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ENVIRONMENTAL MONITORING OF POLK AND COLUMBIA COUNTIES EXPERIMENTAL PHOSPHOGYPSUM ROADS

Prepared By

FIPR

Florida Institute of Phosphate Research

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FINAL REPORT

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PERSPECTIVE

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Since virtually its inception more than a dozen years ago, the Institute has had as one of its primary research goals the development of uses for phosphogypsum, the major by-product of the manufacture of wet process phosphoric acid. Currently over 600 million tons of the material are stockpiled on the ground in Florida, and that total increases daily. Any use, however, must be practical, economic, and perhaps most important, environmentally sound. Three approaches have received most attention: recovery of the sulfur value, use in agriculture as a soil amendment, and use in construction, mainly road construction. This study addresses the long-term environmental impact of using the material in roadbeds.

Florida faces a need for expanded road building, but also faces a diminishing supply of construction materials. Phosphogypsum as a substitute for fill or aggregate might be useful, especially in areas where transportation costs would not be excessive. In 1986-87 two experimental roads incorporating phosphogypsum were built in Florida under the supervision of the University of Miami. Their research showed that phosphogypsum was a suitable building material from an engineering standpoint, and, based on studies conducted before construction and for two years after construction, effects of the gypsum on the local environment, especially groundwater, were minimal. The question was asked as to whether or not there might be any long-term trends in environmental quality as a result of the gypsum's use. Thus the Institute continued for an additional 2 and l/2 years the environmental monitoring that the university had instigated. This report details the findings of that continuation.

Results of this study indicate that long-term effects on the local environment from phosphogypsum use in roads are minimal. This conclusion is in qualitative agreement with a recent Environmental Protection Agency finding that such use does not pose an unacceptable risk to persons constructing such roads, driving over them, living nearby, or eating food or drinking water from sources derived nearby. However, as presented in supporting documentation to its 1992 ruling on phosphogypsum, the EPA did conclude that building a future home on an abandoned phosphogypsum roadway would pose unacceptable risks to that home's occupants because of indoor gamma exposure and indoor radon inhalation. Because of that the EPA currently does not permit the use of phosphogypsum in road construction. Thus, while use of the material does not seem to pose an environmental threat at the time of that use, additional work in risk assessment will be necessary before phosphogypsum can again be considered for road construction.

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EXECUTIVE SUMMARY

Currently over 600 million tons of phosphogypsum, hydrated calcium sulfate produced as a by-product during the manufacture of phosphoric acid, are stockpiled on the ground in Florida. The material could represent a significant resource if practical and environmentally sound uses could be found for it. One possibility is in the construction of roads, where it might be used in pavement, as fill, or especially in the road base. In order to determine the engineering properties of phosphogypsum in roads, and to determine any impacts of its use on the local environment, in 1986-87 two test roads were built incorporating the material. White Springs Road in Columbia County and Parrish Road in Polk County were reconstructed by local authorities, working under the guidance of the Civil Engineering Department of the University of Miami. Their research showed first that phosphogypsum was a suitable building material from an engineering standpoint. To determine any environmental impacts, chemical or radiological, studies of air, groundwater and soil were done by the university before and after construction. Monitoring wells were drilled to the surficial aquifer along both sides of both roads, and water samples collected monthly to define over two dozen parameters, including radium. Since phosphogypsum is known to be elevated in radium content as compared to background soils in Florida, in addition to water radium the research included measurements of soil radium, air and soil radon gas, and gamma radiation at both sites. The university work showed that the presence of the phosphogypsum did not cause any appreciable change in the quality of air, soil, or water at the local sites.

The question arose as to whether or not there might be any long-term trends in environmental quality caused by the phosphogypsum used in the roads. Thus the environmental studies established by the university were continued for an additional 2 and l/2 years by the staff of the Institute. Site visits were made every 2 or 3 months from mid 1988 to late 1990, with air, water and soil being tested for the same chemical and radiological parameters as studied by Miami. Whereas the university had focused on a comparison of parameter levels before and after road construction, the work of the Institute focused on changes in parameter levels over time. In Polk County, during the last year of the Institute's work, water contaminants in the lakes on either side of Parrish Road were determined and compared with groundwater results. A comparison of levels found with water quality standards also was made when possible. Trends were determined by plotting parameter levels, mainly in water but also in air and soil and for external gamma, against elapsed time since the inception of the Institute work. Regression lines were calculated for each parameter at each well, and for parameters at all other air and soil monitoring sites except for soil radium.

Whenever the slope of any line differed significantly from zero, i. e. from the horizontal, then a trend was said to exist.

Trends data are presented in several manners. They are summarized for all wells, for "inner" versus "outer" wells, and for wells lying east of each road versus those lying west. Finally, individual trends data are presented for water parameters that might be indicative of phosphogypsum, i. e. calcium, sulfate, fluoride, and radium. Trend analyses were also performed for gamma, both on and adjacent to each road, and for air and soil radon. All data are summarized in both tabular and graphical forms in this report, and additionally all data points are provided in the Appendix.

For the majority of parameters at the majority of sampling locations, no trends were established over the 2 and 1/2 years of the study. Levels found were highly variable in time and space, and random differences generally more pronounced than differences associated with elapsed time. However, in Polk County most wells showed an upward trend in calcium, possibly indicative of some leaching of phosphogypsum into the groundwater, but possibly influenced by high levels of calcium in the lakes on both sides of the road. Trends in sulfate were both up and down; hence not necessarily indicative of leaching, although in Polk County groundwater sulfate was higher than that found in the adjoining lakes. There were far fewer trends for the other contaminants, with many of those that were seen being downward. Trends among wells in Columbia County were fewer, more random, and more mixed than in Polk. Drinking water standards exist for 14 of the water analytes studied. These were exceeded often for iron and pH, and sometimes for manganese, but rarely exceeded for anything else, including phosphogypsum constituents. The few exceptions were for individual data points, not averages. Trends in air and soil radon were not significant at either road; levels found at Parrish Road were typical of background in the vicinity of mineralized lands, and at White Springs Road were typical of the Florida background. Soil radium levels found were typical of levels expected in the two areas. Direct gamma over the pavement was elevated at both roads as compared to readings taken adjacent to the roads, but still typical of background in the respective areas. Average gamma levels at all locations were below limits for indoor residential exposure as recommended by the Florida Department of Health and Rehabilitative Services.

INTRODUCTION

Phosphogypsum is the name given to gypsum formed as a by-product during the manufacture of phosphoric acid by the phosphate fertilizer industry. Consisting mostly of hydrated calcium sulfate, about five tons of the material are formed for every ton of acid anhydride produced. Impurities consist of phosphate, silica, fluoride and numerous trace metals, including radium. Florida leads the nation in the mining and production of phosphate materials, but, as a result of this activity, more than six hundred million tons of phosphogypsum are currently stockpiled on the ground in central and north Florida. Another thirty million tons are added annually. A major emphasis within the industry has been to try and develop practical, economic, and environmentally sound uses for the material. In recent years research by public and private interests has been conducted along three broad lines - (1) recovery of the sulfur value from the phosphogypsum, (2) use as an agricultural amendment to soils, and (3) use as a construction material. In this last category, one of the more promising concepts has been the use of the gypsum in road construction, where it might serve as an ingredient in base course material as a replacement for aggregate, or in embankment or paving materials. For this to happen, the material must be shown sound from an engineering standpoint, but perhaps the overriding consideration is that its use must not adversely affect the local environment, either chemically or radiologically. Because phosphate ore is enriched in naturally occurring uranium and its decay series progeny, relative to typical soils and rocks, phosphogypsum is elevated in content of several radionuclides, mainly radium, polonium, and lead. For example, central Florida gypsum contains about 25 picoCuries of radium per gram of material (pCi/g), while background soil levels of radium would contain only about 1 to 2 pCi/g. To determine any environmental impacts, radiological or chemical, of the use of phosphogypsum in road construction, in October of 1986 a test road(Parrish Road) of 1 miles in length was built in Polk County, and in April of 1987 a second road (White Springs Road) of 2 miles in length was constructed in Columbia County. Both were county roads, both utilized phosphogypsum in their bases, and both were built by local governments, but under the supervision of the Department of Civil Engineering of the University of Miami, assisted by the Florida Department of Transportation. Details of construction and engineering properties of the two roads can be found in reports by Dr. Wen Chang of the University (1) and Dr. Robert Ho of the Florida Department of Transportation (2). Phosphogypsum from central Florida was used at Parrish Road, the land on either side of the road has been mined and reclaimed, and a number of residences are located along the road. Land under the road has never been mined. Phosphogypsum from north Florida was used at White Springs Road. The area has never been mined, and, as at Parrish, residences are located along the road.

STUDY PLAN

For the study, the university installed monitoring wells along both sides of both roads to determine groundwater quality before and after construction. Ten wells were placed in Polk County, spaced alternately 30 and 80 feet ("inner" and "outer") from the road centerline, and 150 feet apart as measured along that centerline. Eight wells were similarly installed in Columbia County, but slightly farther from the road. Wells were dug to the shallow water table, about 10 to 20 feet in depth in Polk, and about 20 to 25 feet in Columbia. Additionally, along each road one existing residential drinking water well tapping the surficial aquifer was included in the study. Details of well construction have been presented by Chang (1). The university performed sampling and analyses of all parameters for several months prior to actual road construction. After construction of each road, studies were done by the university every month at both roads through August of 1988. Emphasis was placed on environmental conditions pre- and post- construction. From August of 1988 until late in 1990, the work was continued as an in-house project by the Institute, with sampling done every two months the first year and every three months thereafter, for a total of twelve visits to each road. Thus the local environment was monitored at each road for about 4 years following construction. The aim of the continuation project was to detect any long-term trends in contaminant levels. Twenty-five parameters, including radium, were determined in the water from each well each visit. Since environmental radiation was of particular concern, during each visit additional measurements were made along each road of airborne radon (two sites), soil radon, (two sites), above-ground (one meter) gamma radiation over the pavement and over the adjacent embankment (five sites Polk; six sites Columbia), and soil radium (yearly at four sites at each road).

Parrish Road is located in south central Polk County. It runs north to south and is bounded on east and west sides by reclaimed phosphate lands, consisting primarily of sand fill. The land immediately underneath the road has not been mined. Rainfall would induce a general flow of surficial groundwater from west to east because of the presence of lakes of differing sizes and elevations on either side of the road. Monitoring wells were located as shown in Figure 2, generally about midway between the lakes. Six wells were placed 30 feet from the road centerline, and four wells placed 80 feet from the road center. The wells were designed in accordance with generally accepted criteria as outlined by Todd (3).

White Springs Road is located at the western edge of Columbia County and is in an area of non-mined land. It also runs north to south. The geology of the area is mainly clay with some sand, and the groundwater is primarily the Floridan aquifer. Monitoring wells were located as shown in Figure 1. The well array was the same as described for Polk County, except that only eight wells, four inner and four outer, were established.

METHODOLOGY

For water sampling, well water was pumped for several minutes to purge the collection equipment and to insure fresh water in the well; then several one-liter samples were collected into polyethylene or glass containers and preservative added as necessary depending on analytical protocol. A summary of analytical methods is presented in Table 1. On each field trip to either road, one well in rotation was always sampled in duplicate. Air and soil radon were measured by use of alpha track detectors, with a cross-check done on air radon in Polk by electric detectors. Soil was collected in bulk and analyzed by gamma spectroscopy. Field gamma levels were determined with a scintillation meter.

As stated, site visits were made to each road every two or three months during the nearly 2½ years of the study. In water sampling, well water was pumped directly from the well into a container. Readings were taken of conductivity, temperature, and pH. Color, odor, and turbidity (scale of 1 to 4) were noted. Water for further laboratory analyses was placed either into glass or polyethylene bottles and preserved or not according to requirements of the analysis to be done. Water samples were not filtered after collection, in accordance with Florida Department of Environmental Regulation recommendations. All bottles were placed in ice for transfer back to the Institute laboratory. One sample from each well was later sent to the Orlando laboratory of the DHRS Office of Radiation Control for radium analysis. Parameters were measured in accordance with procedures of APHA Standard Methods (4) or the EPA (5). Quality assurance consisted of the sampling of one well, in rotation, entirely in duplicate during each sampling trip. Means and standard deviations of the differences between reference and duplicate samples for each parameter are listed in Table 2 for Columbia and in Table 3 for Polk. In the laboratory every tenth sample was analyzed in duplicate. Quality control standards of known values were established over the ranges of anticipated results and analyzed after every tenth sample. Instrument readings were taken at least in duplicate.

For the environmental radiation studies other than those in well water, external or direct gamma exposure was measured with a standard scintillation meter, field-calibrated twice yearly against a pressurized ion chamber. Measurements were made at six sites in Columbia County and five sites in Polk County. At each site readings were taken on the centerlines of the roads and also one meter off the sides of the roads, one meter above the ground surface. Air and soil-gas radon measurements were taken by means of alpha track detectors, each parameter being measured at two locations along each road. Radon and gamma surveys were made during most site visits to either road. Twice, at the end of each study year, soil samples were taken for radium analyses at four locations along each road. These were surface soils and were analyzed by the Florida Department of Health and Rehabilitative Services Office of Radiation Control.

RESULTS

This monitoring study has resulted in the collection of a large quantity of data, which is presented in its entirety in the Appendix to this report. Since this was primarily a study of trends, the Appendix lists elapsed time for each survey, with the first survey designated as "Day 1." Also, concentrations of many contaminants at many wells were below analytical limits of detection; these are expressed in the tables as "zero." Summaries of the groundwater data are presented in Table 4 for Columbia County and in Table 5 for Polk County. Included in the summaries are the mean, standard deviation, and range of measurements for each constituent at each well. Also included in these tables are summaries for the "inner" wells, those 30 or 37 feet from the roads' centerline and for the "outer" wells, those 80 feet or more from the centerline.

An effort was made to correlate conductivity and turbidity each with the major phosphogypsum constituents of calcium and sulfate, and with radium. As would be expected, calcium and sulfate are major determinants of conductivity, but are in solution and so are not related to turbidity. Radium is a trace constituent and apparently is present in amounts too low to relate it to either conductivity or turbidity. These correlations are shown for both counties in Table 6.

The data also provide some information about the temporal and spatial variability of the water quality beneath each roadway. The temporal variability, or variation over time, at each well may be estimated by the average coefficient of variation for each contaminant at each well. This is defined as the standard deviation divided by the mean. These coefficients are presented in Tables 7 and 8 for Columbia and Polk counties respectively. A comparison of coefficients with means shows that variations over time are generally much higher for trace contaminants than for more prevalent constituents, including pH and temperature. Spatial variability may be estimated by examining ranges of means. These are presented in Tables 9 and 10 for Columbia and Polk counties, respectively. The data show there is significant variability between wells for several contaminants, sometimes more than one order of magnitude. Again, pH and temperature do not vary greatly. Generally the data show that measurements at one well are not very satisfactory to characterize water quality over an extended area of land, and that measurements at one point in time are not very satisfactory to characterize water quality over an extended period of time.

The major treatment of these data, indeed the main goal of the project, involved an attempt to determine if any trends might exist for any contaminant in water, air or soil over an extended period of time. The method used was outlined by Chin (6) and Walpole (7), and consisted of fitting a straight line to the data using least squares "analysis, then determining if the slope of that "best fit" line was significantly different from zero This was done for each contaminant at each well, for radon in air and soil, and for gamma on and off the pavement at each road. In every case a level of contaminant was plotted against time elapsed since the continuation study began in August of 1988. A slope of zero when plotting concentration of parameter against elapsed time would indicate that concentration was independent of time, that no trend existed, and that variations seen were random. A significant slope, in either direction, would indicate that time played some role in parameter level, that the presence of the road material might have played some part in local environmental quality, for better or worse.

A best fit line of concentration versus time is defined by the equation:

$$y = m t + c$$

where

y is the value of the water quality parameter
t is the time in days since a reference date
m is the slope
c is the intercept of the best fit line

These values are obtained from the observed data as follows:

$$m = \frac{N\sum_{i=1}^{N} y_i t_i - (\sum_{i=1}^{N} t_i)(\sum_{i=1}^{N} y_i)}{N\sum_{i=1}^{N} t_i^2 - (\sum_{i=1}^{N} t_i)^2}$$

$$c = \overline{y} - m\overline{t}$$

where

N is the number of measurement points
y_i and t_i are measured values of y and t respectively
$\overline{y}$ and $\overline{t}$ are mean values of y_i and t_i

In order to test the null hypothesis that the slope is not significantly different from zero, the value of the t statistic is calculated by:

$$t = \frac{m(S_{tt})^{\frac{1}{2}}}{s}$$

where

$$S_{tt} = \sum_{i=1}^{N} t_i^2 - \frac{(\sum_{i=1}^{N} t_i)^2}{N}$$

$$s^2 = \frac{S_{yy} - mS_{ty}}{N - 2}$$

$$S_{yy} = \sum_{i=1}^{N} y_i^2 - \frac{(\sum_{i=1}^{N} y_i)^2}{N}$$

$$S_{ty} = \sum_{i=1}^{N} t_i y_i - \frac{(\sum_{i=1}^{N} t_i)(\sum_{i=1}^{N} y_i)}{N}$$

Choosing a confidence interval of 95%, the next step is to look up in statistical tables the value of the t statistic with N-2 degrees of freedom and a significance level of 0.025. Referring to this value as $t_{0.025}$, then if the following inequality is satisfied

$$|t| < t_{0.025}$$

the slope of the trend line does not significantly differ from zero with 95% confidence.

As the emphasis of this continuation study was on long-term trends, water results were statistically analyzed in four ways to detect any such trends. At each road, the number of wells showing an upward trend (Y+), a downward trend (Y-), or no trend (N), for each parameter, was determined and is presented in Table 11 for Columbia County and in Table 15 for Polk County. To illustrate, note that in Columbia County, for example, one of eight monitoring wells exhibited an upward trend in total dissolved solids (TDS), no well showed a downward trend for this parameter, and seven of the eight wells showed no trend, i. e. only random fluctuations. To further illustrate, in Polk County as regarding sulfate anion, three of ten wells exhibited an upward trend, two of the ten a downward trend, and five wells no trend. Generally, upward trends are about balanced between anions and cations; however, downward trends usually involve anions. Overall water quality can be evaluated in terms of electrical conductivity. Trends in conductivity are common at both roads. In the Columbia wells there are more trends down (improved water quality) than up, but in Polk wells there is a significant excess of upward trends (poorer water quality). Overall, most water quality parameters at most wells showed no trend, but, where trends were observed, the majority were upward, especially at Parrish Road in Polk County, and especially involving calcium.

As a second presentation of the data, trends for each parameter were summarized separately for inner and for outer wells, those 30 feet and those 80 feet from the road's centerline in Polk, and at slightly greater distances in Columbia. These comparisons are presented in Table 12 for Columbia County and in Table 16 for Polk. Logic would seem to indicate that if phosphogypsum constituents were leaching out of the bases of the roads and into surficial groundwater, upward trends in wells close to the roads would be more prevalent than those in wells farther from the roads. This appears to be the case in Polk County, where for all contaminants inner wells showed 23 upward trends, versus only 8 upward trends in outer wells. However, 9 trends relate to calcium alone. Inner versus outer wells in Columbia County were more evenly matched in total upward trends, and much fewer in number. It is interesting to note that downward trends, while considerably fewer in total number, were about equally divided between inner and outer wells at both roads.

Since both White Springs Road in Columbia County and Parrish Road in Polk County lie in a north-south direction, a third task was to evaluate numbers of trends occurring on each side of the roads, i. e. wells east of the roads versus wells west of the roads. These data are presented in Tables 13 and 17 for Columbia and Polk. Well water in Columbia County is at atmospheric pressure and there is no clear direction of flow; however it is interesting to note that all but one of 16 upward trends occurred in wells located west of the road. In Polk County there is a general shallow water flow at Parrish Road from west to east caused by rainfall and based on a difference in adjacent lake sizes and elevations. Two-thirds of upward trends noted were in wells east of the road, or "downstream," while the majority of downward trends were in the west wells (upstream).

A final examination of groundwater trend data involved a more in-depth look at four "indicator" constituents of phosphogypsum, namely calcium, sulfate, fluoride, and radium. These trends are detailed in Tables 14 and 18 for Columbia and Polk counties, respectively. Trends over time or a lack thereof are presented for each well, including the drinking water wells, for each of the four substances. At the Polk County site there is evidence of a rise over time in concentration of one major component of gypsum, calcium, but sulfate trends are mixed, including the drinking water well. Ten of eleven wells in Polk showed an upward trend in calcium, and four of the eleven an upward trend in sulfate. Confusing the issue, however, is a decrease with time of sulfate at two of the Polk wells, both of which showed upward trends in calcium. Also confusing the issue is the presence in the lakes on both sides of Parrish Road of calcium levels twice those found in the groundwater. Fewer and more random trends were seen in Columbia County. With one exception (downward), there appears to be no trend at either road in the minor components of fluoride and radium.

Perhaps the best presentation of trends data, that is, levels of contaminants over time, is a graphic one. Thus, for the groundwater data, charts have been prepared of contaminant levels versus elapsed time since the inception of the FIPR phase of the study. These are presented by parameter in Figures 3 through 26 for Columbia County and in Figures 27 through 50 for Polk County. Each figure plots one contaminant over time at one road. For clarity and for comparison, each figure contains two graphs, one for "inner" wells and one for "outer" wells. Each graph shows levels over time for a contaminant at each well, whether 4 or 6 in number. The two drinking water (non-monitoring) wells are not included in these figures. For each analyte at each well, the degree of slope of a best-fit regression line connecting observed levels over time determines the presence or absence of any trend.

The major thrust of this study was to determine if there were any long-term changes in groundwater quality as a result of incorporating phosphogypsum into construction of a roadbase. Perhaps the most "visible" contaminants in phosphogypsum are the naturally-occurring radionuclides of the uranium decay series - notably radium-226 and its decay product - gaseous radon-222. Thus (non-water) environmental radiation monitoring formed a significant part of the study. Parameters measured were gamma radiation, radon gas in soil and in the atmosphere, and radium-226 in the soil. Except for soil radium, data were plotted and analyzed statistically to determine any long-term trends of parameter level over time.

Gamma radiation levels were monitored along both roads, at six points along White Springs Road and at five points along Parrish Road. At each point a reading was taken over the crown of the road and a reading taken one meter off the side of the pavement. All measurements were taken one meter above the surface. Readings are expressed in microRoentgens per hour (μR/hr) and were taken with a scintillation meter calibrated in the field against a pressurized ion chamber. Results for the Columbia County road are shown in Table 19 and for the Polk County road in Table 20, grouped by "on" and "off" road measurements. The same data are presented graphically in μR/hr (Figures 51 and 52) as a function of elapsed time since the study was begun. A next figure, 53, shows averages over all sites per road, per field trip, separated into "on" and "off" pavement. Clearly there is some enhancement of gamma radiation over the roads' surfaces compared to adjacent land, but levels found are not excessive in either case. The generally accepted value for outdoor background gamma radiation in Florida is about 6 μR/hr, although, over mineralized land, background is typically around 12 μR/hr, but can be much higher. The Florida DHRS recommendation of an upper limit for indoor (residential) gamma is 20 μR/hr. The Columbia road is not different from a typical background, ranging from 4 to 7 μR/hr. The Polk road exhibits a gamma level of 10 to 16 μR/hr, 2 to 3 times that expected over unmineralized land, but typical of mineralized land and still well under guidelines for indoor residential exposure.

Since the phosphogypsum used in the roads contains trace levels of radium, radon gas was measured in the air and in the soil at two sites along each road. Nuclear track detectors were mounted about 8 feet above ground on trees or utility poles for the air measurements, or buried about 12 inches into the ground for soil determinations. In the atmosphere, (Polk County) electric detectors in a few cases were used to duplicate the track devices, with good agreement found. Samplers were generally left in place for several months, usually from one site visit to the next, but sometimes longer. Levels of radon in air and soil at two sites per road are presented in Table 21 for Columbia County and in Table 22 for Polk County. The same information is presented graphically for levels found as a function of duration of time in Figures 54 and 55 for Columbia and Polk, respectively.

Table 23 summarizes statistical analyses for trends for radon in air and soil, and for gamma on and off the roads' pavements, at both roads. Radon in soil tended to decrease at one location in Columbia County, and gamma tended to increase at several points in Polk County. No explanation is apparent as to why these trends should have occurred. In the majority of cases no trends were evident.

At the ends of the first and second years of this continuation project, soil samples for radium analysis were collected at a depth of 1 foot at 4 sites along each of the two roads.. Data are shown in Table 24. Levels found were very typical of what would be expected on mineralized land (Polk) and non-mineralized land (Columbia). At White Springs Road soil radium was 1/2 to 1 picoCurie per gram (pCi/g), equivalent to background for most Florida soils. At Parrish Road the soil radium level was 1 to 3 pCi/g, typical of unmined lands mineralized with phosphate deposits. No differences were evident from the first to second year.

DISCUSSION

This study was a continuation of environmental monitoring of the effects of using phosphogypsum in the construction of two experimental roads, one in central Florida and one in north Florida. Primary emphasis was placed on recognizing any trends, over several years time, of pollutants in local air, groundwater, and soil, that might be related to the presence of the gypsum. The monitoring studies of Parrish Road in Polk County and White Springs Road in Columbia County showed that, for the majority of parameters, no trend was established over those several years. Also, levels found were highly variable in time and space. Mostly, random differences were much more pronounced than differences associated with time. In Polk County there may be some effect on surficial water quality as a result of the gypsum in the road. Any evidence of this in Columbia County is minimal. In Polk County there were more total upward trends in water parameters than there were downward trends, there were more upward trends in nearby wells than there were in wells farther away, and there were more upward trends downstream of the road than there were upstream, assuming a west-to-east groundwater flow. These findings, however, apply mainly to calcium and somewhat to sulfate, the main components of phosphogypsum. Far fewer trends were seen for the less prevalent constituents, and those that did appear were more evenly divided between upward and downward trends. In Columbia County trends were fewer, more random among constituents, and more balanced between upward versus downward trends.

The portion of Parrish Road in Polk County where groundwater sampling was done is bordered by lakes to the east and to the west of the road. Because of the variability in water results, especially those for calcium and sulfate, it was decided midway through the study to begin sampling the lakes' waters and analyze them for the same constituents being sought in the well waters. Beginning with field trip #7 this was done, and results are shown in Table 25. Because of lake volumes, it is doubtful that any leaching of road base materials into the groundwater between the lakes would cause an elevation of any constituent in the lakes, even downstream. Rather, it is more likely that lake contamination would pollute the groundwater. Also, a significant excess of a contaminant in the lakes, especially upstream, over that found in the groundwater, would minimize any impact of leaching into the aquifer and would indicate the lakes were polluting the aquifer more so than the other way around. An examination of the data shows that total dissolved solids, conductivity, bicarbonate and sulfate in the lakes are higher downstream than upstream, but that the first three of these parameters are much higher in lake water, even upstream, than in the wells. Only sulfate is higher in the groundwater. Phosphate, fluoride and iron, all present in phosphogypsum, are higher <u>upstream</u> than down. Calcium does not vary appreciably between the lakes, but is much higher in both the lakes than in the wells. The same is true of sodium and magnesium. Fluoride also is higher in both lakes than in the wells. In addition to sulfate, only nitrate, phosphate, ammonia and iron are higher in well water than in lake water. Some of this may be attributed to the fact that the land between the lakes is used extensively for cattle. On the other hand, total dissolved solids, conductivity and bicarbonate, in addition to parameters already mentioned, are higher in the lakes than in the wells. The pH of the groundwater is slightly acidic, whereas the pH of the lake water is slightly basic. Thus there would be some tendency for elements to precipitate more readily in the lakes than in the groundwater, resulting in lower concentrations in solution in the lakes' waters. It would appear that most major contaminants in the groundwater, including calcium, solids, conductivity and fluoride are more influenced by input from the lakes than by any leachate from the roadbase. Sulfate remains an anomaly; well levels exceed lake levels, but a third of trends seen were downward. Since the water was not filtered prior to analysis, it is quite likely that for major ions, such as calcium and sulfate, aquifer solids contributed significantly to levels found.

In both counties, levels of major and minor constituents of phosphogypsum in groundwater generally did not exceed standards established for drinking water supplies. Standards for drinking water (maximum contaminant levels) exist for 14 of the parameters measured in the groundwater at the two road sites. These are listed in Table 26. Average contaminant levels per well at both roads generally did not exceed standards for the materials associated with phosphogypsum, such as sulfate, radium, or fluoride. There is no standard for calcium. Mean levels that did exceed standards primarily involved excess iron and low pH, factors not solely unique to phosphogypsum. A review of individual contaminants by well, as presented in the Appendix' shows that, for major constituents, excursions above the standards were often limited to a single well. Excess sulfate and excess solids, for example, were limited to well #1 in Columbia County, whereas excess nitrate was found mainly in well #7 in Columbia. Low pH was found in wells and #3 in Columbia, but found quite commonly at many wells in Polk. Radium in excess of the standard was detected infrequently and randomly at both roads. As was true for the means, only iron, pH, and occasionally manganese violated drinking water standards more than rarely. For these parameters, however, there are no significant numbers of upward trends. Most contaminants found in excess of drinking water standards are not uniquely related to phosphogypsum in road construction, and most constituents associated with the gypsum are not elevated in the roads' groundwater.

