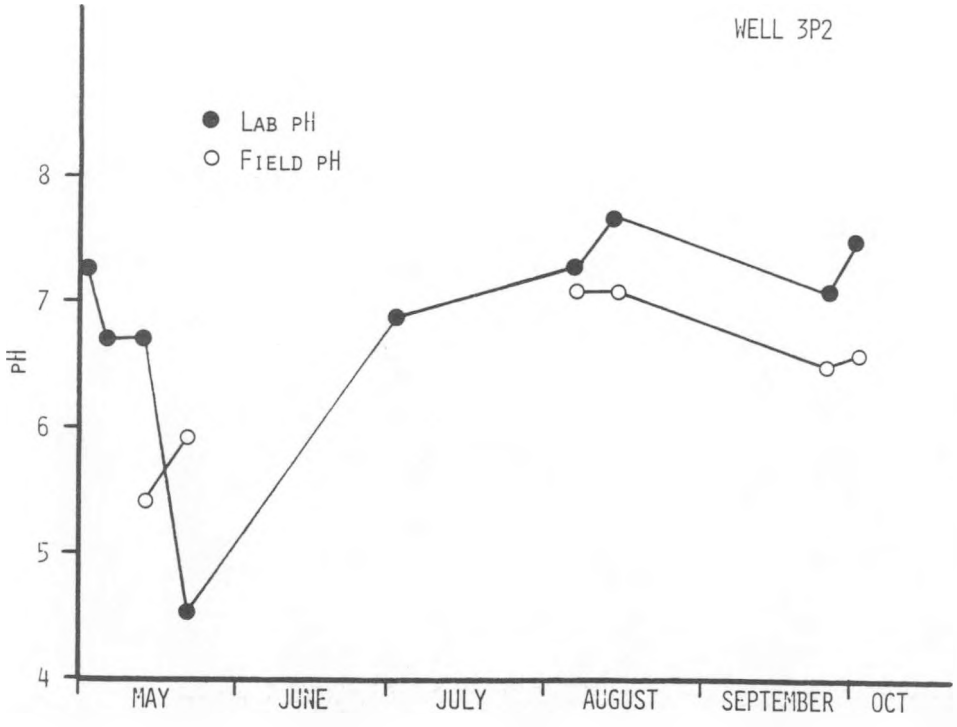

Figure B-2.l

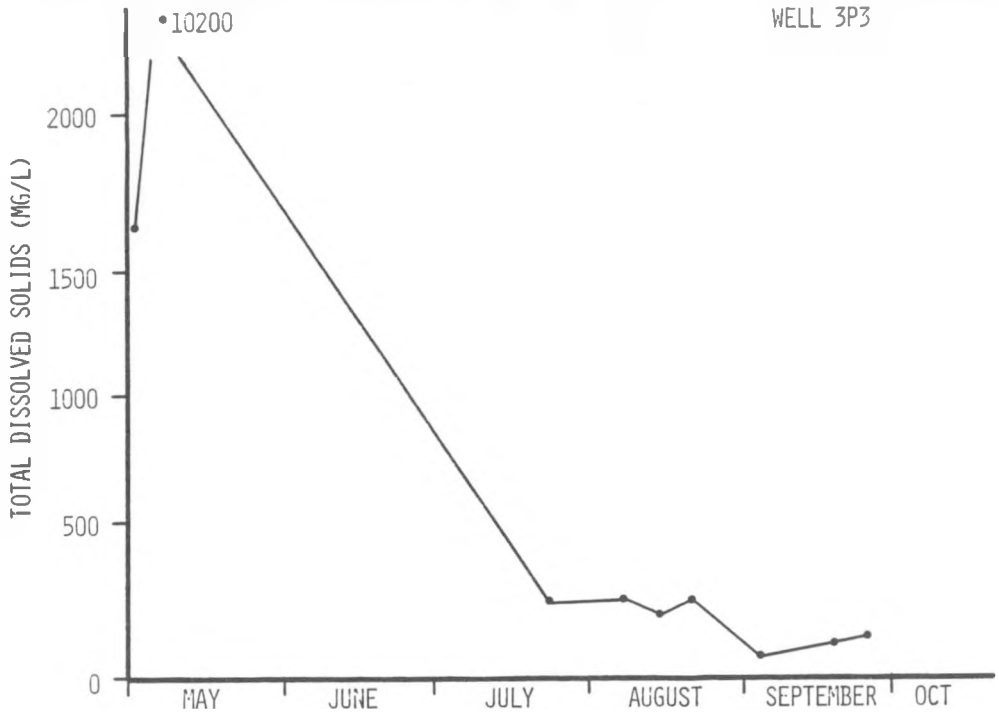

Figure B-3.a

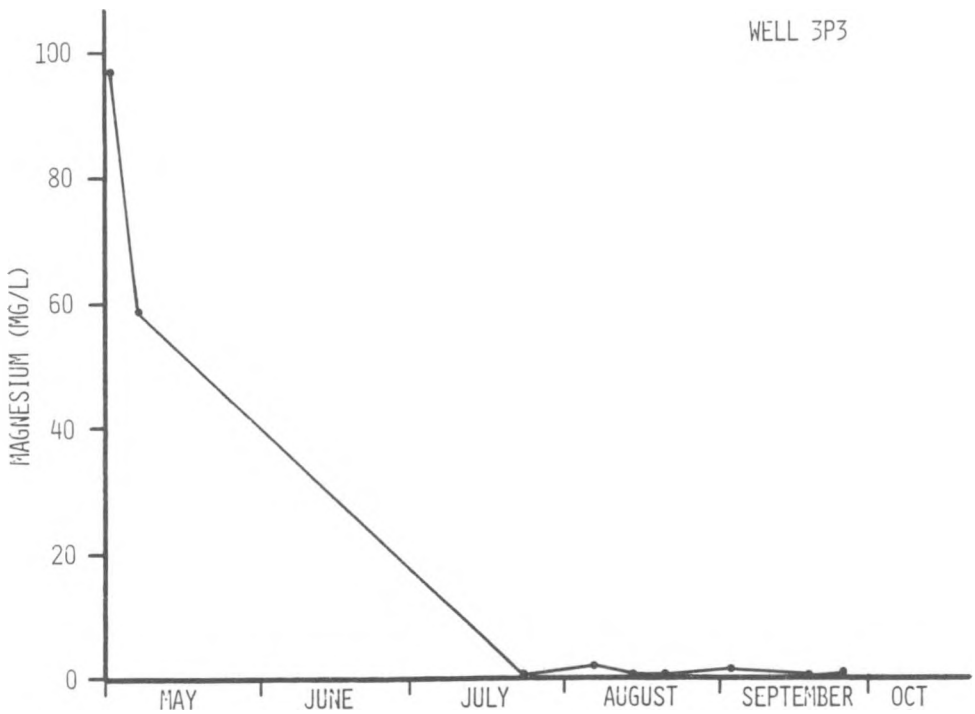

Figure B-3.b

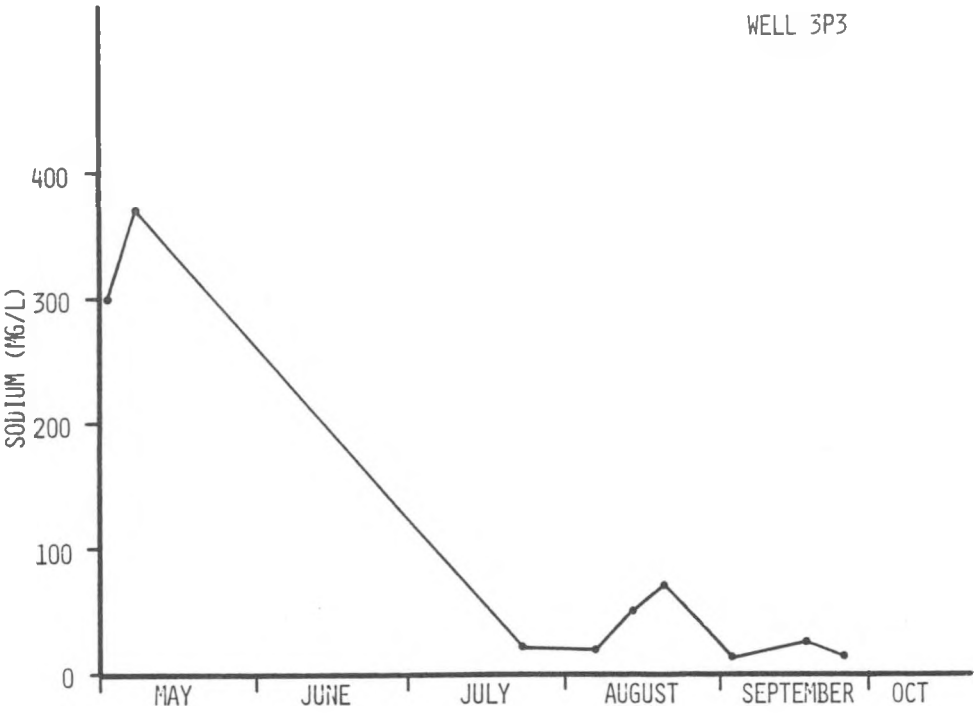

Figure B-3.c

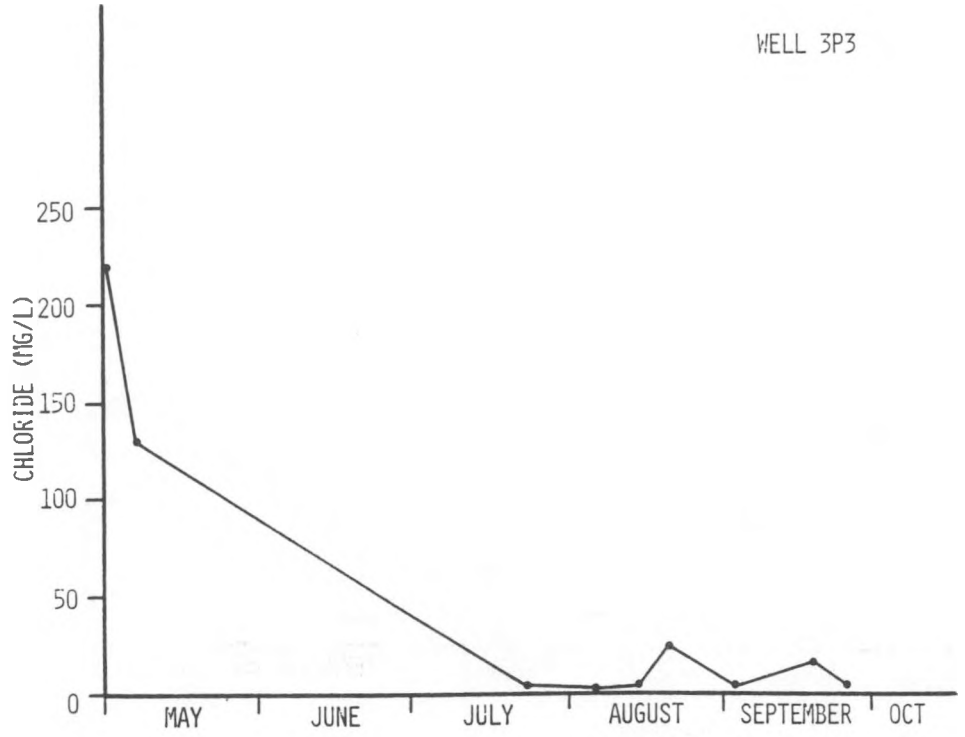

Figure B-3.d

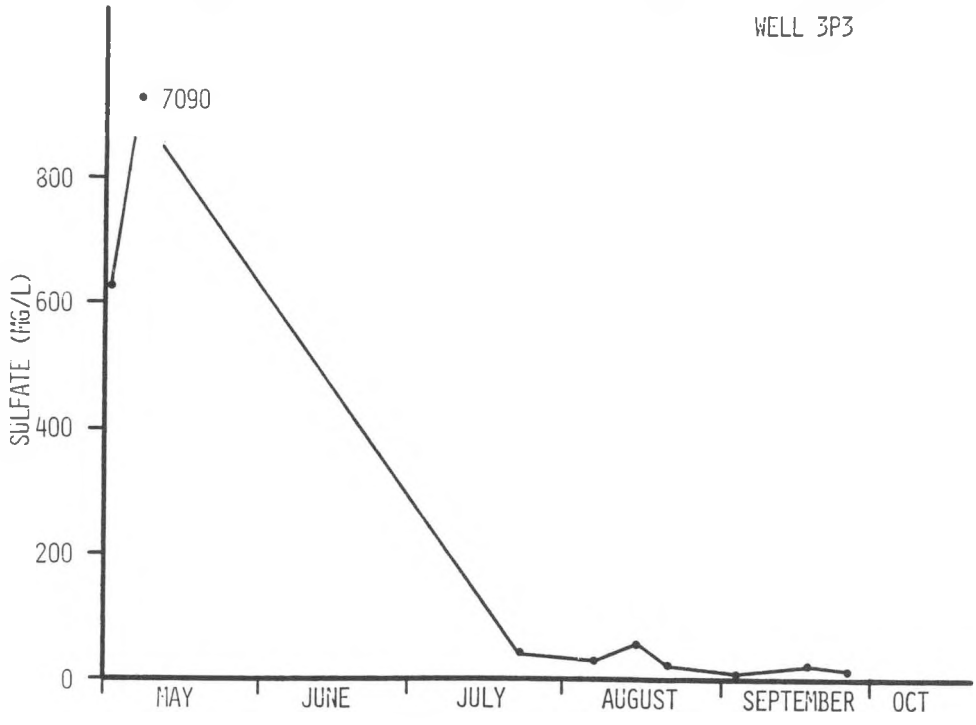

