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Final Report
WDATCP Sustainable Agricultural Demonstration Project #8810

DEMONSTRATION OF LOW INPUT STRATEGIES FOR POTATO/VEGETABLE PRODUCTION ON IRRIGATED SANDS

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Introduction

Wisconsin leads the nation in the production of processing vegetables and is sixth, nationally in potato production. Over 50% of the state's potato and processing snap bean production is located in Wisconsin's Central Sands Area. Such production results in a significant economic base for that area. The Central Sands has the climate and soils that favor potato and processing vegetable production. However, these same light, sandy soils coupled with shallow depths to groundwater, make the area sensitive to groundwater contamination with nitrates and pesticides commonly used in the production of these crops, particularly potatoes.

During the past decade, UW-CALS and CES faculty have conducted research to develop production practices which would protect groundwater resources while maintaining crop productivity and profitability. Much of this research has focused on techniques which reduce nitrogen, pesticide and irrigation inputs. Lowering such inputs can significantly reduce energy use and costs, reduce groundwater contamination and improve net returns (profits) while maintaining crop productivity. It was this research that provided the basis for developing a program of "best management practices" (BMPs) for potato and processing vegetable production on irrigated sands.

To demonstrate these BMPs, a team of CES extension specialists developed an "on farm" demonstration project. This two-year project was supported with WDATCP Sustainable Ag Program, WDNR and research gift funds. The CES team included UW-Madison extension specialists from Horticulture, Entomology, Plant Pathology and Soil Science. Staff from the Central Wisconsin Groundwater Center, College of Natural Rersources - UW Stevens Point also cooperated in this demonstration effort.

Site Characteristics

Three potato/vegetable growers participated in this BMP demonstration project. Growers A and B were located in the Central

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Sands Area (Poprtage County) while grower C was located in northwestern Wisconsin (Barron County) as shown in Figure 1.

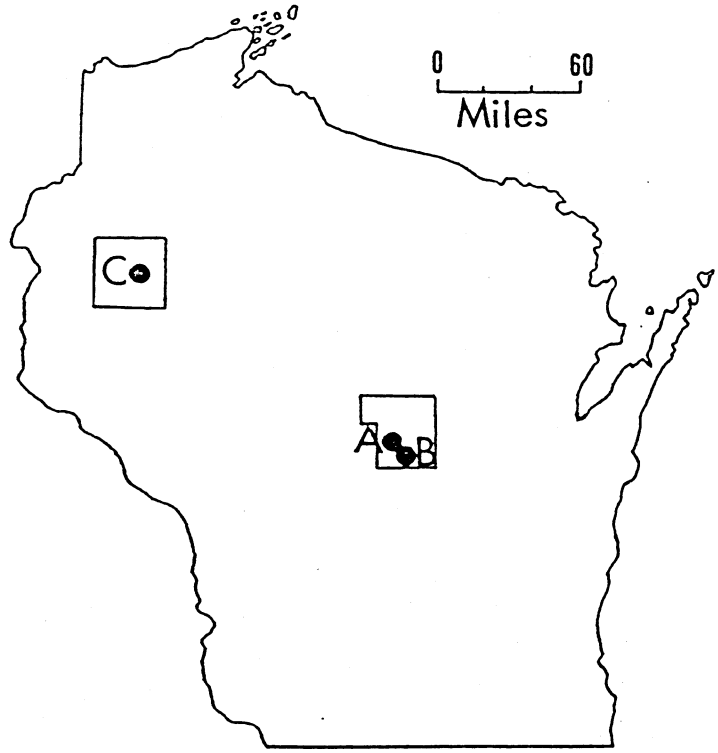

Figure 1. Location of BMP demonstration study fields

Each grower provided a 40 acre, center-pivot irrigated field having sandy soils and a relatively shallow depth to groundwater. The BMP program was used on one-half of the field (20 acres) and was compared to the grower's production practices on the other half. The cooperation of the three growers is acknowledged and greatly appreciated since the demonstrations were not without economic risk to them.

Fields A and B are in the Central Sand Plain Aquifer comprised of undifferentiated sand and gravel of the Pleistocene Horicon Formation (Clayton, 1986). It consists of 20 to 150 feet of slightly gravely sand deposited by braided streams of glacial meltwater flowing westward from end moraines in eastern Portage County. Filed C is located in the sand and gravel outwash of the Red Cedar River plain. The aquifer materials were also deposited by braided streams fed by glacial meltwater and range from 100 to 200 feet thick in the vicinity of Field C (Zaporozec, 1986; Trotta and Cotter, 1973). No silt or clay beds were observed in bore holes or well construction reports at any of the study fields. The average depth to the water table was 6 feet at Field A, 15 feet at Field B and 13 feet at Field C.

The soils at Field A consist entirely of roscommon muck (Mollic Psamnaquent, mixed, frigid) which has about a 9 inch organic surface

what does this mean?

layer over deep medium and coarse sand are present (USDA, 1978). It is poorly drained except near the ditches, such as at Field A and has rapid permeability. Soils at Field B are mostly Richford loamy sand (Psammentic Hapludalf, sandy, mixed, mesic) with a small area of Plainfield loamy sand. They typically have a 5 to 7 inch surface layer of brown loamy sand and about 30 inches of loamy sand subsoil formed over sand and gravel (USDA, 1978). The soils are well drained with rapid permeability. The soils at Field C are primarily Chetek sandy loam (Entric Glossoboralf, coarse, loamy, mixed) which is a well drained soil underlain by sand and gravel (USDA, 1958). All three fields can be rated as having soil and subsurface characteristics which are very vulnerable to groundwater contamination (WDNR, et al., 1987). based on what or by whom?

The irrigation well serving Field A ~~was~~ is located in the middle of the demonstration field. The one at Field B ~~was~~ is located on the up-gradient (east) side of the field at its midpoint. The irrigation well serving Field C ~~was~~ is located about one-quarter mile north of the demonstration field.

The BMP Demonstration Described

This project demonstrated "best management practices" (BMPs) for potato and process vegetable production on irrigated sands. Potatoes were planted in all three fields for the 1988 growing season. The Russet Burbank variety was grown at Fields B and C, while Russet Norkotah was grown at Field A. In 1989, Sweet corn was planted at Field A, snap beans at Field B and red kidney beans at Field C. Field C was included in the 1989 groundwater monitoring program but not in the BMP demonstration.

BMP programs were developed for potatoes, sweet corn and snap beans. The programs were based on research and were designed to reduce fertilizer-nitrogen, pesticide and irrigation inputs. The BMPs used were as follow:

reference?

Nitrogen Management

Crop variety grown, realistic yield goals and soil organic matter were used in determining and minimizing the rates of fertilizer nitrogen application for the BMP program. Since no field had a legume crop the previous year, no nitrogen credits could be used to further reduce fertilizer nitrogen. The BMP programs used split nitrogen applications which were timed to maximize nitrogen uptake. The potato BMP program also used petiole analyses to determine if mid-season additions of nitrogen were needed. Petiole analyses were not available for sweet corn and snap beans.

Weed Control

The BMP weed control program was designed to minimize the use of herbicides. Selection of herbicides was based on the anticipated weed problems as indicated by past experience. When used, herbicides were

applied at the lowest rate consistent with economical control. The potato BMP program also used a computerized potato emergence predictor to "fine tune" the timing of herbicide application. Proper timing optimiizes herbicide effectiveness.

Insect Control

The BMP program did not use systemic insecticdes with potatos and snap beans. Systemics are often used for prophylactic insect control with both crops (systemic are not available for sweet corn). Instead of systemics, the BMP programs treated insect problems as they occurred during the growing season. Weather data, particularly temperature, and field scouting were used to monitor insect activity. The monitoring data was then used with economic thresholds to determine the need for insect control. No insecticide was applied unless insect populations exceeded economic threshold levels.

Disease Control

The BMP programs for potatoes and snap beans used the computer to assist in making some disease control decisions. PDM (Potato Disease Management) was used to predict the incidence of early and late blights which are the major foliar diseases of potatoes. The WMF (White Mold Forcasting) computer program was used to predict the occurrence of white mold in snap beans. This is a major disease problem which reduces pod yields. Weekly field scouting, in conjunction with thresholds, were used to determine the need for controlling other disease problems with all three crops.

Irrigation Management

The BMP irrigation management programs were based on WISP, the Wisconsin Irrigation Scheduling Program. This computer program utilized daily crop water use estimates to monitor soil water storage. Soil water storage levels then determine the amounts and frequency of irrigation needed to meet crop needs. The WISP program was designed to minimize over-irrigation and thus the leaching of contaminants to groundwater. The WISP program also provides for more efficient irrigation which can result in less energy use.

Data Collection

Crop productivity and groundwater quality data were collected to evaluate the effectiveness of the BMP programs. Yield/quality data was collected just prior to the commercial harvest of each demonstration field. Five random samples of each crop were collected from each half of each field. Yield and qualtiy determinations were made according to standards used in commercial practice. Production practices and other cultural data used by the cooperating growers were also collected and are presented in Appendix Tables 1 to 5.

The Central Wisconsin Groundwater Center monitored the groundwater in each of the demonstration fields. Each of the three fields was divided into halves along the cardinal direction most parallel to the hydraulic gradient, with the BMP program used on

one-half and the grower's practices on the other half. Figure 2 illustrates the ground water flow directions and monitoring well installations for each field.

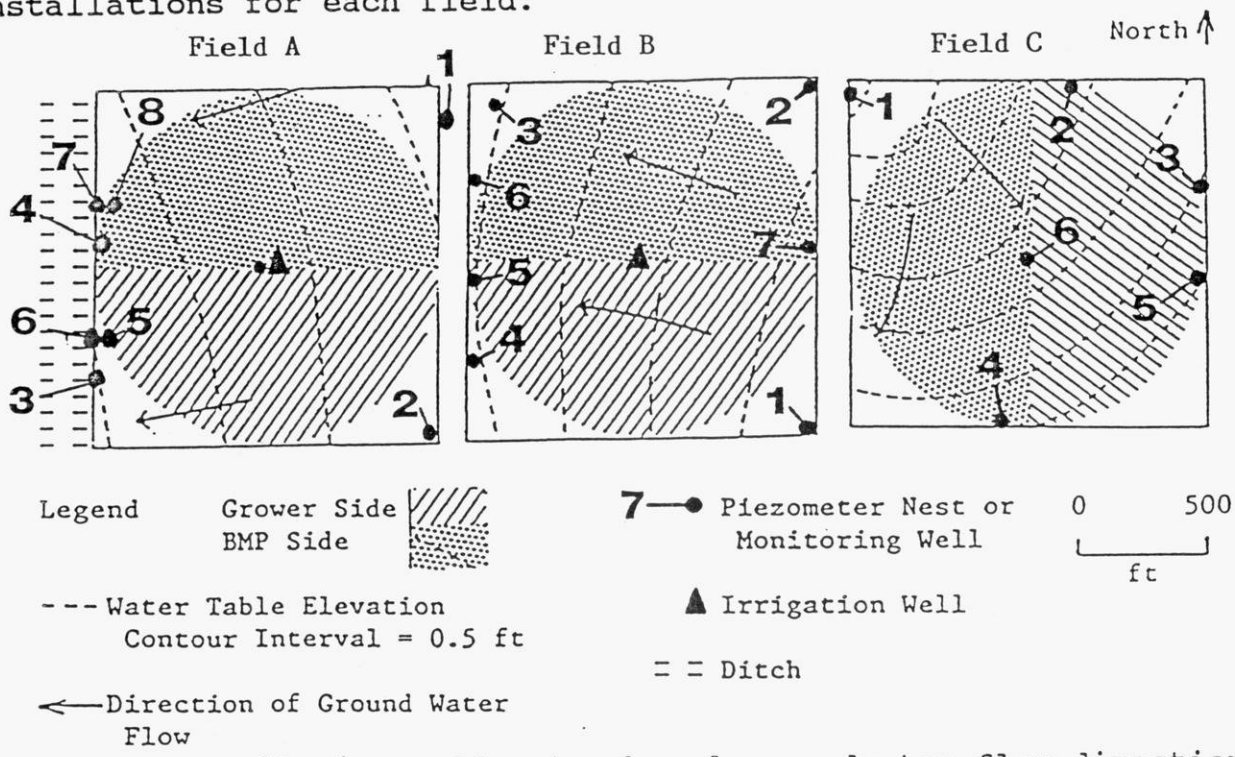

Figure 2. Monitoring well network and groundwater flow directions at demonstration fields.

The basic monitoring well design consisted of one up-gradient well nest and two down-gradient well nests on each half of the field. Up-gradient sites monitored groundwater coming into the demonstration field and reflected land use activities up-gradient of the field. The down-gradient wells monitored the ground water leaving the demonstration field and reflected the practices used on the field. Each nest had two monitoring wells, one screened from 0 to 3 feet and the other from 4 to 7 feet below the water table. Water quality and head measurements were taken about every two weeks during the growing season and monthly otherwise. Analyses were conducted for temperature, pH, conductivity, nitrate, chloride, alkalinity and hardness. Separate samples for herbicide analyses were also collected.

All wells were purged by bailing or puming at least three well volumes of water prior to sampling. All samples were chilled shortly after sampling and refrigerated in the lab. Aqueous nitrate was analyzed by Technicon Method 15871W/A (June 1977). Field blanks and duplicates were collected and analyzed at a continuing rate of about 8 to 10 percent of total samples. The detection limit for nitrate was

0.20 mg/l, NO3-N. Collected water samples were analyzed for the herbicides used by the Department of Horticulture, UW Madison. The samples were not analyzed for the insecticides and fungicides which might have been used.

Crop Productivity Responses to BMPs

The 1988 Results - Potatoes

The "best management practices" employed in the 1988 potato demonstrations were effective in reducing fertilizer nitrogen, pesticide and irrigation inputs. Such input reductions were without a significant loss of productivity at two of the demonstration fields. Some productivity loss was observed at the third field.

1. Potato Productivity

The effects of the BMP program on potato productivity were apparent from the yield/quality data presented in Table 1.

Table 1. Potato Yield/Quality - 1988 BMP Demonstrations

Field	Total Yield cwt/A	US1A %	US1B %	Culls %	Dry Matter %
A Grower	187	71	21	8	--
BMP	117	54	32	14	--
B Grower	557	46	15	39	21
BMP	518	44	12	44	20
C Grower	540	68	7	25	20
BMP	560	74	8	18	20

The data was not subjected to statistical analyses, but the yield and quality differences at Location A were likely significant. The yield for both programs were unusually low, but the BMP yield and quality were especially poor. The overall performance at Field A may have been due, in part, to the climatic stresses of the 1988 growing season. But the poorer performance of the BMP program likely reflected poorer weed control compared to the grower program. Part of the BMP weed control strategy was to use a well-developed plant canopy to shade the soil surface and thus prevent weed development. The reduced herbicide use at Field A (Table 2), was designed to provide weed control only during canopy development. At this Field, the potato variety grown was Russet Norkotah. Under the stress conditions of 1988, this variety did not obtain sufficient canopy development and thus weeds became a problem. While the grower portion of the field had similar canopy development, the higher herbicide rate provided more acceptable weed control and thus higher yields.

The yields and quality differences for Fields B and C were likely not significant. Thus both the BMP and grower programs produced essentially the same results. Yields for both these fields were excellent while overall quality was down due to climatic stress., particularly at Field B. Here the stress-related quality reductions were typical for the variety (Russet Burbank) grown, which is sensitive to stress. It should be noted that grower observations during the harvest of Field C indicated somewhat lower yield for the BMP program.

The BMP yield at Field B was interesting. This field was the only one to show considerable vine growth differences at the time of vine-kill. The BMP side of the field showed earlier and more vine senescence than did the grower side. This difference in vine senescence was likely due to the lessor amount of nitrogen used. However, the impact of the earlier and greater vine senescence on yield/quality was minimal.

2. Production Inputs

Table 2 summarizes the nitrogen, pesticide and irrigation input differences between the BMP and grower programs.

Table 2. Input Summaries - 1988 BMP Demonstrations

Input	Input Differences - BMP from Grower 1/ Field A	Field B	Field C
Nitrogen	-17 lbs.	-55 lbs.	-50 lbs.
Herbicide	- 0.25 lb.	- 0.25 lb.	=
Insecticide	+ 1 appl.	- 2 appl.	=
Fungicide	=	- 3 appl.	=
Irrigation	- 1.4 in.	- 1.5 in.	=

1/ BMP used + (more than), - (less than) or = (same as) the grower program.

The BMP program resulted in less fertilizer nitrogen applied for all fields. The reduction was especially large at Field B. These reductions were due, in part, to the use of petiole analyses in late June. Petiole analyses indicated sufficient nitrogen at all fields at this time. Thus no additional (mid-season) nitrogen was applied to the BMP side of the fields.

The BMP program minimized the rates of herbicide use at all fields. This resulted in 0.25 lb/A less metribuzin (Sencor/Lexone) being used at Fields A and B. The BMP practice of field scouting indicated the need for an insecticide application to control Colorado potato beetle at Field A. Since grower made no such application (because there was no beetle pressure on his side) the BMP program resulted in one more insecticide application. The BMP program did result in two less insecticide applications at Field B. There were no differences, in insecticide applications, at Field C.

The BMP disease management program resulted in equivalent amounts of fungicide being used at Fields A and C. However, the BMP program saved three fungicide applications at Field B. Finally, the BMP program saved 1.4 inches of irrigation (a 12% reduction) at Field A and 1.5 inches (a 8% reduction) at Field B. Irrigation amounts were the same at Field C.

3. Energy Inputs

The reduced inputs associated with the BMP program also had the desired effect of reducing energy inputs and input costs. The energy reductions (Table 3) reflect energy savings in the manufacture and application of these inputs. As expected, Field B had the greatest energy savings since the BMP program resulted in the greatest reduction of production inputs.

Table 3. Input Energy Differences - 1988 BMP Demonstrations

Input	Energy Diff. 1000 BTUs/A - BMP from Grower 1/ Field A	Field B	Field C
Nitrogen	-1,254	-1,344	-1,290
Herbicide	-24	-21	=
Insecticide	+87	-250	=
Fungicide	=	-232	=
Irrigation	-265	-273	=
Total	-1,456	-2,120	-1,290

1/ BMP used + (more than), - (less than) or = (same as) the grower program.

As Table 3 indicates, energy savings due to the BMP programs ranged from 1.3 to 2.2 million BTUs per acre. Data for total energy inputs used by the cooperating growers was not obtained. However, it is estimated that some 15.3 million BTUs of energy inputs are required to produce one acre of irrigated potatoes. This estimate is based on potato crop budget information prepared by UWEX-CES Agricultural Economists. Based on this 15.3 million BTU value for total energy inputs, the following percent energy savings were realized; 9% at Field A, 14% at Field B and 8% at Field C.

4. Input Costs

The reduction of production inputs, due to the BMP program, also resulted in some cost savings. These cost savings, in Table 4, were attributed to reductions in inputs and reduced application costs.

The input cost reductions were minimal for Fields A and C. but were significant for Field B. While actual total cost data was not obtained, the cost reduction for Field B may have approached 11%, based on a total input cost of $687 per acre (this estimate does not include such fixed costs as land, management etc.). However, cost

how was this estimated?

Table 4. Input Cost Differences - 1988 BMP Demonstrations

Input	Cost Differences $/A - BMP from Grower 1/ Field A	Field B	Field C
Nitrogen	-3.40	-11.00	-10.00
Herbicide	-4.63	- 4.63	=
Insecticide	+4.88	-40.00	=
Fungicide	=	-15.08	=
Irrigation	-3.11	- 3.33	=
Total	-6.26	-74.52	-10.00

1/ BMP cost + (more than), - (less than) or = (same as) the grower program.

reductions must also be related to the yield obtained. Field A was a good example. While the BMP program lowered inputs and costs, it also reduced yield. The size of the yield decrease in relation to the cost reduction suggested a higher per unit (cwt) cost for the BMP program. The true measure of this relationship would be determination of per unit costs. This was not done because of a lack of total cost data.

1989 Results - BMPs for Process Vegetables

Because Field C was not available, the 1989 demonstrations were conducted only at Fields A and B in the Central Sands Area. Sweet Corn was the processing vegetable grown at Field A while processing snap beans were grown at Field B.

The "best management practices" (BMPs) used at these locations were also effective in reducing some of the production inputs. Such reductions did not result in loss of productivity at one field while some yield reduction was observed at the other field. However, production input reductions were not to the extent as that observed for potatoes in 1988.

1. Process Vegetable Productivity

The effects of the BMPs on processing vegetable production are shown in Table 6. At Field A, there was a reduction in yield associated with the BMP program. Although the data was not statistically analyzed, this yield reduction was probably significant.

As previously indicated, Field A had a lower potato yield in 1988 associated with the BMP program. And like 1988, overall yields (both grower and BMP) were down from what would normally be expected. There was little difference in ear number between the grower and BMP programs indicating a smaller ear size for the BMP program.

At Field B, there were no snap bean yield differences between the grower and BMP programs. This indicated that both programs were producing the same yield responses. The BMP program did produce a smaller percentage of large pods as indicated by the % sieve size 5+

Table 6. Process Vegetable Yield - 1989 BMP Demonstrations

Field	Sweet Corn Yield tons/A	Sweet Corn Ear No. 1000/A	Snap Bean Yield tons/A	Snap Bean Pod Size 1/ %
A Grower	5.9	17	--	--
BMP	4.8	16	--	--
B Grower	--	--	10.3	52
BMP	--	--	10.4	47

1/ Pod sieve size 5 and larger.

data (47% sieve size 5+ compared to 52% 5+). This would suggest that snap bean maturity (as reflected by pod size) might have been delayed. Had the BMP side been harvested at the same percentage of sieve size 5 and larger pods, the BMP program might have had a larger yield. There is a direct relation between pod size and yield.

2. Production Inputs

Table 7 summarizes the nitrogen, pesticide and irrigation input differences between the grower and BMP programs. It should be noted that no fungicides were used in either program at Field A.

