Golder Associates
CONSULTING GEOTECHNICAL AND MINING ENGINEERS

1.10
9.30.85

REPORT TO
MONSANTO INDUSTRIAL CHEMICAL COMPANY
ON
HYDROGEOLOGICAL INVESTIGATION
SODA SPRINGS PLANT SITE
SODA SPRINGS, IDAHO

VOLUME 3

APPENDICES H - K

DISTRIBUTION:

2 copies - Monsanto Industrial Chemical Co.
Soda Springs, Idaho

2 copies - Golder Associates
Vancouver, B.C.

AR1.8 vol 2 0003

6299

1.10 0003

September, 1985

842-1543

VOLUME 3

TABLE OF CONTENTS

Appendix H Geochemical Data - Northern Engineering and Testing

i) November/December 1984
ii) February/March 1985

Appendix I Quality Assurance/Quality Control Determinations

i) November/December 1984
ii) February/March 1985

Appendix J Geochemical Statistical Analyses (SPSS Package)

i) Water Groupings
ii) Student "T" Test

Appendix K Saturation Indices

Appendix H

Geochemical Data
Northern Engineering and Testing

Well Drilling and
Development Chemistry

UPDATED ANALYSIS

Water Analysis

Client :	MONSANTO, INC.	October 24, 198
Identification:	TW-9	Job No. 79-920
Laboratory Number:	75406	Sheet 7 of 7
Date Sampled:	9-23-84	

pH, standard units:	6.2
Conductivity, umhos/cm:	1950
Total Dissolved Solids (at 180 C), mg/l:	1320
Sodium Adsorption Ratio (SAR):	0.24

CATIONS

Total Hardness (CaCO3):	1040	mg/l	20.79	meq/l
Calcium (Ca):	166	mg/l	8.28	meq/l
Magnesium (Mg):	152	mg/l	12.51	meq/l
Sodium (Na):	18	mg/l	0.78	meq/l
Potassium (K):	58	mg/l	1.48	meq/l
		Total Cations:	23.05	meq/l

ANIONS

Total Alkalinity (CaCO3):	1070	mg/l	21.40	meq/l
Bicarbonate Alkalinity (HCO3):	1306	mg/l	21.40	meq/l
Carbonate Alkalinity (CO3):	0	mg/l	0.00	meq/l
Hydroxide Alkalinity (OH):	0	mg/l	0.00	meq/l
Acidity (CaCO3):	N/A	mg/l	0.00	meq/l
Chloride (Cl):	31	mg/l	0.87	meq/l
Fluoride (F):	0.27	mg/l	0.01	meq/l
Nitrate + Nitrite (N):	0.09	mg/l	0.01	meq/l
Sulfate (SO4):	63	mg/l	1.31	meq/l
		Total Anions:	23.60	meq/l
		Cation-Anion Difference:	0.55	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	0.011	mg/l
Cadmium as Cd	0.012	mg/l
Chromium as Cr	-0.02	mg/l
Lead as Pb	-0.02	mg/l
Iron as Fe	7.6	mg/l
Manganese as Mn	0.29	mg/l
Selenium as Se	0.013	mg/l
Vanadium as V	-0.05	mg/l
Zinc a Zn	0.13	mg/l
Silver as Ag	-0.02	mg/l

Clear 'metals' sample.

MONSANTO CONFIDENTIAL

PUMPED SAMPLE - PRESERVED WITHIN 1 hr of sampling.

PUMPED SAMPLE
FILTERED + PRESERVED
IN SITU.

		Field Measurements
Client:	Monsanto	
Identification:	TW-10	
Laboratory Number:	75233	
Date Sampled:	09-20-84	T= 13.5°C
pH, standard units:	7.0	6.6
Conductivity, umhos/cm:	1360	1050
Total Dissolved Solids (at 180 C), mg/l:	1100	eH= +170mV
Sodium Adsorption Ratio (SAR):	0.88	
CATIONS		
Total Hardness (CaCO3):	661	
Calcium (Ca):	95	
Magnesium (Mg):	103	
Sodium (Na):	52	
Potassium (K):	6	
ANIONS		
Total Alkalinity (CaCO3):	573	
Bicarbonate Alkalinity (HCO3):	699	
Carbonate Alkalinity (CO3):	0	
Hydroxide Alkalinity (OH):	0	
Acidity (CaCO3):	0	
Chloride (Cl):	87	
Fluoride (F):	1.52	
Nitrate + Nitrite (N):	1.7	
Sulfate (SO4):	140	
TRACE ELEMENTS		
Arsenic as As	0.006	
Cadmium as Cd	-0.005	
Chromium as Cr	-0.02	
Iron as Fe	-0.02	
Manganese as Mn	-0.02	
Lead (Pb):	0.09	
Selenium as Se	0.050	
Silver as Ag	0.02	
Vanadium as V	0.04	
Zinc as Zn	-0.02	

MONSANTO CONFIDENTIAL

Northern
Engineering and Testing, Inc.
600 SOUTH 25TH STREET
P. O. BOX 30615
BILLINGS, MT 59107
(406) 248-9161

TECHNICAL REPORT

Report to:

MONSANTO, INC.
ATTN: MR. TIM OLIVER
P O BOX 816
SODA SPRINGS, ID 83276

Date: October 1, 1984
Job Number: 79-920
Sheet: 1 of 1
Invoice No.: 16638

Report of: Water Analysis - Plant Area

Sample Identification:

On September 18 and 20, 1984, these water samples were delivered to our laboratory for analysis. Tests were conducted in accordance with the U.S. Environmental Protection Agency Manual EPA 600/4-79-020, "Methods for Chemical Analysis of Water and Wastes." The results of the analysis are as follows.

TEST RESULTS:

Lab No.:	75002	75228	75229
Sample Identity:	TW-11	TW-11	TW-12
Date Sampled:	9/14/84	9/17/84	9/17/84
Collected by:	Tim Oliver	Tim Oliver	Tim Oliver
	(Dissolved, mg/l)		
Arsenic	-0.005	-0.005	0.006
Cadmium	-0.005	-0.005	-0.005
Chromium	-0.02	-0.02	-0.02
Iron	-0.05	1.32	0.08
Lead	-0.02	-0.02	-0.02
Manganese	0.10	0.14	0.15
Selenium	0.026	0.011	0.014
Silver	-0.02	-0.02	-0.02
Vanadium	0.05	-0.05	0.70
Zinc	0.07	-0.02	-0.02

A minus sign indicates less than the reported value was present in the sample.

Reviewed by Kathleen A. Smit

MONSANTO CONFIDENTIAL

AS A MUTUAL PROTECTION TO CLIENTS, THE PUBLIC AND OURSELVES, ALL REPORTS ARE SUBMITTED AS THE CONFIDENTIAL PROPERTY OF OUR CLIENTS, AND AUTHORIZATION FOR PUBLICATION OF STATEMENTS, CONCLUSIONS OR EXTRACTS FROM OR REGARDING OUR REPORTS IS RESERVED PENDING OUR WRITTEN APPROVAL. SAMPLES WILL BE DISPOSED OF AFTER TESTING IS COMPLETED UNLESS OTHER ARRANGEMENTS ARE AGREED TO IN WRITING.

Northern Engineering & Testing, Inc.

Client:	Monsanto, Inc.	Date	10-18-84
Identification:	TW-13	Job No.	79-920
Laboratory Number:	75469	Sheet	2 of 4
Date Sampled:	10-8-84		

pH, standard units:	6.8
Conductivity, umhos/cm:	675
Total Dissolved Solids (at 180 C), mg/l:	464
Sodium Adsorption Ratio (SAR):	0.15

CATIONS

Total Hardness as CaCO3:	428	mg/l	8.56	meq/l
Calcium as Ca:	104	mg/l	5.19	meq/l
Magnesium as Mg:	41	mg/l	3.37	meq/l
Sodium as Na:	7	mg/l	0.30	meq/l
Potassium as K:	2	mg/l	0.05	meq/l
		Total Cations:	8.91	meq/l

ANIONS

Total Alkalinity as CaCO3:	378	mg/l	7.56	meq/l
Bicarbonate Alkalinity as HCO3	461	mg/l	7.56	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Acidity as CaCO3:	N/A	mg/l	0.00	meq/l
Chloride as Cl:	14	mg/l	0.39	meq/l
Fluoride as F:	0.27	mg/l	0.01	meq/l
Nitrate + Nitrite as N:	4.4	mg/l	0.31	meq/l
Sulfate as SO4:	37	mg/l	0.77	meq/l
		Total Anions:	9.04	meq/l
		Cation-Anion Difference:	0.13	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	0.019	mg/l
Cadmium as Cd	0.018	mg/l
Chromium as Cr	-0.02	mg/l
Iron as Fe	0.04	mg/l
Manganese as Mn	-0.02	mg/l
Lead as Pb:	-0.02	mg/l
Selenium as Se	0.027	mg/l
Silver as Ag	-0.01	mg/l
Vanadium as V	0.18	mg/l
Zinc as Zn	-0.02	mg/l

A minus sign indicates less than the reported value was present in the sample

MONSANTO CONFIDENTIAL

AIR LIFT SAMPLE - NOT FILTERED OR PRESERVED

Client:	Monsanto, Inc.	Date	10-18-84
Identification:	TW-14	Job No.	79-920
Laboratory Number:	75470	Sheet	3 of 4
Date Sampled:	10-8-84		

pH, standard units:	6.9
Conductivity, umhos/cm:	695
Total Dissolved Solids (at 180 C), mg/l:	446
Sodium Adsorption Ratio (SAR):	0.25

CATIONS			
Total Hardness as CaCO3:	428	mg/l	8.56 meq/l
Calcium as Ca:	104	mg/l	5.19 meq/l
Magnesium as Mg:	41	mg/l	3.37 meq/l
Sodium as Na:	12	mg/l	0.52 meq/l
Potassium as K:	2	mg/l	0.05 meq/l
		Total Cations:	9.13 meq/l

ANIONS			
			meq/l
Total Alkalinity as CaCO3:	403	mg/l	8.06 meq/l
Bicarbonate Alkalinity as HCO3	492	mg/l	8.06 meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00 meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00 meq/l
Acidity as CaCO3:	N/A	mg/l	0.00 meq/l
Chloride as Cl:	8	mg/l	0.23 meq/l
Fluoride as F:	0.34	mg/l	0.02 meq/l
Nitrate + Nitrite as N:	4.38	mg/l	0.31 meq/l
Sulfate as SO4:	43	mg/l	0.90 meq/l
		Total Anions:	9.52 meq/l
		Cation-Anion Difference:	0.39 meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	0.017	mg/l
Cadmium as Cd	0.017	mg/l
Chromium as Cr	-0.02	mg/l
Iron as Fe	0.3	mg/l
Manganese as Mn	-0.02	mg/l
Lead as Pb	-0.02	mg/l
Selenium as Se	0.011	mg/l
Silver as Ag	-0.01	mg/l
Vanadium as V	0.18	mg/l
Zinc as Zn	-0.02	mg/l

A minus sign indicates less than the reported value was present in the sample

MONSANTO CONFIDENTIAL

AIR LIFT SAMPLE - NOT FILTERED OR PRESERVED

Northern Engineering & Testing, Inc.

Client:	Monsanto, Inc.	Date	10-18-84
Identification:	TW-15	Job No.	79-920
Laboratory Number:	75471	Sheet	4 of 4
Date Sampled:	10-8-84		

pH, standard units:	6.7
Conductivity, umhos/cm:	680
Total Dissolved Solids (at 180 C), mg/l:	432
Sodium Adsorption Ratio (SAR):	0.17

CATIONS

Total Hardness as CaCO3:	420	mg/l	8.40	meq/l
Calcium as Ca:	104	mg/l	5.19	meq/l
Magnesium as Mg:	39	mg/l	3.21	meq/l
Sodium as Na:	8	mg/l	0.35	meq/l
Potassium as K:	2	mg/l	0.05	meq/l
		Total Cations:	8.80	meq/l

ANIONS

Total Alkalinity as CaCO3:	375	mg/l	7.50	meq/l
Bicarbonate Alkalinity as HCO3	458	mg/l	7.50	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Acidity as CaCO3:	N/A	mg/l	0.00	meq/l
Chloride as Cl:	12	mg/l	0.34	meq/l
Fluoride as F:	0.26	mg/l	0.01	meq/l
Nitrate + Nitrite as N:	4.1	mg/l	0.29	meq/l
Sulfate as SO4:	38	mg/l	0.79	meq/l
		Total Anions:	8.93	meq/l
		Cation-Anion Difference:	0.13	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	0.019	mg/l
Cadmium as Cd	0.017	mg/l
Chromium as Cr	-0.02	mg/l
Iron as Fe	0.2	mg/l
Manganese as Mn	-0.02	mg/l
Lead as Pb:	-0.02	mg/l
Selenium as Se	0.029	mg/l
Silver as Ag	-0.01	mg/l
Vanadium as V	0.18	mg/l
Zinc as Zn	-0.02	mg/l

A minus sign indicates less than the reported value was present in the sample

AIR LIFT SAMPLE - NOT FILTERED OR PRESERVED.

MONSANTO CONFIDENTIAL

AIR LIFT
NOT FILTERED OR PRESERVED
ON SITE

Water Analysis

October 24, 198
Job No. 79-920
Sheet 3 of 7

Client :	MONSANTO, INC.
Identification:	TW-17
Laboratory Number:	75402 82 ft.
Date Sampled:	9-22-84

pH, standard units:	7.7
Conductivity, umhos/cm:	1820
Total Dissolved Solids (at 180 C), mg/l:	1240
Sodium Adsorption Ratio (SAR):	2.27

CATIONS

Total Hardness (CaCO3):	697	mg/l	13.94	meq/l
Calcium (Ca):	139	mg/l	6.94	meq/l
Magnesium (Mg):	85	mg/l	7.00	meq/l
Sodium (Na):	138	mg/l	6.00	meq/l
Potassium (K):	28	mg/l	0.72	meq/l
		Total Cations:	20.66	meq/l

ANIONS

Total Alkalinity (CaCO3):	537	mg/l	10.74	meq/l
Bicarbonate Alkalinity (HCO3):	655	mg/l	10.74	meq/l
Carbonate Alkalinity (CO3):	0	mg/l	0.00	meq/l
Hydroxide Alkalinity (OH):	0	mg/l	0.00	meq/l
Acidity (CaCO3):	0	mg/l	0.00	meq/l
Chloride (Cl):	155	mg/l	4.37	meq/l
Fluoride (F):	9.78	mg/l	0.51	meq/l
Nitrate + Nitrite (N):	6.54	mg/l	0.47	meq/l
Sulfate (SO4):	214	mg/l	4.46	meq/l
		Total Anions:	20.55	meq/l
		Cation-Anion Difference:	0.11	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	0.02	mg/l
Cadmium as Cd	0.88	mg/l
Chromium as Cr	0.03	mg/l
Lead as Pb	-0.02	mg/l
Iron as Fe	0.06	mg/l
Manganese as Mn	0.24	mg/l
Selenium as Se	0.071	mg/l
Vanadium as V	0.33	mg/l
Zinc a Zn	1.3	mg/l
Silver as Ag	-0.02	mg/l

Clear 'metals' sample.

MONSANTO CONFIDENTIAL

AIR LIFT
NOT FILTERED
OR PRESERVED
ON
SITE

Water Analysis

October 24, 1984
Job No. 79-920

Client :	MONSANTO, INC.
Identification:	TW-16
Laboratory Number:	75401
Date Sampled:	9-29-84

pH, standard units:	7.4
Conductivity, umhos/cm:	1670
Total Dissolved Solids (at 180 C), mg/l:	1070
Sodium Adsorption Ratio (SAR):	1.70

CATIONS

Total Hardness (CaCO3):	763	mg/l	15.25	meq/l
Calcium (Ca):	154	mg/l	7.68	meq/l
Magnesium (Mg):	92	mg/l	7.57	meq/l
Sodium (Na):	108	mg/l	4.70	meq/l
Potassium (K):	25	mg/l	0.64	meq/l
		Total Cations:	20.59	meq/l

ANIONS

Total Alkalinity (CaCO3):	594	mg/l	11.88	meq/l
Bicarbonate Alkalinity (HCO3):	725	mg/l	11.88	meq/l
Carbonate Alkalinity (CO3):	0	mg/l	0.00	meq/l
Hydroxide Alkalinity (OH):	0	mg/l	0.00	meq/l
Acidity (CaCO3):	0	mg/l	0.00	meq/l
Chloride (Cl):	128	mg/l	3.61	meq/l
Fluoride (F):	6.84	mg/l	0.36	meq/l
Nitrate + Nitrite (N):	7.11	mg/l	0.51	meq/l
Sulfate (SO4):	189	mg/l	3.94	meq/l
		Total Anions:	20.30	meq/l
		Cation-Anion Difference:	0.29	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	0.032	mg/l
Cadmium as Cd	1.4	mg/l
Chromium as Cr	-0.02	mg/l
Lead as Pb	-0.02	mg/l
Iron as Fe	3.1	mg/l
Manganese as Mn	0.29	mg/l
Selenium as Se	0.074	mg/l
Vanadium as V	0.031	mg/l
Zinc a Zn	4.39	mg/l
Silver as Ag	-0.02	mg/l

Suspended matter in bottle for metals.

MONSANTO CONFIDENTIAL

AIR LIFT SAMPLE

NOT FILTERED OR PRESERVED ONSITE

Water Analysis

Client :	MONSANTO, INC.	October 24, 198[illegible]
Identification:	TW-17	Job No. 79-920
Laboratory Number:	75403	Sheet 4 of 7
Date Sampled:	9-29-84	

pH, standard units:	7.9
Conductivity, umhos/cm:	2200
Total Dissolved Solids (at 180 C), mg/l:	1370
Sodium Adsorption Ratio (SAR):	2.44

CATIONS

Total Hardness (CaCO3):	784	mg/l	15.67	meq/l
Calcium (Ca):	70	mg/l	3.49	meq/l
Magnesium (Mg):	148	mg/l	12.18	meq/l
Sodium (Na):	157	mg/l	6.83	meq/l
Potassium (K):	34	mg/l	0.87	meq/l
		Total Cations:	23.37	meq/l

ANIONS

Total Alkalinity (CaCO3):	366	mg/l	7.32	meq/l
Bicarbonate Alkalinity (HCO3):	447	mg/l	7.32	meq/l
Carbonate Alkalinity (CO3):	0	mg/l	0.00	meq/l
Hydroxide Alkalinity (OH):	0	mg/l	0.00	meq/l
Acidity (CaCO3):	0	mg/l	0.00	meq/l
Chloride (Cl):	317	mg/l	8.94	meq/l
Fluoride (F):	7.48	mg/l	0.39	meq/l
Nitrate + Nitrite (N):	2.44	mg/l	0.17	meq/l
Sulfate (SO4):	301	mg/l	6.27	meq/l
		Total Anions:	23.09	meq/l
		Cation-Anion Difference:	0.28	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	0.011	mg/l
Cadmium as Cd	0.038	mg/l
Chromium as Cr	0.46	mg/l
Lead as Pb	-0.02	mg/l
Iron as Fe	0.21	mg/l
Manganese as Mn	1.07	mg/l
Selenium as Se	0.026	mg/l
Vanadium as V	0.14	mg/l
Zinc a Zn	0.19	mg/l
Silver as Ag	-0.02	mg/l

Clear 'metals' sample.

MONSANTO CONFIDENTIAL

Water Analysis

Client :	MONSANTO, INC.	October 24, 198
Identification:	TW-18	Job No. 79-920
Laboratory Number:	75404	Sheet 5 of 7
Date Sampled:	9-29-84	

pH, standard units:	7.7
Conductivity, umhos/cm:	1780
Total Dissolved Solids (at 180 C), mg/l:	910
Sodium Adsorption Ratio (SAR):	0.26

CATIONS

Total Hardness (CaCO3):	1090	mg/l	21.79	meq/l
Calcium (Ca):	64	mg/l	3.19	meq/l
Magnesium (Mg):	226	mg/l	18.60	meq/l
Sodium (Na):	20	mg/l	0.87	meq/l
Potassium (K):	27	mg/l	0.69	meq/l
		Total Cations:	23.35	meq/l

ANIONS

Total Alkalinity (CaCO3):	1140	mg/l	22.80	meq/l
Bicarbonate Alkalinity (HCO3):	1391	mg/l	22.80	meq/l
Carbonate Alkalinity (CO3):	0	mg/l	0.00	meq/l
Hydroxide Alkalinity (OH):	0	mg/l	0.00	meq/l
Acidity (CaCO3):	0	mg/l	0.00	meq/l
Chloride (Cl):	20	mg/l	0.56	meq/l
Fluoride (F):	0.36	mg/l	0.02	meq/l
Nitrate + Nitrite (N):	0.15	mg/l	0.01	meq/l
Sulfate (SO4):	30	mg/l	0.62	meq/l
		Total Anions:	24.01	meq/l
		Cation-Anion Difference:	0.66	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	0.012	mg/l	Standard = .05
Cadmium as Cd	0.008	mg/l	
Chromium as Cr	0.57	mg/l	std = .05.
Lead as Pb	-0.02	mg/l	
Iron as Fe	4.29	mg/l	
Manganese as Mn	0.44	mg/l	
Selenium as Se	0.008	mg/l	
Vanadium as V	-0.05	mg/l	
Zinc a Zn	0.09	mg/l	
Silver as Ag	-0.02	mg/l	

Light suspendeds sample.

AIR LIFT SAMPLE
NOT FILTERED OR PRESERVED
ON SITE

MONSANTO CONFIDENTIAL

Water Analysis

Client :	MONSANTO, INC.	October 24, 198
Identification:	TW-19	Job No. 79-920
Laboratory Number:	75405	Sheet 6 of 7
Date Sampled:	10-01-84	

pH, standard units:	7.8
Conductivity, umhos/cm:	1300
Total Dissolved Solids (at 180 C), mg/l:	1080
Sodium Adsorption Ratio (SAR):	0.38

CATIONS

Total Hardness (CaCO3):	690	mg/l	13.79	meq/l
Calcium (Ca):	123	mg/l	6.14	meq/l
Magnesium (Mg):	93	mg/l	7.65	meq/l
Sodium (Na):	23	mg/l	1.00	meq/l
Potassium (K):	11	mg/l	0.28	meq/l
		Total Cations:	15.07	meq/l

ANIONS

Total Alkalinity (CaCO3):	361	mg/l	7.22	meq/l
Bicarbonate Alkalinity (HCO3):	441	mg/l	7.22	meq/l
Carbonate Alkalinity (CO3):	0	mg/l	0.00	meq/l
Hydroxide Alkalinity (OH):	0	mg/l	0.00	meq/l
Acidity (CaCO3):	0	mg/l	0.00	meq/l
Chloride (Cl):	76	mg/l	2.14	meq/l
Fluoride (F):	1.25	mg/l	0.07	meq/l
Nitrate + Nitrite (N):	4.97	mg/l	0.36	meq/l
Sulfate (SO4):	262	mg/l	5.45	meq/l
		Total Anions:	15.24	meq/l
		Cation-Anion Difference:	0.17	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	0.080	mg/l
Cadmium as Cd	0.008	mg/l
Chromium as Cr	-0.02	mg/l
Lead as Pb	-0.02	mg/l
Iron as Fe	3.5	mg/l
Manganese as Mn	0.33	mg/l
Selenium as Se	0.04	mg/l
Vanadium as V	0.12	mg/l
Zinc a Zn	0.03	mg/l
Silver as Ag	-0.02	mg/l

Heavy suspendeds sample.

AIR LIFT SAMPE
DURING DRILLING
Not filtered or preserved on site

MONSANTO CONFIDENTIAL

Client:	MONSANTO, INC.	Date	March 4, 1985
Identification:	TW5	Job No.	79-920-1
Laboratory Number:	77261	Sheet	10 of 12
Date Sampled:	2-19-85		

pH, standard units:	6.8
Conductivity, umhos/cm:	2870
Total Dissolved Solids (at 180 C), mg/l:	1900
Sodium Adsorption Ratio (SAR):	2.44

CATIONS

Total Hardness as CaCO3:	867	mg/l	17.33	meq/l
Calcium as Ca:	166	mg/l	8.28	meq/l
Magnesium as Mg:	110	mg/l	9.05	meq/l
Sodium as Na:	165	mg/l	7.18	meq/l
Potassium as K:	130	mg/l	3.32	meq/l
		Total Cations:	27.83	meq/l

ANIONS

Total Alkalinity as CaCO3:	314	mg/l	6.28	meq/l
Bicarbonate Alkalinity as HCO3	383	mg/l	6.28	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Acidity as CaCO3:	N/A	mg/l	0.00	meq/l
Chloride as Cl:	230	mg/l	6.49	meq/l
Fluoride as F:	12.3	mg/l	0.65	meq/l
Nitrate + Nitrite as N:	11.7	mg/l	0.84	meq/l
Sulfate as SO4:	640	mg/l	13.33	meq/l
		Total Anions:	27.59	meq/l
		Cation-Anion Difference:	0.24	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	0.348	mg/l
Chromium as Cr	-0.02	mg/l
Copper as Cu:	-0.02	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb:	-0.02	mg/l
Manganese as Mn:	4.48	mg/l
Selenium as Se	0.010	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.05	mg/l
Zinc as Zn	1.16	mg/l

A minus sign indicates less than the reported value was present in the sample

Client:	MONSANTO, INC.	Date	March 4, 1985
Identification:	TW6	Job No.	79-920-1
Laboratory Number:	77262	Sheet	11 of 12
Date Sampled:	2-19-85		

pH, standard units:	7.0
Conductivity, umhos/cm:	2660
Total Dissolved Solids (at 180 C), mg/l:	1870
Sodium Adsorption Ratio (SAR):	2.48

CATIONS

Total Hardness as CaCO3:	882	mg/l	17.63	meq/l
Calcium as Ca:	172	mg/l	8.58	meq/l
Magnesium as Mg:	110	mg/l	9.05	meq/l
Sodium as Na:	169	mg/l	7.35	meq/l
Potassium as K:	129	mg/l	3.30	meq/l
		Total Cations:	28.28	meq/l

ANIONS

Total Alkalinity as CaCO3:	355	mg/l	7.10	meq/l
Bicarbonate Alkalinity as HCO3	433	mg/l	7.10	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Acidity as CaCO3:	N/A	mg/l	0.00	meq/l
Chloride as Cl:	230	mg/l	6.49	meq/l
Fluoride as F:	14.4	mg/l	0.76	meq/l
Nitrate + Nitrite as N:	9.99	mg/l	0.71	meq/l
Sulfate as SO4:	622	mg/l	12.95	meq/l
		Total Anions:	28.01	meq/l
		Cation-Anion Difference:	0.27	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	0.007	mg/l
Chromium as Cr	0.02	mg/l
Copper as Cu:	-0.02	mg/l
Iron as Fe	1.95	mg/l
Lead as Pb:	-0.02	mg/l
Manganese as Mn:	5.68	mg/l
Selenium as Se	0.026	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.05	mg/l
Zinc as Zn	1.48	mg/l

A minus sign indicates less than the reported value was present in the sample

Client:	MONSANTO, INC.	Date	March 4, 1985
Identification:	TW13	Job No.	79-920-1
Laboratory Number:	77263	Sheet	12 of 12
Date Sampled:	2-19-85		

pH, standard units:	7.4
Conductivity, umhos/cm:	900
Total Dissolved Solids (at 180 C), mg/l:	512
Sodium Adsorption Ratio (SAR):	0.12

CATIONS

Total Hardness as CaCO3:	489	mg/l	9.78	meq/l
Calcium as Ca:	120	mg/l	5.99	meq/l
Magnesium as Mg:	46	mg/l	3.79	meq/l
Sodium as Na:	6	mg/l	0.26	meq/l
Potassium as K:	3	mg/l	0.08	meq/l
		Total Cations:	10.12	meq/l

ANIONS

Total Alkalinity as CaCO3:	411	mg/l	8.22	meq/l
Bicarbonate Alkalinity as HCO3	502	mg/l	8.22	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Acidity as CaCO3:	N/A	mg/l	0.00	meq/l
Chloride as Cl:	10	mg/l	0.28	meq/l
Fluoride as F:	0.45	mg/l	0.02	meq/l
Nitrate + Nitrite as N:	3.79	mg/l	0.27	meq/l
Sulfate as SO4:	43	mg/l	0.90	meq/l
		Total Anions:	9.69	meq/l
		Cation-Anion Difference:	0.43	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	-0.02	mg/l
Copper as Cu:	-0.02	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb:	-0.02	mg/l
Manganese as Mn:	0.06	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.05	mg/l
Zinc as Zn	0.03	mg/l

A minus sign indicates less than the reported value was present in the sample

Client:	MONSANTO, INC.	Date	March 14, 1985
Identification:	TW14	Job No.	79-920-1
Laboratory Number:	77460	Sheet	12 of 48
Date Sampled:	2-21-85		

pH, standard units:	7.6
Conductivity, umhos/cm:	850
Total Dissolved Solids (at 180 C), mg/l:	532
Sodium Adsorption Ratio (SAR):	0.17

CATIONS

Total Hardness as CaCO3:	424	mg/l	8.48	meq/l
Calcium as Ca:	104	mg/l	5.19	meq/l
Magnesium as Mg:	40	mg/l	3.29	meq/l
Sodium as Na:	8	mg/l	0.35	meq/l
Potassium as K:	2	mg/l	0.05	meq/l
		Total Cations:	8.88	meq/l

ANIONS

Total Alkalinity as CaCO3:	387	mg/l	7.74	meq/l
Bicarbonate Alkalinity as HCO3	472	mg/l	7.74	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Chloride as Cl:	8	mg/l	0.23	meq/l
Fluoride as F:	0.35	mg/l	0.02	meq/l
Nitrate + Nitrite as N:	3.70	mg/l	0.26	meq/l
Sulfate as SO4:	18	mg/l	0.37	meq/l
		Total Anions:	8.62	meq/l
		Cation-Anion Difference:	0.26	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	-0.02	mg/l
Copper as Cu	-0.02	mg/l
Iron as Fe	0.08	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	-0.02	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.05	mg/l
Zinc as Zn	-0.02	mg/l

A minus sign indicates less than the reported value was present in the sample

Client:	MONSANTO, INC.	Date	March 14, 1985
Identification:	TW3	Job No.	79-920-1
Laboratory Number:	77451	Sheet	3 of 48
Date Sampled:	2-27-85		

pH, standard units:	6.5
Conductivity, umhos/cm:	1710
Total Dissolved Solids (at 180 C), mg/l:	1240
Sodium Adsorption Ratio (SAR):	0.46

CATIONS

Total Hardness as CaCO3:	912	mg/l	18.24	meq/l
Calcium as Ca:	118	mg/l	5.89	meq/l
Magnesium as Mg:	150	mg/l	12.35	meq/l
Sodium as Na:	32	mg/l	1.39	meq/l
Potassium as K:	14	mg/l	0.36	meq/l
		Total Cations:	19.99	meq/l

ANIONS

Total Alkalinity as CaCO3:	954	mg/l	19.08	meq/l
Bicarbonate Alkalinity as HCO3	1164	mg/l	19.08	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Chloride as Cl:	30	mg/l	0.85	meq/l
Fluoride as F:	0.40	mg/l	0.02	meq/l
Nitrate + Nitrite as N:	-0.05	mg/l	0.00	meq/l
Sulfate as SO4:	98	mg/l	2.04	meq/l
		Total Anions:	21.99	meq/l
		Cation-Anion Difference:	2.00	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	-0.02	mg/l
Copper as Cu	-0.02	mg/l
Iron as Fe	15.1	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	0.27	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.05	mg/l
Zinc as Zn	0.05	mg/l

A minus sign indicates less than the reported value was present in the sample

Client:	MONSANTO, INC.	Date	March 14, 1985
Identification:	TW4	Job No.	79-920-1
Laboratory Number:	77452	Sheet	4 of 38
Date Sampled:	2-27-85		

pH, standard units:	6.7
Conductivity, umhos/cm:	1880
Total Dissolved Solids (at 180 C), mg/l:	1250
Sodium Adsorption Ratio (SAR):	0.49

CATIONS

Total Hardness as CaCO3:	1036	mg/l	20.71	meq/l
Calcium as Ca:	128	mg/l	6.39	meq/l
Magnesium as Mg:	174	mg/l	14.32	meq/l
Sodium as Na:	36	mg/l	1.57	meq/l
Potassium as K:	16	mg/l	0.41	meq/l
		Total Cations:	22.69	meq/l

ANIONS

Total Alkalinity as CaCO3:	1020	mg/l	20.40	meq/l
Bicarbonate Alkalinity as HCO3	1245	mg/l	20.40	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Chloride as Cl:	27	mg/l	0.76	meq/l
Fluoride as F:	0.40	mg/l	0.02	meq/l
Nitrate + Nitrite as N:	-0.05	mg/l	0.00	meq/l
Sulfate as SO4:	96	mg/l	2.00	meq/l
		Total Anions:	23.18	meq/l
		Cation-Anion Difference:	0.49	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	-0.02	mg/l
Copper as Cu	-0.02	mg/l
Iron as Fe	15.5	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	0.60	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.05	mg/l
Zinc as Zn	0.08	mg/l

A minus sign indicates less than the reported value was present in the sample

Client:	MONSANTO, INC.	Date	March 14, 1985
Identification:	TW7	Job No.	79-920-1
Laboratory Number:	77453	Sheet	5 of 48
Date Sampled:	2-27-85		

pH, standard units:	7.3
Conductivity, umhos/cm:	1820
Total Dissolved Solids (at 180 C), mg/l:	1210
Sodium Adsorption Ratio (SAR):	0.53

CATIONS

Total Hardness as CaCO3:	1065	mg/l	21.29	meq/l
Calcium as Ca:	100	mg/l	4.99	meq/l
Magnesium as Mg:	198	mg/l	16.30	meq/l
Sodium as Na:	40	mg/l	1.74	meq/l
Potassium as K:	20	mg/l	0.51	meq/l
		Total Cations:	23.54	meq/l

ANIONS

Total Alkalinity as CaCO3:	979	mg/l	19.58	meq/l
Bicarbonate Alkalinity as HCO3	1195	mg/l	19.58	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Chloride as Cl:	40	mg/l	1.13	meq/l
Fluoride as F:	0.37	mg/l	0.02	meq/l
Nitrate + Nitrite as N:	-0.05	mg/l	0.00	meq/l
Sulfate as SO4:	98	mg/l	2.04	meq/l
		Total Anions:	22.77	meq/l
		Cation-Anion Difference:	0.77	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	-0.02	mg/l
Copper as Cu	-0.02	mg/l
Iron as Fe	4.03	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	0.23	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.05	mg/l
Zinc as Zn	-0.02	mg/l

A minus sign indicates less than the reported value was present in the sample

Client:	MONSANTO, INC.	Date	March 14, 1985
Identification:	TW8	Job No.	79-920-1
Laboratory Number:	77455	Sheet	7 of 48
Date Sampled:	2-27-85		

pH, standard units:	7.3
Conductivity, umhos/cm:	2430
Total Dissolved Solids (at 180 C), mg/l:	1620
Sodium Adsorption Ratio (SAR):	0.59

CATIONS

Total Hardness as CaCO3:	1439	mg/l	28.78	meq/l
Calcium as Ca:	54	mg/l	2.69	meq/l
Magnesium as Mg:	317	mg/l	26.09	meq/l
Sodium as Na:	51	mg/l	2.22	meq/l
Potassium as K:	22	mg/l	0.56	meq/l
		Total Cations:	31.56	meq/l

ANIONS

Total Alkalinity as CaCO3:	1490	mg/l	29.80	meq/l
Bicarbonate Alkalinity as HCO3	1818	mg/l	29.80	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Chloride as Cl:	16	mg/l	0.45	meq/l
Fluoride as F:	0.32	mg/l	0.02	meq/l
Nitrate + Nitrite as N:	-0.05	mg/l	0.00	meq/l
Sulfate as SO4:	44	mg/l	0.92	meq/l
		Total Anions:	31.19	meq/l
		Cation-Anion Difference:	0.37	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	-0.02	mg/l
Copper as Cu	-0.02	mg/l
Iron as Fe	3.95	mg/l
Lead as Pb	0.03	mg/l
Manganese as Mn	-0.02	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.05	mg/l
Zinc as Zn	0.07	mg/l

A minus sign indicates less than the reported value was present in the sample

Client:	MONSANTO, INC.	Date	March 14, 1985
Identification:	TW9	Job No.	79-920-1
Laboratory Number:	77456	Sheet	8 of 48
Date Sampled:	2-27-85		

pH, standard units:	6.7
Conductivity, umhos/cm:	1930
Total Dissolved Solids (at 180 C), mg/l:	1270
Sodium Adsorption Ratio (SAR):.	0.52

CATIONS

Total Hardness as CaCO3:	1103	mg/l	22.06	meq/l
Calcium as Ca:	150	mg/l	7.49	meq/l
Magnesium as Mg:	177	mg/l	14.57	meq/l
Sodium as Na:	40	mg/l	1.74	meq/l
Potassium as K:	16	mg/l	0.41	meq/l
		Total Cations:	24.21	meq/l

ANIONS

Total Alkalinity as CaCO3:	1060	mg/l	21.20	meq/l
Bicarbonate Alkalinity as HCO3	1294	mg/l	21.20	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Chloride as Cl:	27	mg/l	0.76	meq/l
Fluoride as F:	0.42	mg/l	0.02	meq/l
Nitrate + Nitrite as N:	-0.05	mg/l	0.00	meq/l
Sulfate as SO4:	102	mg/l	2.12	meq/l
		Total Anions:	24.10	meq/l
		Cation-Anion Difference:	0.11	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	-0.02	mg/l
Copper as Cu	-0.02	mg/l
Iron as Fe	8.76	mg/l
Lead as Pb	0.02	mg/l
Manganese as Mn	0.42	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.05	mg/l
Zinc as Zn	0.05	mg/l

A minus sign indicates less than the reported value was present in the sample

Client:	MONSANTO, INC.	Date	March 14, 1985
Identification:	TW10	Job No.	79-920-1
Laboratory Number:	77457	Sheet	9 of 48
Date Sampled:	2-21-85		

pH, standard units:	7.6
Conductivity, umhos/cm:	1520
Total Dissolved Solids (at 180 C), mg/l:	1020
Sodium Adsorption Ratio (SAR):	0.84

CATIONS

Total Hardness as CaCO3:	774	mg/l	15.48	meq/l
Calcium as Ca:	114	mg/l	5.69	meq/l
Magnesium as Mg:	119	mg/l	9.79	meq/l
Sodium as Na:	54	mg/l	2.35	meq/l
Potassium as K:	14	mg/l	0.36	meq/l
		Total Cations:	18.19	meq/l

ANIONS

Total Alkalinity as CaCO3:	648	mg/l	12.96	meq/l
Bicarbonate Alkalinity as HCO3	791	mg/l	12.96	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Chloride as Cl:	107	mg/l	3.02	meq/l
Fluoride as F:	1.17	mg/l	0.06	meq/l
Nitrate + Nitrite as N:	2.46	mg/l	0.18	meq/l
Sulfate as SO4:	101	mg/l	2.10	meq/l
		Total Anions:	18.32	meq/l
		Cation-Anion Difference:	0.13	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	-0.02	mg/l
Copper as Cu	-0.02	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	0.53	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.05	mg/l
Zinc as Zn	0.04	mg/l

A minus sign indicates less than the reported value was present in the sample

Client:	MONSANTO, INC.	Date	March 14, 1985
Identification:	TW11	Job No.	79-920-1
Laboratory Number:	77458	Sheet	10 of 48
Date Sampled:	2-28-85		

pH, standard units:	7.7
Conductivity, umhos/cm:	1450
Total Dissolved Solids (at 180 C), mg/l:	1020
Sodium Adsorption Ratio (SAR):	1.78

CATIONS

Total Hardness as CaCO3:	606	mg/l	12.11	meq/l
Calcium as Ca:	147	mg/l	7.34	meq/l
Magnesium as Mg:	58	mg/l	4.77	meq/l
Sodium as Na:	101	mg/l	4.39	meq/l
Potassium as K:	7	mg/l	0.18	meq/l
		Total Cations:	16.68	meq/l

ANIONS

Total Alkalinity as CaCO3:	422	mg/l	8.44	meq/l
Bicarbonate Alkalinity as HCO3	515	mg/l	8.44	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Chloride as Cl:	107	mg/l	3.02	meq/l
Fluoride as F:	0.27	mg/l	0.01	meq/l
Nitrate + Nitrite as N:	4.53	mg/l	0.32	meq/l
Sulfate as SO4:	195	mg/l	4.06	meq/l
		Total Anions:	15.85	meq/l
		Cation-Anion Difference:	0.83	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	-0.02	mg/l
Copper as Cu	-0.02	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	-0.02	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.05	mg/l
Zinc as Zn	-0.02	mg/l

A minus sign indicates less than the reported value was present in the sample

Client:	MONSANTO, INC.	Date	March 14, 1985
Identification:	TW12	Job No.	79-920-1
Laboratory Number:	77459	Sheet	11 of 48
Date Sampled:	2-28-85		

pH, standard units:	7.7
Conductivity, umhos/cm:	2770
Total Dissolved Solids (at 180 C), mg/l:	1770
Sodium Adsorption Ratio (SAR):	5.14

CATIONS

Total Hardness as CaCO3:	724	mg/l	14.48	meq/l
Calcium as Ca:	178	mg/l	8.88	meq/l
Magnesium as Mg:	68	mg/l	5.60	meq/l
Sodium as Na:	318	mg/l	13.83	meq/l
Potassium as K:	8	mg/l	0.20	meq/l
		Total Cations:	28.51	meq/l

ANIONS

Total Alkalinity as CaCO3:	414	mg/l	8.28	meq/l
Bicarbonate Alkalinity as HCO3	505	mg/l	8.28	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Chloride as Cl:	302	mg/l	8.52	meq/l
Fluoride as F:	0.28	mg/l	0.01	meq/l
Nitrate + Nitrite as N:	8.66	mg/l	0.62	meq/l
Sulfate as SO4:	574	mg/l	11.95	meq/l
		Total Anions:	29.38	meq/l
		Cation-Anion Difference:	0.87	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	-0.02	mg/l
Copper as Cu	-0.02	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	0.08	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	0.67	mg/l
Zinc as Zn	-0.02	mg/l

A minus sign indicates less than the reported value was present in the sample

Client:	MONSANTO, INC.	Date	March 14, 1985
Identification:	TW17	Job No.	79-920-1
Laboratory Number:	77463	Sheet	15 of 48
Date Sampled:	2-25-85		

pH, standard units:	7.7
Conductivity, umhos/cm:	2150
Total Dissolved Solids (at 180 C), mg/l:	1410
Sodium Adsorption Ratio (SAR):	2.02

CATIONS

Total Hardness as CaCO3:	835	mg/l	16.70	meq/l
Calcium as Ca:	61	mg/l	3.04	meq/l
Magnesium as Mg:	166	mg/l	13.66	meq/l
Sodium as Na:	134	mg/l	5.83	meq/l
Potassium as K:	21	mg/l	0.54	meq/l
		Total Cations:	23.07	meq/l

ANIONS

Total Alkalinity as CaCO3:	349	mg/l	6.98	meq/l
Bicarbonate Alkalinity as HCO3	426	mg/l	6.98	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Chloride as Cl:	302	mg/l	8.52	meq/l
Fluoride as F:	6.61	mg/l	0.35	meq/l
Nitrate + Nitrite as N:	0.37	mg/l	0.03	meq/l
Sulfate as SO4:	316	mg/l	6.58	meq/l
		Total Anions:	22.46	meq/l
		Cation-Anion Difference:	0.61	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	0.027	mg/l
Chromium as Cr	-0.02	mg/l
Copper as Cu	-0.02	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb	0.02	mg/l
Manganese as Mn	1.29	mg/l
Selenium as Se	0.012	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.05	mg/l
Zinc as Zn	0.10	mg/l

A minus sign indicates less than the reported value was present in the sample

Client:	MONSANTO, INC.	Date	March 14, 1985
Identification:	TW18	Job No.	79-920-1
Laboratory Number:	77464	Sheet	16 of 48
Date Sampled:	2-22-85		

pH, standard units:	6.7
Conductivity, umhos/cm:	1820
Total Dissolved Solids (at 180 C), mg/l:	1180
Sodium Adsorption Ratio (SAR):	0.51

CATIONS

Total Hardness as CaCO3:	1009	mg/l	20.17	meq/l
Calcium as Ca:	81	mg/l	4.04	meq/l
Magnesium as Mg:	196	mg/l	16.13	meq/l
Sodium as Na:	37	mg/l	1.61	meq/l
Potassium as K:	16	mg/l	0.41	meq/l
		Total Cations:	22.19	meq/l

ANIONS

Total Alkalinity as CaCO3:	1030	mg/l	20.60	meq/l
Bicarbonate Alkalinity as HCO3	1257	mg/l	20.60	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Chloride as Cl:	20	mg/l	0.56	meq/l
Fluoride as F:	0.32	mg/l	0.02	meq/l
Nitrate + Nitrite as N:	-0.05	mg/l	0.00	meq/l
Sulfate as SO4:	32	mg/l	0.67	meq/l
		Total Anions:	21.85	meq/l
		Cation-Anion Difference:	0.34	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	0.006	mg/l
Chromium as Cr	-0.02	mg/l
Copper as Cu	-0.02	mg/l
Iron as Fe	5.68	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	0.16	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.05	mg/l
Zinc as Zn	0.03	mg/l

A minus sign indicates less than the reported value was present in the sample

Client:	MONSANTO, INC.	Date	March 14, 1985
Identification:	TW19	Job No.	79-920-1
Laboratory Number:	77465	Sheet	17 of 48
Date Sampled:	2-20-85		

pH, standard units:	7.5
Conductivity, umhos/cm:	1300
Total Dissolved Solids (at 180 C), mg/l:	942
Sodium Adsorption Ratio (SAR):	0.72

CATIONS

Total Hardness as CaCO3:	619	mg/l	12.38	meq/l
Calcium as Ca:	121	mg/l	6.04	meq/l
Magnesium as Mg:	77	mg/l	6.34	meq/l
Sodium as Na:	41	mg/l	1.78	meq/l
Potassium as K:	6	mg/l	0.15	meq/l
		Total Cations:	14.31	meq/l

ANIONS

Total Alkalinity as CaCO3:	331	mg/l	6.62	meq/l
Bicarbonate Alkalinity as HCO3	404	mg/l	6.62	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Chloride as Cl:	69	mg/l	1.95	meq/l
Fluoride as F:	1.37	mg/l	0.07	meq/l
Nitrate + Nitrite as N:	7.71	mg/l	0.55	meq/l
Sulfate as SO4:	266	mg/l	5.54	meq/l
		Total Anions:	14.73	meq/l
		Cation-Anion Difference:	0.42	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	0.006	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	-0.02	mg/l
Copper as Cu	-0.02	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	-0.02	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.05	mg/l
Zinc as Zn	-0.02	mg/l

A minus sign indicates less than the reported value was present in the sample

Client:	MONSANTO, INC.	Date	March 14, 1985
Identification:	TW20	Job No.	79-920-1
Laboratory Number:	77466	Sheet	18 of 48
Date Sampled:	2-24-85		

pH, standard units:	7.6
Conductivity, umhos/cm:	1190
Total Dissolved Solids (at 180 C), mg/l:	868
Sodium Adsorption Ratio (SAR):	0.88

CATIONS

Total Hardness as CaCO3:	513	mg/l	10.26	meq/l
Calcium as Ca:	105	mg/l	5.24	meq/l
Magnesium as Mg:	61	mg/l	5.02	meq/l
Sodium as Na:	46	mg/l	2.00	meq/l
Potassium as K:	24	mg/l	0.61	meq/l
		Total Cations:	12.87	meq/l

ANIONS

Total Alkalinity as CaCO3:	269	mg/l	5.38	meq/l
Bicarbonate Alkalinity as HCO3	328	mg/l	5.38	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Chloride as Cl:	63	mg/l	1.78	meq/l
Fluoride as F:	2.68	mg/l	0.14	meq/l
Nitrate + Nitrite as N:	6.73	mg/l	0.48	meq/l
Sulfate as SO4:	244	mg/l	5.08	meq/l
		Total Anions:	12.86	meq/l
		Cation-Anion Difference:	0.01	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	0.02	mg/l
Copper as Cu	-0.02	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	-0.02	mg/l
Selenium as Se	0.006	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.05	mg/l
Zinc as Zn	0.06	mg/l

A minus sign indicates less than the reported value was present in the sample

Client:	MONSANTO, INC.	Date	March 14, 1985
Identification:	TW21	Job No.	79-920-1
Laboratory Number:	77467	Sheet	19 of 48
Date Sampled:	2-25-85		

pH, standard units:	7.0
Conductivity, umhos/cm:	1930
Total Dissolved Solids (at 180 C), mg/l:	1220
Sodium Adsorption Ratio (SAR):	0.42

CATIONS

Total Hardness as CaCO3:	1090	mg/l	21.80	meq/l
Calcium as Ca:	51	mg/l	2.54	meq/l
Magnesium as Mg:	234	mg/l	19.26	meq/l
Sodium as Na:	32	mg/l	1.39	meq/l
Potassium as K:	16	mg/l	0.41	meq/l
		Total Cations:	23.60	meq/l

ANIONS

Total Alkalinity as CaCO3:	1090	mg/l	21.80	meq/l
Bicarbonate Alkalinity as HCO3	1330	mg/l	21.80	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Chloride as Cl:	20	mg/l	0.56	meq/l
Fluoride as F:	0.26	mg/l	0.01	meq/l
Nitrate + Nitrite as N:	0.07	mg/l	0.01	meq/l
Sulfate as SO4:	28	mg/l	0.58	meq/l
		Total Anions:	22.96	meq/l
		Cation-Anion Difference:	0.64	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	-0.02	mg/l
Copper as Cu	-0.02	mg/l
Iron as Fe	4.98	mg/l
Lead as Pb	0.02	mg/l
Manganese as Mn	-0.02	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.05	mg/l
Zinc as Zn	0.04	mg/l

A minus sign indicates less than the reported value was present in the sample

Client:	Monsanto, Inc.	Date	March 7, 1985
Identification:	TW22	Job No.	79-920-1
Laboratory Number:	77265	Sheet	3 of 12
Date Sampled:	2-18-85		

pH, standard units:	8.0
Conductivity, umhos/cm:	2840
Total Dissolved Solids (at 180 C), mg/l:	2120
Sodium Adsorption Ratio (SAR):	2.13

CATIONS

Total Hardness as CaCO3:	1139	mg/l	22.77	meq/l
Calcium as Ca:	250	mg/l	12.48	meq/l
Magnesium as Mg:	125	mg/l	10.29	meq/l
Sodium as Na:	165	mg/l	7.18	meq/l
Potassium as K:	84	mg/l	2.15	meq/l
		Total Cations:	32.10	meq/l

ANIONS

Total Alkalinity as CaCO3:	240	mg/l	4.80	meq/l
Bicarbonate Alkalinity as HCO3	293	mg/l	4.80	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Chloride as Cl:	232	mg/l	6.54	meq/l
Fluoride as F:	12.3	mg/l	0.65	meq/l
Nitrate + Nitrite as N:	12.6	mg/l	0.90	meq/l
Sulfate as SO4:	912	mg/l	18.99	meq/l
		Total Anions:	31.88	meq/l
		Cation-Anion Difference:	0.22	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	0.007	mg/l
Cadmium as Cd	0.018	mg/l
Chromium as Cr	-0.02	mg/l
Copper as Cu	-0.02	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	0.40	mg/l
Selenium as Se	0.016	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	0.07	mg/l
Zinc as Zn	0.04	mg/l

A minus sign indicates less than the reported value was present in the sample

Client:	MONSANTO, INC.	Date	March 14, 1985
Identification:	TW25	Job No.	79-920-1
Laboratory Number:	77468	Sheet	20 of 48
Date Sampled:	3-02-85		

pH, standard units:	9.0
Conductivity, umhos/cm:	1710
Total Dissolved Solids (at 180 C), mg/l:	1300
Sodium Adsorption Ratio (SAR):	0.50

CATIONS

Total Hardness as CaCO3:	1084	mg/l	21.67	meq/l
Calcium as Ca:	55	mg/l	2.74	meq/l
Magnesium as Mg:	230	mg/l	18.93	meq/l
Sodium as Na:	38	mg/l	1.65	meq/l
Potassium as K:	6	mg/l	0.15	meq/l
		Total Cations:	23.47	meq/l

ANIONS

Total Alkalinity as CaCO3:	605	mg/l	12.10	meq/l
Bicarbonate Alkalinity as HCO3	563	mg/l	9.23	meq/l
Carbonate Alkalinity as CO3:	86	mg/l	2.87	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Chloride as Cl:	115	mg/l	3.24	meq/l
Fluoride as F:	0.32	mg/l	0.02	meq/l
Nitrate + Nitrite as N:	0.05	mg/l	0.00	meq/l
Sulfate as SO4:	360	mg/l	7.50	meq/l
		Total Anions:	22.86	meq/l
		Cation-Anion Difference:	0.61	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	-0.02	mg/l
Copper as Cu	-0.02	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	-0.02	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.05	mg/l
Zinc as Zn	-0.02	mg/l

A minus sign indicates less than the reported value was present in the sample

Client:	MONSANTO, INC.	Date	March 14, 1985
Identification:	TW26	Job No.	79-920-1
Laboratory Number:	77469	Sheet	21 of 48
Date Sampled:	3-01-85		

pH, standard units:	7.6
Conductivity, umhos/cm:	2040
Total Dissolved Solids (at 180 C), mg/l:	1560
Sodium Adsorption Ratio (SAR):	1.16

CATIONS

Total Hardness as CaCO3:	988	mg/l	19.75	meq/l
Calcium as Ca:	117	mg/l	5.84	meq/l
Magnesium as Mg:	169	mg/l	13.91	meq/l
Sodium as Na:	84	mg/l	3.65	meq/l
Potassium as K:	16	mg/l	0.41	meq/l
		Total Cations:	23.81	meq/l

ANIONS

Total Alkalinity as CaCO3:	339	mg/l	6.78	meq/l
Bicarbonate Alkalinity as HCO3	414	mg/l	6.78	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Chloride as Cl:	179	mg/l	5.05	meq/l
Fluoride as F:	0.76	mg/l	0.04	meq/l
Nitrate + Nitrite as N:	7.15	mg/l	0.51	meq/l
Sulfate as SO4:	536	mg/l	11.16	meq/l
		Total Anions:	23.54	meq/l
		Cation-Anion Difference:	0.27	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	-0.02	mg/l
Copper as Cu	-0.02	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	1.15	mg/l
Selenium as Se	0.006	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.05	mg/l
Zinc as Zn	0.07	mg/l

A minus sign indicates less than the reported value was present in the sample

Client:	MONSANTO, INC.	Date	March 14, 1985
Identification:	TW27	Job No.	79-920-1
Laboratory Number:	77470	Sheet	22 of 48
Date Sampled:	2-24-85		

pH, standard units:	7.5
Conductivity, umhos/cm:	1710
Total Dissolved Solids (at 180 C), mg/l:	1310
Sodium Adsorption Ratio (SAR):	1.96