Figure B-3.e

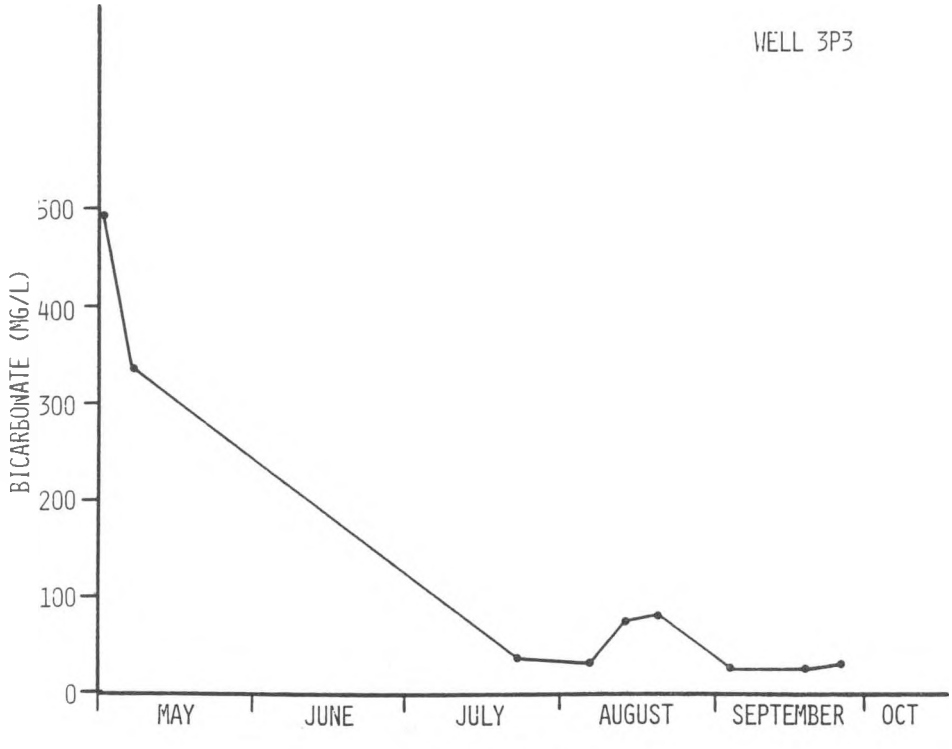

Figure B-3.f

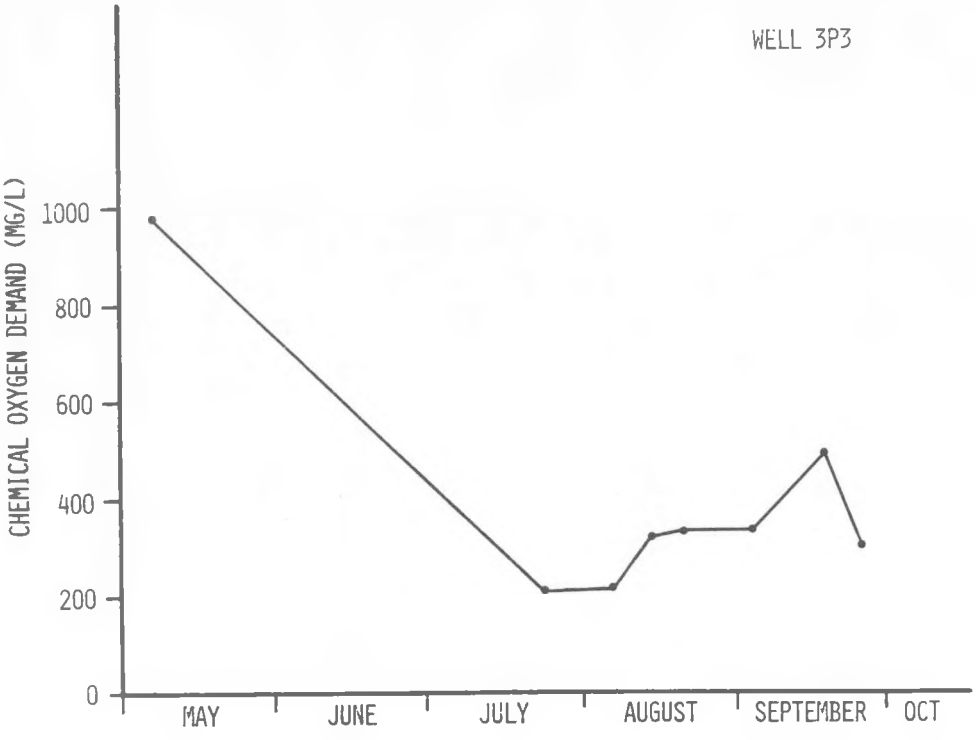

Figure B-3.g

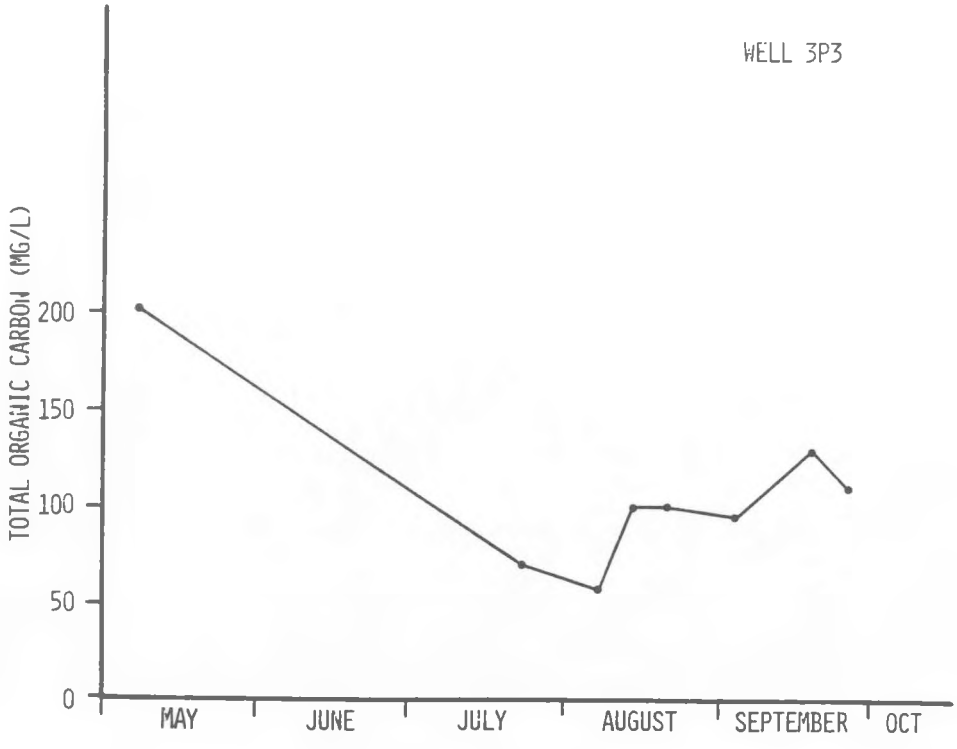

Figure B-3.h

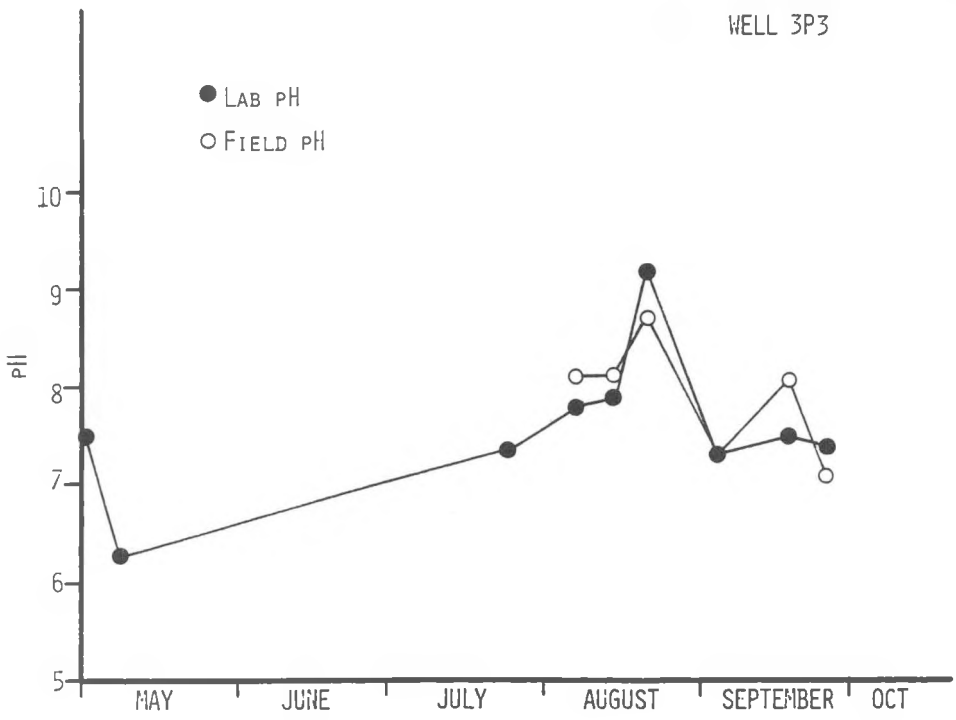
WELL 3P3
LAB pH
FIELD pH
pH
10
9
8
7
6
5
MAY
JUNE
JULY
AUGUST