Table 7. Input Summaries - 1989 BMP Demonstrations

Input	Input Differences - BMP from Grower 1/ Field A	Field B
Nitrogen	-42 lbs.	+10 lbs.
Herbicide	- 2 lbs.	=
	-1/4 pt	--
Insecticide	=	=
Fungicde	none used	=
Irrigation	- 2 in	- 0.8 in

1/ BMP used + (more than), - (less than) or = (same as) the grower program.

The BMP program reduced the nitrogen input at Field A by about 26% of the total nitrogen used by the grower program. This may have had a negative impact on yield. The BMP program also substituted 2,4D for the atrazine used in the grower program. This did result in somewhat poorer weed control and that along with reduced nitrogen probably caused the yield reduction associated with the BMP program. The grower program used 2 inches more irrigation than the BMP program, but this was not believed to have affected yield.

At Field B, input differences were minimal. The BMP program did use 10 lbs more nitrogen and 0.8 inch less irrigation.

3. Energy Inputs

The energy input differences are indicated in Table 8.

Table 8. Input Energy Differences - 1989 BMP Demonstrations

Input	Energy Diff. 1000 BTUs/A - BMP from Grower 1/ Field A	Field B
Nitrogen	-1,281	+284
Herbicide	-99	=
Insecticide	=	=
Fungicide	=	=
Irrigation	-364	-145
Total	-1,744	+139

1/ BMP used + (more than), - (lessThan) or = (same as) the grower program

The BMP program produced energy savings of 1.7 million BTUs/acre. This represented about a 24% reduction in energy use when compared to the estimated 6-7 million BTUs needed to grow a sweet corn crop. As the data (Table 8) indicates, reduced nitrogen and irrigation use provided the largest energy savings. The BMP program at Field B resulted in a net increase in energy use of about 7%. This increase was attributed to the extra nitrogen used by the BMP program.

4. Input Costs

The reduction of production inputs did reduce costs at Field A while total costs were essentially the same at Field B. The cost data is presented in Table 9.

The cost savings of $24/acre at Field A represent about 15% reduction based on a total cost of $161/acre (does not include fixed costs). As indicated in the 1988 potato results, the true measure of the cost impacts of BMPs is the determination of the per unit cost. This was not done because of a lack of total cost data for the grower program. However, as with the potatoes for Field A (1988), the BMP program did reduce costs, but yields were also reduced. This may have resulted in a higher per unit cost for the BMP program.

Table 9. Input Cost Differences - 1989 BMP Demonstrations

Input	Cost Differences $/A - BMP from Grower 1/ Field A	Field B
Nitrogen	-8.40	+0.60
Herbicide	-2.83	=
Insecticide	=	=
Fungicide	=	=
Irrigation	-4.44	-1.76
Total	-24.07	-1.10

1/ BMP used + (more than), - (less than) or = (same as) the grower program

Groundwater Responses to BMPs

A complete listing of all groundwater analyses is presented in Appendix Tables 6 to 8. Time-averaged data are summarized in Table 10.

The groundwater analyses were similar for all three fields. Fields A and C had lower pH, alkalinity, hardness, and conductivity than Field B, probably due to a greater abundance of carbonate minerals in the aquifer matrix at Field B. A disparity between alkalinity and hardness exists beneath all fields. This is due to leached nitrate and chloride from fertilizers replacing bicarbonate as the dominant anions in the water chemistry.

Nitrate

Substantial amounts of nitrate (Tables 11 and 12) were lost to groundwater from both grower and BMP practices, resulting in nitrate-N concentrations substantially exceeding the 10 mn/L groundwtaer standard. The data indicate BMP programs were no more effective in reducing nitrate-N leaching.

Nitrate was lower in up-gradient wells than in down-gradient wells. Nitrate was lower in shallow up-gradient wells than in the deeper wells, probably indicating that a strip of land contributing low-nitrate recharge water intervenes between the demonstration fields and an up-gradient nitrate source.

Nitrate concentrations in down-gradient wells, particularly shallow ones, exhibited "peaky" behavior over time (Figure 3). Nitrate-N concentrations in shallow wells sometines varied from ~~<0.2~~ to >100 mg/L during a one year period. This "peaky" behavior ~~is due~~ to several factors, including (1) annual groundwater recharge patterns, (2) event related groundwater recharge, (3) interference from groundwater withdrawal for irrigation, and (4) timing of nitrogen applications.

Due to their temporal and spatial variability, the monitoring

data are difficult to interpret. Perhaps the best way to contrast BMP vs. grower practice impacts is to compare time-averaged nitrate-N data (Tables 11 and 12) from the shallow monitoring wells, since the shallower wells are likely more representative of the quality of recharge water beneath the study fields during the year of application (cf., Manser, 1983; Bruce, 1985; Harkin et al., 1986). BMP shallow wells are unequivocally higher in nitrate-N in Field A (years 1 & 2), Field B (year 2) and are arguably so in Field B (year 1). Only in Field C (year 1), do results possibly indicate BMP's having less impact on groundwater. Reasons for the apparent greater nitrate leaching under BMP's in Field A may include the poor potato yield in year 1. The reduced yield may have caused a reduced N uptake and hence more soil N available for leaching in both years 1 and 2.

Much of the difficulty in interpreting the data is due to uncertainty as to what the monitoring points are actually sampling: is it water recharged during the year of application, a previous year, or a mixture? A better approach is needed. One possible approach would involve defining the vertical thickness of groundwater containing the current year's recharge water and leached nitrate. This may be possible by utilizing multi-level samplers (i.e., Pickens, 1978) equipped short (6-12 inch) screens evenly over a 5-10 ft. interval. The vertical thickness containing the year's groundwater recharge could be identified by sampling the multi-level piezometer and looking for some "marker" which would delineate its top and bottom. The marker could be a discrete zone of low-nitrate groundwater, a chemical tracer applied with fertilizer, or a particular ratio of stable isotopes in the recharge water.

Herbicide Analyses

Herbicide analyses corresponded to the herbicides that were field applied. Monitoring well samples from all fields were analyzed for metribuzin in year 1. From April through October, 1989, water samples from Field A were analyzed for metribuzin, metolachlor, and atrazine while those from Field B were analyzed for metribuzin and EPTC. There were a total of five herbicide detects, all of which were in 1988 for metribuzxin. At Field A, a detect of 2.5 ug/L was found on 6/8/88 in a shallow well on the BMP side. A detect of 1.1 ug/L was found at Field B in an up-gradient well. There were three detects at Field C from both the deep and shallow wells at the same cluster on the BMP down-gradient side:

6/14/88 - 189.6 ug/L
6/30/88 - 16.7
7/25/88 - 3.6

Table 10. Time-averaged water quality analyses for the period April 1, 1988 - March 30, 1990.

Well*	pH	Alkalinity (mg/L)	Hardness (mg/L)	Chloride (mg/L)	Cond'y. (umho)	NO2/NO3-N (mg/L)
Field A						
O1-7	5.59	10.3	75.3	2.4	167.9	0.9
O2-8	6.39	22.1	58.3	1.9	114.7	1.1
O3-6	6.17	19.2	222.6	58.2	528.3	26.3
O3-10	7.14	87.4	252.5	57.5	536.9	16.2
O4-10	5.72	15.9	305.7	87.0	759.9	45.1
O4-13	6.49	45.9	306.2	85.2	701.0	31.0
O5-9	6.37	21.9	259.3	82.8	583.9	11.7
O6-9	6.20	19.1	264.3	79.2	582.2	15.1
O6-13	6.71	53.6	211.6	54.1	429.7	0.2
O7-9	6.35	29.0	431.9	89.0	995.6	68.8
O7-13	6.27	20.8	276.2	75.2	628.1	17.7
O8-8	6.39	19.5	283.1	100.0	685.2	26.2
O9-20	6.47	16.0	284.0	97.0	657.0	5.5
Field B						
W1-17	7.81	162.9	214.6	26.1	458.0	6.9
W1-22	7.88	140.0	230.1	17.1	467.3	13.7
W2-20	7.77	161.9	230.9	9.8	466.6	10.7
W2-24	7.85	134.5	281.3	25.2	577.4	22.1
W3-17	7.75	106.1	417.9	71.8	870.0	43.5
W3-21	7.78	106.7	376.6	62.7	762.2	36.9
W4-14	7.78	130.5	334.7	45.3	719.7	31.1
W4-18	7.88	93.9	341.8	56.7	722.8	34.0
W5-15	7.76	133.6	355.1	54.4	807.2	32.5
W5-19	7.93	99.4	330.0	52.8	708.6	37.0
W6-16	7.75	110.2	385.1	49.4	808.2	49.1
W6-20	7.84	95.8	349.9	54.7	747.7	40.3
Field C						
M1-25	6.64	27.7	48.4	7.6	113.2	2.1
M1-29	6.69	54.8	72.3	11.3	174.6	1.4
M2-15	6.27	13.1	75.0	6.8	204.9	13.8
M2-19	6.25	13.3	90.5	6.6	237.3	16.0
M3-12	5.78	8.0	174.5	37.5	519.2	30.8
M3-16	6.36	32.2	123.6	18.5	299.1	18.7
M4-13	6.12	13.1	121.7	14.5	296.4	22.7
M4-17	6.35	23.7	142.9	19.8	351.4	25.6
M5-15	6.19	11.5	189.6	41.3	467.4	35.1
M5-19	6.44	21.4	147.9	24.3	365.1	26.8
M6-19	6.31	14.6	171.7	24.0	416.6	32.2
M6-23	5.42	23.6	114.1	8.8	271.4	17.4

* First numeral in well number is the well location; second is the total well depth (feet).

Table 12. Average of replicate monitoring points.

Shallow/ deep	U,G,P*	Year 1 (mg/L)	Year 2 (mg/L)	Year 3 (mg/L)
		FIELD A		
Shallow	U	0.8	1.2	1.0
	G	27.0	14.1	20.7
	B	55.8	58.2	56.9
Deep	G	13.7	2.9	8.2
	B	25.9	22.9	24.4
		FIELD B		
Shallow	U	9.2	8.4	8.8
	G	43.6	21.0	31.8
	B	52.8	43.5	46.3
Deep	U	17.5	18.3	17.9
	G	34.3	36.6	35.5
	B	38.9	38.6	38.6
		FIELD C		
Shallow	U	9.9	5.9	7.9
	G	35.1	30.7	33.0
	B	28.0	26.8	27.4
Deep	U	10.4	7.0	8.7
	B	22.8	22.7	22.7
	G	22.0	21.1	21.5

* First numeral in well number is the well location; second number is the total well depth (feet).

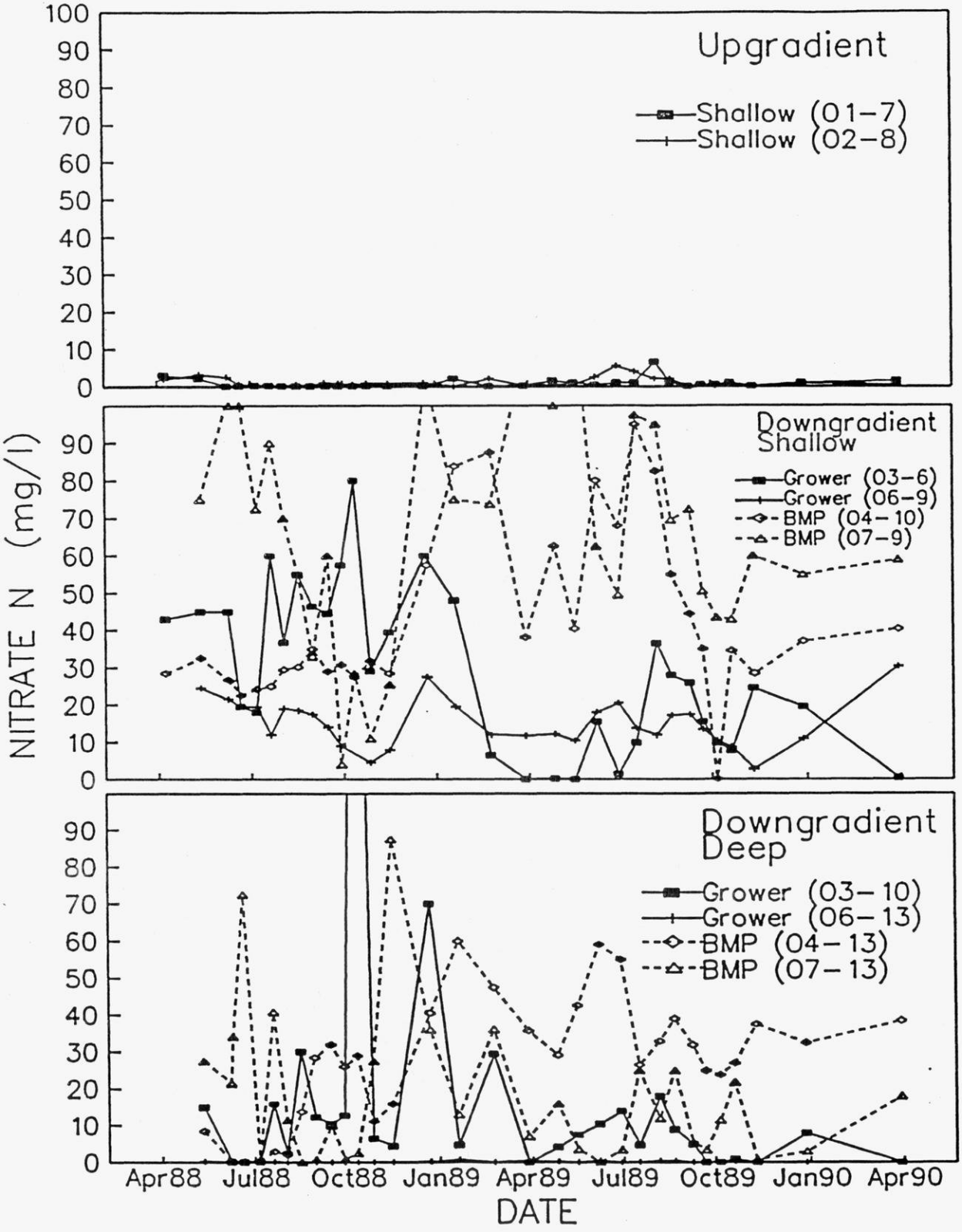

Figure 3. Nitrate-N at up-gradient (top), down-gradient shallow (middle), and down-gradient deep (bottom) monitoring wells where 10 or more samples were taken; Field A.

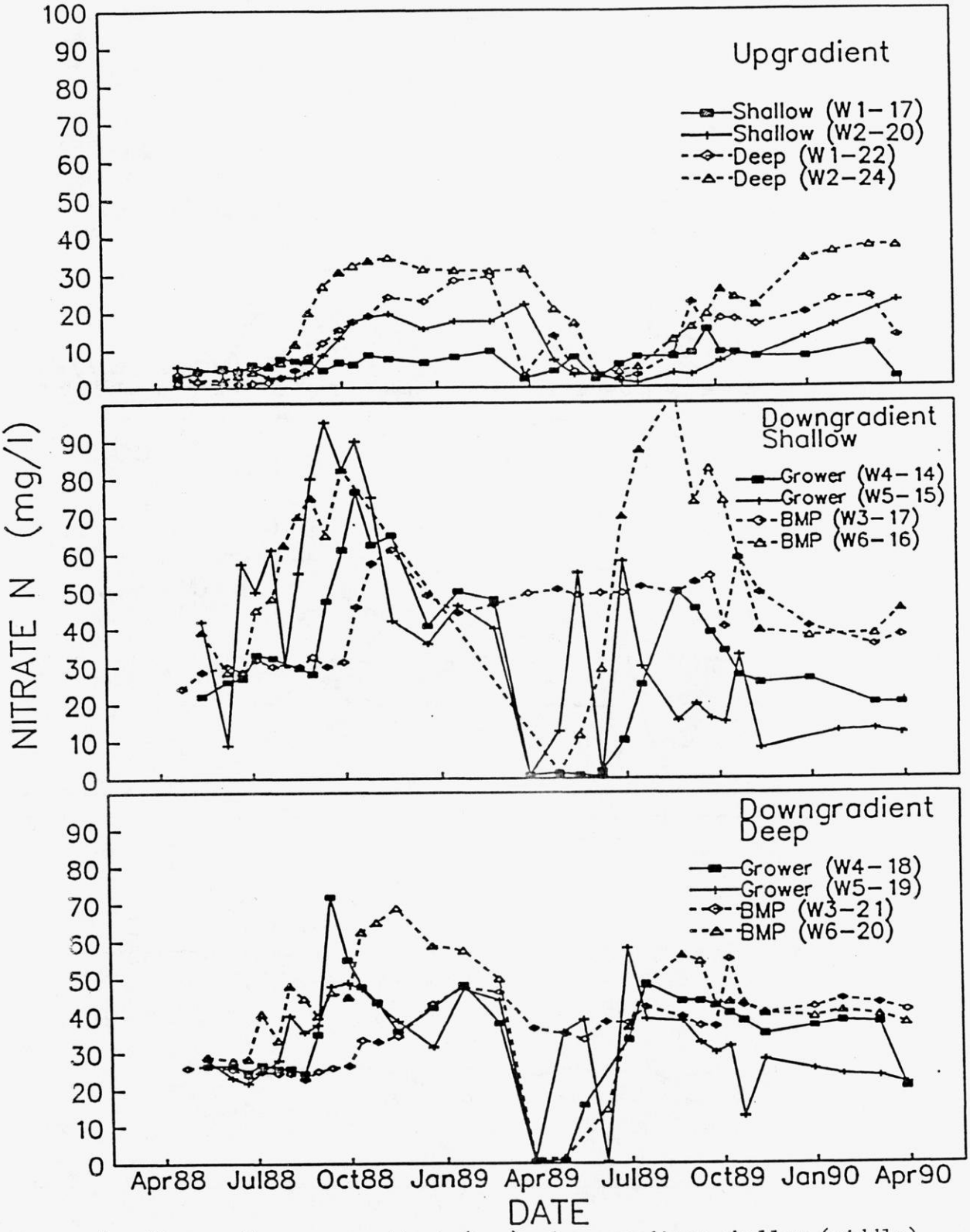

Figure 4. Nitrate-N at up-gradient (top), down-gradient shallow (middle), and down-gradient deep (bottom) monitoring wells where 10 or more samples were taken; Field B.

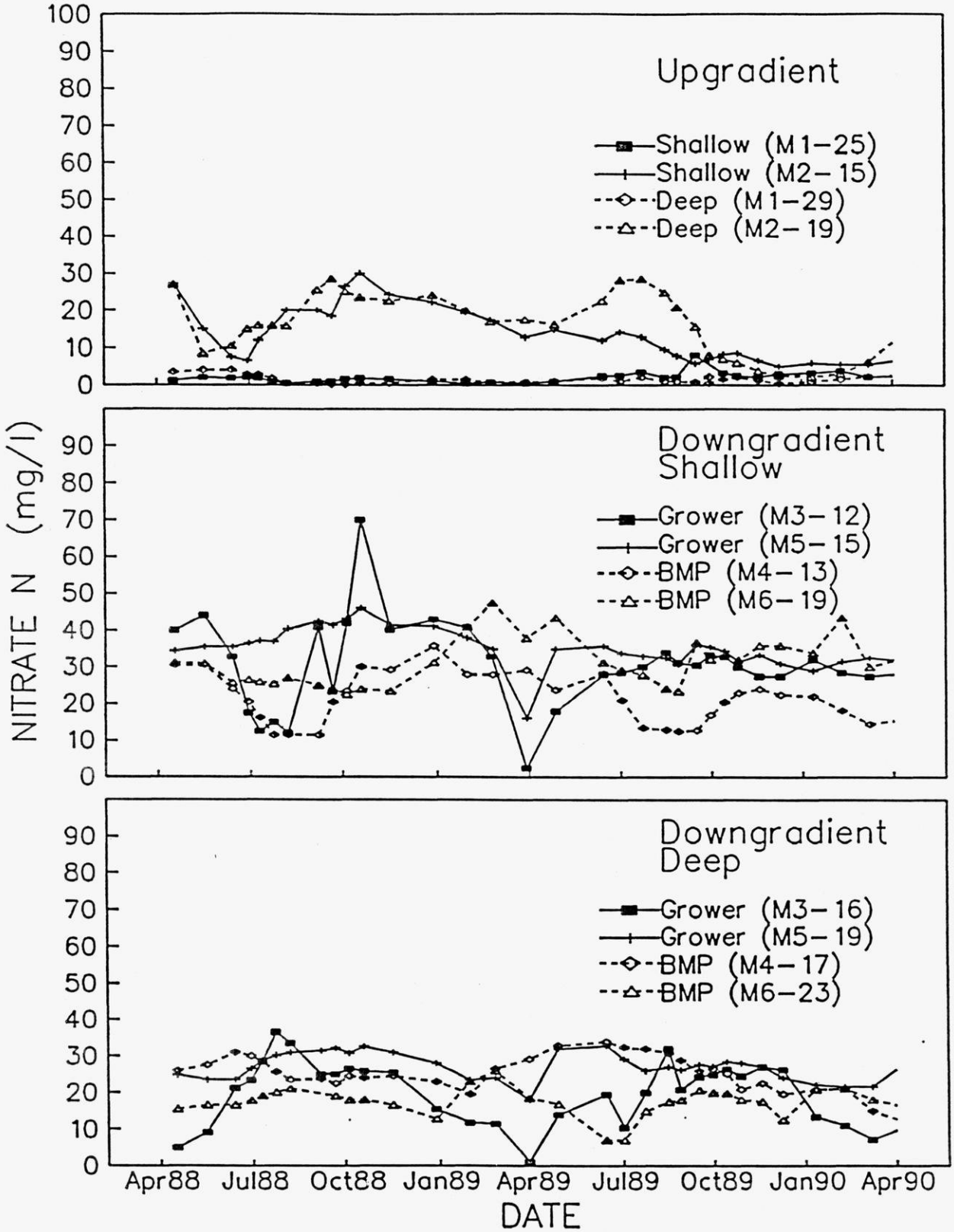

Figure 5. Nitrate-N at up-gradient (top), down-gradient shallow (middle), and down-gradient deep (bottom) monitoring wells where 10 or more samples were taken; Field C.