CATIONS

Total Hardness as CaCO3:	687	mg/l	13.73	meq/l
Calcium as Ca:	168	mg/l	8.38	meq/l
Magnesium as Mg:	65	mg/l	5.35	meq/l
Sodium as Na:	118	mg/l	5.13	meq/l
Potassium as K:	17	mg/l	0.43	meq/l
		Total Cations:	19.29	meq/l

ANIONS

Total Alkalinity as CaCO3:	254	mg/l	5.08	meq/l
Bicarbonate Alkalinity as HCO3	310	mg/l	5.08	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Chloride as Cl:	65	mg/l	1.83	meq/l
Fluoride as F:	2.68	mg/l	0.14	meq/l
Nitrate + Nitrite as N:	12.0	mg/l	0.86	meq/l
Sulfate as SO4:	538	mg/l	11.20	meq/l
		Total Anions:	19.11	meq/l
		Cation-Anion Difference:	0.18	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	0.006	mg/l
Cadmium as Cd	0.023	mg/l
Chromium as Cr	-0.02	mg/l
Copper as Cu	-0.02	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	0.15	mg/l
Selenium as Se	0.028	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.05	mg/l
Zinc as Zn	0.09	mg/l

A minus sign indicates less than the reported value was present in the sample

Client:	MONSANTO, INC.	Date	March 14, 1985
Identification:	TW28	Job No.	79-920-1
Laboratory Number:	77471	Sheet	23 of 48
Date Sampled:	2-23-85		

pH, standard units:	7.1
Conductivity, umhos/cm:	1460
Total Dissolved Solids (at 180 C), mg/l:	1080
Sodium Adsorption Ratio (SAR):	0.29

CATIONS

Total Hardness as CaCO3:	821	mg/l	16.41	meq/l
Calcium as Ca:	182	mg/l	9.08	meq/l
Magnesium as Mg:	89	mg/l	7.33	meq/l
Sodium as Na:	19	mg/l	0.83	meq/l
Potassium as K:	6	mg/l	0.15	meq/l
		Total Cations:	17.39	meq/l

ANIONS

Total Alkalinity as CaCO3:	736	mg/l	14.72	meq/l
Bicarbonate Alkalinity as HCO3	898	mg/l	14.72	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Chloride as Cl:	27	mg/l	0.76	meq/l
Fluoride as F:	0.22	mg/l	0.01	meq/l
Nitrate + Nitrite as N:	3.68	mg/l	0.26	meq/l
Sulfate as SO4:	78	mg/l	1.62	meq/l
		Total Anions:	17.37	meq/l
		Cation-Anion Difference:	0.02	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	0.013	mg/l
Chromium as Cr	-0.02	mg/l
Copper as Cu	-0.02	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	-0.02	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.05	mg/l
Zinc as Zn	0.07	mg/l

A minus sign indicates less than the reported value was present in the sample

Client:	MONSANTO, INC.	Date	March 14, 1985
Identification:	TW33	Job No.	79-920-1
Laboratory Number:	77473	Sheet	25 of 48
Date Sampled:	2-28-85		

pH, standard units:	7.6
Conductivity, umhos/cm:	894
Total Dissolved Solids (at 180 C), mg/l:	562
Sodium Adsorption Ratio (SAR):	0.32

CATIONS

Total Hardness as CaCO3:	479	mg/l	9.58	meq/l
Calcium as Ca:	126	mg/l	6.29	meq/l
Magnesium as Mg:	40	mg/l	3.29	meq/l
Sodium as Na:	16	mg/l	0.70	meq/l
Potassium as K:	2	mg/l	0.05	meq/l
		Total Cations:	10.33	meq/l

ANIONS

Total Alkalinity as CaCO3:	402	mg/l	8.04	meq/l
Bicarbonate Alkalinity as HCO3	491	mg/l	8.04	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Chloride as Cl:	23	mg/l	0.65	meq/l
Fluoride as F:	0.24	mg/l	0.01	meq/l
Nitrate + Nitrite as N:	2.60	mg/l	0.19	meq/l
Sulfate as SO4:	43	mg/l	0.90	meq/l
		Total Anions:	9.79	meq/l
		Cation-Anion Difference:	0.54	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	-0.02	mg/l
Copper as Cu	-0.02	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	-0.02	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	0.30	mg/l
Zinc as Zn	0.03	mg/l

A minus sign indicates less than the reported value was present in the sample

Client:	MONSANTO, INC.	Date	March 14, 1985
Identification:	TW34	Job No.	79-920-1
Laboratory Number:	77475	Sheet	27 of 48
Date Sampled:	2-26-85		

pH, standard units:	7.4
Conductivity, umhos/cm:	1190
Total Dissolved Solids (at 180 C), mg/l:	852
Sodium Adsorption Ratio (SAR):	0.30

CATIONS

Total Hardness as CaCO3:	698	mg/l	13.96	meq/l
Calcium as Ca:	123	mg/l	6.14	meq/l
Magnesium as Mg:	95	mg/l	7.82	meq/l
Sodium as Na:	18	mg/l	0.78	meq/l
Potassium as K:	6	mg/l	0.15	meq/l
		Total Cations:	14.89	meq/l

ANIONS

Total Alkalinity as CaCO3:	402	mg/l	8.04	meq/l
Bicarbonate Alkalinity as HCO3	491	mg/l	8.04	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Chloride as Cl:	64	mg/l	1.81	meq/l
Fluoride as F:	0.44	mg/l	0.02	meq/l
Nitrate + Nitrite as N:	0.65	mg/l	0.05	meq/l
Sulfate as SO4:	213	mg/l	4.43	meq/l
		Total Anions:	14.35	meq/l
		Cation-Anion Difference:	0.54	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	-0.02	mg/l
Copper as Cu	-0.02	mg/l
Iron as Fe	0.16	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	0.27	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.05	mg/l
Zinc as Zn	-0.02	mg/l

A minus sign indicates less than the reported value was present in the sample

Client:	MONSANTO, INC.	Date	March 14, 1985
Identification:	PW1	Job No.	79-920-1
Laboratory Number:	77488	Sheet	40 of 48
Date Sampled:	2-26-85		

pH, standard units:	7.1
Conductivity, umhos/cm:	1380
Total Dissolved Solids (at 180 C), mg/l:	922
Sodium Adsorption Ratio (SAR):	1.21

CATIONS

Total Hardness as CaCO3:	629	mg/l	12.58	meq/l
Calcium as Ca:	135	mg/l	6.74	meq/l
Magnesium as Mg:	71	mg/l	5.84	meq/l
Sodium as Na:	70	mg/l	3.04	meq/l
Potassium as K:	19	mg/l	0.49	meq/l
		Total Cations:	16.11	meq/l

ANIONS

Total Alkalinity as CaCO3:	419	mg/l	8.38	meq/l
Bicarbonate Alkalinity as HCO3	511	mg/l	8.38	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Chloride as Cl:	109	mg/l	3.[illegible]	meq/l
Fluoride as F:	1.60	mg/l	0.0[illegible]	meq/l
Nitrate + Nitrite as N:	6.52	mg/l	0.47	meq/l
Sulfate as SO4:	172	mg/l	3.58	meq/l
		Total Anions:	15.58	meq/l
		Cation-Anion Difference:	0.53	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	0.008	mg/l
Cadmium as Cd	0.201	mg/l
Chromium as Cr	-0.02	mg/l
Copper as Cu	-0.02	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	-0.02	mg/l
Selenium as Se	0.025	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.05	mg/l
Zinc as Zn	0.24	mg/l

A minus sign indicates less than the reported value was present in the sample

Client:	MONSANTO, INC.	Date	March 14, 1985
Identification:	PW2	Job No.	79-920-1
Laboratory Number:	77489	Sheet	41 of 48
Date Sampled:	2-26-85		

pH, standard units:	7.1
Conductivity, umhos/cm:	1260
Total Dissolved Solids (at 180 C), mg/l:	754
Sodium Adsorption Ratio (SAR):	0.69

CATIONS

Total Hardness as CaCO3:	572	mg/l	11.44	meq/l
Calcium as Ca:	127	mg/l	6.34	meq/l
Magnesium as Mg:	62	mg/l	5.10	meq/l
Sodium as Na:	38	mg/l	1.65	meq/l
Potassium as K:	10	mg/l	0.26	meq/l
		Total Cations:	13.35	meq/l

ANIONS

Total Alkalinity as CaCO3:	416	mg/l	8.32	meq/l
Bicarbonate Alkalinity as HCO3	508	mg/l	8.32	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Chloride as Cl:	58	mg/l	1.64	meq/l
Fluoride as F:	0.79	mg/l	0.04	meq/l
Nitrate + Nitrite as N:	6.10	mg/l	0.44	meq/l
Sulfate as SO4:	100	mg/l	2.08	meq/l
		Total Anions:	12.52	meq/l
		Cation-Anion Difference:	0.83	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	0.027	mg/l
Chromium as Cr	-0.02	mg/l
Copper as Cu	-0.02	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	-0.02	mg/l
Selenium as Se	0.009	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.05	mg/l
Zinc as Zn	0.02	mg/l

A minus sign indicates less than the reported value was present in the sample

Client:	MONSANTO, INC.	Date	March 14, 1985
Identification:	PW3*	Job No.	79-920-1
Laboratory Number:	77490	Sheet	42 of 48
Date Sampled:	2-23-85		

pH, standard units:	7.2
Conductivity, umhos/cm:	1040
Total Dissolved Solids (at 180 C), mg/l:	675
Sodium Adsorption Ratio (SAR):	0.54

CATIONS

Total Hardness as CaCO3:	551	mg/l	11.01	meq/l
Calcium as Ca:	125	mg/l	6.24	meq/l
Magnesium as Mg:	58	mg/l	4.77	meq/l
Sodium as Na:	29	mg/l	1.26	meq/l
Potassium as K:	9	mg/l	0.23	meq/l
		Total Cations:	12.50	meq/l

ANIONS

Total Alkalinity as CaCO3:	410	mg/l	8.20	meq/l
Bicarbonate Alkalinity as HCO3	500	mg/l	8.20	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Chloride as Cl:	45	mg/l	1.27	meq/l
Fluoride as F:	0.58	mg/l	0.03	meq/l
Nitrate + Nitrite as N:	5.38	mg/l	0.38	meq/l
Sulfate as SO4:	84	mg/l	1.75	meq/l
		Total Anions:	11.63	meq/l
		Cation-Anion Difference:	0.87	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	0.016	mg/l
Chromium as Cr	-0.02	mg/l
Copper as Cu	-0.02	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	-0.02	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.05	mg/l
Zinc as Zn	0.02	mg/l

A minus sign indicates less than the reported value was present in the sample

*Metals bottle was labeled P33

Client:	MONSANTO, INC.	Date	March 14, 1985
Identification:	TW2	Job No.	79-920-1
Laboratory Number:	77450	Sheet	2 of 48
Date Sampled:	2-21-85		

pH, standard units:	7.4
Conductivity, umhos/cm:	1020
Total Dissolved Solids (at 180 C), mg/l:	709
Sodium Adsorption Ratio (SAR):	0.27

CATIONS

Total Hardness as CaCO3:	514	mg/l	10.28	meq/l
Calcium as Ca:	112	mg/l	5.59	meq/l
Magnesium as Mg:	57	mg/l	4.69	meq/l
Sodium as Na:	14	mg/l	0.61	meq/l
Potassium as K:	5	mg/l	0.13	meq/l
		Total Cations:	11.02	meq/l

ANIONS

Total Alkalinity as CaCO3:	430	mg/l	8.60	meq/l
Bicarbonate Alkalinity as HCO3	525	mg/l	8.60	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Chloride as Cl:	21	mg/l	0.59	meq/l
Fluoride as F:	0.27	mg/l	0.01	meq/l
Nitrate + Nitrite as N:	4.78	mg/l	0.34	meq/l
Sulfate as SO4:	56	mg/l	1.17	meq/l
		Total Anions:	10.71	meq/l
		Cation-Anion Difference:	0.31	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	-0.02	mg/l
Copper as Cu	-0.02	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	-0.02	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.05	mg/l
Zinc as Zn	0.58	mg/l

A minus sign indicates less than the reported value was present in the sample

Northern Engineering & Testing, Inc.

Water Analysis

Client :	MONSANTO, INC.	November 27, 1984
Identification:	Dock	Job No. 79-920-1
Laboratory Number:	75930	Sheet 4 of 34
Date Sampled:	11-09-84	

pH, standard units:	6.2
Conductivity, umhos/cm:	1522
Total Dissolved Solids (at 180 C), mg/l:	906
Sodium Adsorption Ratio (SAR):	0.53

CATIONS

Total Hardness (CaCO3):	750	mg/l	14.99	meq/l
Calcium (Ca):	109	mg/l	5.44	meq/l
Magnesium (Mg):	116	mg/l	9.55	meq/l
Sodium (Na):	33	mg/l	1.44	meq/l
Potassium (K):	15	mg/l	0.38	meq/l
		Total Cations:	16.81	meq/l

ANIONS

Total Alkalinity (CaCO3):	801	mg/l	16.02	meq/l
Bicarbonate Alkalinity (HCO3):	978	mg/l	16.02	meq/l
Carbonate Alkalinity (CO3):	0	mg/l	0.00	meq/l
Hydroxide Alkalinity (OH):	0	mg/l	0.00	meq/l
Acidity (CaCO3):	N/A	mg/l	0.00	meq/l
Chloride (Cl):	24	mg/l	0.68	meq/l
Fluoride (F):	0.44	mg/l	0.02	meq/l
Nitrate + Nitrite (N):	0.15	mg/l	0.01	meq/l
Sulfate (SO4):	50	mg/l	1.04	meq/l
		Total Anions:	17.77	meq/l
		Cation-Anion Difference:	0.96	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	-0.02	mg/l
Iron as Fe	5.79	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	0.22	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.02	mg/l
Zinc as Zn	-0.02	mg/l

Northern Engineering & Testing, Inc.

Water Analysis

Client :	MONSANTO, INC.	November 27, 1984
Identification:	Southwest Springs	Job No. 79-920-1
Laboratory Number:	75933	Sheet 7 of 34
Date Sampled:	11-09-84	

pH, standard units:	6.8
Conductivity, umhos/cm:	1660
Total Dissolved Solids (at 180 C), mg/l:	1040
Sodium Adsorption Ratio (SAR):	0.80

CATIONS

Total Hardness (CaCO3):	893	mg/l	17.85	meq/l
Calcium (Ca):	130	mg/l	6.49	meq/l
Magnesium (Mg):	138	mg/l	11.36	meq/l
Sodium (Na):	55	mg/l	2.39	meq/l
Potassium (K):	16	mg/l	0.41	meq/l
		Total Cations:	20.65	meq/l

ANIONS

Total Alkalinity (CaCO3):	792	mg/l	15.84	meq/l
Bicarbonate Alkalinity (HCO3):	967	mg/l	15.84	meq/l
Carbonate Alkalinity (CO3):	0	mg/l	0.00	meq/l
Hydroxide Alkalinity (OH):	0	mg/l	0.00	meq/l
Acidity (CaCO3):	N/A	mg/l	0.00	meq/l
Chloride (Cl):	42	mg/l	1.18	meq/l
Fluoride (F):	1.26	mg/l	0.07	meq/l
Nitrate + Nitrite (N):	6.91	mg/l	0.49	meq/l
Sulfate (SO4):	134	mg/l	2.79	meq/l
		Total Anions:	20.37	meq/l
		Cation-Anion Difference:	0.28	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	0.007	mg/l
Chromium as Cr	-0.02	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	-0.02	mg/l
Selenium as Se	0.007	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.02	mg/l
Zinc as Zn	0.07	mg/l

Water Analysis

Client :	MONSANTO, INC.	November 27, 1984
Identification:	Mormon Springs	Job No. 79-920-1
Laboratory Number:	75932	Sheet 6 of 34
Date Sampled:	11-09-84	

pH, standard units:	7.0
Conductivity, umhos/cm:	1490
Total Dissolved Solids (at 180 C), mg/l:	922
Sodium Adsorption Ratio (SAR):	1.26

CATIONS

Total Hardness (CaCO3):	642	mg/l	12.84	meq/l
Calcium (Ca):	127	mg/l	6.34	meq/l
Magnesium (Mg):	79	mg/l	6.50	meq/l
Sodium (Na):	73	mg/l	3.18	meq/l
Potassium (K):	27	mg/l	0.69	meq/l
		Total Cations:	16.71	meq/l

ANIONS

Total Alkalinity (CaCO3):	339	mg/l	6.78	meq/l
Bicarbonate Alkalinity (HCO3):	414	mg/l	6.78	meq/l
Carbonate Alkalinity (CO3):	0	mg/l	0.00	meq/l
Hydroxide Alkalinity (OH):	0	mg/l	0.00	meq/l
Acidity (CaCO3):	N/A	mg/l	0.00	meq/l
Chloride (Cl):	112	mg/l	3.16	meq/l
Fluoride (F):	9.77	mg/l	0.51	meq/l
Nitrate + Nitrite (N):	4.48	mg/l	0.32	meq/l
Sulfate (SO4):	285	mg/l	5.93	meq/l
		Total Anions:	16.70	meq/l
		Cation-Anion Difference:	0.01	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	0.005	mg/l
Cadmium as Cd	0.038	mg/l
Chromium as Cr	-0.02	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	-0.02	mg/l
Selenium as Se	0.011	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	0.03	mg/l
Zinc as Zn	0.3	mg/l

Northern Engineering & Testing, Inc.

Water Analysis

Client :	MONSANTO, INC.	November 27, 1984
Identification:	Calf	Job No. 79-920-1
Laboratory Number:	75929	Sheet 3 of 34
Date Sampled:	11-09-84	

pH, standard units:	7.0
Conductivity, umhos/cm:	1490
Total Dissolved Solids (at 180 C), mg/l:	1030
Sodium Adsorption Ratio (SAR):	1.14

CATIONS

Total Hardness (CaCO3):	651	mg/l	13.01	meq/l
Calcium (Ca):	132	mg/l	6.59	meq/l
Magnesium (Mg):	78	mg/l	6.42	meq/l
Sodium (Na):	67	mg/l	2.91	meq/l
Potassium (K):	25	mg/l	0.64	meq/l
		Total Cations:	16.56	meq/l

ANIONS

Total Alkalinity (CaCO3):	317	mg/l	6.34	meq/l
Bicarbonate Alkalinity (HCO3):	387	mg/l	6.34	meq/l
Carbonate Alkalinity (CO3):	0	mg/l	0.00	meq/l
Hydroxide Alkalinity (OH):	0	mg/l	0.00	meq/l
Acidity (CaCO3):	N/A	mg/l	0.00	meq/l
Chloride (Cl):	91	mg/l	2.57	meq/l
Fluoride (F):	8.14	mg/l	0.43	meq/l
Nitrate + Nitrite (N):	7.76	mg/l	0.55	meq/l
Sulfate (SO4):	328	mg/l	6.83	meq/l
		Total Anions:	16.72	meq/l
		Cation-Anion Difference:	0.16	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	0.006	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	-0.02	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	-0.02	mg/l
Selenium as Se	0.026	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	0.03	mg/l
Zinc as Zn	0.08	mg/l

Northern Engineering & Testing, Inc.

Water Analysis

Client :	MONSANTO, INC.	November 27, 1984
Identification:	TW7A	Job No. 79-920-1
Laboratory Number:	75939	Sheet 13 of 34
Date Sampled:	11-10-84	

pH, standard units:	5.2
Conductivity, umhos/cm:	15
Total Dissolved Solids (at 180 C), mg/l:	30
Sodium Adsorption Ratio (SAR):	0.16

CATIONS

Total Hardness (CaCO3):	7	mg/l	0.13	meq/l
Calcium (Ca):	-1	mg/l	0.05	meq/l
Magnesium (Mg):	-1	mg/l	0.08	meq/l
Sodium (Na):	-1	mg/l	0.04	meq/l
Potassium (K):	-1	mg/l	0.03	meq/l
		Total Cations:	0.20	meq/l

ANIONS

Total Alkalinity (CaCO3):	2	mg/l	0.04	meq/l
Bicarbonate Alkalinity (HCO3):	2	mg/l	0.04	meq/l
Carbonate Alkalinity (CO3):	0	mg/l	0.00	meq/l
Hydroxide Alkalinity (OH):	0	mg/l	0.00	meq/l
Acidity (CaCO3):	N/A	mg/l	0.00	meq/l
Chloride (Cl):	-1	mg/l	-0.03	meq/l
Fluoride (F):	-0.1	mg/l	-0.01	meq/l
Nitrate + Nitrite (N):	-0.05	mg/l	0.00	meq/l
Sulfate (SO4):	-1	mg/l	-0.02	meq/l
		Total Anions:	0.04	meq/l
		Cation-Anion Difference:	0.16	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	-0.02	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	-0.02	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	0.04	mg/l
Zinc as Zn	-0.02	mg/l

Water Analysis

Client :	MONSANTO, INC.	November 27, 1984
Identification:	TW13A	Job No. 79-920-1
Laboratory Number:	75946	Sheet 20 of 34
Date Sampled:	11-07-84	

pH, standard units:	6.6
Conductivity, umhos/cm:	10
Total Dissolved Solids (at 180 C), mg/l:	22
Sodium Adsorption Ratio (SAR):	0.16

CATIONS

Total Hardness (CaCO3):	7	mg/l	0.13	meq/l
Calcium (Ca):	-1	mg/l	0.05	meq/l
Magnesium (Mg):	-1	mg/l	0.08	meq/l
Sodium (Na):	-1	mg/l	0.04	meq/l
Potassium (K):	-1	mg/l	0.03	meq/l
		Total Cations:	0.20	meq/l

ANIONS

Total Alkalinity (CaCO3):	2	mg/l	0.04	meq/l
Bicarbonate Alkalinity (HCO3):	2	mg/l	0.04	meq/l
Carbonate Alkalinity (CO3):	0	mg/l	0.00	meq/l
Hydroxide Alkalinity (OH):	0	mg/l	0.00	meq/l
Acidity (CaCO3):	N/A	mg/l	0.00	meq/l
Chloride (Cl):	-1	mg/l	-0.03	meq/l
Fluoride (F):	-0.1	mg/l	-0.01	meq/l
Nitrate + Nitrite (N):	-0.05	mg/l	0.00	meq/l
Sulfate (SO4):	-1	mg/l	-0.02	meq/l
		Total Anions:	0.04	meq/l
		Cation-Anion Difference:	0.16	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	-0.02	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	-0.02	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	0.03	mg/l
Zinc as Zn	-0.02	mg/l

Water Analysis

Client :	MONSANTO, INC.	November 27, 1984
Identification:	TW17A	Job No. 79-920-1
Laboratory Number:	75951	Sheet 25 of 34
Date Sampled:	11-08-84	

pH, standard units:	6.7
Conductivity, umhos/cm:	23
Total Dissolved Solids (at 180 C), mg/l:	24
Sodium Adsorption Ratio (SAR):	0.16

CATIONS

Total Hardness (CaCO3):	7	mg/l	0.13	meq/l
Calcium (Ca):	-1	mg/l	0.05	meq/l
Magnesium (Mg):	-1	mg/l	0.08	meq/l
Sodium (Na):	-1	mg/l	0.04	meq/l
Potassium (K):	-1	mg/l	0.03	meq/l
		Total Cations:	0.20	meq/l

ANIONS

Total Alkalinity (CaCO3):	7	mg/l	0.14	meq/l
Bicarbonate Alkalinity (HCO3):	9	mg/l	0.14	meq/l
Carbonate Alkalinity (CO3):	0	mg/l	0.00	meq/l
Hydroxide Alkalinity (OH):	0	mg/l	0.00	meq/l
Acidity (CaCO3):	N/A	mg/l	0.00	meq/l
Chloride (Cl):	-1	mg/l	-0.03	meq/l
Fluoride (F):	0.1	mg/l	0.01	meq/l
Nitrate + Nitrite (N):	-0.05	mg/l	0.00	meq/l
Sulfate (SO4):	-1	mg/l	-0.02	meq/l
		Total Anions:	0.15	meq/l
		Cation-Anion Difference:	0.05	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	-0.02	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	-0.02	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.02	mg/l
Zinc as Zn	-0.02	mg/l

Water Analysis

Client :	MONSANTO, INC.	November 28, 1984
Identification:	TW21A	Job No. 79-920-1
Laboratory Number:	76010	Sheet 15 of 16
Date Sampled:	11-13-84	

pH, standard units:	6.1
Conductivity, umhos/cm:	8
Total Dissolved Solids (at 180 C), mg/l:	4
Sodium Adsorption Ratio (SAR):	0.86

CATIONS

Total Hardness (CaCO3):	7	mg/l	0.13	meq/l
Calcium (Ca):	-1	mg/l	0.05	meq/l
Magnesium (Mg):	-1	mg/l	0.08	meq/l
Sodium (Na):	5	mg/l	0.22	meq/l
Potassium (K):	-1	mg/l	0.03	meq/l
		Total Cations:	0.38	meq/l

ANIONS

Total Alkalinity (CaCO3):	11	mg/l	0.22	meq/l
Bicarbonate Alkalinity (HCO3):	13	mg/l	0.22	meq/l
Carbonate Alkalinity (CO3):	0	mg/l	0.00	meq/l
Hydroxide Alkalinity (OH):	0	mg/l	0.00	meq/l
Acidity (CaCO3):	N/A	mg/l	0.00	meq/l
Chloride (Cl):	1	mg/l	0.03	meq/l
Fluoride (F):	-0.1	mg/l	-0.01	meq/l
Nitrate + Nitrite (N):	-0.05	mg/l	0.00	meq/l
Sulfate (SO4):	-1	mg/l	-0.02	meq/l
		Total Anions:	0.25	meq/l
		Cation-Anion Difference:	0.13	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	0.006	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	-0.02	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.02	mg/l
Zinc as Zn	-0.02	mg/l

Water Analysis

Client :	MONSANTO, INC.	November 28, 1984
Identification:	SWG	Job No. 79-920-1
Laboratory Number:	75998	Sheet 3 of 16
Date Sampled:	11-14-84	

pH, standard units:	7.3
Conductivity, umhos/cm:	1370
Total Dissolved Solids (at 180 C), mg/l:	980
Sodium Adsorption Ratio (SAR):	1.03

CATIONS

Total Hardness (CaCO3):	604	mg/l	12.07	meq/l
Calcium (Ca):	123	mg/l	6.14	meq/l
Magnesium (Mg):	72	mg/l	5.93	meq/l
Sodium (Na):	58	mg/l	2.52	meq/l
Potassium (K):	23	mg/l	0.59	meq/l
		Total Cations:	15.18	meq/l

ANIONS

Total Alkalinity (CaCO3):	311	mg/l	6.22	meq/l
Bicarbonate Alkalinity (HCO3):	380	mg/l	6.22	meq/l
Carbonate Alkalinity (CO3):	0	mg/l	0.00	meq/l
Hydroxide Alkalinity (OH):	0	mg/l	0.00	meq/l
Acidity (CaCO3):	N/A	mg/l	0.00	meq/l
Chloride (Cl):	81	mg/l	2.28	meq/l
Fluoride (F):	6.2	mg/l	0.33	meq/l
Nitrate + Nitrite (N):	7.46	mg/l	0.53	meq/l
Sulfate (SO4):	277	mg/l	5.77	meq/l
		Total Anions:	15.13	meq/l
		Cation-Anion Difference:	0.05	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	-0.02	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	-0.02	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	0.06	mg/l
Zinc as Zn	0.05	mg/l

Northern Engineering & Testing, Inc.

Water Analysis

Client :	MONSANTO, INC.	November 28, 1984
Identification:	Nelson	Job No. 79-920-1
Laboratory Number:	75997	Sheet 2 of 16
Date Sampled:	11-14-84	

pH, standard units:	7.5
Conductivity, umhos/cm:	695
Total Dissolved Solids (at 180 C), mg/l:	498
Sodium Adsorption Ratio (SAR):	0.55

CATIONS

Total Hardness (CaCO3):	300	mg/l	6.00	meq/l
Calcium (Ca):	79	mg/l	3.94	meq/l
Magnesium (Mg):	25	mg/l	2.06	meq/l
Sodium (Na):	22	mg/l	0.96	meq/l
Potassium (K):	4	mg/l	0.10	meq/l
		Total Cations:	7.06	meq/l

ANIONS

Total Alkalinity (CaCO3):	195	mg/l	3.90	meq/l
Bicarbonate Alkalinity (HCO3):	238	mg/l	3.90	meq/l
Carbonate Alkalinity (CO3):	0	mg/l	0.00	meq/l
Hydroxide Alkalinity (OH):	0	mg/l	0.00	meq/l
Acidity (CaCO3):	N/A	mg/l	0.00	meq/l
Chloride (Cl):	52	mg/l	1.47	meq/l
Fluoride (F):	0.13	mg/l	0.01	meq/l
Nitrate + Nitrite (N):	13.8	mg/l	0.99	meq/l
Sulfate (SO4):	48	mg/l	1.00	meq/l
		Total Anions:	7.37	meq/l
		Cation-Anion Difference:	0.31	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	-0.02	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	1.21	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.02	mg/l
Zinc as Zn	0.09	mg/l

Northern Engineering & Testing, Inc.

Water Analysis

Client :	MONSANTO, INC.	November 28, 1984
Identification:	SWC	Job No. 79-920-1
Laboratory Number:	75999	Sheet 4 of 16
Date Sampled:	11-14-84	

pH, standard units:	7.3
Conductivity, umhos/cm:	2020
Total Dissolved Solids (at 180 C), mg/l:	1250
Sodium Adsorption Ratio (SAR):	3.28

CATIONS

Total Hardness (CaCO3):	564	mg/l	11.27	meq/l
Calcium (Ca):	140	mg/l	6.99	meq/l
Magnesium (Mg):	52	mg/l	4.28	meq/l
Sodium (Na):	179	mg/l	7.79	meq/l
Potassium (K):	9	mg/l	0.23	meq/l
		Total Cations:	19.29	meq/l

ANIONS

Total Alkalinity (CaCO3):	416	mg/l	8.32	meq/l
Bicarbonate Alkalinity (HCO3):	508	mg/l	8.32	meq/l
Carbonate Alkalinity (CO3):	0	mg/l	0.00	meq/l
Hydroxide Alkalinity (OH):	0	mg/l	0.00	meq/l
Acidity (CaCO3):	N/A	mg/l	0.00	meq/l
Chloride (Cl):	186	mg/l	5.25	meq/l
Fluoride (F):	0.29	mg/l	0.02	meq/l
Nitrate + Nitrite (N):	12	mg/l	0.86	meq/l
Sulfate (SO4):	379	mg/l	7.89	meq/l
		Total Anions:	22.34	meq/l
		Cation-Anion Difference:	3.05	meq/l

Need to add NH4 to cations. Reduce Cat-An balance to 0!

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	-0.02	mg/l
Iron as Fe	-0.02	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	0.03	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	0.44	mg/l
Zinc as Zn	0.27	mg/l

Note: The cations and anions in this sample have been analyzed in triplicate. The average of those results are reported here. The cation-anion difference is excessive; therefore, we do not feel this analysis is a complete accounting of the minerals in this sample.

Water Analysis

Client :	MONSANTO, INC.	November 28, 1984
Identification:	Lewis	Job No. 79-920-1
Laboratory Number:	76000	Sheet 5 of 16
Date Sampled:	11-14-84	

pH, standard units:	7.4
Conductivity, umhos/cm:	1140
Total Dissolved Solids (at 180 C), mg/l:	792
Sodium Adsorption Ratio (SAR):	0.97

CATIONS

Total Hardness (CaCO3):	542	mg/l	10.83	meq/l
Calcium (Ca):	118	mg/l	5.89	meq/l
Magnesium (Mg):	60	mg/l	4.94	meq/l
Sodium (Na):	52	mg/l	2.26	meq/l
Potassium (K):	8	mg/l	0.20	meq/l
		Total Cations:	13.29	meq/l

ANIONS

Total Alkalinity (CaCO3):	417	mg/l	8.34	meq/l
Bicarbonate Alkalinity (HCO3):	509	mg/l	8.34	meq/l
Carbonate Alkalinity (CO3):	0	mg/l	0.00	meq/l
Hydroxide Alkalinity (OH):	0	mg/l	0.00	meq/l
Acidity (CaCO3):	N/A	mg/l	0.00	meq/l
Chloride (Cl):	55	mg/l	1.55	meq/l
Fluoride (F):	0.35	mg/l	0.02	meq/l
Nitrate + Nitrite (N):	9.28	mg/l	0.66	meq/l
Sulfate (SO4):	120	mg/l	2.50	meq/l
		Total Anions:	13.07	meq/l
		Cation-Anion Difference:	0.22	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	-0.005	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	-0.02	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.05	mg/l
Zinc as Zn	0.06	mg/l

Water Analysis

Client :	MONSANTO, INC.	November 28, 1984
Identification:	Lab 1	Job No. 79-920-1
Laboratory Number:	76004	Sheet 9 of 16
Date Sampled:	11-14-84	

pH, standard units:	6.0
Conductivity, umhos/cm:	9
Total Dissolved Solids (at 180 C), mg/l:	8
Sodium Adsorption Ratio (SAR):	0.67

CATIONS

Total Hardness (CaCO3):	7	mg/l	0.13	meq/l
Calcium (Ca):	-1	mg/l	0.05	meq/l
Magnesium (Mg):	-1	mg/l	0.08	meq/l
Sodium (Na):	4	mg/l	0.17	meq/l
Potassium (K):	-1	mg/l	0.03	meq/l
		Total Cations:	0.33	meq/l

ANIONS

Total Alkalinity (CaCO3):	6	mg/l	0.12	meq/l
Bicarbonate Alkalinity (HCO3):	7	mg/l	0.12	meq/l
Carbonate Alkalinity (CO3):	0	mg/l	0.00	meq/l
Hydroxide Alkalinity (OH):	0	mg/l	0.00	meq/l
Acidity (CaCO3):	N/A	mg/l	0.00	meq/l
Chloride (Cl):	-1	mg/l	-0.03	meq/l
Fluoride (F):	-0.1	mg/l	-0.01	meq/l
Nitrate + Nitrite (N):	0.12	mg/l	0.01	meq/l
Sulfate (SO4):	-1	mg/l	-0.02	meq/l
		Total Anions:	0.13	meq/l
		Cation-Anion Difference:	0.20	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	-0.02	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	-0.02	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	0.04	mg/l
Zinc as Zn	-0.02	mg/l

Water Analysis

Client :	MONSANTO, INC.	November 28, 1984
Identification:	Lab 2	Job No. 79-920-1
Laboratory Number:	76005	Sheet 10 of 16
Date Sampled:	11-14-84	

pH, standard units:	4.7
Conductivity, umhos/cm:	5
Total Dissolved Solids (at 180 C), mg/l:	9
Sodium Adsorption Ratio (SAR):	0.51

CATIONS

Total Hardness (CaCO3):	7	mg/l	0.13	meq/l
Calcium (Ca):	-1	mg/l	0.05	meq/l
Magnesium (Mg):	-1	mg/l	0.08	meq/l
Sodium (Na):	3	mg/l	0.13	meq/l
Potassium (K):	-1	mg/l	0.03	meq/l
		Total Cations:	0.29	meq/l

ANIONS

Total Alkalinity (CaCO3):	-1	mg/l	-0.02	meq/l
Bicarbonate Alkalinity (HCO3):	0	mg/l	0.00	meq/l
Carbonate Alkalinity (CO3):	0	mg/l	0.00	meq/l
Hydroxide Alkalinity (OH):	0	mg/l	0.00	meq/l
Acidity (CaCO3):	N/A	mg/l	0.00	meq/l
Chloride (Cl):	-1	mg/l	-0.03	meq/l
Fluoride (F):	-0.1	mg/l	-0.01	meq/l
Nitrate + Nitrite (N):	0.08	mg/l	0.01	meq/l
Sulfate (SO4):	-1	mg/l	-0.02	meq/l
		Total Anions:	0.01	meq/l
		Cation-Anion Difference:	0.28	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	-0.02	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	-0.02	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.02	mg/l
Zinc as Zn	-0.02	mg/l

Client:	MONSANTO, INC.	Date	March 14, 1985
Identification:	TW38A	Job No.	79-920-1
Laboratory Number:	77479	Sheet	31 of 48
Date Sampled:	3-01-85		

pH, standard units:	6.3
Conductivity, umhos/cm:	20
Total Dissolved Solids (at 180 C), mg/l:	36
Sodium Adsorption Ratio (SAR):	1

CATIONS

Total Hardness as CaCO3:	3	mg/l	0.05	meq/l
Calcium as Ca:	1	mg/l	0.05	meq/l
Magnesium as Mg:	-1	mg/l	-0.08	meq/l
Sodium as Na:	-1	mg/l	-0.04	meq/l
Potassium as K:	-1	mg/l	-0.03	meq/l
		Total Cations:	0.20	meq/l

ANIONS

Total Alkalinity as CaCO3:	-1	mg/l	-0.02	meq/l
Bicarbonate Alkalinity as HCO3	0	mg/l	0.00	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Chloride as Cl:	-1	mg/l	-0.03	meq/l
Fluoride as F:	-0.10	mg/l	-0.01	meq/l
Nitrate + Nitrite as N:	0.06	mg/l	0.00	meq/l
Sulfate as SO4:	-1	mg/l	-0.02	meq/l
		Total Anions:	0.06	meq/l
		Cation-Anion Difference:	0.14	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	-0.02	mg/l
Copper as Cu	-0.02	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	-0.02	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.05	mg/l
Zinc as Zn	-0.02	mg/l

A minus sign indicates less than the reported value was present in the sample

Appendix I

Quality Assurance/Quality Control Determinations

Northern
Engineering
and Testing, Inc.

600 South 25th St.
Box 30615
Billings, Montana 59107
(406) 248-9161

December 14, 1984

Monsanto, Inc.
P O Box 816
Soda Springs, ID 83276

ATTENTION: Mr. Bill Condie

Gentlemen:

Enclosed is a summary of the quality assurance data generated during the analysis of samples your firm submitted on 11/15/84 and 11/16/84. This data is that which is compared to the quality assurance guidelines I sent to you by mail in September.

Several points should be made regarding this data:

1. Because of the range of sample concentrations, arsenic and selenium spikes were generated at or near the detectable limit of the method. Hence, a wider variation in percent recovery can be expected. For instance, a spike or control of known value 0.007 mg/l can feasibly be recovered as 0.006 or 0.008 mg/l. This variation would result in 87 to 113% recovery. This appears to be a wide variation in results on a percentage basis, but is actually within acceptable limits for that range of concentrations (0.005 - 0.010).

2. Control samples for sulfate, fluoride, and nitrate were not analyzed with this data. They were run with another batch of analyses earlier that week. This practice is part of our quality assurance procedures. However, in future analysis of your firm's samples, a known control will be included, regardless of the occurrence of the last test.

3. All control samples used are purchased from Environmental Resource Associates (ERA) or the Environmental Protection Agency. The values reported are the percent recovery [(observed value ÷ true value) x 100] values for these analyses. None of the control concentrations observed during these tests were outside the allowable range as listed by the control manufacturer.

4. All standards are prepared from NBS traceable solutions or primary standard solids. Blank solutions are analyzed with all samples and standards.

Monsanto, Inc.
Soda Springs, ID

5. The quality of the sulfate data generated before 12/3/84 was poor despite quality assurance measures. This poor quality was apparently due to the method used and the lack of control samples being analyzed. A large number of duplicate analyses were performed as it has been our experience that precision is a problem with the automated methylthymol blue procedure. However, it became apparent after reviewing all other data generated that accuracy was a problem in the analysis of sulfates. Unfortunately, this problem was not recognized before results were reported. The quality assurance data reported here is that generated in the second determination of sulfate in your samples. Values in parenthesis are concentrations generated by the barium chloride gravimetric method. These confirm the values generated by the automated method.

We apologize for any inconvenience this has caused. Enclosed are reports revised for the correct values for all parameters. You can be assured we have taken steps to correct these problems in our laboratory.

If you have any questions regarding this data summary, please contact me. Thank you for using our services.

Very truly yours,

Kathleen A. Smit
Chemical Laboratory Manager

KAS:rmr

Enclosures

cc: Mr. Douglas Morell
Golder & Associates
2950 Northrup Way
Bellevue, WA 98004-1486

Sample Identification: Lab No.:	Effluent 75928	Hooper 75921	Dock 75930	Mormon 75932	TW22 75953	-----Standard------	--------- Control ---------
pH, standard units				7.0, 7.0		7.00, 4.00	7.00
Conductivity, umhos/cm				1490, 1490		2767, 1413, 718 147	1413
Total Dissolved Solids			910, 1010				
Calcium	114, 116		110, 109	127, 122		5, 20, 50, 100, 206	104%, 87, 92, 100%, 115%, 108%, 114%
Magnesium	53, 55		122, 116	81, 79		5, 20, 50, 100, 206	110%, 94, 88, 94%, 95%, 105%, 108%
Sodium	89, 83		34, 33	71, 73		5, 20, 50, 100, 200	117%, 94, 95, 96%, 105%, 98%, 116%
Potassium			15, 15			2, 5, 10, 20	---------
Total Alkalinity		831, 840				1120	100%
Chloride	130, 134					50	100%
Fluoride			0.44, 0.46			0.1, 1.0, 10.0	90%, 98%
Nitrate+Nitrite			0.15, 0.15			0.05, 0.10, 0.25, 0.50, 1.00, 2.00	89%, 90%, 95%, 95%
Sulfate	119, 99, 119, 110	35, 38	5, 5		854, 847	50, 100, 200, 300	97%, 84%, 885, 108%
Arsenic			-0.005,-0.005			0.005, 0.010, 0.020	91%
Cadmium						0.005, 0.010, 0.020	87%, 113%, 98%
Chromium					-0.02, -0.02	0.02, 0.05, 0.10, 1.0, 5.0	98%, 119%
Iron					0.17, 0.20	0.02, 0.05, 0.10, 1.0, 5.0	93%, 112%
Lead					1.13, 1.20	0.02, 0.05, 0.10, 1.0, 5.0	87%, 102%
Manganese						0.02, 0.05, 0.10 1.0, 5.0	99%, 110%
Selenium			-0.005,-0.005			0.005, 0.010, 0.020	92%
Silver					-0.02, 0.03	0.02, 0.05, 0.10, 1.0, 5.0	106%
Vanadium			-0.02,-0.02			0.02, 0.05, 0.10, 1.0, 5.0	91%, 100%
Zinc					0.30, 0.33	0.02, 0.05, 0.10, 1.0, 5.0	

Sample Identification: Lab No.:	TW4 75935	TW5 75936	TW9 75941	TW8 75940	TW10 75942	-----Standard------	--------- Control ---------
pH, standard units				6.9, 7.0		7.00, 4.00	7.00
Conductivity, umhos/cm					1680, 1680	2767, 1413, 718 147	1413
Total Dissolved Solids				1590, 1590			
Calcium	88%	171, 173		46, 42		5, 20, 50, 100, 206	104%, 87, 92, 100%, 115%, 108%, 114%
Magnesium	94%	116, 113		276, 276		5, 20, 50, 100, 206	110%, 94, 88, 94%, 95%, 105%, 108%
Sodium	88%	201, 193		54, 57		5, 20, 50, 100, 200	117%, 94, 95, 96%, 105%, 98%, 116%
Potassium	100%			22, 22		2, 5, 10, 20	---------
Total Alkalinity			1160,1150			1120	100%
Chloride				100%		50	100%
Fluoride	101%		0.2 ?	0.25, 0.24		0.1, 1.0, 10.0	90%, 98%
Nitrate+Nitrite	73%			-0.05,-0.05		0.05, 0.10, 0.25, 0.50, 1.00, 2.00	89%, 90%, 95%, 95%
Sulfate		101, 125, 140, 95%		72, 73	42, 43, 46	50, 100, 200, 300	97%, 84%, 885, 108%
Arsenic	76%			-0.005,-0.005		0.005, 0.010, 0.020	91%
Cadmium	87%					0.005, 0.010, 0.020	87%, 113%, 98%
Chromium	87%					0.02, 0.05, 0.10, 1.0, 5.0	98%, 119%
Iron	117%					0.02, 0.05, 0.10, 1.0, 5.0	93%, 112%
Lead						0.02, 0.05, 0.10, 1.0, 5.0	87%, 102%
Manganese	99%			-0.005,-0.005		0.02, 0.05, 0.10 1.0, 5.0	99%, 110%
Selenium	100%					0.005, 0.010, 0.020	92%
Silver	123%					0.02, 0.05, 0.10, 1.0, 5.0	106%
Vanadium	106%	97%				0.02, 0.05, 0.10, 1.0, 5.0	91%, 100%
Zinc	87%			0.06, 0.03		0.02, 0.05, 0.10, 1.0, 5.0	

Sample Identification:	TW23	TW13	TW27	TW17A	-----Standard------	--------- Control ---------
Lab No.:	75945	75945	75958	75951		
pH, standard units					7.00, 4.00	7.00
Conductivity, umhos/cm					2767, 1413, 718, 147	1413
Total Dissolved Solids						
Calcium		90%		-1, -1	5, 20, 50, 100, 206	104%, 87, 92, 100%, 115%, 108%, 114%
Magnesium		94%		-1, -1	5, 20, 50, 100, 206	110%, 94, 88, 94%, 95%, 105%, 108%
Sodium		92%		-1, 12	5, 20, 50, 100, 200	117%, 94, 95, 96%, 105%, 98%, 116%
Potassium		100%			2, 5, 10, 20	---------
Total Alkalinity				5, 10	1120	100%
Chloride		104%			50	100%
Fluoride		87%			0.1, 1.0, 10.0	90%, 98%
Nitrate+Nitrite		110%			0.05, 0.10, 0.25, 0.50, 1.00, 2.00	89%, 90%, 95%, 95%
Sulfate		90%			50, 100, 200, 300	97%, 84%, 885, 108%
Arsenic		98%			0.005, 0.010, 0.020	91%
Cadmium					0.005, 0.010, 0.020	87%, 113%, 98%
Chromium	-0.02,-0.02		-0.02, -0.02		0.02, 0.05, 0.10, 1.0, 5.0	98%, 119%
Iron	5.50, 5.79		0.12, 0.12		0.02, 0.05, 0.10, 1.0, 5.0	93%, 112%
Lead	-0.02, -0.03		-0.02, -0.02		0.02, 0.05, 0.10, 1.0, 5.0	87%, 102%
Manganese	0.32, 0.30		0.36, 0.29		0.02, 0.05, 0.10 1.0, 5.0	99%, 110%
Selenium		120%			0.005, 0.010, 0.020	92%
Silver	-0.02, -0.02		-0.02, 0.03		0.02, 0.05, 0.10, 1.0, 5.0	106%
Vanadium	0.03, -0.02		0.06		0.02, 0.05, 0.10, 1.0, 5.0	91%, 100%
Zinc	0.12, 0.11	96%	0.10, 0.10		0.02, 0.05, 0.10, 1.0, 5.0	

Sample Identification: Lab No.:	TW17 75950	TW18 75952	TW24 75955	TW26 75957	-----Standard------	--------- Control ---------
pH, standard units	7.5, 7.5				7.00, 4.00	7.00
Conductivity, umhos/cm		1800, 1820			2767, 1413, 718, 147	1413
Total Dissolved Solids	1400, 1380					
Calcium	61, 72		93%, 200, 225, 216	111, 108	5, 20, 50, 100, 206	104%, 87, 92, 100%, 115%, 108%, 114%
Magnesium			98%, 54, 31, 46	160, 167	5, 20, 50, 100, 206	110%, 94, 88, 94%, 95%, 105%, 108%
Sodium			96%, 168, 154, 156	85, 82	5, 20, 50, 100, 200	117%, 94, 95, 96%, 105%, 98%, 116%
Potassium	26, 26		102%		2, 5, 10, 20	---------
Total Alkalinity					1120	100%
Chloride	97%		244, 233		50	100%
Fluoride	8.14, 8.52		99%		0.1, 1.0, 10.0	90%, 98%
Nitrate+Nitrite	1.26, 1.30		103%		0.05, 0.10, 0.25, 0.50, 1.00, 2.00	89%, 90%, 95%, 95%
Sulfate	336, 338				50, 100, 200, 300	97%, 84%, 885, 108%
Arsenic	0.006, 0.007		86%		0.005, 0.010, 0.020	91%
Cadmium	0.087				0.005, 0.010, 0.020	87%, 113%, 98%
Chromium					0.02, 0.05, 0.10, 1.0, 5.0	98%, 119%
Iron					0.02, 0.05, 0.10, 1.0, 5.0	93%, 112%
Lead					0.02, 0.05, 0.10, 1.0, 5.0	87%, 102%
Manganese					0.02, 0.05, 0.10 1.0, 5.0	99%, 110%
Selenium	0.008, 0.008		100%		0.005, 0.010, 0.020	92%
Silver					0.02, 0.05, 0.10, 1.0, 5.0	106%
Vanadium					0.02, 0.05, 0.10, 1.0, 5.0	91%, 100%
Zinc	0.03, 0.03		84%		0.02, 0.05, 0.10, 1.0, 5.0	

Sample Identification:	TW29	Nelson	PW3	PW2	-----Standard------	--------- Control ---------
Lab No.:	75960	79999	76003	76002		
pH, standard units	6.7, 6.6				7.00, 4.00	7.00
Conductivity, umhos/cm				1230, 1230	2767, 1413, 718, 147	1413
Total Dissolved Solids	828, 850					
Calcium	155, 186	136, 140, 144		122, 124	5, 20, 50, 100, 206	104%, 87, 92, 100%, 115%, 108%, 114%
Magnesium	78, 83, 84	51, 52, 53		59, 58	5, 20, 50, 100, 206	110%, 94, 88, 94%, 95%, 105%, 108%
Sodium	35, 28, 24	176, 179, 182		42, 38	5, 20, 50, 100, 200	117%, 94, 95, 96%, 105%, 98%, 116%
Potassium	6, 6				2, 5, 10, 20	---------
Total Alkalinity			119%		1120	100%
Chloride	20, 21				50	100%
Fluoride	0.29, 0.30				0.1, 1.0, 10.0	90%, 98%
Nitrate+Nitrite	5.99, 5.99				0.05, 0.10, 0.25, 0.50, 1.00, 2.00	89%, 90%, 95%, 95%
Sulfate	70, 73				50, 100, 200, 300	97%, 84%, 885, 108%
Arsenic	-0.005, -0.005				0.005, 0.010, 0.020	91%
Cadmium			98%		0.005, 0.010, 0.020	87%, 113%, 98%
Chromium			88%		0.02, 0.05, 0.10, 1.0, 5.0	98%, 119%
Iron			90%		0.02, 0.05, 0.10, 1.0, 5.0	93%, 112%
Lead			110%		0.02, 0.05, 0.10, 1.0, 5.0	87%, 102%
Manganese			104%		0.02, 0.05, 0.10 1.0, 5.0	99%, 110%
Selenium	-0.005, -0.005				0.005, 0.010, 0.020	92%
Silver			100%		0.02, 0.05, 0.10, 1.0, 5.0	106%
Vanadium			106%		0.02, 0.05, 0.10, 1.0, 5.0	91%, 100%
Zinc	-0.02, -0.02		87%		0.02, 0.05, 0.10, 1.0, 5.0	

Sample Identification: Lab No.:	Lewis 76000	PW1 76001	Lab 2 76005	TW2 76006	-----Standard------	--------- Control ---------
pH, standard units	7.5, 7.4				7.00, 4.00	7.00
Conductivity, umhos/cm					2767, 1413, 718, 147	1413
Total Dissolved Solids	792, 828					
Calcium	116, 118	134, 136	94%	114, 120	5, 20, 50, 100, 206	104%, 87, 92, 100%, 115%, 108%, 114%
Magnesium	57, 60	71, 73	100%	55, 58	5, 20, 50, 100, 206	110%, 94, 88, 94%, 95%, 105%, 108%
Sodium	52, 46	92, 93	96%	17, 17	5, 20, 50, 100, 200	117%, 94, 95, 96%, 105%, 98%, 116%
Potassium	8, 8				2, 5, 10, 20	---------
Total Alkalinity	417, 418		97%	107%	1120	100%
Chloride	55, 53	144, 141	104%	86%	50	100%
Fluoride	0.35, 0.35				0.1, 1.0, 10.0	90%, 98%
Nitrate+Nitrite	9.43, 9.13		100%		0.05, 0.10, 0.25, 0.50, 1.00, 2.00	89%, 90%, 95%, 95%
Sulfate	120, 121		90%	7, 4, 78	50, 100, 200, 300	97%, 84%, 885, 108%
Arsenic	-0.005, -0.005		-0.005 (78%), -0.005		0.005, 0.010, 0.020	91%
Cadmium	-0.005, -0.005		-0.005 (78%), -0.005		0.005, 0.010, 0.020	87%, 113%, 98%
Chromium	-0.005, -0.005		-0.02, -0.02		0.02, 0.05, 0.10, 1.0, 5.0	98%, 119%
Iron	-0.05, -0.05		-0.05, -0.05		0.02, 0.05, 0.10, 1.0, 5.0	93%, 112%
Lead	-0.02, 0.03		-0.02, -0.02		0.02, 0.05, 0.10, 1.0, 5.0	87%, 102%
Manganese	-0.02, -0.02		-0.02, -0.02		0.02, 0.05, 0.10 1.0, 5.0	99%, 110%
Selenium	-0.005, -0.005		-0.005 (100%), -0.005		0.005, 0.010, 0.020	92%
Silver	-0.02, -0.02		-0.02 (80%), -0.02		0.02, 0.05, 0.10, 1.0, 5.0	106%
Vanadium	0.05, 0.04		-0.02, -0.02 79%		0.02, 0.05, 0.10, 1.0, 5.0	91%, 100%
Zinc	0.06, 0.06		-0.02, -0.02 79%		0.02, 0.05, 0.10, 1.0, 5.0	

Main Sampling Analyses

Client:	Monsanto, Inc.	Date	March 7, 1985
Identification:	TW15	Job No.	79-920-1
Laboratory Number:	77264	Sheet	2 of 12
Date Sampled:	2-19-85		

pH, standard units:	8.1
Conductivity, umhos/cm:	867
Total Dissolved Solids (at 180 C), mg/l:	480
Sodium Adsorption Ratio (SAR):	0.12

CATIONS

Total Hardness as CaCO3:	509	mg/l	10.18	meq/l
Calcium as Ca:	133	mg/l	6.64	meq/l
Magnesium as Mg:	43	mg/l	3.54	meq/l
Sodium as Na:	6	mg/l	0.26	meq/l
Potassium as K:	3	mg/l	0.08	meq/l
		Total Cations:	10.52	meq/l

ANIONS

Total Alkalinity as CaCO3:	426	mg/l	8.52	meq/l
Bicarbonate Alkalinity as HCO3	520	mg/l	8.52	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Chloride as Cl:	11	mg/l	0.31	meq/l
Fluoride as F:	0.74	mg/l	0.04	meq/l
Nitrate + Nitrite as N:	3.79	mg/l	0.27	meq/l
Sulfate as SO4:	43	mg/l	0.90	meq/l
		Total Anions:	10.04	meq/l
		Cation-Anion Difference:	0.48	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	-0.02	mg/l
Copper as Cu	-0.02	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	-0.02	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.05	mg/l
Zinc as Zn	-0.02	mg/l