Trends in air and soil radon were not significant. Soil radon at both roads was about what would be expected for the two areas. Airborne radon at both locations, but especially at Parrish Road, was elevated above what is considered a typical statewide background, but not particularly elevated for the areas in question. Even at Parrish Road air radon was comparable to levels found in nearby urban residential areas. Soil radium levels were typical for the respective areas in both counties. Gamma levels at White Springs Road were not increased significantly over background, but there was a slight elevation over the pavement as compared to off the pavement. At Parrish Road gamma levels were typical for those found over mineralized land, and about 2 and 1/2 times levels found over non-mineralized land. Levels over the pavement were 2 to 4 μR/hr higher (roughly 20%) than levels off the pavement. Increases in gamma exposure at Parrish Road still would be trivial to anyone living off the pavement, or driving over the road even for appreciable periods of time. In fact, gamma levels found over the pavement were generally below indoor guidelines established for residential structures.

In conclusion, there is no evidence that use of phosphogypsum in the roadbeds has affected the local environments to any significant extent. A small rise in gamma radiation over the pavement is noted, but the elevated level remains below guidelines issued by the Florida DHRS for indoor residential exposure. Except for calcium and sulfate, no clear trends have appeared in groundwater quality. Likely the other constituents in phosphogypsum are present in the material at such low concentrations that any leaching to the aquifer has been minimal. An upward trend in groundwater calcium in Polk County is noted, but this may be as much a result of the high levels of calcium in nearby lakes polluting the groundwater, as the reverse process. Groundwater sulfate shows both upward and downward trends in Polk County, but in all wells is below the permitted sulfate level in drinking water. Because of its low toxicity, no standard has been established for calcium in drinking water.

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(2) Ho, Robert K., 1990, "Pavement Evaluation of Two Gypsum Stabilized County Roads, Proceedings of the Third International Symposium on Phosphogypsum.

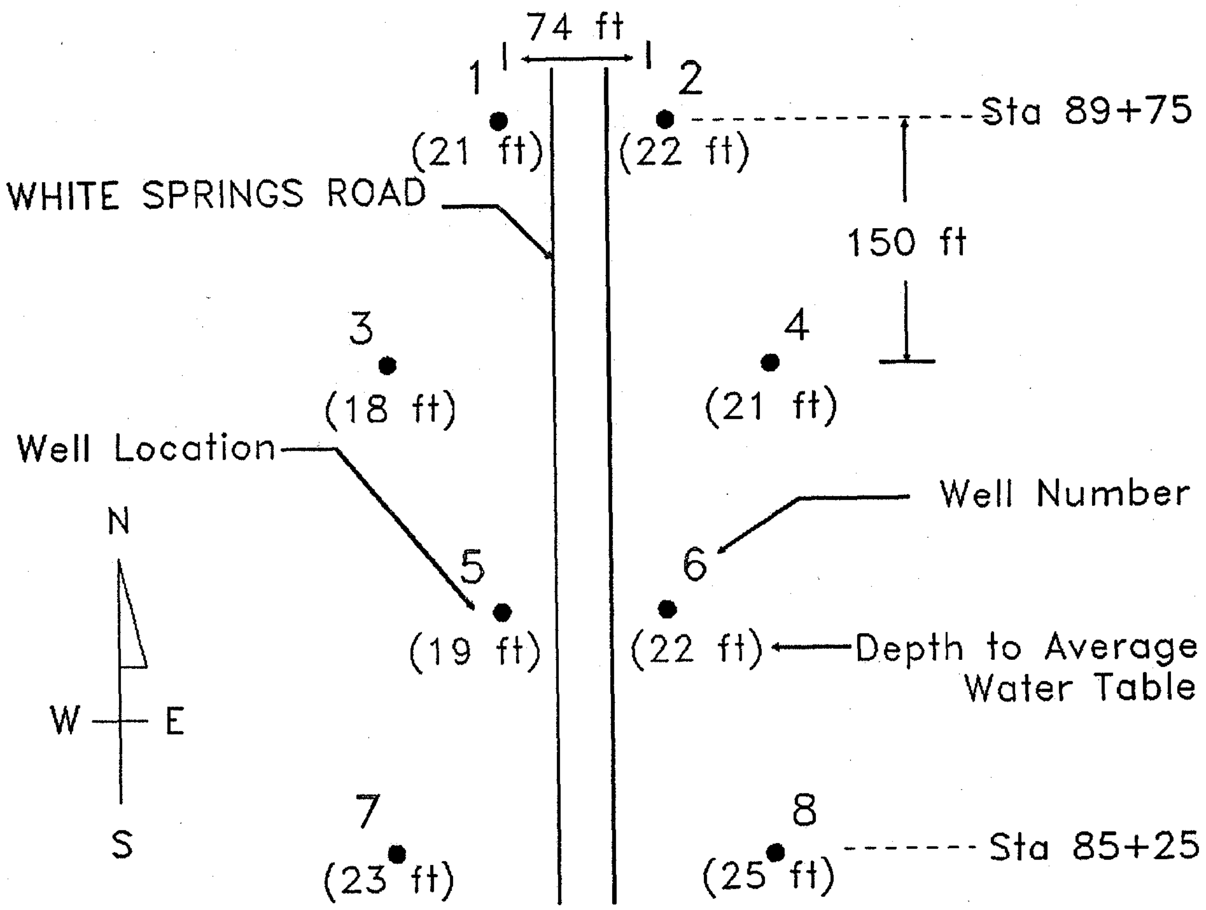
(3) Todd, D. K., 1980, Groundwater Hvdrology, 2nd ed., John Wiley and Sons.

(4) American Public Health Association, 1985, Standard Methods for the Examination Water and Wastewater, 16th ed.

(5) Environmental Protection Agency, 1979, "Methods for Chemical Analysis of Water and Wastes, Report # EPA-600/4-79-020, USEPA-EMSL.

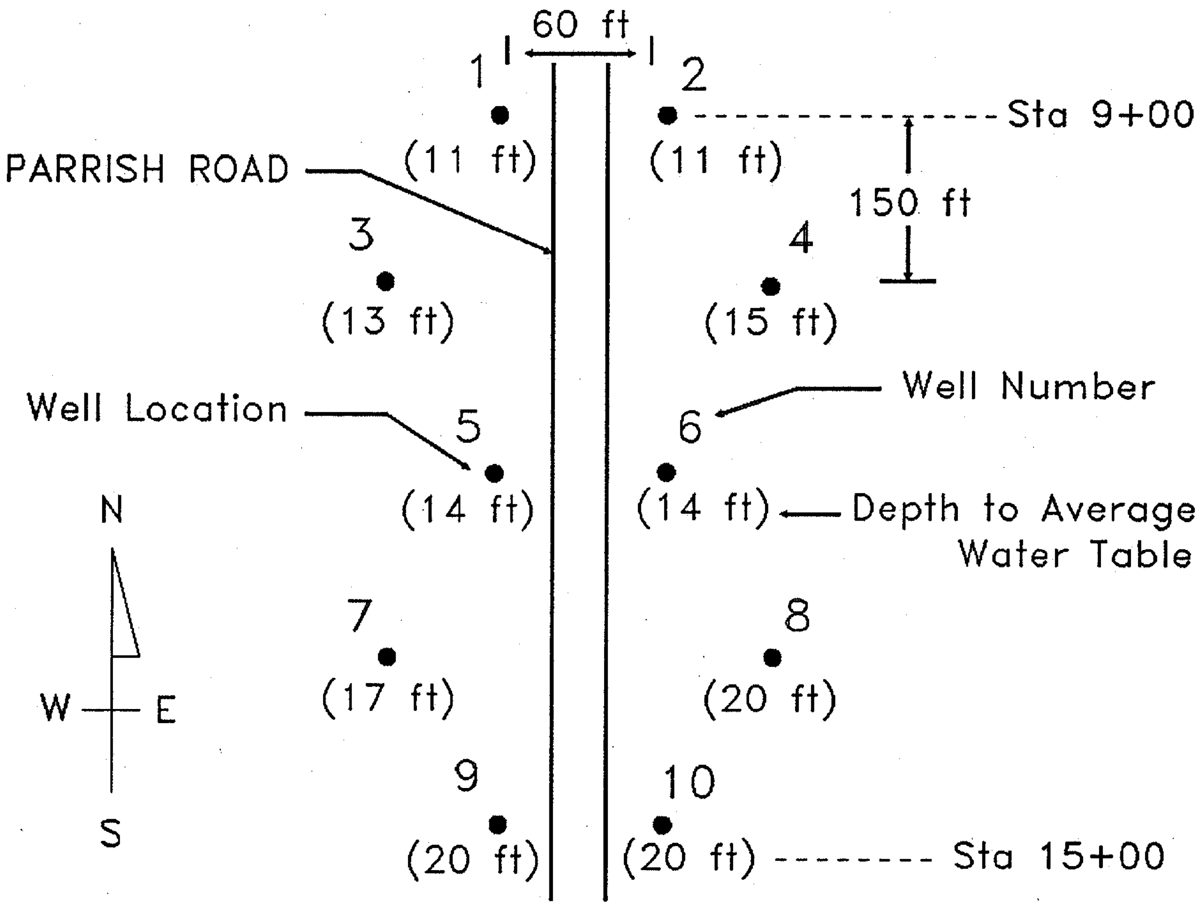
(6) Chin, D. A., 1988, "Geochemical Data Analysis Using Spreadsheets, Proceedings, 6th National Conference on Microcomputers in Civil Engineering.

(7) Walpole, R. E., and R. H. Myers, 1978, Probability Statistics for Engineers and Scientists, 2nd ed., McMillan Publishing Co.



Layout of Monitoring Wells, Columbia County, White Springs Road

Figure 1

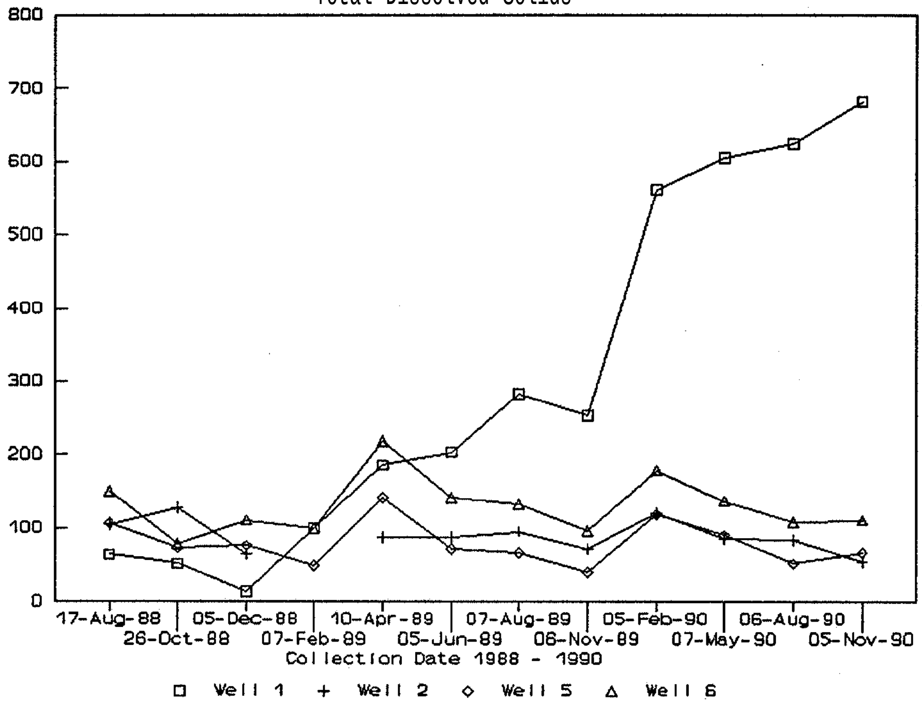


Layout of Monitoring Wells, Polk County, Parrish Road

Figure 2

Columbia County, White Springs Road

Total Dissolved Solids



Columbia County, White Springs Road

Total Dissolved Solids

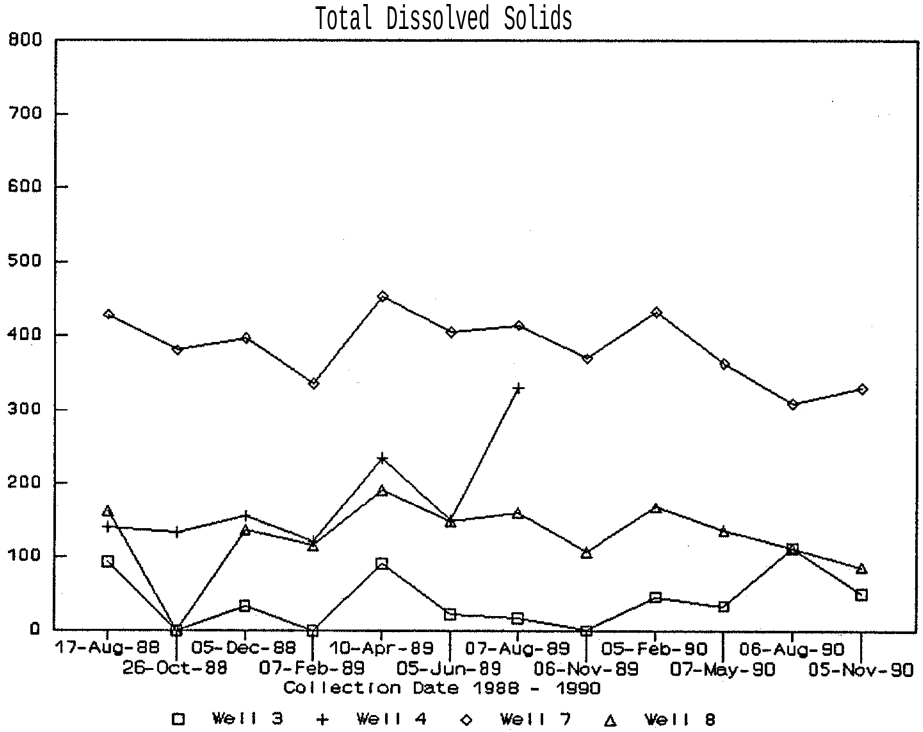
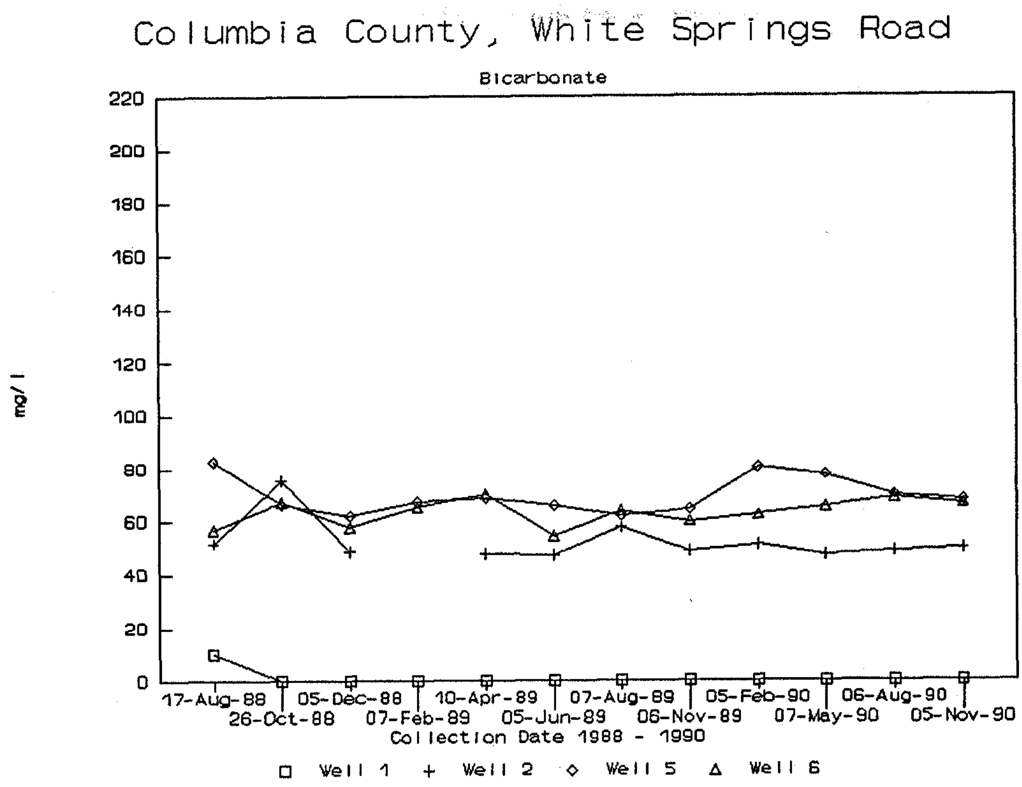


Figure 3


Columbia County, White Springs Road
Bicarbonate
mg/l
220
200
180
160
140
120
100
80
60
40
20
0
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6

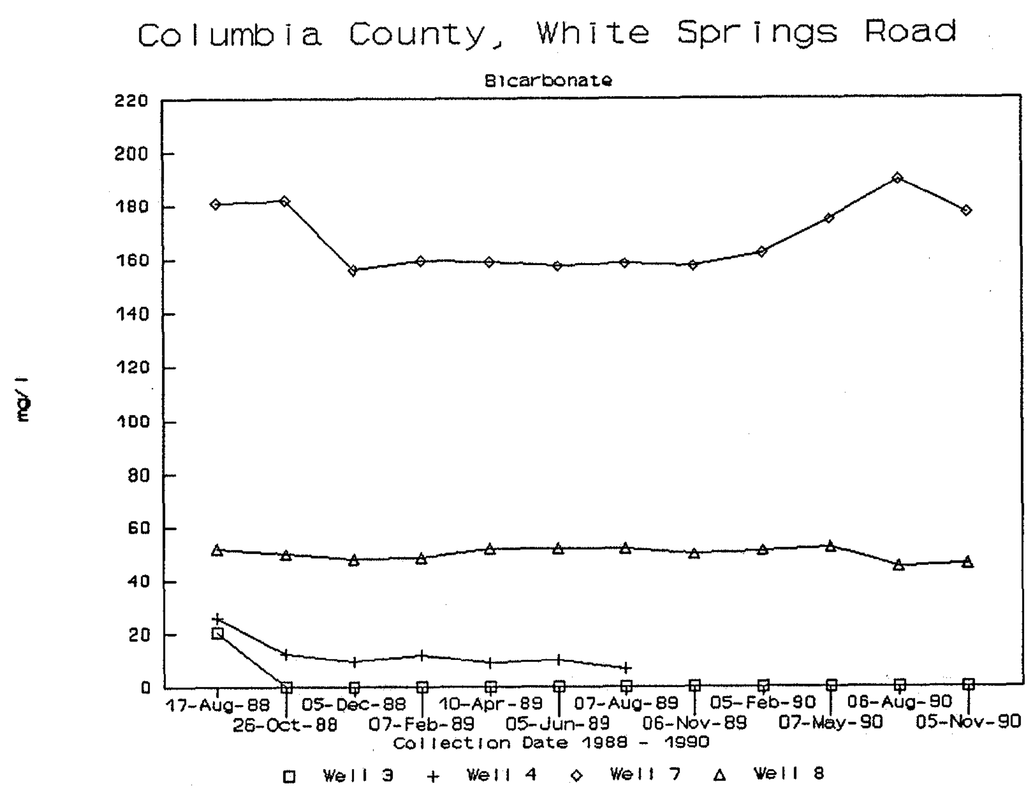
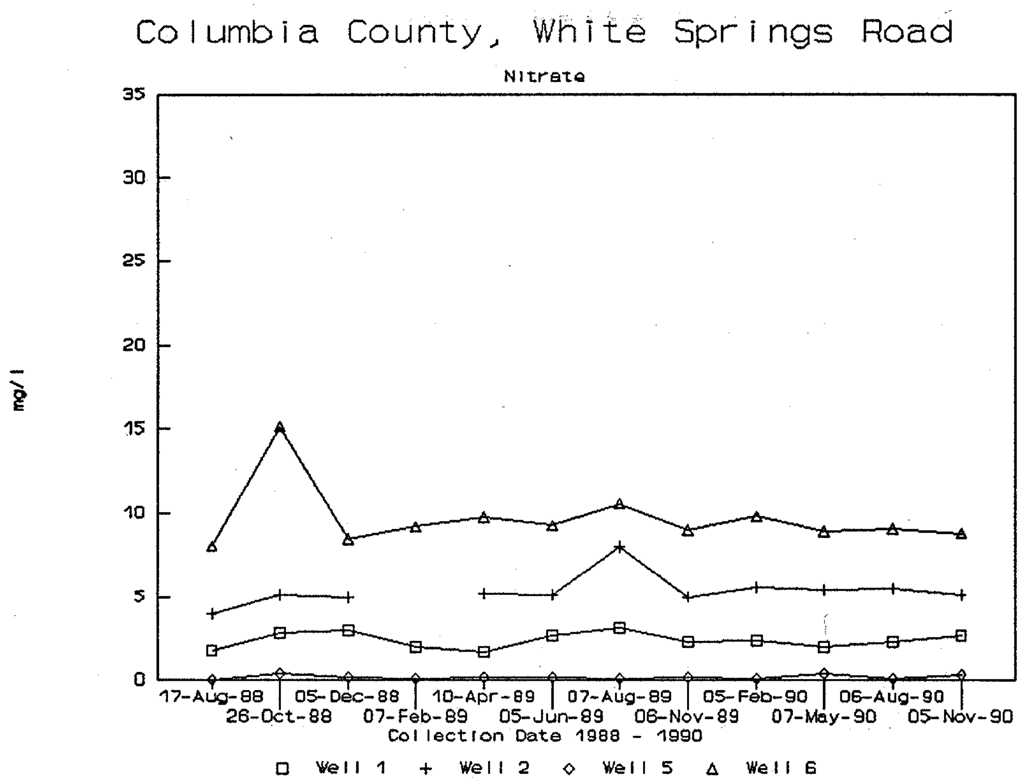

Columbia County, White Springs Road
Bicarbonate
mg/l
220
200
180
160
140
120
100
80
60
40
20
0
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 4


Columbia County, White Springs Road
Nitrate
mg/l
35
30
25
20
15
10
5
0
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6

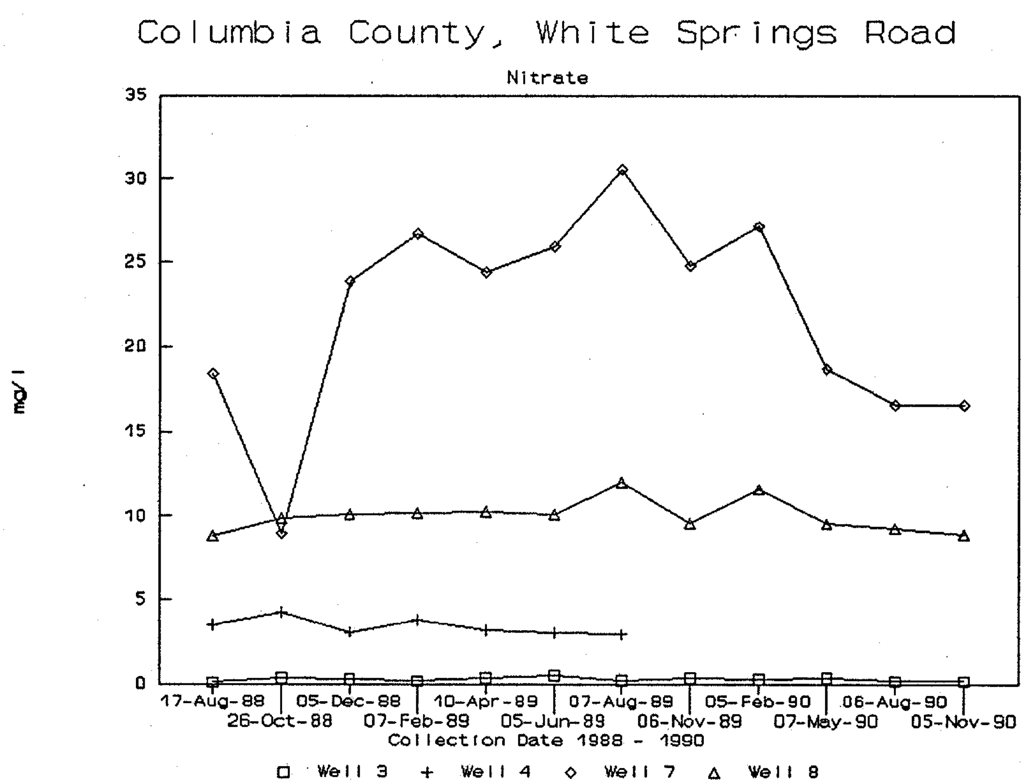
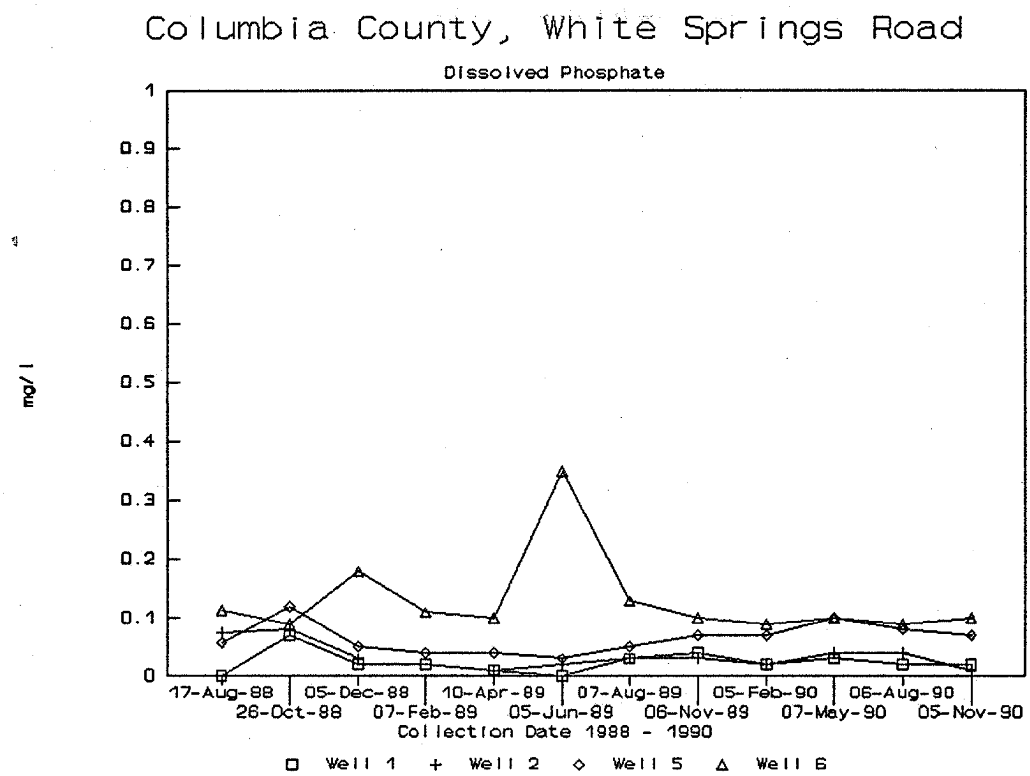

Columbia County, White Springs Road
Nitrate
mg/l
35
30
25
20
15
10
5
0
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 5


Columbia County, White Springs Road
Dissolved Phosphate
mg/l
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6