The Potential for BMPs

The 1988/1989 BMP demonstrations with potatoes and process vegetables indicated there is potential for "best management practices" to reduce production inputs without a loss of productivity. Fertilizer nitrogen, herbicides, insecticides, fungicides and irrigation can all be reduced with careful management. Two of the potato demonstrations showed significant input reductions without yield losses while one potato and the sweet corn demonstration had yield losses with such reductions. In those demonstrations where productivity was not affected, the input reductions resulted in significant energy and costs savings of up to 24% and 15% respectively. Thus BMPs do have potential for effecting energy and cost savings by reducing fertilizer, pesticide and irrigation inputs.

The demonstrations did not clearly establish the effectiveness of BMPs in reducing groundwater contamination with nitrates and pesticides. There was considerable variability in the analytical data which complicated interpretations. However, it still seems logical to assume that if the amounts of fertilizer nitrogen, pesticides and irrigation can be reduced, then the potential for leachiong such materials should be reduced.

The loss of crop productivity with the use of BMPs at two of the demonstration fields indicates the importance of management in implementing BMPs. In many respects, BMPs are designed to remove the "insurance" factor and thus operate on borderline levels of inputs. Thus greater risks are involved and managerial mistakes could be costly.

Informational/Educational Activities

The information obtained from these demonstrations has been used in a variety of educational activities. Demonstration results have been presented to the state's potato growers at three area meetings sponsored by UWEX-CES. Some 360 growers and industry people attended these meetings. Such presentations emphasized the importance of BMPs in reducing energy inputs and production costs and in providing some measure of groundwater protection on irrigated sands. The demonstration results were helpful in showing that potato productivity could be maintained when fertilizer, pesticide and irrigation inputs were reduced. Similar presentations are being planned for the processing industry.

Additionally, the demonstration results were the basis of an article prepared for the "Badger Common'Tater", a publication of the Wisconsin Potato and Vegetable Growers Association. This publication has a national circulation of 3800. This publication goes to all potato growers in Wisconsin and to many growers in other states. Many of Wisconsin's vegetable growers also receive this publication. Information has also been given to local newspapers who prepared articles on these demonstrations. The results have also been used to

modify UWEX-CES recommendations for potato and process vegetable production.

Finally, the results of these demonstrations have been shared with many growers in "one to one" sessions which were designed to assist growers implement some of these "best management practices"

The Future of BMPs

The benefits of "best management practices", as demonstrated by this project, are only of value if growers implement them. Thus educational efforts will be continued to enhance grower implementation of BMPs. Such past efforts have had success as indicated by the fact that some of the cooperating growers were using some of these BMPs.

The development of PCM (Potato Crop Management) computer software will also help growers to implement BMPs. PCM is a computer program which assists growers in making key management decisions (nitrogen, pesticide and irrigation) during the growing season. PCM is built upon "best management practices". The PCM program was released to growers in March of 1989. Activity has also been initiated to develop a snap bean crop management program. BMPs will be an important part of such a program.

Acknowledgements

Acknowledgements are given to UWEX-CES Specialists L.K. Binning, W.R. Stevenson, J.A. Wyman, K.A. Kelling; to Research Associate C.L. Baumgartner and to M. Travis, Project Intern for the Central WI Groundwater Center and most importantly to the growers and processors who cooperated with these demonstrations.

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2. Harkin, J.M., F.A. Jones, R.N. Fathulla, E.K. Dzantor, and D.G. Kroll. 1986. Fate of aldicarb in Wisconsin Groundwater. p. 219-254. In W.Y. Garner, R.C. Honeycutt and H.N. Nigg (ed.) Series 315, American Chemical Society. Washington, D.C.

3. Manser, R.J. 1983. An investigation into the movement of aldicarb residue in groundwater in the Central Sand Plain of Wisconsin. M.S. Thesis, Univ. of Wisconsin-Madison.

APPENDIX

Table 1. 1988 Crop Production Information - Field A

Variety - Russet Norkotah
Planting Date - April 18-19
Emergence Date - May 16
Vine Kill Date - August 3
Harvest Date - August 17

Soil Test pH - 6.5
OM - 12.5
P - 143
K - 217.5
Petiole Analysis - 2.3 % NO_3

Fertility Program
Pre - Plant Broadcast - 500 lbs/A 0-0-62
At Plant Row Applied - 650 lbs/A 7-14-28

	Grower	PCM
Supplemental Nitrogen		
May 14	300 lbs/A 33-0-0	250 lbs/A 33-0-0
June 15	250 lbs/A 33-0-0	SAME
Herbicides Applied		
May 14	0.75 lbs/A Sencor	0.5 lbs/A Sencor
	1.5 pts/A Dual	SAME
Insecticides Applied		
June 15	0.5 lbs/A Ambush	SAME
June 21	2.5 oz/A Asana	SAME
June 29	2 pts/A Endicide	SAME
July 26	1.5 pts/A Endicide	
Fungicides Applied		
June 29	1.5 lbs/A Manzate 200	SAME
July 5	1.2 qts/A MF4	SAME
July 12	1.2 qts/A Manex II	
July 15	1.2 qts/A Manex II	
July 19	1.2 qts/A Manex II	
July 26	1.2 qts/A Manex II	
August 4	2.4 lbs/A Manex II	SAME
Vine Killer Applied		
August 3	1.5 pts/A Diquat and Primrose	SAME

APPENDIX

Table 2. 1988 Crop Production Information - Field B

Variety - Russet Burbank
Planting Date - April 25
Emergence Date - May 18
Vine Kill Date - September 14
Harvest Date - October 1

Soil Test pH - 6.1
OM - 32.5
P - 140
K - 382.5
Petiole Analysis - 2.3 % NO_3

Fertility Program
Pre - Plant Broadcast - 500 lbs/A Cal-Sol
At Plant Row Applied - 750 lbs/A 5-21-25
- 5.75 gal/A 9-18-9

		Grower	PCM
Supplemental Nitrogen			
	May 14	200 lbs/A 35-0-0	230 lbs/A 35-0-0
	June 4	45 gal/A 28% VAN Sol	30 gal/A VAN Sol
	June 30	20 lbs/A N	
Herbicides Applied			
	May 14	0.75 lbs/A Sencor	0.5 lbs/A Sencor
Insecticides Applied			
	June 4	2 pts/A Di-Syston 8	
	June 15	2.6 oz/A Asana	SAME
	June 29	2.6 oz/A Asana	
	July 19	8 oz/A Pydrin	SAME
	August 8		2 pts/A Monitor
	August 15	2 pts/A Monitor	
Fungicides Applied			
	June 15	2.4 pts/A MF4	SAME
	June 29	2.4 pts/A MF4	
	July 7	2 pts/A MF4 + 4 oz/A Triple Tin	SAME
	July 19	3 pts/A MF4	SAME
	July 25	2.4 pts/A MF4 + 5 oz/A Triple Tin	
	July 28		2 pts/A MF4 + 4 oz/A Triple Tin
	August 2	2.4 pts/A MF4 + 5 oz/A Triple Tin	
	August 8	2.4 pts/A MF4 + 5 oz/A Triple Tin	2 pts/A MF4 + 4 oz/A Triple Tin
	August 15/20	1.5 pts/A Bravo	
	August 17/24		1.5 pts/A Bravo
	August 27	3.2 pts/A MF4	
	August 30		3.2 pts/A MF4
	September 2	3 pts/A MF4	3.2 pts/A MF4
	September 10	3 pts/A MF4	3.2 pts/A MF4
	September 17	3 pts/A MF4	
Vine Killer Applied			
	September 14	1.5 pts/A Diquat and 4 oz/A Wet Sol	SAME

APPENDIX

Table 3. 1988 Crop Production Information - Field C

Variety - Russet Burbank
Planting Date - April 26
Emergence Date - May 27
Vine Kill Date - September 22
September 26
Harvest Date - October 4 - 5

Soil Test pH - 56.5
OM - 28.5
P - 300
K - 280
Petiole Analysis - 3.01 % NO3

Fertility Program
Pre - Plant Broadcast - 600 lbs/A 0-0-60
At Plant Row Applied - 425 lbs/A 35-0-0

		Grower	PCM
Supplemental Nitrogen	May 26	250 lbs/A 34-0-0	SAME
	June 15	250 lbs/A 34-0-0	SAME
	June 22	20 lbs/A 28%	
	June 28	20 lbs/A 28%	
Herbicides Applied	May 28	0.5 lbs/A Sencor	SAME
		1.5 pts/A Prowl	SAME
Insecticides Applied	May 26	10 lbs/A Thimet	SAME
	July 21	6.4 oz/A Pydrin	SAME
Fungicides Applied	July 8	1.0 qt/A Manzate + 8 oz/A Duter	SAME
	July 21	1.0 qt/A Manzate + 8 oz/A Duter	SAME
	August 2	2 lbs/A Manzate	SAME
	August 14	2 lbs/A Manzate	SAME
	August 23	2 lbs/A Manzate	SAME
Vine Killer Applied	August 17	1 pt/A Diquat	SAME
	August 26	1pt/A Diquat	SAME

APPENDIX

Table 4. 1989 Crop Production Information - Field A

Variety: Jubilie Sweet Corn
Planting Date - May 24
Emergence Date - June 5
Harvest Date - September 8

Soil Test pH - 5.9
OM - 3.0
P - 79
K - 316

Fertility Program
Pre - Plant Broadcast - 280 lbs/A 8-26-26
At Plant Row Applied - 300 lbs/A 34-0-0

		Grower	PCM
Supplemental Nitrogen			
	July 3	12 gal/A 32 %	
Herbicides			
	May 26	1.0 lb/A Atrazin 1.5 pt/A Dual	1.25 pt/A Dual
	June 30		0.5 lb/A 2,4,D
		1 Cultivation	SAME
Insecticides			
	July 29	6 oz/A Pounce	SAME
	August 4	6 oz/A Pounce	SAME
Fungicides			
Irrigation			
		5.6" 10 Applications	7.6" 15 Applications

APPENDIX

Table 5. 1989 Crop Production Information - Field B

Variety: Snapbeans - BBL 94
Planting Date - June 30
Emergence Date - July 10
Harvest Date - August 20

Soil Test pH - 6.85
OM - 9.0
P - 141
K - 92

Fertility Program
At Plant Row Applied - 140 lbs/A 5-21-25

		Grower	PCM
Supplemental Nitrogen			
	July 17	50 lb/A 28 %	30 lb/A 28 %
	July 24		30 lb/A 28 %
Herbicides			
	June 21	1.0 pt/A Treflan	SAME
		3.0 pt/A Eptam	SAME
		1 Cultivation	SAME
Insecticides			
	July 7	0.5 pt/A Cygon	SAME
	July 3	1 lb/A Benolate	SAME
		1 lb/A Orthene	
	August 7	1 pt/A Pencap	SAME
	August 12	1 pt/A Pencap	SAME
	August 17	1 pt/A Pencap	SAME
Fungicides			
	August 1	2.67 pt/A Champ	SAME
	August 17	2.67 pt/A Champ	SAME
Irrigation		5.57"	4.81"
		11 Applications	10 Applications

APPENDIX

Table 6. Groundwater analyses data for field A.

WELL	DATE	WATER TABLE ELEV FT	IRR ?	pH	COND	ALK	THARD	NO3	CL
						mg/l			
** SITE A									
* WELL/GAGE/SAMPLE ID O1-7									
O1-7	04/08/88	95.36	N	5.98	111.00	8	44	3.0	2
O1-7	05/12/88	95.51		6.54	101.00	12	40	2.0	1
O1-7	06/08/88	94.61		6.48	88.20	6	36	-0.2	-1
O1-7	06/21/88	94.43	Y	6.28	77.30	12	36	-0.2	5
O1-7	07/07/88	93.34		6.63	90.10	8	40	0.2	1
O1-7	07/21/88	94.22		6.22	90.20	12	40	0.2	2
O1-7	08/03/88	93.42	N	6.17	96.20	10	52	-0.2	5
O1-7	08/17/88	93.69	N	6.10	131.00	8	56	-0.2	2
O1-7	08/31/88	94.92	N	6.49	113.00	4	52	-0.2	1
O1-7	09/15/88	94.88	N	6.10	162.00	4	68	-0.2	1
O1-7	09/27/88	95.67	N	6.05	114.00	4	24	-0.2	1
O1-7	10/11/88	95.38		5.86	133.00	8	56	-0.2	1
O1-7	10/25/88	95.24		5.88	129.00	4	80	-0.2	1
O1-7	11/15/88	95.31		5.69	118.00	4	64	-0.2	3
O1-7	12/20/88	95.41		5.80	91.00	4	40	-0.2	-1
O1-7	01/19/89	95.17		5.40	101.00	24	60	2.0	2
O1-7	02/23/89	95.13		5.70	95.00	4	40	-0.2	1
O1-7	03/29/89	96.35		5.47	117.00	4	60	0.2	2
O1-7	04/27/89	95.45		5.51	153.00	8	64	1.5	2
O1-7	05/17/89	95.47		5.58	162.00	152	60	1.0	2
O1-7	05/17/89	95.47		5.58	162.00	152	60	1.0	2
O1-7	06/08/89	96.73		5.34	273.00	-4	120	0.5	1
O1-7	06/30/89	95.45		5.20	246.00	4	108	1.0	2
O1-7	07/18/89	95.31	N	5.17	252.00	4	104	1.0	2
O1-7	08/07/89	95.22	N	5.35	226.00	4	112	6.5	22
O1-7	08/22/89	94.98	N	5.37	246.00	4	88	1.2	2
O1-7	09/09/89	95.19		5.30	199.00	8	96	-0.2	3
O1-7	09/22/89	95.14		5.54	208.00	4	84	0.5	2
O1-7	10/06/89	95.06		5.17	227.00	4	88	0.5	2
O1-7	10/20/89	95.09		5.56	260.00	-4	100	1.0	2
O1-7	11/10/89	95.63		5.55	261.00	-4	108	-0.2	2
O1-7	12/28/89	95.41		5.66	245.00	4	116	1.0	3
O1-7	03/31/90	95.97		5.50	238.00	4	120	1.5	1
* WELL/GAGE/SAMPLE ID O2-8									
O2-8	04/08/88	95.11	N	6.82	113.00	28	48	1.8	2
O2-8	05/12/88	95.21		7.33	126.00	24	56	3.2	2
O2-8	06/08/88	94.67		6.90	118.60	20	72	2.5	1
O2-8	06/21/88	94.39	Y	6.64	93.50	18	48	0.5	5
O2-8	07/07/88	94.06		6.89	86.40	20	44	0.2	1
O2-8	07/21/88	94.08		6.75	95.00	28	44	0.2	2
O2-8	08/03/88	93.86	N	6.49	90.30	24	46	-0.2	4

WELL	DATE	WATER TABLE ELEV FT	IRR ?	pH	COND	ALK	THARD	NO3	CL
						mg/l			
O2-8	08/17/88	94.03	N	6.46	98.50	24	44	0.5	2
O2-8	08/31/88	94.50	N	6.63	86.50	24	44	0.2	1
O2-8	09/13/88	94.43	N	6.66	107.00	20	48	1.0	1
O2-8	09/27/88	95.26	N	6.59	105.00	32	52	0.8	1
O2-8	10/11/88	95.00		6.55	122.00	24	68	0.5	2
O2-8	10/25/88	94.91		6.59	112.00	20	56	0.8	1
O2-8	11/15/88	95.01		6.27	112.00	24	64	0.8	6
O2-8	12/20/88	95.10		6.48	112.00	24	56	1.0	1
O2-8	01/19/89	94.88		6.27	128.00	8	44	-0.2	1
O2-8	02/23/89	94.86		6.26	126.00	24	68	2.0	2
O2-8	03/29/89	96.19		6.28	97.40	24	64	0.2	2
O2-8	04/27/89	95.29		6.35	101.00	24	52	0.5	1
O2-8	05/17/89	95.18		6.35	110.00	20	52	0.5	2
O2-8	06/08/89	95.49		6.22	133.00	28	64	2.5	1
O2-8	06/30/89	95.44		6.10	171.00	20	84	5.5	3
O2-8	07/18/89	94.94	N	6.18	156.00	24	72	4.0	2
O2-8	08/07/89	94.75	N	6.12	136.00	24	84	2.0	1
O2-8	08/22/89	94.57	N	6.45	145.00	24	64	2.0	1
O2-8	09/09/89	94.66		6.51	116.00	24	64	-0.2	2
O2-8	09/22/89	94.63		6.71	115.00	20	56	0.5	1
O2-8	10/06/89	94.59		6.57	108.00	20	52	0.2	1
O2-8	10/20/89	94.67		6.61	112.00	20	56	0.8	2
O2-8	11/10/89	95.27		6.31	116.00	12	56	-0.2	2
O2-8	12/28/89	94.94		6.31	114.00	20	64	0.8	2
O2-8	03/31/90	95.65		6.28	92.80	28	52	0.5	1
* WELL/GAGE/SAMPLE ID O3-10									
O3-10	05/12/88	94.05		7.75	489.00	80	228	15.0	39
O3-10	06/08/88	93.84		7.61	410.00	82	184	0.2	30
O3-10	06/21/88	93.65	Y	7.64	362.00	76	176	0.2	36
O3-10	07/07/88	93.22		7.48	331.00	84	158	0.2	32
O3-10	07/21/88	93.31		7.48	533.00	88	244	16.0	49
O3-10	08/03/88	93.03	N	7.47	487.00	86	228	2.5	54
O3-10	08/17/88	93.29	N	7.46	807.00	76	354	30.0	85
O3-10	08/31/88	93.70	N	7.45	584.00	76	276	12.4	77
O3-10	09/15/88	93.67	N	7.36	612.00	76	268	10.5	74
O3-10	09/28/88	94.26	N	7.32	601.00	18	284	12.8	78
O3-10	10/11/88	94.07		7.43	628.00	88	212	276.0	77
O3-10	10/27/88	93.99		7.40	559.00	88	256	6.5	62
O3-10	11/15/88	94.05		7.33	538.00	92	260	4.5	57
O3-10	12/22/88	94.18		7.18	1084.00	72	508	70.0	110
O3-10	01/19/89	94.11		7.23	596.00	104	276	4.8	78
O3-10	02/23/89	94.32		6.41	756.00	64	366	29.5	101
O3-10	03/29/89	94.82		6.88	103.00	48	52	-0.2	2
O3-10	04/27/89	94.21		7.18	302.00	120	148	4.2	10

WELL	DATE	WATER TABLE ELEV FT	IRR ?	pH	COND	ALK	THARD	NO3	CL
					mg/l				
O3-10	05/17/89	94.35		7.29	518.00	104	228	7.5	49
O3-10	06/08/89	95.25		7.13	277.00	84	128	10.5	1
O3-10	06/30/89	94.46		7.11	618.00	84	284	14.0	66
O3-10	07/18/89	93.99	N	7.16	592.00	100	280	4.8	71
O3-10	08/07/89	93.86	N	7.07	684.00	88	328	18.0	78
O3-10	08/22/89	93.69	N	7.15	681.00	96	284	9.0	74
O3-10	09/09/89	93.88		7.37	542.00	104	296	5.0	64
O3-10	09/22/89	93.88		7.45	502.00	100	248	0.2	58
O3-10	10/06/89	93.83		7.41	505.00	104	260	-0.2	65
O3-10	10/20/89	93.89		7.57	576.00	104	268	1.0	65
O3-10	11/10/89	94.24		7.28	591.00	108	288	-0.2	72
O3-10	12/28/89	94.46		7.27	640.00	104	320	8.0	76
O3-10	03/31/90	94.30		7.10	174.00	76	76	-0.2	1
* WELL/GAGE/SAMPLE ID O3-6									
O3-6	04/08/88	93.62	N	6.79	713.00	36	300	43.0	79
O3-6	05/12/88	94.06		6.71	717.00	20	308	45.0	73
O3-6	06/08/88	93.85		6.44	801.00	12	324	45.0	79
O3-6	06/21/88	93.66	Y	6.53	500.00	18	220	19.5	62
O3-6	07/07/88	93.23		6.65	465.00	24	216	18.0	58
O3-6	07/21/88	93.32		6.28	920.00	20	392	60.0	78
O3-6	08/03/88	93.05	N	6.22	705.00	20	308	36.8	78
O3-6	08/17/88	93.31	N	6.18	936.00	18	380	55.0	94
O3-6	08/31/88	93.72	N	6.29	679.00	16	308	46.5	86
O3-6	09/15/88	93.70	N	6.15	825.00	16	326	44.5	110
O3-6	09/28/88	94.29	N	6.21	712.00	16	300	57.5	56
O3-6	10/11/88	94.10		6.05	996.00	12	400	80.0	73
O3-6	10/27/88	94.03		6.17	649.00	12	260	29.2	89
O3-6	11/15/88	94.09		5.98	739.00	12	312	39.5	90
O3-6	12/20/88	94.21		6.14	889.00	12	380	60.0	95
O3-6	01/18/89	94.14		5.93	825.00	20	348	48.0	95
O3-6	02/23/89	94.35		6.33	131.00	8	52	6.5	2
O3-6	03/29/89	94.86		6.27	47.10	16	20	-0.2	2
O3-6	04/27/89	94.24		6.23	88.80	28	28	0.2	2
O3-6	05/17/89	94.39		6.29	89.40	20	24	-0.2	2
O3-6	06/08/89	95.30		6.16	258.00	24	80	15.5	1
O3-6	06/30/89	94.49		6.20	106.00	20	40	1.5	2
O3-6	07/18/89	94.00	N	6.10	292.00	20	104	10.0	34
O3-6	08/07/89	93.89	N	5.86	739.00	20	328	36.5	94
O3-6	08/22/89	93.73	N	5.90	764.00	20	288	28.0	89
O3-6	09/09/89	93.90		6.09	629.00	24	300	26.0	85
O3-6	09/22/89	93.90		6.42	565.00	20	256	15.5	78
O3-6	10/06/89	93.86		6.19	499.00	28	208	9.8	75
O3-6	10/20/89	93.93		6.27	541.00	24	220	7.8	70
O3-6	11/10/89	94.28		6.00	613.00	16	260	24.5	73