A minus sign indicates less than the reported value was present in the sample

Client:	MONSANTO, INC.	Date	March 14, 1985
Identification:	TW16	Job No.	79-920-1
Laboratory Number:	77462	Sheet	14 of 48
Date Sampled:	2-22-85		

pH, standard units:	7.2
Conductivity, umhos/cm:	1710
Total Dissolved Solids (at 180 C), mg/l:	1090
Sodium Adsorption Ratio (SAR):	1.80

CATIONS

Total Hardness as CaCO3:	643	mg/l	12.86	meq/l
Calcium as Ca:	124	mg/l	6.19	meq/l
Magnesium as Mg:	81	mg/l	6.67	meq/l
Sodium as Na:	105	mg/l	4.57	meq/l
Potassium as K:	14	mg/l	0.36	meq/l
		Total Cations:	17.79	meq/l

ANIONS

Total Alkalinity as CaCO3:	514	mg/l	10.28	meq/l
Bicarbonate Alkalinity as HCO3	627	mg/l	10.28	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Chloride as Cl:	115	mg/l	3.24	meq/l
Fluoride as F:	8.05	mg/l	0.42	meq/l
Nitrate + Nitrite as N:	9.92	mg/l	0.71	meq/l
Sulfate as SO4:	194	mg/l	4.04	meq/l
		Total Anions:	18.69	meq/l
		Cation-Anion Difference:	0.90	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	0.027	mg/l
Cadmium as Cd	1.49	mg/l
Chromium as Cr	-0.02	mg/l
Copper as Cu	-0.02	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb	0.03	mg/l
Manganese as Mn	0.20	mg/l
Selenium as Se	0.173	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	0.24	mg/l
Zinc as Zn	5.71	mg/l

A minus sign indicates less than the reported value was present in the sample

Client:	Monsanto, Inc.	Date	March 7, 1985
Identification:	TW23	Job No.	79-920-1
Laboratory Number:	77266	Sheet	4 of 12
Date Sampled:	2-18-85		

pH, standard units:	6.8
Conductivity, umhos/cm:	2000
Total Dissolved Solids (at 180 C), mg/l:	1430
Sodium Adsorption Ratio (SAR):	0.54

CATIONS

Total Hardness as CaCO3:	1104	mg/l	22.07	meq/l
Calcium as Ca:	180	mg/l	8.98	meq/l
Magnesium as Mg:	159	mg/l	13.09	meq/l
Sodium as Na:	41	mg/l	1.78	meq/l
Potassium as K:	20	mg/l	0.51	meq/l
		Total Cations:	24.36	meq/l

ANIONS

Total Alkalinity as CaCO3:	618	mg/l	12.36	meq/l
Bicarbonate Alkalinity as HCO3	754	mg/l	12.36	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Chloride as Cl:	83	mg/l	2.34	meq/l
Fluoride as F:	1.47	mg/l	0.08	meq/l
Nitrate + Nitrite as N:	-0.05	mg/l	0.00	meq/l
Sulfate as SO4:	431	mg/l	8.97	meq/l
		Total Anions:	23.75	meq/l
		Cation-Anion Difference:	0.61	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	0.013	mg/l
Chromium as Cr	-0.02	mg/l
Copper as Cu	-0.02	mg/l
Iron as Fe	5.28	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	0.19	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.05	mg/l
Zinc as Zn	0.07	mg/l

A minus sign indicates less than the reported value was present in the sample

Client:	Monsanto, Inc.	Date	March 7, 1985
Identification:	TW24	Job No.	79-920-1
Laboratory Number:	77267	Sheet	5 of 12
Date Sampled:	2-18-85		

pH, standard units:	11.3
Conductivity, umhos/cm:	2710
Total Dissolved Solids (at 180 C), mg/l:	1710
Sodium Adsorption Ratio (SAR):	2.69

CATIONS

Total Hardness as CaCO3:	877	mg/l	17.53	meq/l
Calcium as Ca:	348	mg/l	17.37	meq/l
Magnesium as Mg:	2	mg/l	0.16	meq/l
Sodium as Na:	183	mg/l	7.96	meq/l
Potassium as K:	97	mg/l	2.48	meq/l
		Total Cations:	27.97	meq/l

ANIONS

Total Alkalinity as CaCO3:	275	mg/l	5.50	meq/l
Bicarbonate Alkalinity as HCO3	0	mg/l	0.00	meq/l
Carbonate Alkalinity as CO3:	119	mg/l	3.97	meq/l
Hydroxide Alkalinity as OH:	26	mg/l	1.53	meq/l
Chloride as Cl:	227	mg/l	6.40	meq/l
Fluoride as F:	4.60	mg/l	0.24	meq/l
Nitrate + Nitrite as N:	9.27	mg/l	0.66	meq/l
Sulfate as SO4:	641	mg/l	13.35	meq/l
		Total Anions:	26.15	meq/l
		Cation-Anion Difference:	1.82	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	0.007	mg/l
Chromium as Cr	-0.02	mg/l
Copper as Cu	-0.02	mg/l
Iron as Fe	0.06	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	-0.02	mg/l
Selenium as Se	0.016	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.05	mg/l
Zinc as Zn	0.03	mg/l

A minus sign indicates less than the reported value was present in the sample

Client:	Monsanto, Inc.	Date	March 7, 1985
Identification:	TW29	Job No.	79-920-1
Laboratory Number:	77268	Sheet	6 of 12
Date Sampled:	2-20-85		

pH, standard units:	7.0
Conductivity, umhos/cm:	1190
Total Dissolved Solids (at 180 C), mg/l:	700
Sodium Adsorption Ratio (SAR):	0.39

CATIONS

Total Hardness as CaCO3:	671	mg/l	13.42	meq/l
Calcium as Ca:	150	mg/l	7.49	meq/l
Magnesium as Mg:	72	mg/l	5.93	meq/l
Sodium as Na:	23	mg/l	1.00	meq/l
Potassium as K:	4	mg/l	0.10	meq/l
		Total Cations:	14.52	meq/l

ANIONS

Total Alkalinity as CaCO3:	547	mg/l	10.94	meq/l
Bicarbonate Alkalinity as HCO3	668	mg/l	10.94	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Chloride as Cl:	17	mg/l	0.48	meq/l
Fluoride as F:	0.38	mg/l	0.02	meq/l
Nitrate + Nitrite as N:	5.18	mg/l	0.37	meq/l
Sulfate as SO4:	96	mg/l	2.00	meq/l
		Total Anions:	13.81	meq/l
		Cation-Anion Difference:	0.71	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	-0.02	mg/l
Copper as Cu	-0.02	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	-0.02	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.05	mg/l
Zinc as Zn	-0.02	mg/l

A minus sign indicates less than the reported value was present in the sample

Client:	Monsanto, Inc.	Date	March 7, 1985
Identification:	TW30	Job No.	79-920-1
Laboratory Number:	77269	Sheet	7 of 12
Date Sampled:	2-21-85		

pH, standard units:	7.2
Conductivity, umhos/cm:	2090
Total Dissolved Solids (at 180 C), mg/l:	1410
Sodium Adsorption Ratio (SAR):	2.47

CATIONS

Total Hardness as CaCO3:	739	mg/l	14.77	meq/l
Calcium as Ca:	149	mg/l	7.44	meq/l
Magnesium as Mg:	89	mg/l	7.33	meq/l
Sodium as Na:	154	mg/l	6.70	meq/l
Potassium as K:	33	mg/l	0.84	meq/l
		Total Cations:	22.31	meq/l

ANIONS

Total Alkalinity as CaCO3:	397	mg/l	7.94	meq/l
Bicarbonate Alkalinity as HCO3	484	mg/l	7.94	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Chloride as Cl:	189	mg/l	5.33	meq/l
Fluoride as F:	3.61	mg/l	0.19	meq/l
Nitrate + Nitrite as N:	9.82	mg/l	0.70	meq/l
Sulfate as SO4:	367	mg/l	7.64	meq/l
		Total Anions:	21.80	meq/l
		Cation-Anion Difference:	0.51	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	-0.02	mg/l
Copper as Cu	-0.02	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	-0.02	mg/l
Selenium as Se	0.007	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	-0.05	mg/l
Zinc as Zn	-0.02	mg/l

A minus sign indicates less than the reported value was present in the sample

Client:	Monsanto, Inc.	Date	March 7, 1985
Identification:	TW31	Job No.	79-920-1
Laboratory Number:	77270	Sheet	8 of 12
Date Sampled:	2-20-85		

pH, standard units:	7.7
Conductivity, umhos/cm:	824
Total Dissolved Solids (at 180 C), mg/l:	460
Sodium Adsorption Ratio (SAR):	0.45

CATIONS

Total Hardness as CaCO3:	416	mg/l	8.32	meq/l
Calcium as Ca:	109	mg/l	5.44	meq/l
Magnesium as Mg:	35	mg/l	2.88	meq/l
Sodium as Na:	21	mg/l	0.91	meq/l
Potassium as K:	3	mg/l	0.08	meq/l
		Total Cations:	9.31	meq/l

ANIONS

Total Alkalinity as CaCO3:	355	mg/l	7.10	meq/l
Bicarbonate Alkalinity as HCO3	433	mg/l	7.10	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Chloride as Cl:	18	mg/l	0.51	meq/l
Fluoride as F:	0.34	mg/l	0.02	meq/l
Nitrate + Nitrite as N:	4.79	mg/l	0.34	meq/l
Sulfate as SO4:	45	mg/l	0.94	meq/l
		Total Anions:	8.91	meq/l
		Cation-Anion Difference:	0.40	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	0.02	mg/l
Copper as Cu	-0.02	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	-0.02	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	0.16	mg/l
Zinc as Zn	-0.02	mg/l

A minus sign indicates less than the reported value was present in the sample

Client:	MONSANTO, INC.	Date	March 14, 1985
Identification:	TW32	Job No.	79-920-1
Laboratory Number:	77472	Sheet	24 of 48
Date Sampled:	2-28-85		

pH, standard units:	8.7
Conductivity, umhos/cm:	464
Total Dissolved Solids (at 180 C), mg/l:	294
Sodium Adsorption Ratio (SAR):	0.90

CATIONS

Total Hardness as CaCO3:	170	mg/l	3.40	meq/l
Calcium as Ca:	17	mg/l	0.85	meq/l
Magnesium as Mg:	31	mg/l	2.55	meq/l
Sodium as Na:	27	mg/l	1.17	meq/l
Potassium as K:	10	mg/l	0.26	meq/l
		Total Cations:	4.83	meq/l

ANIONS

Total Alkalinity as CaCO3:	134	mg/l	2.68	meq/l
Bicarbonate Alkalinity as HCO3	164	mg/l	2.68	meq/l
Carbonate Alkalinity as CO3:	0	mg/l	0.00	meq/l
Hydroxide Alkalinity as OH:	0	mg/l	0.00	meq/l
Chloride as Cl:	22	mg/l	0.62	meq/l
Fluoride as F:	0.22	mg/l	0.01	meq/l
Nitrate + Nitrite as N:	7.11	mg/l	0.51	meq/l
Sulfate as SO4:	45	mg/l	0.94	meq/l
		Total Anions:	4.76	meq/l
		Cation-Anion Difference:	0.07	meq/l

TRACE ELEMENTS, DISSOLVED

Arsenic as As	-0.005	mg/l
Cadmium as Cd	-0.005	mg/l
Chromium as Cr	0.02	mg/l
Copper as Cu	-0.02	mg/l
Iron as Fe	-0.05	mg/l
Lead as Pb	-0.02	mg/l
Manganese as Mn	-0.02	mg/l
Selenium as Se	-0.005	mg/l
Silver as Ag	-0.02	mg/l
Vanadium as V	0.31	mg/l
Zinc as Zn	-0.02	mg/l

A minus sign indicates less than the reported value was present in the sample

Sample Identification:	TW21A	TW30	-----Standard------	--------- Control ---------
Lab No.:	76010	76011		
pH, standard units	6.1, 6.1	7.1, 7.2	7.00, 4.00	7.00
Conductivity, umhos/cm			2767, 1413, 718, 147	1413
Total Dissolved Solids	42, 32			
Calcium	-1, -1	149, 133 132 102%	5, 20, 50, 100, 206	104% 87, 92, 100%, 115%, 108%, 114%
Magnesium	-1, -1	88, 88, 85 108%	5, 20, 50, 100, 206	110% 94, 88, 94%, 95%, 105%, 108%
Sodium	5, 5	170, 177, 176 103%	5, 20, 50, 100, 200	117% 94, 95, 96%, 105%, 98%, 116%
Potassium			2, 5, 10, 20	---------
Total Alkalinity		400, 407	1120	100%
Chloride			50	100%
Fluoride	-0.10, -0.10	107%	0.1, 1.0, 10.0	90%, 98%
Nitrate+Nitrite	-0.05, -0.05		0.05, 0.10, 0.25, 0.50, 1.00, 2.00	89%, 90%, 95%, 95%
Sulfate	-1, -1	317, 389	50, 100, 200, 300	97%, 84%, 885, 108%
Arsenic	-0.005, -0.005		0.005, 0.010, 0.020	91%
Cadmium	-0.005, -0.005	81%	0.005, 0.010, 0.020	87%, 113%, 98%
Chromium	0.006, -0.005	87%	0.02, 0.05, 0.10, 1.0, 5.0	98%, 119%
Iron	-0.02, -0.02	95%	0.02, 0.05, 0.10, 1.0, 5.0	93%, 112%
Lead	-0.02, -0.02	87%	0.02, 0.05, 0.10, 1.0, 5.0	87%, 102%
Manganese	-0.02, -0.02	87%	0.02, 0.05, 0.10 1.0, 5.0	99%, 110%
Selenium	-0.005, -0.005		0.005, 0.010, 0.020	92%
Silver	-0.02, -0.02	118%	0.02, 0.05, 0.10, 1.0, 5.0	106%
Vanadium	-0.02, -0.02	91%	0.02, 0.05, 0.10, 1.0, 5.0	91%, 100%
Zinc	-0.02, -0.02	83%	0.02, 0.05, 0.10, 1.0, 5.0	

Northern Engineering & Testing, Inc.

DUPLICATE ANALYSIS of Lab Nos. 77264 - 77274

Lab No.: Accuracy (Nov. 84)

pH, standard units		
Electrical Conductivity, umhos/cm		
Total Dissolved Solids, mg/l		
Calcium, mg/l	88, 90, 93, 94, 102	= 93
Magnesium, mg/l	94, 94, 98, 100, 108	= 99
Sodium, mg/l	88, 92, 96, 96, 103	= 95
Potassium, mg/l	100, 100, 102	= 101
Total Alkalinity, mg/l	119, 97, 109	= 108
Chloride, mg/l	100, 104, 97, 104, 86	= 98
Fluoride, mg/l	101, 87, 99, 107	= 98
Nitrate + Nitrite, mg/l	73, 110, 103, 100	= 96
Sulfate, mg/l	95, 90, 90	= 92
Arsenic, mg/l	76, 98, 86, 78	= 84
Cadmium, mg/l	87, 98, 78, 81	= 86
Chromium, mg/l	87, 88, 87	= 87
Copper, mg/l		
Iron, mg/l	117, 90, 95	= 101
Lead, mg/l	110, 87	= 98
Manganese, mg/l	99, 104, 87	= 97
Selenium, mg/l	100, 120, 100, 100	= 105
Silver, mg/l	123, 100, 80, 118	= 105
Vanadium, mg/l	106, 97, 106, 79	= 97
Zinc, mg/l	87, 96, 84, 87, 79, 83	= 86

Northern Engineering & Testing, Inc.

DUPLICATE ANALYSIS of Lab Nos. 77264 - 77274

Lab No.: Precision (Nov 84)

pH, standard units			
Electrical Conductivity, umhos/cm			= .054
Total Dissolved Solids, mg/l	.018, .031, .191		
Calcium, mg/l	.129, .029, .012, .012, .010, .036, 0, .061		= .03
Magnesium, mg/l	.039, .019, .012, .036, .020, .038, 0, .020		= .03
Sodium, mg/l	.192, .017, .071, .087, .005, 0, 0, .022		= .114
Potassium, mg/l	0, =	=	0
Total Alkalinity, mg/l	.002, .012 =	=	.010
Chloride, mg/l	.026, .015 =	=	.026
Fluoride, mg/l	0, 0, =	=	.019
Nitrate + Nitrite, mg/l	.023, 0,	=	.008
Sulfate, mg/l	.006, 1.41, 0, .144	=	.151
Arsenic, mg/l			
Cadmium, mg/l			
Chromium, mg/l			
Copper, mg/l			
Iron, mg/l			
Lead, mg/l			
Manganese, mg/l			
Selenium, mg/l			
Silver, mg/l			
Vanadium, mg/l			
Zinc, mg/l			

Northern Engineering & Testing, Inc.

DUPLICATE ANALYSIS of Lab Nos. 77264 - 77274

Lab No.: Precision (Nov. 84)

pH, standard units	
Electrical Conductivity, umhos/cm	
Total Dissolved Solids, mg/l	.074, ~~.008~~, 0, .010
Calcium, mg/l	.012, .006, .028, .008, .064, 0, .117, .059, .019
Magnesium, mg/l	.026, .036, .018, .018, 0, 0, .27, .030
Sodium, mg/l	.049, .021, .020, .029, .038, 1.20, .048, .025
Potassium, mg/l	0, 0, 0, 0,
Total Alkalinity, mg/l	.008, .006, .47
Chloride, mg/l	.021, .033, .034
Fluoride, mg/l	.031, .029, .032, .024,
Nitrate + Nitrite, mg/l	0, 0, .022, 0
Sulfate, mg/l	.085, .058, 0, .006, .161, .010, .048, .004, .03
Arsenic, mg/l	~~.006~~ 0, 0, .106, 0, 0, 0, 0 = ~~.015~~ .106
Cadmium, mg/l	0, 0, 0 = N/A
Chromium, mg/l	0, 0, 0, 0, 0, .129 = .129
Copper, mg/l	
Iron, mg/l	.115, 0, .036, 0, 0, 0 = .133
Lead, mg/l	.042, 0, .283, .283, 0, 0 = .203
Manganese, mg/l	0, .152, .046, 0, 0, 0 = .099
Selenium, mg/l	0, 0, 0, 0, 0, 0 = 0
Silver, mg/l	.283, .283, 0, 0, 0, 0, = .283
Vanadium, mg/l	0, .283, 0, .157, 0 = .220
Zinc, mg/l	.067, .471, 0, .062, 0, 0, 0, 0, 0 = .100

Northern
Engineering
and Testing, Inc.

600 South 25th St.
Box 30615
Billings, Montana 59107
(406) 248-9161

April 2, 1985

Monsanto, Inc.
P O Box 816
Soda Springs, ID 83276

ATTENTION: Mr. Tim Oliver

Gentlemen:

Enclosed please find a summary of the quality assurance data generated by our laboratory in the analysis of your groundwater. This data is that generated for samples received 2/25/85 and 3/07/85.

If you have any questions regarding this summary, please contact us. Thank you for using our services.

Very truly yours,

Kathleen A. Smit

Kathleen A. Smit
Chemistry Laboratory Manager

KAS:rmr

Enclosure

cc: Golder & Associates
Attn: Mr. Doug Morrell

Northern Engineering & Testing, Inc.

DUPLICATE ANALYSIS for Lab Nos. 77450 - 77493

Lab No.:	77450	77451	77453
pH, standard units	7.4, 7.4		
Electrical Conductivity, umhos/cm	1020, 1030		
Total Dissolved Solids, mg/l	706, 712		
Calcium, mg/l	112, 109		
Magnesium, mg/l	57, 57		
Sodium, mg/l	14, 13		
Potassium, mg/l	5, 5		
Total Alkalinity, mg/l		954, 992	979, 957
Chloride, mg/l		30, 30	
Fluoride, mg/l	0.27, 0.27		
Nitrate + Nitrite, mg/l	4.78, 4.56		
Sulfate, mg/l		98, 112	92, 98
Arsenic, mg/l			
Cadmium, mg/l	-0.005, -0.005		
Chromium, mg/l	-0.02, -0.02		
Copper, mg/l	-0.02, -0.02		
Iron, mg/l	-0.05, -0.05		
Lead, mg/l	-0.02, -0.02		
Manganese, mg/l	-0.02, -0.02		
Selenium, mg/l		-0.005, -0.005	
Silver, mg/l	-0.02, -0.02		
Vanadium, mg/l	-0.05, -0.05		
Zinc, mg/l	0.58, 0.58		

Northern Engineering & Testing, Inc.

DUPLICATE ANALYSIS for Lab Nos. 77450 - 77493

Lab No.:	77458	77459	77460	77463	77470
pH, standard units			7.6, 7.6		7.5, 7.5
Electrical Conductivity, umhos/cm			850, 860		1710, 1680
Total Dissolved Solids, mg/l			522, 542		1320, 1300
Calcium, mg/l			104, 114		168, 170
Magnesium, mg/l			40, 41		65, 65
Sodium, mg/l			8, 14		118, 118
Potassium, mg/l			2, 3		17, 18
Total Alkalinity, mg/l	416, 422				
Chloride, mg/l			8, 10	27, 28	
Fluoride, mg/l			0.34, 0.36		2.68, 2.68
Nitrate + Nitrite, mg/l			3.70, 3.87	0.37, 0.51	
Sulfate, mg/l			5, 18		468, 538
Arsenic, mg/l					
Cadmium, mg/l			-0.005, -0.005	0.027	0.023
Chromium, mg/l			-0.02, -0.02		
Copper, mg/l			-0.02, -0.02		
Iron, mg/l			0.08, 0.08		
Lead, mg/l			-0.02, -0.02		-0.02, -0.(
Manganese, mg/l			-0.02, -0.02		
Selenium, mg/l				0.012, 0.013	0.030, 0.(
Silver, mg/l			-0.02, -0.02		-0.02, -0.(
Vanadium, mg/l			-0.05, -0.05		
Zinc, mg/l			-0.02, -0.02		

Northern Engineering & Testing, Inc.

DUPLICATE ANALYSIS for Lab Nos. 77450 - 77493

Lab No.:	77471	77476	77478
pH, standard units			
Electrical Conductivity, umhos/cm			
Total Dissolved Solids, mg/l			
Calcium, mg/l			
Magnesium, mg/l			
Sodium, mg/l			
Potassium, mg/l			
Total Alkalinity, mg/l		1190, 1200	398, 406
Chloride, mg/l			
Fluoride, mg/l			
Nitrate + Nitrite, mg/l			
Sulfate, mg/l			
Arsenic, mg/l	-0.005, -0.005		
Cadmium, mg/l			
Chromium, mg/l			
Copper, mg/l			
Iron, mg/l			
Lead, mg/l			
Manganese, mg/l			
Selenium, mg/l			
Silver, mg/l			
Vanadium, mg/l			
Zinc, mg/l			

Northern Engineering & Testing, Inc.

DUPLICATE ANALYSIS for Lab Nos. 77450 - 77493

Lab No.:	77480	77481	77487	77488
pH, standard units	8.5, 8.5			
Electrical Conductivity, umhos/cm	1240, 1250			
Total Dissolved Solids, mg/l	886, 862			
Calcium, mg/l	73, 72			
Magnesium, mg/l	77, 77			
Sodium, mg/l	71, 70			
Potassium, mg/l	32, 32			
Total Alkalinity, mg/l				
Chloride, mg/l	85, 87			
Fluoride, mg/l	6.88, 6.88			
Nitrate + Nitrite, mg/l			8.08, 7.68	
Sulfate, mg/l	297, 306			
Arsenic, mg/l		0.007, 0.008		
Cadmium, mg/l	-0.005, -0.005			
Chromium, mg/l	0.02, 0.02			
Copper, mg/l	-0.02, -0.02			
Iron, mg/l	-0.05, -0.05			
Lead, mg/l	-0.02, -0.02			
Manganese, mg/l	-0.02, -0.02			
Selenium, mg/l	0.076, 0.074	0.055, 0.053		0.025, 0.025
Silver, mg/l	-0.02, -0.02			
Vanadium, mg/l	-0.05, -0.05			
Zinc, mg/l	-0.02, -0.02			

Northern Engineering & Testing, Inc.

DUPLICATE ANALYSIS for Lab Nos. 77450 - 77493

Lab No.:	77489	77490	77491
pH, standard units		7.2, 7.2	
Electrical Conductivity, umhos/cm		1040, 1050	
Total Dissolved Solids, mg/l		670, 680	
Calcium, mg/l		125, 123	
Magnesium, mg/l		58, 57	
Sodium, mg/l		29, 28	
Potassium, mg/l		9, 10	
Total Alkalinity, mg/l	416, 410		
Chloride, mg/l		43, 45	
Fluoride, mg/l		Spiked, Not Dup.	
Nitrate + Nitrite, mg/l		5.38, 5.45	
Sulfate, mg/l		73, 76	
Arsenic, mg/l			-0.005, -0.005
Cadmium, mg/l		0.016, 01013	
Chromium, mg/l		-0.02, -0.02	
Copper, mg/l		-0.02, -0.02	
Iron, mg/l		-0.05, -0.05	
Lead, mg/l		-0.02, -0.02	
Manganese, mg/l		-0.02, -0.02	
Selenium, mg/l			
Silver, mg/l		-0.02, -0.02	
Vanadium, mg/l		-0.05, -0.05	
Zinc, mg/l		0.02, 0.02	

Northern Engineering & Testing, Inc.

DUPLICATE ANALYSIS of Lab Nos. 77253 - 77263

Lab No.:	77253	77255	77256	77257	77260	77263
pH, standard units		7.2, 7.2			8.1, 8.1	
Electrical Conductivity, umhos/cm		1160, 1150			4670, 4770	
Total Dissolved Solids, mg/l				1010, 1050		
Calcium, mg/l	127, 128				126, 129	
Magnesium, mg/l	134, 135				59, 60	
Sodium, mg/l	47, 47				75, 75	
Potassium, mg/l					12, 12	
Total Alkalinity, mg/l	803, 813					416, 406
Chloride, mg/l					75, 76	
Fluoride, mg/l					1.02, 1.06	
Nitrate + Nitrite, mg/l					5.79, 5.68	
Sulfate, mg/l					103, 104	
Arsenic, mg/l					*	
Cadmium, mg/l			0.037, 0.038		0.030, 0.030	
Chromium, mg/l					-0.02, -0.02	
Copper, mg/l					-0.02, -0.02	
Iron, mg/l					-0.05, -0.05	
Lead, mg/l					-0.02, -0.02	
Manganese, mg/l					-0.02, -0.02	
Selenium, mg/l			0.009, 0.010			
Silver, mg/l					-0.02, -0.02	
Vanadium, mg/l					-0.05, -0.05	
Zinc, mg/l					0.05, 0.05	

*Duplicate analyses were not performed on this set. Spike sample analyses were used in their stead.

Northern Engineering & Testing, Inc.

SPIKE RECOVERY of Lab Nos. 77253 - 77263
(in % Recovery)

Lab No.:	77255	77256	77258	77262
pH, standard units	None			
Electrical Conductivity, umhos/cm	None			
Total Dissolved Solids, mg/l	None			
Calcium, mg/l	98			
Magnesium, mg/l	96			
Sodium, mg/l	96			
Potassium, mg/l	97			
Total Alkalinity, mg/l		110		
Chloride, mg/l	95			
Fluoride, mg/l	101			
Nitrate + Nitrite, mg/l	100			
Sulfate, mg/l	106			
Arsenic, mg/l			121	112
Cadmium, mg/l	98	75*		
Chromium, mg/l		50*		
Copper, mg/l		104		
Iron, mg/l		150*		
Lead, mg/l	109	87		
Manganese, mg/l		50*		
Selenium, mg/l				88
Silver, mg/l	95			
Vanadium, mg/l		105		
Zinc, mg/l		100		

*These spikes were prepared in concentrations near the detection limit of the test. These values do not meet published quality assurance guidelines for accuracy but do meet those for precision.

Northern Engineering & Testing, Inc.

STANDARDS & CONTROLS ANALYSIS for
Lab Nos. 77253 - 77263

							% Recovery	
pH, standard units	7.00	4.00					None	
Electrical Conductivity, umhos/cm	1413	2767	718	147			None	
Total Dissolved Solids, mg/l	None						None	
Calcium, mg/l	5	10	50	100	200		101	
Magnesium, mg/l	5	10	50	100	200		88	
Sodium, mg/l	5	10	50	100	200		102	
Potassium, mg/l	2	5	10	20			100	
Total Alkalinity, mg/l	None						101	
Chloride, mg/l	12.5	0					102	92
Fluoride, mg/l	0.01	0.10	1.0	10.0			107	
Nitrate + Nitrite, mg/l	0.05	0.10	0.25	0.50	1.00	2.00	103	
Sulfate, mg/l	50	100	200	300			101	104
Arsenic, mg/l	0.005	0.010	0.020				88	
Cadmium, mg/l	0.02	0.05	0.10	1.0	5.0		100	
Chromium, mg/l	0.02	0.05	0.10	1.0	5.0		100	
Copper, mg/l	0.02	0.05	0.10	1.0	5.0		100	
Iron, mg/l	0.02	0.05	0.10	1.0	5.0		*	
Lead, mg/l		0.02	0.05				100	
Manganese, mg/l	0.02	0.05	0.10	1.0	5.0		100	
Selenium, mg/l	0.005	0.010	0.020				112	
Silver, mg/l	0.01	0.02	0.05				100	
Vanadium, mg/l	0.02	0.05	0.10	1.0	5.0		119	
Zinc, mg/l	0.02	0.05	0.10	1.0	5.0		150	

*Indicates poor recovery

Northern Engineering & Testing, Inc.

STANDARDS & CONTROLS ANALYSIS for
Lab Nos. 77450 - 77494

Lab No.:							% Recovery		
pH, standard units	7.00	4.00					None		
Electrical Conductivity, umhos/cm	1413	2767	718	147			None		
Total Dissolved Solids, mg/l	None						None		
Calcium, mg/l	5	20	50	100	200		102		
Magnesium, mg/l	5	20	50	100	200		105		
Sodium, mg/l	5	20	50	100	200		108		
Potassium, mg/l	1	5	10	50	100		96		
Total Alkalinity, mg/l	None						89		
Chloride, mg/l	12.5,	0					110		
Fluoride, mg/l	0.01	0.10	1.0	10.0			None		
Nitrate + Nitrite, mg/l	0.05	0.10	0.25	0.50	1.00	2.00	95, 95		
Sulfate, mg/l	50	100	200	300			None		
Arsenic, mg/l	0.005	0.010	0.020						
Cadmium, mg/l	0.02	0.05	0.010	1.0	5.0		96	100	
Chromium, mg/l	0.02	0.05	0.010	1.0	5.0		94	98	
Copper, mg/l	0.02	0.05	0.010	1.0	5.0		98	120	
Iron, mg/l	0.02	0.05	0.010	1.0	5.0		79		
Lead, mg/l	0.01	0.02	0.05	0.10			102	107	102
Manganese, mg/l	0.02	0.05	0.10	1.0	5.0		71		
Selenium, mg/l	0.005	0.010	0.020				93	115	
Silver, mg/l	0.01	0.02	0.05				100	106	102
Vanadium, mg/l	0.02	0.05	0.10	1.0	5.0		71		
Zinc, mg/l	0.02	0.05	0.10	1.0	5.0		120		

Northern Engineering & Testing, Inc.

DUPLICATE ANALYSIS of Lab Nos. 77264 - 77274

Lab No.:	77264	77265	77267
pH, standard units		8.0, 8.0	
Electrical Conductivity, umhos/cm		2830, 2860	
Total Dissolved Solids, mg/l			1700, 1720
Calcium, mg/l	133, 133		
Magnesium, mg/l	43, 42		
Sodium, mg/l	6, 6		
Potassium, mg/l			
Total Alkalinity, mg/l	410, 426		
Chloride, mg/l			
Fluoride, mg/l			
Nitrate + Nitrite, mg/l			
Sulfate, mg/l			
Arsenic, mg/l			
Cadmium, mg/l			
Chromium, mg/l			
Copper, mg/l			
Iron, mg/l			
Lead, mg/l			
Manganese, mg/l			
Selenium, mg/l			
Silver, mg/l			
Vanadium, mg/l			
Zinc, mg/l			

Northern Engineering & Testing, Inc.

DUPLICATE ANALYSIS of Lab Nos. 77264 - 77274

Lab No.:	77271	77270	77273	77274
pH, standard units		7.7, 7.7		
Electrical Conductivity, umhos/cm		835, 813		
Total Dissolved Solids, mg/l				
Calcium, mg/l		109, 109		
Magnesium, mg/l		35, 35		
Sodium, mg/l		21, 21		
Potassium, mg/l		6, 6		
Total Alkalinity, mg/l			355, 349	
Chloride, mg/l		15, 16		17, 17
Fluoride, mg/l		0.34, 0.33		
Nitrate + Nitrite, mg/l		4.62, 4.79		
Sulfate, mg/l		49, 45		
Arsenic, mg/l		*		
Cadmium, mg/l		-0.005, 0.008		
Chromium, mg/l		0.02, 0.02		
Copper, mg/l		-0.02, -0.02		
Iron, mg/l		-0.05, -0.05		
Lead, mg/l		-0.02, -0.02		
Manganese, mg/l		-0.02, -0.02		
Selenium, mg/l	0.066, 0.068			
Silver, mg/l		-0.02, -0.02		
Vanadium, mg/l		0.16, 0.17		
Zinc, mg/l		-0.02, -0.02		

*Duplicate analyses were not performed. Spike analyses were used in their stead.

Northern Engineering & Testing, Inc.

SPIKE ANALYSIS of Lab Nos. 77264 - 77274
(in % Recovery)

Lab No.:	77265	77266	77268	77270	77272	77274
pH, standard units	None	None				
Electrical Conductivity, umhos/cm	None	None				
Total Dissolved Solids, mg/l		None				
Calcium, mg/l		100				
Magnesium, mg/l		93				
Sodium, mg/l		95				
Potassium, mg/l				105		
Total Alkalinity, mg/l			113			
Chloride, mg/l	96				104	103
Fluoride, mg/l	105					
Nitrate + Nitrite, mg/l	100					
Sulfate, mg/l	104					
Arsenic, mg/l			81	118		
Cadmium, mg/l	91					
Chromium, mg/l	92					
Copper, mg/l	89					
Iron, mg/l	96					
Lead, mg/l	92					
Manganese, mg/l	95					
Selenium, mg/l					94	
Silver, mg/l	119					
Vanadium, mg/l	93					
Zinc, mg/l	98					

Northern Engineering & Testing, Inc.

STANDARDS & CONTROLS ANALYSIS for
Lab Nos. 77264 - 77274

						% Recovery		
pH, standard units	7.00	4.00				None		
Electrical Conductivity, umhos/cm	1413	2767	718	147		None		
Total Dissolved Solids, mg/l	N O N E					None		
Calcium, mg/l	5	10	50	100	200	101		
Magnesium, mg/l	5		50		200	88		
Sodium, mg/l	5		50		200	102		
Potassium, mg/l	2	5	10	20		100		
Total Alkalinity, mg/l	N o n e					102	101	
Chloride, mg/l	12.5	0				92	92	
Fluoride, mg/l	0.01	0.10	1.0	10.0		107		
Nitrate + Nitrite, mg/l	0.05	0.10	0.25	0.50	1.00	2.00	103	
Sulfate, mg/l	50	100	200	300		101	104	
Arsenic, mg/l	0.005	0.010	0.020			88		
Cadmium, mg/l	0.02	0.05	0.10	1.0	5.0	100		
Chromium, mg/l	0.02	0.05	0.10	1.0	5.0	100		
Copper, mg/l	0.02	0.05	0.10	1.0	5.0	100		
Iron, mg/l	0.02	0.05	0.10	1.0	5.0	-		
Lead, mg/l	0.01	0.02	0.05			100		
Manganese, mg/l	0.02	0.05	0.10	1.0	5.0	100		
Selenium, mg/l	0.005	0.010	0.020			105	92	109
Silver, mg/l	0.01	0.02	0.05			100		
Vanadium, mg/l	0.02	0.05	0.10	1.0	5.0	119		
Zinc, mg/l	0.02	0.05	0.10	1.0	5.0	150		

Northern Engineering & Testing, Inc.

SPIKE ANALYSIS of Lab Nos. 77450 - 77493

Lab No.:	77450	77451	77453	77454	77455	77456	77460	77462
pH, standard units	N O N E							
Electrical Conductivity, umhos/cm	N O N E							
Total Dissolved Solids, mg/l	N O N E							
Calcium, mg/l						94		
Magnesium, mg/l						93		
Sodium, mg/l						95		
Potassium, mg/l						103		
Total Alkalinity, mg/l			99					
Chloride, mg/l					118			
Fluoride, mg/l					94			
Nitrate + Nitrite, mg/l					107			
Sulfate, mg/l				101				
Arsenic, mg/l					124		87	
Cadmium, mg/l					114			
Chromium, mg/l					98			
Copper, mg/l					110			
Iron, mg/l					102			
Lead, mg/l		92	86					96
Manganese, mg/l								
Selenium, mg/l	94				86		115	
Silver, mg/l					100			
Vanadium, mg/l					94			
Zinc, mg/l					86			

Northern Engineering & Testing, Inc.

SPIKE ANALYSIS of Lab Nos. 77450 - 77493

Lab No.:	77464	77465	77468	77472	77475
pH, standard units					
Electrical Conductivity, umhos/cm					
Total Dissolved Solids, mg/l					
Calcium, mg/l	98			101	
Magnesium, mg/l	94			98	
Sodium, mg/l	90			100	
Potassium, mg/l	86			100	
Total Alkalinity, mg/l					
Chloride, mg/l		107			105
Fluoride, mg/l		98			97
Nitrate + Nitrite, mg/l	105				
Sulfate, mg/l					
Arsenic, mg/l		80			112
Cadmium, mg/l		94			96
Chromium, mg/l		98			100
Copper, mg/l		114			100
Iron, mg/l		96			118
Lead, mg/l			92		94
Manganese, mg/l		96			112
Selenium, mg/l		82			112
Silver, mg/l		91			90
Vanadium, mg/l		108			100
Zinc, mg/l		98			93

Northern Engineering & Testing, Inc.

SPIKE ANALYSIS for Lab Nos. 77450 - 77493

Lab No.:	77478	77480	77483	77485	77486
pH, standard units					
Electrical Conductivity, umhos/cm					
Total Dissolved Solids, mg/l					
Calcium, mg/l		102			
Magnesium, mg/l		101			
Sodium, mg/l		101			
Potassium, mg/l		100			
Total Alkalinity, mg/l	98				
Chloride, mg/l				104	
Fluoride, mg/l				101	
Nitrate + Nitrite, mg/l					
Sulfate, mg/l		94	91		
Arsenic, mg/l		120			
Cadmium, mg/l					
Chromium, mg/l					
Copper, mg/l					
Iron, mg/l					
Lead, mg/l					104
Manganese, mg/l					
Selenium, mg/l					
Silver, mg/l					87
Vanadium, mg/l					
Zinc, mg/l					

Northern Engineering & Testing, Inc.

SPIKE ANALYSIS for Lab Nos. 77450 - 77493

Lab No.:	77488	77489	77490	77491	77493
pH, standard units					
Electrical Conductivity, umhos/cm					
Total Dissolved Solids, mg/l					
Calcium, mg/l					99
Magnesium, mg/l					99
Sodium, mg/l					100
Potassium, mg/l					95
Total Alkalinity, mg/l	99				
Chloride, mg/l					
Fluoride, mg/l			96		
Nitrate + Nitrite, mg/l				91	103
Sulfate, mg/l					
Arsenic, mg/l					90
Cadmium, mg/l					93
Chromium, mg/l					100
Copper, mg/l					100
Iron, mg/l					94
Lead, mg/l					
Manganese, mg/l					103
Selenium, mg/l		88			
Silver, mg/l					
Vanadium, mg/l					100
Zinc, mg/l					108

Northern Engineering & Testing, Inc.

DUPLICATE ANALYSIS of Lab Nos. 77264 - 77274

Lab No.: Accuracy (March 85)

		Mean % Recoverable
pH, standard units		
Electrical Conductivity, umhos/cm		
Total Dissolved Solids, mg/l		
Calcium, mg/l	100, 98, 94, 98, 101, 102, 99, =	99
Magnesium, mg/l	93, 96, 93, 94, 98, 101, 99, =	96
Sodium, mg/l	95, 96, 95, 90, 100, 101, 100, =	97
Potassium, mg/l	105, 97, 103, 86, 100, 100, 95, =	98
Total Alkalinity, mg/l	113, 110, 99, 98, 99, =	103
Chloride, mg/l	96, 104, 103, 95, 118, 107, 105, 104 =	104
Fluoride, mg/l	105, 101, 94, 98, 97, 101, 96, =	99
Nitrate + Nitrite, mg/l	100, 100, 107, 105, 91, 103, =	101
Sulfate, mg/l	104, 106, 101, 94, 91, =	99
Arsenic, mg/l	81, 118, 121, 112, 124, 80, 112, 120, 90, =	106
Cadmium, mg/l	91, 98, 75, 114, 94, 96, 93, =	94
Chromium, mg/l	92, 50, 98, 98, 100, 100, =	90
Copper, mg/l	89, 104, 110, 114, 100, 100, =	101
Iron, mg/l	96, 150, 102, 96, 118, 94, =	109
Lead, mg/l	92, 109, 87, 92, 86, 96, 92, 94, 104, =	95
Manganese, mg/l	95, 50, 96, 112, 103, =	91
Selenium, mg/l	94, 88, 94, 86, 115, 82, 112, 88, =	95
Silver, mg/l	119, 95, 100, 91, 90, 87, =	97
Vanadium, mg/l	93, 105, 94, 108, 100, 100, =	100
Zinc, mg/l	98, 100, 86, 98, 93, 108, =	97

Northern Engineering & Testing, Inc.

DUPLICATE ANALYSIS of Lab Nos. 77264 - 77274

Lab No.: Precision (March 85)

		Mean CV
pH, standard units		
Electrical Conductivity, umhos/cm		
Total Dissolved Solids, mg/l	.008, .027, .006, .027, .011, .019, .010,	= .015
Calcium, mg/l	0, 0, .017, .006, .019, .065, .008, .010, .011	= .015
Magnesium, mg/l	.017, 0, .005, .012, 0, 0, .017, 0, .012	= .007
Sodium, mg/l	0, 0, 0, .052, .386, 0, .010, .025,	= .059
Potassium, mg/l	0, 0, 0, .283, .040, 0, .074,	= .057
Total Alkalinity, mg/l	.027, .009, .017, .028, .016, .010, .006, .014, .010,	= [illegible]
Chloride, mg/l	.012, .046, 0, .009, 0, .157, .026, .016, .032,	= .033
Fluoride, mg/l	.021, .027, 0, 0, .040, 0,	= .015
Nitrate + Nitrite, mg/l	.026, .014, .033, .032, .225, .036, .009	= .054
Sulfate, mg/l	.060, .007, .094, .045, .799, .098, .021, .028	= .144
Arsenic, mg/l	0, .094, 0,	= .094
Cadmium, mg/l	.326, .019, 0, 0, 0, .113, 0, .318,	= .115
Chromium, mg/l	0, 0, 0, 0, 0, 0,	= 0
Copper, mg/l	0, 0, 0, 0, 0, 0,	= N/A
Iron, mg/l	0, 0, 0, 0, 0, 0,	= 0
Lead, mg/l	0, 0, 0, 0, 0, 0, 0,	= N/A
Manganese, mg/l	0, 0, 0, 0, 0, 0,	= N/A
Selenium, mg/l	.021, .074, 0, .057, .074, .019, .026, 0,	= .039
Silver, mg/l	0, 0, 0, 0, 0, 0, 0,	= N/A
Vanadium, mg/l	.049, 0, 0, 0, 0, 0,	= .049
Zinc, mg/l	0, 0, 0, 0, 0, 0,	= 0

41 is a duplicate of TW-31

42 Nitrate / Fluoride Concentrate #4 was added to aliquot of TW-31

43 is a duplicate of TW-29

44 Had metals from concentrate #2 added to aliquot of TW-29

45 is a duplicate of TW-19

46 Had Nitrate / Fluoride from Concentrate #13 added to aliquot of TW-19

47 is a duplicate of TW-17

48 Had metals from Concentrate #13 added to aliquot of TW-17

49 Duplicate of TW-39

50 Had Nitrate / Fluoride from Concentrate #15 added to aliquot of TW-39

Sample # 50 — 20 ml of # 15 concentrate to 980 ml of TW-39

Conc. #15 NO_3^- = 9.10 mg/l (recalc. soln.)
F^- = 2.28 mg/l

should have added 10 ml only but added

Sample # 48 — 20 ml of # 13 concentrate to 1 liter of TW-17

∴ 2 x = # 13 Conc.

As	= .043	mg/l	Hg = .0014	Recalc. Soln.
Ba	= .344	"	Se = .0076	
Cd	= .0046	"	Ag = .034	
Cr	= .0046	"		
Pb	= .045	"		

Sample # 12 — 974 ml of aliquot (TW-31) to spike # of 20 ml. (Recalc. Soln Vol)

4 Conc. Nitrate .08 mg/l (recalc. soln.)
F .23 mg/l

#46 Sample — 20 ml of Conc. #13 to TW-19
976 ml (Resulting Soln)

#13 Conc. NO_3 = 1.67 mg/l
F^- = 1.36 mg/l
} Resulting Soln Increasing

#44 Sample — Added 10 ml of Conc. #2 to TW-44 to make 974 ml of resulting Soln.

#2 Conc.

As	=	27 ppb	.027
Ba	=	192 "	.197
Cd	=	3.3	.0033
Cr	=	18	.018
Pb	=	28	.028
Hg	=	1.8	.0018
Se	=	~~.06~~ 6	.00~~06~~6
Ag	=	28	.028

Spiked Recoverable Between TW-29 and TW-44

(percent recovered)

Total Dissolved Solids		
Calcium		
Magnesium		
Sodium		
Potassium		
Total Alkalinity		
Chloride		
Fluoride		
Nitrate + Nitrite		
Sulfate		
Arsenic	* 95 %	
Cadmium	* 117 %	
Chromium	0.0 %	← X
Copper		
Iron		
Lead	* 79 %	
Mangonese		
Selenium	33.0 %	← X
Silver	105 %	
Vanadium		
Zinc		

Spiked Recoverable Between TW-31 and TW-42

(percent recovered)

Total Dissolved Solids	
Calcium	
Magnesium	
Sodium	
Potassium	
Total Alkalinity	
Chloride	
Fluoride	91 % ✓
Nitrate + Nitrite	0.0 % ✓
Sulfate	
Arsenic	
Cadmium	
Chromium	
Copper	
Iron	
Lead	
Mangonese	
Selenium	
Silver	
Vanadium	
Zinc	

Spiked Recoverable Between TW-19 and TW-46

(percent recovered)

Total Dissolved Solids
Calcium
Magnesium
Sodium
Potassium

Total Alkalinity
Chloride
Fluoride → 104 %
Nitrate + Nitrite Neg Percentage
Sulfate

Arsenic
Cadmium
Chromium
Copper
Iron
Lead
Mongoness
Selenium
Silver
Vanadium
Zinc

Spiked Recoverable Between TW-17 and TW-48

(percent recovered)

Total Dissolved Solids		
Calcium		
Magnesium		
Sodium		
Potassium		
Total Alkalinity		
Chloride		
Fluoride		
Nitrate + Nitrite		
Sulfate		
Arsenic	*67%	
Cadmium	Negative number	
Chromium	40%	
Copper		
Iron		
Lead	81%	OK
Mangonese		
Selenium	99%	OK
Silver	51%	OK
Vanadium		
Zinc		

Spiked Recoverable Between TW-39 and TW-50

(percent recovered)

Total Dissolved Solids
Calcium
Magnesium
Sodium
Potassium

Total Alkalinity
Chloride
Fluoride
Nitrate + Nitrite
Sulfate

Arsenic
Cadmium
Chromium
Copper
Iron
Lead
Mangonese
Selenium
Silver
Vanadium
Zinc

Coefficient of Variation (CV) Between TW-31 and TW-41

$$\left(CV = \frac{\text{Standard Deviation}}{\text{Mean of Values}} \right)$$

Total Dissolved Solids	0.070
Calcium	0.0
Magnesium	0.020
Sodium	0.03
Potassium	0.0
Total Alkalinity	0.020
Chloride	0.0
Fluoride	0.020
Nitrate + Nitrite	0.015
Sulfate	0.031
Arsenic	N/A
Cadmium	N/A
Chromium	0.0
Copper	N/A
Iron	N/A
Lead	N/A
Mangenese	1.06
Selenium	N/A
Silver	N/A
Vanadium	0.043
Zinc	N/A

Coefficient of Variation (CV) Between TW-29 and TW-43

$$\left(CV = \frac{\text{Standard Deviation}}{\text{Mean of Values}} \right)$$

Total Dissolved Solids	0.067
Calcium	0.009
Magnesium	0.010
Sodium	0.059
Potassium	0.0
Total Alkalinity	0.012
Chloride	0.11 ←
Fluoride	0.0
Nitrate + Nitrite	0.007
Sulfate	0.007
Arsenic	N/A
Cadmium	N/A
Chromium	N/A
Copper	N/A
Iron	N/A
Lead	N/A
Mangonese	1.06 — X
Selenium	N/A
Silver	N/A
Vanadium	N/A
Zinc	N/A

Coefficient of Variation (CV) Between TW-19 and TW-45

$$\left(CV = \frac{\text{Standard Deviation}}{\text{Mean of Values}} \right)$$

Total Dissolved Solids	0.026
Calcium	0.062
Magnesium	0.027
Sodium	0.081
Potassium	0.35
Total Alkalinity	0.009
Chloride	0.020
Fluoride	0.0
Nitrate + Nitrite	0.17
Sulfate	0.024
Arsenic	0.13
Cadmium	N/A
Chromium	N/A
Copper	N/A
Iron	N/A
Lead	N/A
Mangonese	N/A
Selenium	0.0
Silver	N/A
Vanadium	N/A
Zinc	N/A

Coefficient of Variation (CV) Between TW-17 and TW-47

$$\left(CV = \frac{\text{Standard Deviation}}{\text{Mean of Values}} \right)$$

Total Dissolved Solids	0.020
Calcium	0.012
Magnesium	0.009
Sodium	0.038
Potassium	0.064
Total Alkalinity	0.004
Chloride	0.030
Fluoride	0.056
Nitrate + Nitrite	0.37
Sulfate	0.028
Arsenic	N/A
Cadmium	0.25
Chromium	N/A
Copper	N/A
Iron	N/A
Lead	0.0
Mangonese	0.12
Selenium	0.13
Silver	N/A
Vanadium	N/A
Zinc	0.13

Coefficient of Variation (CV) Between TW-39 and TW-49

$$\left(CV = \frac{\text{Standard Deviation}}{\text{Mean of Values}} \right)$$

Total Dissolved Solids	0.006
Calcium	0.028
Magnesium	0.048
Sodium	0.010
Potassium	0.0
Total Alkalinity	0.13 ← X
Chloride	0.016
Fluoride	0.056
Nitrate + Nitrite	0.018
Sulfate	0.005
Arsenic	0.33 ←
Cadmium	N/A
Chromium	0.0
Copper	N/A
Iron	N/A
Lead	N/A
Mangoness	N/A
Selenium	0.27 ← X
Silver	N/A
Vanadium	N/A
Zinc	N/A

Appendix J

Geochemical Statistical Analyses (SPSS Package)

```
TO SEE REMARKS AND A SUMMARY OF NEW FEATURES FOR
THIS PROGRAM, STATE NEWS. IN THE PRINT PARAGRAPH.

THIS VERSION OF BMDP HAS BEEN CONVERTED FOR USE ON
CDC 6000 AND CYBER SERIES COMPUTERS BY
BMDP PROJECT, VOGELBACK COMPUTING CENTER
NORTHWESTERN UNIVERSITY
2129 SHERIDAN ROAD
EVANSTON, ILLINOIS 60201
(312) 492-3681

RELEASED AUGUST 1983 FOR FTN4 COMPILERS

EXECUTED ON 85/01/08.AT 11.40.06.

PROGRAM CONTROL INFORMATION

/PROBLEM  TITLE= 'FACTOR ANALYSIS FOR MONSANTO SODA SPRINGS PLANT
                 WATER QUALITY DATA'
/INPUT    VARIABLES=37.
        FORMAT= '(7X,2A4////2(7X,F8.0/),7X,F8.0//////7X,F8.0///////3(5X,A2,F8.0/),
                 3(5X,A2,F8.0//),5X,A2,F8.0/2(5X,A2,F8.0//),5X,A2,F8.0///
                    7X,F8.0////4(5X,A2,F8.0/),5X,A2,F8.0)'.
          CASES=48.
          UNIT=7.
/VARIABLES NAMES=ID1,ID2,PH,EH,C,TDS,L1,CA,L2,MG,L3,NA,L4,K,L5,CD,L14,FE,L15,MN,
                 L6,SE,L7,V,L13,NH3,HCO3,L8,CL,L9,F,L10,NOX,L11,SO4,L12,
                 H4SIO4,NAK,CAMG.
          BLANKS=MISSING.
          LABEL=ID1,ID2.
          USE=PH,EH,C,TDS,CD,FE,MN,SE,V,NH3,HCO3,CL,F,NOX,SO4,H4SIO4,NAK,
          CAMG.
          ADD=2.
/TRANSFORM IF(L1 EQ CHAR( <)) THEN CA=CA/2.
           IF(L2 EQ CHAR( <)) THEN MG=MG/2.
           IF(L3 EQ CHAR( <)) THEN NA=NA/2.
           IF(L4 EQ CHAR( <)) THEN K=K/2.
           IF(L5 EQ CHAR( <)) THEN CD=CD/2.
           IF(L6 EQ CHAR( <)) THEN SE=SE/2.
           IF(L7 EQ CHAR( <)) THEN V=V/2.
           IF(L8 EQ CHAR( <)) THEN CL=CL/2.
           IF(L9 EQ CHAR( <)) THEN F=F/2.
           IF(L10 EQ CHAR( <)) THEN NOX=NOX/2.
           IF(L11 EQ CHAR( <)) THEN SO4=SO4/2.
           IF(L12 EQ CHAR( <)) THEN H4SIO4=H4SIO4/2.
IPAGE   2 BMDP4M

           IF(L13 EQ CHAR( <)) THEN NH3=NH3/2.
           IF(L14 EQ CHAR( <)) THEN FE=FE/2.
           IF(L15 EQ CHAR( <)) THEN MN=MN/2.
           NAK=NA+K.
```

FACTOR ANALYSIS FOR MONSANTO SODA SPRINGS PLANT WATER QUALITY DATA

```
NUMBER OF VARIABLES TO READ IN. . . . . .          37
NUMBER OF VARIABLES ADDED BY TRANSFORMATIONS. .     2
TOTAL NUMBER OF VARIABLES . . . . . . . . .        39
NUMBER OF CASES TO READ IN. . . . . . . . .        48
CASE LABELING VARIABLES . . . . . . . . . .  ID1        ID2
MISSING VALUES CHECKED BEFORE OR AFTER TRANS. . NEITHER
BLANKS ARE. . . . . . . . . . . . . . . . . . MISSING
INPUT UNIT NUMBER . . . . . . . . . . . . . .       7
REWIND INPUT UNIT PRIOR TO READING. . DATA. . .   YES
NUMBER OF WORDS OF DYNAMIC STORAGE. . . . . .   19998
NUMBER OF CASES DESCRIBED BY INPUT FORMAT . . .     1

***** TRAN     PARAGRAPH IS USED *****

VARIABLES TO BE USED
     3 PH          4 EH          5 C           6 TDS        16 CD
    18 FE         20 MN         22 SE         24 V         26 NH3
    27 HCO3       29 CL         31 F          33 NOX       35 SO4
    37 H4SIO4     38 NAK        39 CAMG
0INPUT FORMAT IS
(7X,2A4////2(7X,F8.0/),7X,F8.0//////7X,F8.0//////3(5X,A2,F8.0/), 3(5X,A2,F8.0//),
5X,A2,F8.0/2(5X,A2,F8.0//),5X,A2,F8.0///  7X,F8.0////4(5X,A2,F8.0/),5X,A2,F8.0)

0MAXIMUM LENGTH DATA RECORD IS  15 CHARACTERS.
1PAGE   3 BMDP4M  FACTOR ANALYSIS FOR MONSANTO SODA SPRINGS PLANT  WATER QUALITY DATA
```

0I N P U T V A R I A B L E S . . . . .