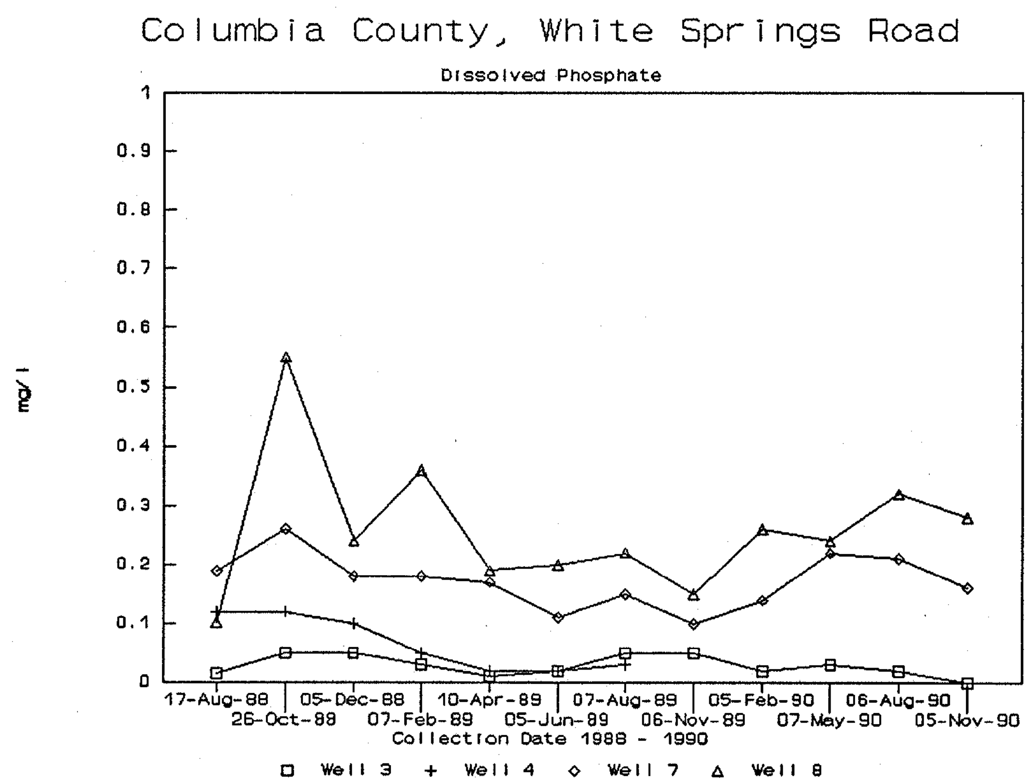
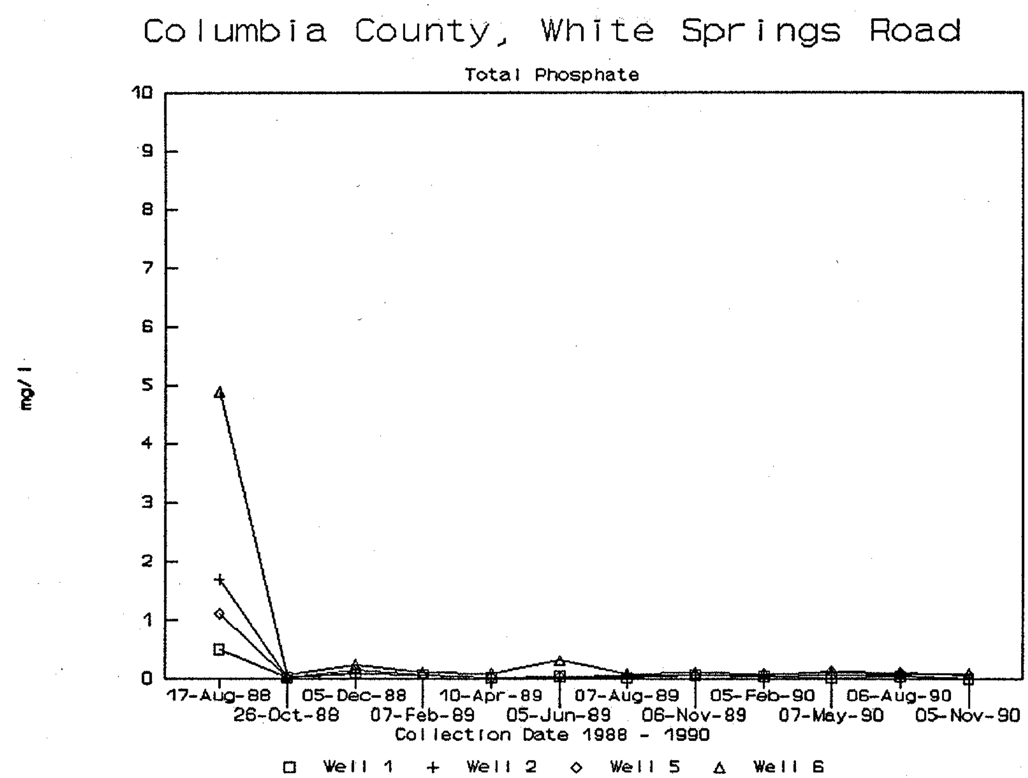

Columbia County, White Springs Road
Dissolved Phosphate
mg/l
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 6


Columbia County, White Springs Road
Total Phosphate
mg/l
0
1
2
3
4
5
6
7
8
9
10
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6

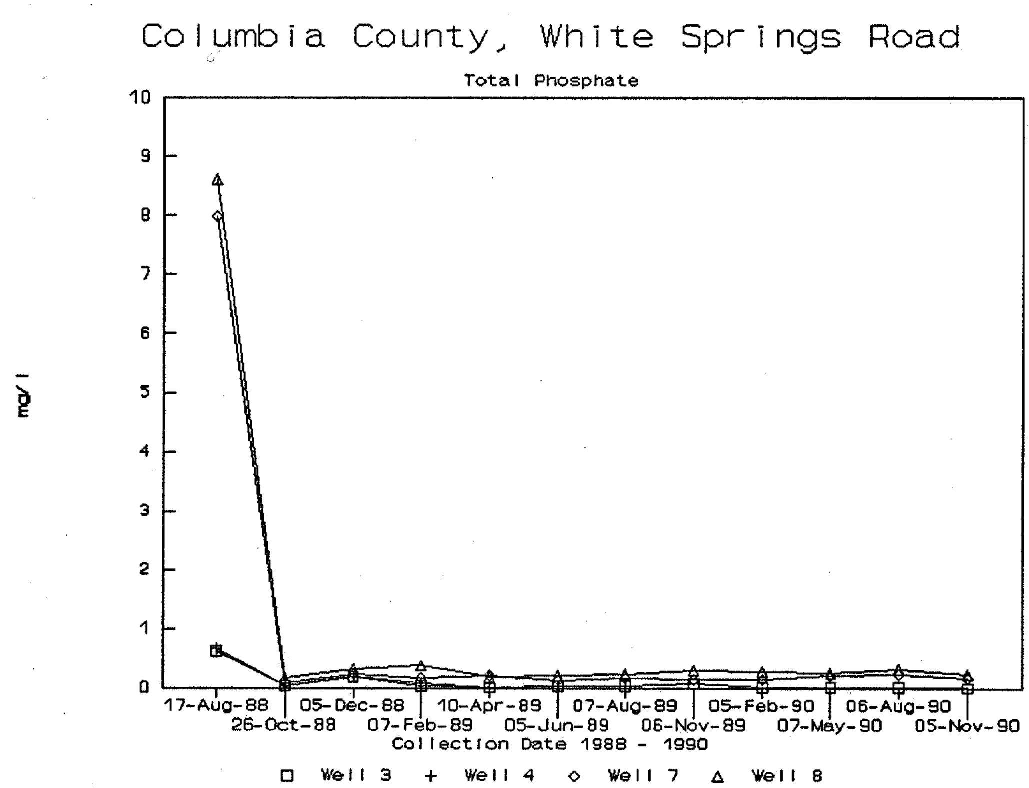
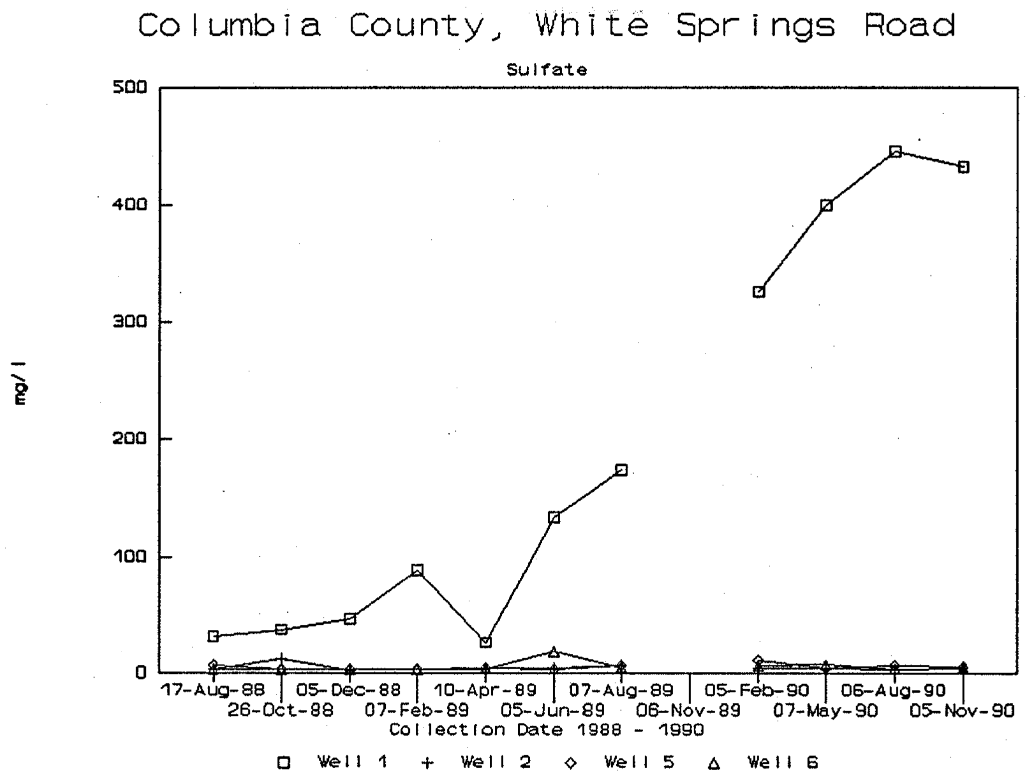
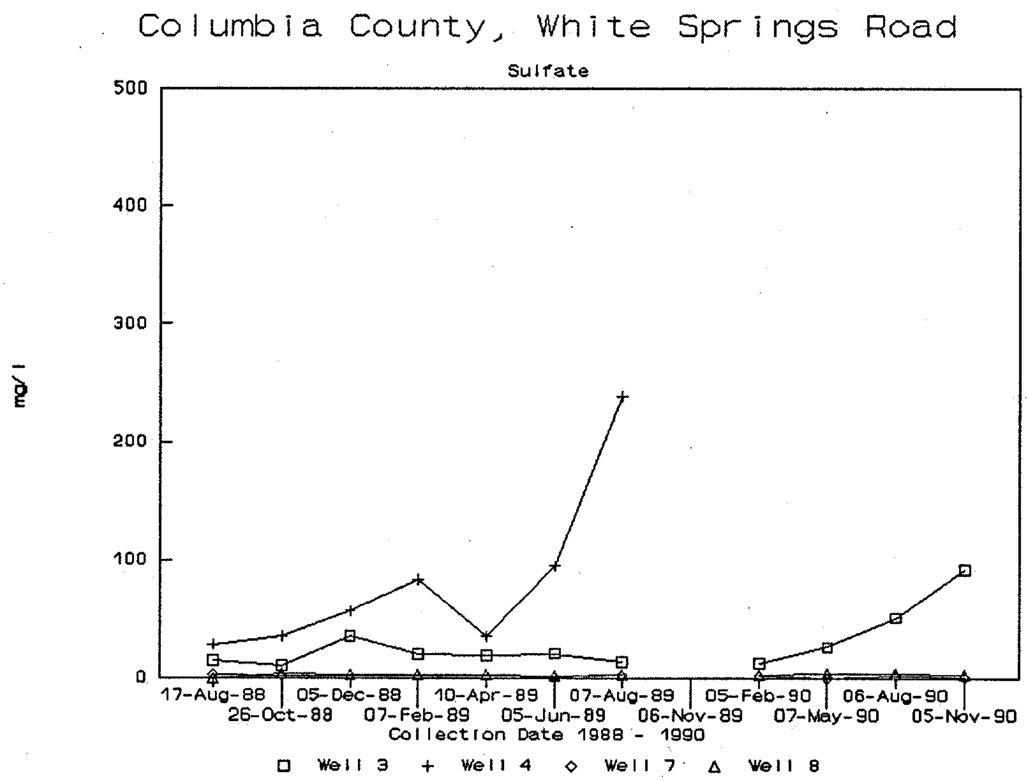

Columbia County, White Springs Road
Total Phosphate
mg/l
0
1
2
3
4
5
6
7
8
9
10
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 7

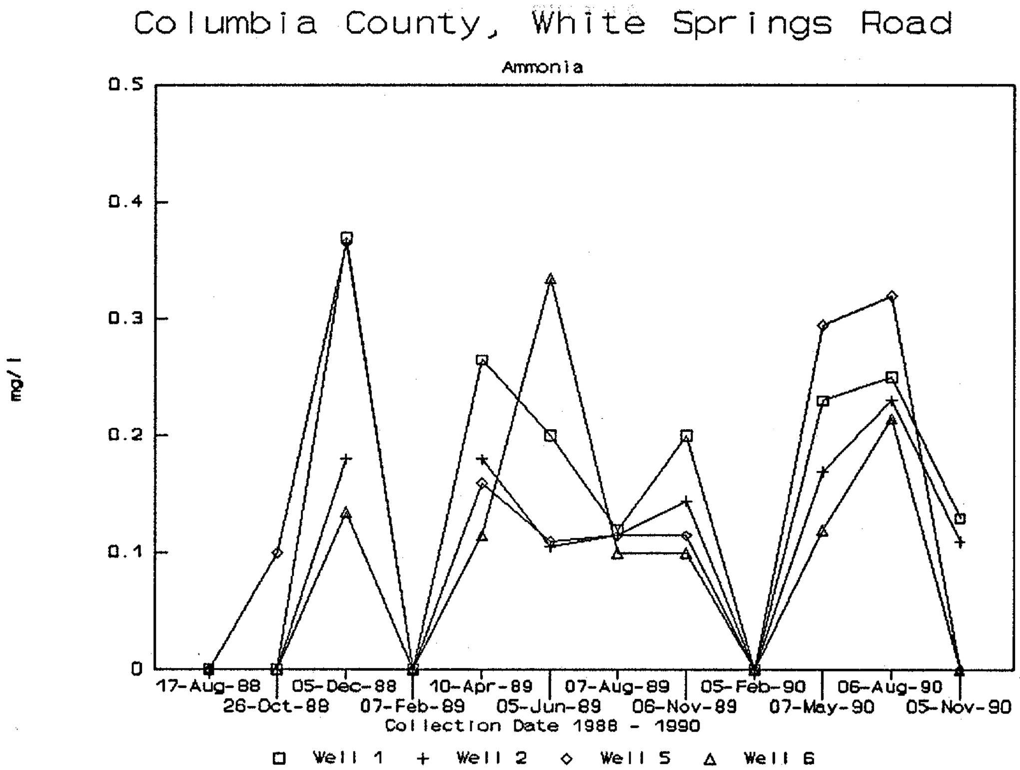


Columbia County, White Springs Road
Sulfate
500
400
300
200
100
0
mg/l
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 1 Well 2 Well 5 Well 6

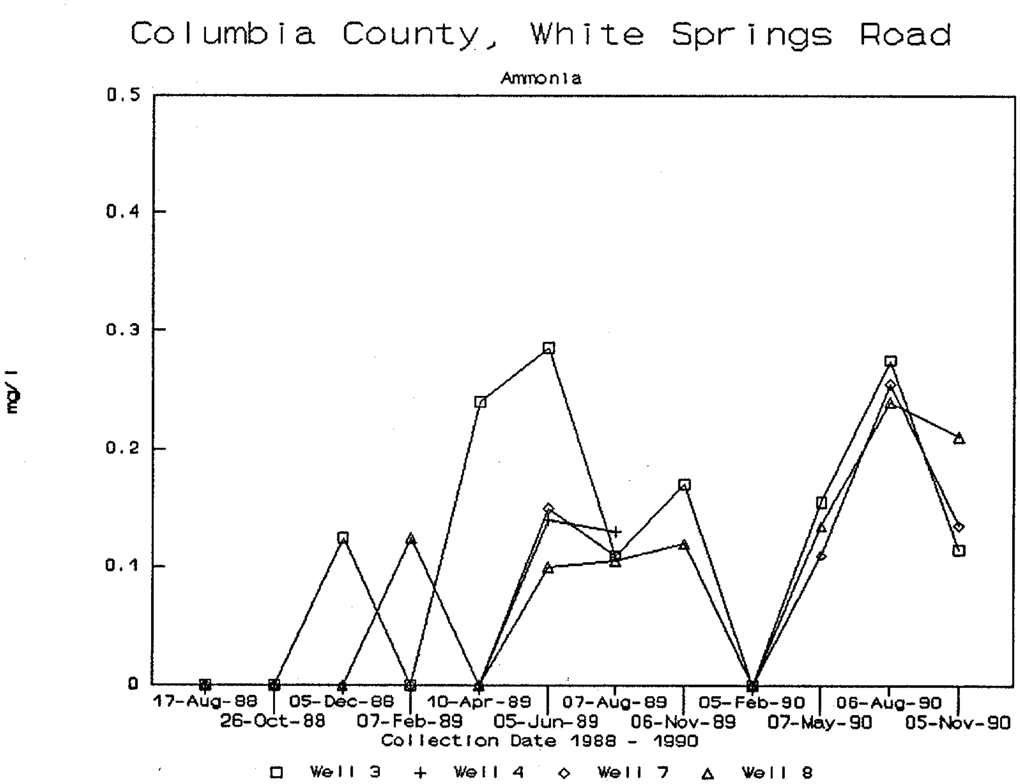


Columbia County, White Springs Road
Sulfate
500
400
300
200
100
0
mg/l
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 3 Well 4 Well 7 Well 8

Figure 8

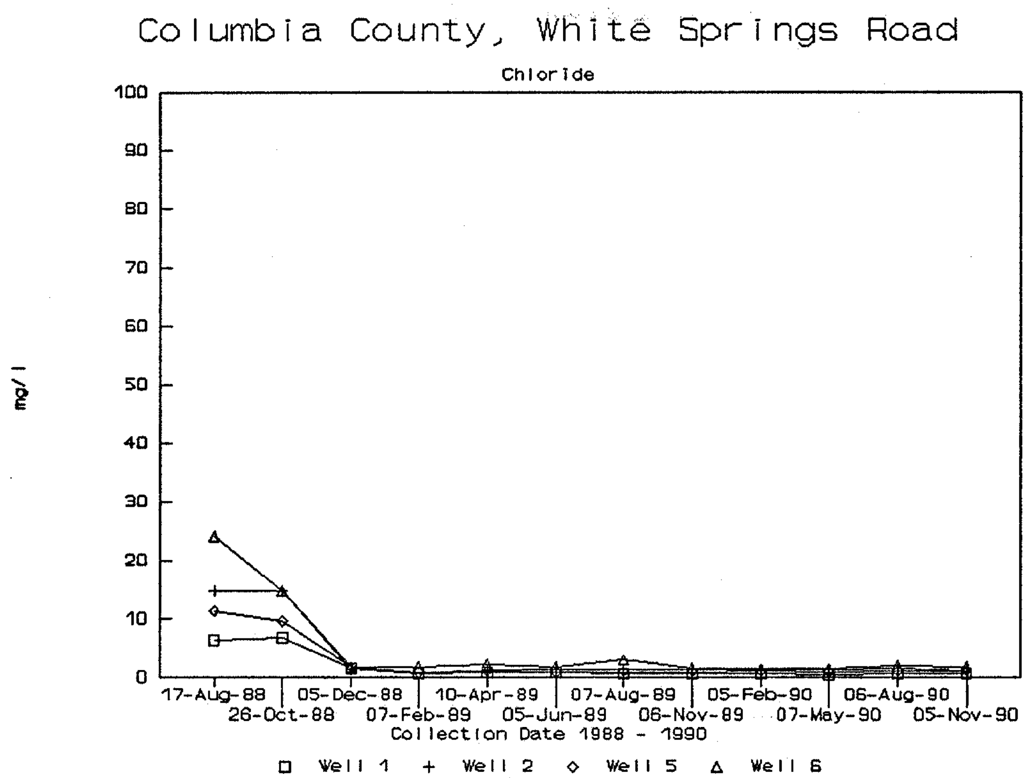


Columbia County, White Springs Road
Ammonia
mg/l
0.5
0.4
0.3
0.2
0.1
0
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
□ Well 1 + Well 2 ◇ Well 5 △ Well 6



Columbia County, White Springs Road
Ammonia
mg/l
0.5
0.4
0.3
0.2
0.1
0
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
□ Well 3 + Well 4 ◇ Well 7 △ Well 8

Figure 9


Columbia County, White Springs Road
Chloride
mg/l
100
90
80
70
60
50
40
30
20
10
0
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6

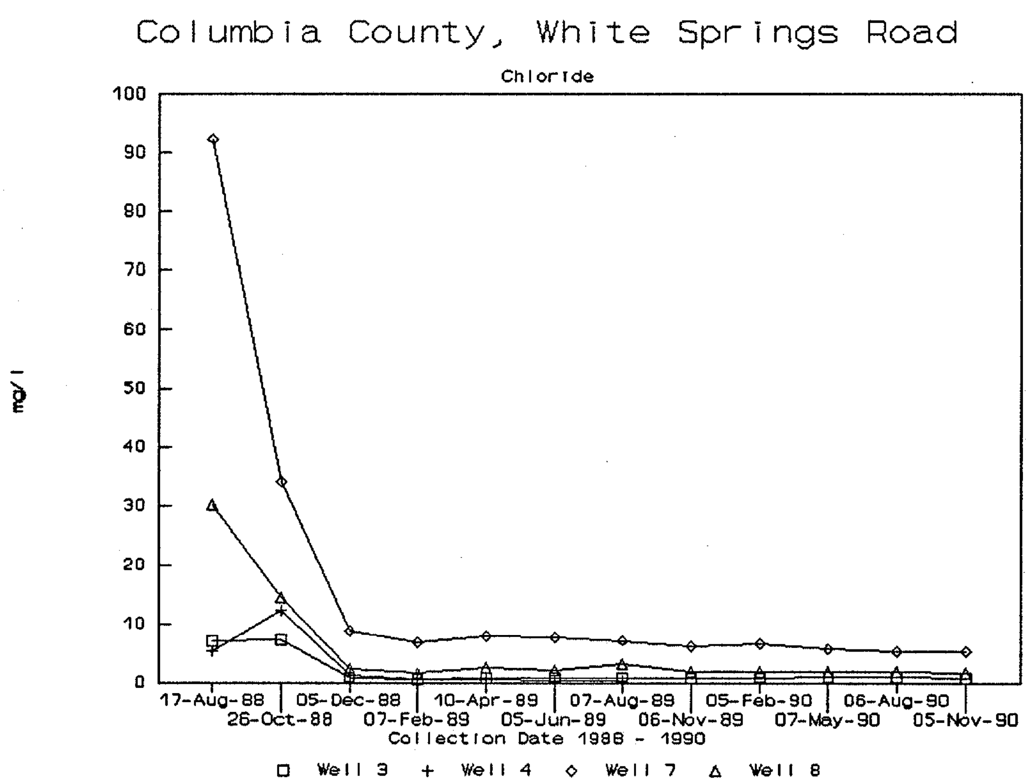
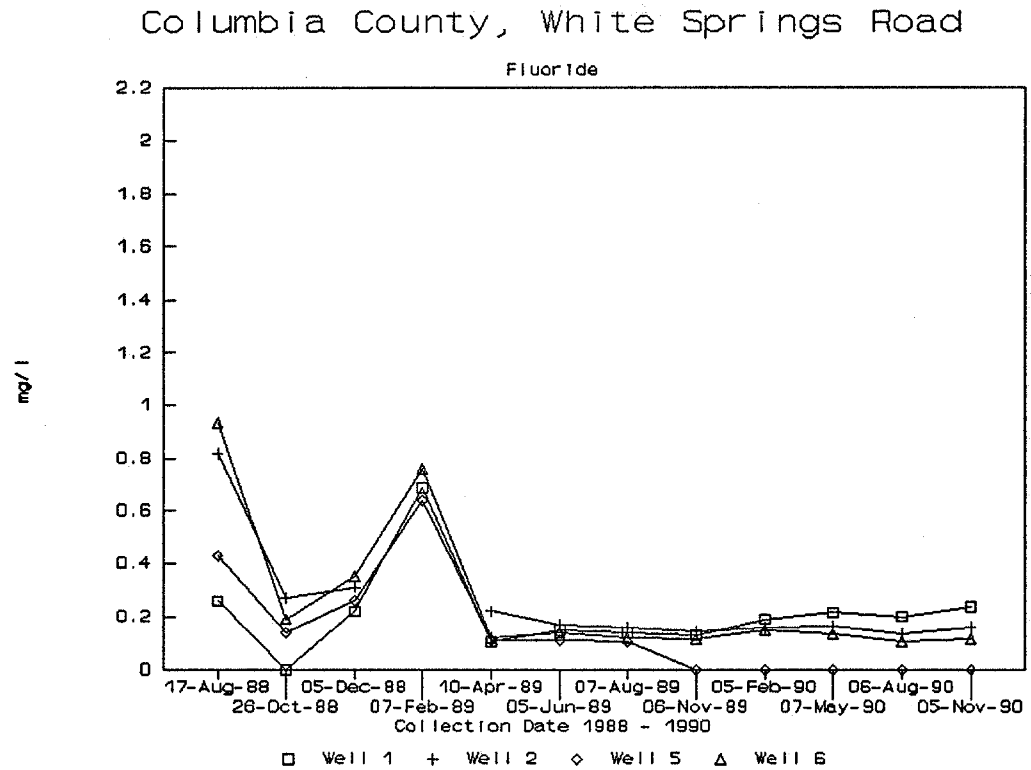

Columbia County, White Springs Road
Chloride
mg/l
100
90
80
70
60
50
40
30
20
10
0
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 10


Columbia County, White Springs Road
Fluoride
mg/l
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6

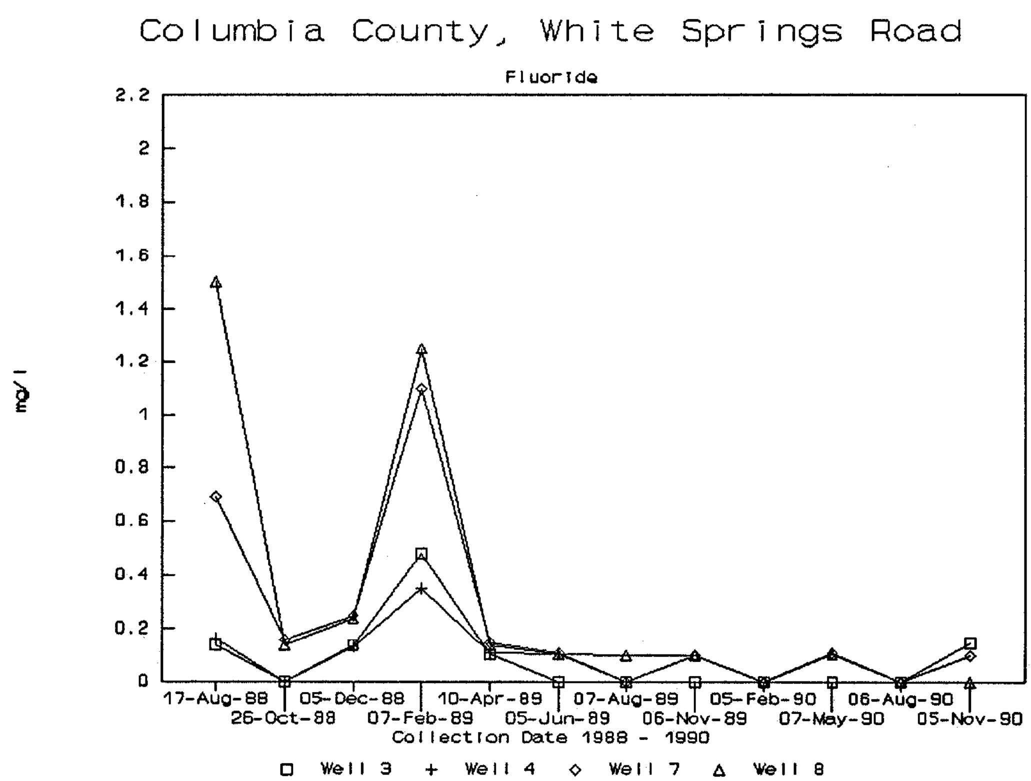
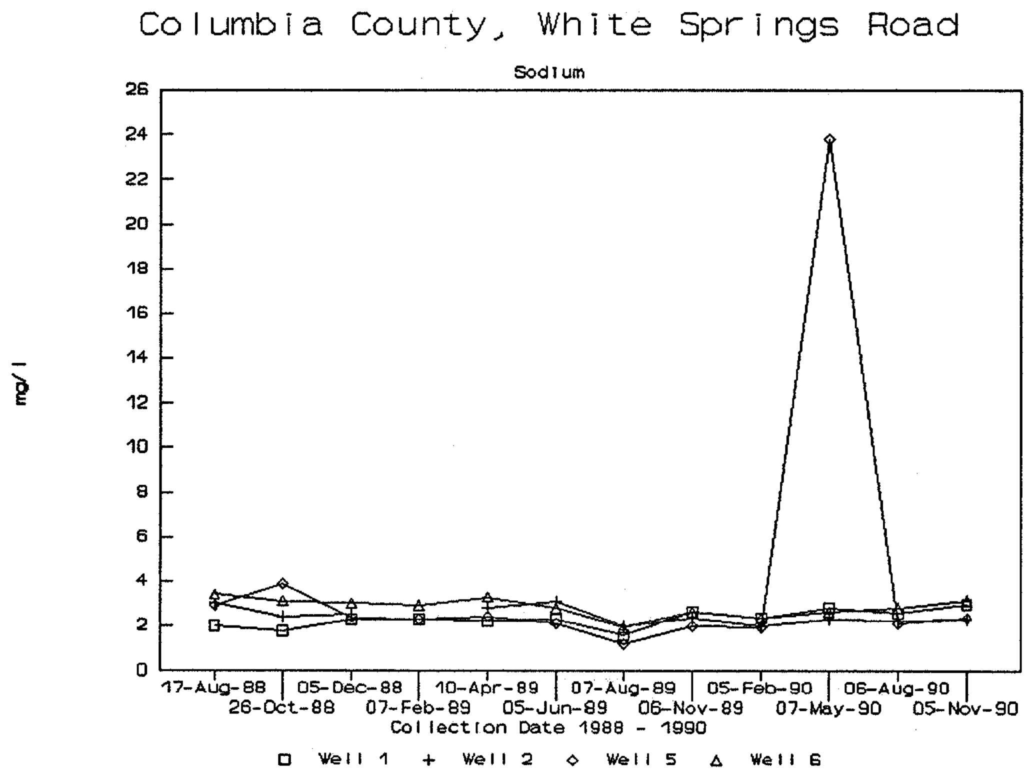

Columbia County, White Springs Road
Fluoride
mg/l
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 11


Columbia County, White Springs Road
Sodium
mg/l
0
2
4
6
8
10
12
14
16
18
20
22
24
26
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6