WELL	DATE	WATER TABLE ELEV FT	IRR ?	pH	COND	ALK	THARD	NO3	CL
					mg/l				
O3-6	12/28/89	94.50		6.06	587.00	20	268	19.5	80
O3-6	03/31/90	94.32		6.38	97.70	28	36	0.5	1
* WELL/GAGE/SAMPLE ID O4-10									
O4-10	04/08/88	93.84	N	6.07	538.00	16	208	28.5	62
O4-10	05/12/88	94.21		6.26	580.00	12	220	32.5	68
O4-10	06/08/88	93.95		6.04	533.00	8	196	26.8	64
O4-10	06/10/88	93.92	Y	6.01	544.00	8	192	26.5	62
O4-10	06/21/88	93.75	Y	5.94	482.00	8	184	22.5	63
O4-10	07/07/88	93.38		6.22	486.00	12	188	24.2	62
O4-10	07/21/88	93.56		5.88	531.00	16	196	25.0	62
O4-10	08/03/88	93.27	Y	5.90	568.00	220	172	29.5	64
O4-10	08/17/88	93.55	N	5.84	611.00	12	220	30.2	70
O4-10	08/31/88	94.00	N	5.92	600.00	12	220	35.0	70
O4-10	09/15/88	93.94	N	5.82	549.00	8	196	29.0	64
O4-10	09/28/88	94.46	N	5.79	559.00	14	208	30.8	68
O4-10	10/11/88	94.27		5.72	526.00	8	212	27.5	72
O4-10	10/27/88	94.18		5.88	629.00	8	232	31.8	81
O4-10	11/15/88	94.22		5.64	617.00	4	232	28.5	80
O4-10	12/22/88	94.23		5.80	804.00	8	324	57.5	83
O4-10	01/19/89	94.22		5.58	1165.00	8	480	83.8	99
O4-10	02/23/89	94.38		5.54	1087.00	4	460	87.5	89
O4-10	03/29/89	94.93		5.57	746.00	12	308	38.2	95
O4-10	04/27/89	94.36		5.55	909.00	8	384	62.5	91
O4-10	05/17/89	94.46		5.72	716.00	12	268	40.5	80
O4-10	06/08/89	95.39		5.55	1059.00	8	436	80.0	100
O4-10	06/30/89	94.69		5.39	977.00	8	388	68.0	99
O4-10	07/18/89	94.33	N	5.49	1224.00	8	480	95.0	100
O4-10	08/07/89	94.20	N	5.45	1061.00	12	432	82.5	93
O4-10	08/22/89	94.06	N	5.62	945.00	12	340	55.0	95
O4-10	09/09/89	94.16		5.57	756.00	12	324	44.5	95
O4-10	09/22/89	94.15		5.76	736.00	8	296	35.0	100
O4-10	10/06/89	94.09		5.74	505.00	104	260	-0.2	65
O4-10	10/20/89	94.12		5.82	705.00	8	276	34.5	99
O4-10	11/11/89	94.43		5.92	703.00	8	280	28.5	110
O4-10	12/28/89	94.83		5.81	739.00	12	316	37.2	105
O4-10	03/31/90	94.58		5.76	758.00	16	336	40.5	101
* WELL/GAGE/SAMPLE ID O4-13									
O4-13	05/12/88	94.21		6.98	396.00	44	172	8.5	47
O4-13	06/08/88	93.96		7.25	346.00	56	146	0.2	37
O4-13	06/10/88	93.98	Y	7.22	347.00	56	140	-0.2	37
O4-13	06/21/88	93.76	Y	7.00	316.00	60	152	0.2	40
O4-13	07/07/88	93.40		7.08	320.00	60	156	0.5	40
O4-13	07/21/88	93.58		6.33	395.00	60	172	3.0	47

WELL	DATE	WATER TABLE ELEV FT	IRR ?	pH	COND	ALK	THARD	NO3	CL
					mg/l				
O4-13	08/03/88	93.29	Y	6.25	399.00	20	172	2.0	52
O4-13	08/17/88	93.57	N	6.80	508.00	54	212	13.8	57
O4-13	08/30/88	94.00	N	6.70	610.00	48	252	28.5	66
O4-13	09/15/88	93.95	N	6.63	655.00	44	276	32.0	77
O4-13	09/28/88	94.46	N	6.64	616.00	52	272	26.0	76
O4-13	10/11/88	94.28		6.72	697.00	48	284	29.0	79
O4-13	10/27/88	94.19		6.84	492.00	56	212	11.2	60
O4-13	11/15/88	94.22		6.54	558.00	48	252	16.0	70
O4-13	12/22/88	94.32		6.40	711.00	28	292	40.5	78
O4-13	01/19/89	94.23		6.05	925.00	28	380	60.0	92
O4-13	02/23/89	94.39		6.20	838.00	64	372	47.5	105
O4-13	03/29/89	94.94		6.34	728.00	40	328	35.8	87
O4-13	04/27/89	94.36		6.70	618.00	60	292	29.2	64
O4-13	05/17/89	94.48		6.67	801.00	48	340	42.6	79
O4-13	06/08/89	95.41		6.57	925.00	44	404	59.0	88
O4-13	06/30/89	94.69		6.39	916.00	40	396	55.0	88
O4-13	07/18/89	94.34	N	6.60	682.00	60	288	26.5	75
O4-13	08/07/89	94.20	N	6.47	731.00	52	328	33.0	90
O4-13	08/22/89	94.05	N	6.54	923.00	48	356	39.0	106
O4-13	09/09/89	94.15		6.61	714.00	48	344	32.0	95
O4-13	09/22/89	94.15		6.84	709.00	48	320	25.0	110
O4-13	10/06/89	94.09		6.72	718.00	48	316	23.8	107
O4-13	10/20/89	94.13		6.93	775.00	48	336	27.0	105
O4-13	11/10/89	94.44		6.70	878.00	44	388	37.5	125
O4-13	12/28/89	94.83		6.57	797.00	48	360	32.5	115
O4-13	03/31/90	94.49		6.27	788.00	24	348	38.5	100
* WELL/GAGE/SAMPLE ID O5-9									
O5-9	05/12/88	94.12		7.22	663.00	28	272	29.5	90
O5-9	06/08/88	93.89		6.77	739.00	16	292	29.5	105
O5-9	06/21/88	93.69	Y	6.61	601.00	18	260	24.2	96
O5-9	07/07/88	93.29		6.75	484.00	16	226	20.2	75
O5-9	07/21/88	93.41		6.26	711.00	20	316	22.5	102
O5-9	08/03/88	93.12	N	6.08	612.00	18	260	27.5	84
O5-9	08/17/88	93.40	N	6.23	627.00	16	256	26.0	82
O5-9	09/09/89	0.00		6.43	600.00	24	296	-0.2	92
O5-9	09/22/89	94.10		6.50	716.00	16	328	12.0	101
O5-9	10/06/89	94.10		6.40	682.00	20	316	14.8	94
O5-9	10/20/89	94.05		6.46	632.00	16	272	7.2	86
O5-9	11/10/89	0.00		6.39	560.00	24	236	-0.2	84
O5-9	12/28/89	0.00		6.39	503.00	24	224	-0.2	76
O5-9	03/31/90	93.73		6.46	274.00	44	120	-0.2	27

WELL	DATE	WATER TABLE ELEV FT	IRR ?	pH	COND	ALK	THARD	NO3	CL
					mg/l				
* WELL/GAGE/SAMPLE ID O6-13									
O6-13	05/12/88	94.10		7.61	463.00	64	208	0.2	71
O6-13	06/08/88	93.87		7.21	476.00	34	204	-0.2	70
O6-13	06/21/88	93.68	Y	7.15	427.00	76	200	0.2	71
O6-13	07/07/88	93.28		7.06	382.00	72	192	0.2	64
O6-13	07/21/88	93.40		6.97	417.00	56	180	0.2	65
O6-13	08/03/88	93.12	N	6.85	381.00	32	172	-0.2	53
O6-13	08/17/88	93.39	N	6.88	406.00	48	178	-0.2	60
O6-13	08/31/88	93.79	N	6.85	351.00	50	156	-0.2	47
O6-13	09/15/88	93.76	N	6.79	362.00	46	164	-0.2	46
O6-13	09/28/88	94.33	N	6.81	335.00	60	160	-0.2	41
O6-13	10/11/88	94.14		6.79	385.00	56	118	-0.2	46
O6-13	10/27/88	94.06		6.79	394.00	56	172	-0.2	48
O6-13	11/15/88	94.10		6.64	415.00	52	192	-0.2	52
O6-13	12/22/88	94.23		6.82	479.00	44	224	0.2	70
O6-13	01/19/89	94.17		6.66	493.00	36	220	0.8	72
O6-13	02/23/89	94.34		6.54	526.00	36	248	-0.2	88
O6-13	03/29/89	94.88		6.67	445.00	64	228	0.5	52
O6-13	04/27/89	94.27		6.79	466.00	68	264	0.2	56
O6-13	05/17/89	94.41		6.95	437.00	72	200	-0.2	40
O6-13	06/08/89	95.33		6.84	368.00	76	180	0.5	28
O6-13	06/30/89	94.53		6.78	399.00	80	192	-0.2	31
O6-13	07/18/89	94.10	N	6.82	352.00	88	168	-0.2	17
O6-13	08/07/89	93.98	N	6.71	342.00	68	172	0.5	24
O6-13	08/22/89	93.82	N	6.72	372.00	68	172	0.5	26
O6-13	09/09/89	93.96		6.62	354.00	64	184	-0.2	32
O6-13	09/22/89	93.97		6.70	434.00	52	200	-0.2	46
O6-13	10/06/89	93.92		6.64	442.00	48	216	-0.2	58
O6-13	10/20/89	93.97		6.80	477.00	44	216	0.2	56
O6-13	11/10/89	94.31		6.56	445.00	32	204	-0.2	51
O6-13	12/28/89	94.61		6.50	422.00	48	216	-0.2	51
O6-13	03/31/90	94.37		6.61	498.00	44	364	-0.2	75
* WELL/GAGE/SAMPLE ID O6-9									
O6-9	05/12/88	94.10		6.99	571.00	28	244	24.5	73
O6-9	06/08/88	93.88		6.43	627.00	16	248	21.5	88
O6-9	06/21/88	93.69	Y	6.52	572.00	14	256	19.5	92
O6-9	07/07/88	93.26		6.46	537.00	16	236	19.5	84
O6-9	07/21/88	93.38		6.33	525.00	20	220	12.0	77
O6-9	08/03/88	93.09	N	6.21	542.00	20	236	19.0	72
O6-9	08/17/88	93.37	N	6.30	383.00	20	244	18.5	73
O6-9	08/31/88	93.77	N	6.40	552.00	16	236	17.5	77
O6-9	09/15/88	93.75	N	9.94	555.00	16	232	14.0	81
O6-9	09/28/88	94.32	N	6.33	519.00	18	228	9.0	78
O6-9	10/27/88	94.06		6.37	498.00	16	212	4.5	74

WELL	DATE	WATER TABLE ELEV FT	IRR ?	pH	COND	ALK	THARD	NO3	CL
						mg/l			
O6-9	11/15/88	94.10		6.05	535.00	16	240	8.0	75
O6-9	12/22/88	94.23		6.36	671.00	16	300	27.5	82
O6-9	01/19/89	94.16		6.12	681.00	24	296	19.5	98
O6-9	02/23/89	94.32		6.08	655.00	16	296	12.0	101
O6-9	03/29/89	94.87		6.07	577.00	16	280	11.8	79
O6-9	04/27/89	94.28		6.21	563.00	20	268	12.2	80
O6-9	05/17/89	94.42		6.24	561.00	20	240	10.5	75
O6-9	06/08/89	95.33		6.10	608.00	16	272	18.0	83
O6-9	06/30/89	94.54		6.02	656.00	20	288	20.5	80
O6-9	07/18/89	94.09	N	6.05	591.00	24	260	13.8	70
O6-9	08/07/89	93.97	N	6.02	568.00	24	268	12.0	73
O6-9	08/22/89	93.83	N	6.07	717.00	20	288	17.2	85
O6-9	09/09/89	93.98		6.05	612.00	16	312	17.5	82
O6-9	09/22/89	94.00		6.20	612.00	20	280	13.5	78
O6-9	10/06/89	93.94		6.10	568.00	20	260	10.5	76
O6-9	10/20/89	93.99		6.26	576.00	16	256	8.8	71
O6-9	11/10/89	94.34		6.25	453.00	24	216	2.8	57
O6-9	12/28/89	94.60		6.29	543.00	24	260	11.0	70
O6-9	03/31/90	94.39		6.05	681.00	16	324	30.5	89
* WELL/GAGE/SAMPLE ID O7-13									
O7-13	05/12/88	94.23		6.50	667.00	20	304	27.5	74
O7-13	06/08/88	93.98		6.51	599.00	12	252	21.5	65
O7-13	06/10/88	93.95	Y	6.31	709.00	16	284	34.2	70
O7-13	06/21/88	93.79	Y	6.16	947.00	14	436	72.5	83
O7-13	07/07/88	0.00		6.47	385.00	20	176	1.0	58
O7-13	07/21/88	93.63		6.14	782.00	20	340	40.8	72
O7-13	08/03/88	93.34	Y	6.33	474.00	20	210	11.5	54
O7-13	08/17/88	93.62	N	6.41	330.00	20	136	-0.2	46
O7-13	08/31/88	94.08	N	6.52	328.00	20	136	0.8	47
O7-13	09/15/88	94.02	N	6.44	485.00	20	208	10.0	61
O7-13	09/28/88	94.50	N	6.49	428.00	24	188	1.0	68
O7-13	10/11/88	94.32		6.48	792.00	24	208	2.5	70
O7-13	10/27/88	94.22		6.51	609.00	24	256	27.5	60
O7-13	11/15/88	94.25		6.09	1073.00	30	496	87.5	67
O7-13	12/22/88	94.34		6.43	706.00	24	328	36.0	69
O7-13	01/19/89	94.25		6.27	544.00	28	240	13.0	70
O7-13	02/23/89	94.41		6.20	760.00	24	348	36.2	78
O7-13	03/29/89	94.95		6.18	543.00	24	244	7.0	73
O7-13	04/27/89	94.39		6.34	532.00	24	248	16.0	74
O7-13	05/17/89	94.49		6.32	448.00	20	192	3.6	66
O7-13	06/08/89	95.44		6.22	505.00	16	228	-0.2	68
O7-13	06/30/89	94.76		6.12	566.00	16	244	3.5	84
O7-13	07/18/89	94.44	N	6.33	729.00	20	308	25.0	81
O7-13	08/07/89	94.31	N	6.10	670.00	20	320	12.0	93

WELL	DATE	WATER TABLE ELEV FT	IRR ?	pH	COND	ALK	THARD	NO3	CL
					mg/l				
O7-13	08/22/89	94.17	N	6.15	899.00	20	364	25.0	106
O7-13	09/09/89	94.23		6.20	600.00	20	300	5.5	92
O7-13	09/22/89	94.23		6.44	615.00	16	280	3.5	87
O7-13	10/06/89	94.15		6.15	667.00	16	308	11.5	97
O7-13	10/20/89	94.17		6.28	848.00	12	368	21.8	105
O7-13	11/10/89	94.45		6.26	495.00	20	220	0.8	75
O7-13	12/28/89	94.90		6.26	496.00	20	224	3.0	77
O7-13	03/31/90	94.50		6.26	809.00	20	340	18.0	88
* WELL/GAGE/SAMPLE ID O7-9									
O7-9	05/12/88	94.24		7.07	986.00	32	416	75.0	77
O7-9	06/08/88	93.99		6.56	1242.00	20	488	101.2	84
O7-9	06/10/88	93.96	Y	6.48	1254.00	22	484	100.0	87
O7-9	06/21/88	93.80	Y	6.53	1175.00	24	504	100.0	95
O7-9	07/07/88	93.49		6.54	954.00	28	418	72.5	85
O7-9	07/21/88	93.67		6.29	1247.00	24	520	90.0	110
O7-9	08/03/88	93.39	Y	6.27	1083.00	26	448	70.0	100
O7-9	08/17/88	93.68	N	6.42	968.00	32	364	55.0	91
O7-9	08/31/88	94.13	N	6.59	685.00	28	268	33.0	65
O7-9	09/15/88	94.06	N	6.42	911.00	24	374	60.0	98
O7-9	09/28/88	94.55	N	6.65	420.00	36	172	4.0	52
O7-9	10/11/88	94.37		6.51	738.00	24	284	28.5	88
O7-9	10/27/88	94.27		6.57	536.00	28	212	11.0	66
O7-9	11/15/88	94.30		6.42	682.00	24	292	25.5	72
O7-9	12/22/88	94.38		6.50	1172.00	28	508	107.5	58
O7-9	01/19/89	94.18		6.28	1030.00	40	440	75.0	71
O7-9	02/23/89	94.44		6.21	982.00	28	408	73.8	70
O7-9	03/29/89	95.09		6.15	1286.00	28	564	113.8	77
O7-9	04/27/89	94.40		6.32	1230.00	32	576	100.0	98
O7-9	05/17/89	94.50		6.20	1554.00	28	652	132.0	100
O7-9	06/08/89	95.47		6.26	1047.00	28	456	62.5	105
O7-9	06/30/89	94.80		6.20	1007.00	32	424	49.5	100
O7-9	07/18/89	94.47	N	6.27	1288.00	32	540	97.5	100
O7-9	08/07/89	94.34	N	6.15	1285.00	36	532	95.0	100
O7-9	08/22/89	94.19	N	6.24	1345.00	36	524	69.5	93
O7-9	09/09/89	94.26		6.27	1052.00	32	488	72.5	110
O7-9	09/22/89	94.28		6.49	970.00	28	420	50.5	90
O7-9	10/06/89	94.17		6.27	898.00	28	400	43.5	114
O7-9	10/20/89	94.21		6.41	961.00	24	384	43.0	110
O7-9	11/10/89	94.51		6.25	993.00	28	416	60.0	115
O7-9	12/28/89	94.93		6.36	943.00	24	412	55.0	105
O7-9	03/31/90	94.54		6.73	496.00	36	364	59.0	76

WELL	DATE	WATER TABLE ELEV FT	IRR ?	pH	COND	ALK	THARD	NO3	CL
					mg/l				
* WELL/GAGE/SAMPLE ID O8-8									
O8-8	05/12/88	94.26		6.84	710.00	20	296	30.0	99
O8-8	06/08/88	93.98		6.54	952.00	18	376	40.0	142
O8-8	06/21/88	93.80	Y	6.36	898.00	20	384	41.0	150
O8-8	07/07/88	93.47		6.66	497.00	20	212	17.8	75
O8-8	07/21/88	93.66		6.20	478.00	20	196	11.5	68
O8-8	08/03/88	93.36	Y	6.25	399.00	20	172	2.0	52
O8-8	08/17/88	93.65	N	6.04	807.00	18	324	42.5	88
* WELL/GAGE/SAMPLE ID O9-20									
O9-20	08/31/88	94.34		6.47	657.00	16	284	5.5	97
* WELL/GAGE/SAMPLE ID OBLANK									
OBLANK	05/12/88	0.00		7.58	1.98	4	-2	-0.2	1
OBLANK	06/08/88	0.00		5.71	173.00	4	-2	-0.2	-1
OBLANK	06/21/88	0.00	Y	6.49	4.14	8	2	-0.2	1
OBLANK	07/07/88	0.00		5.75	1.60	4	-2	-0.2	-1
OBLANK	07/21/88	0.00		5.61	2.82	8	-2	-0.2	3
OBLANK	08/17/88	0.00	N	6.13	1.52	4	10	-0.2	-1
OBLANK	08/31/88	0.00	N	6.28	2.61	-2	-2	-0.2	1
OBLANK	09/15/88	0.00	N	6.23	1.77	-2	-2	-0.2	-1
OBLANK	09/28/88	0.00	N	5.88	1.73	4	8	-0.2	-1
OBLANK	10/11/88	0.00		5.56	3.01	-4	-4	-0.2	-1
OBLANK	12/22/88	-6.18		5.56	2.00	4	4	-0.2	-1
OBLANK	01/19/89	0.00		5.78	2.49	8	8	1.0	-1
OBLANK	02/23/89	93.82		6.47	3.00	-4	4	-0.2	-4
OBLANK	03/29/89	0.00		5.73	1.30	4	4	-0.2	-1
OBLANK	04/27/89	0.00		5.79	2.75	-2	-4	0.2	-1
OBLANK	05/17/89	0.00		5.73	2.04	12	4	-0.2	-1
OBLANK	06/08/89	0.00		5.83	3.07	-4	4	-0.2	-1
OBLANK	06/30/89	0.00		5.96	1.71	-4	4	-0.2	-1
OBLANK	07/18/89	0.00		5.61	2.34	4	4	-0.2	-1
OBLANK	08/07/89	0.00		5.55	4.00	4	4	0.5	-1
OBLANK	08/22/89	0.00	N	6.00	27.00	4	4	-0.2	-1
OBLANK	09/09/89	0.00		5.59	4.00	4	16	-0.2	1
OBLANK	09/22/89	0.00		5.82	3.00	4	-4	-0.2	-1
OBLANK	10/06/89	0.00		5.77	2.33	-4	-4	-0.2	-1
OBLANK	10/20/89	0.00		5.51	424.00	-4	-4	0.5	1
OBLANK	11/10/89	0.00		5.68	3.69	-4	4	-0.2	-1
OBLANK	12/28/89	0.00		6.29	116.00	24	64	0.5	1
OBLANK	12/28/89	0.00		5.71	6.00	4	8	-0.2	1
OBLANK	03/31/90	0.00		6.78	158.00	-4	4	-0.2	-1