SEPTEMBER
OCT

Figure B-3.i

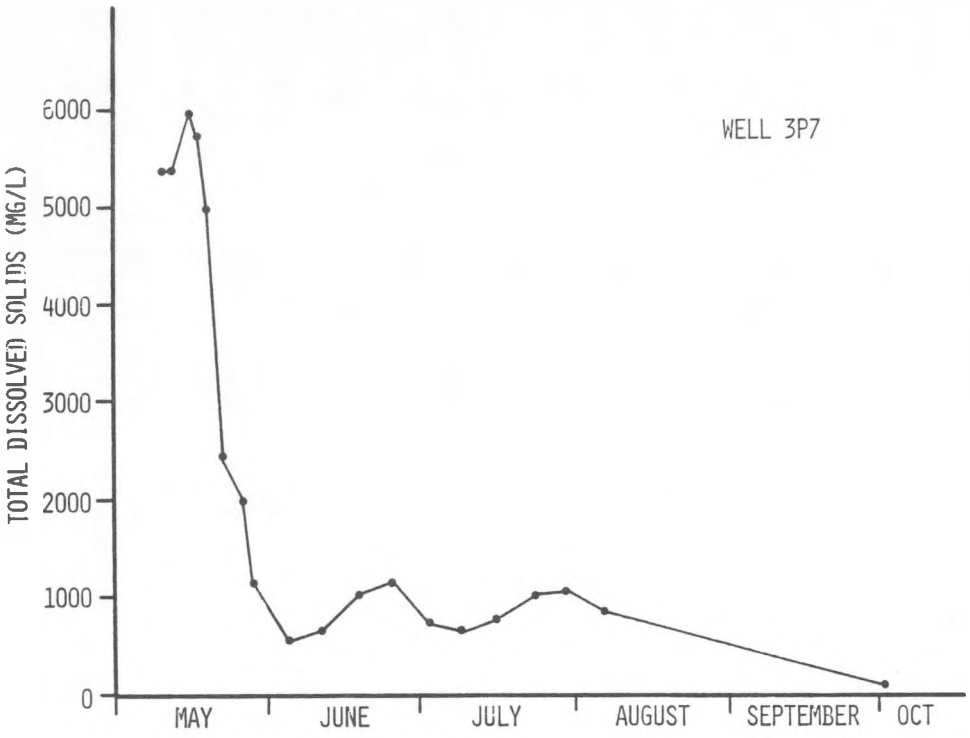

Figure B-4.a

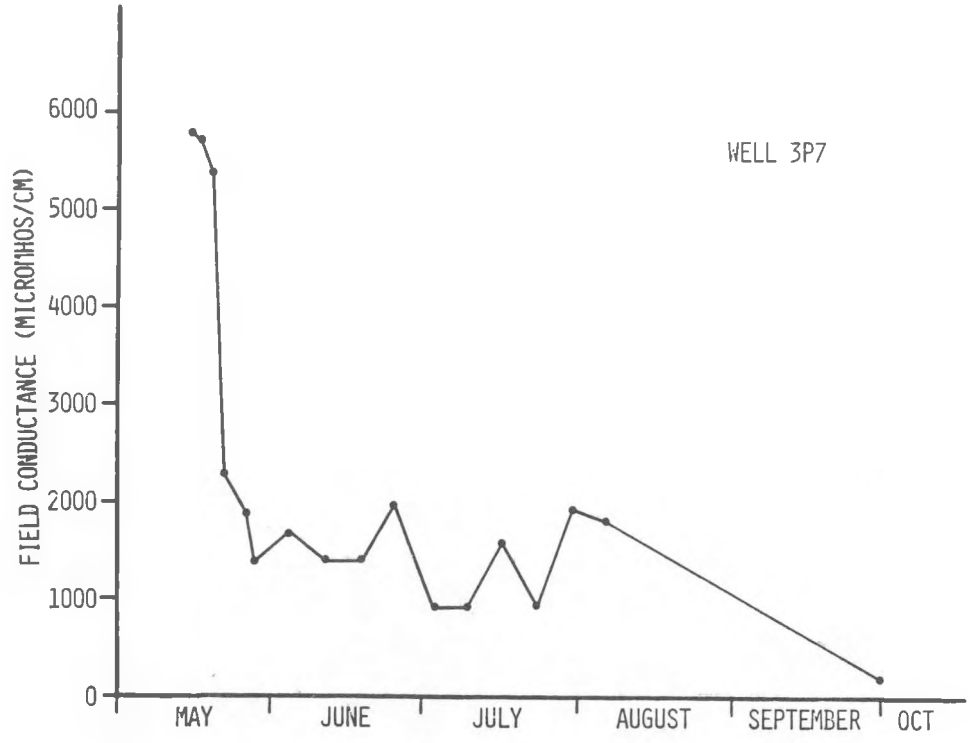

Figure B-4.b

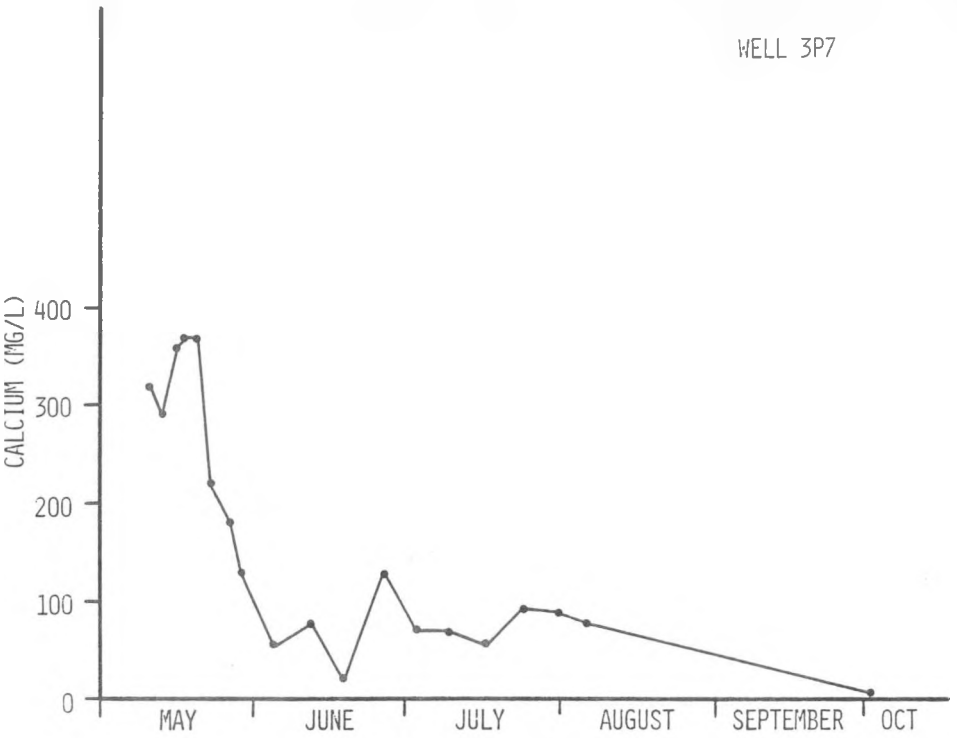

Figure B-4.c

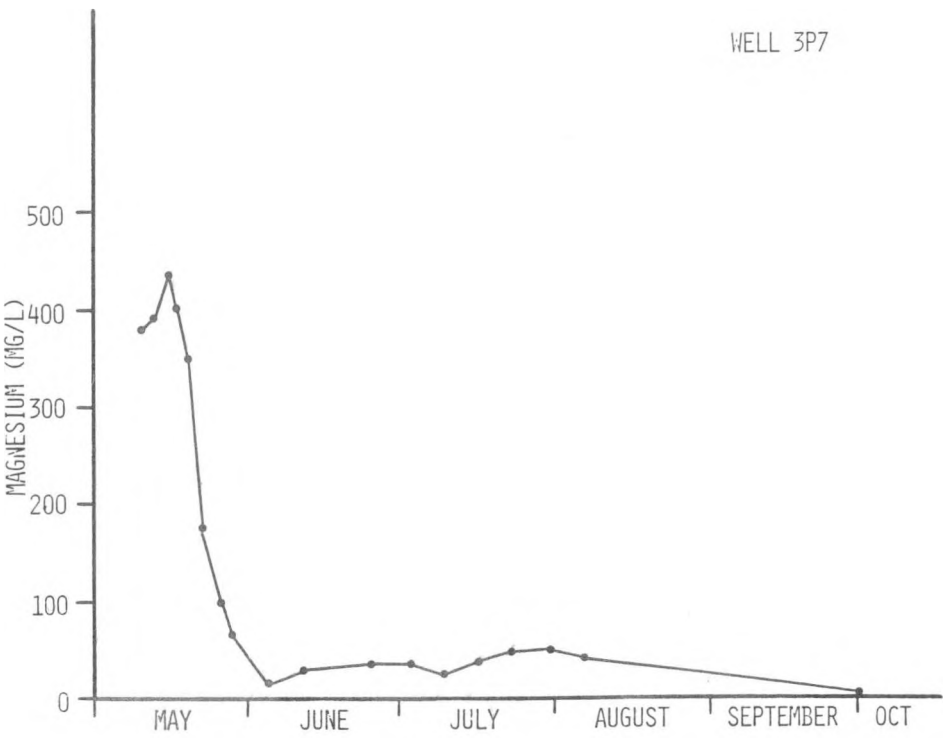

Figure B-4.d

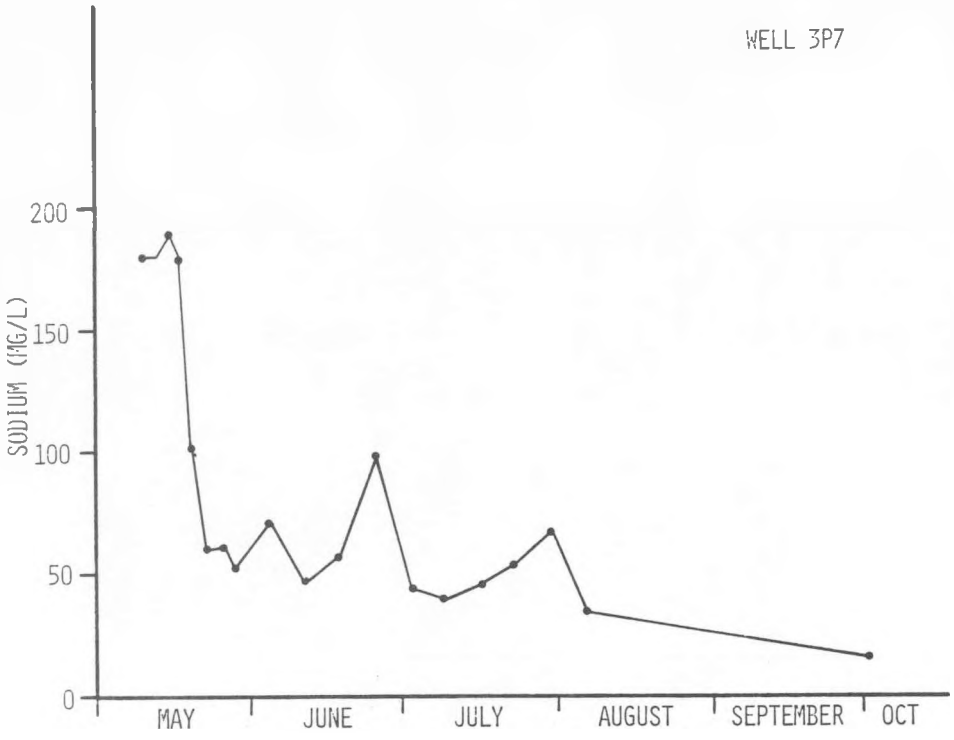

Figure B-4.e