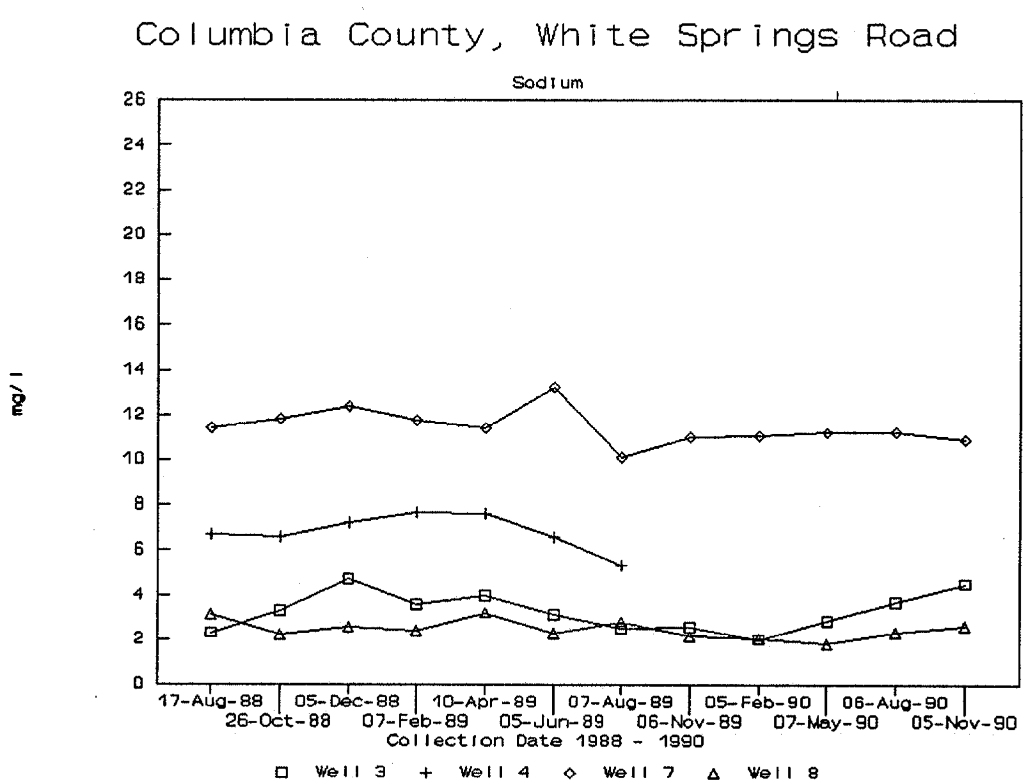
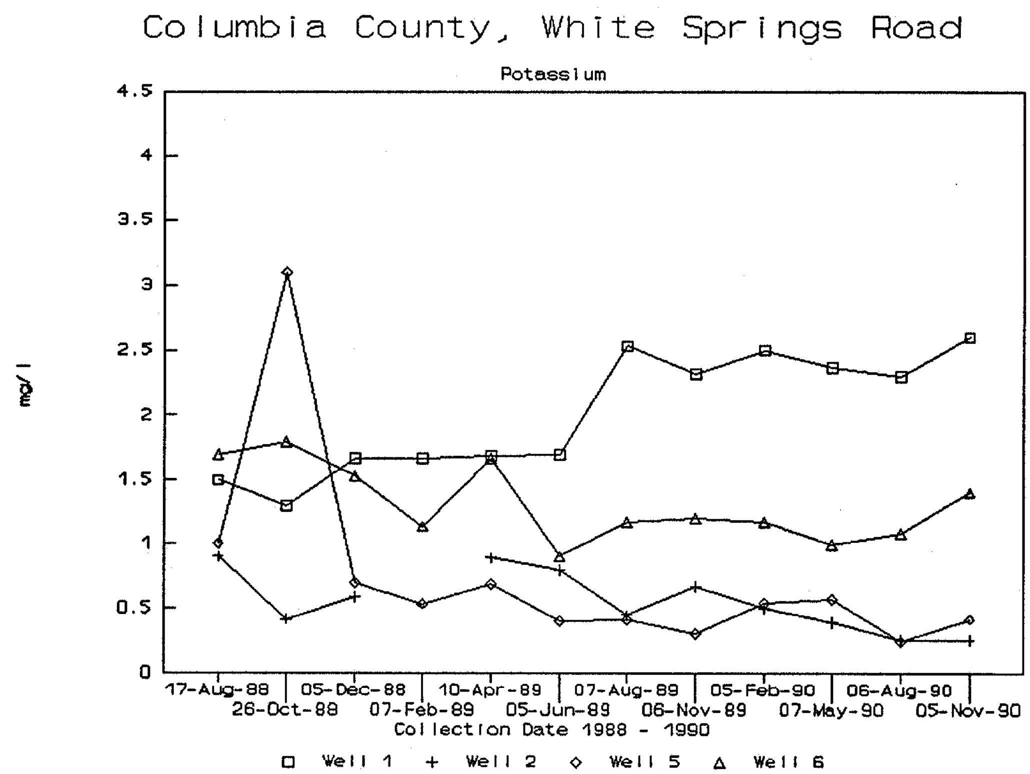
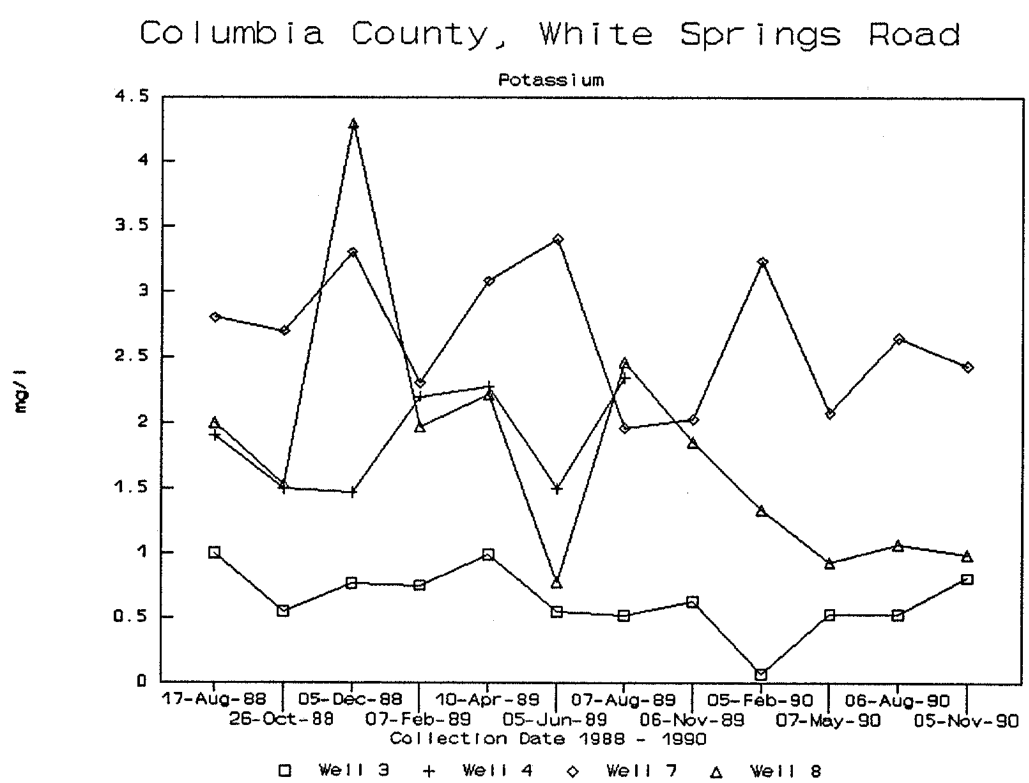

Columbia County, White Springs Road
Sodium
mg/l
0
2
4
6
8
10
12
14
16
18
20
22
24
26
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 12

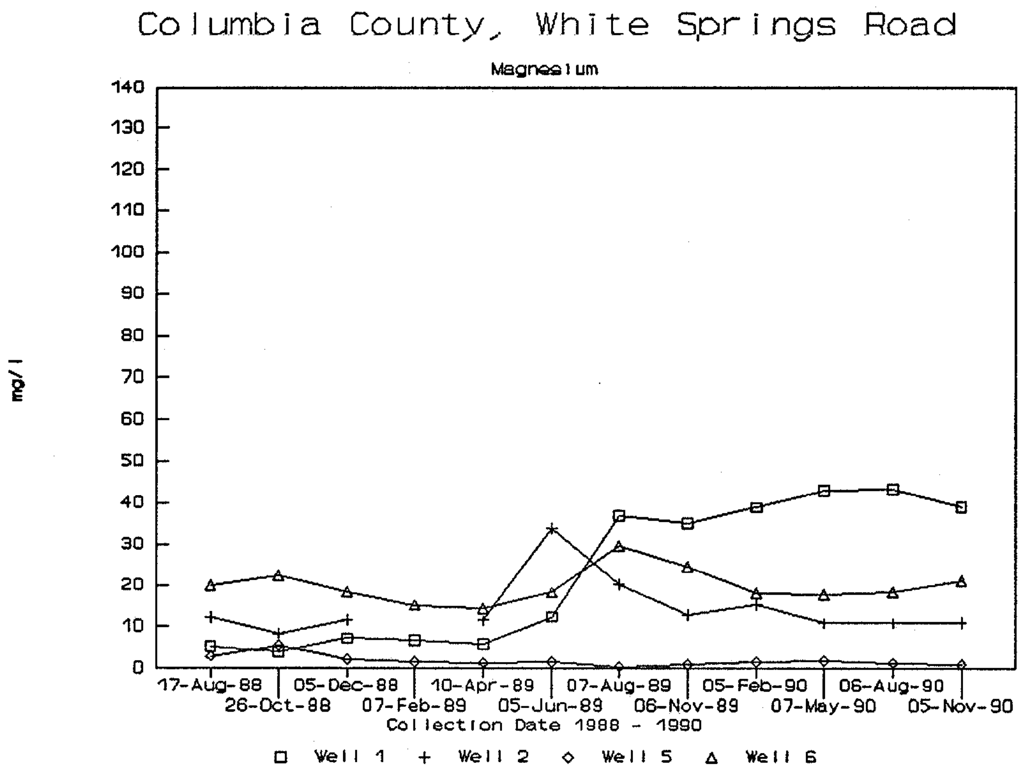


Columbia County, White Springs Road
Potassium
mg/l
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6



Columbia County, White Springs Road
Potassium
mg/l
4.5
4
3.5
3
2.5
2
1.5
1
0.5
0
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 13


Columbia County, White Springs Road
Magnesium
mg/l
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6

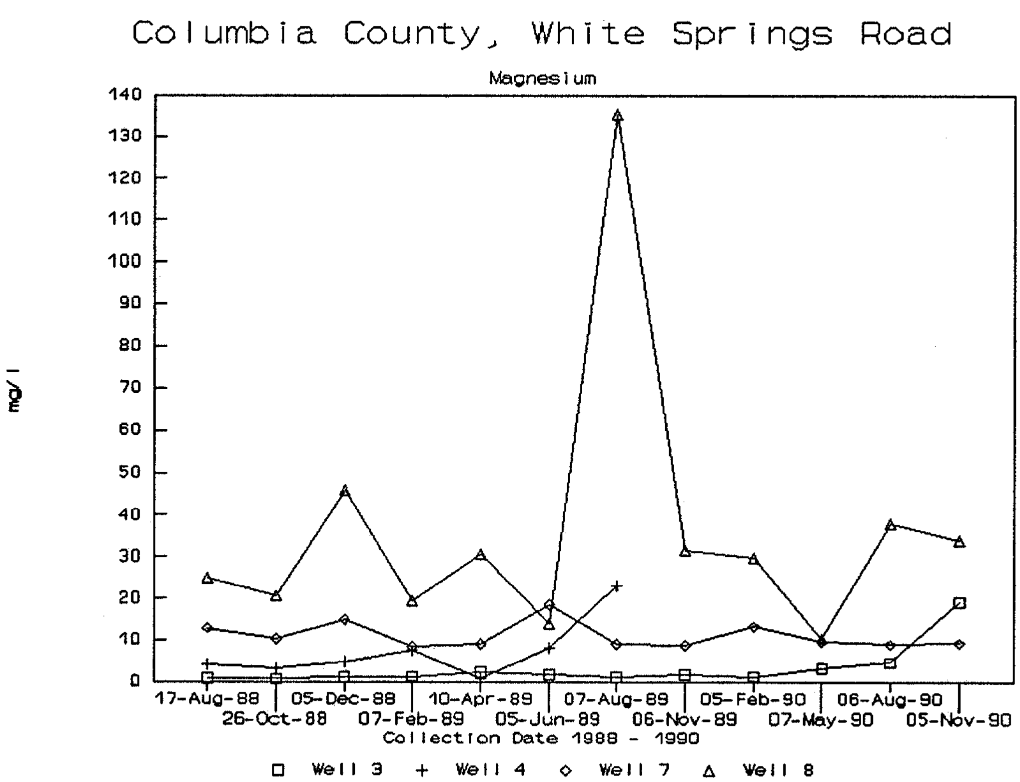
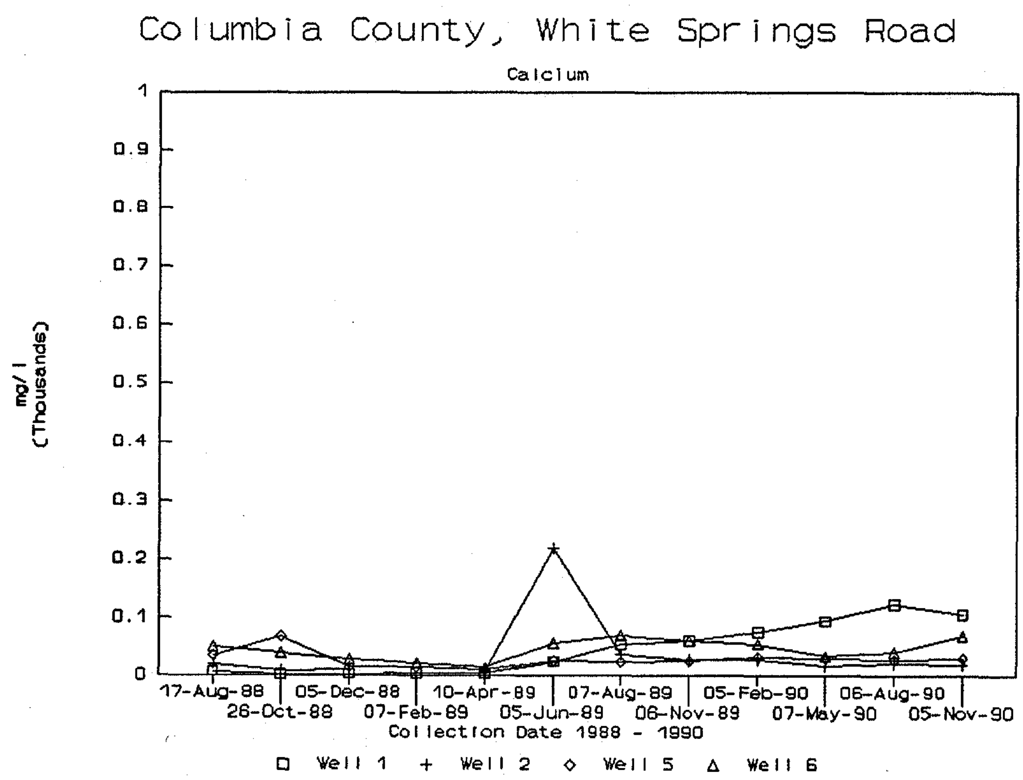

Columbia County, White Springs Road
Magnesium
mg/l
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 14


Columbia County, White Springs Road
Calcium
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
mg/l
(Thousands)
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6

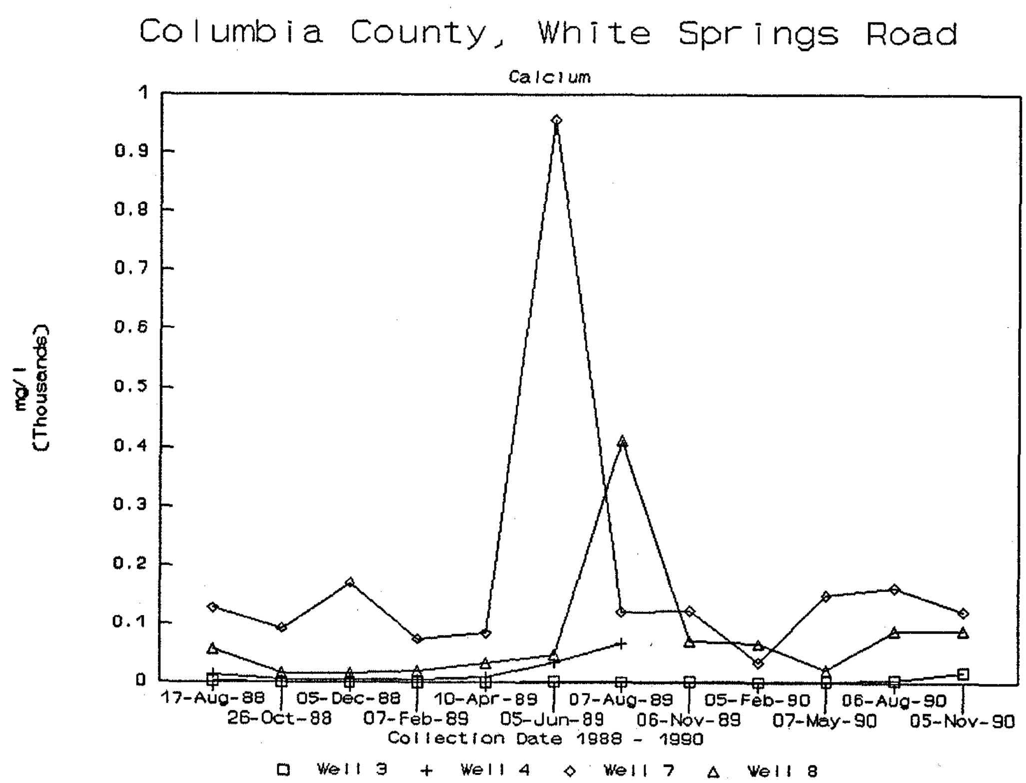
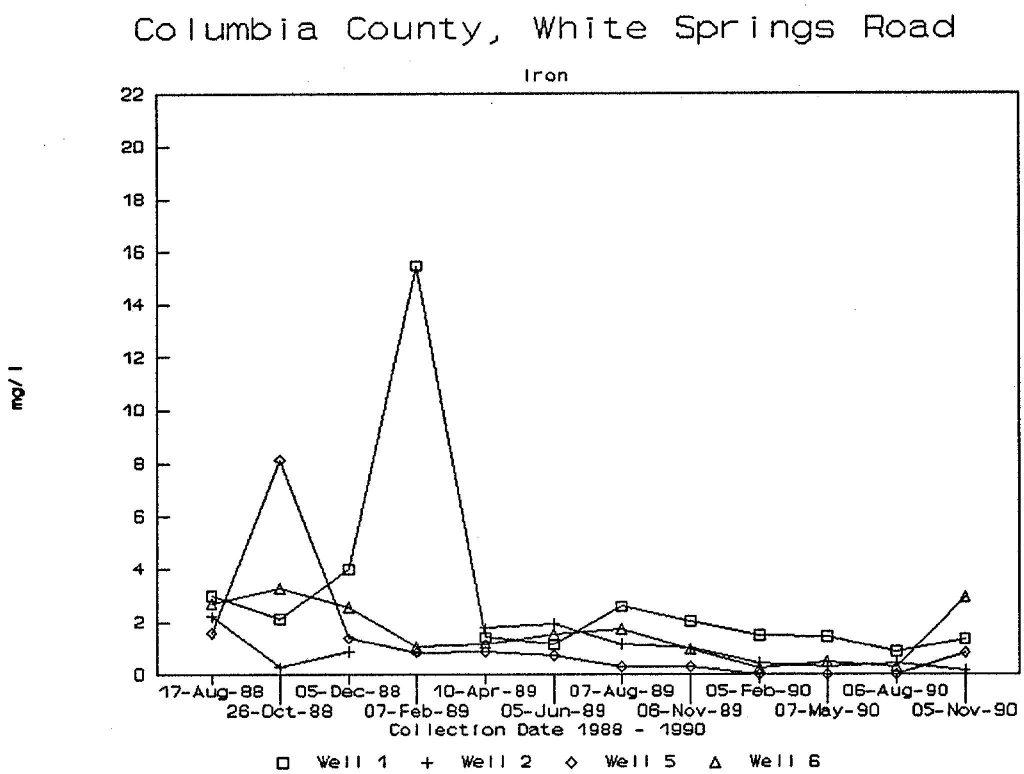
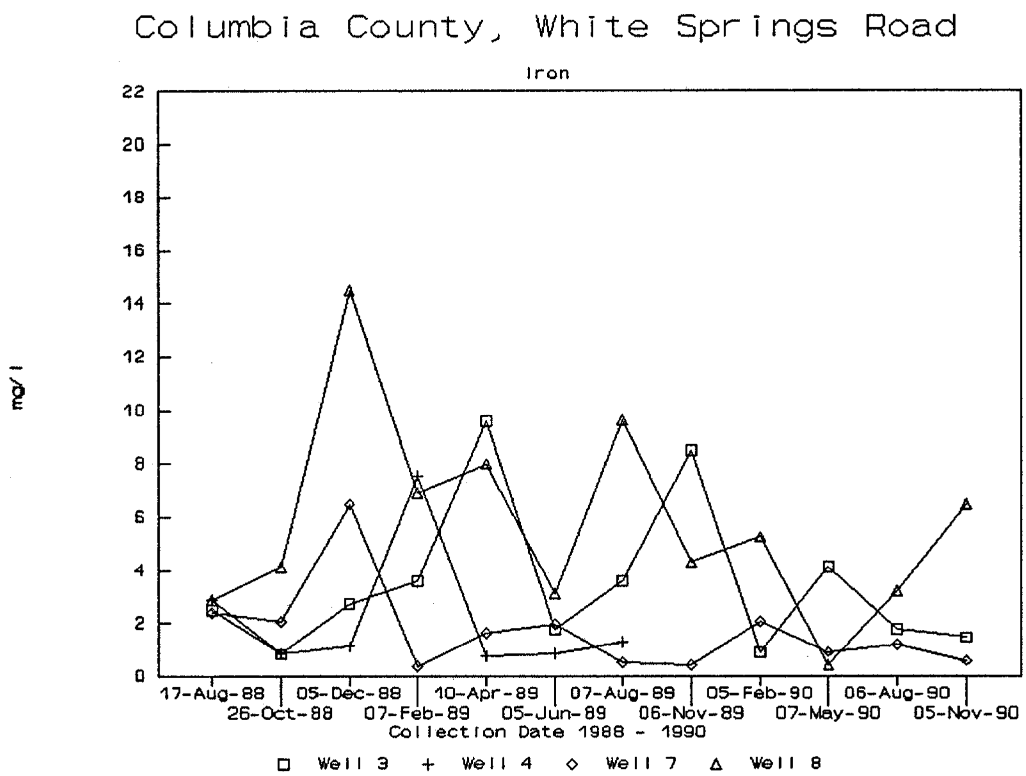

Columbia County, White Springs Road
Calcium
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
mg/l
(Thousands)
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 15

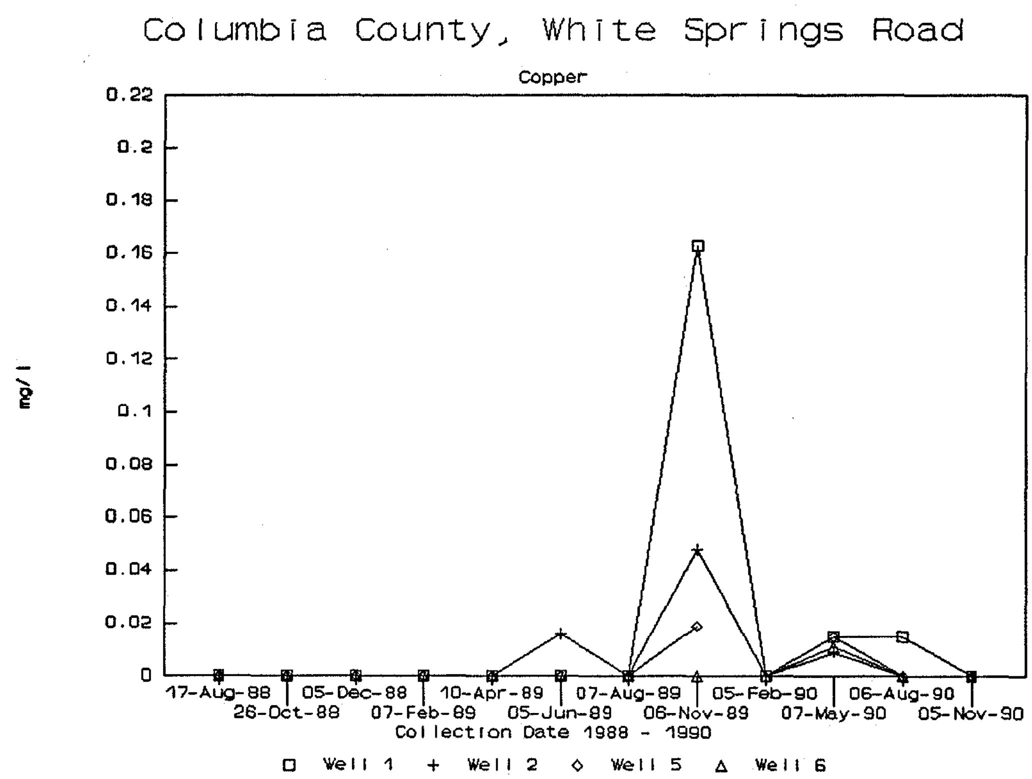


Columbia County, White Springs Road
Iron
mg/l
22
20
18
16
14
12
10
8
6
4
2
0
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
□ Well 1 + Well 2 ◇ Well 5 △ Well 6

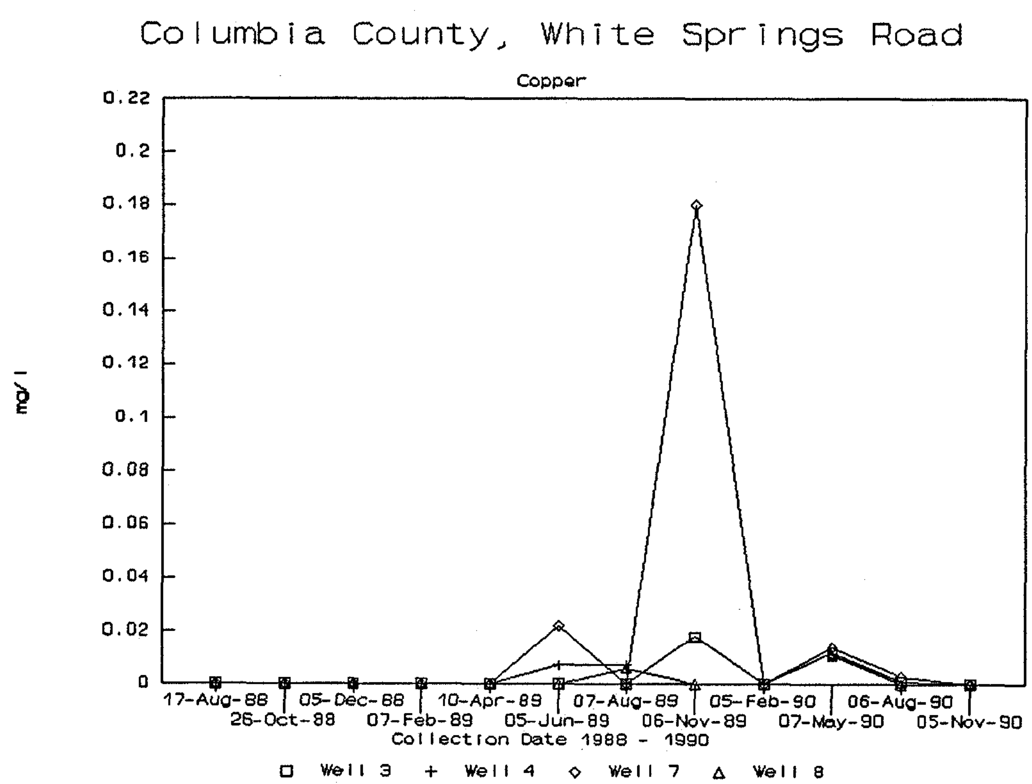


Columbia County, White Springs Road
Iron
mg/l
22
20
18
16
14
12
10
8
6
4
2
0
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
□ Well 3 + Well 4 ◇ Well 7 △ Well 8