WELL	DATE	WATER TABLE ELEV FT	IRR ?	pH	COND	ALK	THARD	NO3	CL
					mg/l				
* WELL/GAGE/SAMPLE ID ODITCH									
ODITCH	05/12/88	93.89	N	8.27	485.00	160	252	6.5	20
ODITCH	06/08/88	93.83		8.30	520.00	164	248	6.0	19
ODITCH	06/21/88	93.69	Y	8.40	460.00	156	240	5.2	20
ODITCH	07/07/88	93.32		8.72	400.00	128	224	4.5	21
ODITCH	07/21/88	93.40		8.66	454.00	148	232	5.0	23
ODITCH	08/03/88	93.28	N	8.56	400.00	110	204	4.5	21
ODITCH	08/17/88	93.44	N	8.93	409.00	112	204	5.0	20
ODITCH	08/31/88	93.75	N	8.30	457.00	168	240	7.0	21
ODITCH	09/15/88	93.70	N	8.45	508.00	164	252	7.5	21
ODITCH	09/28/88	94.07	N	8.03	508.00	168	260	7.0	22
ODITCH	10/11/88	93.94		8.20	527.00	160	256	7.0	22
ODITCH	11/15/88	93.89		8.21	508.00	164	264	6.5	23
ODITCH	01/18/89	93.39		7.98	504.00	188	256	6.8	20
ODITCH	02/23/89	93.82		7.94	505.00	172	268	7.0	21
ODITCH	03/29/89	93.33		7.86	465.00	152	248	5.5	21
ODITCH	04/27/89	-0.12		8.12	467.00	168	252	6.0	21
ODITCH	05/17/89	-0.38		8.41	491.00	8	248	6.2	21
ODITCH	06/08/89	-1.22		7.82	485.00	160	264	6.0	20
ODITCH	06/30/89	-0.44		8.56	472.00	148	244	6.5	19
ODITCH	07/18/89	-0.06	N	8.40	449.00	148	244	5.8	19
ODITCH	08/07/89	0.10	N	8.44	435.00	136	228	6.5	22
ODITCH	08/22/89	-0.14	N	8.47	498.00	140	224	6.5	22
ODITCH	09/09/89	0.00		8.35	473.00	164	268	6.8	22
ODITCH	09/22/89	-0.03		8.42	477.00	160	272	7.5	22
ODITCH	10/06/89	0.00		8.30	479.00	164	248	8.0	26
ODITCH	11/10/89	0.00		8.04	490.00	168	260	7.2	23
ODITCH	03/31/90	0.00		8.07	449.00	160	260	6.5	22
* WELL/GAGE/SAMPLE ID ODUP									
ODUP	05/12/88	95.21		7.21	122.00	24	60	3.0	2
ODUP	06/08/88	101.61		5.02	557.00	8	196	27.5	64
ODUP	06/21/88	101.05	Y	7.22	427.00	76	204	0.2	70
ODUP	07/07/88	102.01		6.56	388.00	20	172	1.2	58
ODUP	07/21/88	93.41		6.24	708.00	16	296	31.5	100
ODUP	08/17/88	93.39	N	6.89	402.00	48	176	-0.2	57
ODUP	08/17/88	93.68	N	6.38	963.00	32	330	60.0	89
ODUP	08/17/88	93.68	N	6.50	951.00	30	380	55.0	89
ODUP	08/17/88	93.68	N	6.40	946.00	28	378	55.0	88
ODUP	08/31/88	0.00	N	6.99	356.00	52	160	-0.2	45
ODUP	09/15/88	0.00	N	6.63	652.00	40	284	32.5	78
ODUP	09/28/88	0.00	N	7.27	602.00	80	288	12.0	77
ODUP	10/11/88	-7.19		6.71	685.00	44	284	28.0	80
ODUP	01/19/89	0.00		7.88	501.00	180	260	7.2	21
ODUP	02/23/89	0.00		6.54	524.00	36	260	-0.2	87

WELL	DATE	WATER TABLE ELEV FT	IRR ?	pH	COND	ALK	THARD	NO3	CL
					----------mg/l----------				
ODUP	03/29/89	0.00		5.35	118.00	4	60	-0.2	1
ODUP	04/27/89	0.00		6.66	615.00	56	288	29.2	64
ODUP	05/17/89	0.00		6.30	446.00	20	188	3.5	66
ODUP	06/08/89	0.00		7.79	492.00	160	260	6.0	21
ODUP	06/30/89	0.00		6.22	106.00	24	36	1.5	2
ODUP	07/18/89	0.00		5.22	255.00	4	108	1.0	1
ODUP	08/07/89	0.00		6.13	1274.00	36	540	97.5	100
ODUP	08/22/89	0.00	N	6.70	375.00	68	176	0.8	26
ODUP	09/09/89	0.00		8.26	470.00	164	260	8.0	22
ODUP	09/22/89	0.00		5.57	212.00	4	84	0.5	3
ODUP	10/06/89	0.00		6.32	685.00	20	312	14.8	94
ODUP	10/20/89	0.00		6.25	531.00	24	220	7.8	71
ODUP	11/10/89	0.00		6.31	558.00	24	240	-0.2	84
ODUP	03/31/90	0.00		5.52	704.00	12	336	42.0	100
* WELL/GAGE/SAMPLE ID OIRRIG									
OIRRIG	06/21/88	0.00	Y	7.57	337.00	144	184	-0.2	7

APPENDIX

Table 7. Groundwater analyses data for Field B.

WELL	DATE	WATER TABLE ELEV FT	IRR ?	pH	COND	ALK	THARD	NO3	CL
					mg/l				
** SITE B									
* WELL/GAGE/SAMPLE ID W1-17									
W1-17	04/23/88	83.36		7.74	228.00	96	100	2.5	5
W1-17	05/13/88	83.37		8.07	280.00	108	124	4.0	9
W1-17	06/07/88	82.52		8.14	371.00	144	160	5.2	13
W1-17	06/22/88	81.83	N	7.87	306.00	128	140	4.0	10
W1-17	07/06/88	81.16		7.94	379.00	144	168	6.0	11
W1-17	07/22/88	80.94	Y	7.92	355.00	150	160	5.2	13
W1-17	08/03/88	80.52	N	7.97	409.00	152	196	7.5	20
W1-17	08/17/88	80.54	N	7.98	426.00	140	192	7.0	27
W1-17	08/30/88	80.95	N	7.80	426.00	140	192	7.0	29
W1-17	09/13/88	81.25	N	8.00	386.00	136	180	4.5	29
W1-17	09/29/88	81.61	N	7.75	411.00	148	216	6.5	29
W1-17	10/12/88	81.92		7.88	487.00	160	208	6.0	31
W1-17	10/27/88	82.06		7.89	474.00	156	216	8.5	34
W1-17	11/15/88	82.13		7.97	446.00	160	212	7.5	28
W1-17	12/19/88	82.12		7.88	502.00	168	248	6.5	38
W1-17	01/18/89	81.95		7.75	511.00	180	244	8.0	37
W1-17	02/22/89	81.75		7.76	577.00	176	224	9.5	31
W1-17	03/28/89	83.13		7.80	370.00	76	112	2.2	26
W1-17	04/26/89	82.27		7.74	523.00	180	244	4.2	41
W1-17	05/16/89	82.16		7.73	602.00	204	260	7.8	33
W1-17	06/06/89	83.11		7.71	414.00	172	200	2.0	23
W1-17	06/29/89	82.68		7.65	463.00	188	236	5.8	25
W1-17	07/17/89	81.74	N	7.78	487.00	184	232	7.8	22
W1-17	08/21/89	81.22	N	7.84	512.00	196	228	8.0	20
W1-17	09/08/89	81.50		7.75	501.00	88	260	9.0	35
W1-17	09/23/89	81.71		7.98	490.00	168	284	15.2	19
W1-17	10/07/89	81.81		7.79	514.00	168	240	9.2	44
W1-17	10/21/89	81.78		7.81	533.00	172	244	9.0	34
W1-17	11/11/89	81.81		7.71	460.00	180	228	8.0	33
W1-17	12/30/89	81.73		7.76	492.00	192	240	8.0	25
W1-17	03/04/90	84.39		7.89	510.00	196	272	11.2	21
W1-17	03/30/90	81.91		7.56	376.00	172	196	2.5	17
W1-17	04/27/90	81.94		7.84	441.00	184	192	5.4	16
* WELL/GAGE/SAMPLE ID W1-22									
W1-22	04/23/88	83.31		7.98	331.00	132	148	3.5	13
W1-22	05/13/88	83.35		8.08	186.00	84	88	1.5	1
W1-22	06/07/88	82.50		7.98	182.00	80	84	1.0	1
W1-22	06/22/88	81.81	N	8.02	167.00	76	80	1.0	3
W1-22	07/06/88	81.15		8.12	190.00	88	88	1.2	2
W1-22	07/22/88	80.91	Y	7.98	221.00	100	112	1.4	7
W1-22	08/03/88	80.51	N	8.01	250.00	100	124	2.5	10

WELL	DATE	WATER TABLE ELEV FT	IRR ?	pH	COND	ALK	THARD	NO3	CL
					mg/l				
W1-22	08/17/88	80.51	N	8.07	323.00	112	156	4.5	15
W1-22	08/30/88	80.95	N	8.01	369.00	116	176	8.0	16
W1-22	09/13/88	81.26	N	8.02	414.00	132	212	11.8	17
W1-22	09/29/88	81.60	N	7.80	491.00	144	248	15.2	20
W1-22	10/12/88	81.92		7.92	557.00	144	260	17.5	21
W1-22	10/27/88	82.05		7.93	556.00	152	270	19.0	26
W1-22	11/15/88	82.11		7.87	649.00	152	312	24.0	34
W1-22	12/19/88	82.10		7.86	643.00	152	336	23.0	33
W1-22	01/18/89	81.93		7.84	687.00	152	332	28.5	41
W1-22	02/22/89	81.74		7.75	785.00	144	336	29.5	42
W1-22	03/28/89	83.11		7.91	344.00	132	172	3.0	18
W1-22	04/26/89	82.27		7.93	505.00	156	252	13.5	14
W1-22	05/16/89	82.25		7.89	378.00	152	176	4.0	4
W1-22	06/07/89	83.11		7.80	273.00	124	132	2.5	4
W1-22	06/29/89	82.66		7.91	253.00	116	136	2.0	3
W1-22	07/17/89	81.73	N	7.96	356.00	152	168	3.0	16
W1-22	08/21/89	81.23	N	7.85	498.00	176	232	8.5	15
W1-22	09/08/89	81.52		7.87	486.00	172	260	22.6	18
W1-22	09/23/89	81.70		8.08	539.00	168	284	15.2	19
W1-22	10/07/89	81.81		7.96	574.00	156	268	18.2	21
W1-22	10/21/89	81.76		7.97	569.00	156	280	18.0	14
W1-22	11/11/89	81.79		7.86	513.00	160	272	16.5	15
W1-22	12/30/89	81.72		7.75	545.00	156	280	19.8	14
W1-22	01/27/90	81.52		7.92	590.00	152	300	23.2	8
W1-22	03/04/90	81.38		7.81	567.00	140	292	24.0	21
W1-22	03/30/90	81.89		7.58	465.00	164	240	13.5	12
W1-22	04/27/90	81.92		7.86	398.00	164	192	6.2	8
* WELL/GAGE/SAMPLE ID W2-20									
W2-20	04/23/88	82.83		7.74	365.00	120	172	5.5	11
W2-20	05/13/88	82.91		8.10	341.00	128	168	5.0	6
W2-20	06/07/88	82.04		8.01	320.00	124	134	4.0	3
W2-20	06/22/88	81.32	N	7.92	323.00	136	164	5.0	7
W2-20	07/06/88	80.62		8.00	339.00	148	164	4.5	4
W2-20	07/22/88	80.33	Y	7.81	299.00	128	148	2.5	3
W2-20	08/17/88	79.95	N	7.99	297.00	136	143	2.5	2
W2-20	08/30/88	80.37	N	7.90	341.00	152	172	3.8	3
W2-20	09/13/88	80.55	N	7.90	386.00	144	204	8.5	7
W2-20	09/29/88	80.94	N	7.64	463.00	124	232	13.0	17
W2-20	10/12/88	81.32		7.83	579.00	136	264	17.5	22
W2-20	10/27/88	81.48		7.74	578.00	152	288	18.8	27
W2-20	11/15/88	81.55		7.71	641.00	176	312	19.5	25
W2-20	12/19/88	81.53		7.79	603.00	186	314	15.5	19
W2-20	01/18/89	81.37		7.68	620.00	196	316	17.5	16
W2-20	02/22/89	81.18		7.69	705.00	200	312	17.5	17

WELL	DATE	WATER TABLE ELEV FT	IRR ?	pH	COND	ALK	THARD	NO3	CL
					mg/l				
W2-20	03/28/89	81.82		7.65	670.00	96	228	22.0	24
W2-20	04/26/89	81.72		7.73	410.00	168	212	7.0	7
W2-20	05/16/89	81.58		7.74	368.00	152	176	3.0	5
W2-20	06/07/89	82.41		7.73	342.00	144	168	3.5	5
W2-20	06/29/89	82.23		7.87	301.00	124	160	1.5	4
W2-20	07/17/89	81.25	N	7.83	280.00	128	144	1.0	4
W2-20	08/21/89	80.62	N	7.81	367.00	160	180	3.5	3
W2-20	09/08/89	80.77		8.03	363.00	176	208	3.2	3
W2-20	10/07/89	81.20		7.88	425.00	168	212	6.8	6
W2-20	10/21/89	81.15		7.98	434.00	168	220	8.5	5
W2-20	11/11/89	81.19		7.73	414.00	172	228	8.2	8
W2-20	12/30/89	81.11		7.73	495.00	184	264	13.2	5
W2-20	01/27/90	80.43		7.70	561.00	212	296	16.2	8
W2-20	03/30/90	81.28		7.55	603.00	204	320	23.0	10
W2-20	04/27/90	81.36		7.69	667.00	216	316	23.0	12
* WELL/GAGE/SAMPLE ID W2-24									
W2-24	04/23/88	82.80		7.94	255.00	112	124	1.5	3
W2-24	05/13/88	82.86		8.08	213.00	88	104	2.0	2
W2-24	06/07/88	81.99		8.03	176.00	68	78	2.0	1
W2-24	06/22/88	81.27	N	7.97	175.00	64	100	3.0	7
W2-24	07/06/88	80.56		8.09	204.00	68	100	4.0	6
W2-24	07/22/88	80.27	Y	7.93	244.00	64	112	6.0	9
W2-24	08/03/88	79.87	N	7.99	263.00	76	128	6.5	9
W2-24	08/17/88	79.90	N	8.01	385.00	80	176	11.5	17
W2-24	08/30/88	80.32	N	7.95	555.00	94	252	20.0	37
W2-24	09/13/88	80.59	N	8.01	671.00	120	348	27.0	46
W2-24	09/29/88	80.88	N	7.81	749.00	136	368	30.8	50
W2-24	10/12/88	81.26		7.89	820.00	144	376	32.5	50
W2-24	10/27/88	81.42		7.87	814.00	148	396	33.8	56
W2-24	11/15/88	81.48		7.82	848.00	148	436	34.5	50
W2-24	12/19/88	81.47		7.86	768.00	148	388	31.5	44
W2-24	01/18/89	81.32		7.83	795.00	156	388	31.2	48
W2-24	02/22/89	81.10		7.65	890.00	148	392	31.0	55
W2-24	03/28/89	81.78		7.78	798.00	148	380	31.5	60
W2-24	04/26/89	81.65		7.78	630.00	148	304	20.8	26
W2-24	05/16/89	81.52		7.84	609.00	148	264	17.0	21
W2-24	06/07/89	82.36		7.89	257.00	104	124	3.5	2
W2-24	06/29/89	82.18		7.98	250.00	100	128	4.0	3
W2-24	07/17/89	81.21	N	7.93	269.00	108	136	5.2	5
W2-24	08/21/89	80.59	N	7.91	464.00	120	212	12.5	15
W2-24	09/08/89	80.76		8.01	476.00	140	260	16.0	13
W2-24	09/23/89	80.07		7.98	540.00	148	284	19.5	15
W2-24	10/07/89	81.13		7.91	621.00	144	292	26.0	22
W2-24	10/21/89	81.10		7.97	610.00	144	300	24.0	19

WELL	DATE	WATER TABLE ELEV FT	IRR ?	pH	COND	ALK	THARD	NO3	CL
					mg/l				
W2-24	11/11/89	81.13		7.85	557.00	152	248	21.8	20
W2-24	12/30/89	81.05		7.76	689.00	184	340	34.2	12
W2-24	01/27/90	80.38		7.78	717.00	184	364	36.0	17
W2-24	03/04/90	80.71		7.72	726.00	168	384	37.5	20
W2-24	03/30/90	81.23		7.57	742.00	180	380	37.5	23
W2-24	04/27/90	81.31		7.70	848.00	200	396	38.5	27
* WELL/GAGE/SAMPLE ID W3-17									
W3-17	04/23/88	81.45		7.93	669.00	128	316	24.0	37
W3-17	05/13/88	81.47		8.00	678.00	124	328	28.5	35
W3-17	06/07/88	80.77		7.90	707.00	128	324	30.0	34
W3-17	06/22/88	80.17	N	7.79	662.00	128	336	28.5	34
W3-17	07/06/88	79.50		7.95	696.00	128	336	31.8	36
W3-17	07/22/88	79.21	Y	7.81	706.00	124	338	30.0	35
W3-17	08/17/88	78.79	N	7.84	697.00	116	324	30.0	31
W3-17	08/30/88	79.11	N	7.80	679.00	116	320	32.5	30
W3-17	09/13/88	79.32	N	7.85	645.00	124	316	30.0	32
W3-17	09/29/88	79.66	N	7.65	673.00	120	328	31.2	33
W3-17	10/12/88	80.04		7.81	818.00	108	386	46.0	35
W3-17	10/27/88	80.05		7.74	884.00	104	408	57.5	48
W3-17	11/15/88	80.10		7.68	951.00	104	432	61.2	57
W3-17	12/19/88	80.27		7.74	884.00	106	436	49.0	73
W3-17	01/18/89	80.09		7.73	968.00	104	452	44.2	93
W3-17	02/22/89	79.88		7.60	1054.00	100	452	46.5	98
W3-17	03/28/89	80.52		7.71	968.00	100	458	49.5	100
W3-17	04/26/89	80.44		7.80	576.00	92	468	50.5	100
W3-17	05/16/89	80.34		7.65	1123.00	92	450	49.0	95
W3-17	06/07/89	80.80		7.61	979.00	100	448	49.5	83
W3-17	06/29/89	80.76		7.64	921.00	96	448	49.5	90
W3-17	07/17/89	79.92	N	7.64	956.00	88	460	51.2	103
W3-17	08/21/89	79.48	N	7.69	1067.00	88	464	49.5	104
W3-17	09/08/89	79.71		7.82	983.00	88	476	52.4	107
W3-17	09/23/89	79.83		7.91	1053.00	240	508	54.0	105
W3-17	10/07/89	79.85		7.88	837.00	108	388	40.5	74
W3-17	10/21/89	79.83		7.82	1112.00	80	520	59.0	105
W3-17	11/11/89	79.93		7.70	983.00	84	472	49.5	99
W3-17	12/30/89	79.85		7.81	837.00	92	420	40.5	67
W3-17	03/04/90	79.51		7.78	812.00	104	416	35.5	57
W3-17	03/30/90	80.15		7.61	817.00	104	420	38.0	64
* WELL/GAGE/SAMPLE ID W3-21									
W3-21	04/23/88	81.47		7.72	676.00	108	316	26.0	55
W3-21	05/13/88	81.43		7.95	666.00	108	320	26.5	52
W3-21	06/07/88	80.79		7.87	665.00	116	300	25.5	47
W3-21	06/22/88	80.19	N	7.78	624.00	112	316	23.8	46