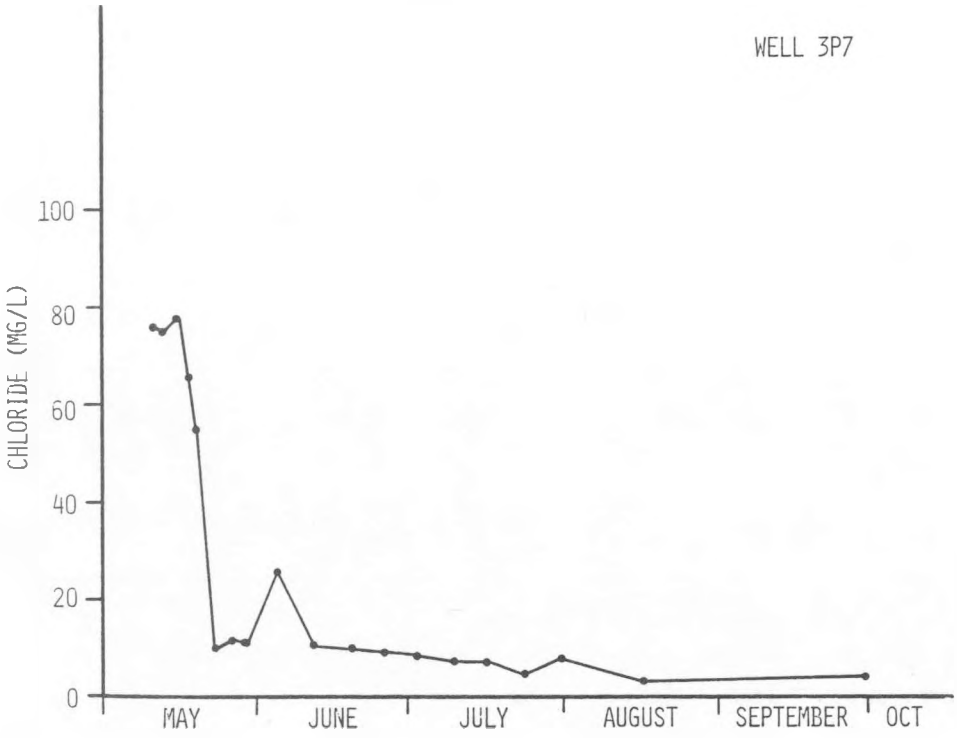

Figure B-4.f

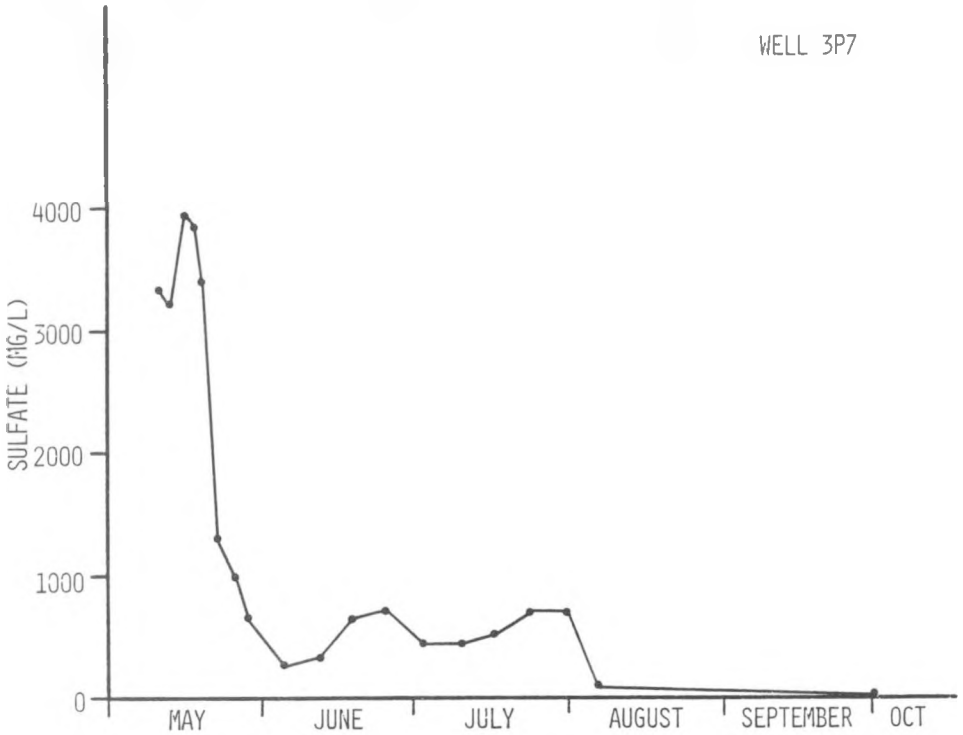

Figure B-4.g

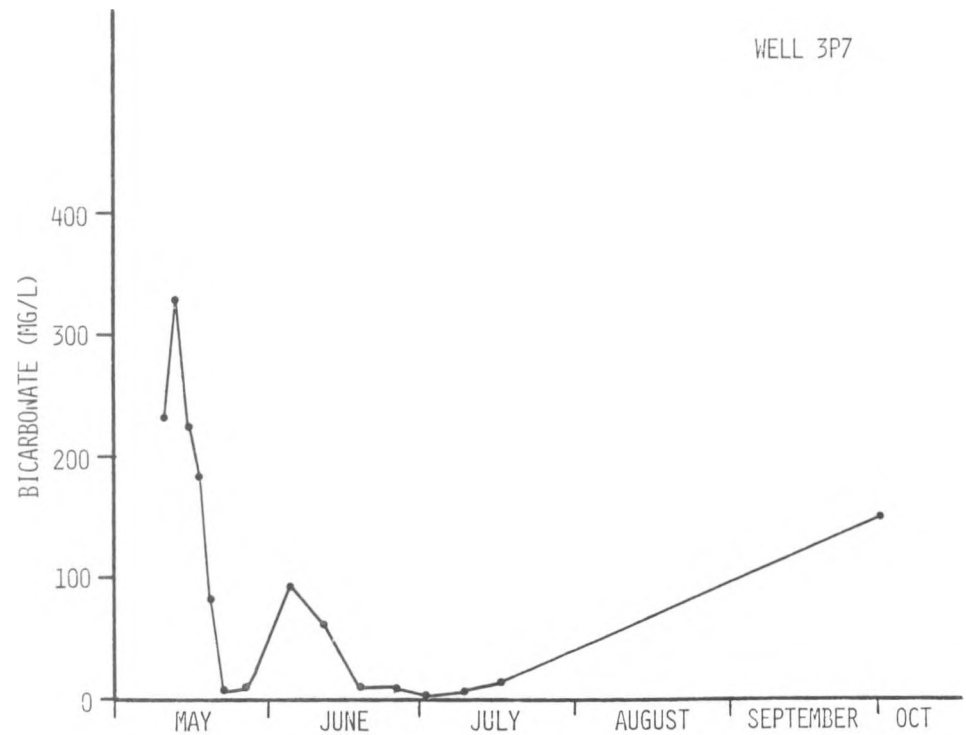

Figure B-4.h

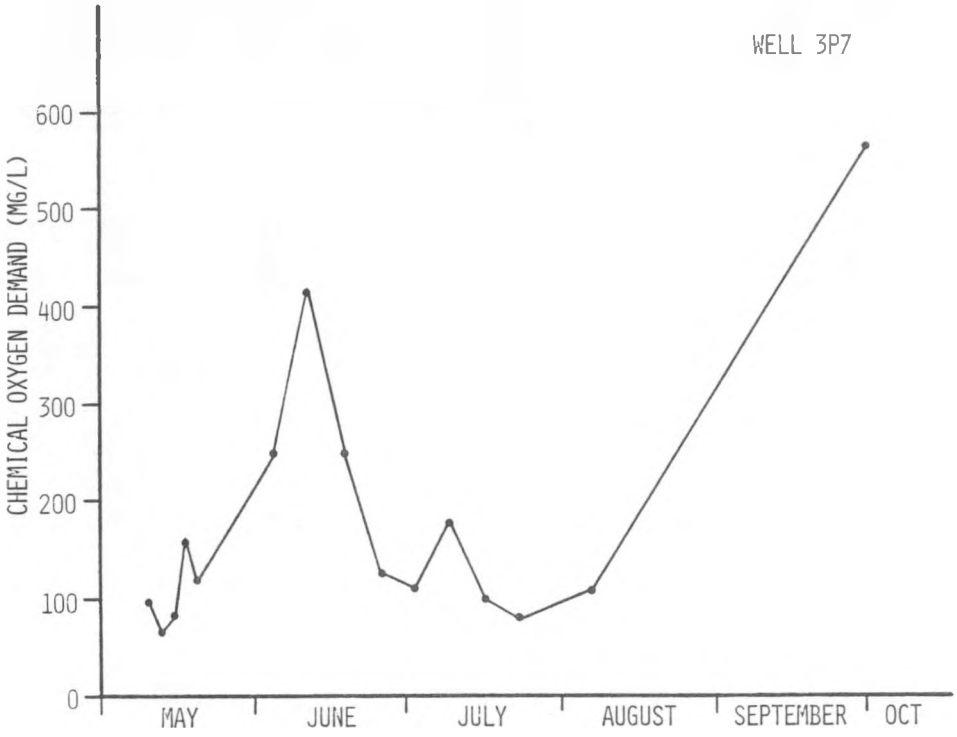

Figure B-4.i

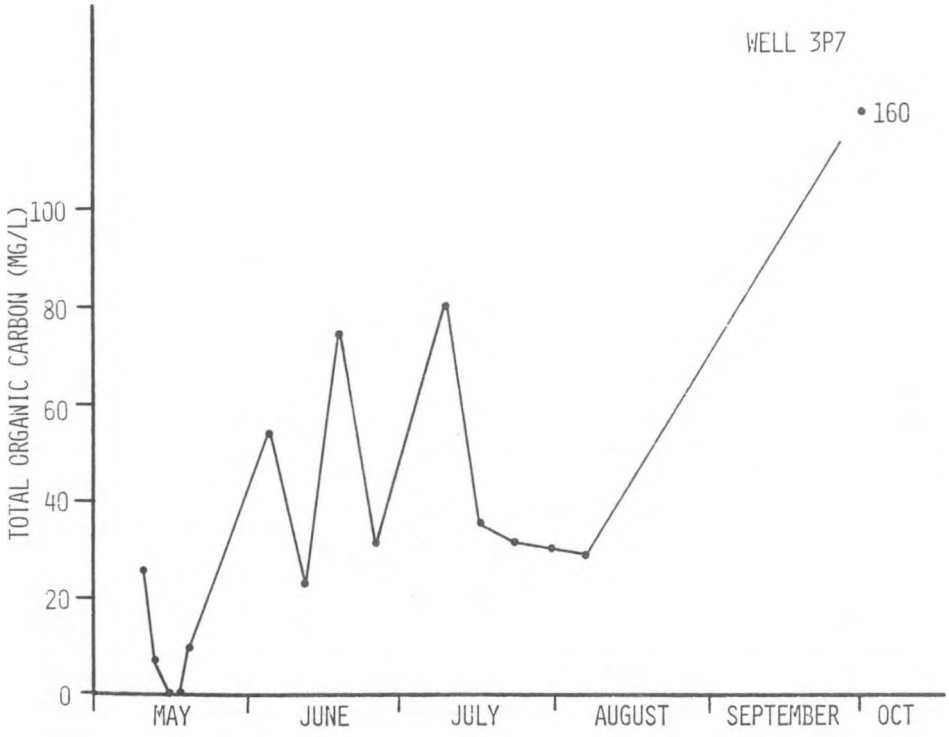

Figure B-4.j

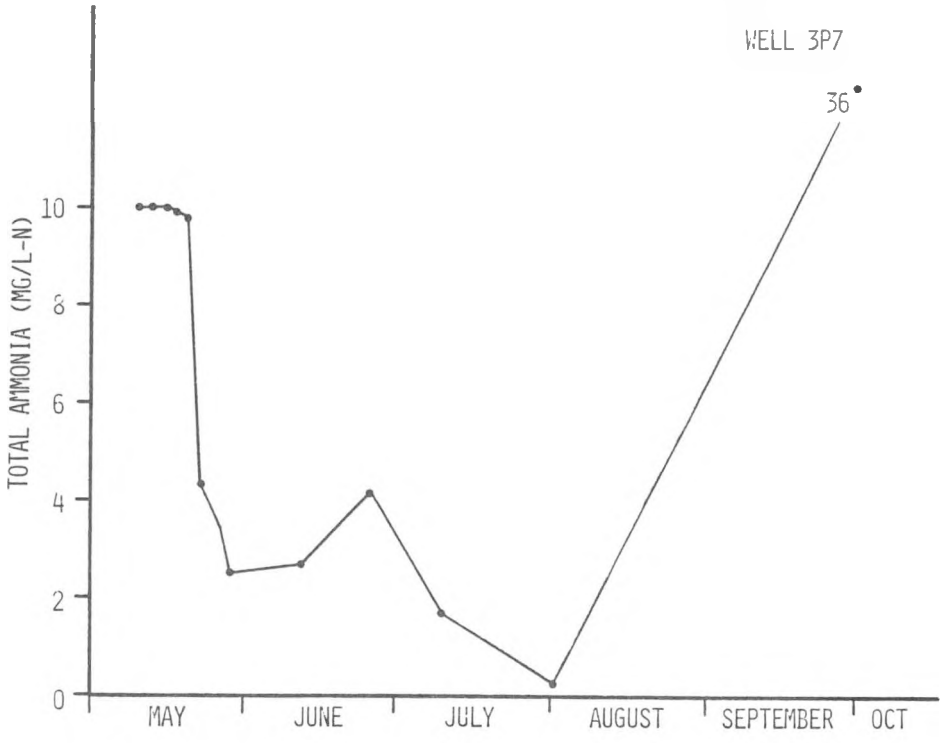