Figure 16

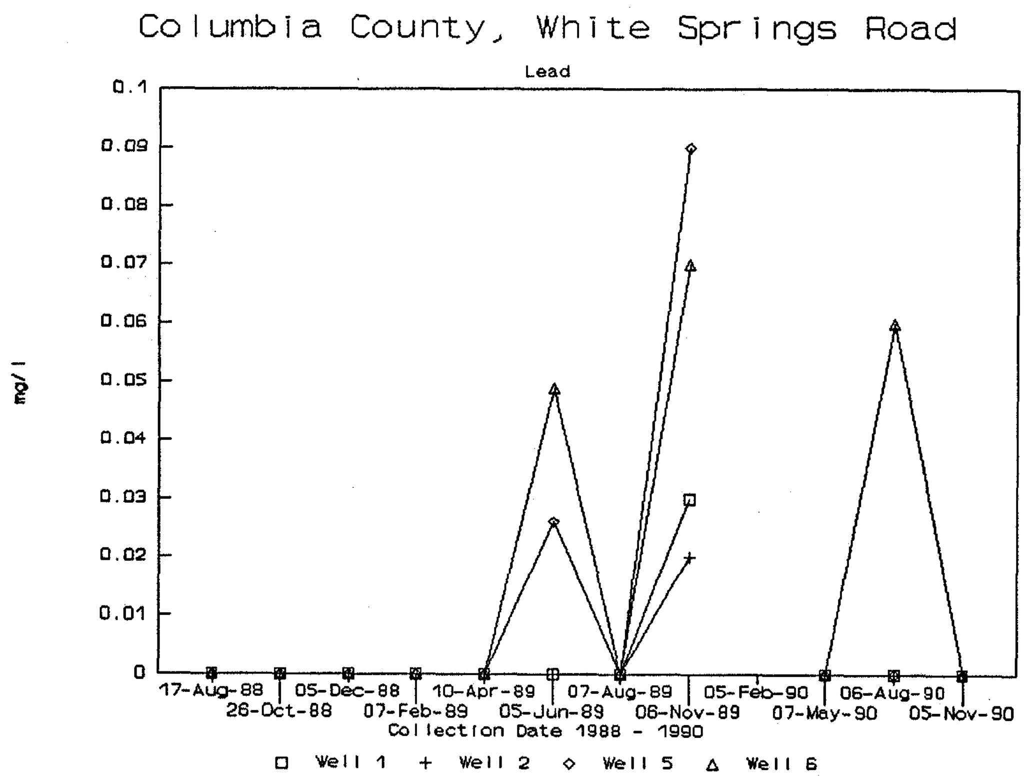


Columbia County, White Springs Road
Copper
mg/l
0.22
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6

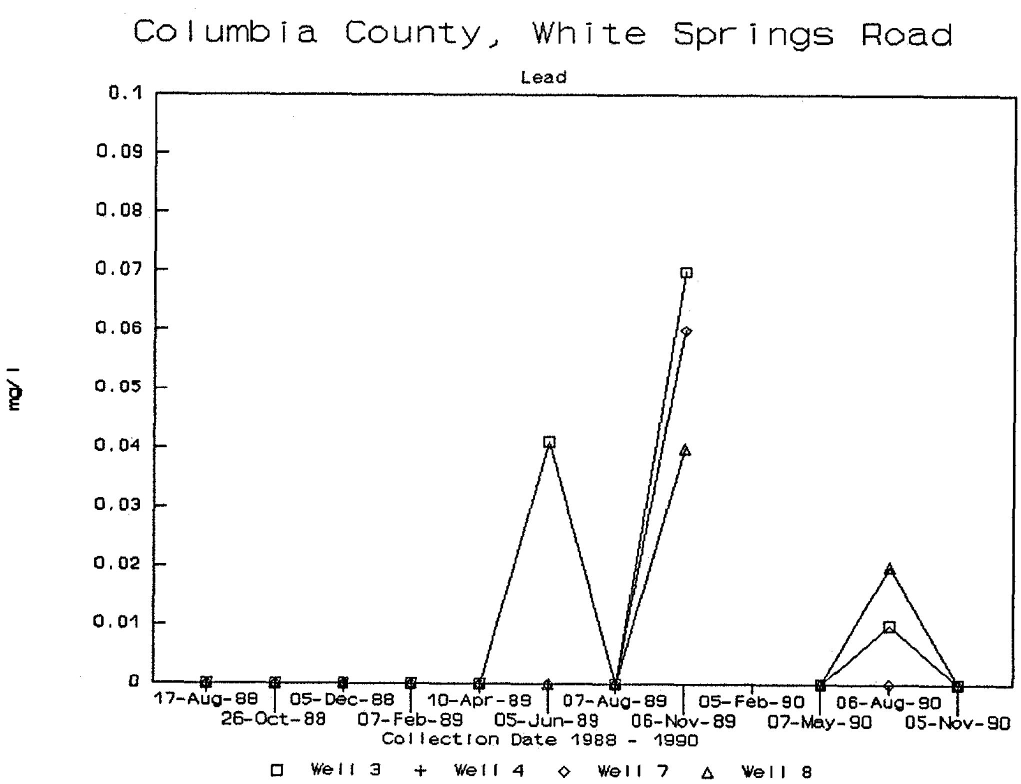


Columbia County, White Springs Road
Copper
mg/l
0.22
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 17

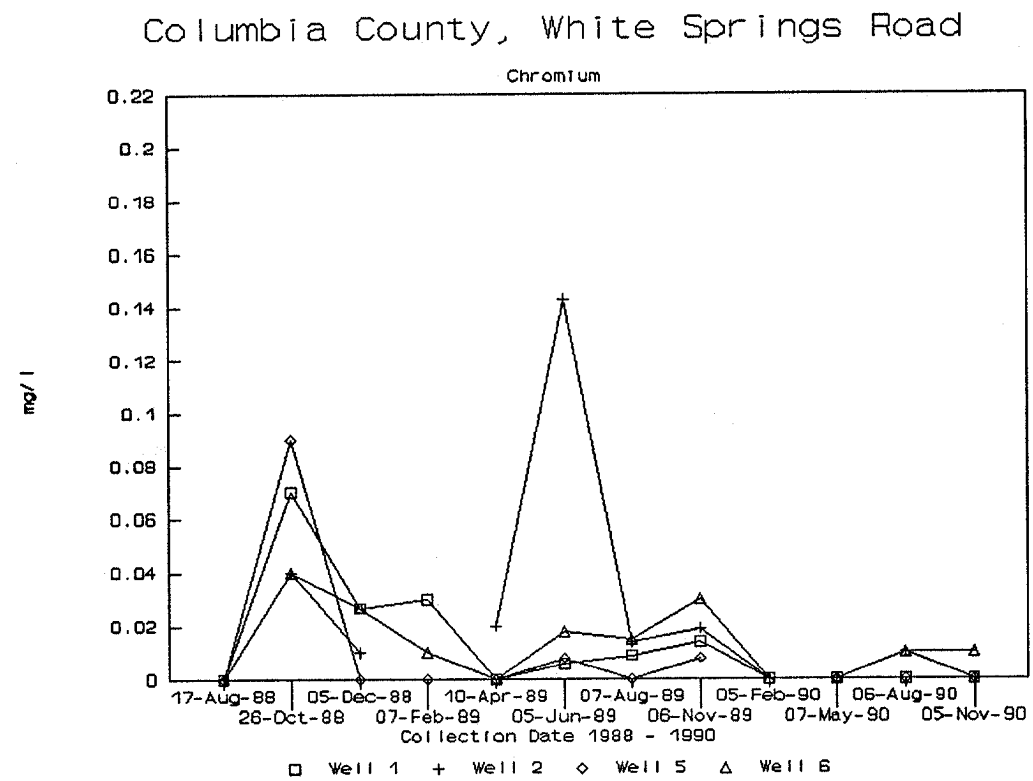


Columbia County, White Springs Road
Lead
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
mg/l
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6



Columbia County, White Springs Road
Lead
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
mg/l
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 18


Columbia County, White Springs Road
Chromium
mg/l
0.22
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6

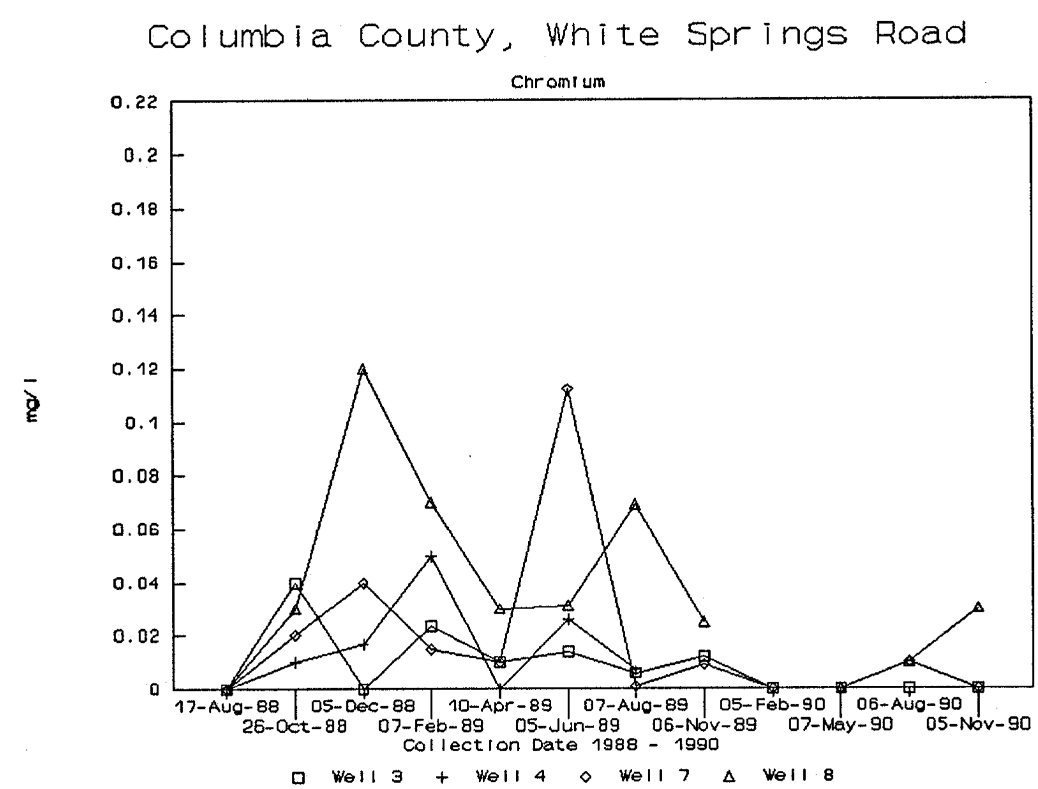
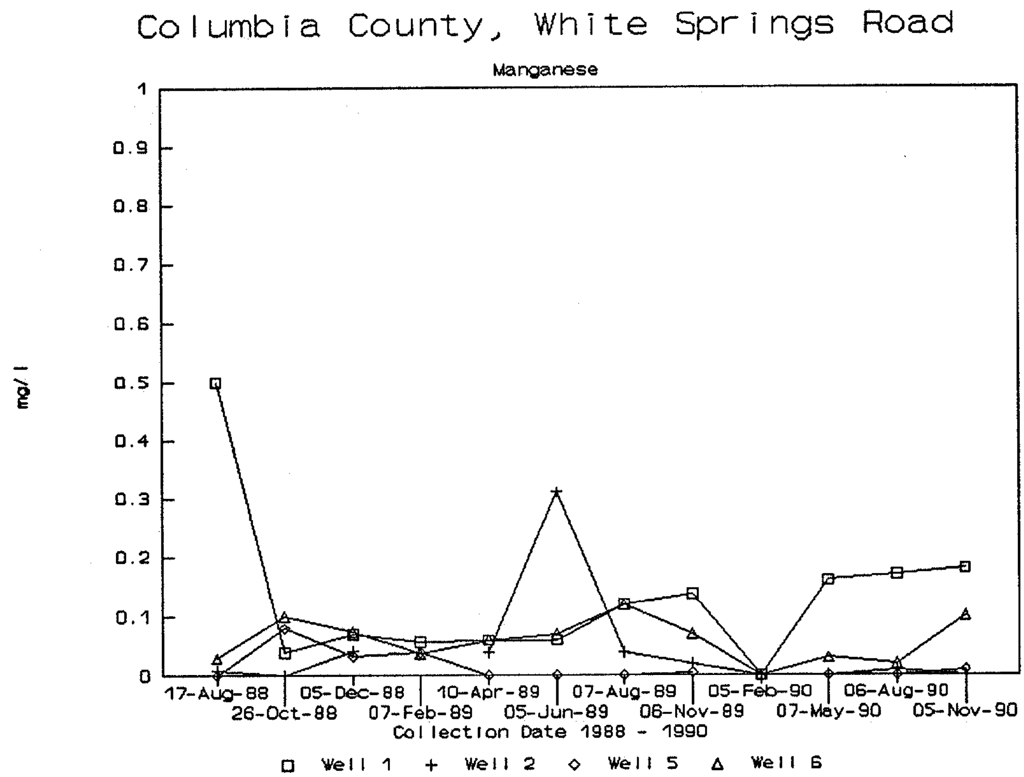

Columbia County, White Springs Road
Chromium
mg/l
0.22
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 19


Columbia County, White Springs Road
Manganese
mg/l
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6

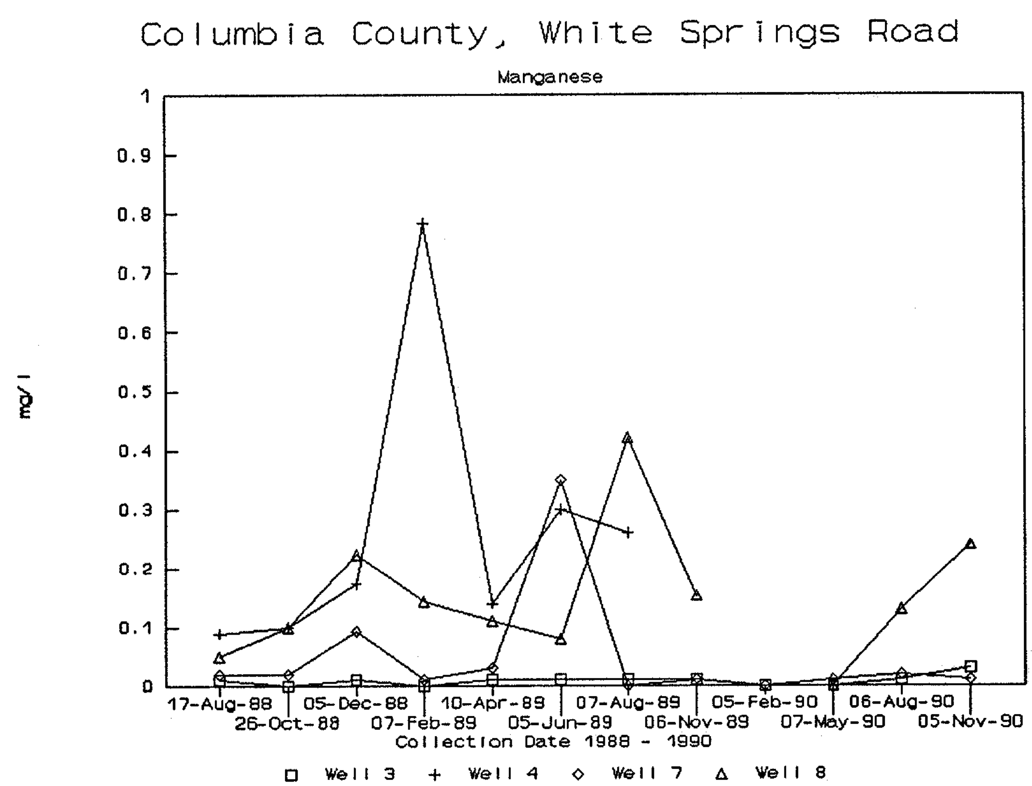
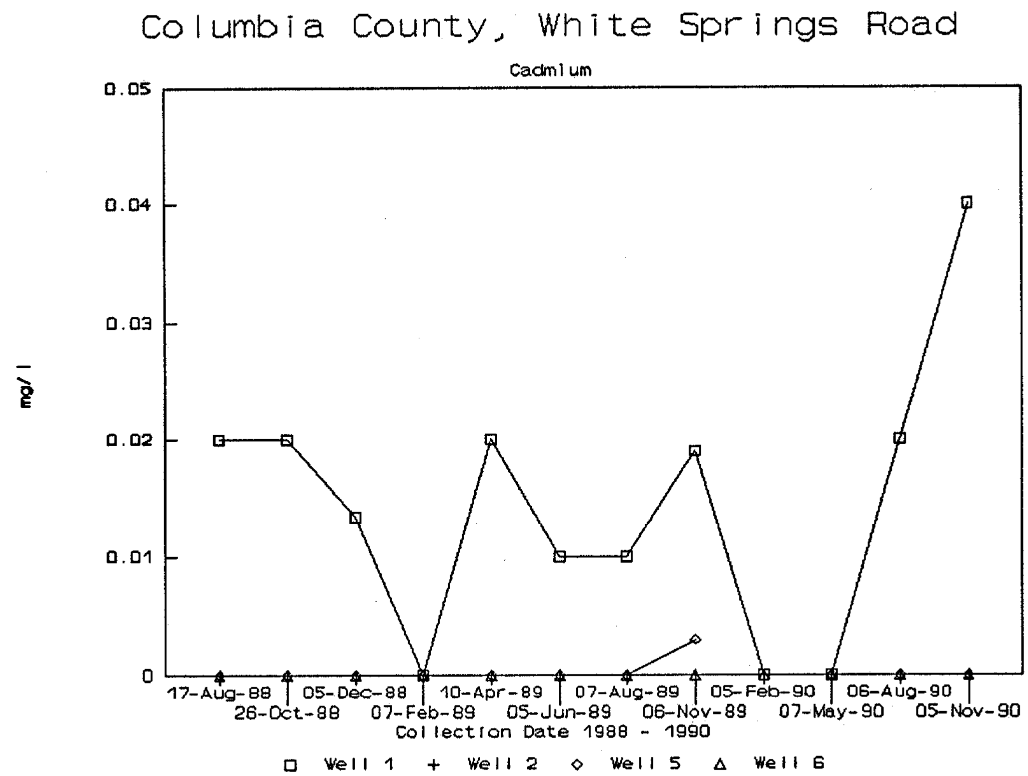

Columbia County, White Springs Road
Manganese
mg/l
0
0.1
0.2
0.3
0.4
0.5
0.6
0.7
0.8
0.9
1
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 20


Columbia County, White Springs Road
Cadmium
mg/l
0.05
0.04
0.03
0.02
0.01
0
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6

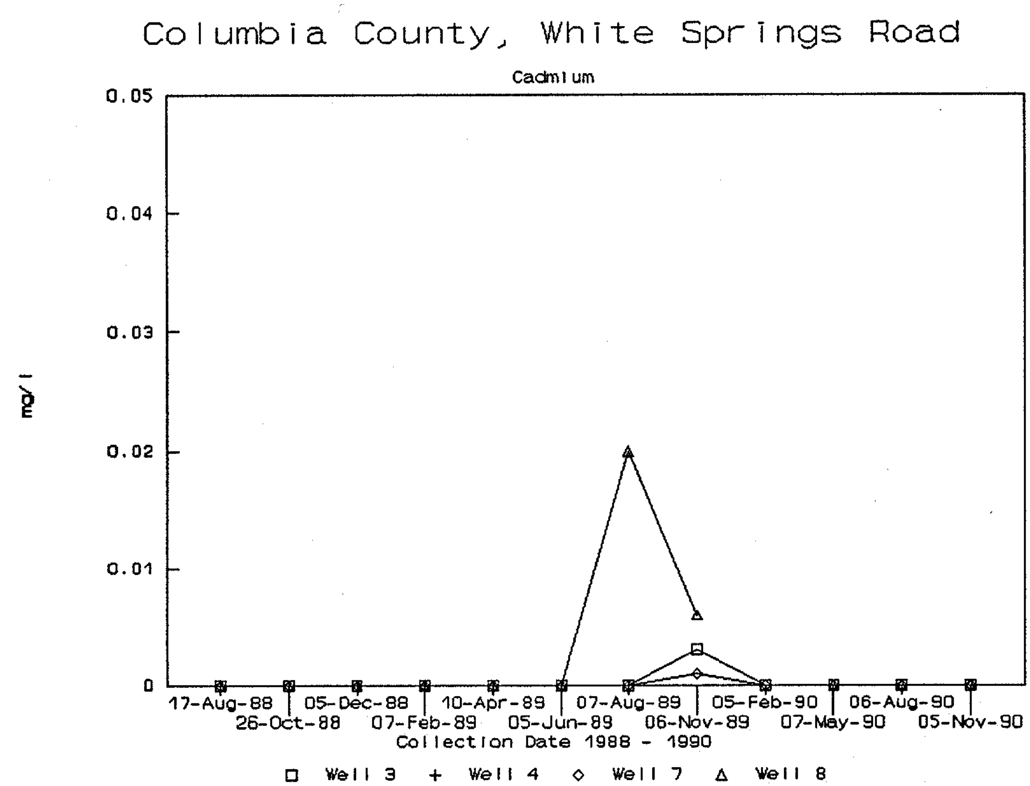
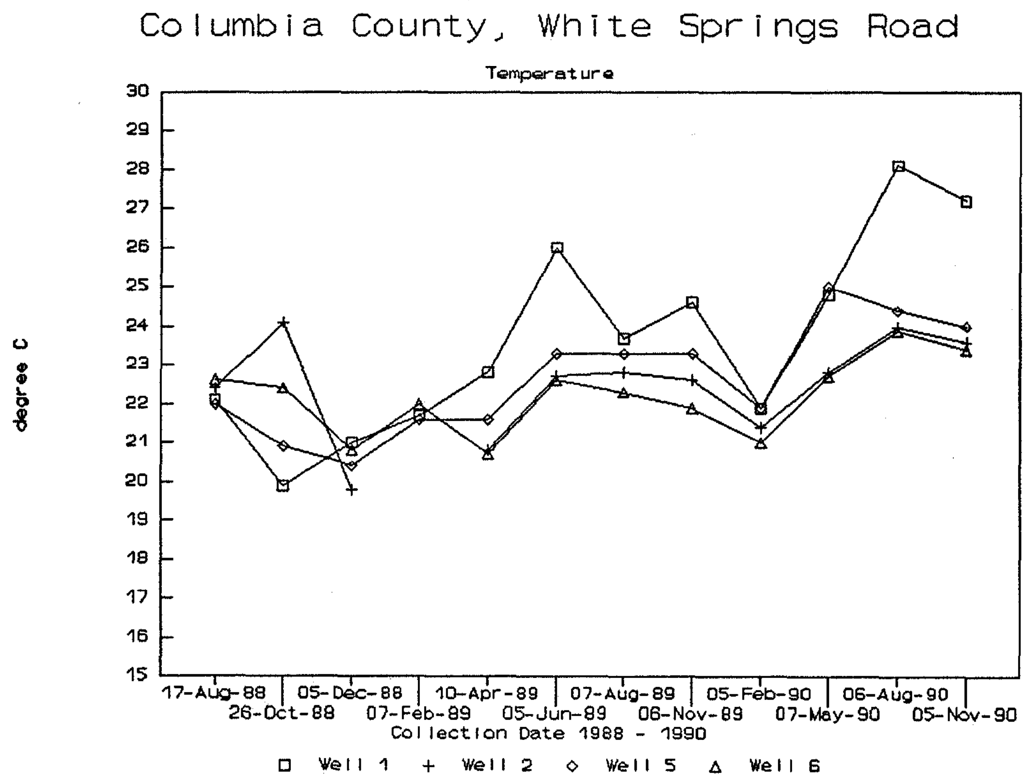

Columbia County, White Springs Road
Cadmium
mg/l
0.05
0.04
0.03
0.02
0.01
0
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 21


Columbia County, White Springs Road
Temperature
degree C
30
29
28
27
26
25
24
23
22
21
20
19
18
17
16
15
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6

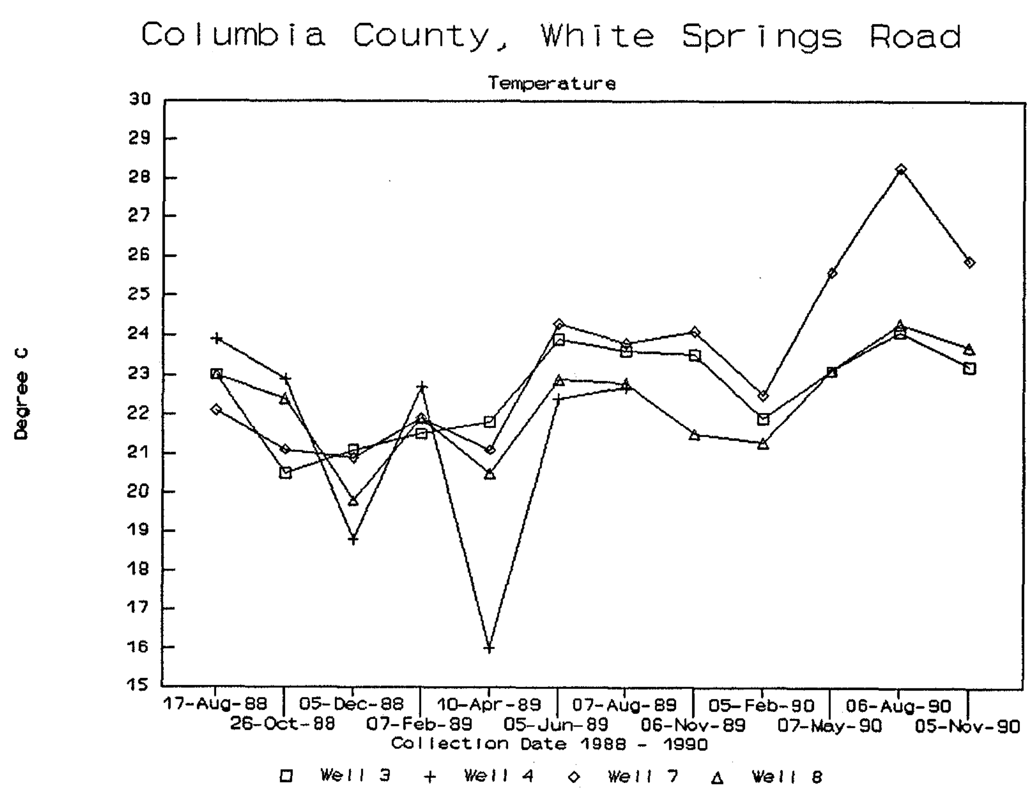
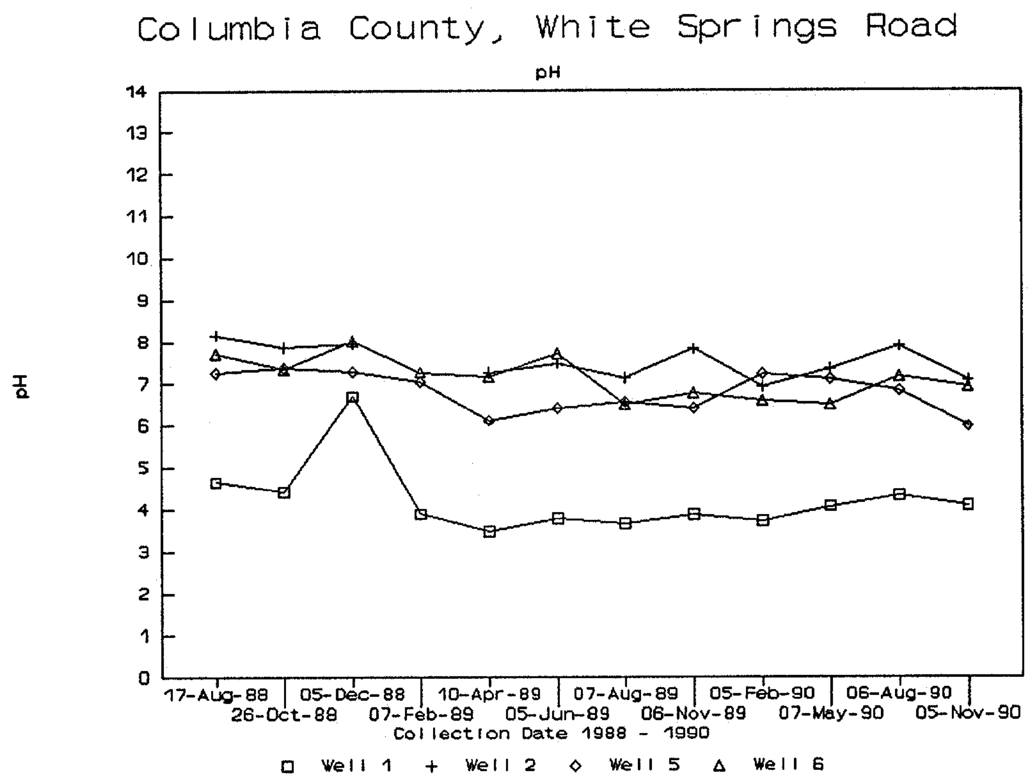

Columbia County, White Springs Road
Temperature
Degree C
30
29
28
27
26
25
24
23
22
21
20
19
18
17
16
15
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 22


Columbia County, White Springs Road
pH
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
pH
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6