VARIABLE INDEX	NAME	RECORD NO.	COLUMNS BEGIN	COLUMNS END	FIELD WIDTH	TYPE
1	ID1	1	8	11	4	A
2	ID2	1	12	15	4	A
3	PH	5	8	15	8	F
4	EH	6	8	15	8	F
5	C	7	8	15	8	F
6	TDS	12	8	15	8	F
7	L1	18	6	7	2	A
8	CA	18	8	15	8	F
9	L2	19	6	7	2	A
10	MG	19	8	15	8	F
11	L3	20	6	7	2	A
12	NA	20	8	15	8	F
13	L4	21	6	7	2	A
14	K	21	8	15	8	F
15	L5	23	6	7	2	A
16	CD	23	8	15	8	F
17	L14	25	6	7	2	A
18	FE	25	8	15	8	F
19	L15	27	6	7	2	A
20	MN	27	8	15	8	F
21	L6	28	6	7	2	A
22	SE	28	8	15	8	F
23	L7	30	6	7	2	A
24	V	30	8	15	8	F
25	L13	32	6	7	2	A
26	NH3	32	8	15	8	F
27	HCO3	35	8	15	8	F
28	L8	39	6	7	2	A
29	CL	39	8	15	8	F
30	L9	40	6	7	2	A
31	F	40	8	15	8	F
32	L10	41	6	7	2	A
33	NOX	41	8	15	8	F
34	L11	42	6	7	2	A
35	SO4	42	8	15	8	F
36	L12	43	6	7	2	A
37	H4SIO4	43	8	15	8	F

1PAGE   4 BMDP4M FACTOR ANALYSIS FOR MONSANTO SODA SPRINGS PLANT WATER QUALITY DATA

DATA AFTER TRANSFORMATIONS FOR FIRST 48 CASES.
CASES WITH ZERO WEIGHTS AND MISSING DATA NOT INCLUDED.

0 CASE NO.	LABEL	3 PH / 27 HCO3	4 EH / 29 CL	5 C / 31 F	6 TDS / 33 NOX	16 CD / 35 SO4	18 FE / 37 HASIO4	20 MN / 38 NAR	22 SE / 39 CAMG	24 V	26 NH3
0BASED ON INPUT FORMAT SUPPLIED		43 RECORDS READ PER CASE.									
1	TW13	7.030	81	590	542	.00250	.0250	.0300	.00250	.0400	.300
		529	16	.220	16.110	36	42.400	24	2.341		
2	TW13A	7.030	81	590	22	.00250	.0250	.01000	.00250	.0300	.300
		2	.500	.0500	.0950	.500	.150	1	1		
3	TW14	6.950	160	600	526	.00250	.0250	.01000	.00250	.0200	.300
		544	7	.280	12.950	58	38.300	24	3.231		
4	TW15	7.040	88	590	512	.00250	.0250	.01000	.00250	.0700	.300
		521	13	.190	16.310	62	39.400	22	2.929		
6	TW17	6.790	32	1080	1400	.0870	.0250	1.400	.00800	.0300	.300
		440	301	8.140	5	338	79.400	169	.474		
7	TW17A	6.970	130	20	24	.00250	.0250	.01000	.00250	.01000	.300
		9	.500	.1000	.0950	.500	12.660	1	1		
8	TW18	6.250	21	1230	1090	.00250	4.360	.190	.00250	.01000	.300
		1135	20	.250	.0950	33	12.490	55	.392		
9	TW22	7.120	36	1990	2200	.0700	.170	1.130	.0230	.130	7.500
		273	313	9.330	59.400	847	98.600	201	1.946		
10	TW23	6.010	19	1350	1470	.0340	5.500	.320	.00700	.0300	1
		803	112	1.310	.800	455	146.500	79	1.237		
11	TW24	10.500	-7	1475	1410	.0390	.250	.0400	.0260	.0900	6.100
		179	233	3.580	42.800	464	11.700	168	7.258		
12	TW25	9.400	-1	810	766	.00250	.0250	.01000	.00250	.01000	.300
		167	106	.250	.0950	521	20.740	195	.249		
13	TW26	7.990	110	1350	1440	.0110	.0250	1.150	.00600	.0400	.900
		452	152	.630	25.750	456	80.800	101	.675		
14	TW27	7.460	120	1280	170	.0390	.120	.360	.0480	.0600	1.200
		523	71	4.110	50	414	79.400	141	2.329		
15	TW28	6.290	180	1010	920	.00250	.0250	.01000	.00250	.01000	.300
		1026	22	.190	15.150	11	87.600	44	1.967		
16	TW29	6.340	200	875	828	.00250	.0250	.0300	.00250	.01000	.300
		859	21	.290	23.090	11	79	34	1.987		
21	PW1	6.650	110	1090	1040	.192	.0250	.01000	.00250	.0800	.300
		541	141	1.730	45.900	166	72.500	117	1.863		
22	PW2	6.720	130	780	782	.00250	.0250	.01000	.00250	.0500	.300
		518	58	.690	40.500	95	39.900	50	2.138		
23	PW3	6.780	140	750	756	.00250	.0250	.01000	.00250	.0600	.300
		523	45	.550	39	84	35.100	41	2.054		
24	LAB 1	8.340	40	18	8	.00250	.0250	.01000	.00250	.0400	.300
		7	.500	.0500	.460	.500	.150	4.500	1		
25	LAB 2	8.340	40	18	9	.00250	.0250	.01000	.00250	.01000	.300
		1	.500	.0500	.310	.500	.150	3.500	1	[illegible]	.300

33 CALF	6.670	180	1010	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	386	91	8.140	29.910	328	71.500	92	1.692		
34 DOCK	5.760	50	1010	906	.00250	3.790	.220	.00250	.01000	.600
	976	24	.440	.580	50	121.100	48	.940		
35 HOOPER	5.910	58	990	860	.00250	4.540	.210	.00250	.01000	.600
	918	9	.400	.0950	35	114	47	1.018		
36 MORMON	6.670	190	1020	922	.0380	.0250	.01000	.0110	.0300	.300
	413	112	9.770	17.270	285	76	100	1.608		
37 SOUTHWES	6.670	94	1180	1040	.00700	.0250	.01000	.00700	.01000	.900
	965	42	1.260	26.640	134	97.900	71	.942		
38 TW3	5.820	58	1030	1160	.00250	9.030	.320	.00250	.01000	.900
	1182	28	.300	.0950	122	139.600	55	.709		
39 TW4	5.800	30	1180	1160	.00250	14.200	.600	.00250	.01000	5.400
	1218	26	.400	.0950	125	141.300	51	.749		
40 TW5	6.650	94	1920	2000	.211	.0250	3.430	.00250	.0500	5.500
	354	332	10.700	46.600	632	107.500	337	1.491		
41 TW6	6.600	43	2010	2050	.470	.0250	3.730	.0290	.0700	.600
	312	250	12.900	51.700	663	104.400	324	1.625		
42 TW7	5.930	16	1200	1130	.00250	5.610	.300	.00250	.0320	.300
	1170	41	.400	.0950	84	126.300	67	.637		
43 TW7A	6.690	-36	25	30	.00250	.0250	.01000	.00250	.0400	.300
	2	.500	.0500	.0950	.500	.150	1	1		
44 TW8	6.310	26	1600	1590	.00250	.0250	.01000	.00250	.0500	.900
	2024	14	.250	.0950	73	148.200	68	.122		
45 TW9	5.900	40	1320	1260	.00250	10.800	.580	.00250	.0200	.600
	1414	29	.350	.190	103	142.400	57	.939		
46 TW10	6.240	39	1220	1080	.00250	1.270	2	.00250	.01000	.300
	1035	71	.870	7.830	43	103	60	.912		
47 TW11	6.810	180	1080	993	.00250	.0250	.01000	.00250	.01000	.300
	577	114	.240	21.200	264	39.700	115	2.982		
48 TW12	7.430	160	1610	1440	.00250	.0250	.0300	.00250	.610	39
	556	233	.250	35.600	475	33.400	234	2.694		

1PAGE 6 BMDP4M FACTOR ANALYSIS FOR MONSANTO SODA SPRINGS PLANT WATER QUALITY DATA

NUMBER OF CASES READ. 48
CASES WITH DATA MISSING OR BEYOND LIMITS . . 5
REMAINING NUMBER OF CASES 43

1PAGE 7 BMDP4M FACTOR ANALYSIS FOR MONSANTO SODA SPRINGS PLANT WATER QUALITY DATA

STATISTICS FOR EACH VARIABLE

VARIABLE	MEAN	STANDARD DEVIATION	COEFFICIENT OF VARIATION	SMALLEST VALUE	SMALLEST STANDARD SCORE	FIRST CASE FOR SMALLEST	LARGEST VALUE	LARGEST STANDARD SCORE	FIRST CASE F LARGES
3 PH	6.90674	.94777	.137224	5.7600	-1.21	34	10.5000	3.79	11
4 EH	81.58140	60.89657	.746452	-36.0000	-1.93	43	200.0000	1.94	16
5 C	1004.95349	504.60751	.501125	12.0000	-1.97	30	2010.0000	2.00	41
6 TDS	942.69767	547.42021	.580695	4.0000	-1.71	30	2200.0000	2.30	9

CASE NUMBERS ABOVE REFER TO DATA MATRIX BEFORE ANY CASES
HAVE BEEN DELETED DUE TO MISSING DATA.
CASES WITH ZERO WEIGHTS ARE NOT INCLUDED.
1PAGE 8 BMDP4M FACTOR ANALYSIS FOR MONSANTO SODA SPRINGS PLANT WATER QUALITY DATA

CORRELATION MATRIX

		PH 3	EH 4	C 5	TDS 6	CD 16	FE 18	MN 20	SE 22	V 24	NH3 26	HCO3 27	CL 29	F 31
PH	3	1.000												
EH	4	-.112	1.000											
C	5	-.220	-.085	1.000										
TDS	6	-.230	-.135	.924	1.000									
CD	16	-.034	-.084	.458	.471	1.000								
FE	18	-.478	-.351	.166	.182	-.142	1.000							
MN	20	-.135	-.183	.541	.573	.779	.023	1.000						
SE	22	.256	.020	.387	.196	.403	-.171	.292	1.000					
V	24	.154	.161	.297	.246	.062	-.166	-.006	.071	1.000 *				
NH3	26	.140	.126	.320	.281	.005	-.014	.034	.035	.958	1.000			
HCO3	27	-.624	-.120	.433	.399	-.173	.569	-.009	-.003	-.086	-.033	1.000		
CL	29	.221	-.046	.680	.722	.583	-.234	.614	.412	.402	.404	-.248	1.000	
F	31	.004	.060	.524	.543	.712	-.206	.679	.619	.051	.040	-.242	.741	1.00
NOX	33	.206	.292	.470	.396	.498	-.418	.337	.578	.335	.264	-.272	.620	.5
SO4	35	.264	-.063	.697	.690	.519	-.163	.530	.569	.348	.353	-.240	.871	.7
H4SIO4	37	-.657	-.104	.667	.662	.168	.561	.326	.057	-.053	-.003	.750	.162	.2
NAK	38	.160	.045	.763	.727	.687	-.165	.674	.456	.402	.408	-.117	.893	.7
CAMG	39	.476	.243	.101	.043	.056	-.296	-.123	.360	.271	.241	-.302	.279	.1

		NOX 33	SO4 35	H4SIO4 37	NAK 38	CAMG 39
NOX	33	1.000				
SO4	35	.616	1.000			
H4SIO4	37	-.004	.216	1.000		
NAK	38	.576	.873	.259	1.000	
CAMG	39	.523	.219	-.305	.178	1.000

1PAGE 9 BMDP4M FACTOR ANALYSIS FOR MONSANTO SODA SPRINGS PLANT WATER QUALITY DATA

SQUARED MULTIPLE CORRELATIONS (SMC) OF
EACH VARIABLE WITH ALL OTHER VARIABLES

3 PH .79321
4 EH .52108

38	NAK	.94669
39	CAMG	.65219

CONDITION NUMBER = 529.3

1PAGE 10 BMDP4M FACTOR ANALYSIS FOR MONSANTO SODA SPRINGS PLANT WATER QUALITY DATA

COMMUNALITIES OBTAINED FROM 6 FACTORS AFTER 1 ITERATIONS.

THE COMMUNALITY OF A VARIABLE IS ITS SQUARED MULTIPLE CORRELATION WITH THE FACTORS.

3	PH	.8853
4	EH	.8815
5	C	.9520
6	TDS	.9622
16	CD	.7817
18	FE	.8078
20	MN	.8231
22	SE	.9033
24	V	.9656
26	NH3	.9848
27	HCO3	.8865
29	CL	.9169
31	F	.8547
33	NOX	.7973
35	SO4	.8572
37	H4SIO4	.9047
38	NAK	.9183
39	CAMG	.7543

1PAGE 11 BMDP4M FACTOR ANALYSIS FOR MONSANTO SODA SPRINGS PLANT WATER QUALITY DATA

FACTOR	VARIANCE EXPLAINED	CUMULATIVE PROPORTION OF TOTAL VARIANCE
1	6.889609	.382756
2	3.793848	.593525
3	2.127170	.711701
4	1.318145	.784932
5	1.069681	.844358
6	.639682	.879896
7	.562050	.911121
8	.431692	.935104
9	.285928	.950989
10	.246397	.964678
11	.191258	.975303
12	.131181	.982591
13	.114425	.988948
14	.083132	.993567
15	.055746	.996664
16	.031384	.998407

		FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6
PH	3	.100	-.778	-.026	-.375	.319	-.166
EH	4	-.005	-.290	.224	.795	-.338	-.025
C	5	.813	.445	.191	.083	.176	-.137
TDS	6	.788	.480	.150	-.013	.069	-.020
CD	16	.721	.038	-.414	-.020	-.254	.152
FE	18	-.165	.734	.124	-.196	.264	.344
MN	20	.706	.252	-.387	-.154	-.286	.073
SE	22	.584	-.235	-.247	.215	.446	.449
V	24	.397	-.246	.802	-.142	-.213	.195
NH3	26	.389	-.165	.828	-.206	-.178	.218
HCO3	27	-.100	.845	.279	.192	.194	-.103
CL	29	.920	.118	.031	-.152	-.054	-.172
F	31	.812	-.032	-.385	.118	-.113	-.141
NOX	33	.718	-.355	.031	.382	.095	.004
SO4	35	.902	-.099	.003	-.137	.108	-.060
H4SIO4	37	.315	.864	.096	-.194	.106	.000
NAK	38	.941	-.006	.022	-.143	-.082	-.072
CAMG	39	.270	-.564	.231	.267	.483	-.074
	VP	6.890	3.794	2.127	1.318	1.070	.640

THE VP FOR EACH FACTOR IS THE SUM OF THE SQUARES OF THE ELEMENTS OF THE COLUMN OF THE FACTOR LOADING MATRIX CORRESPONDING TO THAT FACTOR. THE VP IS THE VARIANCE EXPLAINED BY THE FACTOR.

0ORTHOGONAL ROTATION, GAMMA = 1.0000

0ITERATION	SIMPLICITY CRITERION
0	-5.136275
1	-7.515101
2	-7.613793
3	-7.617006
4	-7.618185
5	-7.618706
6	-7.618927
7	-7.619016
8	-7.619051

1PAGE 13 BMDP4M FACTOR ANALYSIS FOR MONSANTO SODA SPRINGS PLANT WATER QUALITY DATA

ROTATED FACTOR LOADINGS (PATTERN)

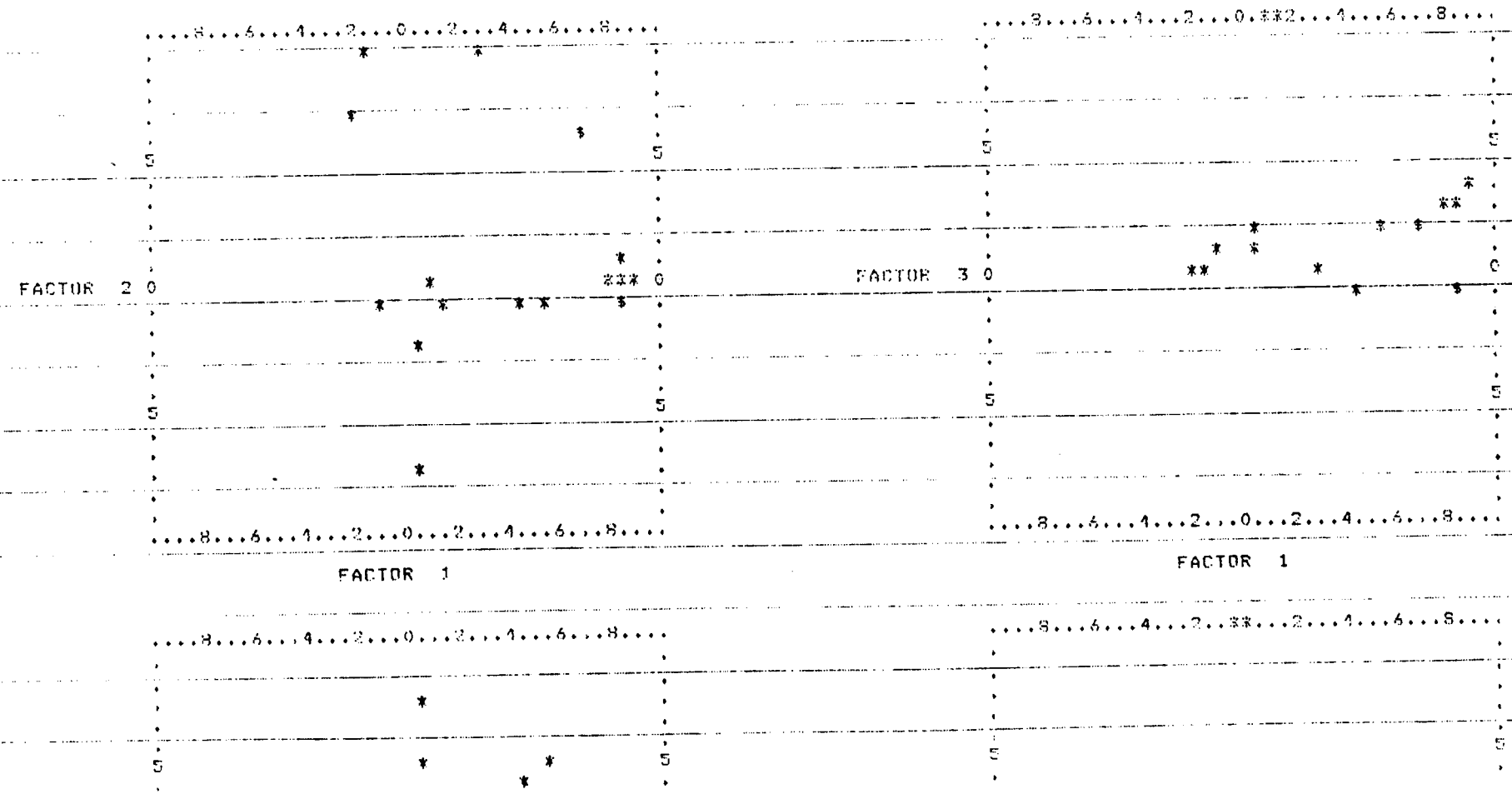
		FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6

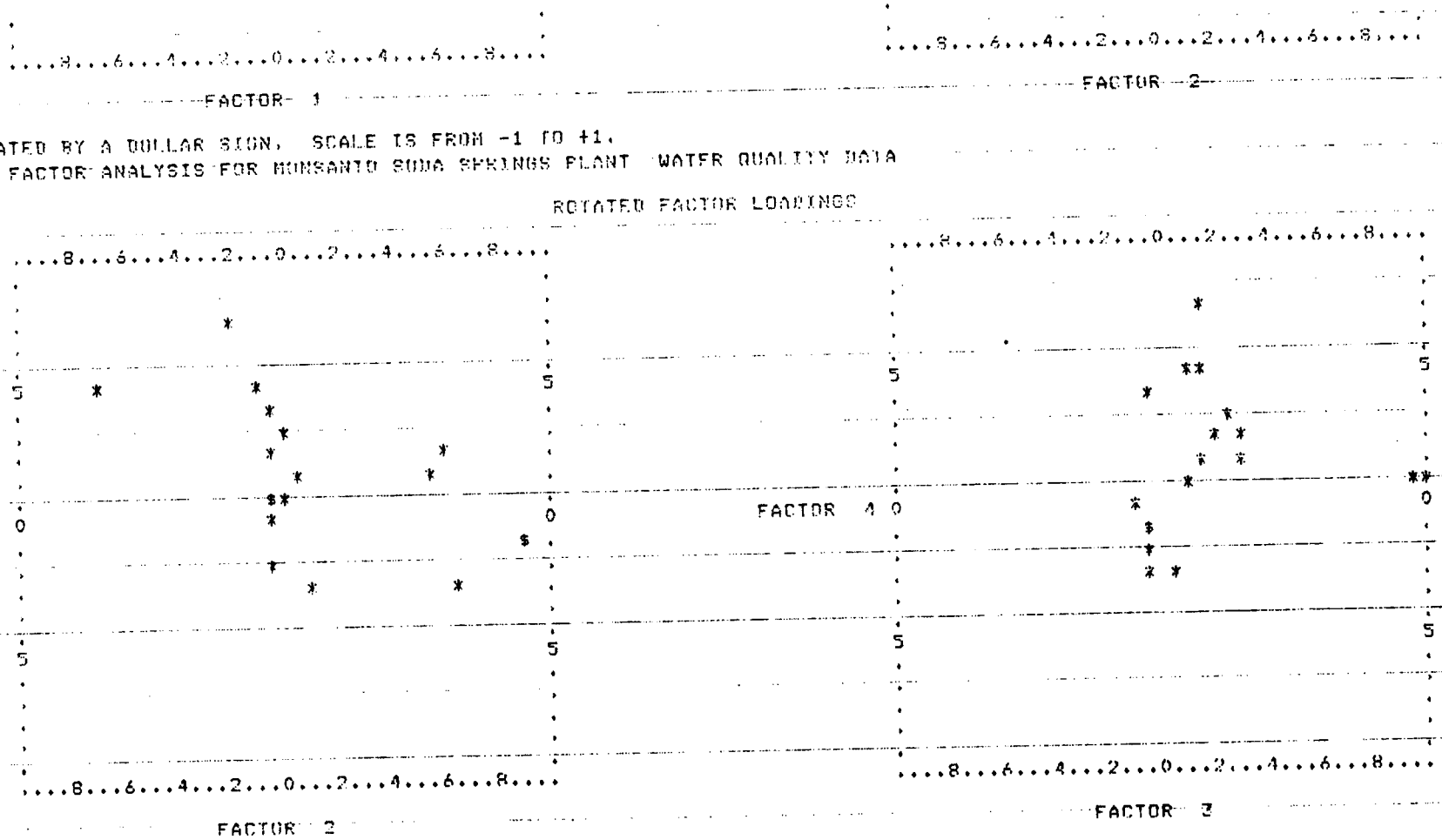
SO4	35	.819	-.006	.242	.338	-.108	.046
H4SIO4	37	.278	.903	-.041	-.098	-.034	.008
NAK	38	.894	.041	.293	.173	-.045	-.027
CAMG	39	.030	-.218	.165	.791	.177	.142
	VP	6.106	3.305	2.269	1.865	1.392	.851

THE VP FOR EACH FACTOR IS THE SUM OF THE SQUARES OF THE ELEMENTS OF THE COLUMN OF THE FACTOR PATTERN MATRIX CORRESPONDING TO THAT FACTOR. WHEN THE ROTATION IS ORTHOGONAL, THE VP IS THE VARIANCE EXPLAINED BY THE FACTOR.

1PAGE 14 BMDP4M FACTOR ANALYSIS FOR MONSANTO SODA SPRINGS PLANT WATER QUALITY DATA

ROTATED FACTOR LOADINGS





OVERLAP IS INDICATED BY A DOLLAR SIGN. SCALE IS FROM -1 TO +1.

1PAGE 15 BMDP4M FACTOR ANALYSIS FOR MONSANTO SODA SPRINGS PLANT WATER QUALITY DATA

ROTATED FACTOR LOADINGS

OVERLAP IS INDICATED BY A DOLLAR SIGN. SCALE IS FROM -1 TO +1.

1PAGE 16 BMDP4M FACTOR ANALYSIS FOR MONSANTO SODA SPRINGS PLANT WATER QUALITY DATA

SORTED ROTATED FACTOR LOADINGS (PATTERN)

		FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6
NAK	72	.894	0.000	.293	0.000	0.000	0.000

CAMG	39	0.000	0.000	0.000	.791	0.000	0.000
EH	4	0.000	0.000	0.000	0.000	.937	0.000
SE	22	.453	0.000	0.000	.444	0.000	.704
	VP	6.106	3.355	2.269	1.865	1.392	.851

THE ABOVE FACTOR LOADING MATRIX HAS BEEN REARRANGED SO THAT THE COLUMNS APPEAR IN DECREASING ORDER OF VARIANCE EXPLAINED BY FACTORS. THE ROWS HAVE BEEN REARRANGED SO THAT FOR EACH SUCCESSIVE FACTOR, LOADINGS GREATER THAN .5000 APPEAR FIRST. LOADINGS LESS THAN .2500 HAVE BEEN REPLACED BY ZERO.

1PAGE 17 BMDP4M FACTOR ANALYSIS FOR MONSANTO SODA SPRINGS PLANT WATER QUALITY DATA

ABSOLUTE VALUES OF CORRELATIONS IN SORTED AND SHADED FORM

```
+  38 NAK      X
+              O
+              *

+  29 CL       XX
+              OO
+              **

+  31 F        XXX
+              OOO
+                *

+  20 MN       XXXX
+              NNNO
+                 *

+  16 CD       XXXXX
+              N NOO
+                  *

+  35 SO4      XXXXXX
+              OON  O
+              **   *

+   6 TDS      XXXX+XX
+              OO   NO
+                    *

+   5 C        XXXX+XXX
+              ON   NOO
+                     **

+  33 NOX      XXX-XX++X
```

```
+  18 FE        ... ....+XX+X
+                          O
+                          *

+  26 NH3       ++    ----  . X
+                           O
+                           *

+  24 V         ++    ----  ..XX
+                           OO
+                           **

+  39 CAMG      .- . .  X--+---X
+                             O
+                             *

+   4 EH          .  . -,  -,.-X
+                             O
+                             *

+  22 SE        ++X-+X.+X. -.  + X
+                 N             O
+                               *
```

THE ABSOLUTE VALUES OF
THE MATRIX ENTRIES HAVE BEEN PRINTED ABOVE IN SHADED FORM
ACCORDING TO THE FOLLOWING SCHEME

+	LESS THAN OR EQUAL TO	.120
.	.120 TO AND INCLUDING	.240
-	.240 TO AND INCLUDING	.359
+	.359 TO AND INCLUDING	.479
X	.479 TO AND INCLUDING	.599

FACTOR SCORE COVARIANCE (COMPUTED FROM FACTOR
STRUCTURE AND FACTOR SCORE COEFFICIENTS)

THE DIAGONAL OF THE MATRIX BELOW CONTAINS THE SQUARED
MULTIPLE CORRELATIONS OF EACH FACTOR WITH THE VARIABLES.

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6
FACTOR 1	1.000					
FACTOR 2	.000	1.000				
FACTOR 3	.000	-.000	1.000			
FACTOR 4	.000	.000	-.000	1.000		
FACTOR 5	-.000	.000	-.000	.000	1.000	
FACTOR 6	-.000	-.000	-.000	-.000	.000	1.000

1PAGE 19 BMDP4M FACTOR ANALYSIS FOR MONSANTO SODA SPRINGS PLANT WATER QUALITY DATA

ESTIMATED FACTOR SCORES AND MAHALANOBIS DISTANCES (CHI-SQUARE S) FROM
EACH CASE TO THE CENTROID OF ALL CASES FOR THE ORIGINAL DATA
(18 D.F.) FACTOR SCORES (6 D.F.) AND THEIR DIFFERENCE (12 D.F.).
EACH CHI-SQUARE HAS BEEN DIVIDED BY ITS DEGREES OF FREEDOM.

CASE LABEL	CASE NO.	CHISQ/DF 18	CHISQ/DF 6	CHISQ/DF 12	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6
TW13	1	.175	.132	.196	-.671	-.452	-.209	.180	.233	-.071
TW13A	2	1.405	.557	1.830	-.725	-1.313	-.038	-.989	-.022	.331
TW14	3	.526	.394	.592	-.792	-.317	-.329	.313	1.122	-.007
TW15	4	.669	.172	.918	-.748	-.433	-.062	.402	.323	.020
TW17	6	1.742	.796	2.215	1.585	-.500	-.339	-.953	-.650	-.753
TW17A	7	.524	.780	.396	-.811	-1.386	-.124	-1.232	.577	.483
TW18	8	1.779	.264	2.536	-.429	.396	-.101	-.549	-.913	-.294
TW22	9	1.247	1.079	1.332	2.021	.253	.565	1.331	-.444	.189
TW23	10	1.189	.451	1.558	.196	1.186	-.068	.057	-1.118	-.001
TW24	11	2.079	4.573	.832	.269	-.922	.148	4.674	-2.114	.419
TW25	12	1.642	1.709	1.609	.397	-1.555	-.178	.319	-2.233	-1.599
TW26	13	1.328	.433	1.775	.706	-.188	-.237	.408	-.097	-1.358
TW27	14	2.160	3.123	1.678	.034	.037	-.098	1.462	.439	4.049
TW28	15	.431	.663	.313	-.568	.683	-.443	.274	1.613	-.564
TW29	16	.434	.769	.266	-.586	.461	-.425	.206	1.925	-.360
PW1	21	1.429	.255	2.016	.548	-.142	-.091	-.049	1.053	-.297
PW2	22	.457	.293	.540	-.367	-.104	-.198	.433	1.150	-.250
PW3	23	.519	.319	.619	-.437	-.148	-.135	.344	1.237	-.193
LAB 1	24	.482	.927	.259	-.795	-1.852	-.022	-.779	-.904	.275
LAB 2	25	.471	.914	.250	-.781	-1.847	-.186	-.732	-.916	.233
TW2	26	.492	.279	.598	-.650	-.169	-.073	-.098	1.070	-.206
TW19	27	.422	.176	.541	-.074	-.215	-.324	.554	.481	-.602
TW20	28	.459	.066	.656	-.196	-.352	-.218	.185	-.208	-.331
TW21	29	.387	.425	.368	-.341	1.153	-.181	-.272	-.813	-.583
TW21A	30	.555	.751	.457	-.812	-1.781	-.172	-.764	-.140	.203
TW30	31	1.428	.470	1.907	.499	.426	.031	.403	.273	-1.466

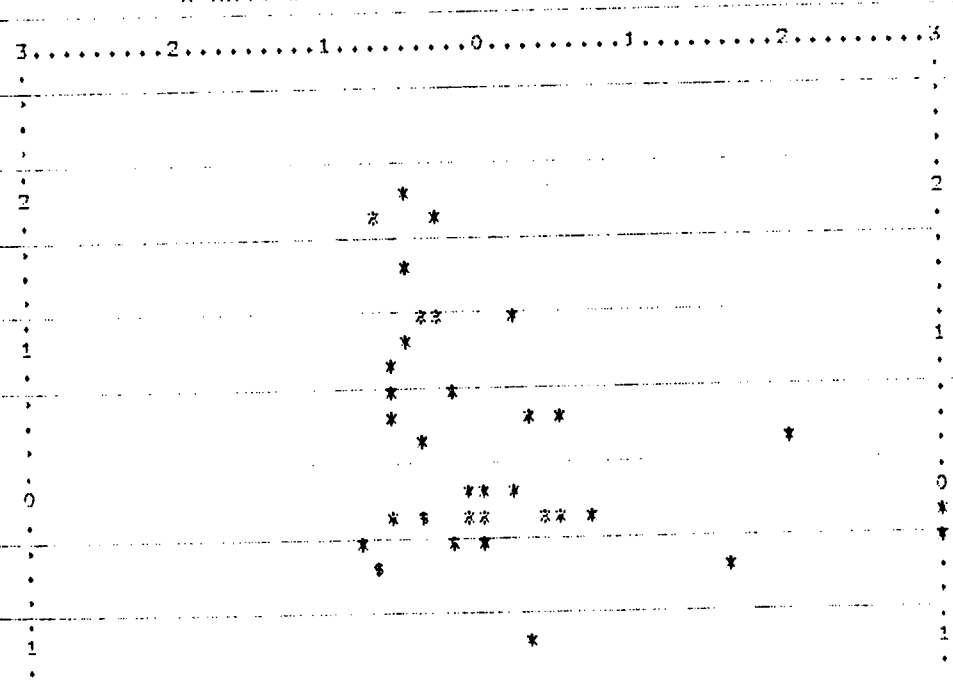
TW10	46	1.070	.271	1.470	.255	.556	-.440	[illegible]	[illegible]	[illegible]
TW11	47	.936	.628	1.090	-.119	-.022	-.361	1.004	1.238	-1.041
TW12	48	2.234	6.603	.049	.022	-.144	6.243	-.175	.717	-.089

FACTOR SCORE COVARIANCE (COMPUTED FROM FACTOR SCORES)

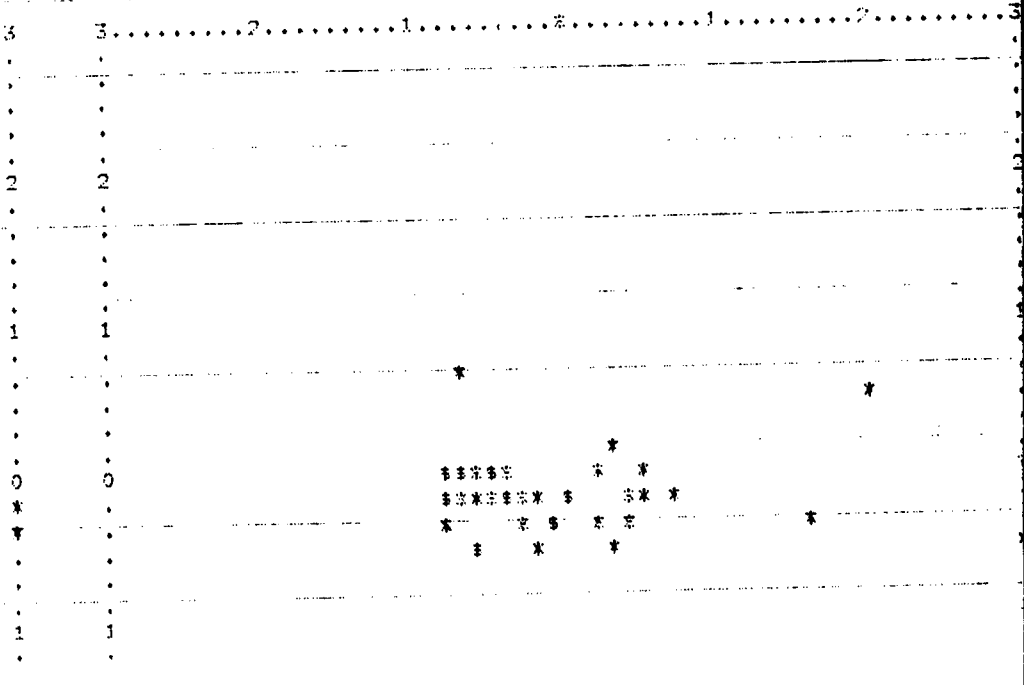
	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5	FACTOR 6
FACTOR 1	1.000					
FACTOR 2	.000	1.000				
FACTOR 3	.000	-.000	1.000			
FACTOR 4	.000	-.000	-.000	1.000		
FACTOR 5	-.000	.000	-.000	.000	1.000	
FACTOR 6	.000	-.000	-.000	-.000	.000	1.000

FACTOR SCORES

X-AXIS IS FACTOR 1, Y-AXIS IS FACTOR 2



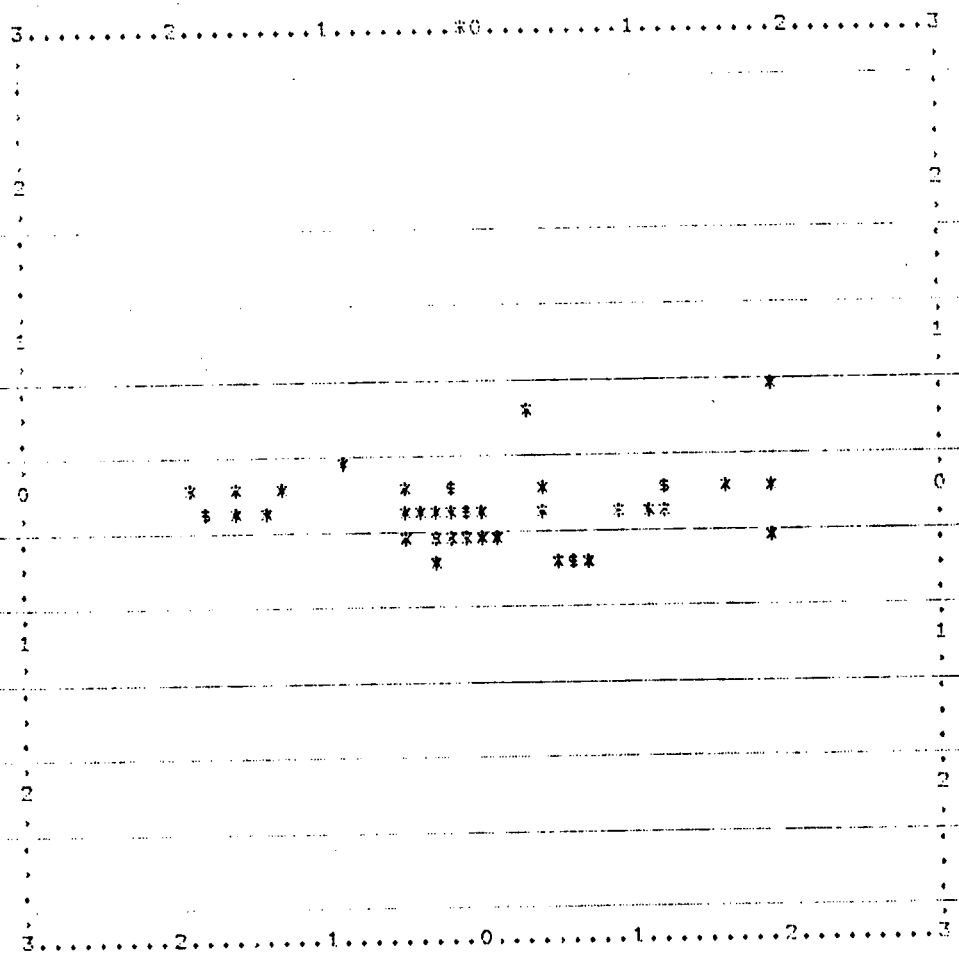
X-AXIS IS FACTOR 1, Y-AXIS IS FACTOR 3



FACTOR SCORES LESS THAN -3 ARE PLOTTED AS -3.
1PAGE 22 BMDP4M FACTOR ANALYSIS FOR MONSANTO SODA SPRINGS PLANT WATER QUALITY DATA

FACTOR SCORES

X-AXIS IS FACTOR 2, Y-AXIS IS FACTOR 3



OVERLAP IS INDICATED BY A DOLLAR SIGN. SCALE IS FROM -3 TO +3.
FACTOR SCORES GREATER THAN 3 ARE PLOTTED AS 3.
FACTOR SCORES LESS THAN -3 ARE PLOTTED AS -3.

CPU TIME USED 1.627 SECONDS

```
11.47.53.*
11.47.53.*****************************************
11.47.53.* M A I L I N G   I N F O R M A T I O N *
11.47.53.*.......................................*
11.47.53.*                                       *
11.47.53.* NAME    - KFJ                         *
11.47.53.* PHONE   -                             *
11.47.53.* MAIL TO -                             *
11.47.53.*                                       *
11.47.53.*****************************************
11.47.53.*
11.47.53.USER,YGAI06,.          KFJ
11.47.53. CHARGE LIMITS OVERRIDDEN
11.47.53.
11.47.54. JOB ENTRY 85/01/08. 11.47.51.
11.47.54. OWNING ST=EKS1      OWNING UN=YGAI06
11.47.54. ORIGIN ST=EKS1      ORIGIN UN=(LOCAL)
11.47.54. DEST   ST=EKS1      DEST   UN=(LOCAL)
11.47.54.MAP,OFF.
11.47.54.GET,TAPE7=MONBOET.
11.47.55.GET,BMDP/UN=EKSAPP.
11.47.55.CALL,BMDP(PROG=BMDP4M)
11.47.56.ATTACH,BMDP82/UN=EKSAPP.
11.47.56.CALL,BMDP82,BMDP4M.
11.47.57.REWIND,BMDP4M.
11.47.57.SKIPF,BMDP82,16.
11.48.03.COPYBF,BMDP82,BMDP4M.
11.48.04. COPY COMPLETE.
11.48.04.REWIND,BMDP4M.
11.48.04.RETURN,BMDP82.
11.48.04.*
11.48.04.BMDP4M,D=TAPE7,L=MONOU7,W=20000.
11.48.06.$FCL      LVL-544   VER-83265
11.48.06./PRG USED/BMDP82M
11.48.12.     STOP  =  END BMDP.
11.48.12.     137100 MAXIMUM EXECUTION FL.
11.48.12.       1.656 CP SECONDS EXECUTION TIME.
11.48.12. REPRIEVED NORMAL TERMINATION.
11.48.12. JOB REPRIEVED.
11.48.12. RPV - PREVIOUS ERROR CONDITIONS RESET.
11.48.12.EXIT,U.
11.48.12.COST,LO=F.
11.48.13.
11.48.13. RUN DATE  85/01/08.  RUN SECS    31.224
11.48.13. UNITS          NUMBER       CCUS   PERCENT
11.48.13. CPU SECS        1.678     86.890    53.691
11.48.13. CHP UNITS       3.251     30.436    18.807
11.48.13. DISK REQS         275     13.301     8.219
11.48.13. DISK SECT       16581     31.199    19.278
11.48.13. JOB PROCESSING CCUS     161.832
11.48.13.
11.48.13. AVERAGE CM USED (DECIMAL)          14272
```

```
THIS VERSION OF BMDP HAS BEEN CONVERTED FOR USE ON
CDC 6000 AND CYBER SERIES COMPUTERS BY
BMDP PROJECT, VOGELBACK COMPUTING CENTER
NORTHWESTERN UNIVERSITY
2129 SHERIDAN ROAD
EVANSTON, ILLINOIS 60201
(312) 492-3681

RELEASED AUGUST 1983 FOR FTN4 COMPILERS

EXECUTED ON 85/01/08.AT 12.09.45.

PROGRAM CONTROL INFORMATION

/PROBLEM  TITLE= 'P2M CLUSTER ANALYSIS FOR MONSANTO SODA SPRINGS PLANT
                  WATER QUALITY DATA'.
/INPUT    VARIABLES=37.
        FORMAT= '(7X,2A4////2(7X,F8.0/),7X,F8.0/////7X,F8.0//////3(5X,A2,F8.0/),
                 3(5X,A2,F8.0//),5X,A2,F8.0/2(5X,A2,F8.0//),5X,A2,F8.0//
                   7X,F8.0////4(5X,A2,F8.0/),5X,A2,F8.0)'.
          CASES=48.
          UNIT=7.
/VARIABLES NAMES=ID1,ID2,PH,EH,C,TDS,L1,CA,L2,MG,L3,NA,L4,K,L5,CD,L14,FE,L15,MN,
                 L6,SE,L7,V,L13,NH3,HCO3,L8,CL,L9,F,L10,NOX,L11,SO4,L12,
                 H4SIO4,NAK,CAMG.
           BLANKS=MISSING.
           LABEL=ID1,ID2.
          USE=F,HCO3,V,CAMG,EH,SE.
           ADD=2.
/TRANSFORM IF(L1 EQ CHAR( <)) THEN CA=CA/2.
           IF(L2 EQ CHAR( <)) THEN MG=MG/2.
           IF(L3 EQ CHAR( <)) THEN NA=NA/2.
           IF(L4 EQ CHAR( <)) THEN K=K/2.
           IF(L5 EQ CHAR( <)) THEN CD=CD/2.
           IF(L6 EQ CHAR( <)) THEN SE=SE/2.
           IF(L7 EQ CHAR( <)) THEN V=V/2.
           IF(L8 EQ CHAR( <)) THEN CL=CL/2.
           IF(L9 EQ CHAR( <)) THEN F=F/2.
           IF(L10 EQ CHAR( <)) THEN NOX=NOX/2.
           IF(L11 EQ CHAR( <)) THEN SO4=SO4/2.
           IF(L12 EQ CHAR( <)) THEN H4SIO4=H4SIO4/2.
           IF(L13 EQ CHAR( <)) THEN NH3=NH3/2.
IPAGE    2 BMDP2M

           IF(L14 EQ CHAR( <)) THEN FE=FE/2.
           IF(L15 EQ CHAR( <)) THEN MN=MN/2.
           NAK=NA+K.
           CAMG=CA/MG.
/PROCEDURE LINK=CENTROID.
            SUMOFSQ.
/PRINT  DATA.
```

```
NUMBER OF VARIABLES TO READ IN. . . . . .        37
NUMBER OF VARIABLES ADDED BY TRANSFORMATIONS.     2
TOTAL NUMBER OF VARIABLES . . . . . . . . .      39
NUMBER OF CASES TO READ IN. . . . . . . . .      48
CASE LABELING VARIABLES . . . . . . . . . .  ID1        ID2
MISSING VALUES CHECKED BEFORE OR AFTER TRANS. . NEITHER
BLANKS ARE. . . . . . . . . . . . . . . . . . MISSING
INPUT UNIT NUMBER . . . . . . . . . . . . .       7
REWIND INPUT UNIT PRIOR TO READING. . DATA. . .  YES
NUMBER OF WORDS OF DYNAMIC STORAGE. . . . . .  19998
NUMBER OF CASES DESCRIBED BY INPUT FORMAT . . .   1

***** TRAN     PARAGRAPH IS USED *****

VARIABLES TO BE USED
    31 F          27 HCO3       24 V          39 CARG       4 EH
    22 SE
0INPUT FORMAT IS
 (7X,2A4////2(7X,F8.0/),7X,F8.0/////7X,F8.0//////3(5X,A2,F8.0/), 3(5X,A2,F8.0//),
 5X,A2,F8.0/2(5X,A2,F8.0//),5X,A2,F8.0///  7X,F8.0////4(5X,A2,F8.0/),5X,A2,F8.0)

0MAXIMUM LENGTH DATA RECORD IS   15 CHARACTERS.
1PAGE   3 BMDP2M  P2M CLUSTER ANALYSIS FOR MONSANTO SODA SPRINGS PLANT  WATER QUALITY DATA

0I N P U T   V A R I A B L E S . . . . .
```

VARIABLE INDEX	VARIABLE NAME	RECORD NO.	COLUMNS BEGIN	COLUMNS END	FIELD WIDTH	TYPE
1	ID1	1	8	11	4	A
2	ID2	1	12	15	4	A
3	PH	5	8	15	8	F
4	EH	6	8	15	8	F
5	C	7	8	15	8	F
6	TDS	12	8	15	8	F
7	L1	18	6	7	2	A
8	CA	18	8	15	8	F
9	L2	19	6	7	2	A
10	MG	19	8	15	8	F
11	L3	20	6	7	2	A
12	NA	20	8	15	8	F
13	L4	21	6	7	2	A
14	K	21	8	15	8	F
15	L5	23	6	7	2	A
16	CD	23	8	15	8	F
17	L14	25	6	7	2	A
18	FE	25	8	15	8	F
19	L15	27	6	7	2	A
20	MN	27	8	15	8	F
21	L6	28	6	7	2	A
22	SE	28	8	15	8	F
23	L7	30	6	7	2	A
24	V	30	8	15	8	F
25	L13	32	6	7	2	A
26	NH3	32	8	15	8	F
27	HCO3	35	8	15	8	F
28	L8	39	6	7	2	A
29	CL	39	8	15	8	F
30	L9	40	6	7	2	A
31	F	40	8	15	8	F
32	L10	41	6	7	2	A
33	NOX	41	8	15	8	F
34	L11	42	6	7	2	A
35	SO4	42	8	15	8	F
36	L12	43	6	7	2	A
37	H4SIO4	43	8	15	8	F

```
1PAGE   4 BMDP2M  P2M CLUSTER ANALYSIS FOR MONSANTO SODA SPRINGS PLANT  WATER QUALITY DATA

0BASED ON INPUT FORMAT SUPPLIED   43 RECORDS READ PER CASE.

 NUMBER OF CASES READ                    48
```

NO.	LABEL	4	22	24	27	31	37	
1	TW13	-.010	-.423	-.103	-.184	-.517	.634	1.000
2	TW13A	-.010	-.423	-.213	-1.361	-.567	-.482	1.000
3	TW14	1.288	-.423	-.322	-.150	-.499	1.408	1.000
4	TW15	.105	-.423	.224	-.202	-.526	1.152	1.000
6	TW17	-.814	.157	-.213	-.383	1.831	-.928	1.000
7	TW17A	.795	-.423	-.431	-1.346	-.552	-.482	1.000
8	TW18	-.995	-.423	-.431	1.170	-.508	-.997	1.000
9	TW22	-.749	1.738	.860	-.756	2.183	.620	1.000
10	TW23	-1.028	.051	-.213	.428	-.194	-.281	1.000
11	TW24	-1.455	2.054	.443	-.966	.479	4.820	1.000
12	TW25	-1.356	-.423	-.431	-.993	-.508	-1.176	1.000
13	TW26	.467	-.054	-.103	-.356	-.395	-.757	1.000
14	TW27	.631	4.372	.115	-.197	.636	.644	1.000
15	TW28	1.616	-.423	-.431	.926	-.526	.337	1.000
16	TW29	1.945	-.423	-.431	.553	-.496	.354	1.000
21	PW1	.467	-.423	.334	-.157	-.069	.249	1.000
22	PW2	.795	-.423	.006	-.208	-.377	.482	1.000
23	PW3	.959	-.423	.115	-.197	-.419	.411	1.000
24	LAB 1	-.683	-.423	-.103	-1.350	-.567	-.482	1.000
25	LAB 2	-.683	-.423	-.431	-1.364	-.567	-.482	1.000
26	TW2	1.288	-.423	.115	-.101	-.517	.424	1.000
27	TW19	.253	-.423	-.267	-.434	-.271	-.122	1.000
28	TW20	-.831	-.423	-.103	-.423	-.256	.039	1.000
29	TW21	-1.093	-.423	-.103	1.630	-.517	-1.141	1.000
30	TW21A	.467	-.423	-.431	-1.337	-.567	-.482	1.000
31	TW30	.467	-.423	.224	-.275	.124	-.033	1.000
32	EFFLUENT	-.469	-.054	.006	-.282	-.377	.595	1.000
33	CALF	1.616	2.054	-.213	-.503	1.831	.105	1.000
34	DOCK	-.519	-.423	-.431	.815	-.451	-.533	1.000
35	HOOPER	-.387	-.423	-.431	.685	-.463	-.466	1.000
36	MORMON	1.780	.473	-.213	-.443	2.314	.033	1.000
37	SOUTHWES	.204	.051	-.431	.790	-.208	-.531	1.000
38	TW3	-.387	-.423	-.431	1.275	-.493	-.928	1.000
39	TW4	-.847	-.423	-.431	1.355	-.463	-.695	1.000
40	TW5	.204	-.107	.006	-.575	2.589	-.066	1.000
41	TW6	-.634	2.370	.224	-.669	3.241	.048	1.000
42	TW7	-1.077	-.423	-.191	1.248	-.463	-.789	1.000
43	TW7A	-1.931	-.423	-.103	-1.361	-.567	-.482	1.000
44	TW8	-.913	-.423	.006	3.156	-.508	-1.220	1.000
45	TW9	-.683	-.423	-.322	1.793	-.478	-.534	1.000
46	TW10	-.699	-.423	-.431	.947	-.324	-.556	1.000
47	TW11	1.616	-.423	-.431	-.077	-.511	1.197	1.000
48	TW12	1.288	-.423	6.125	-.124	-.508	.953	1.000

1PAGE 6 BMDP2M P2M CLUSTER ANALYSIS FOR MONSANTO SODA SPRINGS PLANT WATER QUALITY DATA

					4	22	24	27	31	39
					EH	SE	V	HCO3	F	CAMG
1	.197	35	34	2.000	-.453	-.423	-.431	.750	-.407	-.500
2	.214	23	22	2.000	.877	-.423	.060	-.203	-.398	.446
3	.328	25	24	2.000	-.683	-.423	-.267	-1.357	-.567	-.482