WELL	DATE	WATER TABLE ELEV FT	IRR ?	pH	COND	ALK	THARD	NO3	CL
					mg/l				
W3-21	07/06/88	79.52		8.00	673.00	120	308	25.0	40
W3-21	07/22/88	79.21	Y	7.79	665.00	112	328	24.5	46
W3-21	08/03/88	78.75	N	7.80	656.00	120	316	24.5	44
W3-21	08/17/88	78.79	N	7.84	656.00	120	316	23.0	40
W3-21	08/30/88	79.11	N	7.86	647.00	116	312	25.0	42
W3-21	09/13/88	79.31	N	7.88	645.00	120	320	26.0	45
W3-21	09/29/88	79.64	N	7.63	650.00	120	320	26.5	42
W3-21	10/12/88	80.02		7.91	715.00	112	328	33.5	36
W3-21	10/27/88	80.03		7.83	680.00	120	332	33.0	36
W3-21	11/15/88	80.16		7.74	701.00	120	344	34.5	37
W3-21	12/19/88	80.24		7.78	772.00	104	396	43.0	58
W3-21	01/18/89	80.06		7.79	858.00	100	416	47.5	72
W3-21	02/22/89	79.86		7.66	980.00	96	420	46.2	79
W3-21	03/28/89	80.50		7.82	715.00	112	346	36.5	54
W3-21	04/28/89	80.42		7.81	703.00	104	360	35.0	57
W3-21	05/16/89	80.33		7.75	837.00	108	356	33.5	58
W3-21	06/07/89	81.31		7.67	817.00	108	380	38.2	62
W3-21	06/29/89	80.74		7.72	760.00	104	376	38.0	62
W3-21	07/17/89	79.91	N	7.74	825.00	108	400	42.0	72
W3-21	08/21/89	79.51	N	7.77	902.00	108	400	39.5	76
W3-21	09/08/89	79.69		7.89	762.00	108	388	37.2	68
W3-21	09/23/89	79.81		8.02	794.00	116	396	37.0	65
W3-21	10/07/89	79.87		7.72	108.50	84	480	55.0	120
W3-21	10/21/89	79.81		7.94	889.00	104	440	42.5	75
W3-21	11/11/89	79.90		7.75	827.00	100	416	40.5	84
W3-21	12/30/89	79.82		7.75	841.00	100	412	42.0	75
W3-21	01/27/90	79.60		7.77	891.00	96	444	44.2	84
W3-21	03/04/90	79.49		7.79	833.00	92	428	43.0	80
W3-21	03/31/90	80.14		7.62	757.00	96	380	41.0	63
* WELL/GAGE/SAMPLE ID W4-14									
W4-14	05/13/88	81.42		7.94	440.00	64	192	22.0	24
W4-14	06/07/88	80.81		8.08	712.00	166	328	25.8	35
W4-14	06/22/88	80.26	N	7.97	677.00	160	324	26.8	40
W4-14	07/06/88	79.65		7.97	789.00	164	312	33.0	42
W4-14	07/22/88	79.41	Y	7.81	757.00	152	332	32.2	41
W4-14	08/17/88	78.91	N	7.87	792.00	180	372	29.5	35
W4-14	08/30/88	79.23	N	7.79	832.00	188	396	28.0	39
W4-14	09/13/88	79.45	N	7.70	929.00	184	432	47.5	50
W4-14	09/29/88	79.88	N	7.56	1123.00	196	540	61.2	71
W4-14	10/12/88	80.20		7.69	1240.00	212	560	76.5	70
W4-14	10/27/88	80.21		7.75	1220.00	196	588	62.5	88
W4-14	11/15/88	80.34		7.53	1127.00	170	536	65.0	84
W4-14	12/19/88	80.43		7.74	981.00	156	480	40.8	67
W4-14	01/18/89	80.21		7.51	1026.00	156	492	50.0	82

WELL	DATE	WATER TABLE ELEV FT	IRR ?	pH	COND	ALK	THARD	NO3	CL
					mg/l				
W4-14	02/22/89	80.03		7.55	1098.00	120	456	48.0	88
W4-14	03/28/89	81.55		8.24	76.53	36	36	0.8	2
W4-14	04/26/89	80.65		8.33	106.00	48	48	1.5	-1
W4-14	05/16/89	80.49		8.15	120.00	48	46	1.0	1
W4-14	06/07/89	81.56		8.10	141.00	68	56	0.5	-1
W4-14	06/07/89	81.57		8.15	138.00	60	64	2.0	-1
W4-14	06/29/89	80.84		8.05	326.00	108	160	10.2	6
W4-14	07/17/89	80.06	N	7.87	595.00	152	284	25.0	40
W4-14	08/21/89	79.68	N	7.64	1144.00	172	516	50.0	95
W4-14	09/08/89	79.88		7.72	984.00	176	496	45.4	82
W4-14	09/23/89	80.01		7.95	903.00	160	440	39.0	59
W4-14	10/07/89	80.06		7.84	806.00	140	356	34.0	46
W4-14	10/21/89	80.05		7.89	719.00	128	320	27.5	32
W4-14	11/11/89	80.12		7.80	656.00	124	312	25.5	38
W4-14	12/30/89	80.05		7.82	673.00	100	308	26.5	45
W4-14	03/04/90	79.70		7.85	575.00	100	280	20.0	28
W4-14	03/30/90	80.37		7.52	568.00	116	284	20.0	26
W4-14	04/27/90	77.17		7.76	718.00	136	324	32.5	40
* WELL/GAGE/SAMPLE ID W4-18									
W4-18	05/13/88	81.44		7.99	619.00	100	288	26.5	51
W4-18	06/07/88	80.83		8.01	630.00	100	280	26.5	50
W4-18	06/22/88	80.27	N	7.99	590.00	104	288	24.8	52
W4-18	07/06/88	79.68		8.04	645.00	100	284	26.8	57
W4-18	07/22/88	79.43	Y	7.89	643.00	108	288	25.8	60
W4-18	08/03/88	78.94	N	7.86	631.00	100	296	25.8	55
W4-18	08/17/88	78.94	N	7.95	677.00	120	320	24.5	43
W4-18	08/30/88	79.25	N	7.93	747.00	154	364	35.0	43
W4-18	09/13/88	79.48	N	7.86	1219.00	112	588	72.0	100
W4-18	09/29/88	79.90	N	7.78	958.00	116	460	55.0	71
W4-18	10/12/88	80.20		7.88	907.00	116	408	47.8	56
W4-18	10/27/88	80.20		7.88	819.00	112	380	43.5	59
W4-18	11/15/88	80.32		7.80	715.00	96	328	35.8	50
W4-18	12/19/88	80.42		7.80	827.00	100	416	42.0	52
W4-18	01/18/89	80.21		7.82	833.00	108	400	48.2	55
W4-18	02/22/89	80.05		7.78	777.00	96	340	38.0	45
W4-18	03/28/89	81.51		8.55	63.70	32	36	0.5	2
W4-18	04/26/89	80.66		8.50	81.60	40	36	0.8	-1
W4-18	05/16/89	80.51		8.16	387.00	52	156	15.8	19
W4-18	06/29/89	80.85		7.85	634.00	84	300	33.5	45
W4-18	07/17/89	76.05	N	7.80	888.00	108	416	48.5	73
W4-18	08/21/89	79.65	N	7.85	931.00	108	408	43.8	74
W4-18	09/08/89	79.90		7.85	867.00	104	428	43.8	81
W4-18	09/23/89	79.99		7.97	900.00	104	440	42.5	83
W4-18	10/07/89	80.07		7.92	887.00	100	404	40.5	82

WELL	DATE	WATER TABLE ELEV FT	IRR ?	pH	COND	ALK	THARD	NO3	CL
					mg/l				
W4-18	10/21/89	80.03		7.98	863.00	96	412	38.5	78
W4-18	11/11/89	80.02		7.87	812.00	96	392	35.0	80
W4-18	12/30/89	80.03		7.87	801.00	92	392	37.2	79
W4-18	01/27/90	79.87		7.78	857.00	96	412	38.5	86
W4-18	03/04/90	79.75		7.75	828.00	88	420	38.0	88
W4-18	03/30/90	80.37		7.55	796.00	92	396	20.5	27
W4-18	04/27/90	80.25		7.84	500.00	104	248	15.5	35
* WELL/GAGE/SAMPLE ID W5-15									
W5-15	05/13/88	81.46		7.84	575.00	56	244	42.0	23
W5-15	06/07/88	80.85		8.04	870.00	96	356	9.0	28
W5-15	06/22/88	80.28	N	7.81	820.00	104	352	57.5	29
W5-15	07/06/88	79.67		7.91	820.00	104	336	50.0	38
W5-15	07/22/88	79.41	Y	7.80	918.00	96	380	61.2	50
W5-15	08/03/88	78.91	N	7.87	785.00	132	344	30.5	75
W5-15	08/17/88	78.92	N	7.85	1168.00	182	308	55.0	94
W5-15	08/30/88	79.24	N	7.78	1472.00	196	644	80.0	135
W5-15	09/13/88	79.46	N	7.62	1645.00	176	724	95.0	170
W5-15	09/29/88	79.88	N	7.43	1696.00	192	756	82.5	220
W5-15	10/12/88	80.18		7.39	1647.00	180	724	90.0	170
W5-15	10/27/88	80.18		7.50	1480.00	164	636	75.0	158
W5-15	11/15/88	80.31		7.49	1116.00	172	492	42.2	110
W5-15	12/19/88	80.42		7.70	1063.00	160	508	36.0	91
W5-15	01/18/89	80.20		7.53	1125.00	144	500	46.2	100
W5-15	02/22/89	80.02		7.57	1061.00	120	432	40.0	99
W5-15	03/28/89	81.29		8.04	94.70	40	44	0.8	1
W5-15	04/26/89	80.61		8.07	336.00	84	152	12.5	15
W5-15	05/16/89	80.49		7.75	1247.00	132	500	55.0	101
W5-15	06/07/89	81.54		8.14	149.00	68	68	0.2	-1
W5-15	06/29/89	80.82		7.84	859.00	72	388	58.0	43
W5-15	07/17/89	80.02	N	7.90	776.00	136	352	29.8	34
W5-15	08/21/89	79.64	N	7.80	572.00	120	228	15.5	8
W5-15	09/08/89	79.84		7.86	605.00	132	288	19.8	10
W5-15	09/23/89	79.96		7.94	565.00	128	276	16.0	7
W5-15	10/07/89	80.01		7.89	572.00	132	252	15.0	8
W5-15	10/21/89	79.99		7.98	797.00	92	367	32.8	81
W5-15	11/11/89	80.08		7.86	475.00	136	220	8.2	7
W5-15	01/27/90	79.84		7.82	611.00	188	296	12.5	15
W5-15	03/04/90	79.72		7.89	568.00	176	288	13.0	13
W5-15	03/30/90	80.35		7.73	517.00	164	260	11.8	9
W5-15	04/27/90	80.36		7.72	500.00	124	232	17.7	12
* WELL/GAGE/SAMPLE ID W5-19									
W5-19	05/13/88	81.44		8.06	564.00	84	260	28.0	29
W5-19	06/07/88	80.83		8.09	601.00	108	272	23.2	31

WELL	DATE	WATER TABLE ELEV FT	IRR ?	pH	COND	ALK	THARD	NO3	CL
					----------mg/l----------				
W5-19	06/22/88	80.26	N	7.96	581.00	116	280	21.8	31
W5-19	07/06/88	79.66		8.11	625.00	120	268	25.0	31
W5-19	07/22/88	79.41	Y	8.00	649.00	120	280	28.0	31
W5-19	08/03/88	78.91	N	7.95	733.00	122	336	40.0	34
W5-19	08/17/88	78.92	N	7.99	740.00	120	344	35.5	34
W5-19	08/30/88	79.23	N	7.98	694.00	116	316	37.5	29
W5-19	09/13/88	79.46	N	8.04	761.00	104	348	47.8	35
W5-19	09/29/88	79.87	N	7.63	812.00	96	372	48.8	54
W5-19	10/12/88	80.18		7.79	919.00	102	420	47.2	87
W5-19	10/27/88	80.17		7.93	860.00	100	386	42.8	75
W5-19	11/15/88	80.32		7.95	834.00	112	380	38.5	71
W5-19	12/19/88	80.40		7.93	742.00	112	380	31.5	44
W5-19	01/18/89	80.20		7.94	846.00	104	388	47.0	62
W5-19	02/22/89	80.02		7.80	897.00	100	384	44.0	64
W5-19	03/28/89	81.28		8.49	78.40	32	40	0.8	1
W5-19	04/26/89	80.60		8.07	734.00	88	348	35.5	71
W5-19	05/16/89	80.48		8.01	869.00	100	356	38.8	60
W5-19	06/07/89	81.52		8.16	137.00	64	64	0.5	-1
W5-19	06/29/89	80.82		7.89	1066.00	120	500	58.0	91
W5-19	07/17/89	80.02	N	7.90	873.00	116	400	39.0	77
W5-19	08/21/89	79.67	N	7.80	926.00	116	396	38.5	79
W5-19	09/08/89	79.87		7.88	745.00	100	360	32.6	45
W5-19	09/23/89	79.97		8.01	744.00	96	360	30.0	63
W5-19	10/07/89	79.98		7.92	791.00	92	324	320.0	72
W5-19	10/21/89	80.00		8.00	535.00	132	356	12.8	5
W5-19	11/11/89	80.09		7.87	748.00	96	360	28.2	72
W5-19	12/30/89	80.01		7.87	711.00	96	348	25.5	70
W5-19	01/27/90	79.92		7.85	690.00	96	324	24.0	61
W5-19	03/04/90	79.69		7.90	645.00	88	320	23.5	56
W5-19	03/30/90	80.34		7.80	607.00	84	292	21.5	52
W5-19	04/27/90	80.24		7.88	578.00	96	276	19.2	45
* WELL/GAGE/SAMPLE ID W6-16									
W6-16	05/13/88	81.40		8.04	704.00	140	336	39.2	28
W6-16	06/07/88	80.78		7.96	691.00	136	308	28.5	30
W6-16	06/22/88	80.19	N	7.96	675.00	136	312	28.5	29
W6-16	07/06/88	79.57		7.94	746.00	116	316	45.0	31
W6-16	07/22/88	79.26	Y	7.76	808.00	112	332	48.2	32
W6-16	08/03/88	78.77	N	7.76	892.00	120	408	62.5	36
W6-16	08/17/88	78.80	N	7.72	1184.00	112	532	70.0	81
W6-16	08/30/88	79.11	N	7.73	1136.00	128	524	75.0	79
W6-16	09/13/88	79.32	N	7.60	1088.00	132	500	65.0	81
W6-16	09/29/88	79.69	N	7.51	1206.00	124	552	82.5	86
W6-16	04/26/89	80.42		8.20	149.00	44	76	1.5	1
W6-16	05/16/89	80.35		8.03	362.00	80	144	11.5	13

WELL	DATE	WATER TABLE ELEV FT	IRR ?	pH	COND	ALK	THARD	NO3	CL
					----------mg/l----------				
W6-16	06/07/89	81.43		7.75	644.00	108	280	29.2	44
W6-16	06/29/89	80.67		7.68	1049.00	128	500	70.0	69
W6-16	07/17/89	79.87	Y	7.70	1205.00	124	568	87.5	77
W6-16	08/21/89	79.52	N	7.56	1489.00	132	644	102.5	96
W6-16	09/08/89	79.34		7.60	1112.00	128	536	73.8	68
W6-16	09/23/89	79.80		7.77	1225.00	148	612	82.5	72
W6-16	10/07/89	79.88		7.71	116.90	140	536	74.0	66
W6-16	10/21/89	79.85		7.81	1012.00	140	476	59.0	39
W6-16	11/11/89	79.92		7.75	761.00	120	372	39.5	40
W6-16	12/30/89	79.84		7.78	796.00	124	376	38.0	51
W6-16	03/04/90	79.53		7.79	770.00	112	376	38.5	46
W6-16	03/30/90	80.16		7.68	811.00	120	404	45.2	46
W6-16	04/27/90	80.10		7.70	826.00	128	388	43.0	50
* WELL/GAGE/SAMPLE ID W6-20									
W6-20	05/13/88	81.37		8.05	642.00	120	312	29.0	34
W6-20	06/07/88	80.74		7.97	681.00	126	308	28.0	37
W6-20	06/22/88	80.15	N	8.00	689.00	132	316	28.5	33
W6-20	07/06/88	79.51		7.98	729.00	120	324	40.5	32
W6-20	07/22/88	79.22	Y	7.59	720.00	112	276	33.5	35
W6-20	08/03/88	78.74	N	7.83	772.00	112	356	48.0	32
W6-20	08/17/88	78.77	N	7.88	870.00	116	396	44.5	50
W6-20	08/30/88	79.09	N	7.88	767.00	108	352	40.0	50
W6-20	09/13/88	79.31	N	7.88	838.00	108	392	46.2	59
W6-20	09/29/88	79.67	N	7.75	598.00	92	372	45.0	54
W6-20	10/12/88	80.08		7.70	935.00	100	436	62.5	61
W6-20	10/27/88	82.38		7.74	964.00	96	444	65.0	68
W6-20	11/15/88	80.17		7.76	998.00	104	464	68.8	62
W6-20	12/19/88	80.25		7.82	950.00	96	472	58.8	72
W6-20	01/18/89	80.06		7.74	948.00	96	448	57.5	79
W6-20	02/22/89	79.87		7.67	966.00	100	416	49.8	77
W6-20	03/28/89	80.63		8.31	117.00	48	56	1.2	12
W6-20	04/26/89	80.42		8.20	149.00	44	76	1.5	1
W6-20	06/07/89	81.33		7.96	386.00	76	172	14.5	22
W6-20	06/29/89	80.69		7.88	699.00	96	332	36.8	54
W6-20	07/17/89	79.88	Y	7.80	810.00	96	372	48.0	59
W6-20	08/21/89	79.52	N	7.76	1009.00	100	432	56.2	68
W6-20	09/08/89	79.79		7.70	903.00	112	440	54.5	63
W6-20	09/23/89	79.82		8.04	834.00	96	404	42.8	66
W6-20	10/07/89	79.86		7.90	864.00	96	338	43.5	72
W6-20	10/21/89	79.83		8.03	870.00	92	400	43.2	70
W6-20	11/11/89	79.91		7.85	790.00	96	388	40.5	72
W6-20	12/30/89	79.82		7.84	790.00	96	376	39.5	71
W6-20	01/27/90	79.66		7.81	818.00	100	396	41.0	71
W6-20	03/04/90	79.52		7.78	782.00	96	392	39.8	67

WELL	DATE	WATER TABLE ELEV FT	IRR ?	pH	COND	ALK	THARD	NO3	CL
					mg/l				
W6-20	03/30/90	80.16		7.74	763.00	104	368	37.8	61
W6-20	04/27/90	80.07		7.78	779.00	108	364	35.7	64
* WELL/GAGE/SAMPLE ID WBLANK									
WBLANK	05/13/88	0.00		7.93	1.93	-4	-2	0.5	-1
WBLANK	06/07/88	0.00		6.37	2.63	-2	-2	-0.2	-1
WBLANK	06/22/88	0.00		6.81	1.93	8	2	0.2	-1
WBLANK	07/06/88	0.00		6.16	1.97	8	2	-0.2	-1
WBLANK	07/22/88	0.00	Y	6.20	2.40	7	-2	-0.2	-1
WBLANK	08/03/88	0.00	N	6.43	2.13	4	4	-0.2	-1
WBLANK	08/30/88	0.00	N	6.12	2.10	-2	-2	-0.2	-1
WBLANK	09/13/88	0.00	N	6.38	2.68	-2	8	0.5	-1
WBLANK	09/29/88	0.00	N	7.21	1.81	-2	8	-0.2	-1
WBLANK	10/12/88	0.00		6.13	2.60	-4	-4	0.2	1
WBLANK	10/27/88	0.00		6.02	6.90	4	6	-0.2	-1
WBLANK	11/15/88	0.00		6.59	17.10	8	8	0.2	1
WBLANK	12/19/88	0.00		6.51	3.37	-2	4	-0.2	1
WBLANK	01/18/89	0.00		5.83	295.00	-4	20	0.2	-1
WBLANK	02/22/89	0.00		6.23	2.58	-4	4	-0.2	-1
WBLANK	03/28/89	0.00		6.94	2.20	8	4	-0.2	1
WBLANK	04/26/89	0.00		6.32	4.45	8	4	0.2	-1
WBLANK	05/16/89	0.00		6.05	3.14	-4	4	-0.2	-1
WBLANK	06/07/89	0.00		6.09	2.66	-4	6	-0.2	-1
WBLANK	06/29/89	0.00		6.58	2.00	-4	8	0.5	-1
WBLANK	07/17/89	0.00		6.70	3.00	4	4	-0.2	-1
WBLANK	08/21/89	0.00		5.98	3.10	-4	4	0.2	-1
WBLANK	09/08/89	0.00		5.78	4.00	4	8	-0.5	-2
WBLANK	09/23/89	0.00		6.27	2.56	-4	4	-0.2	-1
WBLANK	10/07/89	0.00		5.77	3.08	-4	-4	-0.2	1
WBLANK	10/21/89	0.00		5.61	14.23	-4	-4	1.0	1
WBLANK	11/11/89	0.00		5.24	4.00	-4	-4	-0.2	2
WBLANK	12/30/89	0.00		6.24	4.00	8	8	-0.2	1
WBLANK	01/27/90	0.00		8.68	8.50	8	16	0.2	NA
WBLANK	03/04/90	0.00		7.05	2.00	-4	4	12.5	13
WBLANK	03/30/90	0.00		7.06	3.48	4	4	-0.2	-2
WBLANK	03/30/90	0.00		7.33	10.20	4	4	-0.2	-1
WBLANK	04/27/90	0.00		7.82	2.53	4	-4	-0.2	-1
* WELL/GAGE/SAMPLE ID WDUP									
WDUP	05/13/88	94.64		8.07	626.00	104	292	26.0	51
WDUP	06/07/88	97.20		7.86	673.00	108	304	25.8	48
WDUP	06/22/88	80.19	N	7.91	647.00	112	312	24.0	46
WDUP	06/22/88	80.19	N	7.91	647.00	112	312	24.0	46
WDUP	07/06/88	81.15		8.15	188.00	88	92	0.5	2
WDUP	07/22/88	0.00	Y	7.99	643.00	120	274	28.5	30

WELL	DATE	WATER TABLE ELEV FT	IRR ?	pH	COND	ALK	THARD	NO3	CL
					mg/l				
WDUP	08/03/88	0.00	N	7.84	644.00	118	316	25.5	42
WDUP	08/30/88	0.00	N	7.92	641.00	112	308	25.5	42
WDUP	09/13/88	0.00	N	7.90	651.00	116	314	26.0	45
WDUP	10/12/88	0.00		7.80	946.00	104	420	48.0	90
WDUP	11/15/88	0.00		7.81	843.00	156	408	34.0	55
WDUP	12/19/88	96.50		7.78	772.00	104	396	43.0	58
WDUP	12/19/88	0.00		7.80	762.00	100	396	42.0	54
WDUP	01/18/89	0.00		7.72	950.00	92	440	57.5	78
WDUP	02/22/89	0.00		7.89	904.00	100	388	44.0	64
WDUP	03/28/89	0.00		8.00	346.00	140	164	3.0	18
WDUP	04/26/89	0.00		8.34	78.30	36	44	0.8	-1
WDUP	05/16/89	0.00		7.80	604.00	148	272	17.0	21
WDUP	06/07/89	0.00		7.95	281.00	124	140	2.5	3
WDUP	06/29/89	0.00		7.77	758.00	104	372	38.5	62
WDUP	07/17/89	0.00		7.89	613.00	156	296	25.0	40
WDUP	08/21/89	81.22	N	7.71	525.00	188	236	8.0	21
WDUP	09/08/89	0.00		7.55	1106.00	132	536	71.8	68
WDUP	09/23/89	0.00		8.15	702.00	200	384	23.0	36
WDUP	10/07/89	0.00		7.87	602.00	148	288	25.5	21
WDUP	10/21/89	0.00		7.93	707.00	128	312	27.0	30
WDUP	11/11/89	0.00		7.72	468.00	136	224	9.0	7
WDUP	12/30/89	0.00		7.81	465.00	184	240	8.0	25
WDUP	01/27/90	0.00		7.75	695.00	84	336	24.5	62
WDUP	03/04/90	0.00		8.05	542.00	72	288	12.0	12
WDUP	03/30/90	0.00		7.46	444.00	156	240	13.2	12
WDUP	04/27/90	0.00		7.72	386.00	164	192	6.0	8
* WELL/GAGE/SAMPLE ID WIRRIG									
WIRRIG	09/09/88	0.00	Y	7.49	492.00	136	248	17.8	26
WIRRIG	09/09/88	0.00	Y	7.60	495.00	140	252	17.0	24
* WELL/GAGE/SAMPLE ID WPOND									
WPOND	03/28/89	-9.00		6.70	32.00	12	12	0.5	2
* WELL/GAGE/SAMPLE ID WREC									
WREC	09/08/89	0.00		7.89	7222.16	392	24	36.0	NA
WREC	09/23/89	-18.32		8.15	708.00	200	388	23.2	36
WREC	10/07/89	0.00		7.94	685.00	196	348	22.2	36
WREC	10/21/89	-18.30		7.87	638.00	180	312	21.0	24
WREC	11/11/89	-18.30		7.78	533.00	160	280	15.5	30
WREC	12/30/89	0.00		7.64	820.00	184	420	45.8	28
WREC	01/27/90	0.00		7.59	1095.00	240	560	71.0	32

APPENDIX

Table 8. Groundwater analyses data for Field C.