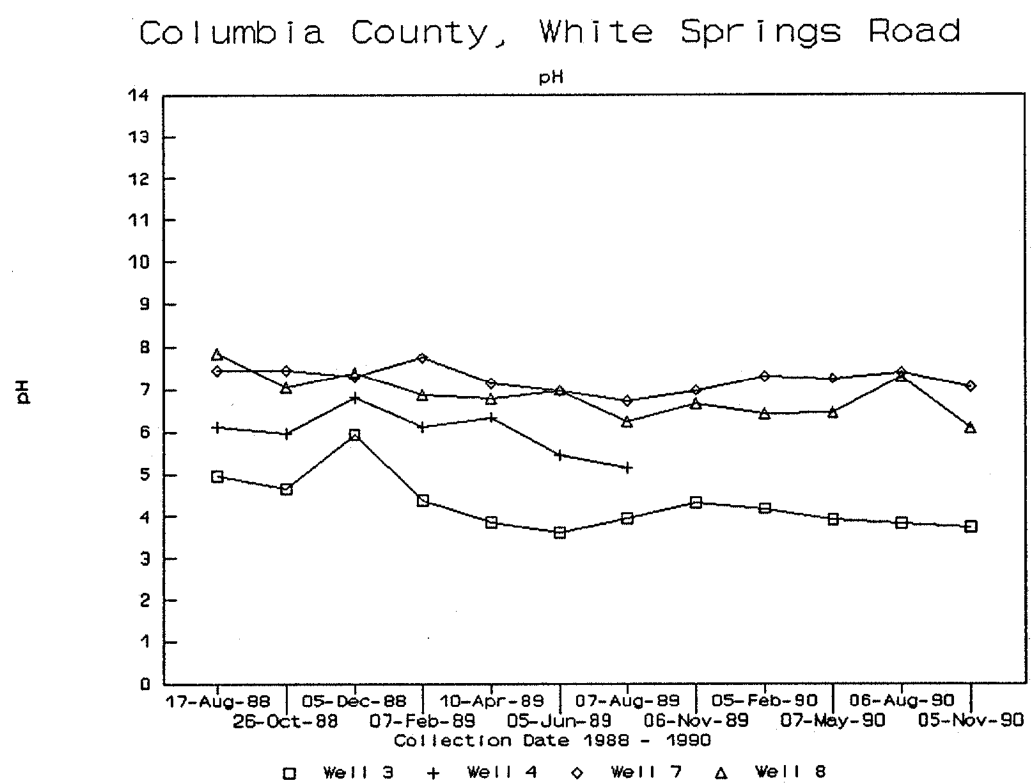
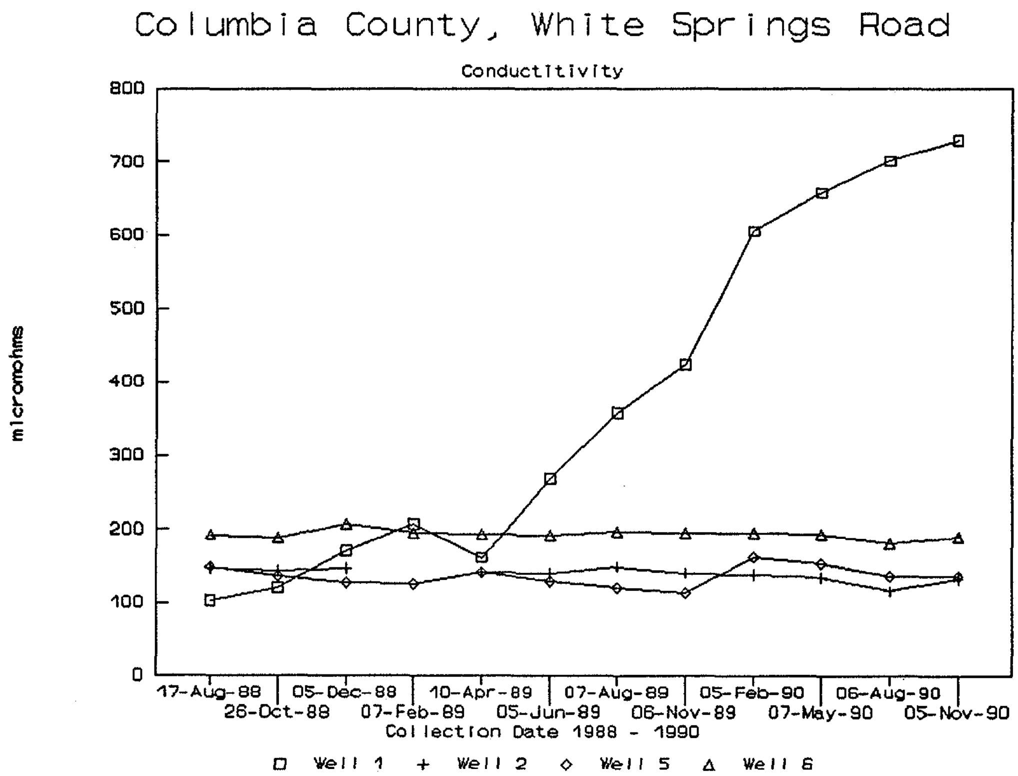

Columbia County, White Springs Road
pH
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
pH
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 23


Columbia County, White Springs Road
Conductitivity
micromohms
800
700
600
500
400
300
200
100
0
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6

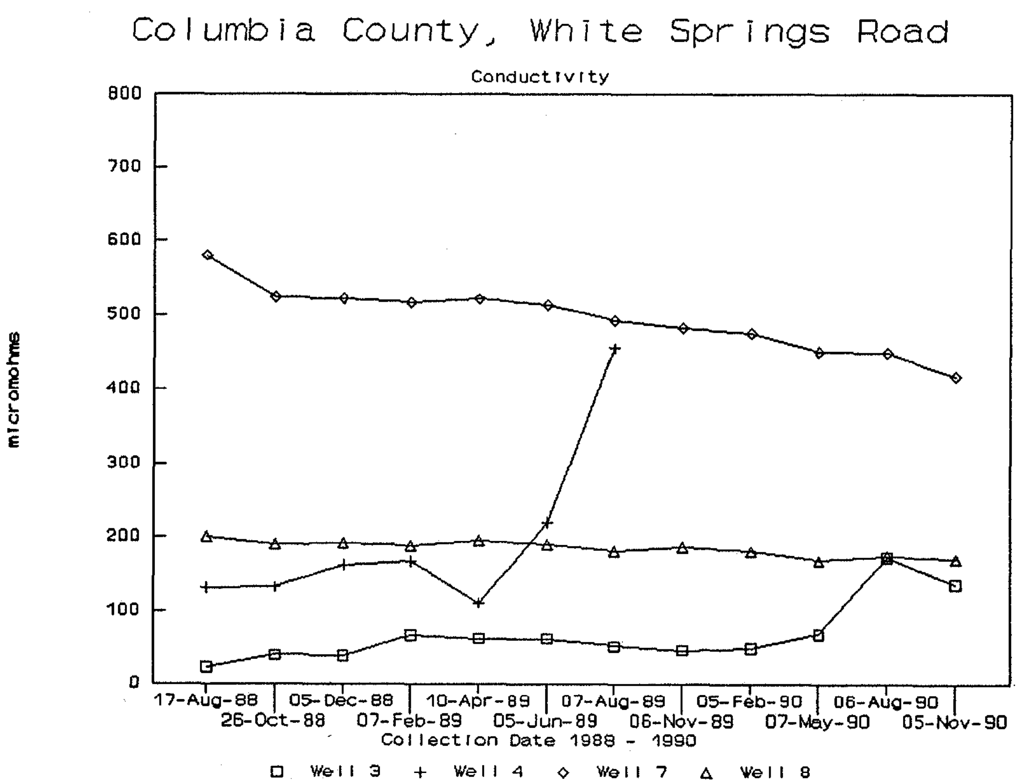
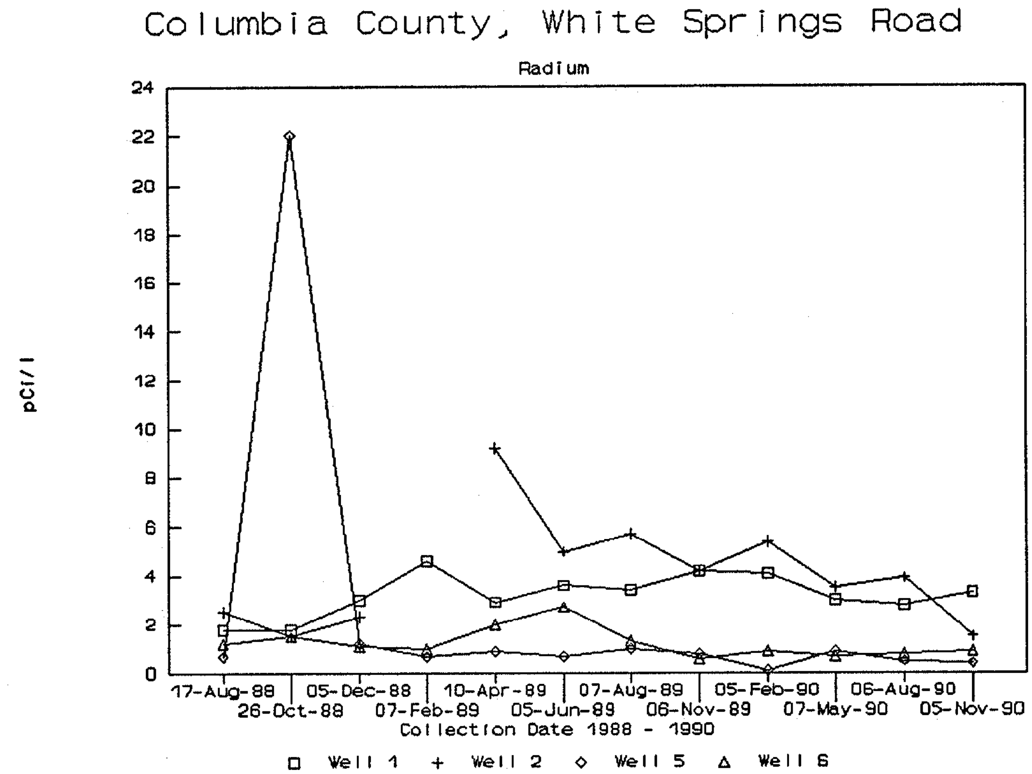

Columbia County, White Springs Road
Conductivity
micromohms
800
700
600
500
400
300
200
100
0
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 24


Columbia County, White Springs Road
Radium
pCi/l
24
22
20
18
16
14
12
10
8
6
4
2
0
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6

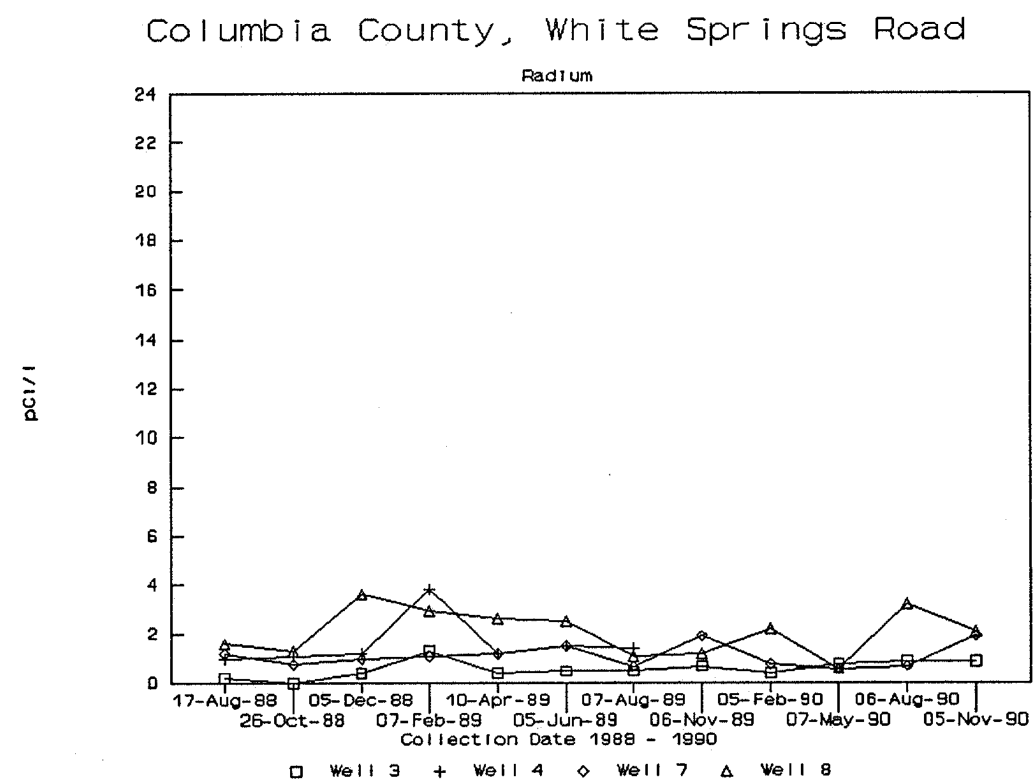
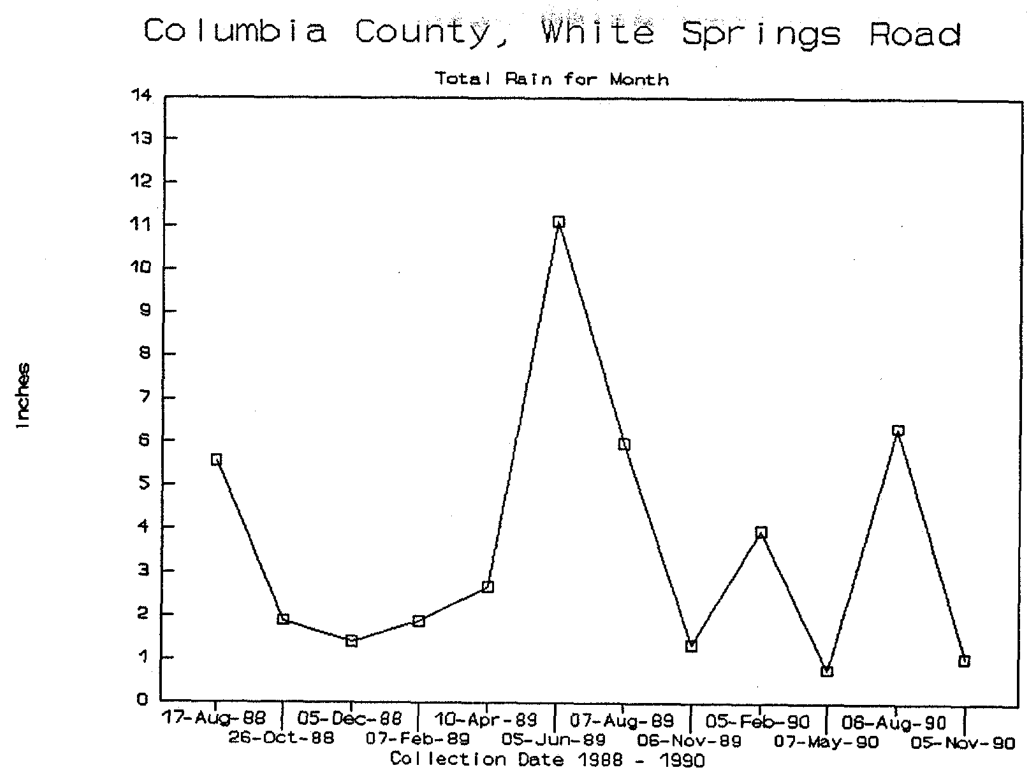
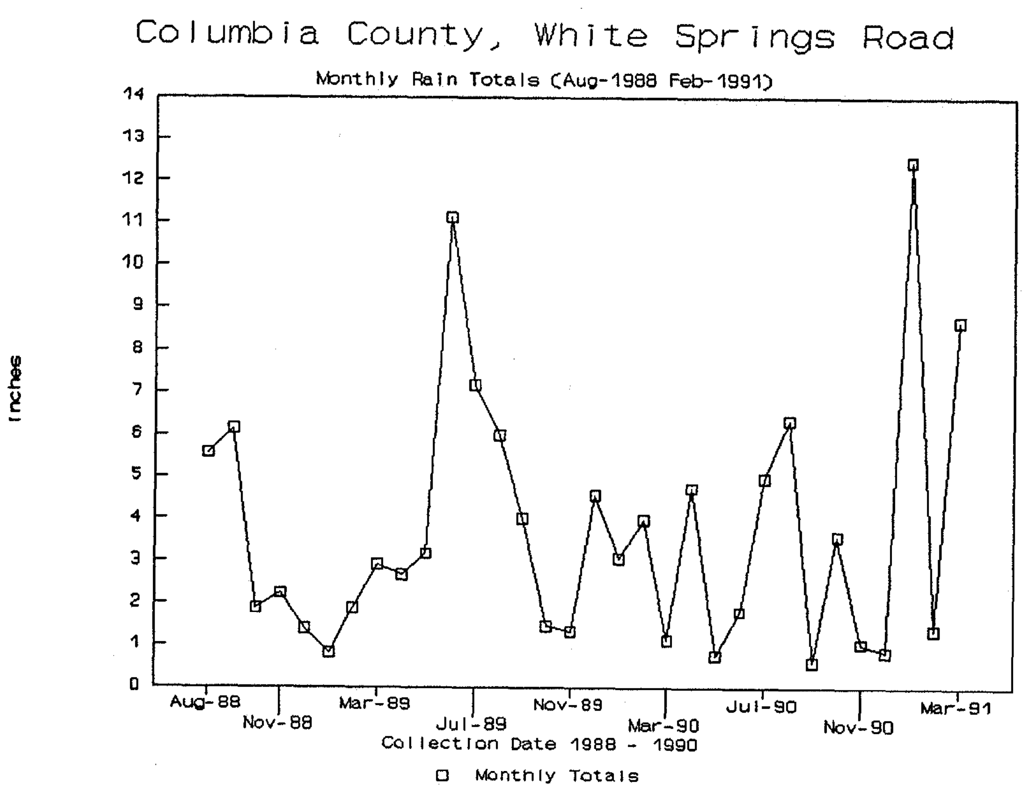

Columbia County, White Springs Road
Radium
pCi/l
24
22
20
18
16
14
12
10
8
6
4
2
0
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 25

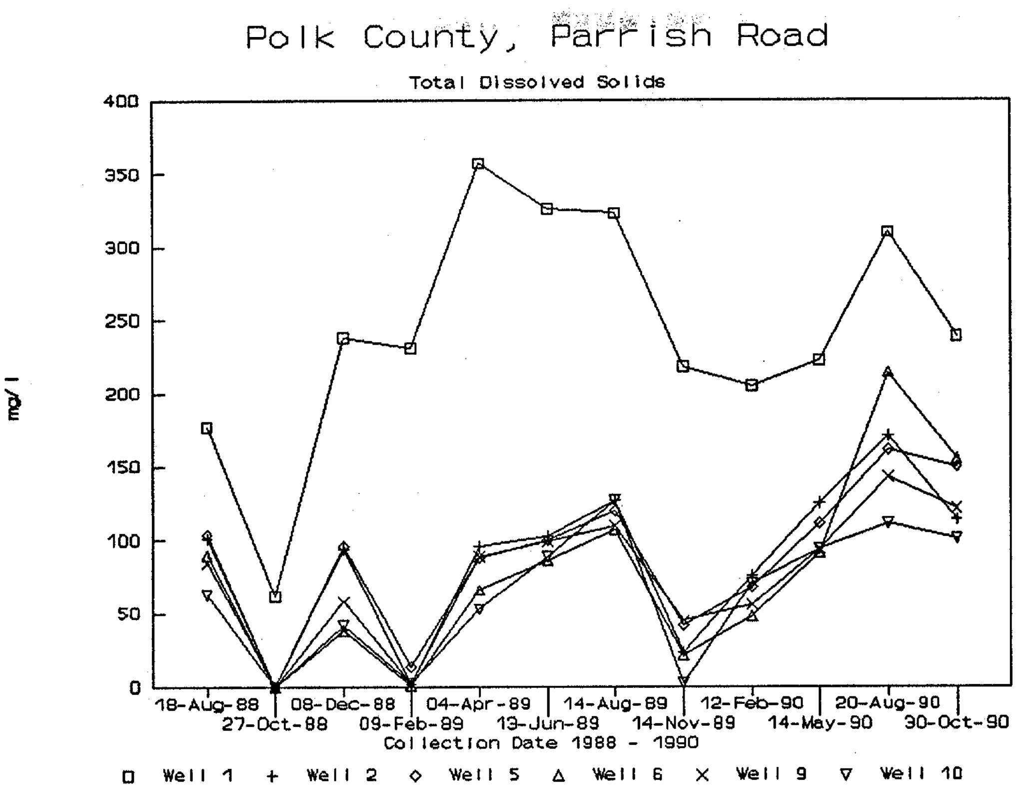


Columbia County, White Springs Road
Total Rain for Month
Inches
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
17-Aug-88
26-Oct-88
05-Dec-88
07-Feb-89
10-Apr-89
05-Jun-89
07-Aug-89
06-Nov-89
05-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Date 1988 - 1990

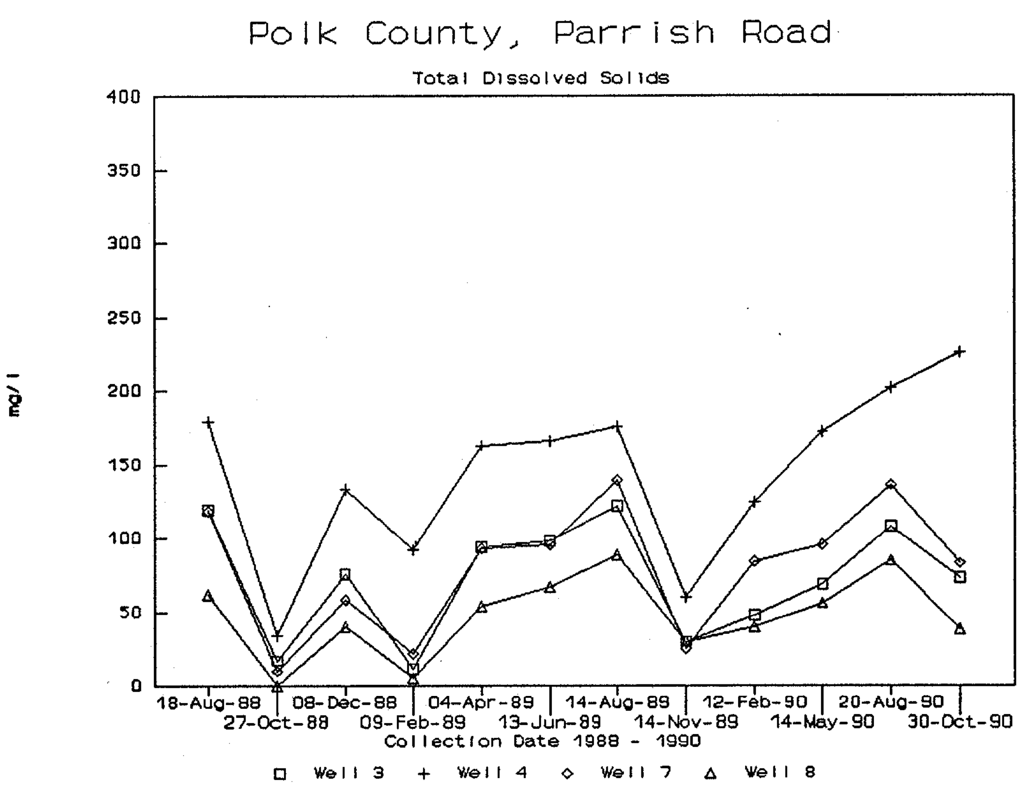


Columbia County, White Springs Road
Monthly Rain Totals (Aug-1988 Feb-1991)
Inches
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
Aug-88
Nov-88
Mar-89
Jul-89
Nov-89
Mar-90
Jul-90
Nov-90
Mar-91
Collection Date 1988 - 1990
Monthly Totals

Figure 26

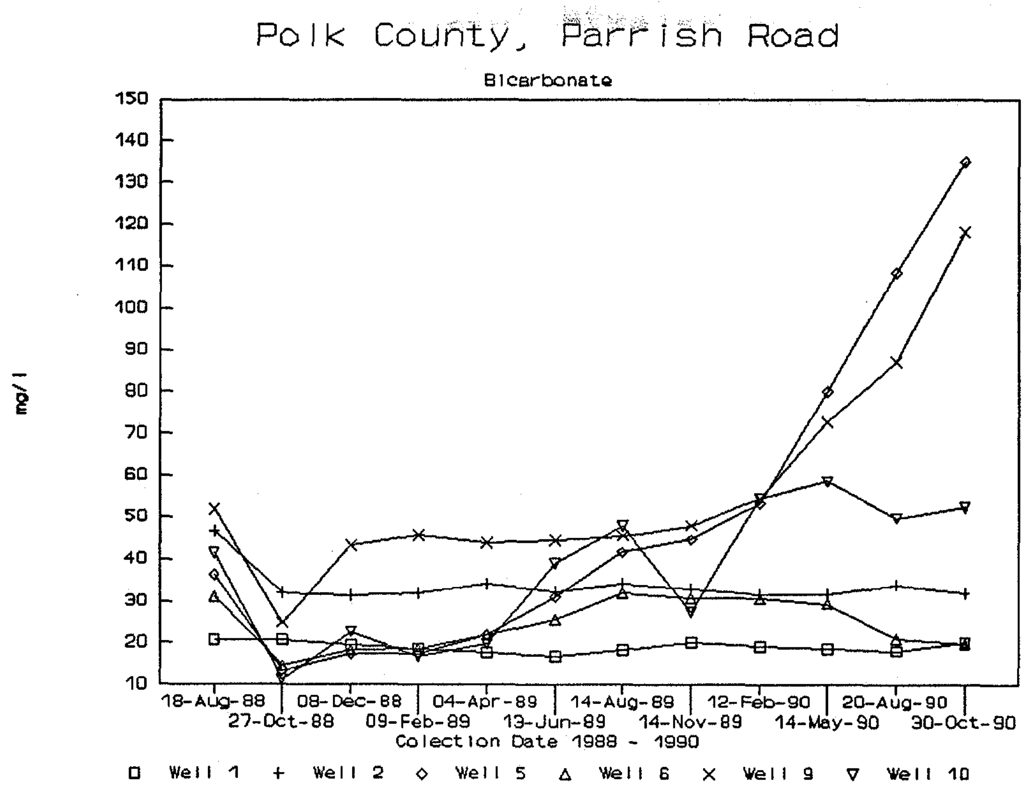


Polk County, Parrish Road
Total Dissolved Solids
mg/l
400
350
300
250
200
150
100
50
0
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6
Well 9
Well 10

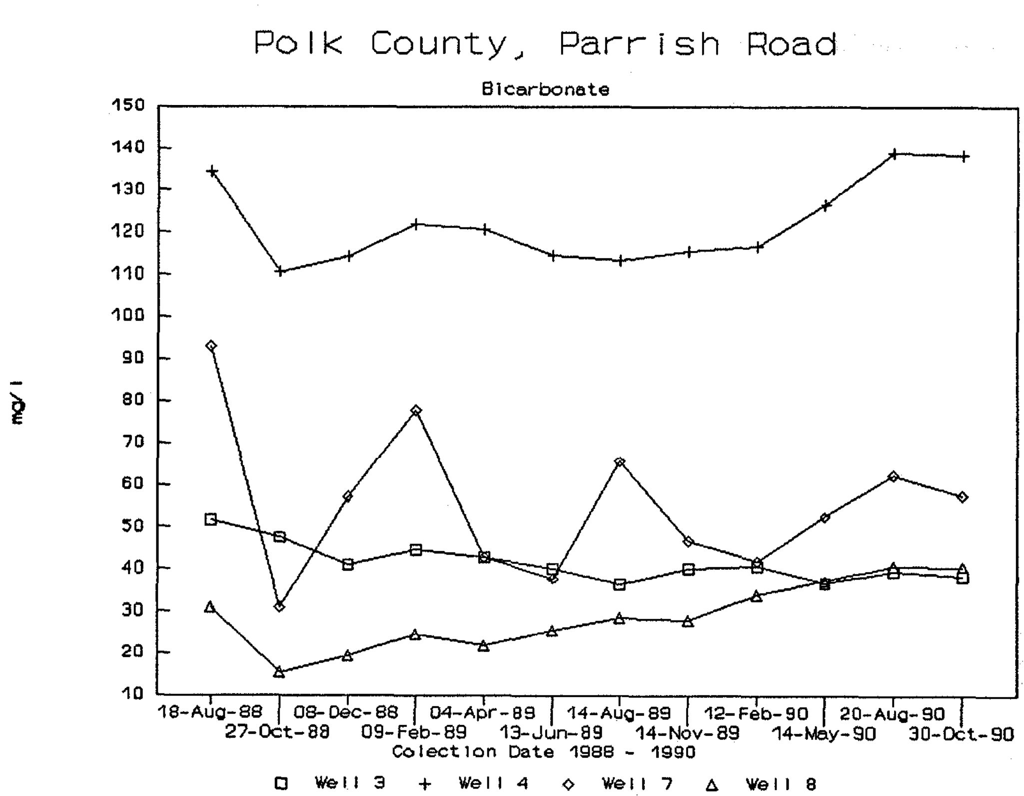


Polk County, Parrish Road
Total Dissolved Solids
mg/l
400
350
300
250
200
150
100
50
0
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 27