Figure B-4.k

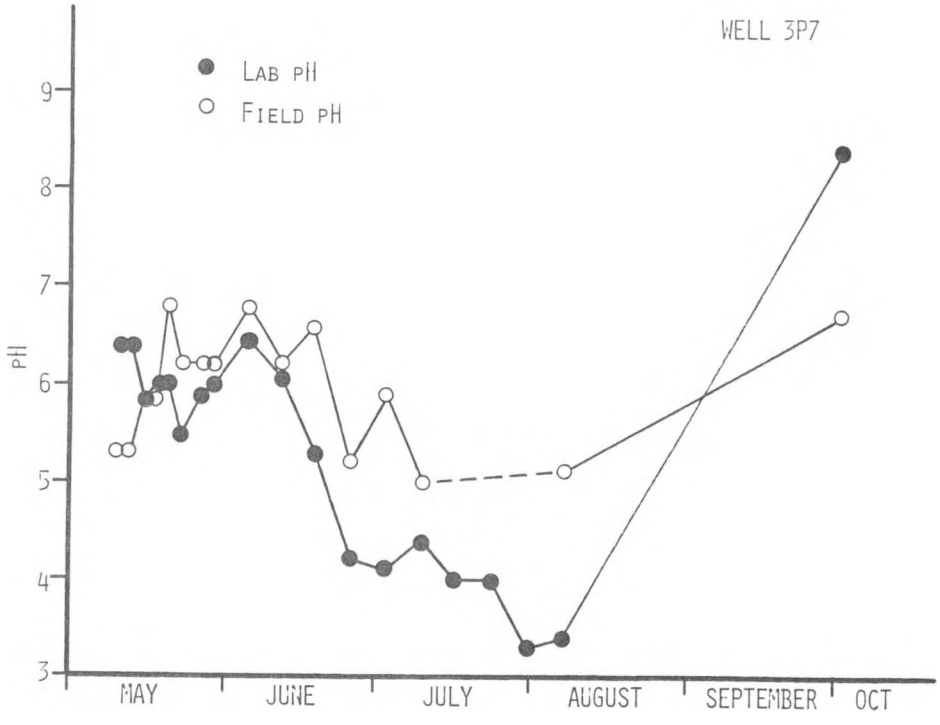

Figure B-4.l

APPENDIX C

ENVIRONMENTAL SIGNIFICANCE

SUITABILITY FOR DOMESTIC USE

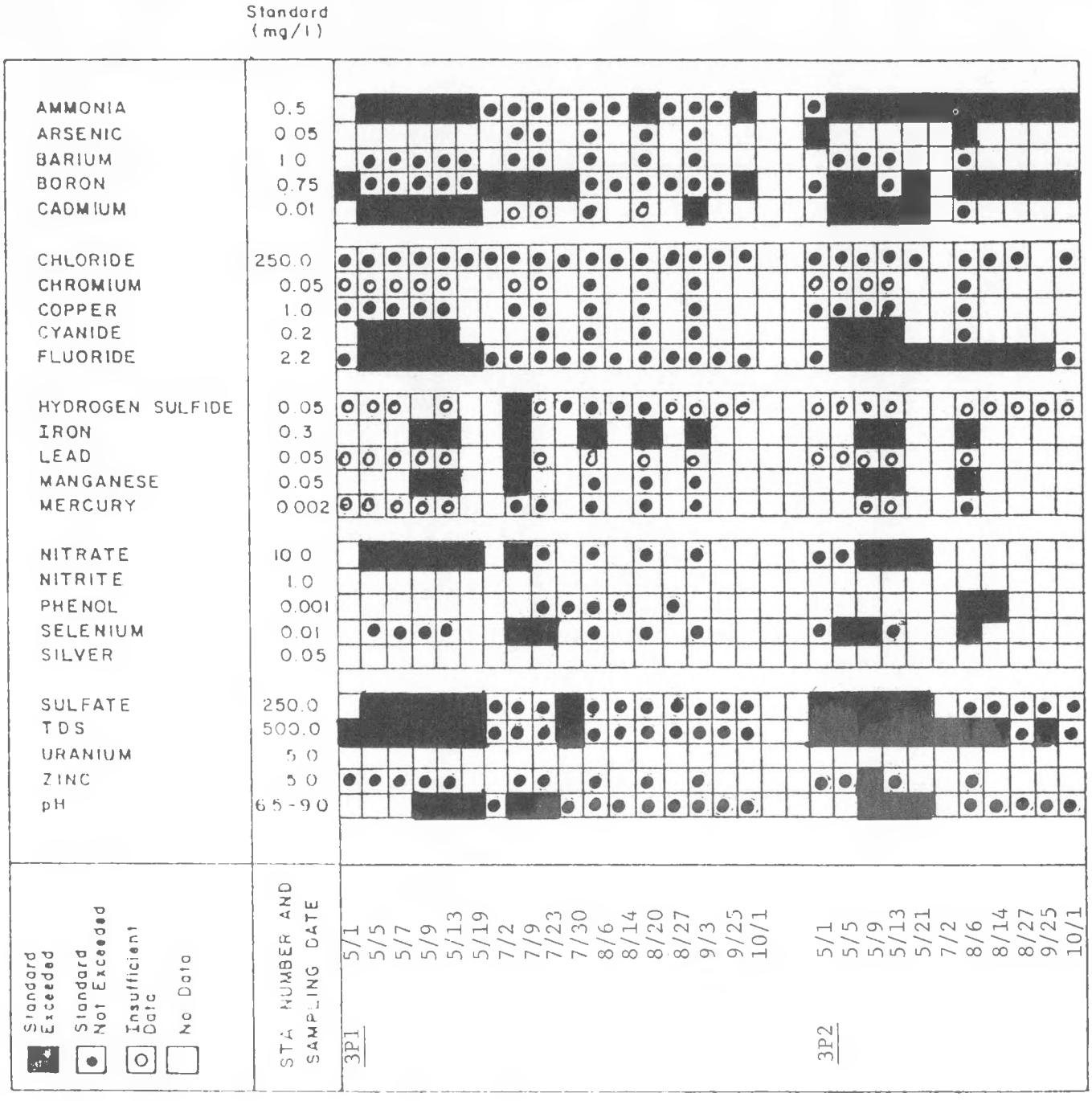

Figure C-1.a

SUITABILITY FOR DOMESTIC USE

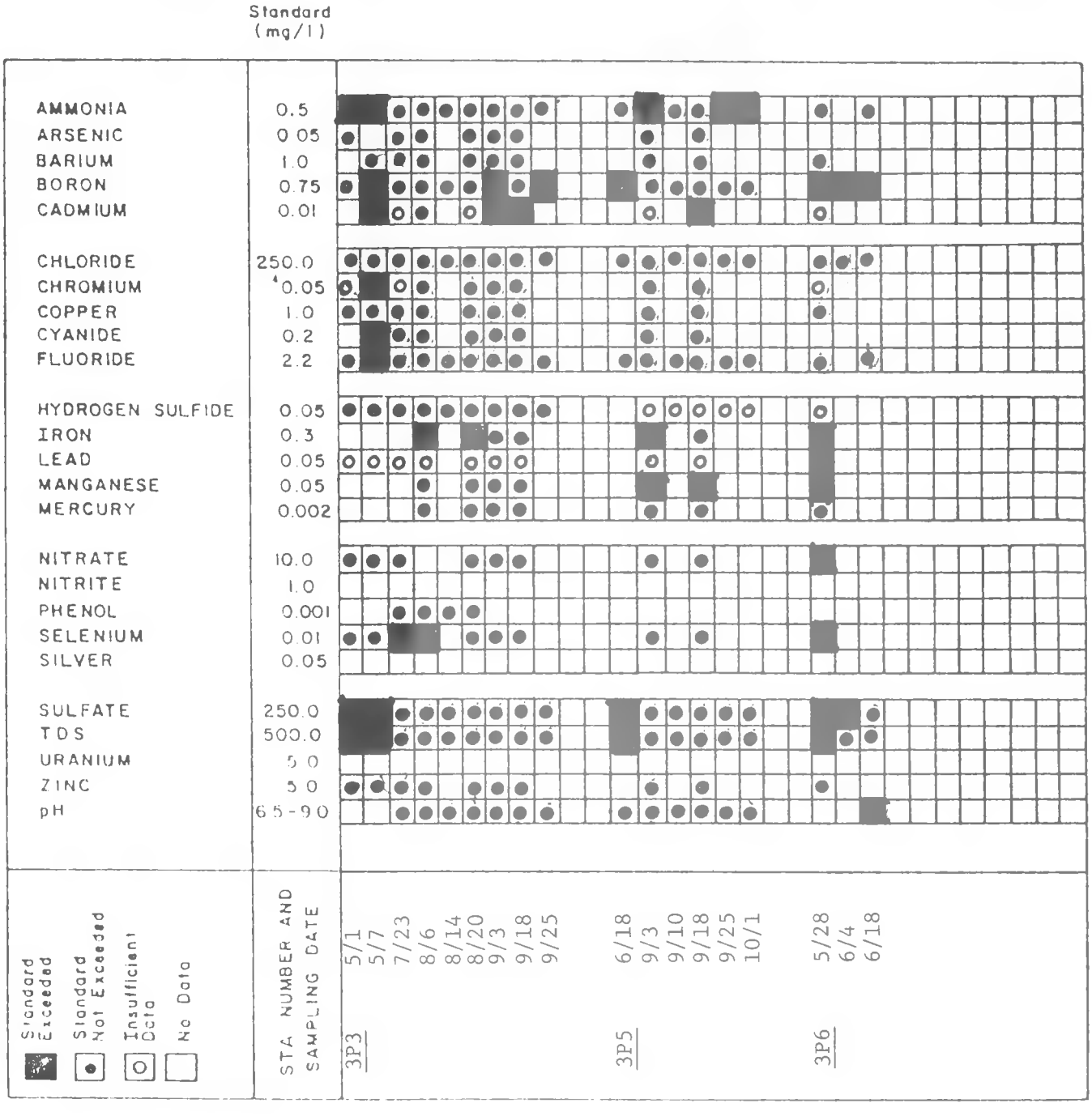

Figure C-1.b