WELL	DATE	WATER TABLE ELEV FT	IRR ?	pH	COND	ALK	THARD	NO3	CL
						mg/l			
** SITE C									
* WELL/GAGE/SAMPLE ID M1-25									
M1-25	04/18/88	93.11	N	7.30	117.00	40	40	1.2	6
M1-25	05/17/88	92.66		7.58	97.80	28	33	2.0	4
M1-25	06/14/88	92.35		7.21	97.60	28	36	1.8	3
M1-25	06/30/88	92.01		7.04	104.00	28	36	2.0	4
M1-25	07/11/88	91.93	Y	6.76	90.00	28	36	1.8	4
M1-25	07/25/88	91.77		6.81	98.80	28	40	1.0	4
M1-25	08/08/88	91.87		6.91	107.00	28	40	0.5	6
M1-25	09/07/88	92.18	N	6.87	93.00	28	40	1.0	5
M1-25	09/21/88	92.45	N	6.70	98.00	28	38	1.0	6
M1-25	10/05/88	92.61		6.81	104.00	32	60	1.5	4
M1-25	10/19/88	92.50		6.81	98.00	24	40	1.8	4
M1-25	11/16/88	102.03		6.42	94.00	32	44	1.5	5
M1-25	12/28/88	92.87		6.95	107.00	24	40	1.0	5
M1-25	01/30/89	93.07		6.60	115.00	32	56	0.5	8
M1-25	02/24/89	93.13		6.57	124.00	32	48	0.8	8
M1-25	03/31/89	94.24		6.46	129.00	32	72	0.5	10
M1-25	04/28/89	93.25		6.35	116.00	32	52	1.0	7
M1-25	06/15/89	92.77		7.20	128.00	28	56	2.5	8
M1-25	07/03/89	92.66	N	7.01	121.00	32	52	2.5	6
M1-25	07/24/89	92.38	Y	6.91	117.00	32	48	3.5	6
M1-25	08/16/89	92.52	N	6.87	111.00	28	44	2.0	8
M1-25	08/28/89	93.05		7.03	106.00	28	44	2.2	8
M1-25	09/16/89	93.13		6.66	97.00	24	44	8.0	2
M1-25	10/14/89	92.76		6.44	115.00	24	48	3.2	13
M1-25	10/28/89	92.68		6.53	119.00	24	52	2.5	13
M1-25	11/18/89	92.62		6.46	127.00	24	52	2.2	17
M1-25	12/09/89	92.78		6.47	137.00	27	56	3.0	13
M1-25	01/11/90	93.21		6.50	131.00	20	60	3.2	15
M1-25	02/09/90	93.31		6.47	127.00	32	56	3.8	10
M1-25	03/09/90	93.17		6.30	124.00	12	56	2.2	10
M1-25	04/13/90	92.99		6.97	132.00	28	56	2.5	10
* WELL/GAGE/SAMPLE ID M1-29									
M1-29	04/18/88	93.15	N	7.28	193.00	52	72	3.5	14
M1-29	05/17/88	92.72		7.21	183.00	48	80	4.0	13
M1-29	06/14/88	92.42		6.82	199.00	48	80	4.0	13
M1-29	06/30/88	92.18		7.07	199.00	52	76	2.8	14
M1-29	07/11/88	92.00	Y	6.80	178.00	52	80	2.8	14
M1-29	07/25/88	91.86		7.28	201.00	32	80	1.8	13
M1-29	08/08/88	91.94		7.18	178.00	76	76	0.5	12
M1-29	09/07/88	92.25	N	6.83	154.00	54	68	0.5	9
M1-29	09/21/88	92.51	N	6.81	162.00	60	48	-0.2	9

WELL	DATE	WATER TABLE ELEV FT	IRR ?	pH	COND	ALK	THARD	NO3	CL
					mg/l				
M1-29	10/05/88	92.68		6.79	178.00	64	84	-0.2	10
M1-29	10/19/88	92.57		6.63	184.00	60	72	0.5	11
M1-29	11/16/88	92.66		6.43	167.00	48	68	0.5	11
M1-29	12/28/88	92.94		6.58	189.00	51	68	1.5	11
M1-29	01/30/89	93.12		6.62	173.00	56	96	1.5	12
M1-29	02/24/89	93.21		6.65	182.00	52	68	0.8	13
M1-29	03/30/89	94.29		6.62	190.00	60	80	0.8	13
M1-29	04/28/89	93.32		6.51	198.00	64	84	1.0	13
M1-29	06/15/89	92.85		7.06	200.00	56	80	1.8	15
M1-29	07/03/89	92.74	N	6.82	180.00	56	72	1.0	11
M1-29	07/24/89	92.45	Y	6.97	176.00	56	68	2.0	11
M1-29	08/16/89	92.59	N	6.94	164.00	56	68	1.0	9
M1-29	08/28/89	93.11		7.02	152.00	72	76	1.0	10
M1-29	09/16/89	93.20		7.19	160.00	56	64	0.8	10
M1-29	09/30/89	92.91		6.48	115.00	20	48	2.2	9
M1-29	09/30/89	92.99		6.75	157.00	52	60	0.5	9
M1-29	10/14/89	92.85		6.55	156.00	52	60	1.5	9
M1-29	10/28/89	92.74		6.67	158.00	60	64	2.0	11
M1-29	11/18/89	92.69		6.50	173.00	52	60	1.2	12
M1-29	12/09/89	92.85		6.52	160.00	52	72	0.5	10
M1-29	01/11/90	93.27		6.53	151.00	60	64	0.8	8
M1-29	02/09/90	93.36		6.50	141.00	44	68	1.5	8
M1-29	03/09/90	93.23		6.54	166.00	56	68	2.2	10
M1-29	04/13/90	93.04		6.81	186.00	60	92	2.8	12
* WELL/GAGE/SAMPLE ID M2-15									
M2-15	04/18/88	91.67	N	6.71	354.00	16	156	27.2	12
M2-15	05/17/88	91.23		7.00	225.00	16	80	15.0	7
M2-15	06/14/88	90.45		6.68	175.00	18	60	7.5	5
M2-15	06/30/88	90.61		6.59	153.00	20	52	6.5	5
M2-15	07/11/88	90.34	Y	6.77	171.00	20	64	12.0	6
M2-15	07/25/88	90.21		6.71	241.00	16	80	15.5	8
M2-15	08/08/88	90.42		6.72	275.00	12	94	20.0	9
M2-15	09/07/88	90.82	N	6.33	258.00	15	96	20.0	10
M2-15	09/21/88	91.23	N	6.20	252.00	20	94	18.5	9
M2-15	10/05/88	91.29		6.26	335.00	16	132	26.5	11
M2-15	10/19/88	91.09		6.22	362.00	12	128	30.0	11
M2-15	11/16/88	91.25		5.97	312.00	16	116	24.2	10
M2-15	12/28/88	91.56		5.98	282.00	8	108	22.2	9
M2-15	01/30/89	91.67		6.01	275.00	12	120	19.5	8
M2-15	02/23/89	91.68		6.07	261.00	8	92	17.5	7
M2-15	03/30/89	93.09		6.18	208.00	12	88	12.8	6
M2-15	04/28/89	91.82		6.02	225.00	12	80	14.8	6
M2-15	06/15/89	91.40		6.61	202.00	8	48	12.0	8
M2-15	07/03/89	91.25	N	6.71	205.00	12	72	14.0	7

WELL	DATE	WATER TABLE ELEV FT	IRR ?	pH	COND	ALK	THARD	NO3	CL
					mg/l				
M2-15	07/24/89	90.89	Y	6.69	200.00	12	64	12.8	8
M2-15	08/16/89	91.10	N	6.55	180.00	12	64	9.5	14
M2-15	08/28/89	91.79		6.61	139.00	16	52	7.8	8
M2-15	09/16/89	91.85		6.33	108.00	12	40	5.8	5
M2-15	09/30/89	91.49		6.28	122.00	8	40	6.8	6
M2-15	10/14/89	91.69		6.21	126.00	8	40	8.2	5
M2-15	10/28/89	91.23		6.25	125.00	12	44	8.5	5
M2-15	11/18/89	91.17		6.26	125.00	8	40	6.5	3
M2-15	12/09/89	91.47		6.23	109.00	12	40	5.0	3
M2-15	01/11/90	91.78		6.23	96.00	12	40	5.8	2
M2-15	02/09/90	91.84		6.43	94.00	16	40	5.5	2
M2-15	03/09/90	91.65		6.38	99.00	20	40	5.5	2
M2-15	04/13/90	91.57		6.82	116.00	16	44	7.0	2
* WELL/GAGE/SAMPLE ID M2-19									
M2-19	04/18/88	91.65	N	6.67	376.00	16	144	27.0	13
M2-19	05/17/88	91.25		6.59	175.00	16	68	8.5	6
M2-19	06/14/88	91.31		6.53	176.00	16	60	10.5	6
M2-19	06/30/88	90.63		6.72	231.00	20	84	15.0	9
M2-19	07/11/88	90.35	Y	6.53	219.00	20	88	16.0	9
M2-19	07/25/88	90.22		6.98	254.00	20	92	16.0	9
M2-19	08/08/88	90.45		6.68	257.00	20	92	15.8	9
M2-19	09/07/88	90.84	N	6.22	326.00	14	128	25.5	10
M2-19	09/21/88	91.25	N	6.14	352.00	12	132	28.5	10
M2-19	10/05/88	91.31		6.26	347.00	12	132	25.0	9
M2-19	10/19/88	91.12		6.11	324.00	10	124	23.5	10
M2-19	11/16/88	91.26		5.99	323.00	16	128	22.5	9
M2-19	12/28/88	91.60		5.99	347.00	4	124	24.0	10
M2-19	01/30/89	91.71		6.05	298.00	12	120	20.0	7
M2-19	02/23/89	91.73		6.21	280.00	16	100	17.0	7
M2-19	03/30/89	93.14		6.03	260.00	12	108	17.5	7
M2-19	04/28/89	91.86		6.00	269.00	12	60	16.2	7
M2-19	06/15/89	91.44		6.48	299.00	12	108	22.5	9
M2-19	07/03/89	91.29	N	6.39	326.00	12	124	28.2	8
M2-19	07/24/89	90.93	Y	6.42	352.00	12	120	28.5	10
M2-19	08/16/89	91.14	N	6.40	297.00	12	112	24.8	8
M2-19	08/28/89	91.83		6.39	242.00	16	104	20.8	7
M2-19	09/16/89	91.86		6.23	203.00	12	80	15.6	5
M2-19	09/30/89	91.54		6.28	160.00	8	56	8.0	3
M2-19	10/14/89	91.73		6.31	130.00	8	40	7.0	3
M2-19	10/28/89	91.25		6.40	113.00	12	44	6.0	3
M2-19	11/18/89	91.21		6.28	112.00	12	36	3.8	3
M2-19	12/09/89	91.52		6.25	100.00	12	88	2.5	1
M2-19	01/11/90	91.81		6.32	81.00	12	68	2.2	1
M2-19	02/09/90	91.89		6.42	71.00	16	28	3.0	1

WELL	DATE	WATER TABLE ELEV FT	IRR ?	pH	COND	ALK	THARD	NO3	CL
					mg/l				
M2-19	03/09/90	91.69		6.41	98.00	16	36	6.2	2
M2-19	04/13/90	91.60		6.53	177.00	12	60	14.0	4
* WELL/GAGE/SAMPLE ID M3-12									
M3-12	04/18/88	90.60	N	6.44	431.00	12	164	40.0	17
M3-12	05/17/88	90.22		6.56	455.00	16	176	44.0	16
M3-12	06/14/88	89.98		6.05	411.00	6	144	32.8	18
M3-12	06/30/88	89.81		6.19	257.00	12	48	17.5	10
M3-12	07/11/88	89.66	Y	6.07	188.00	8	76	12.5	10
M3-12	07/25/88	89.57		6.01	239.00	8	84	15.0	11
M3-12	08/08/88	89.67		6.07	219.00	8	76	12.0	10
M3-12	09/07/88	89.91	N	5.70	448.00	4	184	41.0	26
M3-12	09/21/88	90.67	N	5.83	324.00	8	124	23.2	19
M3-12	10/05/88	90.31		5.79	503.00	4	196	42.0	27
M3-12	10/19/88	90.11		5.60	590.00	6	208	70.0	34
M3-12	11/16/88	90.22		5.40	521.00	12	204	40.2	50
M3-12	12/28/88	90.45		5.55	595.00	4	236	43.0	51
M3-12	01/30/89	90.54		5.52	554.00	4	248	40.8	63
M3-12	02/23/89	90.54		5.73	507.00	4	192	33.0	50
M3-12	03/30/89	92.54		5.88	90.60	4	52	2.4	2
M3-12	04/28/89	90.79		5.56	303.00	4	120	18.0	22
M3-12	06/15/89	90.37		6.21	460.00	4	176	28.0	51
M3-12	07/03/89	90.26	N	6.15	441.00	8	172	28.5	8
M3-12	07/24/89	90.10	Y	6.20	475.00	8	176	30.0	46
M3-12	08/16/89	90.33	N	5.96	486.00	12	196	34.0	48
M3-12	08/28/89	90.89		6.10	418.00	8	184	31.2	44
M3-12	09/16/89	90.85		5.76	431.00	12	188	30.5	51
M3-12	09/30/89	90.54		5.77	501.00	4	204	33.5	54
M3-12	10/14/89	90.45		5.69	5014.00	4	204	32.8	52
M3-12	10/28/89	90.27		5.70	469.00	8	200	30.0	58
M3-12	11/18/89	90.20		5.69	462.00	8	184	27.5	60
M3-12	12/09/89	90.41		5.72	490.00	8	196	27.5	53
M3-12	01/11/90	90.67		5.81	476.00	8	300	32.0	55
M3-12	02/09/90	90.73		5.87	436.00	16	192	28.5	51
M3-12	03/09/90	90.62		5.89	452.00	16	160	27.5	46
M3-12	04/13/90	91.58		6.02	470.00	8	188	28.5	50
* WELL/GAGE/SAMPLE ID M3-16									
M3-16	04/18/88	90.74	N	7.35	231.00	56	96	5.0	17
M3-16	05/17/88	90.22		6.83	215.00	52	96	9.2	7
M3-16	06/14/88	89.97		6.47	331.00	36	124	21.2	10
M3-16	06/30/88	89.79		6.68	334.00	28	124	23.5	13
M3-16	07/11/88	89.65	Y	6.42	337.00	24	136	28.5	15
M3-16	07/25/88	89.56		6.30	455.00	18	172	36.5	22
M3-16	08/08/88	89.66		6.34	446.00	18	160	33.5	23

WELL	DATE	WATER TABLE ELEV FT	IRR ?	pH	COND	ALK	THARD	NO3	CL
					mg/l				
M3-16	09/07/88	89.89	N	6.38	346.00	24	140	25.0	15
M3-16	09/21/88	90.64	N	6.19	335.00	20	132	25.0	17
M3-16	10/05/88	90.29		6.45	365.00	24	140	26.5	17
M3-16	10/19/88	90.09		6.34	350.00	28	140	25.8	16
M3-16	11/16/88	90.21		6.15	341.00	36	136	25.5	16
M3-16	12/28/88	90.44		6.14	278.00	36	104	15.5	11
M3-16	01/30/89	90.53		6.30	223.00	36	128	11.8	9
M3-16	02/24/89	90.53		6.42	234.00	36	92	11.5	10
M3-16	03/30/89	92.51		6.51	51.60	8	36	1.2	1
M3-16	04/28/89	90.03		6.18	282.00	28	112	14.0	19
M3-16	06/15/89	90.33		6.83	238.00	36	100	19.5	17
M3-16	07/03/89	89.29	N	6.79	242.00	40	104	10.5	15
M3-16	07/24/89	90.07	Y	6.53	356.00	32	136	20.0	28
M3-16	08/16/89	90.31	N	6.54	366.00	32	148	32.0	31
M3-16	08/28/89	90.86		6.63	318.00	28	140	20.8	27
M3-16	09/16/89	0.00		6.39	351.00	36	160	24.4	31
M3-16	09/30/89	90.54		6.31	394.00	28	160	25.0	33
M3-16	10/14/89	90.33		6.20	386.00	30	156	26.5	34
M3-16	10/28/89	90.24		6.25	373.00	32	156	24.5	35
M3-16	11/18/89	995.33		6.25	422.00	24	176	27.0	37
M3-16	12/09/89	90.39		6.17	423.00	24	172	26.2	32
M3-16	01/11/90	90.63		6.45	260.00	36	120	13.5	21
M3-16	02/09/90	90.72		6.27	242.00	44	112	11.0	20
M3-16	03/09/90	90.69		6.26	220.00	44	92	7.2	15
M3-16	04/13/90	90.56		6.19	273.00	44	116	11.0	18
* WELL/GAGE/SAMPLE ID M4-13									
M4-13	04/18/88	89.58	N	6.67	363.00	16	140	30.5	17
M4-13	05/17/88	89.32		6.91	349.00	16	145	30.5	15
M4-13	06/14/88	89.14		6.66	315.00	16	120	24.0	11
M4-13	06/30/88	89.05		6.77	284.00	20	104	20.5	10
M4-13	07/11/88	88.91	Y	6.45	218.00	16	92	16.2	8
M4-13	07/25/88	88.90		6.72	213.00	16	78	11.5	7
M4-13	08/08/88	89.00		6.58	219.00	16	76	11.5	7
M4-13	09/07/88	89.13	N	6.46	188.00	14	80	11.5	5
M4-13	09/21/88	89.57	N	6.30	254.00	16	100	20.5	8
M4-13	10/05/88	89.33		6.57	289.00	16	112	23.5	7
M4-13	10/19/88	89.20		6.38	335.00	12	128	30.0	8
M4-13	11/16/88	89.41		5.91	315.00	16	128	29.2	9
M4-13	12/28/88	89.43		5.86	386.00	16	160	35.8	10
M4-13	01/30/89	89.45		5.92	327.00	12	160	28.0	12
M4-13	02/24/89	89.43		6.06	370.00	8	128	28.0	19
M4-13	03/30/89	90.99		5.88	355.00	8	164	29.2	20
M4-13	04/28/89	89.62		5.88	328.00	12	136	23.8	17
M4-13	06/15/89	89.35		6.28	395.00	8	192	28.2	31