18	.734	44	8	9.000	-.748	.423	-.656	1.213	-.462	-.713	
19	.742	32	28	2.000	-.650	-.238	-.049	-.353	-.317	.282	
20	.798	22	21	6.000	.705	-.423	.088	-.229	-.255	.276	
21	.948	21	1	8.000	.541	-.423	.081	-.220	-.391	.433	
22	.996	43	12	2.000	-1.643	-.423	-.267	-1.177	-.537	-.804	
23	1.093	28	10	3.000	-.776	-.142	-.103	-.092	-.276	.094	
24	1.103	7	2	5.000	-.023	-.423	-.322	-1.351	-.564	-.482	
25	1.185	37	8	10.000	-.648	-.375	-.364	1.171	-.437	-.697	
26	1.262	13	2	6.000	.059	-.361	-.286	-1.186	-.536	-.528	
27	1.325	15	3	4.000	1.616	-.423	-.404	.313	-.008	.824	
28	1.363	3	1	12.000	.899	-.423	-.081	-.042	-.384	.363	
29	1.430	41	9	2.000	-.691	2.054	.552	-.712	2.712	.184	
30	1.545	10	8	13.000	-.678	-.321	-.303	.879	-.400	-.514	
31	1.584	40	6	2.000	-.305	.025	-.103	-.479	2.210	-.497	
32	1.664	36	33	2.000	1.698	1.263	-.213	-.473	2.072	.069	
33	1.726	12	2	8.000	-.367	-.377	-.281	-1.183	-.036	-.597	
34	2.077	2	1	20.000	.393	-.404	-.161	-.499	-.445	.099	
35	1.858	8	1	33.000	-.029	-.372	-.217	.044	-.427	-.143	
36	2.337	9	6	4.000	-.498	1.039	.224	-.596	2.461	-.156	
37	2.298	33	6	6.000	.234	1.114	.079	-.555	2.331	-.081	
38	3.215	6	1	39.000	.012	-.143	-.172	-.048	-.003	-.133	
39	3.561	44	1	40.000	-.012	-.150	-.167	.032	-.010	-.160	
40	4.698	14	1	41.000	.004	-.040	-.160	.027	.001	-.141	
41	5.718	11	1	42.000	-.031	.010	-.146	.003	.012	-.023	
42	6.518	48	1	43.000	.000	-.000	.000	-.000	.000	.000	

1PAGE 7 BMDP2M P2M CLUSTER ANALYSIS FOR MONSANTO SODA SPRINGS PLANT WATER QUALITY DATA

```
      C N
        O       2 2 2 2 3 2 1 1 4   1 4 1   3 2 2   1 3 2 3 3 3 4 3 4 2 3 4   3 3   4 4   4 1 1 4
      A .  1 4 2 3 6 7 1 1 5 6 7 3 2 3 3 7 0 4 5 2 0 2 8 7 4 5 6 8 5 9 9 2 8 3 6 9 1 0 6 4 4 1 8

      S L  T T F F T T T F T T T T T T T T T T L I T T E T S D H T T T I T T T O K Y T T T T T T T
        A  W W W W W W W W W W W W W W W W W W A A W W F W O O O W W W W W W W A O W W W W W W W
        B  1 1 2 3 2 1 3 1 7 2 1 1 2 7 2 1 2 B B 1 2 F 2 U C C U I 3 9 2 4 7 1 L R 2 6 5 1 8 2 2 1
        E  3 5       9 0   8 9 1 4 5 A 6 7 1     3 3 L 0 T K P O     1     8 F M 2     7   7 4 2
        L                                 A A 1 2 A   U   H   E                   D
                                                    E   W   R                   N
                                                    N   E
                                                    T   S

AMALG.
DISTANCE
        * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * * *
   .197 I I I I I I I I I I I I I I I I I I I I I I I I I -+- I I I I I I I I I I I I I I I I I I
   .214 I I -+- I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I
   .328 I I  I  I I I I I I I I I I I I I I I -+- I I I I I I I I I I I I I I I I I I I I I I I I
   .329 I I  I  I I I I I I I I I I I I I I I I I I I I I I I I I I I I I -+- I I I I I I I I I I
   .340 I I  I  I I I I I I I I I I I I I I I I I I I I I I I I I I I I I --+- I I I I I I I I I I
   .333 I I  I  I I I I I I I I I I I I I I I I I I I I I I I I I I I I I -+-- I I I I I I I I I I
   .347 I I  I  I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I
   .378 I I  I  I I -+- I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I I
```

```
     1.105
     1.185
     1.232
     1.325
     1.365
     1.430
     1.545
     1.584
     1.664
     1.726
     2.077
     1.856
     2.337
     2.298
JOB IN SUSPENSION.
S>GO
INVALID ENTRY, TRY AGAIN OR ENTER HELP.
S>
INVALID ENTRY, TRY AGAIN OR ENTER HELP.
S>GO
--- I I
     5.718
     6.518
1PAGE   8 BMDP2M  P2M CLUSTER ANALYSIS FOR MONSANTO SODA SPRINGS PLANT  WATER QUALITY DATA

0DISTANCES BETWEEN CASES REPRESENTED IN SHADED FORM.
 HEAVY SHADING INDICATES SMALL DISTANCES.


0CASE  CASE
  NO.  LABEL

    1 TW13      X
    4 TW15      XX
   22 PW2       XXX
   23 PW3       XXXX
   26 TW2       XXXXX
   27 TW19      XXXXXX
   31 TW30      XXXXXXX
   21 PW1       XXXXXXXX
   15 TW28      ++XXX+++X
   16 TW29      ++XXX+++XX
   47 TW11      ++XXX+++XXX
    3 TW14      XXXXX++XXXXX
   12 TW25      +---.+--....X
   43 TW7A      ---..---. ..XX
   13 TW26      X+XXXXXX+++++-X
    7 TW17A     ++XX+XX+-++++-XX
   30 TW21A     ++XX+XX+--+++-XXX
   24 LAB 1     ++++-X++..--XXXXXX
   25 LAB 2     ++++-X++..--XX+XXXX
```

```
33 CALF      .............  ..............      X
36 MORMON    ..----------...  ...............  .  +X
 9 TW22      .........   ...................  ...--X
41 TW6             .              .                -.XX
40 TW5       ..-..---.....-.....--.........-++-X
 6 TW17      -.....---....--------+-+-----..---.-+-XX
44 TW8       ...........  . .     -..---++XX+++     .X
14 TW27                                          - ..   X
11 TW24                                                   X
48 TW12                                                    X
```

0
0THE DISTANCES HAVE BEEN REPRESENTED ABOVE IN SHADED
FORM ACCORDING TO THE FOLLOWING SCHEME

X			LESS THAN	1.635
+	FROM	1.635	TO	2.400
-	FROM	2.400	TO	3.138
.	FROM	3.138	TO	4.404
			GREATER THAN	4.404

1PAGE 9 BMDP2M P2M CLUSTER ANALYSIS FOR MONSANTO SODA SPRINGS PLANT WATER QUALITY DATA

0 INITIAL DISTANCES BETWEEN CASES

CASE NUMBER	1	2	3	4	6	7	8	9	10	11	12	13	14	15	16
1	0.00	1.64	1.52	.61	3.01	1.84	2.37	3.73	1.62	5.24	2.40	1.55	4.98	2.02	2.14
2	1.64	0.00	2.60	2.05	2.81	.83	2.77	3.87	2.15	6.16	1.55	1.22	5.25	2.93	2.87
3	1.52	2.60	0.00	1.33	3.96	2.29	3.57	4.36	2.98	5.24	3.76	2.37	5.05	1.56	1.43
4	.61	2.05	1.33	0.00	3.36	2.21	2.85	3.76	2.06	4.86	2.90	2.01	4.99	2.16	2.24
6	3.01	2.81	3.96	3.36	0.00	3.13	2.88	2.35	2.29	6.30	2.56	2.58	4.89	3.89	3.99
7	1.84	.83	2.29	2.21	3.13	0.00	3.13	4.15	2.63	6.42	2.27	1.20	5.23	2.55	2.37
8	2.37	2.77	3.57	2.85	2.88	3.13	0.00	4.37	1.20	6.82	2.20	2.19	5.64	2.94	3.29
9	3.73	3.87	4.36	3.76	2.35	4.15	4.37	0.00	3.40	4.90	4.02	3.69	3.50	4.71	4.75
10	1.62	2.15	2.98	2.06	2.29	2.63	1.20	3.40	0.00	5.75	1.79	1.77	4.84	2.83	3.10
11	5.24	6.16	5.24	4.86	6.30	6.42	6.82	4.90	5.75	0.00	6.58	6.38	5.28	6.40	6.45
12	2.40	1.55	3.76	2.90	2.56	2.27	2.20	4.02	1.79	6.58	0.00	2.03	5.68	3.83	3.93
13	1.55	1.22	2.37	2.01	2.58	1.20	2.19	3.69	1.77	6.38	2.03	0.00	4.77	2.10	2.12
14	4.98	5.25	5.05	4.99	4.89	5.23	5.64	3.50	4.84	5.28	5.68	4.77	0.00	5.19	5.19
15	2.02	2.93	1.56	2.16	3.89	2.55	2.94	4.71	2.83	6.40	3.83	2.10	5.19	0.00	.50
16	2.14	2.87	1.43	2.24	3.99	2.37	3.29	4.75	3.10	6.45	3.93	2.12	5.19	.50	0.00
21	.88	1.66	1.62	1.08	2.71	1.70	2.50	3.45	1.84	5.63	2.59	1.22	4.87	1.82	1.86
22	.84	1.73	1.11	1.00	3.14	1.56	2.74	3.83	2.15	5.61	2.84	1.35	4.91	1.48	1.46
23	1.03	1.79	1.14	1.14	3.24	1.57	2.82	3.91	2.28	5.74	2.94	1.35	4.93	1.42	1.36
24	1.76	.68	2.99	2.17	2.69	1.51	2.61	3.77	1.92	6.03	1.05	1.60	5.37	3.35	3.37
25	1.80	.71	2.99	2.35	2.70	1.48	2.60	3.87	1.94	6.07	1.00	1.64	5.39	3.35	3.36
26	1.34	2.05	1.08	1.40	3.50	1.71	3.02	4.14	2.56	5.96	3.24	1.53	4.98	1.21	1.08
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	2.63	1.26	2.34	3.63	1.67	5.70	2.13	1.00	4.94	1.96	1.99

42	2.30	2.84	3.52	2.73	2.89	3.22	.34	4.26	3.11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
43	2.52	1.92	3.93	2.88	2.92	2.75	2.77	3.95	3.11	6.00	1.00	2.65	5.80	4.31	4.42
44	3.94	4.67	4.78	4.24	4.30	4.89	2.05	5.51	2.95	7.82	4.20	3.82	6.44	3.74	4.20
45	2.41	3.23	3.38	2.78	3.25	3.47	.84	4.32	1.54	6.67	2.93	2.49	5.61	2.61	3.04
46	1.83	2.43	3.01	2.31	2.64	2.75	.60	4.04	.86	6.38	2.13	1.83	5.36	2.49	2.83
47	1.75	2.68	.41	1.65	4.05	2.36	3.63	4.52	3.13	5.59	3.88	2.34	5.09	1.32	1.10
48	6.37	6.74	6.46	6.02	7.35	6.84	7.33	6.66	6.91	7.91	7.42	6.53	7.81	6.68	6.65

1PAGE 10 BMDP2M P2M CLUSTER ANALYSIS FOR MONSANTO SODA SPRINGS PLANT WATER QUALITY DATA

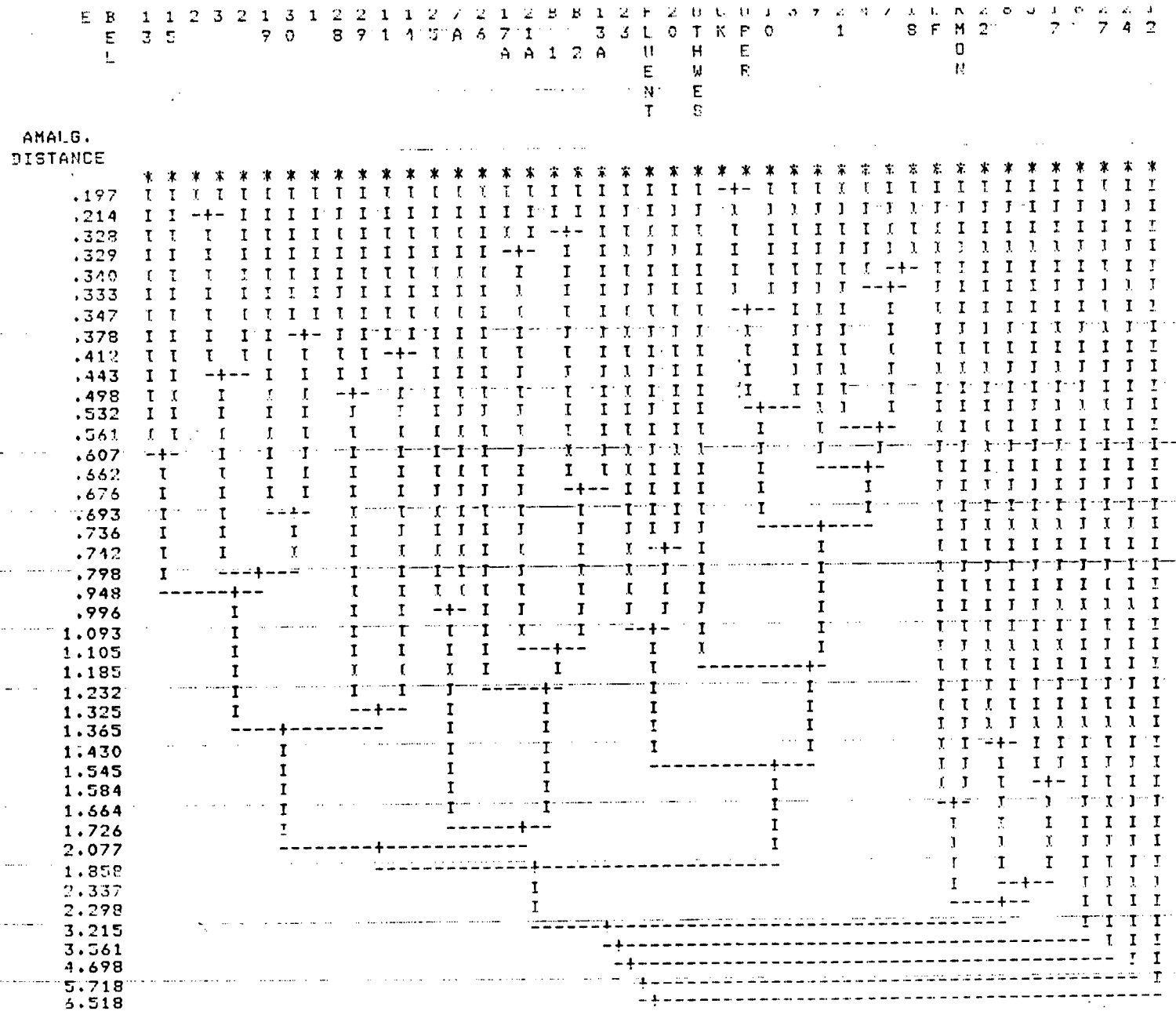
INITIAL DISTANCES BETWEEN CASES (CONTINUED)

CASE NUMBER	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35
1	.88	.84	1.03	1.76	1.80	1.34	.71	1.09	2.77	1.72	1.11	.64	3.83	1.67	1.50
2	1.66	1.73	1.79	.68	.71	2.05	1.18	1.39	3.25	.52	1.51	1.62	3.95	2.25	2.10
3	1.62	1.11	1.14	2.99	2.99	1.08	1.69	2.56	3.92	2.38	1.86	2.04	3.67	2.82	2.65
4	1.08	1.00	1.14	2.17	2.25	1.40	1.20	1.53	3.19	2.13	1.40	.97	3.92	2.17	2.02
6	2.71	3.14	3.24	2.69	2.70	3.50	2.65	2.37	3.17	2.98	2.43	2.68	3.25	2.70	2.68
7	1.70	1.56	1.57	1.51	1.48	1.71	1.26	1.99	3.60	.33	1.53	2.03	3.69	2.53	2.35
8	2.50	2.74	2.82	2.61	2.60	3.02	2.34	1.95	.59	2.95	2.45	2.25	4.74	.76	.94
9	3.45	3.83	3.91	3.77	3.87	4.14	3.63	3.43	4.57	4.05	3.34	3.30	2.67	4.07	4.03
10	1.84	2.15	2.28	1.92	1.94	2.56	1.67	1.05	1.59	2.41	1.82	1.25	4.01	.90	.93
11	5.63	5.61	5.74	6.03	6.07	5.90	5.70	5.52	7.06	6.32	5.83	5.02	5.84	6.36	6.25
12	2.59	2.84	2.94	1.05	1.00	3.24	2.13	1.46	2.66	1.96	2.42	2.09	4.72	2.08	2.05
13	1.22	1.35	1.35	1.60	1.64	1.53	1.00	1.57	2.58	1.14	1.02	1.59	3.39	1.62	1.46
14	4.87	4.91	4.93	5.37	5.39	4.98	4.94	5.14	5.82	5.23	4.87	4.68	2.87	5.31	5.25
15	1.82	1.48	1.42	3.35	3.35	1.21	1.96	2.84	3.18	2.67	1.94	2.49	3.72	2.31	2.17
16	1.86	1.46	1.36	3.37	3.36	1.08	1.99	2.99	3.57	2.54	1.96	2.63	3.59	2.63	2.48
21	0.00	.61	.66	1.93	2.04	.98	.74	1.42	2.82	1.66	.38	1.14	3.39	1.81	1.64
22	.61	0.00	.21	2.11	2.16	.54	.75	1.71	3.10	1.59	.82	1.32	3.46	2.00	1.82
23	.66	.21	0.00	2.21	2.27	.36	.90	1.86	3.17	1.63	.87	1.49	3.45	2.10	1.91
24	1.93	2.11	2.21	0.00	.33	2.51	1.48	1.12	3.08	1.20	1.81	1.54	4.27	2.20	2.09
25	2.04	2.16	2.27	.33	0.00	2.57	1.49	1.18	3.11	1.15	1.90	1.61	4.28	2.19	2.07
26	.98	.54	.36	2.51	2.57	0.00	1.22	2.20	3.34	1.82	1.16	1.82	3.48	2.31	2.13
27	.74	.75	.90	1.48	1.49	1.22	0.00	1.10	2.79	1.16	.70	.96	3.52	1.63	1.44
28	1.42	1.71	1.86	1.12	1.18	2.20	1.10	0.00	2.40	1.73	1.40	.74	4.06	1.45	1.35
29	2.82	3.10	3.17	3.08	3.11	3.34	2.79	2.40	0.00	3.43	2.79	2.64	5.01	1.22	1.40
30	1.66	1.59	1.63	1.20	1.15	1.82	1.16	1.73	3.43	0.00	1.49	1.83	3.78	2.37	2.20
31	.38	.82	.87	1.81	1.90	1.16	.70	1.40	2.79	1.49	0.00	1.27	3.26	1.78	1.62
32	1.14	1.32	1.49	1.54	1.61	1.82	.96	.74	2.64	1.83	1.27	0.00	3.73	1.63	1.50
33	3.39	3.46	3.45	4.27	4.28	3.48	3.52	4.06	5.01	3.78	3.26	3.73	0.00	4.25	4.15
34	1.81	2.00	2.10	2.20	2.19	2.31	1.63	1.45	1.22	2.37	1.78	1.63	4.25	0.00	.20
35	1.64	1.82	1.91	2.09	2.07	2.13	1.44	1.35	1.40	2.20	1.62	1.50	4.15	.20	0.00
36	2.94	3.05	3.04	4.03	4.04	3.07	3.13	3.77	4.77	3.46	2.75	3.59	1.66	3.96	3.84
37	1.55	1.68	1.73	2.41	2.40	1.87	1.48	1.79	1.79	2.22	1.49	1.72	3.51	.90	.81
38	2.12	2.30	2.36	2.67	2.67	2.52	2.03	1.96	.95	2.76	2.10	2.08	4.41	.52	.65
39	2.38	2.59	2.68	2.74	2.73	2.87	2.27	1.96	.67	3.00	2.37	2.16	4.65	.65	.84
[illegible]	[illegible]	[illegible]	[illegible]	3.41	3.44	3.38	2.90	3.05	4.18	3.33	2.53	3.11	2.71	3.49	3.42

1	3.53	1.68	2.07	2.24	3.24	4.80	2.30	2.52	3.94	2.41	1.83	1.75	6.37
2	3.66	2.25	2.68	2.86	3.31	4.86	2.84	1.92	3.67	3.23	2.43	2.68	6.74
3	3.31	2.48	3.07	3.36	3.64	5.28	3.52	3.93	4.78	3.38	3.01	.41	6.46
4	3.63	2.14	2.53	2.68	3.39	4.90	2.73	2.88	4.24	2.78	2.31	1.65	6.02
6	2.83	2.61	2.96	2.95	1.58	2.85	2.89	2.92	4.30	3.25	2.64	4.05	7.35
7	3.33	2.29	2.89	3.17	3.36	3.04	3.22	2.75	4.89	3.47	2.75	2.26	6.84
8	4.49	1.45	.67	.39	3.90	5.19	.34	2.77	2.05	.84	.60	3.63	7.32
9	3.06	3.78	4.35	4.35	2.33	1.43	4.26	3.95	5.51	4.52	4.04	4.52	6.66
10	3.90	1.33	1.30	1.19	3.22	4.34	1.11	2.11	2.95	1.54	.86	3.13	6.91
11	6.32	6.30	6.69	6.63	6.01	5.60	6.63	6.00	7.82	6.67	6.38	5.59	7.91
12	4.50	2.51	2.50	2.44	3.69	4.93	2.30	1.00	4.20	2.93	2.13	3.68	7.42
13	3.16	1.26	1.91	2.22	3.08	4.60	2.26	2.65	3.82	2.49	1.83	2.34	6.53
14	4.46	4.71	5.45	5.36	4.97	3.60	5.60	5.80	6.44	5.61	5.36	5.09	7.81
15	3.30	1.76	2.30	2.71	3.80	5.49	2.95	4.31	3.74	2.61	2.49	1.32	6.68
16	3.14	2.04	2.67	3.09	3.78	5.52	3.31	4.42	4.20	3.04	2.83	1.10	6.65
21	2.94	1.55	2.12	2.38	2.76	4.50	2.42	2.86	3.92	2.52	1.97	1.73	5.91
22	3.05	1.68	2.30	2.59	3.11	4.84	2.70	3.12	4.14	2.71	2.20	1.19	6.16
23	3.04	1.73	2.36	2.68	3.18	4.91	2.79	3.25	4.18	2.78	2.30	1.17	6.04
24	4.03	2.41	2.67	2.74	3.41	4.81	2.65	1.25	4.57	3.15	2.33	3.14	6.80
25	4.04	2.40	2.67	2.73	3.44	4.85	2.67	1.29	4.61	3.16	2.32	3.12	7.10
26	3.07	1.87	2.52	2.87	3.38	5.11	3.00	3.58	4.26	2.93	2.32	1.00	6.03
27	3.13	1.48	2.03	2.27	2.90	4.61	2.34	2.47	4.02	2.51	1.82	1.80	6.54
28	3.77	1.79	1.96	1.96	3.05	4.50	1.89	1.57	3.81	2.31	1.34	2.76	6.65
29	4.77	1.79	.95	.67	4.18	5.38	.53	3.18	1.54	.78	1.05	3.98	7.21
30	3.46	2.22	2.76	3.00	3.33	4.97	3.04	2.42	4.78	3.34	2.58	2.39	6.87
31	2.75	1.49	2.10	2.37	2.53	4.35	2.41	2.78	3.94	2.55	1.94	1.93	6.07
32	3.59	1.72	2.08	2.16	3.11	4.41	2.15	2.12	3.90	2.39	1.75	2.28	6.37
33	1.66	3.51	4.41	4.65	2.71	2.72	4.75	5.06	5.76	4.74	4.33	3.61	7.26
34	3.96	.90	.52	.65	3.49	4.94	.79	2.62	2.51	1.00	.26	2.89	7.02
35	3.84	.81	.65	.84	3.42	4.91	.98	2.59	2.67	1.15	.44	2.71	6.96
36	0.00	3.30	4.12	4.39	1.72	3.24	4.50	4.90	5.53	4.47	4.03	3.22	7.08
37	3.30	0.00	.96	1.32	3.18	4.57	1.50	3.11	2.80	1.45	1.04	2.46	6.89
38	4.12	.96	0.00	.47	3.74	5.16	.73	3.08	2.06	.64	.51	3.09	7.11
39	4.39	1.32	.47	0.00	3.85	5.16	.36	2.95	1.93	.51	.48	3.42	7.24
40	1.72	3.18	3.74	3.85	0.00	2.71	3.87	3.93	5.12	4.03	3.49	3.71	7.04
41	3.24	4.57	5.16	5.16	2.71	0.00	5.13	4.99	6.18	5.32	4.89	5.39	7.84
42	4.50	1.50	.73	.36	3.87	5.13	0.00	2.77	1.97	.73	.60	3.61	7.10
43	4.90	3.11	3.08	2.95	3.93	4.99	2.77	0.00	4.69	3.40	2.65	4.14	7.26
44	5.53	2.80	2.06	1.93	5.12	6.18	1.97	4.69	0.00	1.58	2.37	4.79	7.60
45	4.47	1.45	.64	.51	4.03	5.32	.73	3.40	1.58	0.00	.87	3.43	7.16
46	4.03	1.04	.51	.48	3.49	4.89	.60	2.65	2.37	.87	0.00	3.08	7.10
47	3.22	2.46	3.09	3.42	3.71	5.39	3.61	4.14	4.79	3.43	3.08	0.00	6.57
48	7.08	6.89	7.11	7.24	7.04	7.84	7.10	7.26	7.60	7.16	7.10	6.57	0.00

NUMBER OF INTEGER WORDS OF STORAGE USED IN PRECEDING PROBLEM 2113
CPU TIME USED 1.340 SECONDS

```
12.09.32.* PHONE   -                                  *
12.09.32.* MAIL TO -                                  *
12.09.32.*                                            *
12.09.32.*************************************
12.09.32.*
12.09.32.USER,YGAI06,.          KFJ
12.09.33. CHARGE LIMITS OVERRIDDEN
12.09.33.
12.09.33. JOB ENTRY 85/01/08. 12.09.25.
12.09.33. OWNING ST=EKS1      OWNING UN=YGAI06
12.09.33. ORIGIN ST=EKS1      ORIGIN UN=(LOCAL)
12.09.33. DEST   ST=EKS1      DEST   UN=(LOCAL)
12.09.34.MAP,OFF.
12.09.34.GET,TAPE7=MONBOFT.
12.09.34.GET,BMDP/UN=EKSAPP.
12.09.35.CALL,BMDP(PROG=BMDP2M)
12.09.35.ATTACH,BMDP82/UN=EKSAPP.
12.09.36.CALL,BMDP82,BMDP2M.
12.09.37.REWIND,BMDP2M.
12.09.37.SKIPF,BMDP82,14.
12.09.43.COPYBF,BMDP82,BMDP2M.
12.09.44. COPY COMPLETE.
12.09.44.REWIND,BMDP2M.
12.09.44.RETURN,BMDP82.
12.09.44.*
12.09.44.BMDP2M,D=TAPE7,L=MONOUS,W=20000.
12.09.45.$FCL      LVL=564   VER=83265
12.09.45./PRG USED/BMDPS2M
12.09.50.   STOP  -  END BMDP.
12.09.50.    137000 MAXIMUM EXECUTION FL.
12.09.50.     1.351 CP SECN
                          JZW7.EON
J.*N    -L@@Plv Jr*rEPRIEVED NORMAL TERMINATION.
12.09.50. JOB REPRIEVED.
12.09.50. RPV - PREVIOUS ERROR CONDITIONS RESET.
12.09.50.EXIT,U.
12.09.50.COST,LO=F.
12.09.51.
12.09.51. RUN DATE  85/01/08.  RUT SECS    26.216
12.09.51. UNITS          NUMBER       CCUS   PERCENT
12.09.51. CPU SECS        1.369     70.867    53.421
12.09.51. CMP UNITS       2.627     24.587    18.534
12.09.51. DISK REQS         237     10.963     8.264
12.09.51. DISK SECT       13879     26.231    19.773
12.09.51. JOB PROCESSING CCUS    132.656
12.09.51.
12.09.51. AVERAGE CM USED (DECIMAL)          13392
12.09.51. AVERAGE CM USED (OCTAL)            32430
12.09.51. MAX FIELD LENGTH USED (OCTAL)     137000
12.09.51. ITEMS CHARGED SEPARATELY
12.09.51.DAYFILE,MONOUS.
EOI ENCOUNTERED.
```


AMALG.
DISTANCE
.197
.214
.328
.329
.340
.333
.347
.378
.412
.443
.498
.532
.561
.607
.662
.676
.693
.736
.742
.798
.948
.996
1.093
1.105
1.185
1.232
1.325
1.365
1.430
1.545
1.584
1.664
1.726
2.077
1.858
2.337
2.298
3.215
3.561
4.698
5.718
6.518

```
TO SEE REMARKS AND A SUMMARY OF NEW FEATURES FOR
THIS PROGRAM, STATE NEWS. IN THE PRINT PARAGRAPH.

THIS VERSION OF BMDP HAS BEEN CONVERTED FOR USE ON
CDC 6000 AND CYBER SERIES COMPUTERS BY
BMDP PROJECT, VOGELBACK COMPUTING CENTER
NORTHWESTERN UNIVERSITY
2129 SHERIDAN ROAD
EVANSTON, ILLINOIS 60201
(312) 492-3681

RELEASED AUGUST 1983 FOR FTN4 COMPILERS

EXECUTED ON 85/04/11.AT 16.28.34.

PROGRAM CONTROL INFORMATION

/PROBLEM  TITLE= 'FACTOR ANALYSIS FOR MONSANTO SODA SPRINGS PLANT
                  WATER QUALITY DATA, FEB, 1985'.
/INPUT    VARIABLES=33.
        FORMAT= '(7X,2A4////2(7X,F8.0/),7X,F8.0/////7X,F8.0//////3(5X,A2,F8.0/),
                 2(5X,A2,F8.0//)/5X,A2,F8.0//,5X,A2,F8.0/2(5X,A2,F8.0//):
                    //7X,F8.0////4(5X,A2,F8.0)///)'.
          CASES=50.
           UNIT=7.
/VARIABLES NAMES=ID1,ID2,PH,EH,C,TDS,L1,CA,L2,MG,L3,NA,L4,K,L5,CD,L14,FE,L15,MN,
                 L6,SE,L7,V,HCO3,L8,CL,L9,F,L10,NOX,L11,SO4,
                 NAK,CAMG.
           BLANKS=MISSING.
           LABEL=ID1,ID2.
           USE=PH,EH,C,TDS,CD,FE,MN,SE,V,HCO3,CL,F,NOX,SO4,NAK,
           CAMG.
           ADD=2.
/TRANSFORM IF(L1 EQ CHAR( <)) THEN CA=CA/2.
           IF(L2 EQ CHAR( <)) THEN MG=MG/2.
           IF(L3 EQ CHAR( <)) THEN NA=NA/2.
           IF(L4 EQ CHAR( <)) THEN K=K/2.
           IF(L5 EQ CHAR( <)) THEN CD=CD/2.
           IF(L6 EQ CHAR( <)) THEN SE=SE/2.
           IF(L7 EQ CHAR( <)) THEN V=V/2.
           IF(L8 EQ CHAR( <)) THEN CL=CL/2.
           IF(L9 EQ CHAR( <)) THEN F=F/2.
           IF(L10 EQ CHAR( <)) THEN NOX=NOX/2.
           IF(L11 EQ CHAR( <)) THEN SO4=SO4/2.
           IF(L14 EQ CHAR( <)) THEN FE=FE/2.
1PAGE   2 BMDP4M

           IF(L15 EQ CHAR( <)) THEN MN=MN/2.
           NAK=NA+K.
           CAMG=CA/MG.
```

```
NUMBER OF VARIABLES TO READ IN. . . . . .        33
NUMBER OF VARIABLES ADDED BY TRANSFORMATIONS. .   2
TOTAL NUMBER OF VARIABLES . . . . . . . . . .    35
NUMBER OF CASES TO READ IN. . . . . . . . . .    50
CASE LABELING VARIABLES . . . . . . . . . . .ID1        ID2
MISSING VALUES CHECKED BEFORE OR AFTER TRANS. . NEITHER
BLANKS ARE. . . . . . . . . . . . . . . . . . MISSING
INPUT UNIT NUMBER . . . . . . . . . . . . . .     7
REWIND INPUT UNIT PRIOR TO READING. . DATA. . .  YES
NUMBER OF WORDS OF DYNAMIC STORAGE. . . . . .  19998
NUMBER OF CASES DESCRIBED BY INPUT FORMAT . . .   1

***** TRAN     PARAGRAPH IS USED *****

VARIABLES TO BE USED
     3 PH          4 EH          5 C           6 TDS        16 CD
    18 FE         20 MN         22 SE         24 V         25 HCO3
    27 CL         29 F          31 NOX        33 SO4       34 NAK
    35 CAMG
0INPUT FORMAT IS
 (7X,2A4////2(7X,F8.0/),7X,F8.0/////7X,F8.0//////3(5X,A2,F8.0/), 2(5X,A2,F8.0//)/
 5X,A2,F8.0//,5X,A2,F8.0/2(5X,A2,F8.0//),  //7X,F8.0////4(5X,A2,F8.0)///)

0MAXIMUM LENGTH DATA RECORD IS   15 CHARACTERS.
1PAGE   3 BMDP4M  FACTOR ANALYSIS FOR MONSANTO SODA SPRINGS PLANT  WATER QUALITY DATA, FEB, 1985

0I N P U T   V A R I A B L E S . . . . .
```

VARIABLE INDEX	VARIABLE NAME	RECORD NO.	COLUMNS BEGIN	COLUMNS END	FIELD WIDTH	TYPE
1	ID1	1	8	11	4	A
2	ID2	1	12	15	4	A
3	PH	5	8	15	8	F
4	EH	6	8	15	8	F
5	C	7	8	15	8	F
6	TDS	12	8	15	8	F
7	L1	18	6	7	2	A
8	CA	18	8	15	8	F
9	L2	19	6	7	2	A
10	MG	19	8	15	8	F
11	L3	20	6	7	2	A
12	NA	20	8	15	8	F
13	L4	21	6	7	2	A
14	K	21	8	15	8	F
15	L5	23	6	7	2	A
16	CD	23	8	15	8	F
17	L14	26	6	7	2	A
18	FE	26	8	15	8	F
19	L15	28	6	7	2	A
20	MN	28	8	15	8	F
21	L6	29	6	7	2	A
22	SE	29	8	15	8	F
23	L7	31	6	7	2	A
24	V	31	8	15	8	F
25	HCO3	35	8	15	8	F
26	L8	39	6	7	2	A
27	CL	39	8	15	8	F
28	L9	40	6	7	2	A
29	F	40	8	15	8	F
30	L10	41	6	7	2	A
31	NOX	41	8	15	8	F
32	L11	42	6	7	2	A
33	SO4	42	8	15	8	F

```
1PAGE   4 BMDP4M  FACTOR ANALYSIS FOR MONSANTO SODA SPRINGS PLANT  WATER QUALITY DATA, FEB, 1985

 NUMBER OF VARIABLES TO BE USED. . . . . . . .   16
```

CASES WITH ZERO WEIGHTS AND MISSING DATA NOT INCLUDED.

0 C A S E NO. LABEL	3 PH	4 EH	5 C	6 TDS	16 CD	18 FE	20 MN	22 SE	24 V	25 HCO3
	27 CL	29 F	31 NOX	33 SO4	34 NAK	35 CAMG				
0BASED ON INPUT FORMAT SUPPLIED 45 RECORDS READ PER CASE.										
0*** WARNING --- 3 EXTRA RECORDS AT END OF EACH CASE ***										
1 PW1	6.840	87	830	922	.201	.0250	.01000	.0250	.0250	511
	109	1.600	25.140	172	89	1.901				
2 PW2	6.560	39	650	754	.0270	.0250	.01000	.00900	.0250	507
	58	.790	23.520	100	48	2.048				
3 PW3	6.450	166	700	675	.0160	.0250	.01000	.00250	.0250	500
	45	.580	20.740	84	38	2.155				
4 TW2	6.710	197	700	709	.00250	.0250	.01000	.00250	.0250	524
	21	.270	18.430	56	19	1.965				
5 TW3	6.030	6	1110	1240	.00250	15.100	.270	.00250	.0250	1163
	30	.400	.0950	98	46	.787				
6 TW4	6.140	7	900	1250	.00250	15.500	.600	.00250	.0250	1243
	27	.400	.0950	96	52	.736				
7 TW5	6.720	32	1550	1900	.348	.0250	4.480	.01000	.0250	383
	230	12.300	45.100	640	295	1.509				
8 TW6	6.920	13	1550	1870	.00700	1.950	5.680	.0260	.0250	433
	230	14.400	38.510	622	298	1.564				
9 TW7	6.340	97	1230	1210	.00250	4.030	.230	.00250	.0250	1193
	40	.370	.0950	98	60	.505				
10 TW8	6.280	27	1600	1620	.00250	3.950	.01000	.00250	.0250	1816
	16	.320	.0950	44	73	.170				
11 TW9	6.150	87	1350	1270	.00250	8.760	.420	.00250	.0250	1292
	27	.420	.0950	102	56	.847				
12 TW10	6.690	180	850	1020	.00250	.0250	.530	.00250	.0250	790
	107	1.170	9.480	101	68	.958				
13 TW11	7.490	70	1230	1020	.00250	.0250	.01000	.00250	.0250	514
	107	.270	17.460	195	108	2.534				
14 TW12	7.600	83	2325	1770	.00250	.0250	.0800	.00250	.670	505
	302	.280	33.380	574	326	2.618				
15 TW13	7.120	93	625	512	.00250	.0250	.0600	.00250	.0250	501
	10	.450	14.610	43	9	2.609				
16 TW14	7.100	214	450	532	.00250	.0800	.01000	.00250	.0250	472
	8	.350	14.260	18	10	2.600				
17 TW15	7.700	89	525	480	.00250	.0250	.01000	.00250	.0250	519
	11	.740	14.610	43	9	3.093				
18 TW16	6.780	120	875	1090	1.490	.0250	.200	.173	.240	627
	115	8.050	9.920	194	119	1.531				
19 TW17	6.450	18	1050	1410	.0270	.0250	1.290	.0120	.0250	425
	302	6.610	1.430	316	155	.367				
20 TW18	6.280	34	950	1180	.00600	5.680	.160	.00250	.0250	1256
	20	.320	.0950	32	53	.413				
21 TW19	7.200	169	900	942	.00250	.0250	.01000	.00250	.0250	403
	69	1.370	29.720	266	47	1.571				
	[illegible]	[illegible]	[illegible]	[illegible]	.00250	.0250	.01000	.00600	.0250	328

29 TW27	[illegible]	[illegible]	[illegible]	[illegible]	135	2.585					
	65	2.680	46.260	538	.0130	.0250	.01000	.00250	.0250	897	
30 TW28	6.050	158	825	1080	25	2.045					
	27	.220	14.190	78	.00250	.0250	.01000	.00250	.0250	667	
31 TW29	6.520	206	600	700	27	2.083					
	17	.380	19.970	96	.00250	.0250	.01000	.00700	.0250	484	
32 TW30	6.650	122	1425	1410	187	1.674					
	189	3.610	37.860	367	.00250	.0250	.01000	.00250	.160	433	
33 TW31	7.250	145	575	460	24	3.114					
	18	.340	18.470	45	.00250	.0250	.01000	.00250	.310	163	
34 TW32	8.770	106	400	294	37	.548					
	22	.220	27.410	45	.00250	.0250	.01000	.00250	.300	490	
35 TW33	8.760	141	700	562	18	3.150					
	23	.240	10.020	43	.00250	.160	.270	.00250	.0250	490	
36 TW34	6.940	39	600	852	24	1.295					
	64	.440	2.510	213	.00250	3.510	.210	.00250	.0250	1463	
37 TW35	6.590	22	1430	1320	52	.392					
	32	.370	.0950	88	.0530	.0250	.0800	.0780	.0250	351	
38 TW36	6.790	57	990	1070	91	1.424					
	101	11.900	34.930	385	1.210	.0250	2.500	.0660	.150	527	
39 TW37	7.150	83	1910	1860	263	2.624					
	214	31.300	43.950	600	.00250	.0250	.01000	.00250	.0250	495	
40 TW38	6.300	135	700	626	26	2.571					
	30	.310	44.720	56	.00250	.0250	.01000	.0760	.0250	215	
41 TW39	8.390	5	1050	874	103	.948					
	87	6.880	28.870	306	70.400	.01000	11	.0550	.160	115	
42 TW40	6	-40	3650	4900	1013	2.337					
	1180	11.900	75.170	1770	.00250	5.270	.170	.00250	.0250	959	
43 HOOPER	5.850	39	1000	980	37	.975					
	8	.580	.0950	54	.00250	7.200	.160	.00250	.0250	991	
44 DOCK	6.020	52	725	920	41	.906					
	12	.620	.0950	59	.00250	.0250	.01000	.00250	.0250	484	
45 LEWIS	6.040	128	700	832	49	1.919					
	39	.510	25.290	139	.0300	.0250	.01000	.00250	.0250	514	
46 EFFLUENT	7.900	79	750	804	85	2.136					
	75	1.020	21.900	133	.00250	.0250	.01000	.00250	.0250	356	
47 SWG	6.990	121	775	956	72	1.685					
	56	7.520	23.360	291	.00250	.0250	.01000	.00250	.0250	363	
48 CALF	7.030	116	875	1030	82	1.662					
	64	8.850	24.860	316	.0380	.0250	.01000	.00450	.0250	378	
49 MORMAN	6.960	138	1000	1050	90	1.557					
	78	10.800	24.630	293	.00900	.01000	.170	.00600	.0250	985	
50 SW SPRIN	6.250	95	1050	1150	62	.948					
	33	1.600	13.570	113							

1PAGE 6 BMDP4M FACTOR ANALYSIS FOR MONSANTO SODA SPRINGS PLANT WATER QUALITY DATA, FEB, 1985

NUMBER OF CASES READ. 50

1PAGE 7 BMDP4M FACTOR ANALYSIS FOR MONSANTO SODA SPRINGS PLANT WATER QUALITY DATA, FEB, 1985

STATISTICS FOR EACH VARIABLE

25 HCO3	627.72000	379.83326	.605100	0.0000	-1.65	26	1816.0000	3.13	10
27 CL	104.74000	174.44382	1.66549	8.0000	-.55	16	1180.0000	6.16	42
29 F	3.52280	5.75924	1.63485	.2200	-.57	30	31.3000	4.82	39
31 NOX	19.48520	16.98422	.871647	.0950	-1.14	5	73.1700	3.28	42
33 SO4	261.48000	303.98498	1.16256	18.0000	-.80	16	1770.0000	4.96	42
34 NAK	107.46000	154.40355	1.43685	9.0000	-.64	15	1013.0000	5.86	42
35 CAMG	5.02127	24.39906	4.85914	.1703	-.20	10	174.0000	6.93	26

CASE NUMBERS ABOVE REFER TO DATA MATRIX BEFORE ANY CASES
HAVE BEEN DELETED DUE TO MISSING DATA.
CASES WITH ZERO WEIGHTS ARE NOT INCLUDED.

CORRELATION MATRIX

		PH 3	EH 4	C 5	TDS 6	CD 16	FE 18	MN 20	SE 22	V 24	HCO3 25	CL 27	F 29	NOX 31
PH	3	1.000												
EH	4	-.200	1.000											
C	5	.075	-.563	1.000										
TDS	6	-.090	-.550	.938	1.000									
CD	16	-.140	-.257	.666	.796	1.000								
FE	18	-.359	-.357	.019	.047	-.070	1.000							
MN	20	-.155	-.346	.705	.834	.820	-.051	1.000						
SE	22	.043	-.119	.210	.240	.222	-.172	.233	1.000					
V	24	.254	.059	.287	.131	.134	-.156	.078	.193	1.000				
HCO3	25	-.497	-.116	-.050	-.067	-.196	.676	-.217	-.217	-.180	1.000			
CL	27	.021	-.391	.833	.907	.892	-.192	.864	.284	.249	-.363	1.000		
F	29	.075	-.225	.449	.467	.226	-.219	.498	.510	.051	-.345	.429	1.000	
NOX	31	.185	-.045	.500	.502	.477	-.505	.550	.272	.198	-.685	.620	.550	1.000
SO4	33	.144	-.463	.843	.896	.720	-.226	.782	.301	.188	-.472	.902	.582	.733
NAK	34	.038	-.430	.886	.930	.850	-.152	.878	.306	.280	-.331	.971	.505	.680
CAMG	35	.627	-.322	.241	.111	-.017	-.080	-.045	.012	-.039	-.257	.105	.032	.155

		SO4 33	NAK 34	CAMG 35
SO4	33	1.000		
NAK	34	.922	1.000	
CAMG	35	.185	.166	1.000

SQUARED MULTIPLE CORRELATIONS (SMC) OF
EACH VARIABLE WITH ALL OTHER VARIABLES

31	NOX	[illegible]
33	SO4	.99167
34	NAK	.98752
35	CAMG	.73160

CONDITION NUMBER = 3047.

1PAGE 10 BMDP4M FACTOR ANALYSIS FOR MONSANTO SODA SPRINGS PLANT WATER QUALITY DATA, FEB, 1985

COMMUNALITIES OBTAINED FROM 5 FACTORS AFTER 1 ITERATIONS.

THE COMMUNALITY OF A VARIABLE IS ITS SQUARED MULTIPLE CORRELATION WITH THE FACTORS.

3	PH	.8730
4	EH	.8047
5	C	.8976
6	TDS	.9660
16	CD	.8284
18	FE	.7823
20	MN	.8615
22	SE	.7855
24	V	.9587
25	HCO3	.8600
27	CL	.9584
29	F	.8053
31	NOX	.7993
33	SO4	.9326
34	NAK	.9850
35	CAMG	.7925

1PAGE 11 BMDP4M FACTOR ANALYSIS FOR MONSANTO SODA SPRINGS PLANT WATER QUALITY DATA, FEB, 1985

FACTOR	VARIANCE EXPLAINED	CUMULATIVE PROPORTION OF TOTAL VARIANCE
1	7.389965	.461873
2	2.592137	.623881
3	1.741329	.732714
4	1.124589	.803001
5	1.042792	.868176
6	.573598	.904026
7	.420737	.930322
8	.358086	.952702
9	.278271	.970094
10	.160818	.980145
11	.153845	.989760
12	.097326	.995843
13	.035870	.998085
14	.018570	.999246
15	.009642	.999848
16	.002425	1.000000

PH	3	.105	-.679	.618	-.061	.124
EH	4	-.455	-.353	-.648	-.230	.020
C	5	.877	.234	.224	-.049	.146
TDS	6	.921	.335	.072	-.027	-.012
CD	16	.814	.240	-.183	-.269	-.042
FE	18	-.213	.785	.304	.130	.110
MN	20	.866	.239	-.188	-.047	-.132
SE	22	.374	-.182	-.173	.696	.313
U	24	.249	-.240	-.049	-.229	.886
HCO3	25	-.407	.805	.106	.074	.174
CL	27	.959	.085	-.063	-.168	.009
F	29	.597	-.186	-.138	.625	-.073
NOX	31	.730	-.444	-.208	-.025	-.159
SO4	33	.961	-.049	.038	-.005	-.076
NAK	34	.983	.084	-.011	-.100	.036
CAMG	35	.182	-.350	.782	-.033	-.155
	VP	7.390	2.592	1.741	1.125	1.043

THE VP FOR EACH FACTOR IS THE SUM OF THE SQUARES OF THE ELEMENTS OF THE COLUMN OF THE FACTOR LOADING MATRIX CORRESPONDING TO THAT FACTOR. THE VP IS THE VARIANCE EXPLAINED BY THE FACTOR.

0ORTHOGONAL ROTATION, GAMMA = 1.0000

0ITERATION	SIMPLICITY CRITERION
0	-5.225305
1	-7.570196
2	-7.628347
3	-7.629107
4	-7.629129

1PAGE 13 BMDP4M FACTOR ANALYSIS FOR MONSANTO SODA SPRINGS PLANT WATER QUALITY DATA, FEB, 1985

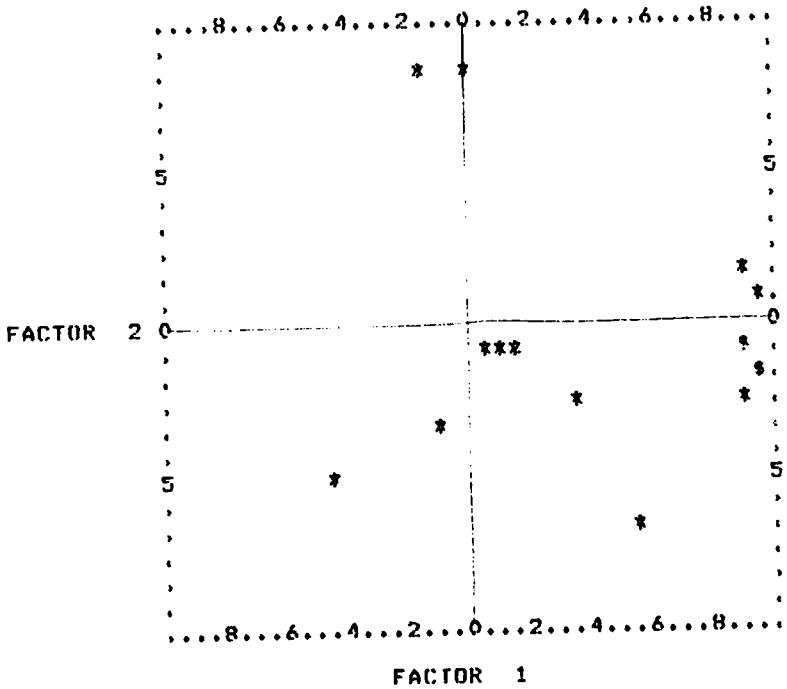
ROTATED FACTOR LOADINGS (PATTERN)

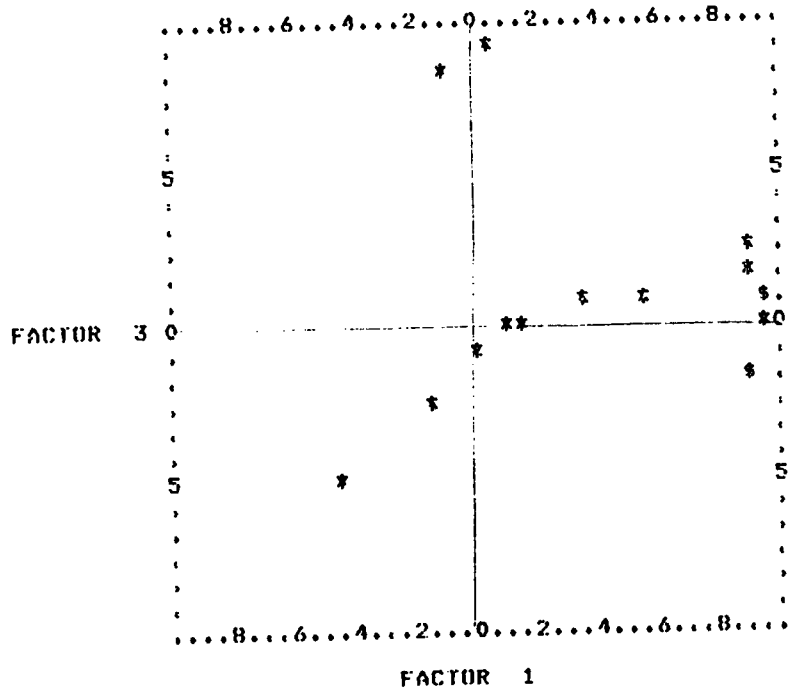
		FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5
PH	3	-.108	-.340	.829	.026	.240
EH	4	-.469	-.500	-.527	-.200	.128
C	5	.880	.134	.229	.163	.164
TDS	6	.959	.119	.065	.168	-.002
CD	16	.890	-.095	-.152	-.044	.047
FE	18	-.004	.875	-.050	-.078	-.091
MN	20	.896	-.084	-.139	.159	-.089
SE	22	.121	-.077	-.034	.854	.186

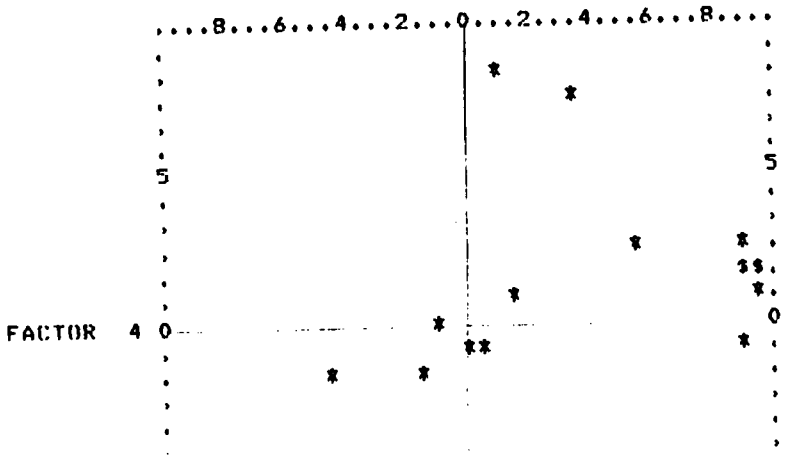
ORTHOGONAL, THE VF IS THE VARIANCE [illegible]

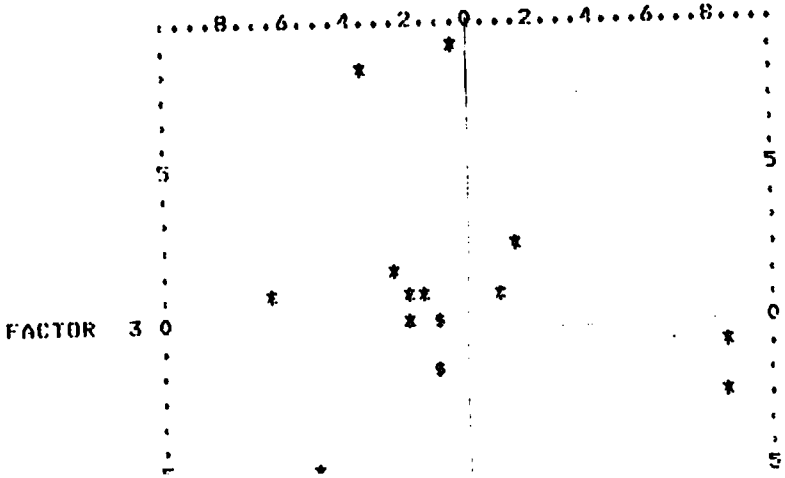
1PAGE 14 BMDP4M FACTOR ANALYSIS FOR MONSANTO SODA SPRINGS PLANT WATER QUALITY DATA, FEB, 1985

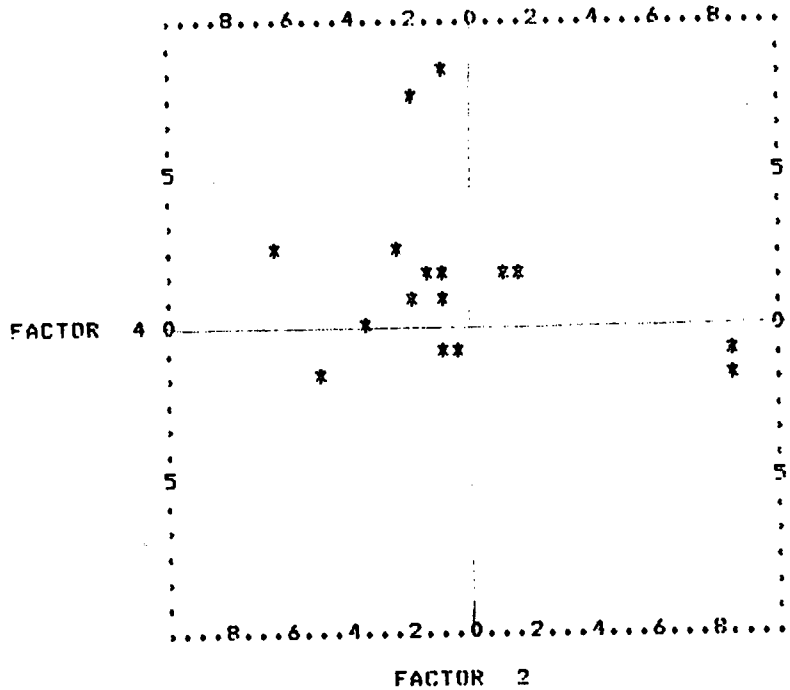
ROTATED FACTOR LOADINGS

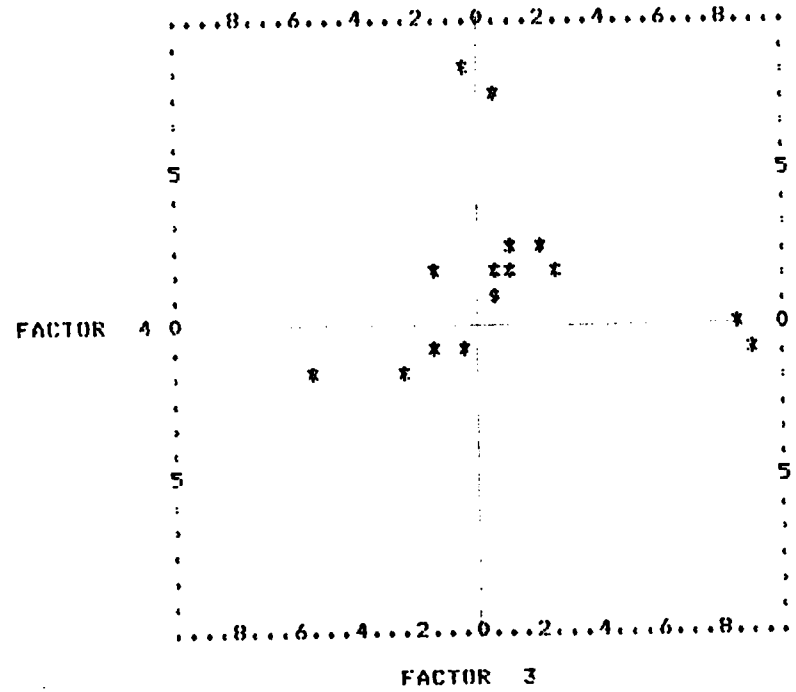












OVERLAP IS INDICATED BY A DOLLAR SIGN. SCALE IS FROM -1 TO +1.