SUITABILITY FOR DOMESTIC USE

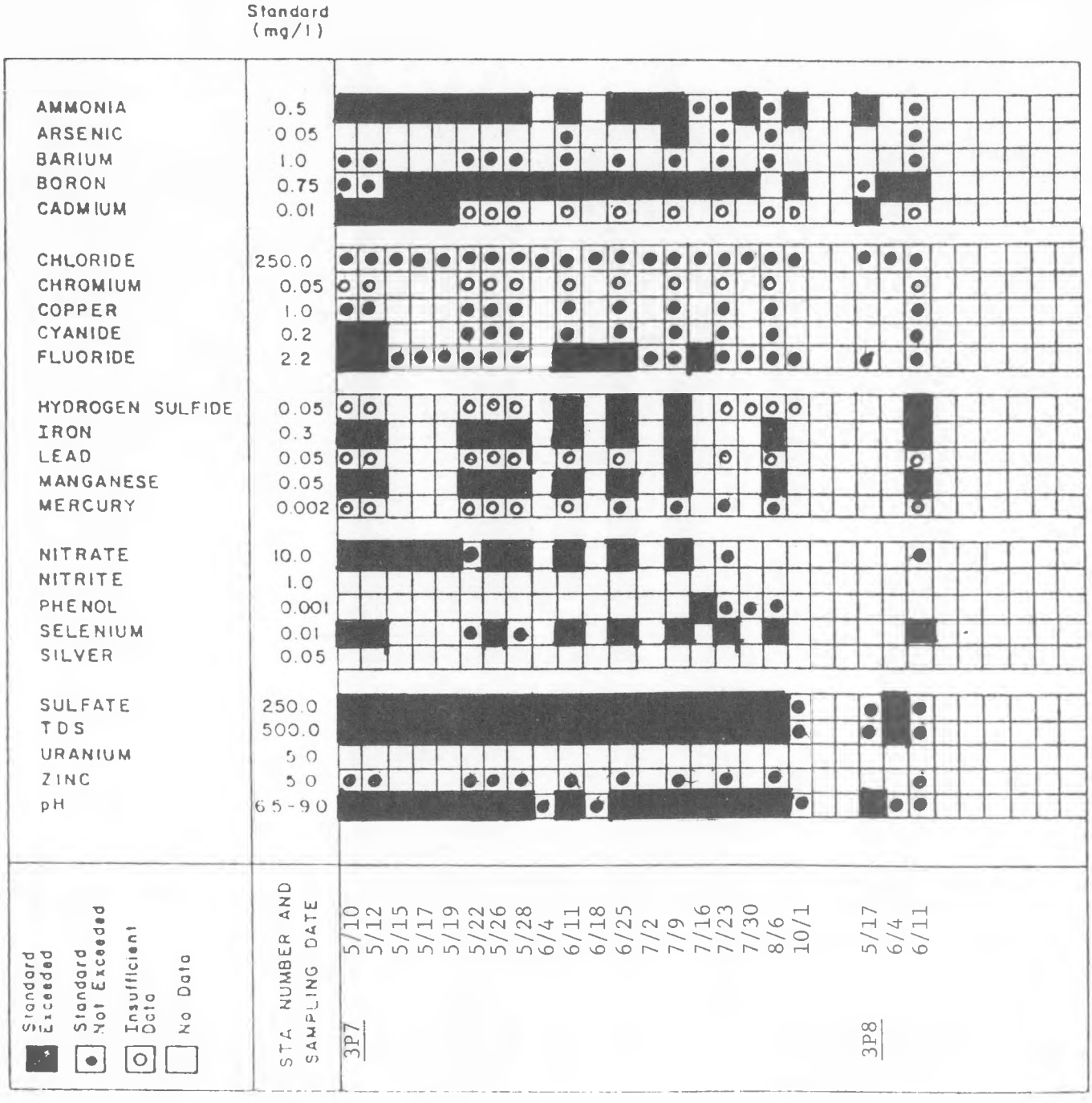

Figure C-1.c

SUITABILITY FOR AGRICULTURE

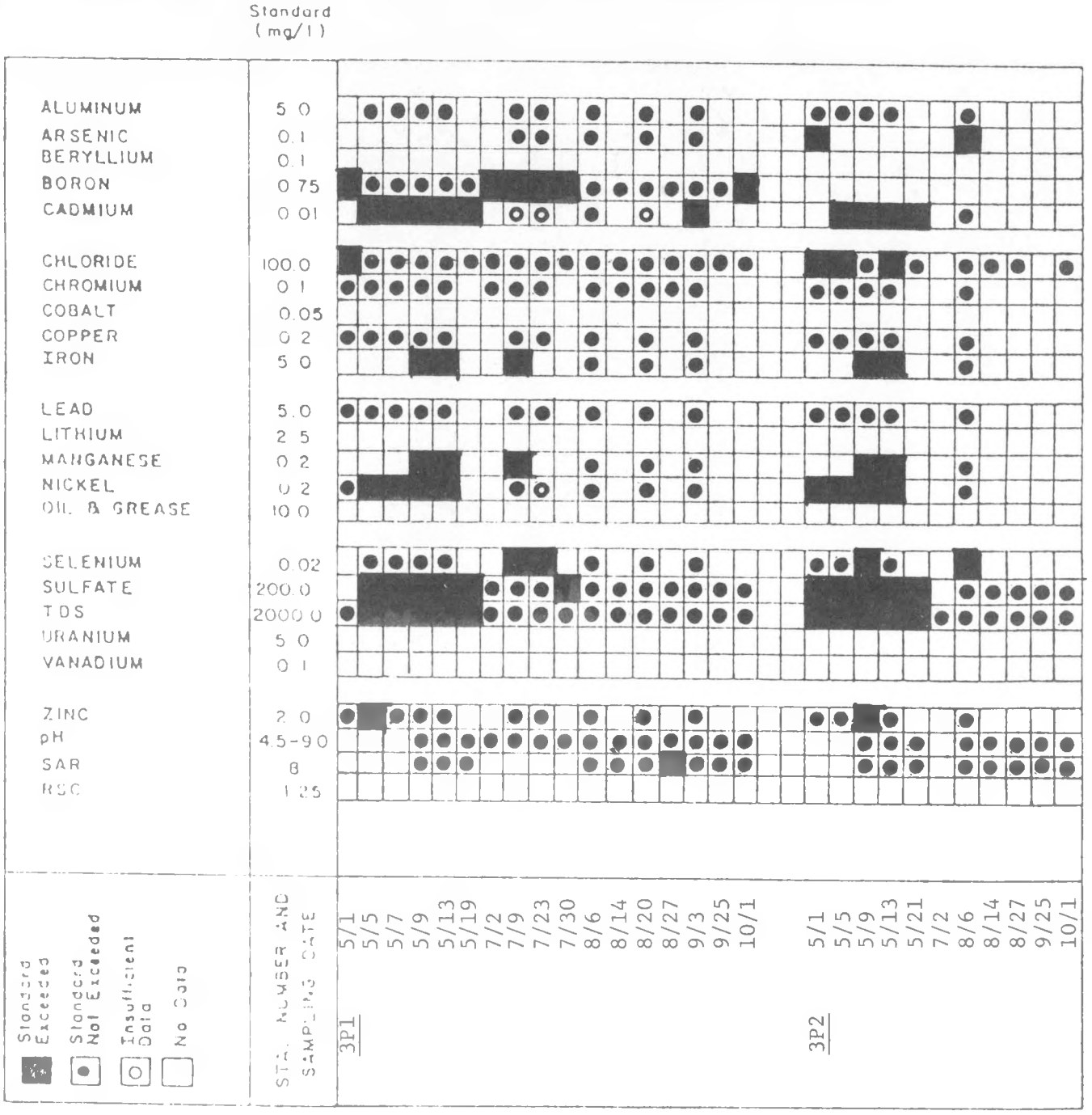

Figure C-2.a

SUITABILITY FOR AGRICULTURE

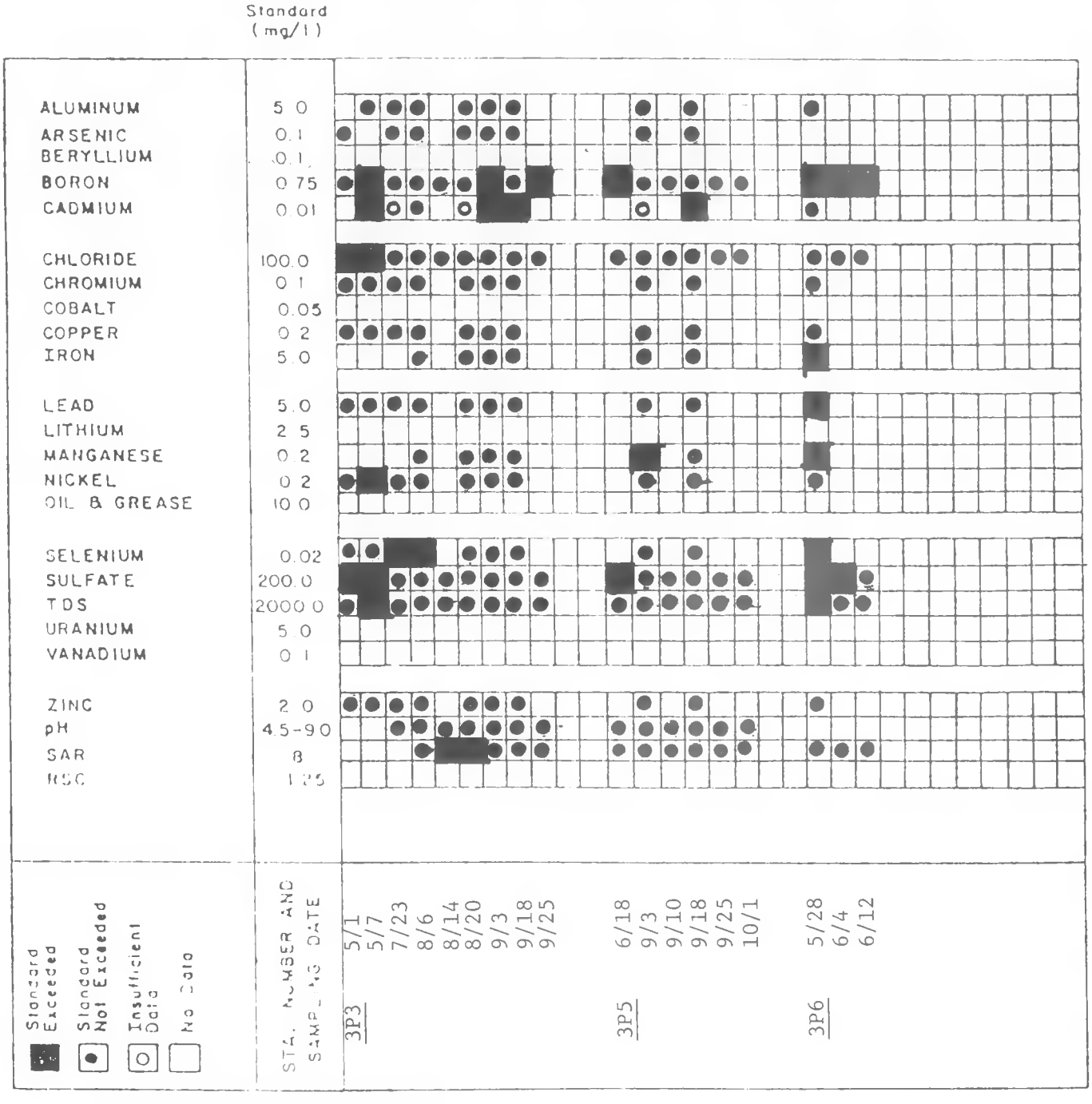

Figure C-2.b

SUITABILITY FOR AGRICULTURE

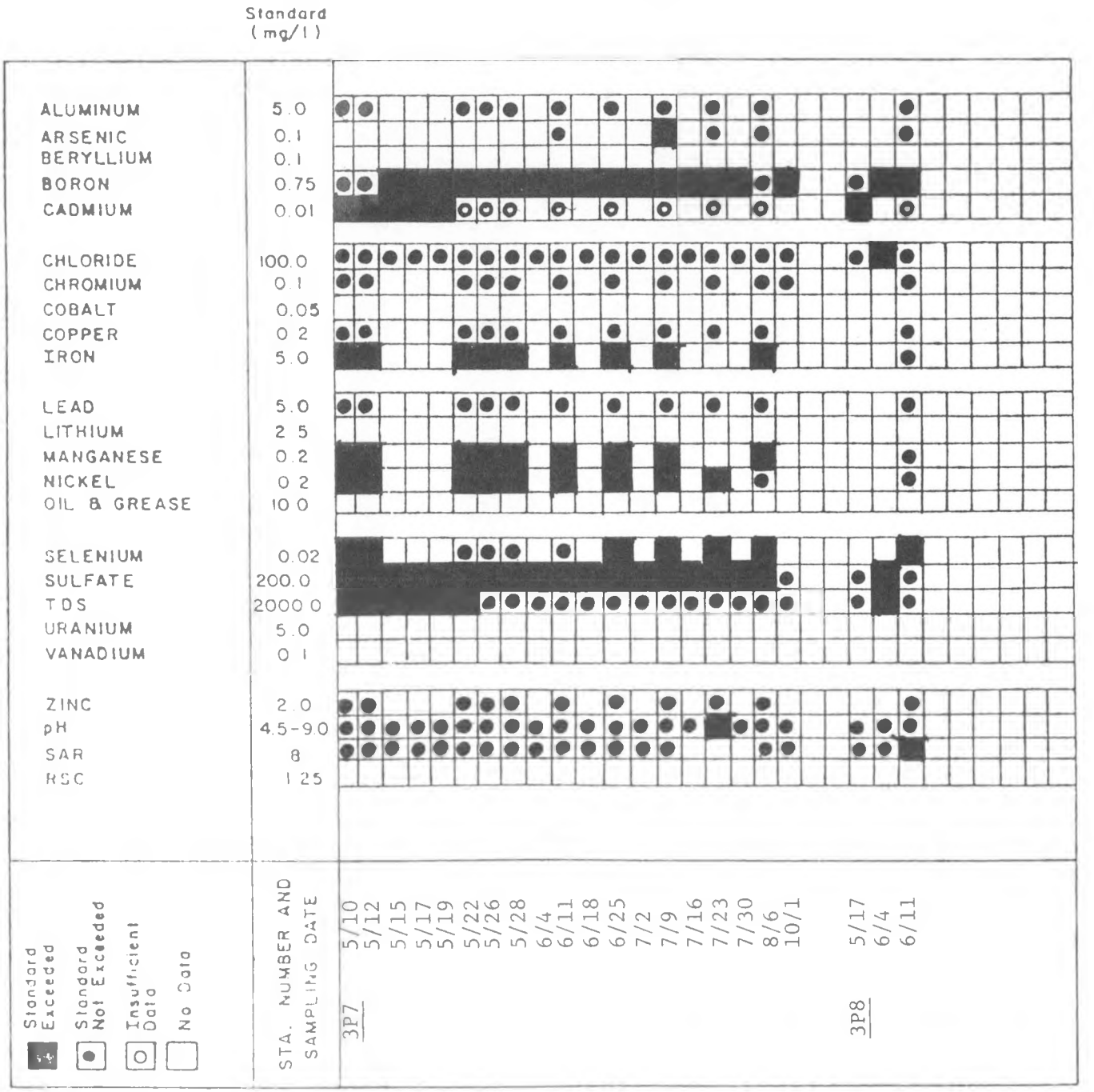