WELL	DATE	WATER TABLE ELEV FT	IRR ?	pH	COND	ALK	THARD	NO3	CL
					mg/l				
M4-13	07/03/89	88.90	N	6.46	309.00	12	120	21.0	21
M4-13	07/24/89	89.24	Y	6.53	217.00	12	84	13.5	12
M4-13	08/16/89	89.54	N	6.45	210.00	16	80	13.0	9
M4-13	08/28/89	89.95		6.62	191.00	12	84	12.5	9
M4-13	09/16/89	89.93		6.61	195.00	16	80	12.8	8
M4-13	09/30/89	90.67		6.07	236.00	8	92	17.0	8
M4-13	10/14/89	89.55		5.99	259.00	8	100	20.5	10
M4-13	10/28/89	89.43		6.01	265.00	12	108	23.0	12
M4-13	11/18/89	89.39		5.94	282.00	12	120	24.0	13
M4-13	12/09/89	89.49		5.87	299.00	16	116	22.5	14
M4-13	01/11/90	90.17		5.95	302.00	8	128	22.0	26
M4-13	02/09/90	89.72		6.11	279.00	16	120	18.2	27
M4-13	03/09/90	89.62		6.05	261.00	12	100	14.5	21
M4-13	04/13/90	89.60		6.31	263.00	12	108	15.8	21
* WELL/GAGE/SAMPLE ID M4-17									
M4-17	04/18/88	89.64	N	6.60	352.00	28	136	26.0	15
M4-17	05/17/88	89.32		7.03	342.00	32	136	27.5	15
M4-17	06/14/88	89.15		6.62	409.00	22	148	31.0	15
M4-17	06/30/88	89.07		6.57	398.00	32	152	30.0	16
M4-17	07/11/88	88.94	Y	6.60	349.00	28	148	28.5	16
M4-17	07/25/88	88.90		6.76	387.00	32	140	25.6	16
M4-17	08/08/88	89.01		6.72	362.00	30	132	23.5	15
M4-17	09/07/88	89.15	N	6.55	325.00	24	136	23.8	14
M4-17	09/21/88	89.58	N	6.49	305.00	32	128	22.5	13
M4-17	10/05/88	89.35		6.57	331.00	24	132	24.5	11
M4-17	10/19/88	89.21		6.57	305.00	18	112	24.0	10
M4-17	11/16/88	89.41		6.23	306.00	24	124	24.5	12
M4-17	12/28/88	89.45		6.16	330.00	28	128	23.0	13
M4-17	01/30/89	89.47		6.23	293.00	32	168	19.5	13
M4-17	02/24/89	89.44		6.26	374.00	24	140	26.5	15
M4-17	03/30/89	91.01		6.19	359.00	24	164	29.2	15
M4-17	04/28/89	89.63		6.09	437.00	20	172	33.0	20
M4-17	06/15/89	89.38		6.69	422.00	12	164	34.0	26
M4-17	07/03/89	89.25	N	6.68	419.00	16	168	32.5	27
M4-17	07/24/89	89.27	Y	6.68	428.00	16	172	32.0	33
M4-17	08/16/89	89.55	N	6.62	390.00	20	156	30.8	27
M4-17	08/28/89	89.88		6.70	355.00	20	152	28.8	26
M4-17	09/16/89	90.04		6.64	354.00	24	160	26.0	28
M4-17	09/30/89	89.69		6.29	368.00	16	148	26.5	26
M4-17	10/14/89	89.57		6.21	344.00	20	140	25.2	26
M4-17	10/28/89	89.45		6.33	312.00	24	128	20.8	30
M4-17	11/18/89	89.39		6.24	327.00	16	136	22.5	29
M4-17	12/09/89	89.51		6.20	323.00	20	124	19.5	24
M4-17	01/11/90	89.67		6.22	306.00	24	128	20.8	25

WELL	DATE	WATER TABLE ELEV FT	IRR ?	pH	COND	ALK	THARD	NO3	CL
					----------mg/l----------				
M4-17	02/09/90	89.72		6.13	325.00	32	144	21.0	29
M4-17	03/09/90	89.64		6.21	283.00	24	112	15.0	22
M4-17	04/13/90	89.56		6.54	236.00	28	96	11.8	15
* WELL/GAGE/SAMPLE ID M5-15									
M5-15	04/18/88	89.46	N	6.66	384.00	16	148	34.5	17
M5-15	05/17/88	89.15		6.69	377.00	20	152	35.5	17
M5-15	06/14/88	88.94		6.50	435.00	12	160	35.5	17
M5-15	06/30/88	89.22		6.58	456.00	16	168	36.5	20
M5-15	07/11/88	88.68	Y	6.49	409.00	16	176	37.2	25
M5-15	07/25/88	88.65		6.59	472.00	12	168	37.0	21
M5-15	08/08/88	88.78		6.45	494.00	8	180	40.5	21
M5-15	09/07/88	89.00	N	6.26	464.00	15	192	42.5	21
M5-15	09/21/88	89.42	N	6.22	456.00	12	192	41.5	24
M5-15	10/05/88	89.28		6.26	493.00	12	200	43.2	26
M5-15	10/19/88	89.08		6.30	507.00	12	196	46.0	25
M5-15	11/16/88	89.25		6.12	493.00	16	204	41.5	41
M5-15	12/28/88	89.57		5.99	562.00	8	208	41.2	51
M5-15	01/30/89	89.62		6.07	507.00	24	248	38.0	51
M5-15	02/24/89	89.59		6.23	505.00	12	196	35.0	42
M5-15	03/30/89	90.81		6.16	224.00	4	123	16.2	13
M5-15	04/28/89	89.65		5.90	547.00	8	216	35.0	59
M5-15	06/15/89	89.36		6.52	528.00	4	204	35.8	59
M5-15	07/03/89	89.24	N	6.65	502.00	12	200	33.8	54
M5-15	07/24/89	89.25	Y	6.43	468.00	8	180	33.0	49
M5-15	08/16/89	89.41	N	6.43	438.00	16	176	32.5	42
M5-15	08/28/89	89.87		6.50	415.00	16	188	30.8	48
M5-15	09/16/89	89.83		5.99	467.00	8	200	36.2	56
M5-15	09/30/89	89.51		6.02	505.00	8	204	35.5	54
M5-15	10/14/89	89.64		5.94	500.00	4	204	34.5	58
M5-15	10/28/89	89.26		5.98	473.00	12	196	31.5	61
M5-15	11/18/89	89.22		5.94	492.00	8	188	33.5	53
M5-15	12/09/89	89.52		6.00	495.00	8	200	31.0	53
M5-15	01/11/90	89.78		6.14	412.00	8	176	29.0	51
M5-15	02/09/90	89.82		5.98	436.00	16	192	31.5	53
M5-15	03/09/90	89.65		6.96	491.00	12	196	32.5	50
M5-15	04/13/90	89.51		6.24	464.00	12	184	31.8	49
* WELL/GAGE/SAMPLE ID M5-19									
M5-19	04/18/88	89.38	N	6.96	330.00	24	128	24.8	17
M5-19	05/17/88	89.13		6.80	304.00	28	124	23.5	15
M5-19	06/14/88	88.91		6.77	344.00	26	124	23.5	16
M5-19	06/30/88	88.78		6.73	363.00	32	140	26.5	19
M5-19	07/11/88	88.63	Y	6.62	347.00	28	140	28.8	20
M5-19	07/25/88	88.60		6.82	416.00	24	156	30.2	19

WELL	DATE	WATER TABLE ELEV FT	IRR ?	pH	COND	ALK	THARD	NO3	CL
						mg/l			
M5-19	08/08/88	88.74		6.68	418.00	20	156	31.0	19
M5-19	09/07/88	88.94	N	6.58	377.00	22	160	31.5	19
M5-19	09/21/88	89.36	N	6.50	384.00	28	160	32.2	17
M5-19	10/05/88	89.23		6.56	389.00	20	148	30.8	17
M5-19	10/19/88	89.02		6.41	383.00	22	152	32.6	14
M5-19	11/16/88	89.16		6.44	364.00	24	152	31.0	18
M5-19	12/28/88	89.50		6.24	394.00	24	156	28.0	24
M5-19	01/30/89	89.54		6.43	319.00	28	128	23.5	17
M5-19	02/24/89	89.53		6.43	353.00	24	132	24.0	17
M5-19	03/30/89	90.73		6.34	257.00	12	112	18.0	17
M5-19	04/28/89	89.55		6.26	477.00	20	196	32.0	37
M5-19	06/15/89	89.28		6.66	423.00	16	172	33.0	28
M5-19	07/03/89	89.14	N	6.71	398.00	20	160	29.2	26
M5-19	07/24/89	89.05	Y	6.64	355.00	20	140	26.0	25
M5-19	08/16/89	89.32	N	6.60	374.00	24	148	27.0	28
M5-19	08/28/89	89.79		6.60	345.00	20	152	26.2	29
M5-19	09/16/89	89.74		6.46	368.00	20	156	27.6	33
M5-19	09/30/89	89.33		6.42	394.00	16	160	27.2	35
M5-19	10/14/89	89.45		6.35	387.00	12	160	28.5	38
M5-19	10/28/89	89.18		6.47	395.00	20	168	28.0	43
M5-19	11/18/89	89.14		6.25	399.00	20	148	27.0	40
M5-19	12/09/89	89.42		6.30	361.00	-4	148	24.0	33
M5-19	01/11/90	89.68		6.35	309.00	20	132	22.0	27
M5-19	02/09/90	89.74		6.16	306.00	28	136	21.5	25
M5-19	03/09/90	89.58		6.29	335.00	24	144	21.5	25
M5-19	04/13/90	89.43		6.25	412.00	24	168	28.5	36
* WELL/GAGE/SAMPLE ID M6-19									
M6-19	04/18/88	90.37	N	6.68	371.00	20	152	31.2	13
M6-19	05/17/88	90.09		6.63	358.00	16	152	31.0	14
M6-19	06/14/88	89.81	N	6.69	352.00	16	128	25.8	10
M6-19	06/30/88	89.66		6.61	395.00	20	132	26.5	11
M6-19	07/11/88	89.46	Y	6.73	315.00	16	132	26.0	12
M6-19	07/25/88	89.41		6.81	365.00	16	138	25.5	11
M6-19	08/08/88	89.59		6.90	381.00	16	140	27.0	12
M6-19	09/07/88	89.89	N	6.61	326.00	16	140	25.0	11
M6-19	09/21/88	90.24	N	6.38	314.00	20	128	24.0	10
M6-19	10/05/88	90.25		6.56	315.00	16	136	22.5	9
M6-19	10/19/88	90.04		6.42	313.00	18	124	24.0	10
M6-19	11/16/88	90.20		6.27	305.00	20	132	23.5	10
M6-19	12/28/88	90.60		6.07	409.00	16	156	31.2	16
M6-19	01/30/89	90.65		6.18	487.00	8	196	41.0	27
M6-19	02/24/89	90.65		6.23	603.00	8	240	47.5	41
M6-19	03/30/89	91.78		6.12	444.00	12	200	38.0	22
M6-19	04/28/89	90.71		6.07	581.00	8	244	43.5	42

WELL	DATE	WATER TABLE ELEV FT	IRR ?	pH	COND	ALK	THARD	NO3	CL
					mg/l				
M6-19	06/15/89	90.38		6.77	399.00	12	164	31.2	21
M6-19	07/03/89	90.23	N	6.77	361.00	16	144	29.2	18
M6-19	07/24/89	90.01	Y	6.61	365.00	16	148	28.0	16
M6-19	08/16/89	90.26	N	6.59	331.00	20	136	24.2	13
M6-19	08/28/89	90.84		6.56	299.00	20	140	23.5	13
M6-19	09/16/89	90.77		6.59	353.00	20	156	36.8	20
M6-19	09/30/89	90.45		6.30	446.00	12	184	32.2	33
M6-19	10/14/89	90.57		6.25	465.00	12	184	33.5	34
M6-19	10/28/89	90.19		6.18	419.00	20	180	32.0	32
M6-19	11/18/89	90.17		6.10	502.00	12	200	36.0	41
M6-19	12/09/89	90.51		6.11	530.00	12	220	36.0	50
M6-19	01/11/90	90.78		6.23	426.00	12	192	34.0	34
M6-19	02/09/90	90.83		6.03	552.00	16	244	43.5	57
M6-19	03/09/90	90.60		6.21	428.00	12	172	30.0	29
M6-19	04/13/90	90.50		6.18	448.00	12	180	32.5	36
* WELL/GAGE/SAMPLE ID M6-23									
M6-23	04/18/88	90.32	N	6.80	254.00	28	104	15.5	7
M6-23	05/17/88	90.05		6.54	246.00	24	100	16.5	7
M6-23	06/14/88	89.76	N	6.73	273.00	20	100	16.5	6
M6-23	06/30/88	89.59		6.76	298.00	24	108	17.8	7
M6-23	07/11/88	89.40	Y	6.75	266.00	24	116	19.0	8
M6-23	07/25/88	89.33		6.75	315.00	26	124	20.0	9
M6-23	08/08/88	89.50		6.84	331.00	20	124	21.0	9
M6-23	09/21/88	90.14	N	6.44	274.00	24	120	19.0	7
M6-23	10/05/88	90.14		6.47	286.00	20	120	18.0	7
M6-23	10/19/88	89.93		6.42	278.00	24	112	18.0	8
M6-23	11/16/88	90.09		6.36	254.00	28	116	16.5	7
M6-23	12/28/88	90.49		6.31	234.00	24	96	12.8	7
M6-23	01/30/89	90.55		6.22	317.00	20	128	23.0	11
M6-23	02/24/89	90.54		6.39	360.00	20	148	26.0	12
M6-23	03/30/89	91.66		6.34	281.00	10	120	18.5	8
M6-23	04/28/89	90.59		6.39	274.00	24	120	16.8	8
M6-23	06/15/89	90.26		6.84	186.00	28	80	7.0	6
M6-23	07/03/89	90.10	N	3.91	191.00	32	81	7.0	5
M6-23	07/24/89	89.90	Y	6.83	258.00	28	100	15.0	8
M6-23	08/16/89	90.14	N	6.74	274.00	28	112	17.5	8
M6-23	08/28/89	90.70		6.79	255.00	28	120	18.0	9
M6-23	09/16/89	90.65		6.61	277.00	28	124	20.6	12
M6-23	09/30/89	90.32		6.45	291.00	16	124	20.0	11
M6-23	10/14/89	90.45		6.49	272.00	20	116	19.8	10
M6-23	10/28/89	90.07		6.41	260.00	24	116	18.0	11
M6-23	11/18/89	90.07		7.34	284.00	24	112	17.5	11
M6-23	12/09/89	90.39		6.42	212.00	24	100	12.5	6
M6-23	01/11/90	90.66		6.44	287.00	20	128	20.8	14

WELL	DATE	WATER TABLE ELEV FT	IRR ?	pH	COND	ALK	THARD	NO3	CL
					mg/l				
M6-23	02/09/90	90.71		6.23	296.00	28	132	21.0	14
M6-23	03/09/90	90.50		6.43	285.00	24	120	18.0	10
M6-23	04/13/90	90.37		6.35	259.00	24	112	16.0	10
* WELL/GAGE/SAMPLE ID M7DUP									
M7DUP	12/09/89	0.00		6.26	298.00	24	124	19.5	23
* WELL/GAGE/SAMPLE ID MBARK									
MBARK	03/09/90	0.00		6.90	633.00	200	84	-0.2	44
MBARK	04/13/90	0.00		7.20	169.00	64	76	1.5	7
* WELL/GAGE/SAMPLE ID MBLANK									
MBLANK	05/17/88	0.00		6.22	1.82	4	2	-0.2	-1
MBLANK	06/14/88	0.00	N	5.81	2.24	2	-2	0.5	-1
MBLANK	07/11/88	0.00	Y	6.27	3.00	12	4	0.2	1
MBLANK	07/25/88	0.00		6.21	4.05	4	2	-0.2	1
MBLANK	08/08/88	0.00		5.96	1.42	4	4	-0.2	-1
MBLANK	09/07/88	0.00	N	6.19	1.71	2	4	-0.2	-1
MBLANK	09/21/88	0.00	N	6.39	4.52	4	8	-0.2	-1
MBLANK	10/05/88	0.00		5.79	2.11	4	4	-0.2	-1
MBLANK	10/19/88	0.00		6.07	3.00	-4	4	-0.2	-1
MBLANK	11/16/88	0.00		6.30	2.00	8	2	-0.2	-2
MBLANK	12/28/88	-6.82		5.71	2.50	4	4	0.2	-1
MBLANK	01/30/89	0.00		5.31	5.00	-4	4	-0.2	1
MBLANK	02/24/89	0.00		5.99	2.00	4	4	-0.2	-1
MBLANK	03/30/89	0.00		6.30	2.80	-4	4	0.2	-1
MBLANK	04/28/89	0.00		5.71	3.00	-4	4	-0.2	-1
MBLANK	06/15/89	0.00		5.91	4.00	4	4	-0.2	-1
MBLANK	07/03/89	0.00		6.04	2.08	4	8	-0.2	-1
MBLANK	07/24/89	0.00	Y	5.66	3.00	4	4	0.2	1
MBLANK	08/16/89	0.00	N	5.85	238.00	4	4	-0.2	-1
MBLANK	08/28/89	0.00		6.91	2.39	8	4	-0.2	-1
MBLANK	09/16/89	0.00		4.52	13.00	-4	4	-0.5	-2
MBLANK	09/30/89	0.00		3.90	48.00	-4	4	-0.2	5
MBLANK	10/14/89	0.00		5.30	3.68	-2	-2	0.8	-1
MBLANK	10/28/89	0.00		5.70	7.84	4	-4	-0.2	-1
MBLANK	11/18/89	0.00		5.99	3.00	-4	4	-0.2	-1
MBLANK	12/09/89	0.00		4.73	5.51	-4	12	0.5	-1
MBLANK	01/11/90	0.00		6.18	2.00	4	4	-0.2	-1
MBLANK	02/09/90	0.00		6.14	4.00	4	-4	-0.2	-1
MBLANK	03/09/90	0.00		5.80	1480.00	-4	4	-0.2	-1
MBLANK	04/13/90	0.00		7.04	2.88	4	-4	-0.2	-1

WELL	DATE	WATER TABLE ELEV FT	IRR ?	pH	COND	ALK	THARD	NO3	CL
						mg/l			
* WELL/GAGE/SAMPLE ID MDUP									
MDUP	05/17/88	0.00		6.64	248.00	24	104	15.8	7
MDUP	06/14/88	0.00	N	6.77	345.00	30	128	23.0	16
MDUP	07/11/88	0.00	Y	6.74	268.00	24	146	28.0	20
MDUP	07/25/88	0.00		6.81	415.00	24	138	29.5	19
MDUP	08/08/88	0.00		6.82	332.00	20	122	21.0	9
MDUP	09/07/88	0.00	N	6.51	379.00	24	160	31.5	19
MDUP	09/21/88	0.00	N	6.44	378.00	28	156	32.2	18
MDUP	10/05/88	0.00		6.48	287.00	20	124	18.0	7
MDUP	10/19/88	0.00		6.41	387.00	20	148	33.0	17
MDUP	11/16/88	0.00		6.36	366.00	28	148	30.8	18
MDUP	12/28/88	0.00		6.05	346.00	10	124	23.2	9
MDUP	01/30/89	0.00		6.47	169.00	52	48	1.5	12
MDUP	02/24/89	0.00		6.19	281.00	12	100	17.2	4
MDUP	03/30/89	0.00		6.18	228.00	8	108	16.2	13
MDUP	04/28/89	0.00		7.28	146.00	56	60	0.8	5
MDUP	06/15/89	0.00		6.64	428.00	20	172	33.0	28
MDUP	07/03/89	0.00		6.75	398.00	20	160	30.0	26
MDUP	07/24/89	0.00	Y	6.64	352.00	20	140	26.0	24
MDUP	08/16/89	0.00	N	6.74	273.00	28	116	18.0	8
MDUP	08/28/89	90.70		6.65	255.00	28	120	18.0	9
MDUP	09/16/89	0.00		6.93	424.00	12	200	31.0	53
MDUP	09/30/89	0.00		6.80	157.00	48	64	0.5	9
MDUP	10/14/89	0.00		5.97	245.00	8	96	20.5	10
MDUP	10/28/89	0.00		7.41	169.00	76	80	1.5	6
MDUP	11/18/89	0.00		5.88	304.00	12	112	23.5	11
MDUP	01/11/90	0.00		6.29	264.00	40	112	13.8	21
MDUP	02/09/90	0.00		6.89	442.00	16	192	29.0	51
MDUP	03/09/90	0.00		6.08	489.00	16	196	29.5	50
MDUP	04/13/90	0.00		6.38	409.00	20	164	29.0	36
* WELL/GAGE/SAMPLE ID MIRRIG									
MIRRIG	07/11/88	0.00	Y	7.24	210.00	56	118	7.0	10
* WELL/GAGE/SAMPLE ID MUBARK									
MUBARK	05/17/88	93.73		7.91	161.00	48	76	1.2	5
MUBARK	06/14/88	93.69	N	7.96	190.00	76	76	1.5	4
MUBARK	06/30/88	93.71		7.95	194.00	72	72	1.5	5
MUBARK	07/11/88	93.74		8.43	178.00	76	88	1.5	5
MUBARK	07/25/88	93.79		7.79	196.00	80	92	1.0	4
MUBARK	08/08/88	93.77		7.69	196.00	80	86	1.0	5
MUBARK	09/07/88	93.71	N	7.85	174.00	76	84	1.2	4
MUBARK	09/21/88	94.16	N	7.38	124.00	48	60	0.2	4
MUBARK	10/05/88	93.72		7.52	182.00	64	44	1.5	6
MUBARK	11/16/88	94.02		7.25	150.00	56	68	1.2	6

WELL	DATE	WATER TABLE ELEV FT	IRR ?	pH	COND	ALK	THARD	NO3	CL
					mg/l				
MUBARK	12/28/88	94.46		6.75	186.00	72	92	2.0	5
MUBARK	01/30/89	94.85		7.07	172.00	68	100	2.0	5
MUBARK	02/24/89	95.54		7.09	185.00	68	80	2.0	5
MUBARK	03/30/89	97.17		6.80	97.10	24	40	1.0	5
MUBARK	04/28/89	93.97		7.28	134.00	56	64	0.8	6
MUBARK	06/15/89	79.79		7.94	152.00	60	80	0.8	6
MUBARK	07/03/89	93.79	N	7.77	169.00	72	84	1.0	5
MUBARK	07/24/89	93.74	Y	8.02	181.00	76	80	1.5	6
MUBARK	08/16/89	94.01	N	7.58	135.00	60	64	0.2	5
MUBARK	08/28/89	94.02		7.41	142.00	52	116	0.5	7
MUBARK	09/16/89	-3.25		7.27	160.00	72	76	1.6	7
MUBARK	09/30/89	-14.09		7.14	172.00	64	80	2.0	6
MUBARK	10/14/89	93.70		7.35	181.00	64	76	2.2	5
MUBARK	10/28/89	93.72		7.24	167.00	76	80	1.5	6
MUBARK	11/18/89	93.68		6.83	190.00	52	80	2.0	7
MUBARK	02/09/90	0.00		6.57	163.00	72	84	2.0	6