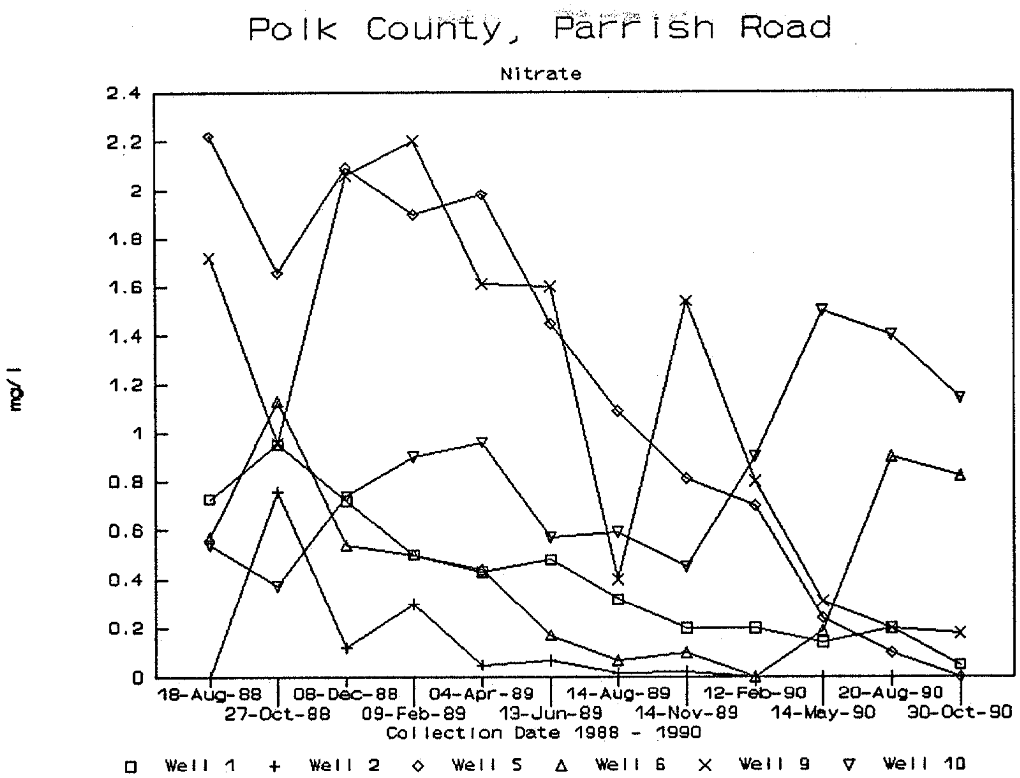


Polk County, Parrish Road
Bicarbonate
mg/l
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Colection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6
Well 9
Well 10



Polk County, Parrish Road
Bicarbonate
mg/l
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Colection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 28


Polk County, Parrish Road
Nitrate
mg/l
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6
Well 9
Well 10

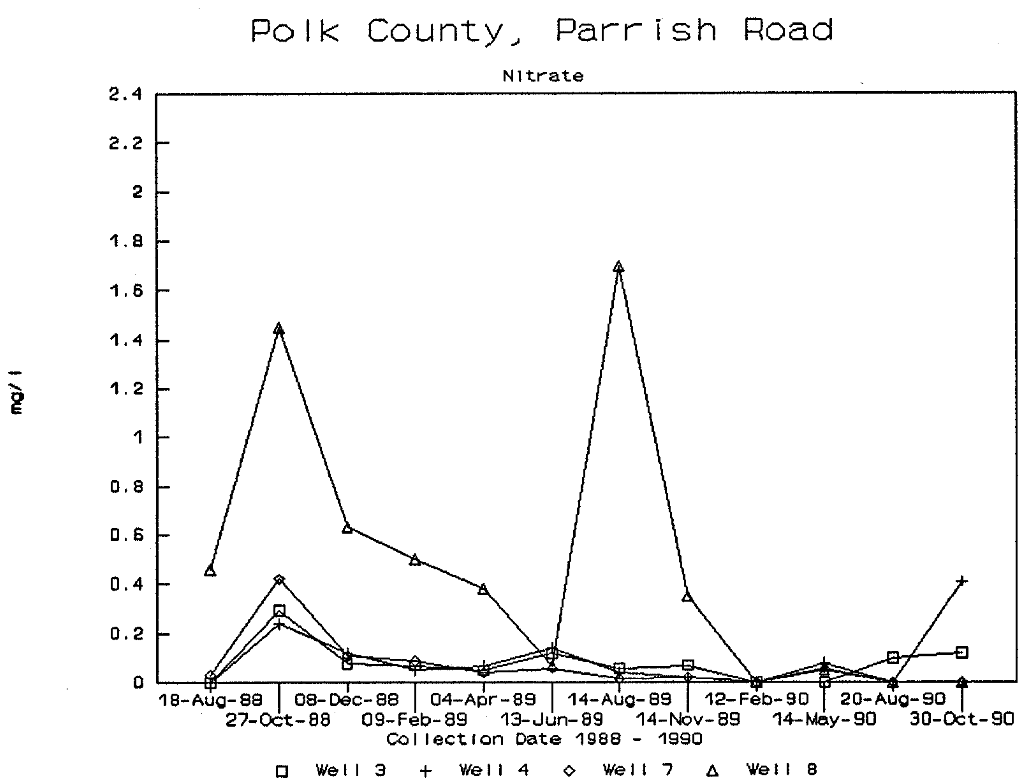
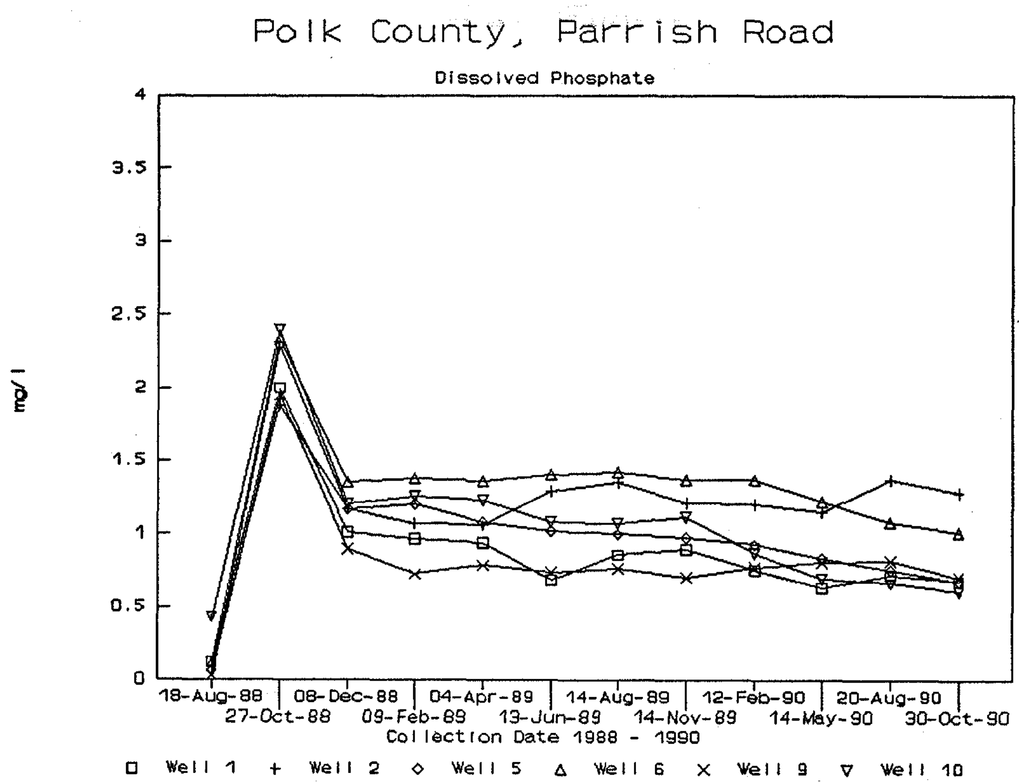

Polk County, Parrish Road
Nitrate
mg/l
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 29


Polk County, Parrish Road
Dissolved Phosphate
mg/l
4
3.5
3
2.5
2
1.5
1
0.5
0
18-Aug-88
08-Dec-88
04-Apr-89
14-Aug-89
12-Feb-90
20-Aug-90
27-Oct-88
09-Feb-89
13-Jun-89
14-Nov-89
14-May-90
30-Oct-90
Collection Date 1988 - 1990
□ Well 1 + Well 2 ◇ Well 5 Δ Well 6 X Well 9 ∇ Well 10

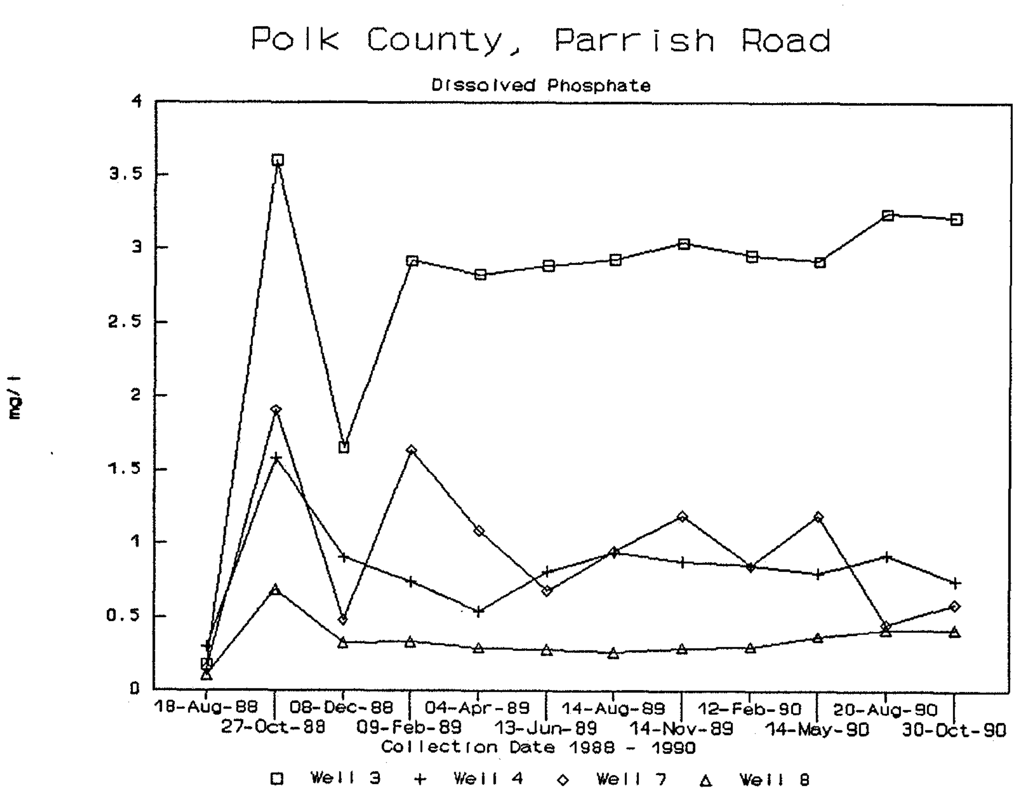
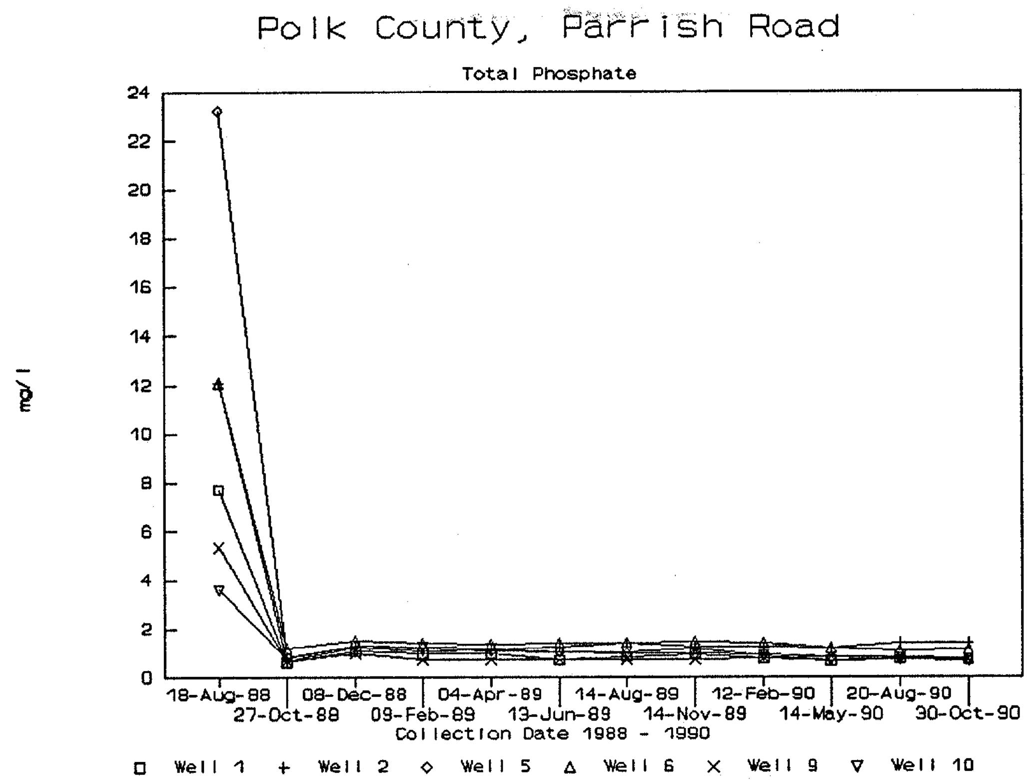

Polk County, Parrish Road
Dissolved Phosphate
mg/l
4
3.5
3
2.5
2
1.5
1
0.5
0
18-Aug-88
08-Dec-88
04-Apr-89
14-Aug-89
12-Feb-90
20-Aug-90
27-Oct-88
09-Feb-89
13-Jun-89
14-Nov-89
14-May-90
30-Oct-90
Collection Date 1988 - 1990
□ Well 3 + Well 4 ◇ Well 7 Δ Well 8

Figure 30


Polk County, Parrish Road
Total Phosphate
mg/l
0
2
4
6
8
10
12
14
16
18
20
22
24
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6
Well 9
Well 10

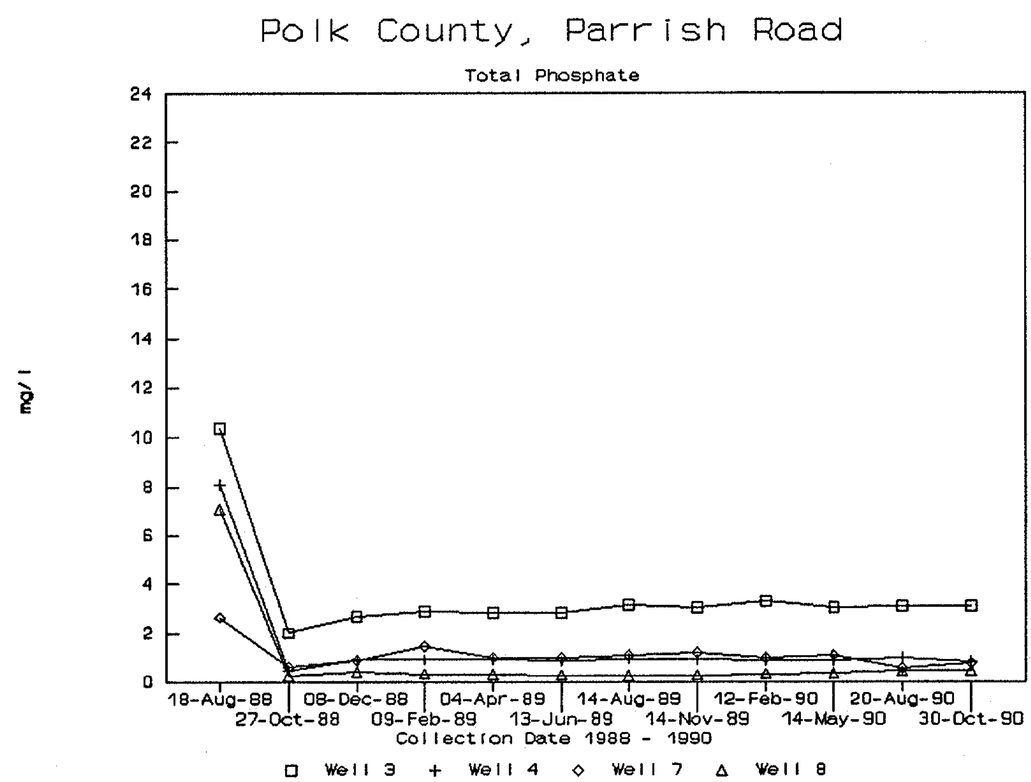
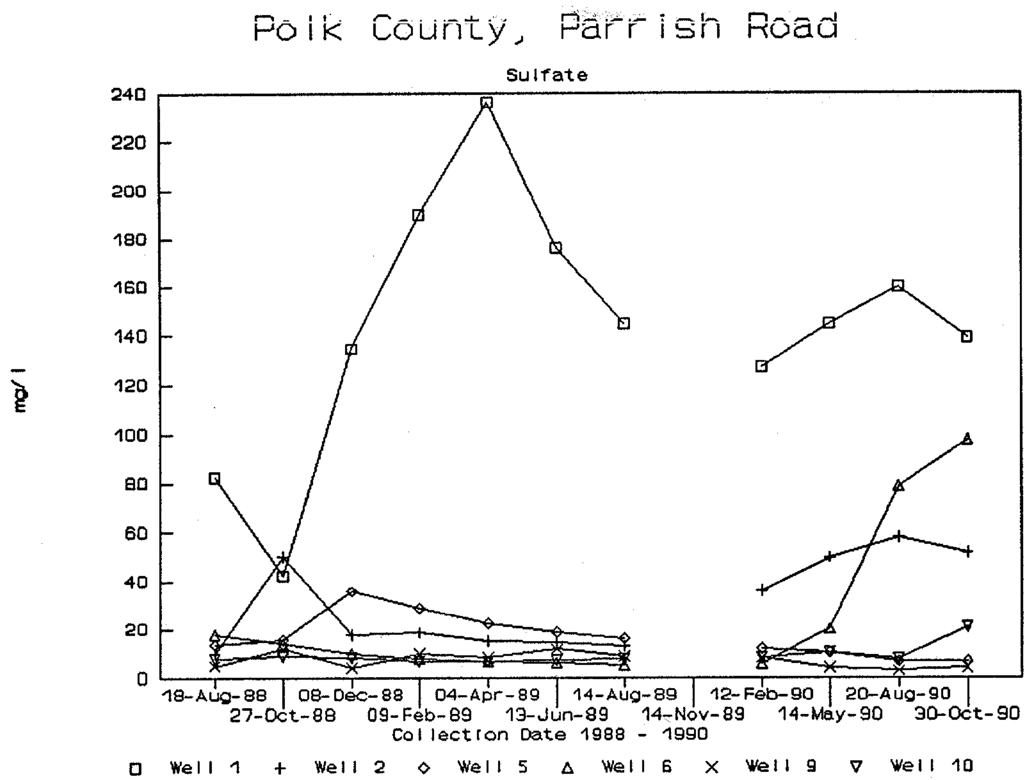

Polk County, Parrish Road
Total Phosphate
mg/l
0
2
4
6
8
10
12
14
16
18
20
22
24
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 31


Polk County, Parrish Road
Sulfate
mg/l
240
220
200
180
160
140
120
100
80
60
40
20
0
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6
Well 9
Well 10

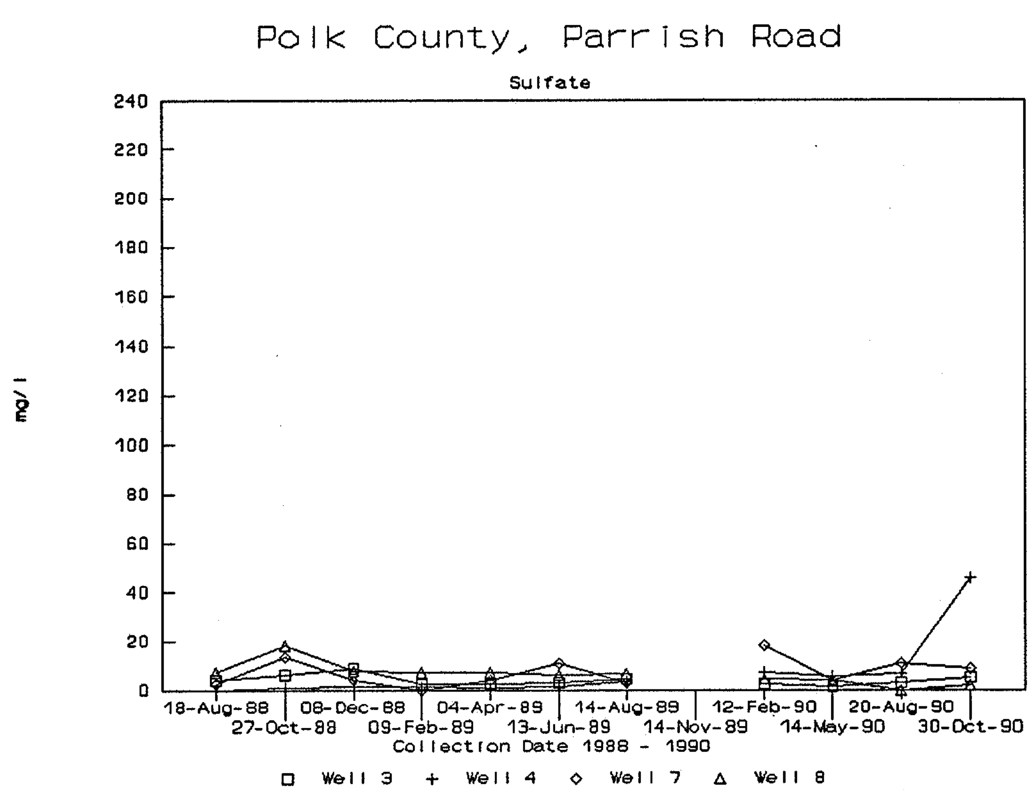
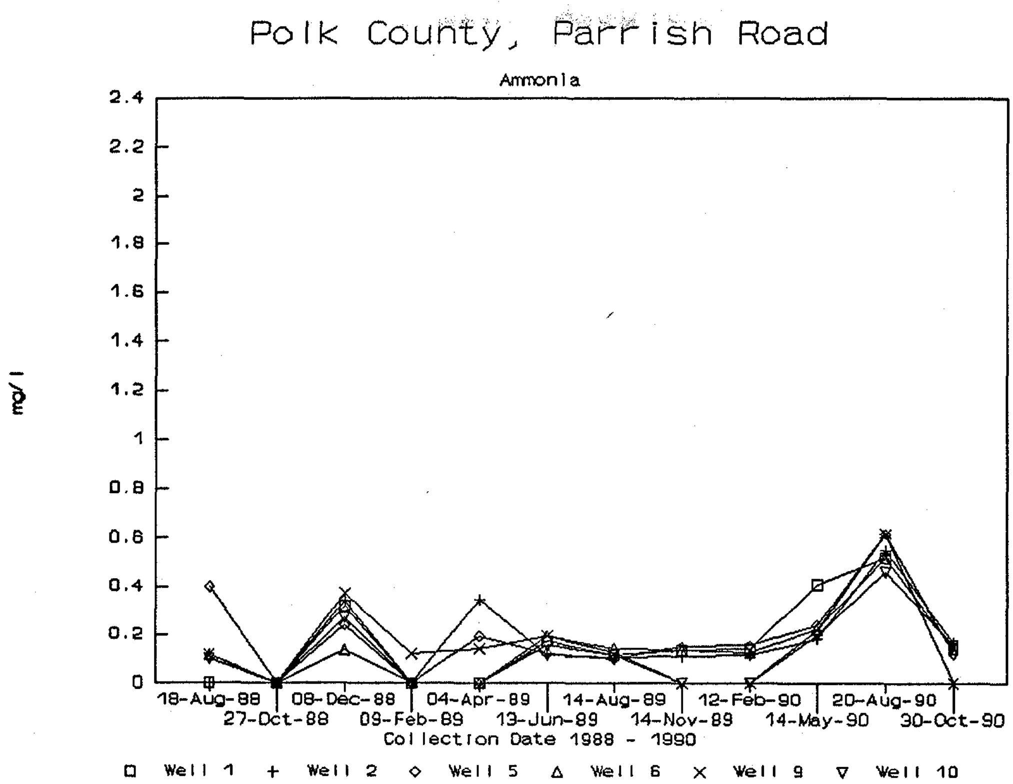

Polk County, Parrish Road
Sulfate
mg/l
240
220
200
180
160
140
120
100
80
60
40
20
0
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 32


Polk County, Parrish Road
Ammonia
mg/l
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6
Well 9
Well 10

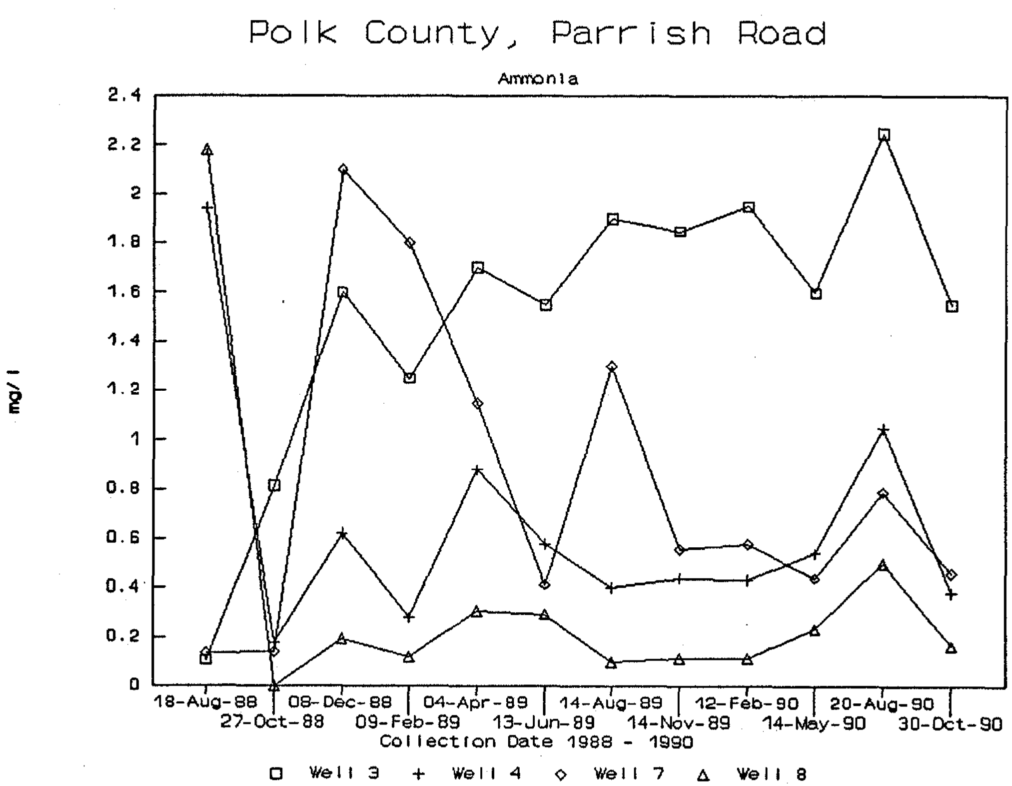
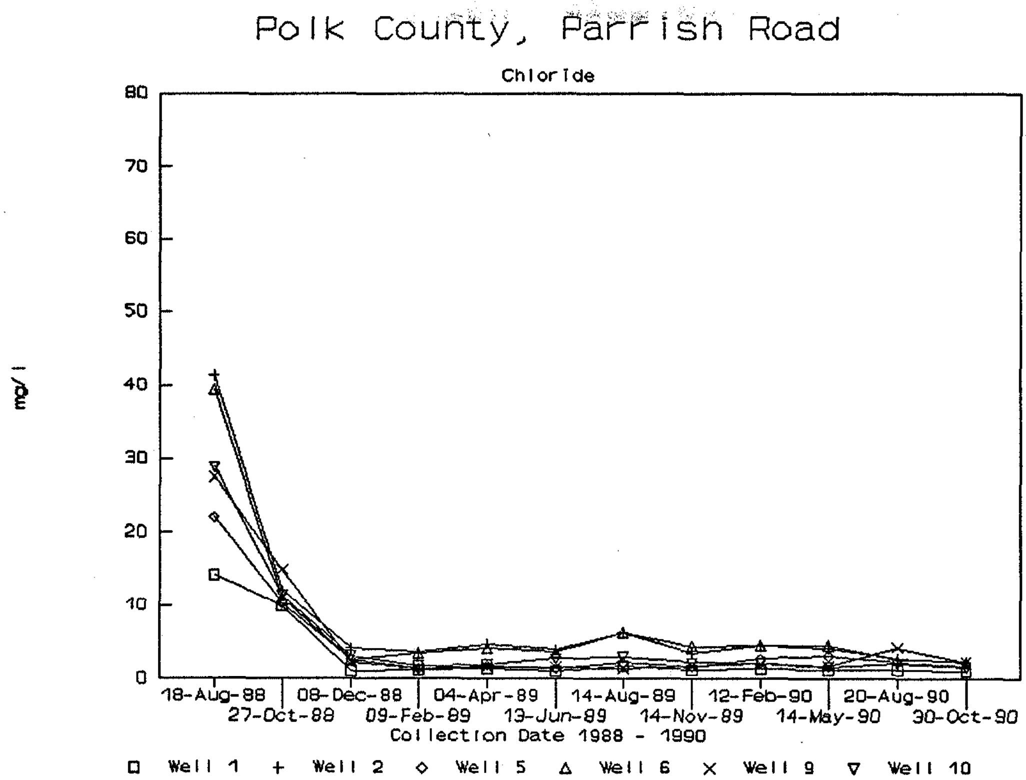

Polk County, Parrish Road
Ammonia
mg/l
2.4
2.2
2
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 33


Polk County, Parrish Road
Chloride
mg/l
80
70
60
50
40
30
20
10
0
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6
Well 9
Well 10