Figure C-2.c

SUITABILITY FOR LIVESTOCK

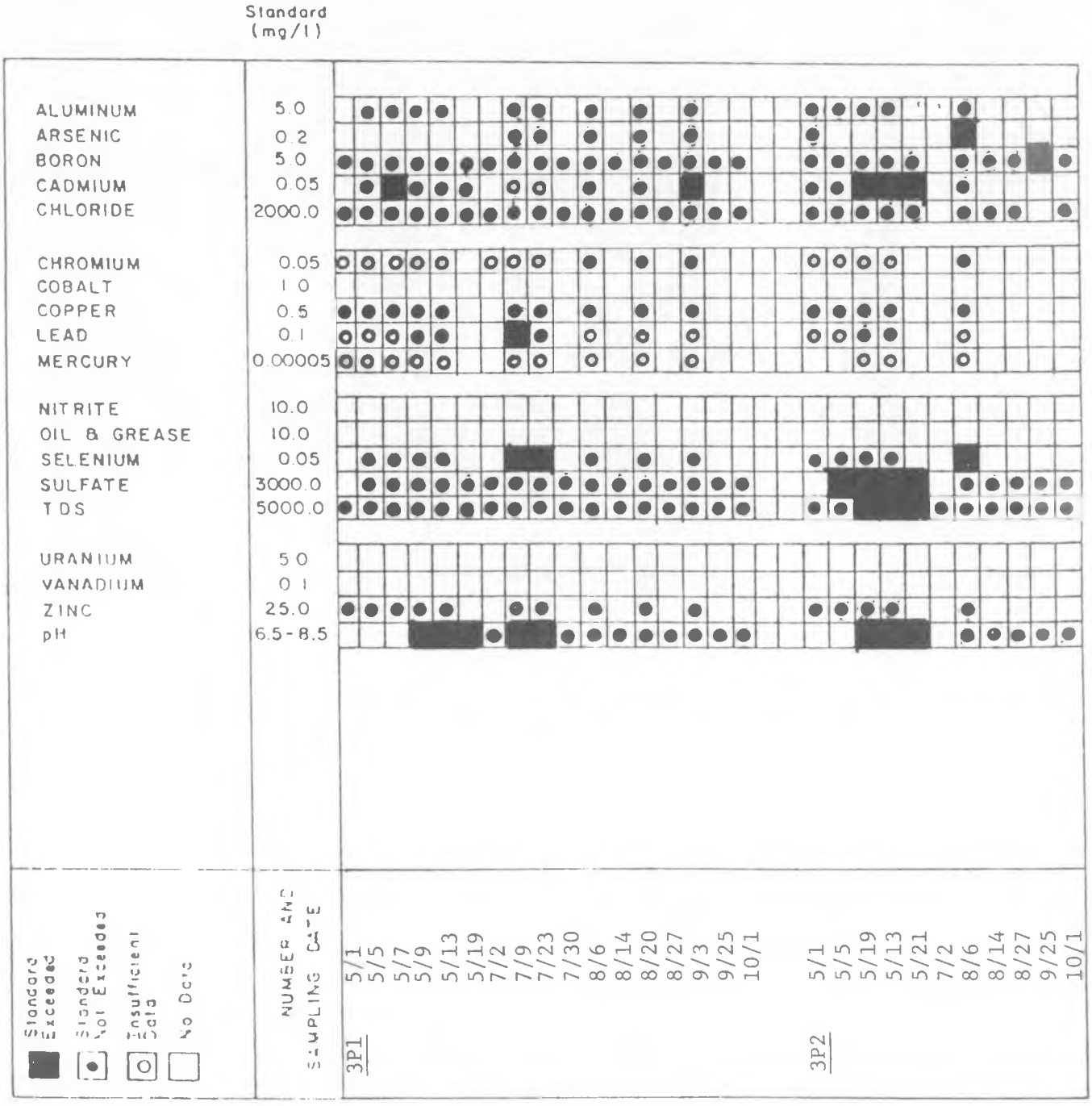

Figure C-3.a

SUITABILITY FOR LIVESTOCK

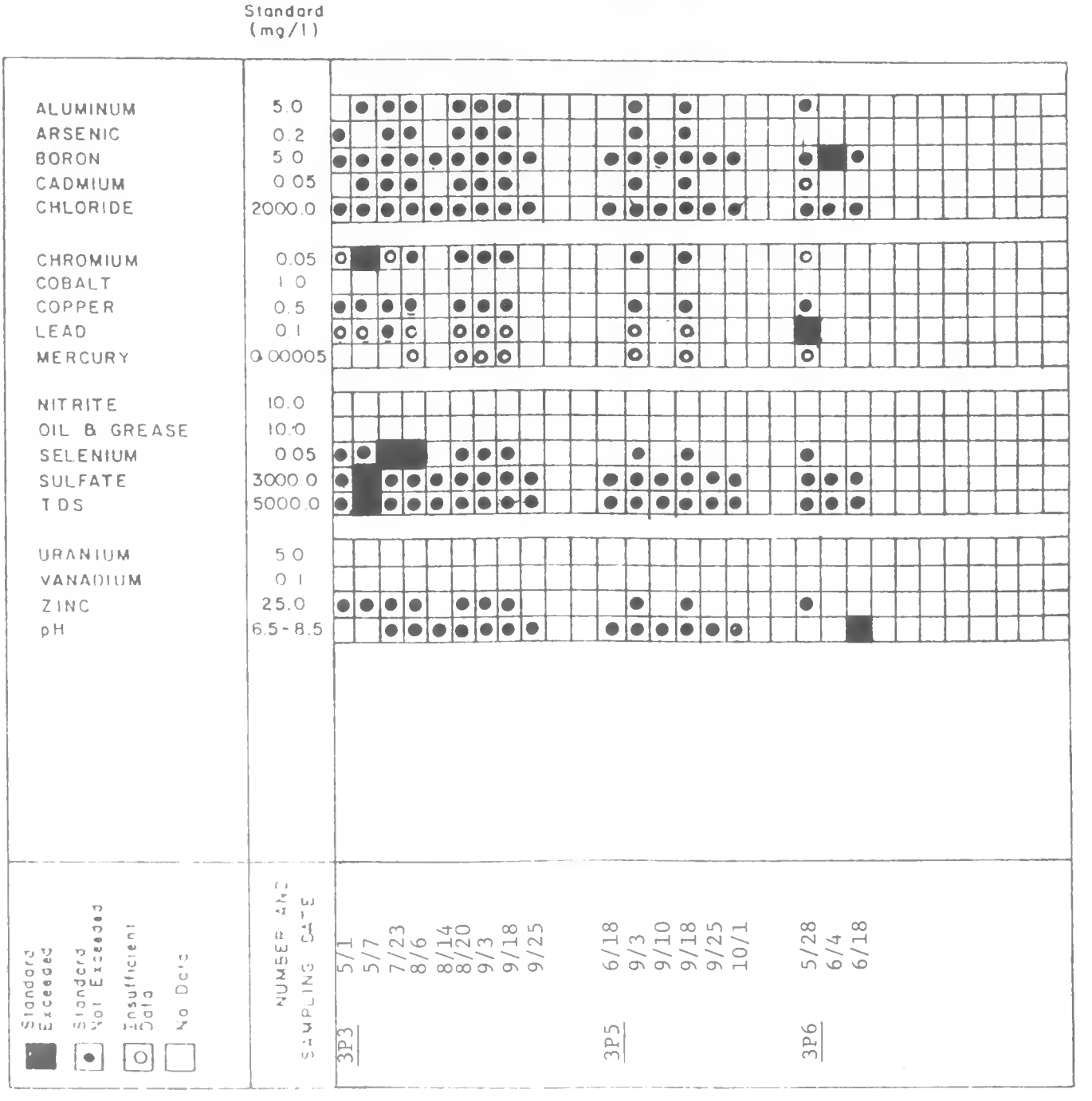

Figure C-3.b

SUITABILITY FOR LIVESTOCK

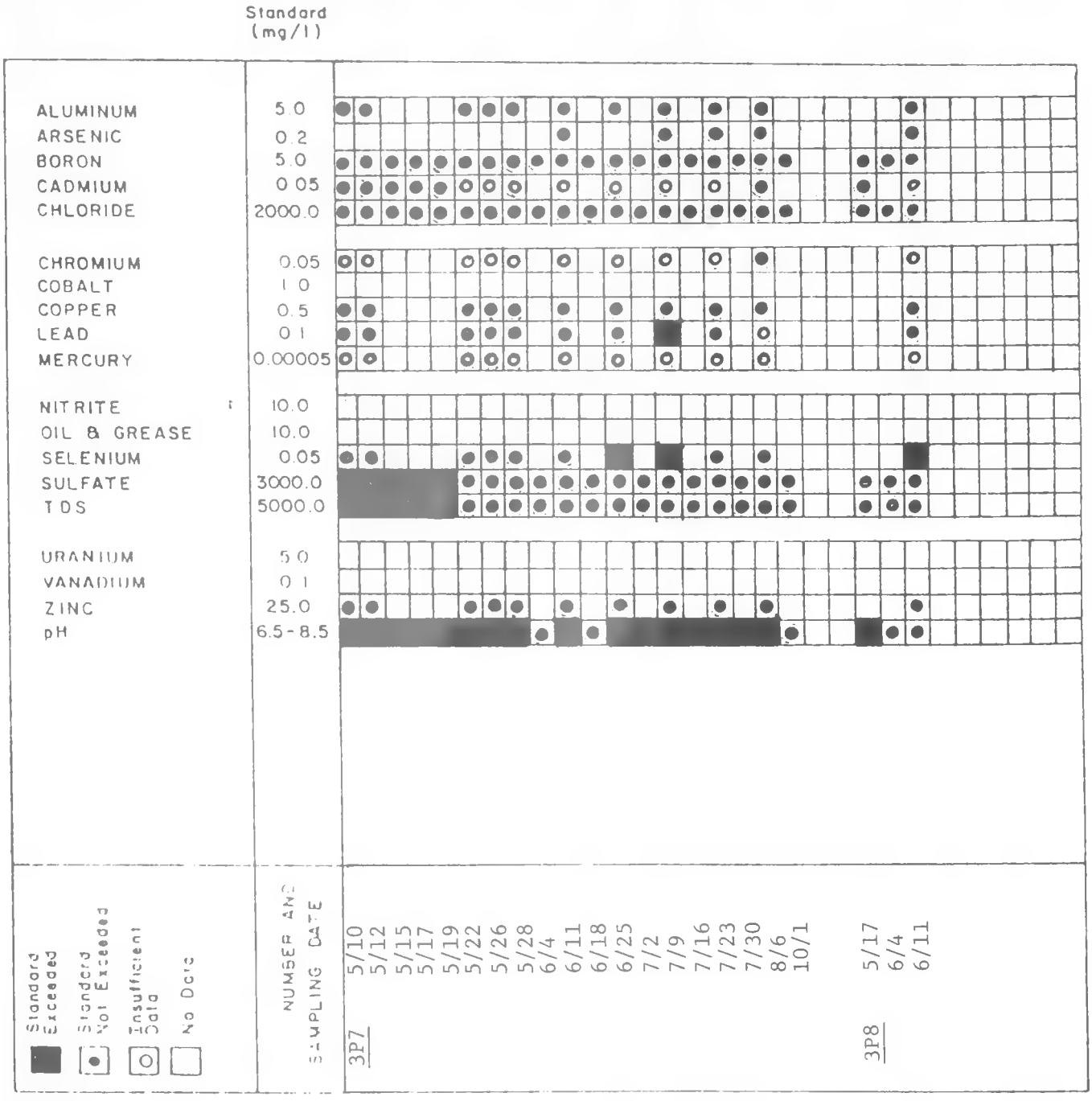

Figure C-3.c

SUITABILITY FOR FISH AND AQUATIC LIFE