1PAGE 16 BMDP4M FACTOR ANALYSIS FOR MONSANTO SODA SPRINGS PLANT WATER QUALITY DATA: FEB: 1985

SORTED ROTATED FACTOR LOADINGS (PATTERN)

		FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5
TDS	6	.959	0.000	0.000	0.000	0.000
NAK	34	.956	0.000	0.000	0.000	0.000
CL	27	.951	0.000	0.000	0.000	0.000
MN	20	.896	0.000	0.000	0.000	0.000
CD	16	.890	0.000	0.000	0.000	0.000
SO4	33	.882	0.000	0.000	.251	0.000
C	5	.880	0.000	0.000	0.000	0.000
FE	18	0.000	.875	0.000	0.000	0.000
HCO3	25	0.000	.858	-.269	0.000	0.000
NOX	31	.565	-.643	0.000	0.000	0.000
CAMG	35	0.000	0.000	.878	0.000	0.000

EACH CHI-SQUARE HAS BEEN DIVIDED BY ITS DEGREES OF FREEDOM.

CASE LABEL	NO.	CHISQ/DF 16	CHISQ/DF 5	CHISQ/DF 11	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5
PW1	1	.298	.068	.403	-.261	-.431	-.156	.086	-.238
PW2	2	.555	.088	.768	-.337	-.271	-.049	-.201	-.458
PW3	3	.225	.333	.176	-.437	-.778	-.642	-.614	-.287
TW2	4	.426	.396	.439	-.525	-.854	-.675	-.696	-.179
TW3	5	1.230	1.371	1.165	.038	2.608	.006	-.083	-.219
TW4	6	1.351	1.431	1.315	.018	2.662	-.019	-.080	-.250
TW5	7	1.152	.594	1.406	1.084	-.557	-.075	.676	-1.010
TW6	8	1.771	.760	2.231	1.071	-.115	.009	1.274	-1.008
TW7	9	.332	.302	.346	-.095	1.076	-.388	-.442	-.014
TW8	10	1.123	.905	1.222	.120	2.098	-.154	-.274	.105
TW9	11	.644	.670	.632	.010	1.759	-.372	-.339	-.020
TW10	12	.674	.218	.881	-.242	-.368	-.683	-.648	-.093
TW11	13	.802	.098	1.122	-.065	-.255	.337	-.547	-.092
TW12	14	2.581	5.790	1.122	.894	.037	.344	-.735	5.243
TW13	15	.379	.167	.475	-.577	-.447	-.027	-.475	-.279
TW14	16	.430	.487	.404	-.718	-1.005	-.604	-.727	-.136
TW15	17	.509	.192	.653	-.650	-.481	.227	-.454	-.218
TW16	18	2.477	4.282	1.656	-.931	.352	-.701	3.908	2.157
TW17	19	2.042	.083	2.933	.308	.136	-.027	.235	-.493
TW18	20	.402	.499	.358	-.160	1.529	-.174	-.274	-.155
TW19	21	.406	.316	.447	-.256	-1.023	-.286	-.574	-.239
TW20	22	.818	.176	1.109	-.367	-.594	-.405	-.301	-.372
TW21	23	.459	.596	.397	-.110	1.703	-.007	-.219	-.141
TW22	24	1.526	.691	1.906	.856	-.300	1.211	1.028	-.326
TW23	25	.902	.326	1.164	.167	1.177	.291	-.157	-.327
TW24	26	3.000	7.647	.888	.495	-.363	6.107	-.346	-.661
TW25	27	1.544	.406	2.061	-.157	.067	1.302	-.510	.212
TW26	28	1.325	.148	1.860	.437	-.462	-.006	-.464	-.345
TW27	29	1.143	.296	1.528	.073	-.997	-.415	.235	-.501
TW28	30	.768	.241	1.008	-.315	-.163	-.818	-.603	-.221
TW29	31	.801	.423	.973	-.516	-.801	-.834	-.685	-.207
TW30	32	.937	.163	1.288	.326	-.694	-.265	-.260	-.300
TW31	33	.345	.416	.314	-.632	-.738	-.230	-.599	.850
TW32	34	1.170	1.331	1.098	-.762	-1.039	.510	-.566	2.101
TW33	35	.944	1.323	.772	-.717	-.527	.413	-.651	2.286
TW34	36	.610	.085	.848	-.341	-.028	.139	-.406	-.354
TW35	37	.803	.551	.917	.003	1.633	.030	-.288	.013
TW36	38	.829	1.193	.663	-.393	-.426	-.101	2.326	-.456
TW37	39	2.147	2.709	1.892	.424	-.329	-.151	3.638	.029
TW38	40	1.126	.400	1.456	-.368	-.992	-.592	-.536	-.494
TW39	41	1.295	.916	1.467	-.496	-.349	.858	1.863	-.074
TW40	42	3.001	7.976	.739	6.172	-.652	-1.033	-.457	.289
HOOPER	43	.680	.347	.831	-.205	1.206	-.302	-.256	-.291
DOCK	44	.450	.404	.470	-.281	1.300	-.320	-.251	-.293
LEWIS	45	.399	.283	.452	-.303	-.657	-.640	-.527	-.450
EFFLUENT	46	.598	.150	.802	-.334	-.508	.368	-.465	-.173
SWG	47	.319	.212	.367	-.301	-.795	-.170	.101	-.546

ABSOLUTE VALUES OF CORRELATIONS IN SORTED AND SHADED FORM

```
+   6 TDS       X
+               0
+               *

+  34 NAK       XX
+               OO
+               **

+  27 CL        XXX
+               OOO
+               ***

+  20 MN        XXXX
+               OOOO
+                ***

+  16 CD        XXXXX
+               OOOOO
+                ** *

+  33 SO4       XXXXXX
+               OOOONO
+               ***  *

+   5 C         XXXXXXX
+               OOONNOO
+               **    *

+  18 FE         ..  . X
+                      O
+                      *

+  25 HCO3       --..+ XX
+                      NO
+                       *

+  31 NOX       XXXX+XXXXX
+                NN  O  NO
+                        *

+  35 CAMG       .   .. -.X
+                         O
+                         *

+   3 PH           ... -X.XX
```

```
+  24 V        .-- ..-... - . X
+                             O
+                             *
```

THE ABSOLUTE VALUES OF
THE MATRIX ENTRIES HAVE BEEN PRINTED ABOVE IN SHADED FORM
ACCORDING TO THE FOLLOWING SCHEME

```
+
+
+                LESS THAN OR EQUAL TO          .121
+     .         .121  TO AND INCLUDING          .243
+
+                 .
+     -         .243  TO AND INCLUDING          .364
+
+
+     +         .364  TO AND INCLUDING          .485
+
+
+     X         .485  TO AND INCLUDING          .607
+
+
+     X         .607  TO AND INCLUDING          .728
+     N
+
+     X         .728  TO AND INCLUDING          .849
+     O
+
+     X                   GREATER THAN          .849
+     O
+     *
```

1PAGE 18 BMDP4M FACTOR ANALYSIS FOR MONSANTO SODA SPRINGS PLANT WATER QUALITY DATA, FEB, 1985

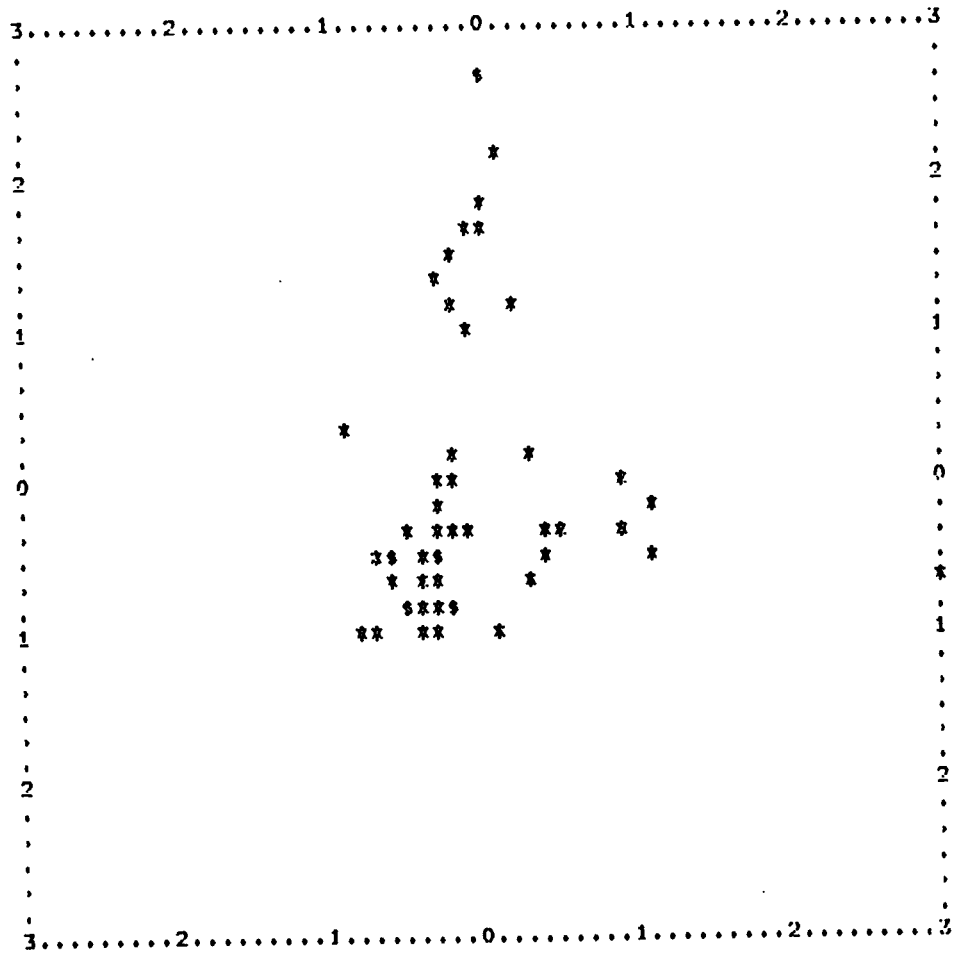
FACTOR SCORE COVARIANCE (COMPUTED FROM FACTOR
STRUCTURE AND FACTOR SCORE COEFFICIENTS)

THE DIAGONAL OF THE MATRIX BELOW CONTAINS THE SQUARED
MULTIPLE CORRELATIONS OF EACH FACTOR WITH THE VARIABLES.

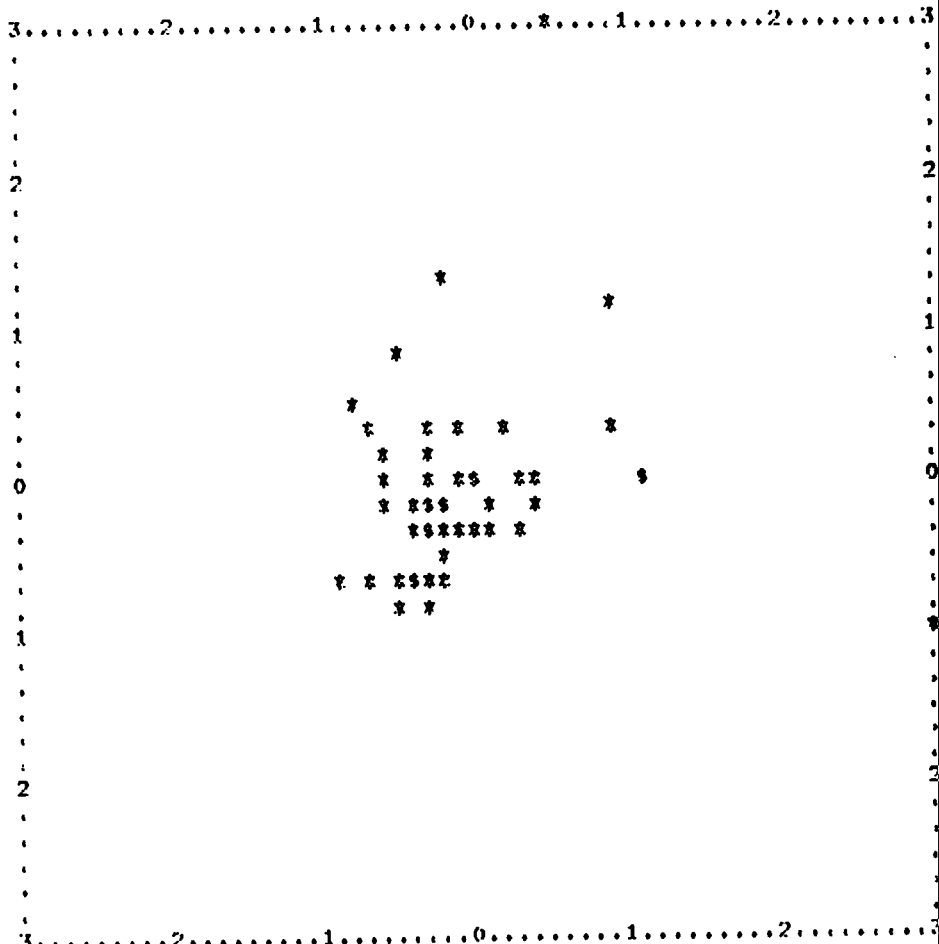
FACTOR	2	.000	1.000			
FACTOR	3	.000	-.000	1.000		
FACTOR	4	.000	-.000	.000	1.000	
FACTOR	5	.000	-.000	.000	-.000	1.000

FACTOR SCORES

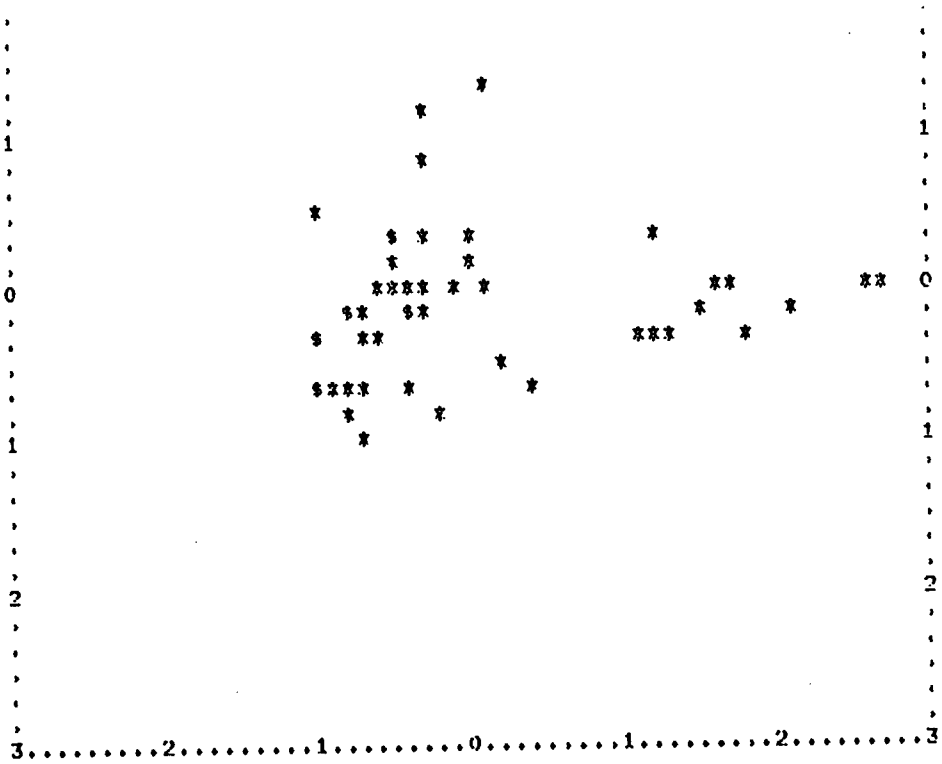
X-AXIS IS FACTOR 1, Y-AXIS IS FACTOR 2



X-AXIS IS FACTOR 1, Y-AXIS IS FACTOR 3



OVERLAP IS INDICATED BY A DOLLAR SIGN. SCALE IS FROM -3 TO +3.
FACTOR SCORES GREATER THAN 3 ARE PLOTTED AS 3.
FACTOR SCORES LESS THAN -3 ARE PLOTTED AS -3.



OVERLAP IS INDICATED BY A DOLLAR SIGN. SCALE IS FROM -3 TO +3.
FACTOR SCORES GREATER THAN 3 ARE PLOTTED AS 3.
FACTOR SCORES LESS THAN -3 ARE PLOTTED AS -3.

CPU TIME USED 2.850 SECONDS

1PAGE 23 BMDP4M

BMDP4M - FACTOR ANALYSIS
EXECUTED ON 85/04/11.AT 16.28.43.

PROGRAM CONTROL INFORMATION

NO MORE CONTROL LANGUAGE.

PROGRAM TERMINATED
16.28.13.NEWFAC,P2,CM170000,T5.
16.28.13.*
16.28.13.**********

```
16.28.15. DEST   ST=EKS1      DEST   UN=(LOCAL)
16.28.16.MAP,OFF.
16.28.16.GET,TAPE7=NEWBOET.
16.28.20.GET,BMDP/UN=EKSAPP.
16.28.21.CALL,BMDP(PROG=BMDP4M)
16.28.22.ATTACH,BMDP82/UN=EKSAPP.
16.28.22.CALL,BMDP82,BMDP4M.
16.28.23.REWIND,BMDP4M.
16.28.23.SKIPF,BMDP82,16.
16.28.29.COPYBF,BMDP82,BMDP4M.
16.28.30. COPY COMPLETE.
16.28.30.REWIND,BMDP4M.
16.28.30.RETURN,BMDP82.
16.28.30.*
16.28.30.BMDP4M,D=TAPE7,L=NEWOUT,W=20000.
16.28.33.*FCL       LVL-564   VER-83265
16.28.33./PRG USED/BMDP82M
16.28.43.    STOP  -  END BMDP.
16.28.43.    137100 MAXIMUM EXECUTION FL.
16.28.43.      2.881 CP SECONDS EXECUTION TIME.
16.28.43. REPRIEVED NORMAL TERMINATION.
16.28.43. JOB REPRIEVED.
16.28.44. RPV - PREVIOUS ERROR CONDITIONS RESET.
16.28.44.EXIT,U.
16.28.44.COST,LO=F.
16.28.44.
16.28.44. RUN DATE  85/04/11.  RUT SECS     32.561
16.28.44. UNITS         NUMBER       CCUS   PERCENT
16.28.44. CPU SECS       2.924     90.666    54.244
16.28.44. CMP UNITS      3.385     31.699    18.965
16.28.44. DISK REQS        276     13.492     8.072
16.28.44. DISK SECT      16630     31.282    18.715
16.28.44. JOB PROCESSING CCUS    167.144
16.28.44.
16.28.44. AVERAGE CM USED (DECIMAL)          14433
16.28.44. AVERAGE CM USED (OCTAL)            34141
16.28.44. MAX FIELD LENGTH USED (OCTAL)     137100
16.28.44. ITEMS CHARGED SEPARATELY
16.28.44.DAYFILE,NEWOUT.
EOI ENCOUNTERED.
C>CATLIST
CATALOG OF YGAI06              FM/BCS000  85/04/11. 16.41.31.

 FILE NAME(S)


INDIRECT ACCESS FILE(S)

 CLUSTAN    CLUST4     FACTAN     FACTAN4    NEWBOET    NEWBOE3    NEWFAC
 CLUST2     CLUST5     FACTAN2    LABEL      NEWBOE1    NEWBOE4    NEWOUT
 CLUST3     CLUST6     FACTAN3    MONBOET    NEWBOE2
```

```
THIS VERSION OF BMDP HAS BEEN CONVERTED FOR USE ON
CDC 6000 AND CYBER SERIES COMPUTERS BY
BMDP PROJECT, VOGELBACK COMPUTING CENTER
NORTHWESTERN UNIVERSITY
2129 SHERIDAN ROAD
EVANSTON, ILLINOIS 60201
(312) 492-3681

RELEASED AUGUST 1983 FOR FTN4 COMPILERS

EXECUTED ON 85/04/16.AT 15.13.35.

PROGRAM CONTROL INFORMATION

/PROBLEM  TITLE= 'P2M CLUSTER ANALYSIS FOR MONSANTO SODA SPRINGS PLANT
                  WATER QUALITY DATA, FEB, 1985'.
/INPUT    VARIABLES=33.
        FORMAT= '(7X,2A4////2(7X,F8.0/),7X,F8.0//////7X,F8.0//////3(5X,A2,F8.0/),
                 2(5X,A2,F8.0//)/5X,A2,F8.0//,5X,A2,F8.0/2(5X,A2,F8.0//):
                    //7X,F8.0////4(5X,A2,F8.0)///)'.
          CASES=50.
           UNIT=7.
/VARIABLES NAMES=ID1,ID2,PH,EH,C,TDS,L1,CA,L2,MG,L3,NA,L4,K,L5,CD,L14,FE,L15,MN,
                 L6,SE,L7,V,HCO3,L8,CL,L9,F,L10,NOX,L11,SO4,
                 NAK,CAMG.
           BLANKS=MISSING.
           LABEL=ID1,ID2.
           USE=CL,HCO3,CAMG,F,V.
           ADD=2.
/TRANSFORM IF(L1 EQ CHAR( <)) THEN CA=CA/2.
           IF(L2 EQ CHAR( <)) THEN MG=MG/2.
           IF(L3 EQ CHAR( <)) THEN NA=NA/2.
           IF(L4 EQ CHAR( <)) THEN K=K/2.
           IF(L5 EQ CHAR( <)) THEN CD=CD/2.
           IF(L6 EQ CHAR( <)) THEN SE=SE/2.
           IF(L7 EQ CHAR( <)) THEN V=V/2.
           IF(L8 EQ CHAR( <)) THEN CL=CL/2.
           IF(L9 EQ CHAR( <)) THEN F=F/2.
           IF(L10 EQ CHAR( <)) THEN NOX=NOX/2.
           IF(L11 EQ CHAR( <)) THEN SO4=SO4/2.
           IF(L14 EQ CHAR( <)) THEN FE=FE/2.
           IF(L15 EQ CHAR( <)) THEN MN=MN/2.
1PAGE   2 BMDP2M

           NAK=NA+K.
           CAMG=CA/MG.
/PROCEDURE  LINK=CENTROID.
            SUMOFSQ.
/PRINT  DATA.
        DISTANCES.
```

The Cluster was used
For F8/Hard
Groups.

```
NUMBER OF VARIABLES ADDED BY TRANSFORMATIONS. .          2
TOTAL NUMBER OF VARIABLES . . . . . . . . . . .         35
NUMBER OF CASES TO READ IN. . . . . . . . . . .         50
CASE LABELING VARIABLES . . . . . . . . . . . .ID1        ID2
MISSING VALUES CHECKED BEFORE OR AFTER TRANS. . NEITHER
BLANKS ARE. . . . . . . . . . . . . . . . . . . MISSING
INPUT UNIT NUMBER . . . . . . . . . . . . . . .          7
REWIND INPUT UNIT PRIOR TO READING. . DATA. . .        YES
NUMBER OF WORDS OF DYNAMIC STORAGE. . . . . . .      19998
NUMBER OF CASES DESCRIBED BY INPUT FORMAT . . .          1

***** TRAN     PARAGRAPH IS USED *****

VARIABLES TO BE USED
    27 CL          25 HCO3        35 CAMG        29 F           24 V
0INPUT FORMAT IS
 (7X,2A4////2(7X,F8.0/),7X,F8.0/////7X,F8.0//////3(5X,A2,F8.0/), 2(5X,A2,F8.0//)/
 5X,A2,F8.0//,5X,A2,F8.0/2(5X,A2,F8.0//),  //7X,F8.0////4(5X,A2,F8.0/)//)

0MAXIMUM LENGTH DATA RECORD IS   15 CHARACTERS.
1PAGE   3 BMDP2M  P2M CLUSTER ANALYSIS FOR MONSANTO SODA SPRINGS PLANT  WATER QUALITY DATA, FEB, 1985
```

0I N P U T V A R I A B L E S . . . . .

VARIABLE INDEX	VARIABLE NAME	RECORD NO.	COLUMNS BEGIN	COLUMNS END	FIELD WIDTH	TYPE
1	ID1	1	8	11	4	A
2	ID2	1	12	15	4	A
3	PH	5	8	15	8	F
4	EH	6	8	15	8	F
5	C	7	8	15	8	F
6	TDS	12	8	15	8	F
7	L1	18	6	7	2	A
8	CA	18	8	15	8	F
9	L2	19	6	7	2	A
10	MG	19	8	15	8	F
11	L3	20	6	7	2	A
12	NA	20	8	15	8	F
13	L4	21	6	7	2	A
14	K	21	8	15	8	F
15	L5	23	6	7	2	A
16	CD	23	8	15	8	F
17	L14	26	6	7	2	A
18	FE	26	8	15	8	F
19	L15	28	6	7	2	A
20	MN	28	8	15	8	F
21	L6	29	6	7	2	A
22	SE	29	8	15	8	F
23	L7	31	6	7	2	A
24	V	31	8	15	8	F
25	HCO3	35	8	15	8	F
26	L8	39	6	7	2	A
27	CL	39	8	15	8	F
28	L9	40	6	7	2	A
29	F	40	8	15	8	F
30	L10	41	6	7	2	A
31	NOX	41	8	15	8	F
32	L11	42	6	7	2	A
33	SO4	42	8	15	8	F

```
1PAGE   4 BMDP2M  P2M CLUSTER ANALYSIS FOR MONSANTO SODA SPRINGS PLANT  WATER QUALITY DATA, FEB, 1985

0BASED ON INPUT FORMAT SUPPLIED   45 RECORDS READ PER CASE.
0*** WARNING ---    3 EXTRA RECORDS AT END OF EACH CASE ***

NUMBER OF CASES READ. . . . . . . . . . . . . .         50
PRINT DISTANCE MATRIX . . . . . . . . . . . . .        YES
TYPE OF TREE PRINTED. . . . . . . . . . . . . .   VERTICAL
CALCULATING PROCEDURE . . . . . . . . . . . . .   SUM-SQR
```

5	TW3	-.335	1.409	-.428	-.542	-.174	1.000
6	TW4	-.335	1.620	-.446	-.542	-.176	1.000
7	TW5	-.335	-.644	.718	1.524	-.144	1.000
8	TW6	-.335	-.513	.718	1.889	-.142	1.000
9	TW7	-.335	1.488	-.371	-.547	-.185	1.000
10	TW8	-.335	3.128	-.509	-.556	-.199	1.000
11	TW9	-.335	1.749	-.446	-.539	-.171	1.000
12	TW10	-.335	.427	.013	-.409	-.167	1.000
13	TW11	-.335	-.299	.013	-.565	-.102	1.000
14	TW12	5.474	-.323	1.131	-.563	-.099	1.000
15	TW13	-.335	-.334	-.543	-.534	-.099	1.000
16	TW14	-.335	-.410	-.555	-.551	-.099	1.000
17	TW15	-.335	-.286	-.537	-.483	-.079	1.000
18	TW16	1.601	-.002	.059	.786	-.143	1.000
19	TW17	-.335	-.534	1.131	.536	-.191	1.000
20	TW18	-.335	1.654	-.486	-.556	-.189	1.000
21	TW19	-.335	-.592	-.205	-.374	-.141	1.000
22	TW20	-.335	-.789	-.239	-.146	-.135	1.000
23	TW21	-.335	1.846	-.486	-.567	-.197	1.000
24	TW22	.070	-.881	.730	1.524	-.124	1.000
25	TW23	-.335	.330	-.125	-.356	-.159	1.000
26	TW24	-.335	-1.653	.701	.187	6.926	1.000
27	TW25	-.335	-.170	.059	-.556	-.196	1.000
28	TW26	-.335	-.565	.426	-.480	-.177	1.000
29	TW27	-.335	-.836	-.228	-.146	-.100	1.000
30	TW28	-.335	.709	-.446	-.573	-.122	1.000
31	TW29	-.335	.103	-.503	-.546	-.120	1.000
32	TW30	-.335	-.378	.483	.015	-.137	1.000
33	TW31	.881	-.513	-.497	-.553	-.078	1.000
34	TW32	2.232	-1.223	-.474	-.573	-.183	1.000
35	TW33	2.142	-.363	-.469	-.570	-.077	1.000
36	TW34	-.335	-.363	-.234	-.535	-.153	1.000
37	TW35	-.335	2.199	-.417	-.547	-.190	1.000
38	TW36	-.335	-.729	-.021	1.455	-.147	1.000
39	TW37	.791	-.265	.626	4.823	-.098	1.000
40	TW38	-.335	-.349	-.428	-.558	-.100	1.000
41	TW39	-.335	-1.087	-.102	.583	-.167	1.000
42	TW40	.881	-1.350	6.164	1.455	-.110	1.000
43	HOOPER	-.335	.872	-.555	-.511	-.166	1.000
44	DOCK	-.335	.956	-.532	-.504	-.169	1.000
45	LEWIS	-.335	-.378	-.377	-.523	-.127	1.000
46	EFFLUENT	-.335	-.299	-.170	-.435	-.118	1.000
47	SWG	-.335	-.715	-.279	.694	-.137	1.000
48	CALF	-.335	-.697	-.234	.925	-.138	1.000
49	MORMAN	-.335	-.657	-.153	1.264	-.142	1.000
50	SW SPRIN	-.335	.941	-.411	-.334	-.167	1.000

1PAGE 6 BMDP2M P2M CLUSTER ANALYSIS FOR MONSANTO SODA SPRINGS PLANT WATER QUALITY DATA, FEB, 1985

					24	25	27	29	35
					Y	HCO3	CL	F	CARB
1	.056	20	6	2.000	-.335	1.637	-.466	-.549	-.182

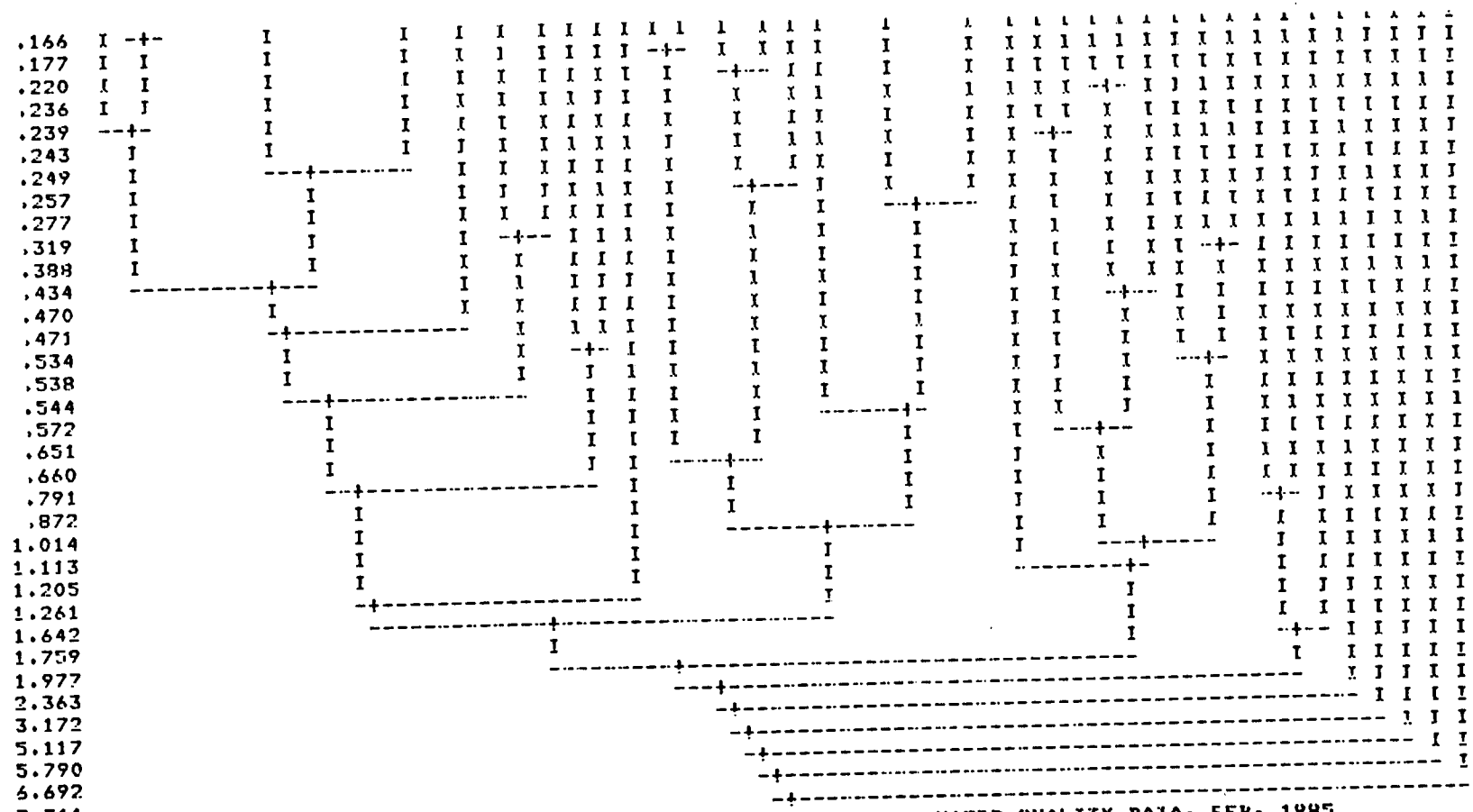
16	.177	25	12	2.000	-.335	.379	-.056	-.382	-.165
17	.220	50	43	3.000	-.335	.923	-.499	-.450	-.167
18	.236	48	47	2.000	-.335	-.706	-.256	.810	-.137
19	.239	13	1	3.000	-.335	-.259	.032	-.485	-.142
20	.243	49	38	2.000	-.335	-.693	-.087	1.359	-.145
21	.249	3	2	10.000	-.335	-.335	-.393	-.517	-.114
22	.257	43	30	4.000	-.335	.870	-.486	-.481	-.156
23	.277	6	5	6.000	-.335	1.628	-.444	-.549	-.182
24	.319	22	21	3.000	-.335	-.739	-.224	-.222	-.126
25	.388	8	7	2.000	-.335	-.578	.718	1.706	-.143
26	.434	2	1	13.000	-.335	-.317	-.295	-.510	-.120
27	.470	47	41	3.000	-.335	-.833	-.205	.734	-.147
28	.471	31	1	14.000	-.335	-.287	-.310	-.512	-.120
29	.534	32	28	2.000	-.335	-.472	.454	-.232	-.157
30	.538	24	7	3.000	-.200	-.679	.722	1.646	-.136
31	.544	21	1	17.000	-.335	-.367	-.295	-.461	-.121
32	.572	37	5	7.000	-.335	1.709	-.440	-.549	-.183
33	.651	41	38	5.000	-.335	-.777	-.158	.984	-.146
34	.660	30	12	6.000	-.335	.706	-.342	-.448	-.158
35	.791	28	1	19.000	-.335	-.378	-.216	-.437	-.125
36	.872	35	34	2.000	2.187	-.793	-.471	-.572	-.130
37	1.014	12	5	13.000	-.335	1.246	-.395	-.502	-.172
38	1.113	38	7	8.000	-.284	-.740	.172	1.232	-.143
39	1.205	19	7	9.000	-.290	-.717	.279	1.155	-.148
40	1.261	33	1	20.000	-.274	-.385	-.230	-.443	-.123
41	1.642	5	1	33.000	-.298	.258	-.295	-.466	-.142
42	1.759	34	18	3.000	1.992	-.529	-.295	-.119	-.134
43	1.977	7	1	42.000	-.296	.049	-.172	-.119	-.143
44	2.363	18	1	45.000	-.144	.010	-.180	-.119	-.143
45	3.172	10	1	46.000	-.148	.078	-.187	-.128	-.144
46	5.117	39	1	47.000	-.128	.071	-.170	-.023	-.143
47	5.790	14	1	48.000	-.011	.063	-.143	-.034	-.142
48	6.692	42	1	49.000	.007	.034	-.014	-.004	-.141
49	7.311	26	1	50.000	-.000	.000	.000	.000	.000

1PAGE 7 BMDP2M . P2M CLUSTER ANALYSIS FOR MONSANTO SODA SPRINGS PLANT WATER QUALITY DATA, FEB, 1985

Dil — Fresh — Slightly Cont. — & fresh — More Soda — Dil Contaminated — Highly not Fresh

CASE NO.	LABEL
1	PW1
27	TW125
13	TW111
3	PW3
45	LEWIS
40	TW318
16	TW114
15	TW113
17	TW115
4	TW2
46	EFFLUENT
36	TW34
2	PW2
31	TW29
22	TW20
29	TW27
21	TW19
32	TW30
28	TW26
33	TW31
12	TW10
25	TW23
43	HOOPER
44	DOCK
50	SW SPRIN
30	TW28
37	TW35
6	TW4
20	TW18
23	TW21
11	TW9
9	TW7
5	TW3
19	TW17
38	TW36
49	MORNAN
47	SWG
48	CALF
41	TW39
24	TW22
8	TW6
7	TW5
34	TW32
35	TW33
18	TW16
10	TW8
39	TW37
14	TW12
42	TW40
26	TW24

AMALG.
DISTANCE
* * * * * * * * * * * * * * * * * * *!* *



1PAGE 8 BMDP2M P2M CLUSTER ANALYSIS FOR MONSANTO SODA SPRINGS PLANT WATER QUALITY DATA, FEB, 1985

0DISTANCES BETWEEN CASES REPRESENTED IN SHADED FORM.
HEAVY SHADING INDICATES SMALL DISTANCES.

0CASE NO.	CASE LABEL	
1	PW1	X
27	TW25	XX
13	TW11	XXX
3	PW3	XXXX
45	LEWIS	XXXXX
40	TW38	XXXXXX
[illegible]	[illegible]	[illegible]

```
25 TW23      XXXXXX+XXXXXXX++++++XX
43 HOOPER    +++++++++++++X--+---XXX
44 DOCK      +++++++++++++X--+---XXXX
50 SW SPRIN  ++++++++++++++--++--XXXXX
30 TW28      ++++++++++++++X+++++-XXXXXX
37 TW35      .............-......--++++X
 6 TW4       -------------+..---.++XXX+XX
20 TW18      -------------+..--..++XXX+XXX
23 TW21      --------------......++++++XXXX
11 TW9       --------------..-...+++XX+XXXXX
 9 TW7       -------------+------++XXXXXXXXXX
 5 TW3       -------------+------++XXXXXXXXXXX
19 TW17      +++-----------+++X+---..--.......X
38 TW36      --------------++-+-.--.... ......+X
49 NORMAN    --------------++-+---..-- ......+XX
47 SWG       ++++++++++++++XX+++-++----.......+XXX
48 CALF      +++++++++++++-+++++-------.......+XXXX
41 TW39      +++++++++++++-XX+++------- ......++XXXX
24 TW22      ---.......---.-----.......     ..++++++X
 8 TW6       -.............--.-........     ..+++++-XX
 7 TW5       -----....---.---+-.--..... .. ...+X++++XXX
34 TW32      ....................+......       .......  X
35 TW33      ....................+...... ............  +X
18 TW16      --........-.-.----.---.........-------.--+X
10 TW8        .           .      ..---.+++++--            X
39 TW37                                                .     X
14 TW12                                                        X
42 TW40                                                         X
26 TW24                                                          X
```

0
0THE DISTANCES HAVE BEEN REPRESENTED ABOVE IN SHADED
FORM ACCORDING TO THE FOLLOWING SCHEME

X			LESS THAN	.864
+	FROM	.864	TO	1.635
-	FROM	1.635	TO	2.375
.	FROM	2.375	TO	3.392
			GREATER THAN	3.392

1PAGE 9 BMDP2M P2M CLUSTER ANALYSIS FOR MONSANTO SODA SPRINGS PLANT WATER QUALITY DATA, FEB, 1985

0 INITIAL DISTANCES BETWEEN CASES

CASE NUMBER	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	0.00	.32	.41	.56	1.79	2.00	2.01	2.34	1.85	3.48	2.12	.74	.23	5.92	.60
2	.32	0.00	.09	.23	1.74	1.95	2.25	2.57	1.81	3.46	2.08	.80	.30	5.98	.28
3	.41	.09	0.00	.16	1.75	1.96	2.32	2.63	1.83	3.47	2.09	.85	.36	5.99	.20

18	2.26	2.36	2.39	2.44	2.78	2.90	2.27	2.38	2.82	3.96	2.97	2.32	2.38	3.23	2.44
19	1.43	1.74	1.82	1.97	2.71	2.88	1.08	1.42	2.74	4.16	2.98	1.75	1.59	5.92	2.00
20	2.04	1.99	2.00	1.93	.25	.06	3.33	3.48	.20	1.47	.11	1.33	2.02	6.35	1.99
21	.37	.30	.32	.46	2.02	2.23	2.11	2.44	2.09	3.74	2.36	1.04	.41	5.97	.46
22	.58	.58	.59	.71	2.24	2.45	1.93	2.27	2.32	3.95	2.58	1.27	.69	6.00	.67
23	2.23	2.18	2.19	2.12	.44	.23	3.47	3.61	.38	1.28	.11	1.51	2.20	6.41	2.18
24	2.11	2.34	2.40	2.52	3.32	3.47	.47	.66	3.36	4.70	3.57	2.48	2.32	5.83	2.51
25	.66	.67	.72	.73	1.14	1.34	2.28	2.54	1.20	2.83	1.47	.18	.68	5.98	.81
26	7.23	7.27	7.27	7.32	7.85	7.94	7.27	7.36	7.88	8.70	7.99	7.45	7.23	9.25	7.29
27	.27	.38	.44	.55	1.65	1.86	2.23	2.56	1.71	3.35	1.98	.62	.17	5.91	.63
28	.50	.74	.80	.96	2.15	2.35	2.03	2.39	2.20	3.81	2.47	1.08	.50	5.86	1.00
29	.62	.62	.63	.75	2.29	2.50	1.93	2.27	2.36	4.00	2.62	1.31	.72	6.00	.71
30	1.15	1.05	1.05	.98	.70	.91	2.75	2.98	.79	2.42	1.04	.56	1.11	6.11	1.05
31	.70	.49	.47	.38	1.31	1.52	2.52	2.79	1.39	3.03	1.65	.63	.66	6.05	.44
32	.58	.90	.98	1.13	2.08	2.27	1.55	1.89	2.13	3.69	2.39	1.02	.75	5.87	1.17
33	1.36	1.26	1.24	1.24	2.28	2.46	2.70	2.99	2.35	3.84	2.57	1.63	1.34	4.88	1.23
34	2.78	2.73	2.72	2.74	3.68	3.83	3.57	3.82	3.74	5.05	3.93	3.10	2.77	3.73	2.72
35	2.54	2.49	2.48	2.48	3.05	3.17	3.47	3.69	3.10	4.28	3.26	2.65	2.52	3.70	2.48
36	.33	.09	.12	.27	1.78	1.99	2.29	2.61	1.86	3.50	2.12	.84	.26	5.97	.32
37	2.55	2.52	2.54	2.47	.79	.58	3.70	3.82	.71	.93	.45	1.83	2.54	6.52	2.54
38	1.84	1.99	2.03	2.12	2.95	3.11	.75	.88	3.01	4.38	3.21	2.19	2.07	6.27	2.09
39	5.31	5.49	5.54	5.61	5.83	5.90	3.51	3.15	5.85	6.56	5.94	5.43	5.54	7.16	5.60
40	.51	.18	.10	.10	1.76	1.97	2.40	2.71	1.84	3.48	2.10	.91	.44	6.02	.12
41	1.21	1.32	1.35	1.46	2.76	2.95	1.32	1.65	2.82	4.39	3.07	1.81	1.40	6.10	1.42
42	6.59	6.90	6.98	7.13	7.52	7.61	5.62	5.66	7.50	8.37	7.66	6.78	6.67	7.18	7.17
43	1.33	1.23	1.23	1.15	.55	.76	2.84	3.05	.64	2.26	.88	.73	1.30	6.17	1.21
44	1.39	1.30	1.31	1.23	.47	.67	2.87	3.07	.56	2.17	.80	.77	1.37	6.18	1.29
45	.45	.13	.06	.15	1.79	2.00	2.34	2.65	1.87	3.51	2.13	.90	.40	6.00	.17
46	.22	.11	.19	.34	1.73	1.94	2.18	2.50	1.80	3.45	2.07	.75	.23	5.95	.39
47	1.15	1.23	1.26	1.35	2.46	2.65	1.30	1.57	2.53	4.05	2.76	1.61	1.36	6.12	1.31
48	1.34	1.45	1.48	1.57	2.57	2.75	1.13	1.37	2.64	4.11	2.86	1.76	1.56	6.16	1.54
49	1.65	1.77	1.81	1.90	2.76	2.92	.91	1.08	2.82	4.22	3.02	2.00	1.87	6.23	1.87
50	1.32	1.28	1.29	1.24	.51	.71	2.69	2.89	.59	2.20	.83	.67	1.33	6.15	1.30

0 INITIAL DISTANCES BETWEEN CASES (CONTINUED)

CASE NUMBER	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1	.63	.58	2.26	1.43	2.04	.37	.58	2.23	2.11	.66	7.23	.27	.50	.62	1.15
2	.31	.27	2.36	1.74	1.99	.30	.58	2.18	2.34	.67	7.27	.38	.74	.62	1.05
3	.23	.21	2.39	1.82	2.00	.32	.59	2.19	2.40	.72	7.27	.44	.80	.63	1.05
4	.16	.11	2.44	1.97	1.93	.46	.71	2.12	2.52	.73	7.32	.55	.96	.75	.98
5	1.83	1.70	2.78	2.71	.25	2.02	2.24	.44	3.32	1.14	7.85	1.65	2.15	2.29	.70
6	2.03	1.91	2.90	2.88	.06	2.23	2.45	.23	3.47	1.34	7.94	1.86	2.35	2.50	.91
7	2.45	2.40	2.27	1.08	3.33	2.11	1.93	3.47	.47	2.28	7.27	2.23	2.03	1.93	2.75
8	2.75	2.69	2.38	1.42	3.48	2.44	2.27	3.61	.66	2.54	7.36	2.56	2.39	2.27	2.98
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.20	2.09	2.32	.38	3.36	1.20	7.88	1.71	2.20	2.36	.79

24	2.52	2.48	2.03	1.19	3.52	2.17	1.98	3.67	0.00	2.43	7.42	.57	1.06	1.19	.54
25	.88	.76	2.28	1.77	1.39	.93	1.14	1.57	2.43	0.00	7.42	7.34	7.22	7.14	7.56
26	7.28	7.27	7.56	7.23	7.97	7.23	7.18	8.06	7.23	7.42	0.00	0.00	.54	.84	1.02
27	.67	.62	2.36	1.57	1.90	.53	.80	2.09	2.33	.57	7.34	.54	0.00	.79	1.55
28	1.00	1.01	2.41	1.24	2.40	.64	.78	2.58	2.09	1.06	7.22	.84	.79	0.00	1.62
29	.67	.72	2.32	1.55	2.54	.34	.06	2.73	1.97	1.19	7.14	1.02	1.55	1.62	0.00
30	1.12	1.00	2.52	2.29	.95	1.34	1.57	1.14	2.91	.54	7.56	.63	1.15	1.06	.61
31	.52	.40	2.42	2.06	1.55	.78	1.01	1.74	2.63	.48	7.40	.74	.53	.86	1.55
32	1.18	1.14	2.16	.85	2.32	.82	.85	2.50	1.66	1.00	7.18	1.39	1.53	1.35	1.73
33	1.22	1.24	1.70	2.31	2.49	1.27	1.34	2.66	2.57	1.54	7.34	2.83	2.80	2.64	3.21
34	2.70	2.74	2.01	3.30	3.86	2.67	2.65	4.00	3.26	3.03	7.70	2.54	2.64	2.57	2.70
35	2.48	2.48	1.59	3.16	3.20	2.51	2.56	3.32	3.22	2.60	7.67	.35	.696	.62	1.09
36	.33	.33	2.39	1.74	2.03	.28	.58	2.22	2.37	.72	7.29	2.42	2.89	3.07	1.49
37	2.61	2.49	3.26	3.32	.55	2.80	3.02	.36	3.91	1.90	8.20	2.09	1.99	1.62	2.52
38	2.10	2.05	2.18	1.49	3.15	1.84	1.62	3.31	.87	2.10	7.28	5.53	5.43	5.20	5.70
39	5.62	5.55	4.17	4.47	5.93	5.39	5.19	6.00	3.43	5.39	8.60	.53	.89	.67	1.06
40	.14	.15	2.43	1.92	2.01	.38	.63	2.20	2.47	.77	7.27	1.47	1.30	.78	2.16
41	1.40	1.41	2.23	1.35	2.99	1.08	.80	3.17	1.34	1.70	7.17	6.65	6.23	6.72	7.32
42	7.18	7.16	6.33	5.32	7.67	6.78	6.73	7.75	5.51	6.86	9.08	1.21	1.74	1.78	.21
43	1.28	1.16	2.56	2.43	.79	1.51	1.73	.98	3.01	.71	7.66	1.27	1.80	1.85	.28
44	1.37	1.25	2.58	2.46	.70	1.59	1.81	.89	3.04	.76	7.69	.49	.83	.61	1.09
45	.18	.20	2.41	1.85	2.04	.31	.57	2.23	2.41	.77	7.28	.30	.66	.61	1.05
46	.42	.37	2.32	1.64	1.98	.30	.57	2.17	2.27	.64	7.25	1.41	1.38	.85	1.91
47	1.31	1.28	2.09	1.43	2.69	1.08	.84	2.86	1.38	1.49	7.21	1.60	1.56	1.08	2.07
48	1.54	1.50	2.08	1.43	2.79	1.30	1.08	2.96	1.22	1.65	7.23	1.90	1.84	1.42	2.31
49	1.88	1.83	2.11	1.48	2.96	1.64	1.42	3.12	1.03	1.90	7.27	1.23	1.73	1.80	.34
50	1.38	1.25	2.47	2.30	.75	1.55	1.75	.94	2.87	.68	7.65				

1PAGE 11 BMDP2M P2M CLUSTER ANALYSIS FOR MONSANTO SODA SPRINGS PLANT WATER QUALITY DATA, FEB, 1985

INITIAL DISTANCES BETWEEN CASES (CONTINUED)

0

CASE NUMBER	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45
1	.70	.58	1.36	2.78	2.54	.33	2.55	1.84	5.31	.51	1.21	6.59	1.33	1.39	.45
2	.49	.90	1.26	2.73	2.49	.09	2.52	1.99	5.49	.18	1.32	6.90	1.23	1.30	.13
3	.47	.98	1.24	2.72	2.48	.12	2.54	2.03	5.54	.10	1.35	6.98	1.23	1.31	.06
4	.38	1.13	1.24	2.74	2.48	.27	2.47	2.12	5.61	.10	1.46	7.13	1.15	1.23	.15
5	1.31	2.08	2.28	3.68	3.05	1.78	.79	2.95	5.83	1.76	2.76	7.52	.55	.47	1.79
6	1.52	2.27	2.46	3.83	3.17	1.99	.58	3.11	5.90	1.97	2.95	7.61	.76	.67	2.00
7	2.52	1.55	2.70	3.57	3.47	2.29	3.70	.75	3.51	2.40	1.32	5.62	2.84	2.87	2.34
8	2.79	1.89	2.99	3.82	3.69	2.61	3.82	.88	3.15	2.71	1.65	5.66	3.05	3.07	2.65
9	1.39	2.13	2.35	3.74	3.10	1.86	.71	3.01	5.85	1.84	2.82	7.50	.64	.56	1.87
10	3.03	3.69	3.84	5.05	4.28	3.50	.93	4.38	6.56	3.48	4.39	8.37	2.26	2.17	3.51
11	1.65	2.39	2.57	3.93	3.26	2.12	.45	3.21	5.94	2.10	3.07	7.66	.88	.80	2.13
12	.63	1.02	1.63	3.10	2.65	.84	1.83	2.19	5.43	.91	1.81	6.78	.73	.77	.90
13	.66	.75	1.34	2.77	2.52	.26	2.54	2.07	5.54	.44	1.40	6.67	1.30	1.37	.40
14	6.05	5.87	4.88	3.73	3.70	5.97	6.52	6.27	7.16	6.02	6.10	7.18	6.17	6.18	6.00
15	.44	1.17	1.23	2.72	2.48	.32	2.54	2.09	5.60	.12	1.42	7.17	1.21	1.29	.17

30	.61	1.55	1.73	3.21	2.70	1.09	1.49	2.52	5.70	1.06	2.16	7.32	.21	.28	1.07
31	0.00	1.23	1.36	2.89	2.52	.54	2.10	2.22	5.61	.46	1.69	7.21	.77	.86	.50
32	1.23	0.00	1.67	2.93	2.72	.90	2.79	1.56	4.94	1.08	1.08	6.06	1.71	1.76	1.01
33	1.36	1.67	0.00	1.53	1.27	1.26	2.98	2.41	5.50	1.23	1.81	7.01	1.85	1.91	1.23
34	2.89	2.93	1.53	0.00	.87	2.72	4.28	3.34	5.77	2.71	2.84	7.07	3.32	3.37	2.71
35	2.52	2.72	1.27	.87	0.00	2.49	3.57	3.25	5.67	2.48	2.85	7.12	2.77	2.81	2.48
36	.54	.90	1.26	2.72	2.49	0.00	2.57	2.03	5.54	.20	1.34	6.88	1.28	1.35	.15
37	2.10	2.79	2.98	4.28	3.57	2.57	0.00	3.57	6.11	2.55	3.49	7.84	1.33	1.25	2.58
38	2.22	1.56	2.41	3.34	3.25	2.03	3.57	0.00	3.64	2.09	.95	6.33	2.59	2.63	2.04
39	5.61	4.94	5.50	5.77	5.67	5.54	6.11	3.64	0.00	5.60	4.52	6.57	5.69	5.70	5.56
40	.46	1.08	1.23	2.71	2.48	.20	2.55	2.09	5.60	0.00	1.40	7.07	1.23	1.31	.07
41	1.69	1.08X	1.81	2.84	2.85	1.34	3.49	.95	4.52	1.40	0.00	6.45	2.29	2.35	1.34
42	7.21	6.06	7.01	7.07	7.12	6.88	7.84	6.33	6.57	7.07	6.45	0.00	7.44	7.45	7.01
43	.77	1.71	1.85	3.32	2.77	1.28	1.33	2.59	5.69	1.23	2.29	7.44	0.00	.09	1.26
44	.86	1.76	1.91	3.37	2.81	1.35	1.25	2.63	5.70	1.31	2.35	7.45	.09	0.00	1.34
45	.50	1.01	1.23	2.71	2.48	.15	2.58	2.04	5.56	.07	1.34	7.01	1.26	1.34	0.00
46	.53	.80	1.28	2.75	2.50	.14	2.51	1.94	5.44	.29	1.29	6.80	1.24	1.31	.24
47	1.50	1.08	1.77	2.91	2.81	1.28	3.17	.80	4.40	1.31	.43	6.63	2.01	2.07	1.27
48	1.70	1.20	1.94	3.03	2.92	1.50	3.25	.57	4.17	1.54	.54	6.57	2.15	2.21	1.49
49	1.99	1.43	2.22	3.22	3.11	1.82	3.39	.24	3.83	1.87	.81	6.47	2.38	2.42	1.82
50	.87	1.63	1.91	3.37	2.81	1.33	1.28	2.48	5.51	1.31	2.25	7.29	.24	.21	1.33

1PAGE 12 BMDP2M P2M CLUSTER ANALYSIS FOR MONSANTO SODA SPRINGS PLANT WATER QUALITY DATA, FEB, 1985

0 INITIAL DISTANCES BETWEEN CASES (CONTINUED)

CASE NUMBER	46	47	48	49	50
1	.22	1.15	1.34	1.65	1.32
2	.11	1.23	1.45	1.77	1.28
3	.19	1.26	1.48	1.81	1.29
4	.34	1.35	1.57	1.90	1.24
5	1.73	2.46	2.57	2.76	.51
6	1.94	2.65	2.75	2.92	.71
7	2.18	1.30	1.13	.91	2.69
8	2.50	1.57	1.37	1.08	2.89
9	1.80	2.53	2.64	2.82	.59
10	3.45	4.05	4.11	4.22	2.20
11	2.07	2.76	2.86	3.02	.83
12	.75	1.61	1.76	2.00	.67
13	.23	1.36	1.56	1.87	1.33
14	5.95	6.12	6.16	6.23	6.15
15	.39	1.31	1.54	1.87	1.30
16	.42	1.31	1.54	1.88	1.38
17	.37	1.28	1.50	1.83	1.25
18	2.32	2.09	2.08	2.11	2.47
19	1.64	1.43	1.43	1.48	2.30
20	1.98	2.69	2.79	2.96	.75
21	.30	1.08	1.30	1.64	1.55
22	.57	.84	1.08	1.42	1.75
23	2.17	2.86	2.96	3.12	.94

```
   38    1.94     .80     .57     .24    2.48
   39    5.44    4.40    4.17    3.83    5.51
   40     .29    1.31    1.54    1.87    1.31
   41    1.29     .43     .54     .81    2.25
   42    6.80    6.63    6.57    6.47    7.29
   43    1.24    2.01    2.15    2.38     .24
   44    1.31    2.07    2.21    2.42     .21
   45     .24    1.27    1.49    1.82    1.33
   46    0.00    1.21    1.42    1.74    1.27
   47    1.21    0.00     .24     .59    1.95
   48    1.42     .24    0.00     .35    2.07
   49    1.74     .59     .35    0.00    2.27
   50    1.27    1.95    2.07    2.27    0.00

 NUMBER OF INTEGER WORDS OF STORAGE USED IN PRECEDING    PROBLEM    2106
 CPU TIME USED      2.464 SECONDS

1PAGE  13
0BMDP2M - CLUSTER ANALYSIS OF CASES
 EXECUTED ON 85/04/16.AT 15.15.47.

 PROGRAM CONTROL INFORMATION


 NO MORE CONTROL LANGUAGE.

 PROGRAM TERMINATED
 15.13.16.NEWCLUS,P2,CM200000,T5.
 15.13.17.*
 15.13.17.*****************************************
 15.13.17.* M A I L I N G  I N F O R M A T I O N *
 15.13.17.*.......................................*
 15.13.17.*                                       *
 15.13.17.* NAME    - KFJ                         *
 15.13.17.* PHONE   -                             *
 15.13.17.* MAIL TO -                             *
 15.13.17.*                                       *
 15.13.17.*****************************************
 15.13.17.*
 15.13.17.USER,YGAI06,.          KFJ
 15.13.17. CHARGE LIMITS OVERRIDDEN
 15.13.17.
 15.13.17. JOB ENTRY 85/04/16. 14.43.27.
 15.13.17. OWNING ST=EKS1      OWNING UN=YGAI06
 15.13.17. ORIGIN ST=EKS1      ORIGIN UN=(LOCAL)
 15.13.17. DEST   ST=EKS1      DEST   UN=(LOCAL)
 15.13.19.MAP,OFF.
 15.13.19.GET,TAPE7=NEWBOET.
 15.13.19.GET,BMDP/UN=EKSAPP.
 15.13.20.CALL,BMDP(PROG=BMDP2M)
 15.13.20.ATTACH,BMDP82/UN=EKSAPP.
 15.13.21.CALL,BMDP82,BMDP2M.
```

```
15.13.21.REWIND,BMDP2M.
15.13.21.SKIPF,BMDP82,14.
15.13.30.COPYBF,BMDP82,BMDP2M.
15.13.31. COPY COMPLETE.
15.13.31.REWIND,BMDP2M.
15.13.31.RETURN,BMDP82.
15.13.31.*
15.13.31.BMDP2M,D=TAPE7,L=MONOUT,W=20000.
15.13.34.$FCL      LVL-564   VER-83265
15.13.35./PRG USED/BMDP82M
15.15.47.    STOP  -  END BMDP.
15.15.47.    137000 MAXIMUM EXECUTION FL.
15.15.47.     2.483 CP SECONDS EXECUTION TIME.
15.15.47. REPRIEVED NORMAL TERMINATION.
15.15.47. JOB REPRIEVED.
15.15.47. RPV - PREVIOUS ERROR CONDITIONS RESET.
15.15.47.EXIT,U.
15.15.48.COST,LO=F.
15.15.48.
15.15.48. RUN DATE  85/04/16.  RUT SECS    29.105
15.15.48. UNITS        NUMBER      CCUS   PERCENT
15.15.48. CPU SECS      2.520    78.098    53.675
15.15.48. CMP UNITS     2.906    27.179    18.679
15.15.48. DISK REQS       250    11.888     8.170
15.15.48. DISK SECT     14890    28.324    19.466
15.15.48. JOB PROCESSING CCUS   145.500
15.15.48.
15.15.48. AVERAGE CM USED (DECIMAL)          14546
15.15.48. AVERAGE CM USED (OCTAL)            34322
15.15.48. MAX FIELD LENGTH USED (OCTAL)     137000
15.15.48. ITEMS CHARGED SEPARATELY
                                                    15.15.48.DAYFILE,MONOUT.
```

1
S


```
BOEING COMPUTER SERVICES
SEATTLE, WA. 98188

S P S S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

VERSION 8.3 (NOS) -- MAY 04, 1982

100000 CM MAXIMUM FIELD LENGTH REQUEST


          RUN NAME        T-TEST ON WELLS UPSTREAM AND DOWNSTREAM FROM SOURCE
          VARIABLE LIST   CD,SE,F,SO4,CL,V,LOCATION,UNIT,WELL
          INPUT FORMAT    FIXED(6F10.0,2F5.0,2X,F2.0)


         ACCORDING TO YOUR INPUT FORMAT, VARIABLES ARE TO BE READ AS FOLLOWS

         VARIABLE  FORMAT  RECORD    COLUMNS

         CD        F10. 0       1     1-  10
         SE        F10. 0       1    11-  20
         F         F10. 0       1    21-  30
         SO4       F10. 0       1    31-  40
         CL        F10. 0       1    41-  50
         V         F10. 0       1    51-  60
         LOCATION  F 5. 0       1    61-  65
         UNIT      F 5. 0       1    66-  70
         WELL      F 2. 0       1    73-  74

THE INPUT FORMAT PROVIDES FOR   9 VARIABLES.    9 WILL BE READ.
IT PROVIDES FOR  1 RECORDS (*CARDS*) PER CASE.
A MAXIMUM OF    74 *COLUMNS* ARE USED ON A RECORD.

          N OF CASES      16
          VALUE LABELS    LOCATION (0) UPSTREAM OF SOURCE
                                   (1) DOWNSTREAM OF SOURCE/
                          UNIT (0) UPPER BASALT
                               (1) LOWER BASALT
          MISSING VALUES CD TO V(BLANK)
          IF              (WELL EQ 15) WELL=29
          IF              (WELL EQ 18) WELL=28

CPU TIME REQUIRED..       .020 SECONDS


          T-TEST          GROUPS-WELL(29,16)/VARIABLES-CD TO V
          READ INPUT DATA

     00036100 CM NEEDED FOR T-TEST
```



```
FILE   NONAME   (CREATION DATE = 85/06/21.)
- - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - T - T E S T - - - - - - - - - - - - - - - - - - - - - - - -
```

GROUP 1 - WELL EQ 29.
GROUP 2 - WELL EQ 16.

VARIABLE		NUMBER OF CASES	MEAN	STANDARD DEVIATION	STANDARD ERROR	F VALUE	2-TAIL PROB.	POOLED VARIANCE ESTIMATE T VALUE	DEGREES OF FREEDOM	2-TAIL PROB.	SEPARATE VARIANCE ESTIMATE T VALUE	DEGREES OF FREEDOM	2-TAIL PROB.
CD	GROUP 1	4	.0025	.002	.001	696.56	.000	-58.97	4	.000	-36.17	1.00	.009 .018
	GROUP 2	2	1.4500	.057	.040								
SE	GROUP 1	4	.0025	.002	.001	∞ 0	0 1.000	-71.15	3	.000	-159.11	3.00	.000 ✓
	GROUP 2	1	.1730	0	0								
F	GROUP 1	4	.4000	.240	.120	3.35	.329	-28.08	4	.000 ✓	-22.09	1.31	.029
	GROUP 2	2	7.7400	.438	.310								
SO4	GROUP 1	4	53.0000	35.562	17.781	3.23	.767	-5.53	4	.005 ✓	-6.85	3.66	.002
	GROUP 2	2	208.0000	19.799	14.000								
CL	GROUP 1	4	15.5000	4.435	2.217	1.09	1.000	-26.98	4	.000 ✓	-27.48	2.17	.001
	GROUP 2	2	118.0000	4.243	3.000								
V	GROUP 1	4	.0475	.021	.010	∞ 0	0 1.000	-8.35	3	.004	-18.68	3.00	.000 ✓
	GROUP 2	1	.2400	0	0								

1T-TEST ON WELLS UPSTREAM AND DOWNSTREAM FROM SOURCE 85/06/21. 12.41.10. PAGE 3

CPU TIME REQUIRED.. .030 SECONDS

T-TEST GROUPS=WELL(29,30)/VARIABLES=CD TO V

00036100 CM NEEDED FOR T-TEST

1T-TEST ON WELLS UPSTREAM AND DOWNSTREAM FROM SOURCE 85/06/21. 12.41.10. PAGE 4

FILE NONAME (CREATION DATE = 85/06/21.)

- T - T E S T -

GROUP 1 - WELL EQ 29.
GROUP 2 - WELL EQ 30.

POOLED VARIANCE ESTIMATE SEPARATE VARIANCE ESTIMATE

GROUP 2 - WELL EQ 30.

VARIABLE		NUMBER OF CASES	MEAN	STANDARD DEVIATION	STANDARD ERROR	F VALUE	2-TAIL PROB.	POOLED VARIANCE ESTIMATE T VALUE	DEGREES OF FREEDOM	2-TAIL PROB.	SEPARATE VARIANCE ESTIMATE T VALUE	DEGREES OF FREEDOM	2-TAIL PROB.
CD	GROUP 1	4	.0025	.002	.001	1.00	1.000	-1.56	4	.195	-2.33	3.00	.102
	GROUP 2	2	~~.0050~~ .0025	~~0~~ .002	~~0~~ .001								
SE	GROUP 1	4	.0025	.002	.001	2.30	.887	-2.03	4	.112	-2.39	3.21	.097
	GROUP 2	2	.0060	.001	.001								
F	GROUP 1	4	.4000	.240	.120	13.18	.072	-6.22	4	.003	-4.14	1.08	.151
	GROUP 2	2	2.9950	.870	.615								
SO4	GROUP 1	4	53.0000	35.562	17.781	5.23	.617	-11.81	4	.000	-15.54	3.98	.000
	GROUP 2	2	378.0000	15.556	11.000								
CL	GROUP 1	4	15.5000	4.435	2.217	58.58	.009	-9.92	4	.001	-6.20	1.02	.102
	GROUP 2	2	165.0000	33.941	24.000								
V	GROUP 1	4	.0475	.021	.010	2.13	.916	-.75	4	.494	-.87	3.09	.448
	GROUP 2	2	.0600	.014	.010								

1T-TEST ON WELLS UPSTREAM AND DOWNSTREAM FROM SOURCE 85/06/21. 12.41.10. PAGE 5

CPU TIME REQUIRED.. .024 SECONDS

T-TEST GROUPS=WELL(29,37)/VARIABLES=CD TO V

00036100 CM NEEDED FOR T-TEST

1T-TEST ON WELLS UPSTREAM AND DOWNSTREAM FROM SOURCE 85/06/21. 12.41.10. PAGE 6

FILE NONAME (CREATION DATE = 85/06/21.)

- T - T E S T -

GROUP 1 - WELL EQ 29.
GROUP 2 - WELL EQ 37.

* POOLED VARIANCE ESTIMATE * SEPARATE VARIANCE ESTIMATE

VARIABLE		NUMBER OF CASES	MEAN	STANDARD DEVIATION	STANDARD ERROR	F VALUE	2-TAIL PROB.	T VALUE	DEGREES OF FREEDOM	2-TAIL PROB.	T VALUE	DEGREES OF FREEDOM	2-TAIL PROB.
CD	GROUP 1	4	.0025	.002	.001	∞ 0	0 1.000	-503.93	3	.000		3.00	.000
	GROUP 2	1	1.2100	0	0								
SE	GROUP 1	4	.0025	.002	.001	∞ 0	0 1.000	-26.50	3	.000	-59.26	3.00	.000
	GROUP 2	1	.0660	0	0								
F	GROUP 1	4	.4000	.240	.120	∞ 0	0 1.000	-115.36	3	.000	-257.95	3.00	.000
	GROUP 2	1	31.3000	0	0								
SO4	GROUP 1	4	53.0000	35.562	17.781	∞ 0	0 1.000	-13.76	3	.001	-30.76	3.00	.000
	GROUP 2	1	600.0000	0	0								
CL	GROUP 1	4	15.5000	4.435	2.217	∞ 0	0 1.000	-40.04	3	.000	-89.52	3.00	.000
	GROUP 2	1	214.0000	0	0								
V	GROUP 1	4	.0475	.021	.010	∞ 0	0 1.000	-4.45	3	.021	-9.94	3.00	.002
	GROUP 2	1	.1500	0	0								

CPU TIME REQUIRED.. .022 SECONDS

T-TEST GROUPS=WELL(29,40)/VARIABLES=CD TO V

00036100 CM NEEDED FOR T-TEST

FILE NONAME (CREATION DATE = 85/06/21.)

- T - T E S T -

GROUP 1 - WELL EQ 29.
GROUP 2 - WELL EQ 40.

VARIABLE	NUMBER OF CASES	MEAN	STANDARD DEVIATION	STANDARD ERROR	F VALUE	2-TAIL PROB.	POOLED VARIANCE ESTIMATE T VALUE	DEGREES OF FREEDOM	2-TAIL PROB.	SEPARATE VARIANCE ESTIMATE T VALUE	DEGREES OF FREEDOM	2-TAIL PROB.

		OF CASES	MEAN	DEVIATION	ERROR	* VALUE	PROB.	* VALUE	FREEDOM	PROB.	* VALUE	FREEDOM	PROB.
CD	GROUP 1	4	.0025	.002	.001	∞ 0	0 1.000		3	.000	[illegible]	3.00	.000
	GROUP 2	1	70.4000	0	0								
SE	GROUP 1	4	.0025	.002	.001	∞ 0	0 1.000	-21.91	3	.000	-48.99	3.00	.000
	GROUP 2	1	.0550	0	0								
F	GROUP 1	4	.4000	.240	.120	∞ 0	0 1.000	-42.93	3	.000	-96.00	3.00	.000
	GROUP 2	1	11.9000	0	0								
SO4	GROUP 1	4	53.0000	35.562	17.781	∞ 0	0 1.000	-43.18	3	.000	-96.56	3.00	.000
	GROUP 2	1	1770.0000	0	0								
CL	GROUP 1	4	15.5000	4.435	2.217	∞ 0	0 1.000	-234.87	3	.000	-525.18	3.00	.000
	GROUP 2	1	1130.0000	0	0								
V	GROUP 1	4	.0475	.021	.010	∞ 0	0 1.000	-4.88	3	.016	-10.91	3.00	.002
	GROUP 2	1	.1600	0	0								

1T-TEST ON WELLS UPSTREAM AND DOWNSTREAM FROM SOURCE 85/06/21. 12.41.10. PAGE 9

CPU TIME REQUIRED.. .023 SECONDS

T-TEST GROUPS=WELL(28,5)/VARIABLES=CD TO V

00036100 CM NEEDED FOR T-TEST

1T-TEST ON WELLS UPSTREAM AND DOWNSTREAM FROM SOURCE 85/06/21. 12.41.10. PAGE 10

FILE NONAME (CREATION DATE = 85/06/21.)

- T - T E S T -

GROUP 1 - WELL EQ 28.
GROUP 2 - WELL EQ 5.

VARIABLE	NUMBER OF CASES	MEAN	STANDARD DEVIATION	STANDARD ERROR	* F VALUE	2-TAIL PROB.	* POOLED VARIANCE ESTIMATE T VALUE	DEGREES OF FREEDOM	2-TAIL PROB.	* SEPARATE VARIANCE ESTIMATE T VALUE	DEGREES OF FREEDOM	2-TAIL PROB.

CD	GROUP 1	4	.0073	.004	.002	629.13	.000	-6.47	4	.003	-3.97	1.00	.157
	GROUP 2	2	.2795	.097	.068								
SE	GROUP 1	4	.0025	.002	.001	9.19	.474	-4.89	4	.008	-6.77	3.89	.002
	GROUP 2	2	.0105	.001	.001								
F	GROUP 1	4	.2450	.056	.028	412.90	.001	-22.89	4	.000	-14.06	1.00	.045
	GROUP 2	2	11.5000	1.131	.800								
SO4	GROUP 1	4	38.5000	28.219	14.110	24.89	.292	-28.04	4	.000	-40.74	3.44	.000
	GROUP 2	2	636.0000	5.657	4.000								
CL	GROUP 1	4	22.2500	3.304	1.652	476.52	.000	-8.26	4	.001	-5.07	1.00	.124
	GROUP 2	2	281.0000	72.125	51.000								
U	GROUP 1	4	.0350	.017	.009	2.06	high	-1.15	4	.313	-1.73	3.00	.182
	GROUP 2	2	.0500	0	0								
			.025	.C85									

1T-TEST ON WELLS UPSTREAM AND DOWNSTREAM FROM SOURCE 85/06/21. 12.41.10. PAGE 11

CPU TIME REQUIRED.. .024 SECONDS

FINISH

TOTAL CPU TIME USED.. .144 SECONDS

RUN COMPLETED

NUMBER OF CONTROL CARDS READ 18
NUMBER OF ERRORS DETECTED 0

```
S
S
1    FULL  DAYFILE.  85/06/21. 12.41.13.*12.41.08* PAGE    1

 12.41.08.TTEST,CM100000,P4,T10.
 12.41.08.*
 12.41.08.*****************************************
 12.41.08.* M A I L I N G  I N F O R M A T I O N *
 12.41.08.*.......................................*
 12.41.08.*                                       *
 12.41.08.* NAME    - KFJ                         *
 12.41.08.* PHONE   -                             *
 12.41.08.* MAIL TO -                             *
 12.41.08.*                                       *
 12.41.08.*****************************************
 12.41.08.*
 12.41.08.USER,YGAI06,.          KFJ
```

```
12.41.08.USER,YGAI06,.          KFJ
12.41.08. CHARGE LIMITS OVERRIDDEN
12.41.08.
12.41.08. JOB ENTRY 85/06/21. 12.31.44.
12.41.08. OWNING ST=EKS1      OWNING UN=YGAI06
12.41.08. ORIGIN ST=EKS1      ORIGIN UN=(LOCAL)
12.41.08. DEST   ST=EKS1      DEST   UN=(LOCAL)
12.41.09.MAP,OFF.
12.41.09.ATTACH,SPSS/UN=EKSAPP.
12.41.09.SPSS.
12.41.12.END SPSS
12.41.12.EXIT,U.
12.41.12.COST,LO=F.
12.41.13.
12.41.13. RUN DATE  85/06/21.  RUT SECS      5.850
12.41.13. UNITS         NUMBER       CCUS   PERCENT
12.41.13. CPU SECS       0.156     10.888    33.232
12.41.13. CMP UNITS      0.275      3.145     9.599
12.41.13. DISK REQS        141     10.215    31.178
12.41.13. DISK SECT       2198      8.507    25.965
12.41.13. JOB PROCESSING CCUS     32.763
12.41.13.
12.41.13. AVERAGE CM USED (DECIMAL)          19107
12.41.13. AVERAGE CM USED (OCTAL)            45243
12.41.13. MAX FIELD LENGTH USED (OCTAL)      75600
12.41.13. ITEMS CHARGED SEPARATELY
12.41.13.DAYFILE.
$
EOI ENCOUNTERED.
C>LIST,FN=TOUT2
```

$sd = \sqrt{\frac{\sum (x_i - \bar{x})^2}{N-1}}$

2.025^2

```
!
S                                                                                    85/06/21.    12.45.11.    PAGE    1
        BOEING COMPUTER SERVICES
        SEATTLE, WA.  98188

        S P S S - - STATISTICAL PACKAGE FOR THE SOCIAL SCIENCES

        VERSION 8.3 (NOS) -- MAY 04, 1982

        100000 CM MAXIMUM FIELD LENGTH REQUEST


                    RUN NAME        T-TEST ON WELLS UPSTREAM AND DOWNSTREAM FROM SOURCE
                    VARIABLE LIST   CD,SE,F,SO4,CL,V,LOCATION,UNIT,WELL
                    INPUT FORMAT    FIXED(6F10.0,2F5.0,2X,F2.0)


                   ACCORDING TO YOUR INPUT FORMAT, VARIABLES ARE TO BE READ AS FOLLOWS

                   VARIABLE  FORMAT  RECORD    COLUMNS

                   CD        F10. 0     1      1-  10
                   SE        F10. 0     1     11-  20
                   F         F10. 0     1     21-  30
                   SO4       F10. 0     1     31-  40
                   CL        F10. 0     1     41-  50
                   V         F10. 0     1     51-  60
                   LOCATION  F 5. 0     1     61-  65
                   UNIT      F 5. 0     1     66-  70
                   WELL      F 2. 0     1     73-  74

THE INPUT FORMAT PROVIDES FOR   9 VARIABLES.    9 WILL BE READ.
IT PROVIDES FOR  1 RECORDS (*CARDS*) PER CASE.
A MAXIMUM OF    74 *COLUMNS* ARE USED ON A RECORD.

                    N OF CASES      16
                    VALUE LABELS    LOCATION (0) UPSTREAM OF SOURCE
                                             (1) DOWNSTREAM OF SOURCE/
                                    UNIT (0) UPPER BASALT
                                         (1) LOWER BASALT
                    MISSING VALUES CD TO V(BLANK)

CPU TIME REQUIRED..        .018 SECONDS


                    T-TEST          GROUPS=WELL(18,28)/VARIABLES=CD TO V
                    READ INPUT DATA

            00036100 CM NEEDED FOR T-TEST


1T-TEST ON WELLS UPSTREAM AND DOWNSTREAM FROM SOURCE                                 85/06/21.    12.45.11.    PAGE    2

 FILE   NONAME   (CREATION DATE =  85/06/21.)
 - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - - T - T E S T - - - - - - - - - - - - - - - - - - - - - - - -

 GROUP 1 - WELL      EQ        18.
 GROUP 2 - WELL      EQ        28.
                                                                                  * POOLED VARIANCE ESTIMATE * SEPARATE VARIANCE ESTIMATE
                                                                                  *                          *
                                                                  *               *                          *
 VARIABLE          NUMBER                STANDARD    STANDARD    *    F    2-TAIL *    T    DEGREES OF 2-TAIL *    T    DEGREES OF  2-TAIL
                  OF CASES     MEAN    DEVIATION     ERROR      *  VALUE  PROB.  *  VALUE   FREEDOM   PROB. *  VALUE   FREEDOM    PROB.
```

VARIABLE		NUMBER OF CASES	MEAN	STANDARD DEVIATION	STANDARD ERROR	F VALUE	2-TAIL PROB.	POOLED VARIANCE ESTIMATE T VALUE	DEGREES OF FREEDOM	2-TAIL PROB.	SEPARATE VARIANCE ESTIMATE T VALUE	DEGREES OF FREEDOM	2-TAIL PROB.
CD	GROUP 1	2	.0055	.001	.001	64.00	.158	-.87	2	.477	-.87	1.03	.545
	GROUP 2	2	.0090	.006	.004								
SE	GROUP 1	2	.0016	.002	.002	1.00	1.000	-.73	2	.542	-.73	2.00	.542
	GROUP 2	2	.0034	.002	.002								
F	GROUP 1	2	.2850	.049	.035	5.44	.516	2.10	2	.170	2.10	1.36	.283
	GROUP 2	2	.2050	.021	.015								
SO4	GROUP 1	2	32.5000 PP	.707	.500	4489.00	.019	-.36	2	.754	-.36	1.00	.781
	GROUP 2	2	44.5000	47.376	33.500								
CL	GROUP 1	2	20.0000	0	0	0	1.000	-1.80	2	.214	-1.80	1.00	.323
	GROUP 2	2	24.5000	3.536	2.500								
V	GROUP 1	2	.0350	.021	.015	1.00	1.000	0	2	1.000	0	2.00	1.000
	GROUP 2	2	.0350	.021	.015								

1T-TEST ON WELLS UPSTREAM AND DOWNSTREAM FROM SOURCE 85/06/21. 12.45.11. PAGE 3

CPU TIME REQUIRED.. .027 SECONDS

T-TEST GROUPS=WELL(5,28)/VARIABLES=CD TO V

00036100 CM NEEDED FOR T-TEST

1T-TEST ON WELLS UPSTREAM AND DOWNSTREAM FROM SOURCE 85/06/21. 12.45.11. PAGE 4

FILE NONAME (CREATION DATE = 85/06/21.)

- T - T E S T -

GROUP 1 - WELL EQ 5.
GROUP 2 - WELL EQ 28.

VARIABLE		NUMBER	MEAN	STANDARD	STANDARD	F	2-TAIL	POOLED VARIANCE ESTIMATE T	DEGREES OF FREEDOM	2-TAIL	SEPARATE VARIANCE ESTIMATE T	DEGREES OF FREEDOM	2-TAIL

VARIABLE		NUMBER OF CASES	MEAN	STANDARD DEVIATION	STANDARD ERROR	*	VALUE	PROB.	*	VALUE	FREEDOM	PROB.	*	VALUE	FREEDOM	PROB.
CD	GROUP 1	2	.2795	.097	.068	*	293.27	.074	*	3.94	2	.059	*	3.94	1.01	.158
	GROUP 2	2	.0090	.006	.004	*			*				*			
SE	GROUP 1	2	.0105	.001	.001	*	10.89	.375	*	4.15	2	.054	*	4.15	1.18	.151
	GROUP 2	2	.0034	.002	.002	*			*				*			
F	GROUP 1	2	11.5000	1.131	.800	*	2844.44	.024	*	14.12	2	.005	*	14.12	1.00	.045
	GROUP 2	2	.2050	.021	.015	*			*				*			
SO4	GROUP 1	2	634.0000	5.657	4.000	*	70.14	.151	*	17.53	2	.003	*	17.53	1.03	.036
	GROUP 2	2	44.5000	47.376	33.500	*			*				*			
CL	GROUP 1	2	281.0000	72.125	51.000	*	416.16	.062	*	5.02	2	.037	*	5.02	1.00	.125
	GROUP 2	2	24.5000	3.536	2.500	*			*				*			
V	GROUP 1	2	.0500	0	0	*	0	1.000	*	1.00	2	.423	*	1.00	1.00	.500
	GROUP 2	2	.0350	.021	.015	*			*				*			

1T-TEST ON WELLS UPSTREAM AND DOWNSTREAM FROM SOURCE 85/06/21. 12.45.11. PAGE 5

CPU TIME REQUIRED.. .024 SECONDS

T-TEST GROUPS=WELL(5,18)/VARIABLES=CD TO V

P 00036100 CM NEEDED FOR T-TEST

1T-TEST ON WELLS UPSTREAM AND DOWNSTREAM FROM SOURCE 85/06/21. 12.45.11. PAGE 6

FILE NONAME (CREATION DATE = 85/06/21.)

- T - T E S T -

GROUP 1 - WELL EQ 5.
GROUP 2 - WELL EQ 18.

VARIABLE		NUMBER OF CASES	MEAN	STANDARD DEVIATION	STANDARD ERROR	*	F VALUE	2-TAIL PROB.	*	POOLED VARIANCE ESTIMATE T VALUE	DEGREES OF FREEDOM	2-TAIL PROB.	*	SEPARATE VARIANCE ESTIMATE T VALUE	DEGREES OF FREEDOM	2-TAIL PROB.
CD	GROUP 1	2	.2795	.097	.068	*	[illegible]	[illegible]	*	[illegible]	[illegible]	[illegible]	*	[illegible]	[illegible]	.156

CD													
	GROUP 1	2	.2795	.097	.068		.009	4.00	2	.057	4.00	1.00	.156
	GROUP 2	2	.0055	.001	.001								
SE													
	GROUP 1	2	.0105	.001	.001	10.89	.375	5.13	2	.036	5.13	1.18	.122
	GROUP 2	2	.0016	.002	.002								
F													
	GROUP 1	2	11.5000	1.131	.800	522.45	.056	14.01	2	.005	14.01	1.00	.045
	GROUP 2	2	.2850	.049	.035								
S04													
	GROUP 1	2	636.0000	5.657	4.000	64.00	.158	149.71	2	.000	149.71	1.03	.004
	GROUP 2	2	32.5000	.707	.500								
CL													
	GROUP 1	2	281.0000	72.125	51.000	∞	0	5.12	2	.036	5.12	1.00	.123
	GROUP 2	2	20.0000	0 real	0	0	1.000						
V													
	GROUP 1	2	.0500	0	0	0	1.000	1.00	2	.423	1.00	1.00	.500
	GROUP 2	2	.0350	.021	.015								

CPU TIME REQUIRED.. .024 SECONDS

```
T-TEST        GROUPS=WELL(15,29)/VARIABLES=CD TO V
00036100 CM NEEDED FOR T-TEST
```


FILE NONAME (CREATION DATE = 85/06/21.)

T - T E S T

GROUP 1 - WELL EQ 15.
GROUP 2 - WELL EQ 29.

VARIABLE	NUMBER OF CASES	MEAN	STANDARD DEVIATION	STANDARD ERROR	F VALUE	2-TAIL PROB.	POOLED VARIANCE ESTIMATE T VALUE	DEGREES OF FREEDOM	2-TAIL PROB.	SEPARATE VARIANCE ESTIMATE T VALUE	DEGREES OF FREEDOM	2-TAIL PROB.
CD												

GROUP 1	2	.0016	.002	.002	1.00	1.000	-.73	2	.542	-.73	2.00	.542
GROUP 2	2	.0034	.002	.002								
SE												
GROUP 1	2	.0016	.002	.002	1.00	1.000	-.73	2	.542	-.73	2.00	.542
GROUP 2	2	.0034	.002	.002								
F												
GROUP 1	2	.4650	.389	.275	37.35	.207	.47	2	.687	.47	1.05	.722
GROUP 2	2	.3350	.064	.045								
SO4												
GROUP 1	2	52.5000	13.435	9.500	20.01	.280	-.02	2	.984	-.02	1.10	.985
GROUP 2	2	53.5000	60.104	42.500								
CL												
GROUP 1	2	12.0000	1.414	1.000	4.00	.590	-3.13	2	.089	-3.13	1.47	.197
GROUP 2	2	19.0000	2.828	2.000								
V												
GROUP 1	2	.0600	.014	.010	2.25	.749	1.39	2	.300	1.39	1.74	.300
GROUP 2	2	.0350	.021	.013								

CPU TIME REQUIRED.. .022 SECONDS

T-TEST GROUPS=WELL(16,30)/VARIABLES=CD TO V

00036100 CM NEEDED FOR T-TEST

FILE NONAME (CREATION DATE = 85/06/21.)

T - T E S T

GROUP 1 - WELL EQ 16.
GROUP 2 - WELL EQ 30.

VARIABLE	NUMBER OF CASES	MEAN	STANDARD DEVIATION	STANDARD ERROR	F VALUE	2-TAIL PROB.	POOLED VARIANCE ESTIMATE T VALUE	DEGREES OF FREEDOM	2-TAIL PROB.	SEPARATE VARIANCE ESTIMATE T VALUE	DEGREES OF FREEDOM	2-TAIL PROB.
CD												
GROUP 1	2	1.4500	.057	.040	0	1.000	36.13	2	.001	36.13	1.00	.018
GROUP 2	2	.0050	0	0								

SE	GROUP 1	1	.1730	0	0	0	1.000	96.42	1	.007	167.00	1.00	.004
	GROUP 2	2	.0060	.001	.001								
F	GROUP 1	2	7.7400	.438	.310	3.94	.594	6.89	2	.020	6.89	1.48	.092
	GROUP 2	2	2.9950	.870	.615								
SO4	GROUP 1	2	208.0000	19.799	14.000	1.62	.848	-9.55	2	.011	-9.55	1.89	.011
	GROUP 2	2	378.0000	15.556	11.000								
CL	GROUP 1	2	118.0000	4.243	3.000	64.00	.158	-1.94	2	.191	-1.94	1.03	.303
	GROUP 2	2	165.0000	33.941	24.000								
V	GROUP 1	1	.2400	0	0	0	1.000	10.39	1	.061	18.00	1.00	.035
	GROUP 2	2	.0600	.014	.010								

CPU TIME REQUIRED.. .026 SECONDS

```
*IF        (WELL EQ 16) WELL=30
T-TEST     GROUPS=WELL(40,30)/VARIABLES=CD TO V
```

00036100 CM NEEDED FOR T-TEST

FILE NONAME (CREATION DATE = 85/06/21.)

T - T E S T

GROUP 1 - WELL EQ 40.
GROUP 2 - WELL EQ 30.

VARIABLE		NUMBER OF CASES	MEAN	STANDARD DEVIATION	STANDARD ERROR	F VALUE	2-TAIL PROB.	POOLED VARIANCE ESTIMATE T VALUE	DEGREES OF FREEDOM	2-TAIL PROB.	SEPARATE VARIANCE ESTIMATE T VALUE	DEGREES OF FREEDOM	2-TAIL PROB.
CD	GROUP 1	1	70.4000	0	0	∞ ~~0~~	0 ~~1.000~~	74.64	3	.000	166.90	3.00	.000
	GROUP 2	4	.7275	.835	.417								

```
12.45.09. JOB ENTRY 85/06/21. 12.45.20.
12.45.09. OWNING ST=EKS1      OWNING UN=YGA106
12.45.09. ORIGIN ST=EKS1      ORIGIN UN=(LOCAL)
12.45.09. DEST   ST=EKS1      DEST   UN=(LOCAL)
12.45.09.MAP,OFF.
12.45.09.ATTACH,SPSS/UN=EKSAPP.
12.45.10.SPSS.
12.45.13.END SPSS
12.45.13.EXIT,U.
12.45.13.COST,LO=F.
12.45.14.
12.45.14. RUN DATE  85/06/21.  RUT SECS      6.428
12.45.14. UNITS         NUMBER       CCUS   PERCENT
12.45.14. CPU SECS       0.183     12.539    33.544
12.45.14. CMP UNITS      0.309      3.563     9.331
12.45.14. DISK REQS        154     11.454    30.642
12.45.14. DISK SECT       2418      9.816    26.260
12.45.14. JOB PROCESSING CCUS     37.380
12.45.14.
12.45.14. AVERAGE CM USED (DECIMAL)          19187
12.45.14. AVERAGE CM USED (OCTAL)            45363
12.45.14. MAX FIELD LENGTH USED (OCTAL)      75600
12.45.14. ITEMS CHARGED SEPARATELY
12.45.14.DAYFILE.
B
 EOI ENCOUNTERED.
C>BYE
 JOB PROCESSING CCUS      4.616
BYE  85/06/21. 12.59.09.

select desired service:
```

Appendix K

Saturation Indices

SATURATION INDICES

Fluorite

The saturation index for fluorite is determined from the following relationship

$$(CaF_2)\ S_I = \frac{[Ca^{2+}][F_2^-]}{K_{eq}}$$

where [ ] indicate ion activities determined from an analysis of the groundwater sample and

K_{eq} is the equilibrium constant for fluorite as determined from equilibrium-constant tabulations or experimental data.

If $S_I > 1$ the water contains in excess of the ionic constituents and mineral precipitation occurs. If $S_I < 1$ mineral dissolution occurs. If $S_I = 1$, the reaction is at equilibrium, which means that it is saturated with respect to fluorite.

The saturation index is sometimes expressed in logarithmic form (see Wateq F printouts - Log IAP/KT)

in which case an index value of zero denotes equilibrium

Procedure:

i) Activity coefficients for fluorite were calculated by either Wateq F program or wateq 2 program. Both programs calculate identical activities. Raw water quality data used to input to programs.

ii) Fluorite saturation indices calculated either using Wateq F equilibrium constant of $10^{-10.54}$ or CRC equilibrium constant of $10^{-9.79}$.

iii) Results presented as computer printouts for Wateq F runs and tabulated on Table 1 attached. Program also lists saturation indices for numerous other minerals.
Wateq 2 program runs are not included since output is lengthy. These runs can be supplied on request.

Note:

v) No calculations for other groundwaters since waters are undersaturated with respect to fluorite using K const of $10^{-9.79}$ (most applicable K const) with exception of Calf Spring which is probably at equilibrium and is well represented by SWG and Mormon.

Table 1
Fluorite Saturation Indices

TEST WELL OR SPRING	FLUORITE ACTIVITY COEFFICIENT. (IAP)	SATURATION INDEX USING Keq $10^{-10.54}$	$10^{-9.79}$
TW5	4.10×10^{-10}	14	2.5
TW6	5.83×10^{-10}	20	3.6
TW16	1.73×10^{-10}	6	1.1
TW17	4.62×10^{-11}	1.6	0.3
TW22	5.44×10^{-10}	19	3.4
TW36	1.12×10^{-13}	13	2.3
TW37	3.95×10^{-9}	140	25
TW39	7.58×10^{-11}	2.6	0.50
TW40	5.84×10^{-10}	20	3.6
SWG	1.56×10^{-10}	5.4	1.0
MORMON	3.12×10^{-10}	11	1.9

Fluorite Saturation Index calculated as:

$$S_I = IAP / K_{eq.} \text{ (or } K_T)$$

Cadmium Carbonate.

The saturation index for cadmium carbonate is determined from the following relationship:

$$S_I = \frac{[Cd^{2+}][CO_3^{2-}]}{K_{eq}}$$

where [ ] are the ion activities determined from groundwater analyses and

K_{eq} is the equilibrium constant for cadmium carbonate. This value has been determined experimentally as $10^{-11.19}$.

Procedure:

i) Activity coefficients for reaction calculated by Wateq 2 program based on water quality data (Wateq F does not calculate saturation indices for Cadmium carbonate)

ii) Cadmium carbonate S_I calculated by Wateq 2 based on activities and K_{eq} for $CdCO_3$.

iii) Since Wateq 2 print out is lengthy and contains many unnecessary calculations the results are tabulated on Table 2 attached.

Table 2
Cadmium Carbonate Saturation Indices

TEST WELL / SPRING	$CdCO_3$ Activity Coefficient (IAP)	$CdCO_3$ Saturation Index
TW5	4.55×10^{-13}	0.07
TW6	1.567×10^{-14}	0.002
TW16	4.842×10^{-12}	0.76
TW17	1.84×10^{-14}	0.002
TW22	2.51×10^{-13}	0.04
TW36	1.12×10^{-13}	0.02
TW37	5.24×10^{-12}	0.82
TW39	—	N/A
TW40	1.55×10^{-12}	0.26
SWG	—	N/A
Mormon	1.38×10^{-13}	0.02

$CdCO_3$ $\quad S_I = IAP / 6.45 \times 10^{-12}$

where IAP = Activity Coefficient for $CdCO_3$

N/A - no cadmium detected in sample ∴ no S_I calculation possible

Note: All other groundwaters are undersaturated with respect to $CdCO_3$.

MONSANTO WELL 37 SPECIATION USING WATEQF

INITIAL SOLUTION

TEMPERATURE = 14.00 DEGREES C PH = 7.15 ANALYTICAL EPMCAT = 29.51 ANALYTICAL EPMAN = 29.52

***** OXIDATION - REDUCTION *****

DISSOLVED OXYGEN = 0.000 MG/L
EH MEASURED WITH CALOMEL = 10.0000 VOLTS
MEASURED EH OF ZOBELL SOLUTION = 10.0000 VOLTS
CORRECTED EH = 0.0830 VOLTS
PE COMPUTED FROM CORRECTED EH = 1.46

FLAG	CORALK	PECALC	IDAVES
2	0	1	0

*** TOTAL CONCENTRATIONS OF INPUT SPECIES ***

SPECIES		TOTAL MOLALITY	LOG TOTAL MOLALITY	TOTAL MG/LITRE
CA	2	6.10E-03	-2.2147	2.44E 02
MG	2	3.83E-03	-2.4165	9.30E 01
NA	1	6.97E-03	-2.1565	1.60E 02
K	1	2.64E-03	-2.5785	1.03E 02
CL	-1	6.05E-03	-2.2184	2.14E 02
SO4	-2	6.26E-03	-2.2035	6.00E 02
HCO3	-1	8.65E-03	-2.0628	5.27E 02
FE	2	4.49E-07	-6.3482	2.50E-02
F	-1	1.65E-03	-2.7823	3.13E 01
NO3	-1	7.10E-04	-3.1486	4.39E 01
MN	2	4.56E-05	-4.3411	2.50E 00

MONSANTO WELL 37 SPECIATION USING WATEQF

****DESCRIPTION OF SOLUTION ****

	ANALYTIC AL	COMPUTED
EPMCAT	29.512	25.678
EPMAN	29.521	25.691

PH
7.150

TEMPERATURE
14.00 DEG C

IONIC STRENGTH
3.77E-02

ACTIVITY H2O = 0.9993
PCO2 = 2.82E-02
LOG PCO2 = -1.5494
PO2 = 2.95E-53
PCH4 = 1.57E-46
CO2 TOT = 9.970691E-03
DENSITY = 1.0000
TDS = 2018.8 MG/L
CARBONATE ALK = 8.65E 00 MEQ/KG H2O

EH = 0.0830 PE = 1.457
PE CALC S = 1.00E 02
PE CALC DOX= 1.00E 02
PE SATO DOX= 1.00E 02
TOT ALK = 8.65E 00 MEQ/KG H2O
ELECT = -1.34E-02 MEQ/KG H2O

IN COMPUTING THE DISTRIBUTION OF SPECIES, PE = 1.457 EQUIVALENT EH = 0.083VOLTS

DISTRIBUTION OF SPECIES

I	SPECIES		PPM	MOLALITY	LOG MOL	ACTIVITY	LOG ACT	ACT. COEFF.	LOG A COF
1	CA	2	1.95E 02	4.87E-03	-2.3129	2.49703E-03	-2.6026	5.13E-01	-0.2897
2	MG	2	7.28E 01	3.00E-03	-2.5226	1.57031E-03	-2.8040	5.23E-01	-0.2814
3	NA	1	1.58E 02	5.87E-03	-2.1628	5.78481E-03	-2.2377	8.42E-01	-0.0749
4	K	1	1.02E 02	2.61E-03	-2.5841	2.17116E-03	-2.6633	8.33E-01	-0.0792
64	H	1	8.21E-05	8.17E-08	-7.0880	7.07946E-08	-7.1500	8.67E-01	-0.0620
5	CL	-1	2.14E 02	6.05E-03	-2.2185	5.03913E-03	-2.2976	8.33E-01	-0.0792
6	SO4	-2	4.35E 02	4.53E-03	-2.3436	2.28572E-03	-2.6410	5.04E-01	-0.2974
7	HCO3	-1	5.04E 02	8.28E-03	-2.0818	7.00842E-03	-2.1544	8.46E-01	-0.0726
18	CO3	-2	4.19E-01	7.00E-06	-5.1548	3.58808E-06	-5.4451	5.12E-01	-0.2903
86	H2CO3	0	8.15E 01	1.32E-03	-2.8808	1.32874E-03	-2.8766	1.01E 00	0.0042
27	OH	-1	1.22E-03	7.19E-08	-7.1433	5.98419E-08	-7.2230	8.32E-01	-0.0797
62	F	-1	2.86E 01	1.51E-03	-2.8207	1.25751E-03	-2.9005	8.32E-01	-0.0797
19	MGOH	1	6.52E-04	1.58E-08	-7.8012	1.34844E-08	-7.8702	8.53E-01	-0.0690
23	MGSO4 AQ	0	6.81E 01	5.67E-04	-3.2464	5.71937E-04	-3.2427	1.01E 00	0.0038
22	MGHCO3	1	1.23E 01	1.44E-04	-3.8415	1.20452E-04	-3.9192	8.36E-01	-0.0777
21	MGCO3 AQ	0	3.79E-01	4.50E-06	-5.3466	4.54153E-06	-5.3428	1.01E 00	0.0038
20	MGF	1	4.96E 00	1.15E-04	-3.9399	9.64405E-05	-4.0157	8.40E-01	-0.0758
29	CAOH	1	2.33E-04	4.09E-09	-8.3884	3.47549E-09	-8.4590	8.50E-01	-0.0706
32	CASO4 AQ	0	1.42E 02	1.05E-03	-2.9804	1.05519E-03	-2.9767	1.01E 00	0.0038
30	CAHCO3	1	1.54E 01	1.52E-04	-3.8172	1.29501E-04	-3.8877	8.50E-01	-0.0706
31	CACO3 AQ	0	1.03E 00	1.03E-05	-4.9882	1.03646E-05	-4.9844	1.01E 00	0.0038
49	CAF+	1	1.46E 00	2.48E-05	-4.6048	2.09534E-05	-4.6787	8.43E-01	-0.0740
44	NASO4	-1	9.08E 00	7.64E-05	-4.1170	6.46288E-05	-4.1896	8.46E-01	-0.0726
43	NAHCO3	0	1.89E 00	2.26E-05	-4.6459	2.27987E-05	-4.6421	1.01E 00	0.0038
42	NACO3	-1	2.12E-02	2.56E-07	-6.5925	2.16246E-07	-6.6651	8.46E-01	-0.0726
94	NACL	0	4.21E-02	7.23E-07	-6.1411	7.23861E-07	-6.1374	1.01E 00	0.0038
46	KSO4	-1	4.56E 00	3.38E-05	-4.4714	2.85748E-05	-4.5440	8.46E-01	-0.0726
95	KCL	0	2.10E-02	2.82E-07	-6.5497	2.84477E-07	-6.5460	1.01E 00	0.0038
63	HSO4	-1	1.34E-03	1.39E-08	-7.8583	1.16376E-08	-7.9341	8.40E-01	-0.0758
96	H2SO4	0	1.11E-13	1.14E-18	-17.9447	1.14557E-18	-17.9410	1.01E 00	0.0038
93	HCL	0	3.07E-12	8.42E-17	-16.0745	8.49697E-17	-16.0707	1.01E 00	0.0038
8	FE	2	2.11E-02	3.79E-07	-6.4211	1.97946E-07	-6.7035	5.22E-01	-0.2823
9	FE	3	5.92E-14	1.06E-18	-17.9739	2.93680E-19	-18.5321	2.77E-01	-0.5582
10	FEOH	2	1.05E-09	1.45E-14	-13.8389	7.33082E-15	-14.1348	5.06E-01	-0.2959
11	FEOH	1	4.92E-05	6.76E-10	-9.1699	5.70319E-10	-9.2439	8.43E-01	-0.0740

12	FE(OH)3	-1	2.91E-11	2.72E-16	-15.5648	2.29745E-16	-15.6389	8.43E-01	-0.0740
77	FE(OH)2	1	8.03E-07	9.96E-12	-11.0478	7.57938E-12	-11.1204	8.46E-01	-0.0726
78	FE(OH)3	0	4.52E-06	4.24E-11	-10.3724	4.27901E-11	-10.3687	1.01E 00	0.0038
79	FE(OH)4	-1	4.20E-07	3.39E-12	-11.4694	2.87111E-12	-11.5419	8.46E-01	-0.0726
80	FE(OH)2	0	1.49E-09	1.66E-14	-13.7799	1.67462E-14	-13.7761	1.01E 00	0.0038
15	FESO4	1	1.08E-12	7.13E-18	-17.1468	6.01521E-19	-17.2207	8.43E-01	-0.0740
16	FECL	2	3.99E-15	4.38E-20	-19.3582	2.21776E-20	-19.6541	5.06E-01	-0.2959
28	FECL2	1	2.60E-16	2.06E-21	-20.6869	1.73413E-21	-20.7609	8.43E-01	-0.0740
33	FECL3	0	1.36E-19	8.55E-25	-24.0682	8.62141E-25	-24.0644	1.01E 00	0.0038
34	FESO4	0	1.04E-02	5.86E-08	-7.1639	5.91584E-08	-7.1602	1.01E 00	0.0038
101	MN	2	1.94E 00	3.53E-05	-4.4521	1.84318E-05	-4.7344	5.22E-01	-0.2823
102	MN	3	6.15E-25	1.12E-29	-28.9498	3.10430E-30	-29.5080	2.77E-01	-0.5582
106	MNOH	1	2.64E-04	3.68E-09	-8.4346	3.10048E-09	-8.5086	8.43E-01	-0.0740
107	MN(OH)3	-1	3.00E-14	2.83E-19	-18.5479	2.38863E-19	-18.6218	8.43E-01	-0.0740
111	MNHCO3	1	9.22E-01	7.96E-06	-5.0988	6.71720E-06	-5.1728	8.43E-01	-0.0740
109	MNSO4	0	2.53E-01	1.68E-06	-5.7751	1.69318E-06	-5.7713	1.01E 00	0.0038
110	MN(NO3)2	0	1.33E-06	7.43E-12	-11.1290	7.49491E-12	-11.1252	1.01E 00	0.0038
103	MNCL	1	4.02E-02	4.46E-07	-6.3511	3.75772E-07	-6.4251	8.43E-01	-0.0740
104	MNCL2	0	6.41E-05	5.10E-10	-9.2923	5.14543E-10	-9.2886	1.01E 00	0.0038
105	MNCL3	-1	2.23E-07	1.39E-12	-11.8581	1.16928E-12	-11.9321	8.43E-01	-0.0740
108	MNF	1	1.44E-02	1.95E-07	-6.7109	1.64089E-07	-6.7849	8.43E-01	-0.0740
115	HMNO2	-1	1.96E-13	2.23E-18	-17.6510	1.88354E-18	-17.7250	8.43E-01	-0.0740
85	NO3	-1	4.39E 01	7.10E-04	-3.1486	5.88220E-04	-3.2305	8.23E-01	-0.0819