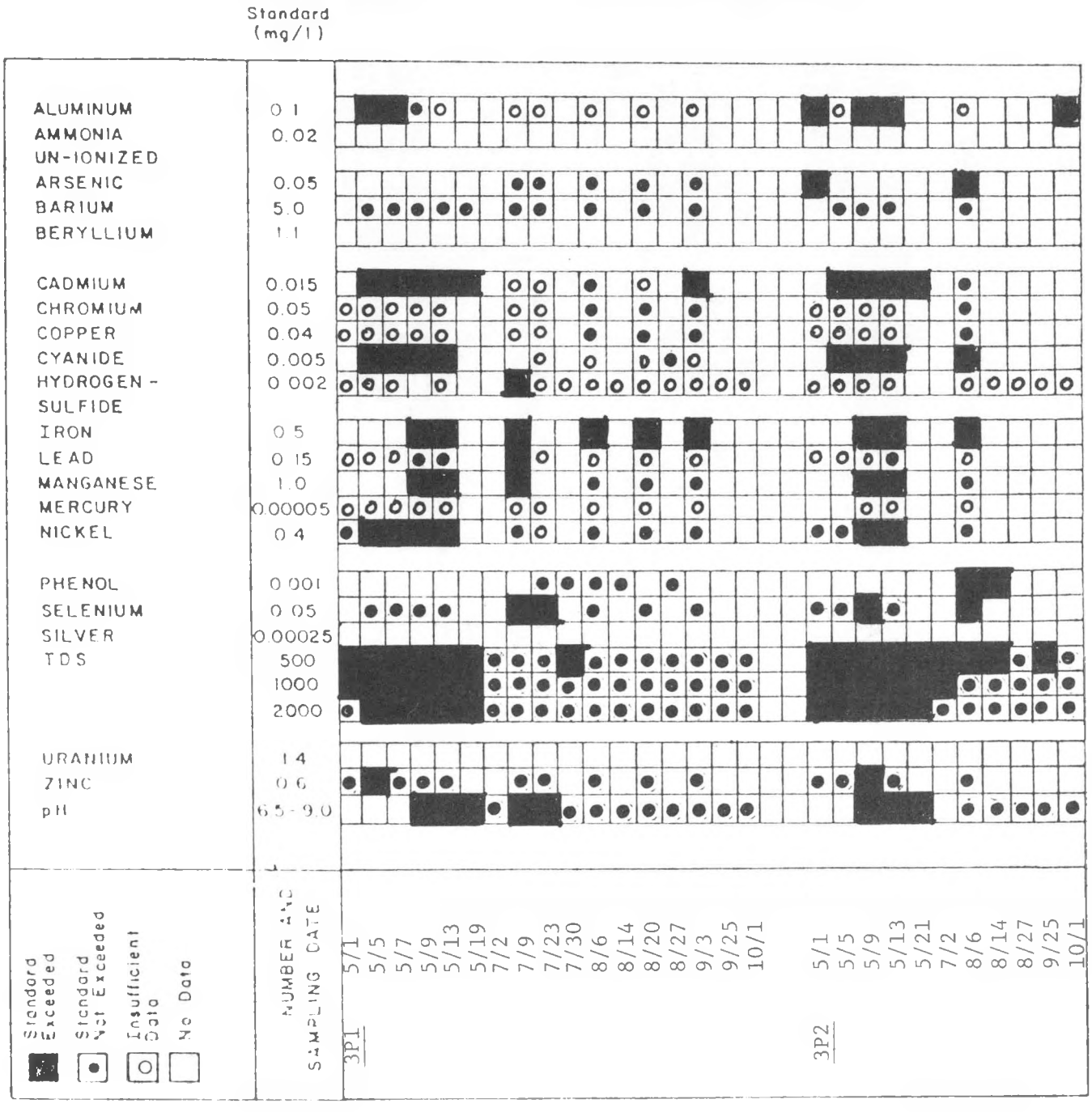

Figure C-4.a

SUITABILITY FOR FISH AND AQUATIC LIFE

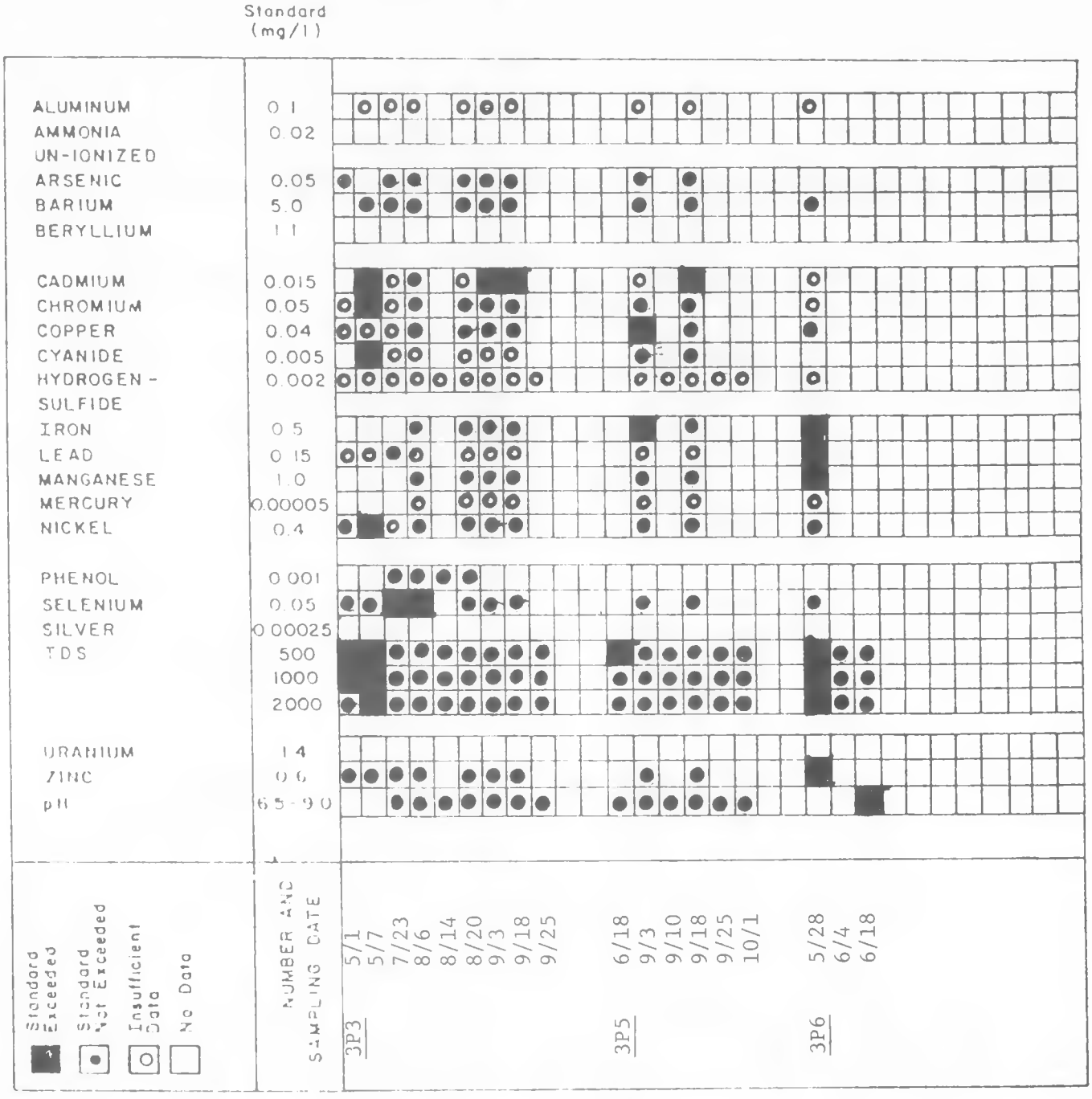

Figure C-4.b

SUITABILITY FOR FISH AND AQUATIC LIFE

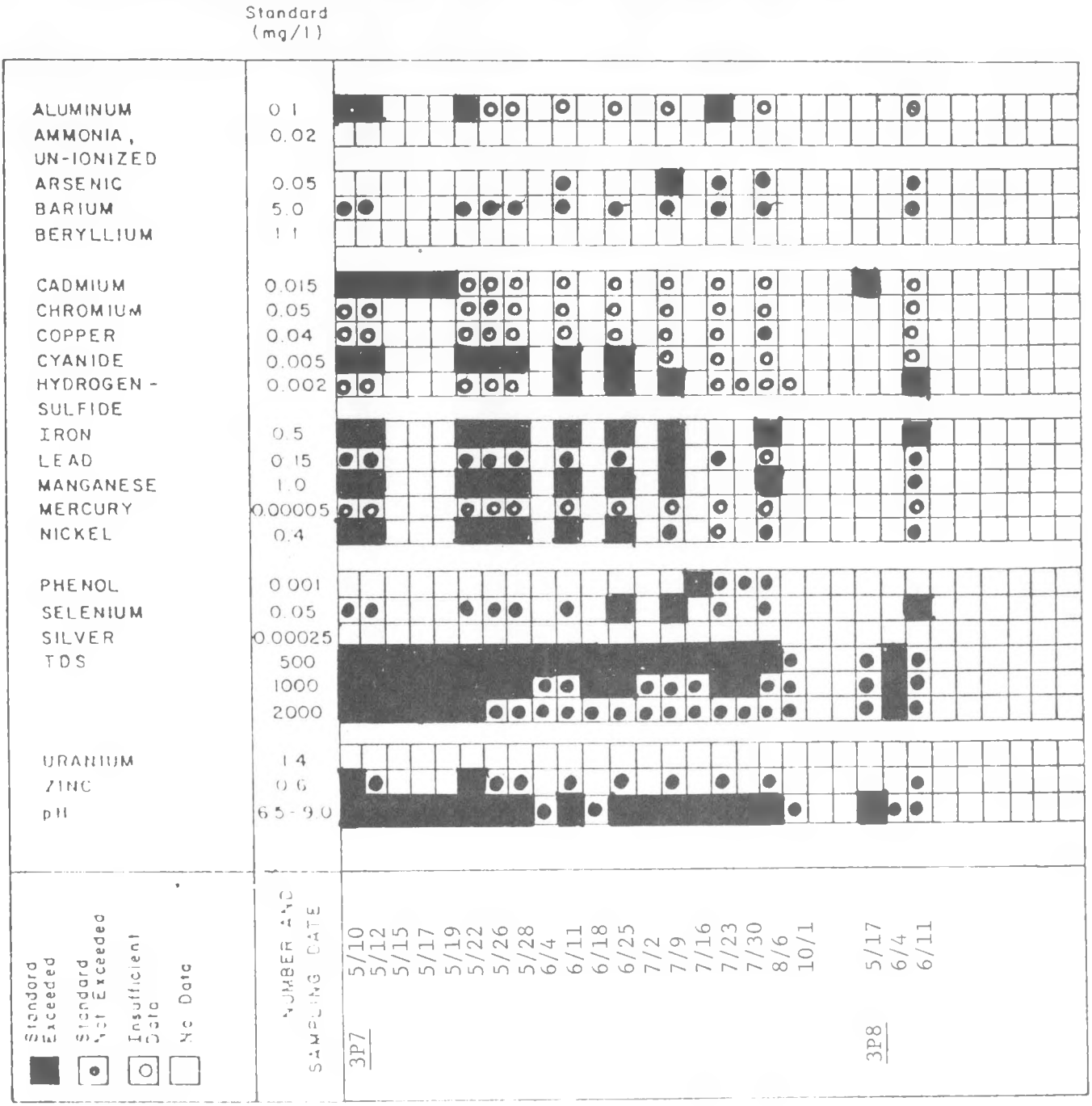

Figure C-4.c

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