MONSANTO WELL 37 SPECIATION USING WATEQF

	PHASE	IAP	KT	LOG IAP	LOG KT	IAP/KT	LOG IAP/KT	DELGR
18	ANHYDRIT	5.71E-06	3.61E-05	-5.2436	-4.4422	1.58E-01	-0.80138	-1.05297
22	ARAGONIT	8.96E-09	7.38E-09	-8.0477	-8.1319	1.21E 00	0.08420	0.11064
151	ARTIN	8.00E-26	3.86E-19	-25.0971	-18.4140	2.07E-07	-6.68317	-8.78134
20	BRUCITE	5.62E-18	3.68E-12	-17.2500	-11.4339	1.53E-06	-5.81613	-7.64210
13	CALCITE	8.96E-09	3.81E-09	-8.0477	-8.4193	2.35E 00	0.37154	0.48818
12	DOLOMITE	5.05E-17	1.63E-17	-16.2969	-16.7872	3.09E 00	0.49037	0.64432
113	FEOHJA	8.26E 02	7.67E 04	2.9170	4.8850	1.08E-02	-1.96801	-2.58586
63	FLUOR	3.95E-09	2.86E-11	-8.4036	-10.5430	1.38E 02	2.13941	2.81107
111	GOETH	6.30E-41	1.21E-42	-40.2008	-41.9175	5.21E 01	1.71674	2.25570
19	GYPSUM	5.70E-06	2.53E-05	-5.2441	-4.5973	2.26E-01	-0.64681	-0.84988
65	HALITE	2.92E-05	3.60E 01	-4.5354	1.5562	8.10E-07	-6.09158	-8.00402
109	HEMATI	6.84E 05	7.23E-04	5.8349	-3.1409	9.46E 08	8.97582	11.79377
118	HUNTITE	1.60E-33	1.63E-30	-32.7952	-29.7867	9.81E-04	-3.00847	-3.95297
39	HYDMAG	1.00E-42	7.88E-38	-41.9983	-37.1035	1.27E-05	-4.89485	-6.43158
110	MAGHEM	6.84E 05	2.34E 06	5.8349	6.3700	2.92E-01	-0.53512	-0.70311
11	MAGNESIT	5.63E-09	8.57E-09	-8.2492	-8.0668	6.57E-01	-0.18236	-0.23962
108	MAGNET	4.89E-02	3.77E-09	-1.3109	-8.4234	1.30E 07	7.11245	9.34540
67	MIRABI	7.60E-08	2.26E-02	-7.1193	-1.6461	3.36E-06	-5.47323	-7.19154
59	NAHCOL	4.05E-05	2.23E-01	-4.3921	-0.6524	1.82E-04	-3.73964	-4.91369
61	NATRON	1.19E-10	1.77E-02	-9.9235	-1.7531	6.75E-09	-8.17042	-10.73551
150	NESQUE	5.62E-09	8.26E-06	-8.2500	-5.0832	6.81E-04	-3.16682	-4.16104
10	SIDERITE	7.10E-13	3.98E-11	-12.1486	-10.4004	1.79E-02	-1.74819	-2.29703
66	THENAR	7.65E-08	6.87E-01	-7.1164	-0.1629	1.11E-07	-6.95346	-9.13649
62	THRNAT	1.20E-10	1.60E 00	-9.9209	0.2037	7.51E-11	-10.12453	-13.30311
60	TRONA	4.86E-15	5.13E-01	-14.3132	-0.2896	9.47E-15	-14.02364	-18.42633
172	MANGANO	3.68E 09	4.10E 18	9.5653	18.6126	8.97E-10	-9.04729	-11.88767
173	PYROLUST	3.53E 00	4.79E 16	0.5481	16.6803	7.37E-17	-16.13223	-21.19691
174	BIRNSITE	3.53E 00	1.23E 18	0.5481	18.0910	2.86E-18	-17.54292	-23.05049

```
175 NUSTITE       3.53E 00    3.19E 17     0.5481    17.5040    1.11E-17   -16.95592   -22.27919
176 BIXBYITE      7.64E-17    6.56E-01   -16.1169    -0.1830    1.16E-16   -15.93398   -20.93642
177 HAUSMITE      8.11E 45    6.17E 63    45.9089    63.7901    1.31E-18   -17.38127   -23.49507
178 MNOH2         6.60E-20    9.39E-14   -19.1804   -13.0271    7.03E-07    -6.15330    -8.08512
179 MNOH3         6.65E-52    6.19E-37   -51.1770   -36.2081    1.07E-15   -14.96893   -19.66840
180 MANGANIT      8.74E-09    5.78E-01    -8.0586    -0.2380    1.51E-08    -7.82061   -10.27588
181 RHODOCHR      6.61E-11    3.31E-11   -10.1796   -10.4806    2.00E 00     0.30106     0.39557
183 MNCL2         4.68E-10    1.80E 09    -9.3297     9.2548    2.60E-19   -18.58450   -24.41907
184 MNCL2,1W      4.68E-10    5.29E 05    -9.3300     5.7235    8.84E-16   -15.05347   -19.77948
185 MNCL2,2W      4.67E-10    8.43E 03    -9.3303     3.9260    5.54E-14   -13.25629   -17.41808
186 MNCL2,4W      4.67E-10    1.67E 02    -9.3309     2.2220    2.80E-12   -11.55290   -15.17992
190 MNSO4         4.21E-08    1.27E 03    -7.3754     3.1036    3.32E-11   -10.47905   -13.76894
191 MN2SO4.3      1.15E-57    2.43E-05   -66.9390    -4.6143    4.73E-63   -62.32469   -81.89143
STATEMENTS EXECUTED=    14095
CORE USAGE        OBJECT CODE=    95232 BYTES,ARRAY AREA=    27000 BYTES,TOTAL AREA AVAILABLE= 1624032  BYTES
DIAGNOSTICS        NUMBER OF ERRORS=        0, NUMBER OF WARNINGS=        4, NUMBER OF EXTENSIONS=        0
COMPILE TIME=     3.50 SEC,EXECUTION TIME=     1.32 SEC,     12.22.52     FRIDAY        19 JUL 85     WATFIV - MAR 1980 V2L0

      C$STOP
```

INITIAL SOLUTION

TEMPERATURE = 14.00 DEGREES C PH = 8.39 ANALYTICAL EPMCAT = 17.97 ANALYTICAL EPMAN = 13.18

***** OXIDATION - REDUCTION *****

DISSOLVED OXYGEN = 0.000 MG/L
EH MEASURED WITH CALOMEL = 10.0000 VOLTS
MEASURED EH OF ZOBELL SOLUTION = 10.0000 VOLTS
CORRECTED EH = 0.0050 VOLTS
PE COMPUTED FROM CORRECTED EH = 0.09

FLAG	CURALK	PECALC	IDAVES
2	0	1	0

*** TOTAL CONCENTRATIONS OF INPUT SPECIES ***

SPECIES		TOTAL MOLALITY	LOG TOTAL MOLALITY	TOTAL MG/LITRE
CA	2	1.62E-03	-2.7392	7.30E 01
MG	2	3.17E-03	-2.4989	7.70E 01
NA	1	7.18E-03	-2.1436	1.65E 02
K	1	8.19E-04	-3.0866	3.20E 01
CL	-1	2.46E-03	-2.6097	8.70E 01
SO4	-2	3.19E-03	-2.4964	3.06E 02
HCO3	-1	3.53E-03	-2.4526	2.15E 02
FE	2	4.48E-07	-5.3486	2.50E-02
F	-1	3.62E-04	-3.4407	6.88E 00
NO3	-1	4.66E-04	-3.3315	2.89E 01
MN	2	1.82E-07	-6.7395	1.00E-02

****DESCRIPTION OF SOLUTION ****

	ANALYTIC A.	COMPUTED
EPMCAT	17.974	15.451
EPMAN	13.176	11.654

EH = 0.0050 PE = 0.088
PE CALC S = 1.00E 02
PE CALC DOX= 1.00E 02
PE SATO DOX= 1.00E 02
TOT ALK = 3.53E 00 MEQ/KG H2O
ELECT = 4.80E 00 MEQ/KG H2O

PH
8.390

TEMPERATURE
14.00 DEG C

IONIC STRENGTH
2.06E-02

ACTIVITY H2O = 0.9996
PCO2 = 6.56E-04
LOG PCO2 = -3.1831
PO2 = 9.01E-54
PCH4 = 3.93E-47
CO2 TOT = 3.463401E-03
DENSITY = 1.0000
TDS = 990.8 MG/L
CARBONATE ALK = 3.53E 00 MEQ/KG H2O

IN COMPUTING THE DISTRIBUTION OF SPECIES, PE = 0.088 EQUIVALENT EH = 0.005VOLTS

DISTRIBUTION OF SPECIES

I	SPECIES		PPM	MOLALITY	LOG MOL	ACTIVITY	LOG ACT	ACT. COEFF.	LOG A COF
1	CA	2	6.13E 01	1.53E-03	-2.8153	9.01113E-04	-3.0452	5.89E-01	-0.2300
2	MG	2	6.52E 01	2.68E-03	-2.5714	1.59842E-03	-2.7963	5.96E-01	-0.2249
3	NA	1	1.64E 02	7.12E-03	-2.1474	6.21523E-03	-2.2065	8.73E-01	-0.0591
4	K	1	3.17E 01	8.12E-04	-3.0903	7.04988E-04	-3.1518	8.68E-01	-0.0616
64	H	1	4.61E-06	4.58E-09	-8.3394	4.07380E-09	-8.3900	8.90E-01	-0.0506
5	CL	-1	8.70E 01	2.46E-03	-2.6098	2.13144E-03	-2.6713	8.58E-01	-0.0616
6	SO4	-2	2.41E 02	2.52E-03	-2.5993	1.46715E-03	-2.8335	5.83E-01	-0.2342
7	HCO3	-1	1.97E 02	3.23E-03	-2.4906	2.83097E-03	-2.5481	8.76E-01	-0.0575
18	CO3	-2	2.56E 00	4.28E-05	-4.3690	2.51871E-05	-4.5988	5.89E-01	-0.2299
86	H2CO3	0	1.90E 00	3.07E-05	-4.5126	3.08854E-05	-4.5102	1.01E 00	0.0023
27	OH	-1	2.04E-02	1.20E-06	-5.9210	1.04026E-06	-5.9829	8.67E-01	-0.0619
62	F	-1	6.35E 00	3.35E-04	-3.4756	2.90112E-04	-3.5374	8.67E-01	-0.0619
19	MGOH	1	1.12E-02	2.71E-07	-6.5671	2.38603E-07	-6.6223	8.81E-01	-0.0552
23	MGSO4 AQ	0	4.47E 01	3.72E-04	-3.4296	3.73686E-04	-3.4275	1.00E 00	0.0021
22	MGHCO3	1	4.85E 00	5.69E-05	-4.2445	4.95263E-05	-4.3052	8.70E-01	-0.0606
21	MGCO3 AQ	0	2.72E 00	3.23E-05	-4.4908	3.24507E-05	-4.4888	1.00E 00	0.0021
20	MGF	1	1.12E 00	2.60E-05	-4.5855	2.26474E-05	-4.6450	8.72E-01	-0.0595
29	CAOH	1	1.42E-03	2.48E-08	-7.6053	2.18025E-08	-7.6615	8.79E-01	-0.0562
32	CASO4 AQ	0	3.31E 01	2.43E-04	-3.6139	2.44420E-04	-3.6119	1.00E 00	0.0021
30	CAHCO3	1	2.17E 00	2.15E-05	-4.6679	1.88774E-05	-4.7241	8.79E-01	-0.0562
31	CACO3 AQ	0	2.61E 00	2.61E-05	-4.5828	2.62557E-05	-4.5808	1.00E 00	0.0021
49	CAF+	1	1.18E-01	2.00E-06	-5.7000	1.74447E-06	-5.7583	8.74E-01	-0.0583
44	NASO4	-1	6.05E 00	5.09E-05	-4.2935	4.45704E-05	-4.3510	8.76E-01	-0.0575
43	NAHCO3	0	8.26E-01	9.85E-06	-5.0067	9.89447E-05	-5.0046	1.00E 00	0.0021
42	NACO3	-1	1.54E-01	1.86E-06	-5.7301	1.63092E-06	-5.7876	8.76E-01	-0.0575
94	NACL	0	1.92E-02	3.30E-07	-6.4819	3.31230E-07	-6.4799	1.00E 00	0.0021
46	KSO4	-1	9.18E-01	5.80E-06	-5.1676	5.95560E-06	-5.2251	8.76E-01	-0.0575
95	KCL	0	2.90E-03	3.89E-08	-7.4102	3.90710E-08	-7.4081	1.00E 00	0.0021
63	HSO4	-1	4.78E-05	4.93E-10	-9.3072	4.29849E-10	-9.3667	8.72E-01	-0.0595
96	H2SO4	0	2.37E-16	2.42E-21	-20.6156	2.43486E-21	-20.6135	1.00E 00	0.0021
93	HCL	0	7.50E-14	2.06E-18	-17.6865	2.06814E-18	-17.6844	1.00E 00	0.0021
8	FE	2	2.02E-02	3.63E-07	-6.4403	2.16238E-07	-6.6651	5.96E-01	-0.2248
9	FE	3	2.19E-15	3.92E-20	-19.4069	1.37192E-20	-19.8627	3.50E-01	-0.4558
10	FEOH	2	7.42E-10	1.02E-14	-13.9919	5.95310E-15	-14.2253	5.84E-01	-0.2334
11	FEOH	1	9.02E-04	1.24E-08	-7.9070	1.08302E-08	-7.9654	8.74E-01	-0.0583

11	FEOH	1	9.02E-04	1.24E-08	-7.9070	1.08302E-08	-7.9654	8.74E-01	-0.2334
								8.74E-01	-0.0583
12	FE(OH)3	-1	1.61E-07	1.51E-12	-11.8216	1.31838E-12	-11.8800	8.74E-01	-0.0583
77	FE(OH)2	1	1.10E-05	1.22E-10	-9.9132	1.06994E-10	-9.9706	8.76E-01	-0.0575
78	FE(OH)3	0	1.12E-03	1.05E-08	-7.9809	1.05004E-08	-7.9788	1.00E 00	0.0021
79	FE(OH)4	-1	1.73E-03	1.40E-08	-7.8545	1.22476E-08	-7.9120	8.76E-01	-0.0575
80	FE(OH)2	0	4.94E-07	5.50E-12	-11.2595	5.52807E-12	-11.2574	1.00E 00	0.0021
15	FESO4	1	3.13E-14	2.06E-19	-18.6855	1.80368E-19	-18.7438	8.74E-01	-0.0583
16	FECL	2	6.84E-17	7.50E-22	-21.1249	4.38214E-22	-21.3583	5.84E-01	-0.2334
28	FECL2	1	2.10E-18	1.66E-23	-22.7806	1.44899E-23	-22.8389	8.74E-01	-0.0583
33	FECL3	0	4.91E-22	3.03E-27	-26.5183	3.04631E-27	-26.5162	1.00E 00	0.0021
34	FESO4	0	7.32E-03	4.83E-08	-7.3164	4.84934E-08	-7.3143	1.00E 00	0.0021
101	MN	2	8.74E-03	1.59E-07	-6.7981	9.48585E-08	-7.0229	5.96E-01	-0.2248
102	MN	3	1.07E-28	1.95E-33	-32.7097	6.83191E-34	-33.1655	3.50E-01	-0.4558
106	MNOH	1	2.28E-05	3.17E-10	-9.4985	2.77448E-10	-9.5568	8.74E-01	-0.0583
107	MN(OH)3	-1	7.82E-13	7.39E-18	-17.1313	6.46234E-18	-17.1896	8.74E-01	-0.0583
111	MNHCO3	1	1.85E-03	1.60E-08	-7.7966	1.39640E-08	-7.8550	8.74E-01	-0.0583
109	MNSO4	0	8.40E-04	5.57E-09	-8.2544	5.59324E-09	-8.2523	1.00E 00	0.0021
110	MN(NO3)2	0	3.22E-09	1.80E-14	-13.7442	1.81058E-14	-13.7422	1.00E 00	0.0021
103	MNCL	1	8.45E-05	9.36E-10	-9.0289	8.17992E-10	-9.0873	8.74E-01	-0.0583
104	MNCL2	0	5.93E-08	4.71E-13	-12.3266	4.73651E-13	-12.3245	1.00E 00	0.0021
105	MNCL3	-1	8.39E-11	5.21E-16	-15.2835	4.55163E-15	-15.3418	8.74E-01	-0.0583
108	MNF	1	1.65E-05	2.23E-10	-9.6520	1.94824E-10	-9.7104	8.74E-01	-0.0583
115	HMNO2	-1	5.12E-12	5.82E-17	-16.2349	5.09046E-17	-15.2932	8.74E-01	-0.0583
85	NO3	-1	2.89E 01	4.66E-04	-3.3315	4.03006E-04	-3.3947	8.65E-01	-0.0631

MONSANTO WELL 39 SPECIATION USING WATEQF

	PHASE	IAP	KT	LOG IAP	LOG KT	IAP/KT	LOG IAP/KT	DELGR
18	ANHYDRIT	1.32E-06	3.61E-05	-5.8787	-4.4422	3.65E-02	-1.43657	-1.88758
22	ARAGONIT	2.27E-08	7.38E-09	-7.6440	-8.1319	3.08E 00	0.48788	0.64104
151	ARTIN	2.21E-23	3.86E-19	-22.6554	-18.4140	5.73E-05	-4.24147	-5.57307
20	BRUCITE	1.73E-15	3.63E-12	-14.7620	-11.4339	4.70E-04	-3.32816	-4.37303
13	CALCITE	2.27E-08	3.81E-09	-7.6440	-8.4193	5.96E 00	0.77521	1.01859
12	DOLOMITE	9.14E-16	1.63E-17	-15.0392	-16.7872	5.60E 01	1.74806	2.29686
113	FEOH3A	2.03E 05	7.67E 04	5.3068	4.8850	2.64E 00	0.42184	0.55427
63	FLUOR	7.58E-11	2.86E-11	-10.1201	-10.5430	2.65E 00	0.42287	0.55563
111	GOETH	1.55E-38	1.21E-42	-37.8111	-41.9175	1.28E 04	4.10646	5.39568
19	GYPSUM	1.32E-05	2.53E-05	-5.8791	-4.5973	5.23E-02	-1.28173	-1.68413
65	HALITE	1.32E-05	3.60E 01	-4.8779	1.5562	3.68E-07	-6.43409	-8.45407
109	HEMATI	4.11E 10	7.23E-04	10.6142	-3.1409	5.69E 13	13.75512	18.07352
118	HUNTITE	1.48E-30	1.53E-30	-29.8294	-29.7867	9.06E-01	-0.04272	-0.05614
39	HYDMAG	1.13E-37	7.88E-38	-36.9479	-37.1035	1.43E 00	0.15558	0.20442
110	MAGHEM	4.11E 10	2.34E 06	10.6142	6.3700	1.75E 04	4.24418	5.57664
11	MAGNESIT	4.03E-08	8.57E-09	-7.3951	-8.0668	4.70E 00	0.67166	0.88252
108	MAGNET	2.27E 07	3.77E-09	7.3559	-8.4234	6.01E 15	15.77922	20.73308
57	MIRABI	5.65E-08	2.26E-02	-7.2482	-1.6461	2.50E-06	-5.60209	-7.36085
59	NAHCOL	1.76E-05	2.23E-01	-4.7546	-0.6524	7.90E-05	-4.10216	-5.39002
61	NATRON	9.69E-10	1.77E-02	-9.0135	-1.7531	5.49E-08	-7.26041	-9.53981
150	NESQUE	4.02E-08	8.26E-06	-7.3956	-5.0832	4.87E-03	-2.31239	-3.03836
10	SIDERITE	5.45E-12	3.98E-11	-11.2639	-10.4004	1.37E-01	-0.86349	-1.13458
56	THENAR	5.67E-08	6.87E-01	-7.2466	-0.1629	8.25E-08	-7.08367	-9.30758
62	THRNAT	9.73E-10	1.60E 00	-9.0121	0.2037	6.09E-10	-9.21574	-12.10900
50	TRONA	1.71E-14	5.13E-01	-13.7668	-0.2896	3.33E-14	-13.47723	-17.70839
172	MANGANO	5.71E 09	4.10E 18	9.7569	18.6126	1.39E-09	-8.85565	-11.63587
173	PYROLUST	3.03E 00	4.79E 16	0.4820	16.6803	6.33E-17	-16.19832	-21.28375
174	BIRNSITE	3.03E 00	1.23E 18	0.4820	18.0910	2.46E-18	-17.60901	-23.13733

```
175 NUSTITE       3.03E 00    3.19E 17     0.4820    17.5040    9.51E-18   -17.02200   -22.36603
176 BIXBYITE      1.02E-16    6.56E-01   -15.9914    -0.1830    1.55E-16   -15.90843   -20.77145
177 HAUSMITE      1.68E 46    6.17E 63    46.2261    63.7901    2.73E-18   -17.56404   -23.07825
178 MNOH2         1.03E-19    9.39E-14   -18.9886   -13.0271    1.09E-06    -5.96151    -7.83312
179 MNOH3         7.69E-52    6.19E-37   -51.1140   -36.2081    1.24E-15   -14.90594   -19.58563
180 MANGANIT      1.01E-08    5.78E-01    -7.9958    -0.2380    1.75E-08    -7.75776   -10.19329
181 RHODOCHR      2.39E-12    3.31E-11   -11.6217   -10.4806    7.23E-02    -1.14112    -1.49937
183 MNC_2         4.31E-13    1.80E 09   -12.3656     9.2548    2.40E-22   -21.62035   -28.40804
184 MNCL2,1W      4.31E-13    5.29E 05   -12.3657     5.7235    8.14E-19   -18.08919   -23.76825
185 MNCL2,2W      4.31E-13    8.43E 03   -12.3659     3.9260    5.11E-17   -16.29187   -21.40668
186 MNCL2,4W      4.30E-13    1.67E 02   -12.3662     2.2220    2.58E-15   -14.58822   -19.16817
190 MNSO4         1.39E-10    1.27E 03    -9.8564     3.1036    1.10E-13   -12.96009   -17.02888
191 MN2SO4,3      1.47E-75    2.43E-05   -74.8315    -4.6143    6.06E-71   -70.21718   -92.26176

STATEMENTS EXECUTED=    14095
CORE USAGE        OBJECT CODE=    95232 BYTES,ARRAY AREA=    27000 BYTES,TOTAL AREA AVAILABLE= 1624032  BYTES
DIAGNOSTICS       NUMBER OF ERRORS=        0, NUMBER OF WARNINGS=        4, NUMBER OF EXTENSIONS=        0
COMPILE TIME=     3.47 SEC,EXECUTION TIME=     1.32 SEC,     17.44.32    FRIDAY       19 JUL 85    WATFIV - MAR 1980 V2L0

        CSSTOP
```

INITIAL SOLUTION

TEMPERATURE = 14.00 DEGREES C PH = 6.96 ANALYTICAL EPMCAT = 16.16 ANALYTICAL EPMAN = 15.46

***** OXIDATION - REDUCTION *****

DISSOLVED OXYGEN = 0.000 MG/L
EH MEASURED WITH CALOMEL = 10.0000 VOLTS
MEASURED EH OF ZOBELL SOLUTION = 10.0000 VOLTS
CORRECTED EH = 0.1380 VOLTS
PE COMPUTED FROM CORRECTED EH = 2.42

FLAG	CORALK	PECA_C	IDAVES
2	0	1	0

*** TOTAL CONCENTRATIONS OF INPUT SPECIES ***

SPECIES		TOTAL MOLALITY	LOG TOTAL MOLALITY	TOTA_ MG/LITRE
CA	2	3.07E-03	-2.5126	1.23E 02
MG	2	3.25E-03	-2.4877	7.90E 01
NA	1	2.96E-03	-2.5286	6.80E 01
K	1	5.63E-04	-3.2493	2.20E 01
CL	-1	2.20E-03	-2.6571	7.80E 01
SO4	-2	3.05E-03	-2.5152	2.93E 02
HCO3	-1	6.20E-03	-2.2075	3.78E 02
FE	2	4.48E-07	-6.3486	2.50E-02
F	-1	5.69E-04	-3.2448	1.08E 01
NO3	-1	3.98E-04	-3.4005	2.46E 01
MN	2	1.82E-07	-6.7394	1.00E-02

****DESCRIPTION OF SOLUTION ****

	ANALYTICAL	COMPUTED
EPMCAT	16.158	14.458
EPMAN	15.461	13.761

PH 6.950

TEMPERATURE 14.00 DEG C

IONIC STRENGTH 2.16E-02

EH = 0.1380 PE = 2.422
PE CALC S = 1.00E 02
PE CALC DOX= 1.00E 02
PE SATO DOX= 1.00E 02
TOT ALK = 6.20E 00 MEQ/KG H2O
ELECT = 6.97E-01 MEQ/KG H2O

ACTIVITY H2O = 0.9996
PCO2 = 3.27E-02
LOG PCO2 = -1.4853
PO2 = 3.73E-50
PCH4 = 1.14E-52
CO2 TOT = 7.732224E-03
DENSITY = 1.0000
TDS = 1076.5 MG/L
CARBONATE ALK = 6.20E 00 MEQ/KG H2O

IN COMPUTING THE DISTRIBUTION OF SPECIES, PE = 2.422 EQUIVALENT EH = 0.138VOLTS

DISTRIBUTION OF SPECIES

I	SPECIES		PPM	MOLALITY	LOG MOL	ACTIVITY	LOG ACT	ACT. COEFF.	LOG A COF
1	CA	2	1.05E 02	2.62E-03	-2.5815	1.52802E-03	-2.8159	5.83E-01	-0.2344
2	MG	2	6.70E 01	2.76E-03	-2.5595	1.62714E-03	-2.7886	5.90E-01	-0.2291
3	NA	1	6.74E 01	2.93E-03	-2.5325	2.55414E-03	-2.5928	8.70E-01	-0.0603
4	K	1	2.18E 01	5.59E-04	-3.2526	4.83676E-04	-3.3154	8.65E-01	-0.0628
64	H	1	1.24E-04	1.23E-07	-6.9085	1.09648E-07	-6.9600	8.88E-01	-0.0515
5	CL	-1	7.80E 01	2.20E-03	-2.6571	1.90570E-03	-2.7199	8.65E-01	-0.0628
6	SO4	-2	2.22E 02	2.31E-03	-2.6362	1.33362E-03	-2.8750	5.77E-01	-0.2388
7	HCO3	-1	3.66E 02	5.00E-03	-2.2217	5.24474E-03	-2.2803	8.74E-01	-0.0586
18	CO3	-2	1.78E-01	2.97E-06	-5.5267	1.73367E-06	-5.7610	5.83E-01	-0.2343
86	H2CO3	0	9.49E 01	1.53E-03	-2.8149	1.54008E-03	-2.8125	1.01E 00	0.0024
27	OH	-1	7.59E-04	4.47E-08	-7.3497	3.86497E-08	-7.4129	8.65E-01	-0.0632
62	F	-1	9.92E 00	5.23E-04	-3.2819	4.51800E-04	-3.3451	8.65E-01	-0.0632
19	MGOH	1	4.24E-04	1.03E-08	-7.9884	9.02430E-09	-8.0446	8.79E-01	-0.0562
23	MGSO4 AQ	0	4.14E 01	3.44E-04	-3.4634	3.45779E-04	-3.4612	1.00E 00	0.0022
22	MGHCO3	1	9.18E 00	1.08E-04	-3.9678	9.34025E-05	-4.0296	8.67E-01	-0.0619
21	MGCO3 AQ	0	1.91E-01	2.26E-06	-5.6454	2.27377E-06	-5.6433	1.00E 00	0.0022
20	MGF	1	1.79E 00	4.13E-05	-4.3842	3.59032E-05	-4.4449	8.70E-01	-0.0607
29	CAOH	1	8.94E-05	1.57E-09	-8.8049	1.37361E-09	-8.8621	8.76E-01	-0.0573
32	CASO4 AQ	0	5.10E 01	3.75E-04	-3.4261	3.76744E-04	-3.4240	1.00E 00	0.0022
30	CAHCO3	1	6.83E 00	5.77E-05	-4.1697	5.93037E-05	-4.2269	8.76E-01	-0.0573
31	CACO3 AQ	0	3.05E-01	3.05E-06	-5.5158	3.06453E-06	-5.5136	1.00E 00	0.0022
49	CAF+	1	3.12E-01	5.28E-06	-5.2771	4.60675E-06	-5.3366	8.72E-01	-0.0595
44	NASO4	-1	2.27E 00	1.91E-05	-4.7200	1.66492E-05	-4.7786	8.74E-01	-0.0586
43	NAHCO3	0	6.29E-01	7.50E-06	-5.1252	7.53303E-06	-5.1230	1.00E 00	0.0022
42	NACO3	-1	4.38E-03	5.28E-08	-7.2774	4.61327E-08	-7.3360	8.74E-01	-0.0586
94	NACL	0	7.07E-03	1.21E-07	-6.9169	1.21702E-07	-6.9147	1.00E 00	0.0022
46	KSO4	-1	5.74E-01	4.25E-05	-5.3716	3.71413E-05	-5.4301	8.74E-01	-0.0586
95	KCL	0	1.76E-03	2.38E-08	-7.6226	2.39667E-08	-7.6204	1.00E 00	0.0022
63	HSO4	-1	1.17E-03	1.21E-08	-7.9175	1.05166E-08	-7.9781	8.70E-01	-0.0607
96	H2SO4	0	1.56E-13	1.60E-18	-17.7971	1.60337E-18	-17.7950	1.00E 00	0.0022
93	HCL	0	1.80E-12	4.95E-17	-16.3052	4.97693E-17	-16.3030	1.00E 00	0.0022
8	FE	2	2.23E-02	4.00E-07	-6.3984	2.35821E-07	-6.6274	5.90E-01	-0.2290
9	FE	3	5.24E-13	9.39E-18	-17.0273	3.22983E-18	-17.4908	3.44E-01	-0.4635
10	FEOH	2	6.55E-09	9.01E-14	-13.0455	5.20714E-14	-13.2834	5.78E-01	-0.2379
11	FEOH	1	3.66E-05	5.03E-10	-9.2982	4.38828E-10	-9.3577	8.72E-01	-0.0595

12	FE(OH)3	-1	9.03E-12	8.46E-17	-16.0728	7.37403E-17	-16.1323	8.72E-01	-0.0595
77	FE(OH)2	1	3.57E-06	3.98E-11	-10.4002	3.47714E-11	-10.4588	8.74E-01	-0.0586
78	FE(OH)3	0	1.35E-05	1.26E-10	-9.8991	1.26786E-10	-9.8969	1.00E 00	0.0022
79	FE(OH)4	-1	7.78E-07	5.29E-12	-11.2015	5.49440E-12	-11.2601	8.74E-01	-0.0586
80	FE(OH)2	0	7.43E-10	8.28E-15	-14.0819	8.32212E-15	-14.0798	1.00E 00	0.0022
15	FESO4	1	6.72E-12	4.43E-17	-16.3539	3.85983E-17	-16.4134	8.72E-01	-0.0595
16	FECL	2	1.45E-14	1.60E-19	-18.7971	9.22397E-20	-19.0351	5.78E-01	-0.2379
28	FECL2	1	3.96E-16	3.13E-21	-20.5048	2.72706E-21	-20.5643	8.72E-01	-0.0595
33	FECL3	0	8.26E-20	5.10E-25	-24.2924	5.12626E-25	-24.2902	1.00E 00	0.0022
34	FESO4	0	7.26E-03	4.78E-08	-7.3203	4.80719E-08	-7.3181	1.00E 00	0.0022
101	MN	2	8.17E-03	1.49E-07	-6.8270	8.78874E-08	-7.0561	5.90E-01	-0.2290
102	MN	3	2.18E-26	3.97E-31	-30.4009	1.36645E-31	-30.8644	3.44E-01	-0.4635
106	MNOH	1	7.86E-07	1.10E-11	-10.9605	9.55035E-12	-11.0200	8.72E-01	-0.0595
107	MN(OH)3	-1	3.73E-17	3.52E-22	-21.4533	3.07045E-22	-21.5128	8.72E-01	-0.0595
111	MNHCO3	1	3.18E-03	2.75E-08	-7.5609	2.39691E-08	-7.6203	8.72E-01	-0.0595
109	MNSO4	0	7.07E-04	4.69E-09	-8.3291	4.71055E-09	-8.3269	1.00E 00	0.0022
110	MN(NO3)2	0	2.16E-09	1.21E-14	-13.9181	1.21367E-14	-13.9159	1.00E 00	0.0022
103	MNCL	1	7.02E-05	7.77E-10	-9.1095	6.77610E-10	-9.1690	8.72E-01	-0.0595
104	MNCL2	0	4.39E-08	3.49E-13	-12.4571	3.50821E-13	-12.4549	1.00E 00	0.0022
105	MNCL3	-1	5.57E-11	3.46E-16	-15.4613	3.01434E-15	-15.5208	8.72E-01	-0.0595
108	MNF	1	2.38E-05	3.22E-10	-9.4916	2.81107E-10	-9.5511	8.72E-01	-0.0595
115	HMNO2	-1	2.44E-16	2.77E-21	-20.5569	2.41889E-21	-20.6164	8.72E-01	-0.0595
85	NO3	-1	2.46E 01	3.98E-04	-3.4005	3.42790E-04	-3.4650	8.52E-01	-0.0645

MONSANTO MORMON SPRING SPECIATION USING WATEQF

	PHASE	IAP	KT	LOG IAP	LOG KT	IAP/KT	LOG IAP/KT	DELGR
18	ANHYDRIT	2.04E-05	3.61E-05	-5.6908	-4.4422	5.64E-02	-1.24866	-1.64068
22	ARAGONIT	2.65E-09	7.38E-09	-8.5769	-8.1319	3.59E-01	-0.44498	-0.58469
151	ARTIN	6.04E-27	3.86E-19	-26.2189	-18.4140	1.57E-08	-7.80496	-10.25532
20	BRUCITE	2.43E-18	3.68E-12	-17.6143	-11.4339	6.60E-07	-6.18041	-8.12074
13	CALCITE	2.65E-09	3.81E-09	-8.5769	-8.4193	6.96E-01	-0.15765	-0.20714
12	DOLOMITE	7.47E-18	1.63E-17	-17.1265	-16.7872	4.58E-01	-0.33925	-0.44578
113	FEOH3A	2.45E 03	7.67E 04	3.3887	4.8850	3.19E-02	-1.49628	-1.96604
63	FLUOR	3.12E-10	2.86E-11	-9.5060	-10.5430	1.09E 01	1.03698	1.36254
111	GOETH	1.87E-40	1.21E-42	-39.7292	-41.9175	1.54E 02	2.18832	2.87534
19	GYPSUM	2.04E-05	2.53E-05	-5.6911	-4.5973	8.05E-02	-1.09381	-1.43722
65	HALITE	4.87E-06	3.60E 01	-5.3127	1.5562	1.35E-07	-6.86892	-9.02541
109	HEMATI	6.00E 06	7.23E-04	6.7779	-3.1409	8.30E 09	9.91884	13.03285
118	HUNTITE	5.95E-35	1.63E-30	-34.2257	-29.7867	3.64E-05	-4.43901	-5.83263
39	HYDMAG	5.45E-44	7.88E-38	-43.2635	-37.1035	6.92E-07	-6.16010	-8.09405
110	MAGHEM	6.00E 06	2.34E 06	6.7779	6.3700	2.56E 00	0.40791	0.53597
11	MAGNESIT	2.82E-09	8.57E-09	-8.5496	-8.0668	3.29E-01	-0.48282	-0.63440
108	MAGNET	2.31E-02	3.77E-09	-1.6370	-8.4234	6.11E 06	6.78639	8.91697
67	MIRABI	8.67E-09	2.26E-02	-8.0620	-1.6461	3.84E-07	-6.41590	-8.43016
59	NAHCO_	1.34E-05	2.23E-01	-4.8730	-0.6524	6.02E-05	-4.22058	-5.54562
51	NATRON	1.13E-11	1.77E-02	-10.9481	-1.7531	6.38E-10	-9.19500	-12.08175
150	NESQUE	2.82E-09	8.26E-06	-8.5501	-5.0832	3.41E-04	-3.46685	-4.55526
10	SIDERITE	4.09E-13	3.98E-11	-12.3884	-10.4004	1.03E-02	-1.98805	-2.61219
66	THENAR	8.70E-09	6.87E-01	-8.0605	-0.1629	1.27E-08	-7.89753	-10.37695
52	THRNAT	1.13E-11	1.60E 00	-10.9467	0.2037	7.07E-12	-11.15037	-14.65101
50	TRONA	1.51E-16	5.13E-01	-15.8199	-0.2896	2.95E-16	-15.53028	-20.40599
172	MANGANU	7.31E 09	4.10E 18	6.8638	18.6126	1.78E-12	-11.74879	-15.43731
173	PYROLUST	2.50E-01	4.79E 16	-0.6028	16.6803	5.21E-18	-17.28305	-22.70903
174	BIRNSITE	2.50E-01	1.23E 18	-0.6028	18.0910	2.02E-19	-18.69374	-24.56261

```
175 NUSTITE       2.50E-01    3.19E 17    -0.6028   17.5040    7.82E-19   -18.10674   -23.79131
176 BIXBYITE      1.07E-20    6.56E-01   -19.9693   -0.1830    1.64E-20   -19.73630   -25.99817
177 HAUSMITE      2.27E 39    6.17E 63    39.3551   63.7901    3.67E-25   -24.43507   -32.10643
178 MNOH2         1.31E-22    9.39E-14   -21.8818  -13.0271    1.40E-09    -8.85466   -11.63456
179 MNO43         7.89E-54    6.19E-37   -53.1030  -36.2081    1.27E-17   -16.89488   -22.19901
180 MANGANIT      1.04E-10    5.78E-01    -9.9847   -0.2380    1.79E-10    -9.74671   -12.80668
181 RHODOCHR      1.52E-13    3.31E-11   -12.8171  -10.4806    4.61E-03    -2.33648    -3.07001
183 MNC_2         3.19E-13    1.80E 09   -12.4960    9.2548    1.78E-22   -21.75075   -28.57936
184 MNCL2,1W      3.19E-13    5.29E 05   -12.4961    5.7235    6.03E-19   -18.21957   -23.93958
185 MNC_2,2W      3.19E-13    8.43E 03   -12.4963    3.9260    3.78E-17   -16.42226   -21.57799
186 MNCL2,4W      3.19E-13    1.67E 02   -12.4966    2.2220    1.91E-15   -14.71859   -19.33946
190 MNSO4         1.17E-10    1.27E 03    -9.9310    3.1036    9.23E-14   -13.03468   -17.12689
191 MN2SO4,3      4.43E-71    2.43E-05   -70.3537   -4.6143    1.82E-66   -65.73940   -36.37817

TATEMENTS EXECUTED=   14095

ORE USAGE       OBJECT CODE=   95232 BYTES,ARRAY AREA=   27000 BYTES,TOTAL AREA AVAILABLE= 1624032  BYTES

IAGNOSTICS        NUMBER OF ERRORS=       0, NUMBER OF WARNINGS=       4, NUMBER OF EXTENSIONS=       0

OMPILE TIME=     3.55 SEC,EXECUTION TIME=     1.32 SEC,     17.59.56    FRIDAY       19 JUL 85    WATFIV - MAR 1980 V2L0

        CSSTOP
```

INITIAL SOLUTION

TEMPERATURE = 14.00 DEGREES C PH = 6.99 ANALYTICAL EPMCAT = 14.92 ANALYTICAL EPMAN = 14.25

***** OXIDATION - REDUCTION *****

DISSOLVED OXYGEN = 0.000 MG/L
EH MEASURED WITH CALOMEL = 10.0000 VOLTS
MEASURED EH OF ZOBELL SOLUTION = 10.0000 VOLTS
CORRECTED EH = 0.1210 VOLTS
PE COMPUTED FROM CORRECTED EH = 2.12

FLAG	CORALK	PECA_C	IDAVES
2	0	1	0

*** TOTAL CONCENTRATIONS OF INPUT SPECIES ***

SPECIES		TOTAL MOLALITY	LOG TOTAL MOLALITY	TOTAL MG/LITRE
CA	2	3.07E-03	-2.5126	1.23E 02
MG	2	3.01E-03	-2.5221	7.30E 01
NA	1	2.26E-03	-2.6451	5.20E 01
K	1	5.12E-04	-3.2907	2.00E 01
CL	-1	1.58E-03	-2.8010	5.60E 01
SO4	-2	3.03E-03	-2.5182	2.91E 02
HCO3	-1	5.84E-03	-2.2336	3.56E 02
FE	2	4.48E-07	-6.3486	2.50E-02
F	-1	3.96E-04	-3.4021	7.52E 00
NO3	-1	3.77E-04	-3.4235	2.34E 01
MN	2	1.82E-07	-6.7395	1.00E-02

****DESCRIPTION OF SOLUTION ****

	ANALYTIC A.	COMPUTED
EPMCAT	14.918	13.272
EPMAN	14.245	12.600

PH
6.990

TEMPERATURE
14.00 DEG C

IONIC STRENGTH
2.02E-02

ACTIVITY H2O = 0.9997
PCO2 = 2.89E-02
LOG PCO2 = -1.5394
PO2 = 3.15E-51
PCH4 = 1.42E-50
CO2 TOT = 7.189967E-03
DENSITY = 1.0000
TDS = 1001.9 MG/L
CARBONATE ALK = 5.84E 00 MEQ/KG H2O

EH = 0.1210 PE = 2.124
PE CALC S = 1.00E 02
PE CALC DOX= 1.00E 02
PE SATO DOX= 1.00E 02
TOT ALK = 5.84E 00 MEQ/KG H2O
ELECT = 6.73E-01 MEQ/KG H2O

IN COMPUTING THE DISTRIBUTION OF SPECIES, PE = 2.124 EQUIVALENT EH = 0.121VOLTS

DISTRIBUTION OF SPECIES

I	SPECIES		PPM	MOLALITY	LOG MOL	ACTIVITY	LOG ACT	ACT. COEFF.	LOG A COF
1	CA	2	1.05E 02	2.62E-03	-2.5823	1.54670E-03	-2.8106	5.91E-01	-0.2283
2	MG	2	5.20E 01	2.55E-03	-2.5927	1.52738E-03	-2.8161	5.98E-01	-0.2233
3	NA	1	5.15E 01	2.24E-03	-2.6490	1.96032E-03	-2.7077	8.74E-01	-0.0587
4	K	1	1.98E 01	5.08E-04	-3.2941	4.41407E-04	-3.3552	8.69E-01	-0.0611
64	H	1	1.16E-04	1.15E-07	-6.9397	1.02329E-07	-6.9900	8.91E-01	-0.0503
5	CL	-1	5.60E 01	1.58E-03	-2.8011	1.37361E-03	-2.8621	8.69E-01	-0.0611
6	SO4	-2	2.21E 02	2.30E-03	-2.6377	1.34852E-03	-2.8701	5.86E-01	-0.2325
7	HCO3	-1	3.45E 02	5.66E-03	-2.2473	4.96173E-03	-2.3044	8.77E-01	-0.0571
18	CO3	-2	1.78E-01	2.97E-06	-5.5269	1.75742E-06	-5.7551	5.91E-01	-0.2282
86	H2CO3	0	8.38E 01	1.35E-03	-2.8688	1.35973E-03	-2.8665	1.01E 00	0.0023
27	OH	-1	8.10E-04	4.77E-08	-7.3215	4.14153E-08	-7.3828	8.68E-01	-0.0614
62	F	-1	6.93E 00	3.65E-04	-3.4373	3.17210E-04	-3.4987	8.68E-01	-0.0614
19	MGOH	1	4.25E-04	1.03E-08	-7.9872	9.07716E-09	-8.0420	8.81E-01	-0.0548
23	MGSO4 AQ	0	3.93E 01	3.27E-04	-3.4859	3.28205E-04	-3.4839	1.00E 00	0.0020
22	MGHCO3	1	8.12E 00	9.53E-05	-4.0210	8.29445E-05	-4.0812	8.71E-01	-0.0602
21	MGCO3 AQ	0	1.81E-01	2.15E-06	-5.6668	2.16359E-06	-5.6648	1.00E 00	0.0020
20	MGF	1	1.17E 00	2.71E-05	-4.5669	2.36622E-05	-4.6259	8.73E-01	-0.0590
29	CAOH	1	9.66E-05	1.69E-09	-8.7710	1.48988E-09	-8.8268	8.79E-01	-0.0558
32	CASO4 AQ	0	5.22E 01	3.84E-04	-3.4159	3.85608E-04	-3.4139	1.00E 00	0.0020
30	CAHCO3	1	5.52E 00	5.46E-05	-4.1899	5.67891E-05	-4.2457	8.79E-01	-0.0558
31	CACO3 AQ	0	3.13E-01	3.13E-06	-5.5045	3.14446E-06	-5.5025	1.00E 00	0.0020
49	CAF+	1	2.21E-01	3.74E-06	-5.4270	3.27394E-06	-5.4849	8.75E-01	-0.0579
44	NASO4	-1	1.75E 00	1.47E-05	-4.8316	1.29211E-05	-4.8887	8.77E-01	-0.0571
43	NAHCO3	0	4.57E-01	5.44E-06	-5.2641	5.46965E-06	-5.2620	1.00E 00	0.0020
42	NACO3	-1	3.39E-03	4.09E-08	-7.3879	3.58920E-08	-7.4450	8.77E-01	-0.0571
94	NACL	0	3.91E-03	5.70E-08	-7.1738	6.73270E-08	-7.1718	1.00E 00	0.0020
46	KSO4	-1	5.28E-01	3.91E-06	-5.4080	3.42741E-06	-5.4650	8.77E-01	-0.0571
95	KCL	0	1.17E-03	1.57E-08	-7.8043	1.57653E-08	-7.8023	1.00E 00	0.0020
63	HSO4	-1	1.10E-03	1.14E-08	-7.9443	9.92432E-09	-8.0033	8.73E-01	-0.0590
96	H2SO4	0	1.38E-13	1.41E-18	-17.8522	1.41208E-18	-17.8501	1.00E 00	0.0020
93	HCL	0	1.21E-12	3.33E-17	-16.4772	3.34789E-17	-16.4752	1.00E 00	0.0020
8	FE	2	2.22E-02	3.99E-07	-6.3995	2.38356E-07	-6.6228	5.98E-01	-0.2232
9	FE	3	2.60E-13	4.66E-18	-17.3316	1.64235E-18	-17.7845	3.52E-01	-0.4529
10	FEOH	2	3.52E-09	4.84E-14	-13.3154	2.83728E-14	-13.5471	5.87E-01	-0.2317
11	FEOH	1	3.95E-05	5.43E-10	-9.2651	4.75283E-10	-9.3230	8.75E-01	-0.0579

11	FEOH	1	3.95E-05	5.43E-10	-9.2651	[illegible]	[illegible]	[illegible]	[illegible]
12	FE(OH)3	-1	1.12E-11	1.05E-16	-15.9797	9.17053E-17	-16.0376	8.75E-01	-0.0579
77	FE(OH)2	1	2.08E-06	2.32E-11	-10.6354	2.03021E-11	-10.6925	8.77E-01	-0.0571
78	FE(OH)3	0	8.43E-06	7.90E-11	-10.1026	7.93243E-11	-10.1006	1.00E 00	0.0020
79	FE(OH)4	-1	5.20E-07	4.20E-12	-11.3767	3.68357E-12	-11.4337	8.77E-01	-0.0571
80	FE(OH)2	0	8.63E-10	9.61E-15	-14.0171	9.65846E-15	-14.0151	1.00E 00	0.0020
15	FESO4	1	3.44E-12	2.27E-17	-16.6444	1.98463E-17	-16.7023	8.75E-01	-0.0579
16	FECL	2	5.26E-15	5.76E-20	-19.2393	3.38077E-20	-19.4710	5.87E-01	-0.2317
28	FECL2	1	1.04E-16	9.23E-22	-21.0845	7.20446E-22	-21.1424	8.75E-01	-0.0579
33	FECL3	0	1.57E-20	9.72E-26	-25.0125	9.76151E-26	-25.0105	1.00E 00	0.0020
34	FESO4	0	7.42E-03	4.89E-08	-7.3107	4.91315E-08	-7.3086	1.00E 00	0.0020
101	MN	2	8.24E-03	1.50E-07	-6.8237	8.97625E-08	-7.0469	5.98E-01	-0.2232
102	MN	3	1.09E-26	1.99E-31	-30.7007	7.02110E-32	-31.1536	3.52E-01	-0.4529
106	MNOH	1	8.57E-07	1.19E-11	-10.9229	1.04521E-11	-10.9808	8.75E-01	-0.0579
107	MN(OH)3	-1	4.67E-17	4.41E-22	-21.3557	3.85849E-22	-21.4136	8.75E-01	-0.0579
111	MNHCO3	1	3.07E-03	2.65E-08	-7.5774	2.31594E-08	-7.6353	8.75E-01	-0.0579
109	MNSO4	0	7.30E-04	4.84E-09	-8.3150	4.86479E-09	-8.3129	1.00E 00	0.0020
110	MN(NO3)2	0	2.00E-09	1.12E-14	-13.9511	1.12434E-14	-13.9491	1.00E 00	0.0020
103	MNCL	1	5.15E-05	5.70E-10	-9.2441	4.98836E-10	-9.3020	8.75E-01	-0.0579
104	MNCL2	0	2.33E-08	1.85E-13	-12.7321	1.86155E-13	-12.7301	1.00E 00	0.0020
105	MNCL3	-1	2.12E-11	1.32E-16	-15.8803	1.15290E-16	-15.9382	8.75E-01	-0.0579
108	MNF	1	1.70E-05	2.30E-10	-9.6376	2.01577E-10	-9.6956	8.75E-01	-0.0579
115	HMNO2	-1	3.05E-16	3.47E-21	-20.4593	3.03959E-21	-20.5172	8.75E-01	-0.0579
85	NO3	-1	2.34E 01	3.77E-04	-3.4235	3.26469E-04	-3.4862	8.66E-01	-0.0626

MONSANTO SWG SPECIATION USING WATEQF

	PHASE	IAP	KT	LOG IAP	LOG KT	IAP/KT	LOG IAP/KT	DELGR
18	ANHYDRIT	2.09E-06	3.61E-05	-5.6807	-4.4422	5.77E-02	-1.23856	-1.62741
22	ARAGONIT	2.72E-09	7.38E-09	-8.5657	-8.1319	3.68E-01	-0.43380	-0.56999
151	ARTIN	7.20E-27	3.86E-19	-26.1424	-18.4140	1.87E-08	-7.72842	-10.15475
20	BRUCITE	2.62E-18	3.68E-12	-17.5817	-11.4339	7.11E-07	-6.14786	-8.07797
13	CALCITE	2.72E-09	3.81E-09	-8.5657	-8.4193	7.14E-01	-0.14647	-0.19245
12	DOLOMITE	7.30E-18	1.63E-17	-17.1369	-16.7872	4.47E-01	-0.34965	-0.45943
113	FEOH3A	1.53E 03	7.67E 04	3.1850	4.8850	2.00E-02	-1.69996	-2.23366
63	FLUOR	1.56E-10	2.86E-11	-9.8079	-10.5430	5.43E 00	0.73506	0.96583
111	GOETH	1.17E-40	1.21E-42	-39.9329	-41.9175	9.65E 01	1.98463	2.60771
19	GYPSUM	2.08E-06	2.53E-05	-5.6810	-4.5973	8.25E-02	-1.08368	-1.42390
65	HALITE	2.69E-05	3.60E 01	-5.5698	1.5562	7.48E-08	-7.12603	-9.36324
109	HEMATI	2.35E 05	7.23E-04	6.3705	-3.1409	3.25E 09	9.51145	12.49756
118	HUNTITE	5.26E-35	1.63E-30	-34.2792	-29.7867	3.22E-05	-4.49254	-5.90296
39	HYDMAG	5.06E-44	7.88E-38	-43.2957	-37.1035	6.42E-07	-6.19220	-8.13623
110	MAGHEM	2.35E 06	2.34E 06	6.3705	6.3700	1.00E 00	0.00051	0.00067
11	MAGNESIT	2.68E-09	8.57E-09	-8.5712	-8.0668	3.13E-01	-0.50439	-0.66274
108	MAGNET	2.08E-02	3.77E-09	-1.6813	-8.4234	5.52E 06	6.74202	8.85866
67	MIRABI	5.17E-09	2.26E-02	-8.2869	-1.6461	2.29E-07	-6.64076	-8.72561
59	NAHCOL	9.73E-06	2.23E-01	-5.0120	-0.6524	4.37E-05	-4.35959	-5.72828
51	NATRON	6.73E-12	1.77E-02	-11.1719	-1.7531	3.81E-10	-9.41877	-12.37578
150	NESQUE	2.68E-09	8.26E-06	-8.5716	-5.0832	3.25E-04	-3.48837	-4.58354
10	SIDERITE	4.19E-13	3.98E-11	-12.3779	-10.4004	1.05E-02	-1.97750	-2.59833
66	THENAR	5.18E-09	6.87E-01	-8.2855	-0.1629	7.54E-09	-8.12255	-10.67261
62	THRNAT	6.75E-12	1.60E 00	-11.1706	0.2037	4.22E-12	-11.37428	-14.94522
60	TRONA	6.56E-17	5.13E-01	-16.1828	-0.2896	1.28E-16	-15.89319	-20.88283
172	MANGANO	8.57E 06	4.10E 18	6.9330	18.6126	2.09E-12	-11.67961	-15.34640
173	PYROLUST	8.51E-02	4.79E 16	-1.0703	16.6803	1.78E-18	-17.75058	-23.32335
174	BIRNSITE	8.51E-02	1.23E 18	-1.0703	18.0910	6.90E-20	-19.16127	-25.17691

```
175 NJSTITE      8.51E-02   3.19E 17   -1.0703    17.5040   2.67E-19   -18.57425   -24.40562
176 BIXBYITE     4.29E-21   6.56E-01  -20.3676    -0.1830   6.54E-21   -20.18463   -26.52156
177 HAUSMITE     1.06E 39   6.17E 63   39.0259    63.7901   1.72E-25   -24.75421   -32.53888
178 MNOH2        1.54E-22   9.39E-14  -21.8126   -13.0271   1.64E-09    -8.78545   -11.54364
179 MNOH3        4.99E-54   6.19E-37  -53.3021   -36.2081   8.05E-18   -17.09402   -22.46066
180 MANGANIT     6.55E-11   5.78E-01  -10.1839    -0.2380   1.13E-10    -9.94587   -13.06836
181 RHODOCHR     1.58E-13   3.31E-11  -12.8020   -10.4806   4.77E-03    -2.32140    -3.05020
183 MNCL2        1.69E-13   1.80E 09  -12.7712     9.2548   9.42E-23   -22.02596   -28.94096
184 MNCL2.1W     1.69E-13   5.29E 05  -12.7713     5.7235   3.20E-19   -18.49477   -24.30116
185 MNCL2.2W     1.69E-13   8.43E 03  -12.7715     3.9260   2.01E-17   -16.69743   -21.93956
186 MNC_2.4W     1.69E-13   1.67E 02  -12.7717     2.2220   1.01E-15   -14.99373   -19.70099
190 MNSO4        1.21E-10   1.27E 03   -9.9170     3.1036   9.53E-14   -13.02069   -17.10851
191 MN2SO4.3     1.21E-71   2.43E-05  -70.9176    -4.6143   4.97E-67   -66.30328   -37.11909

STATEMENTS EXECUTED=   14095
CORE USAGE      OBJECT CODE=   95232 BYTES,ARRAY AREA=   27000 BYTES,TOTAL AREA AVAILABLE= 1624032  BYTES
DIAGNOSTICS       NUMBER OF ERRORS=       0, NUMBER OF WARNINGS=       4, NUMBER OF EXTENSIONS=       0
COMPILE TIME=     3.52 SEC,EXECUTION TIME=     1.35 SEC,     17.55.42    FRIDAY       19 JUL 85    WATFIV - MAR 1980 V2L0

      C$STOP
```