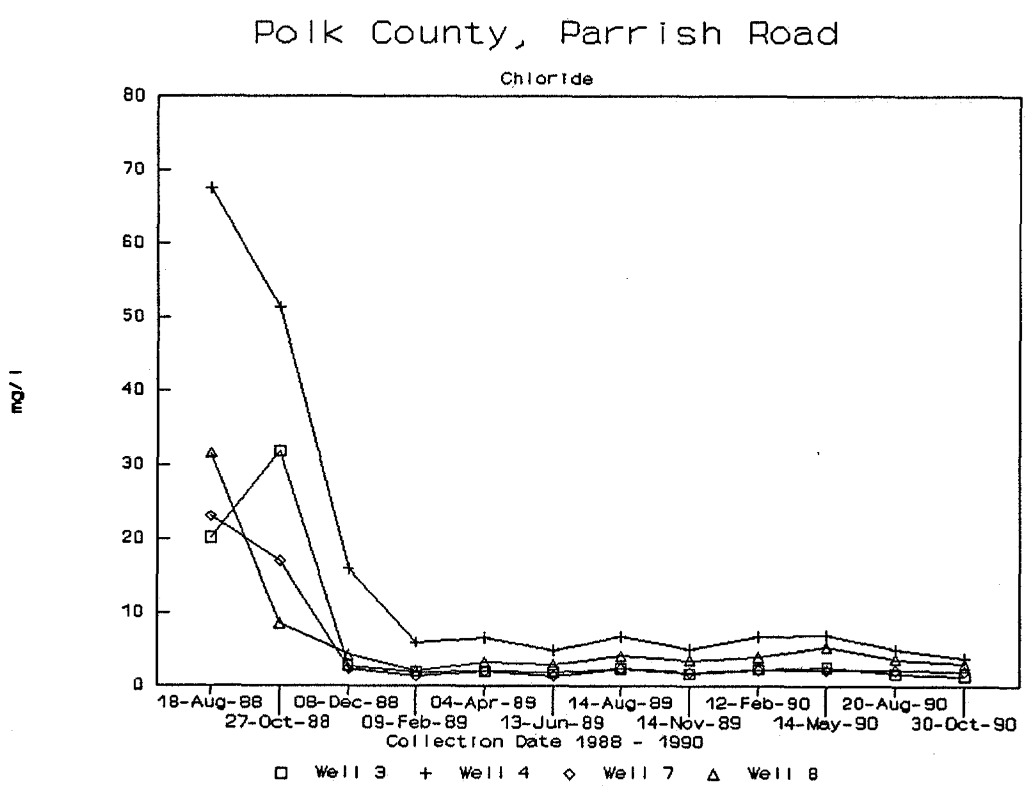
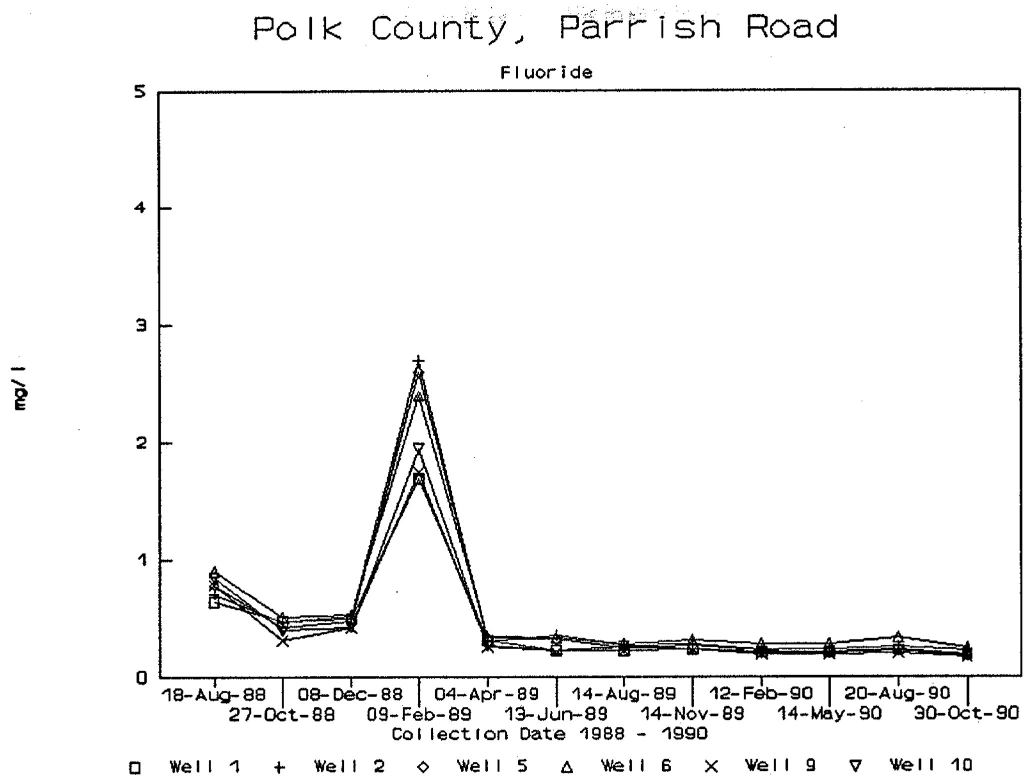

Polk County, Parrish Road
Chloride
mg/l
80
70
60
50
40
30
20
10
0
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 34


Polk County, Parrish Road
Fluoride
mg/l
0
1
2
3
4
5
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
□ Well 1 + Well 2 ◇ Well 5 △ Well 6 × Well 9 ▽ Well 10

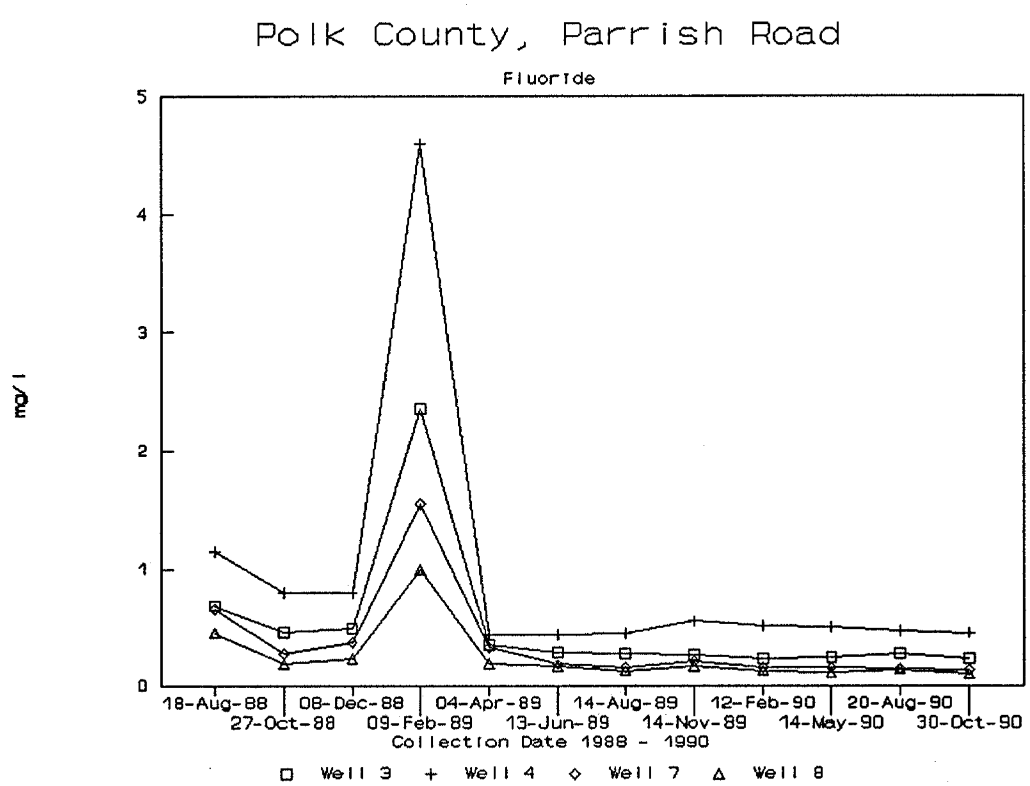
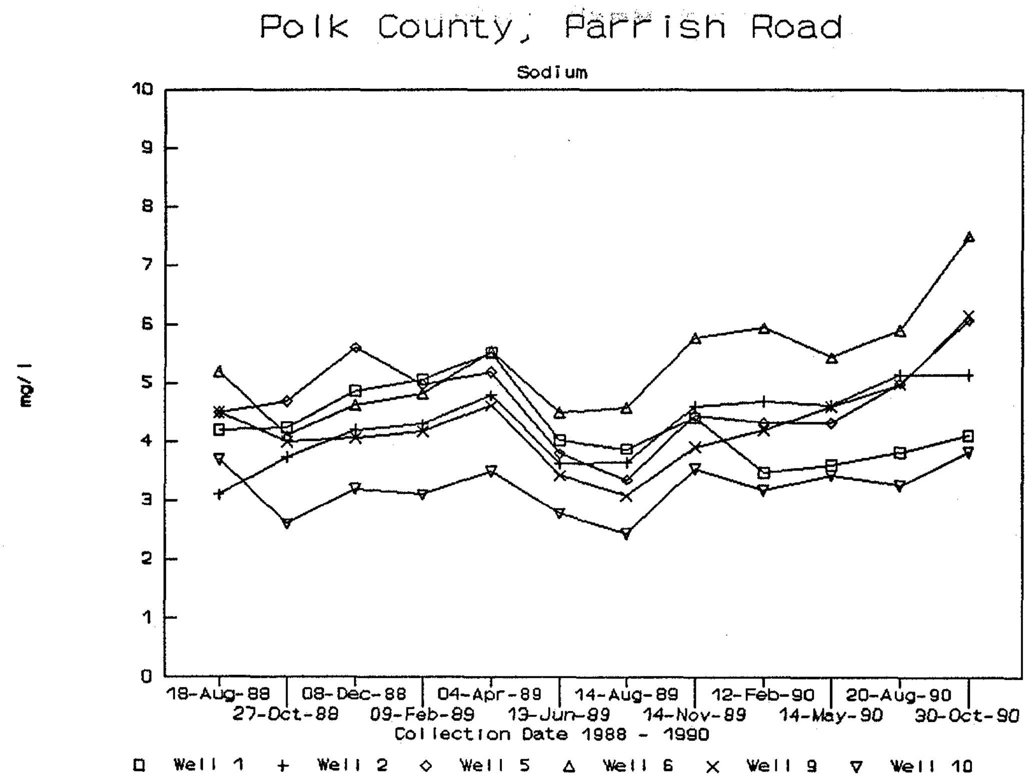
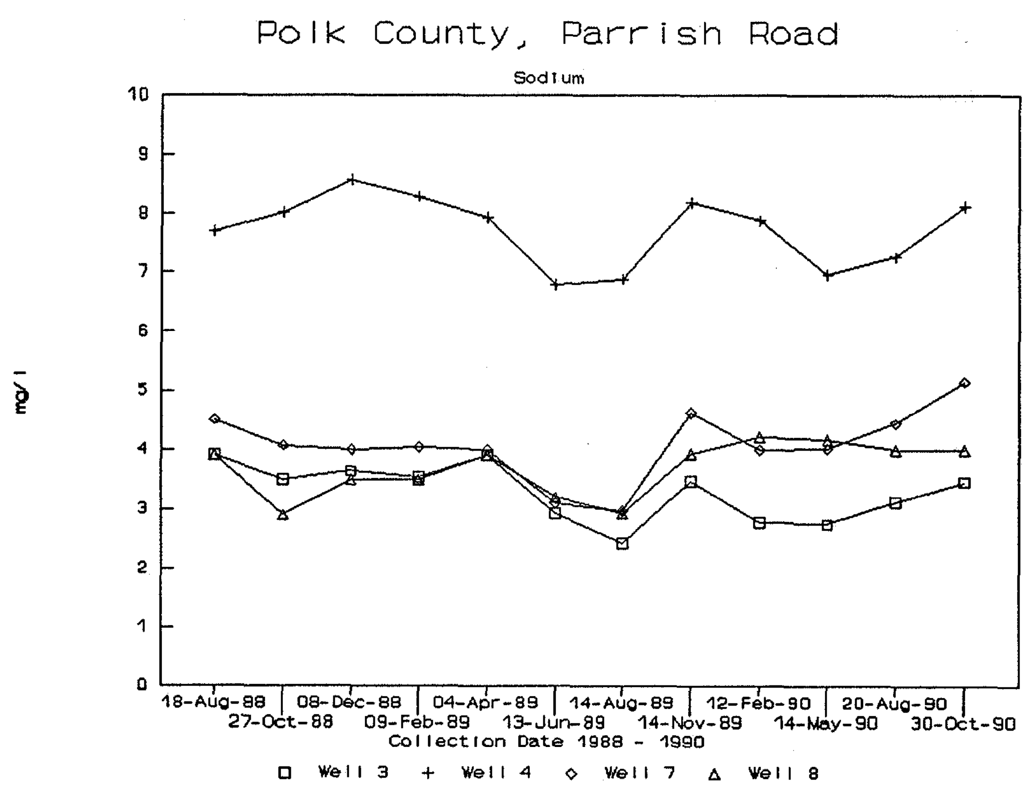

Polk County, Parrish Road
Fluoride
mg/l
0
1
2
3
4
5
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
□ Well 3 + Well 4 ◇ Well 7 △ Well 8

Figure 35

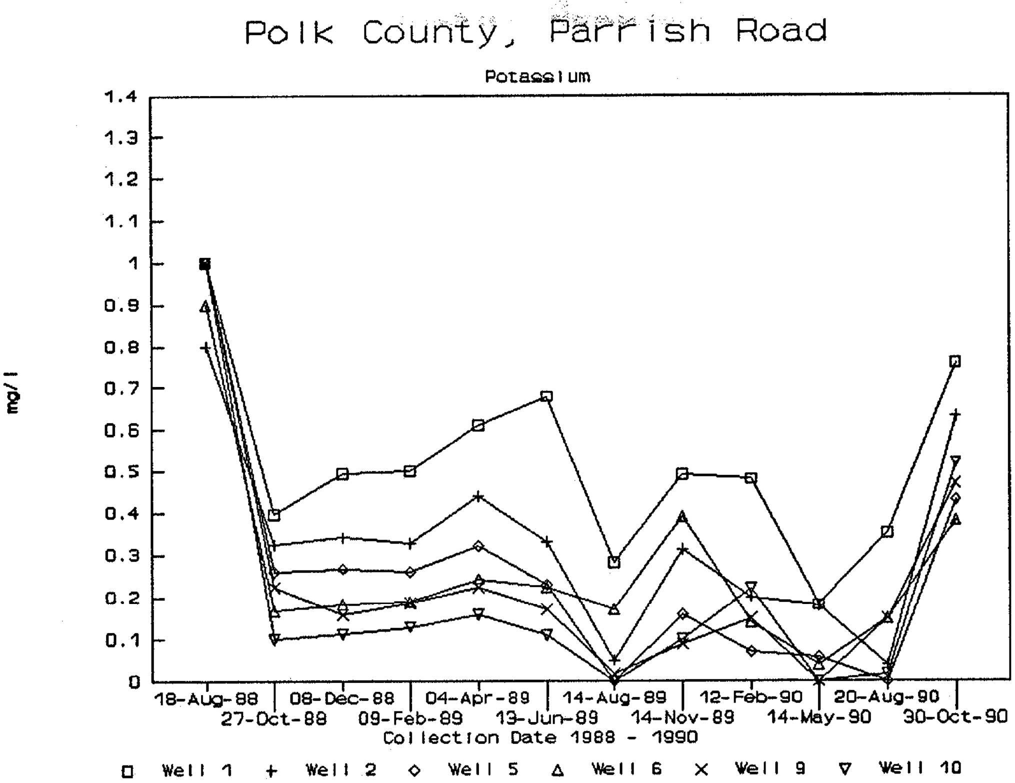


Polk County, Parrish Road
Sodium
mg/l
0
1
2
3
4
5
6
7
8
9
10
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6
Well 9
Well 10



Polk County, Parrish Road
Sodium
mg/l
0
1
2
3
4
5
6
7
8
9
10
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 36


Polk County, Parrish Road
Potassium
mg/l
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6
Well 9
Well 10

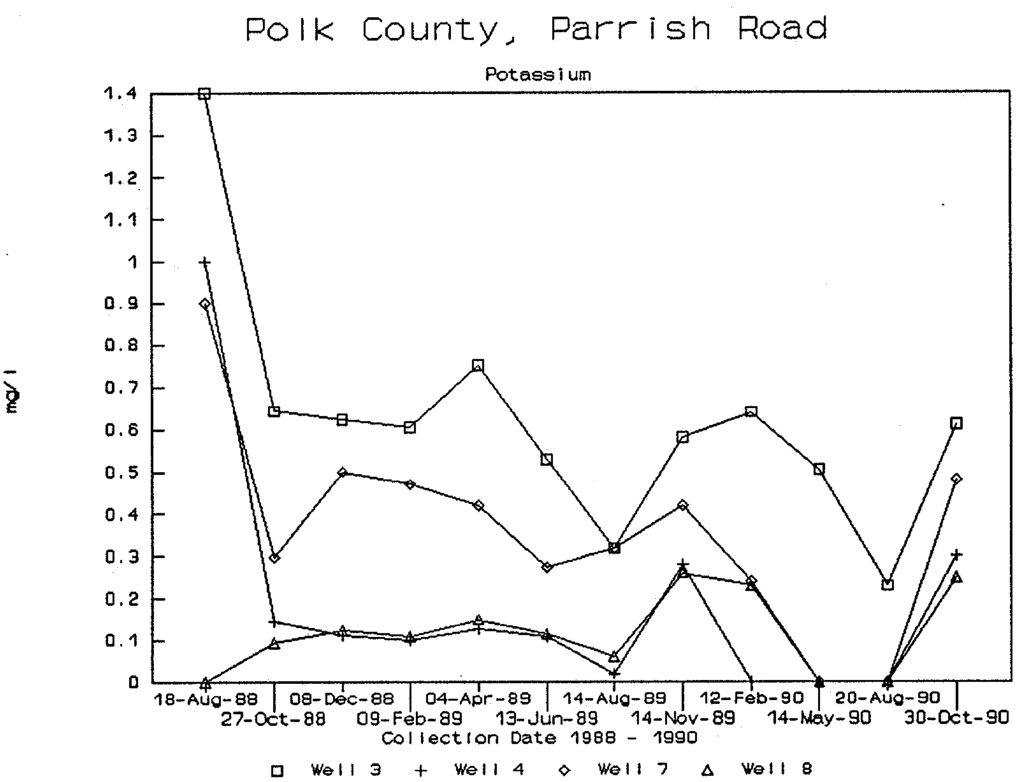
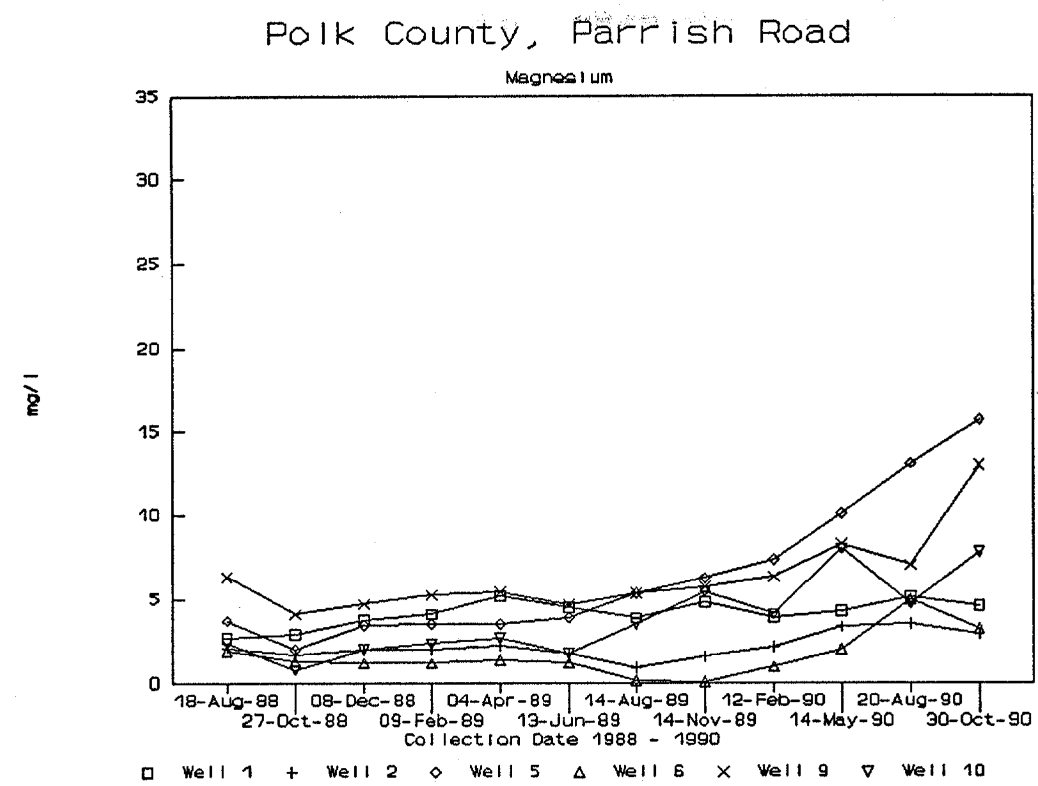

Polk County, Parrish Road
Potassium
mg/l
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 37


Polk County, Parrish Road
Magnesium
mg/l
35
30
25
20
15
10
5
0
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6
Well 9
Well 10

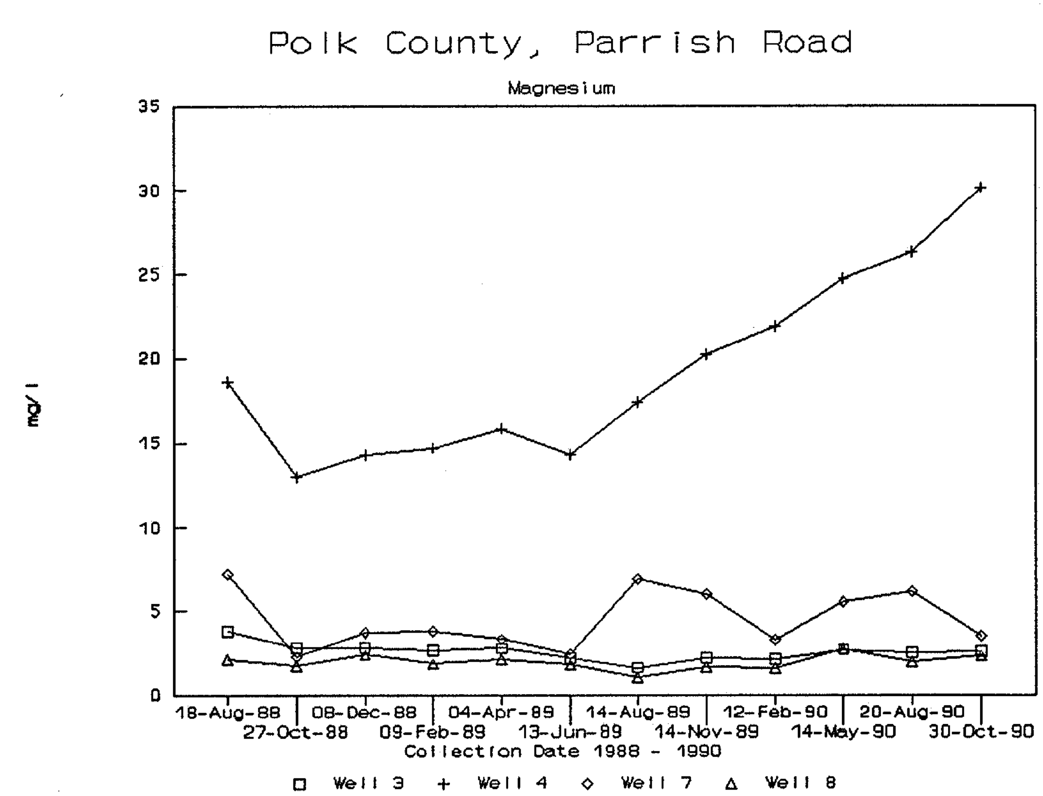
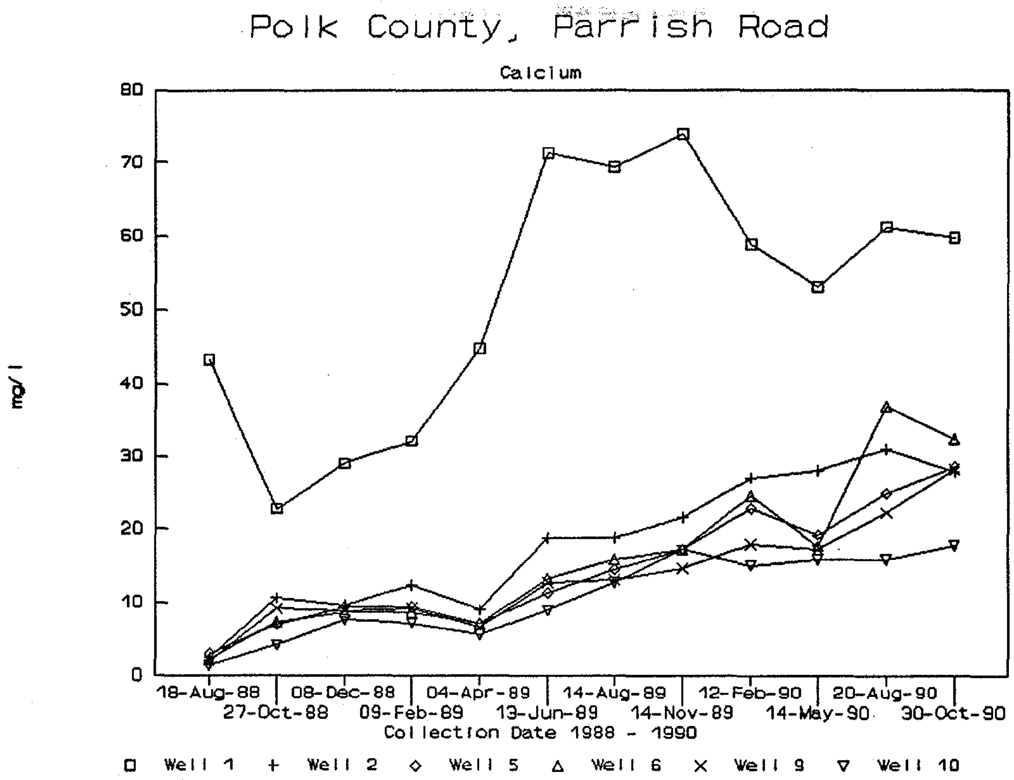

Polk County, Parrish Road
Magnesium
mg/l
35
30
25
20
15
10
5
0
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 38


Polk County, Parrish Road
Calcium
mg/l
0
10
20
30
40
50
60
70
80
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6
Well 9
Well 10

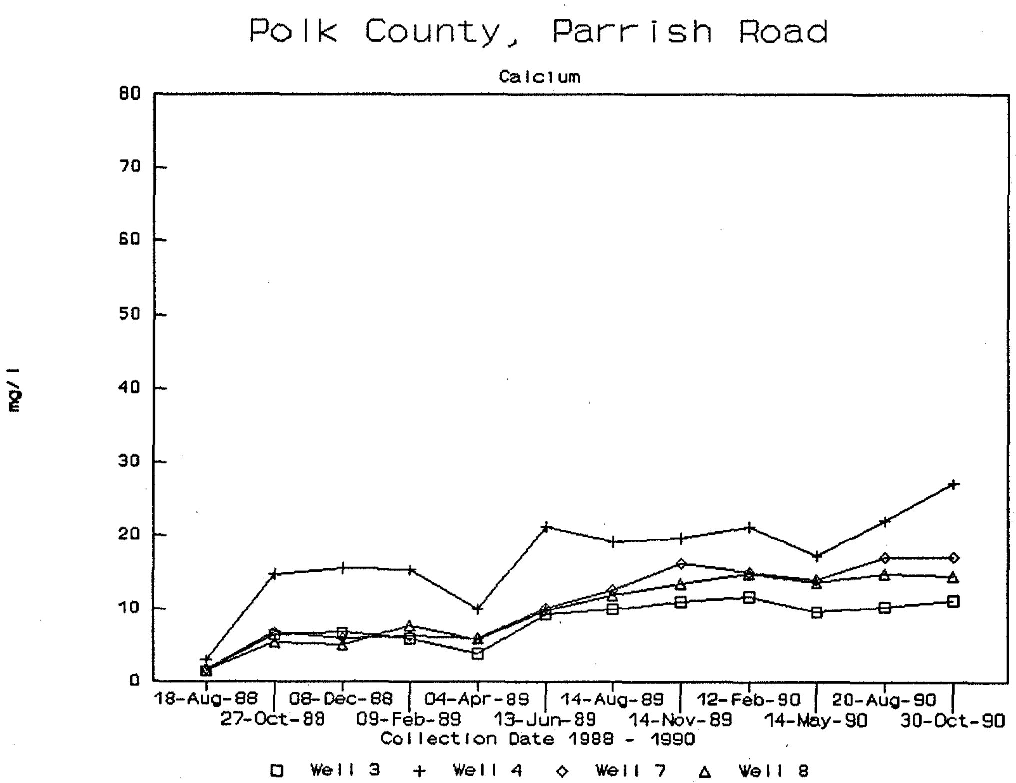
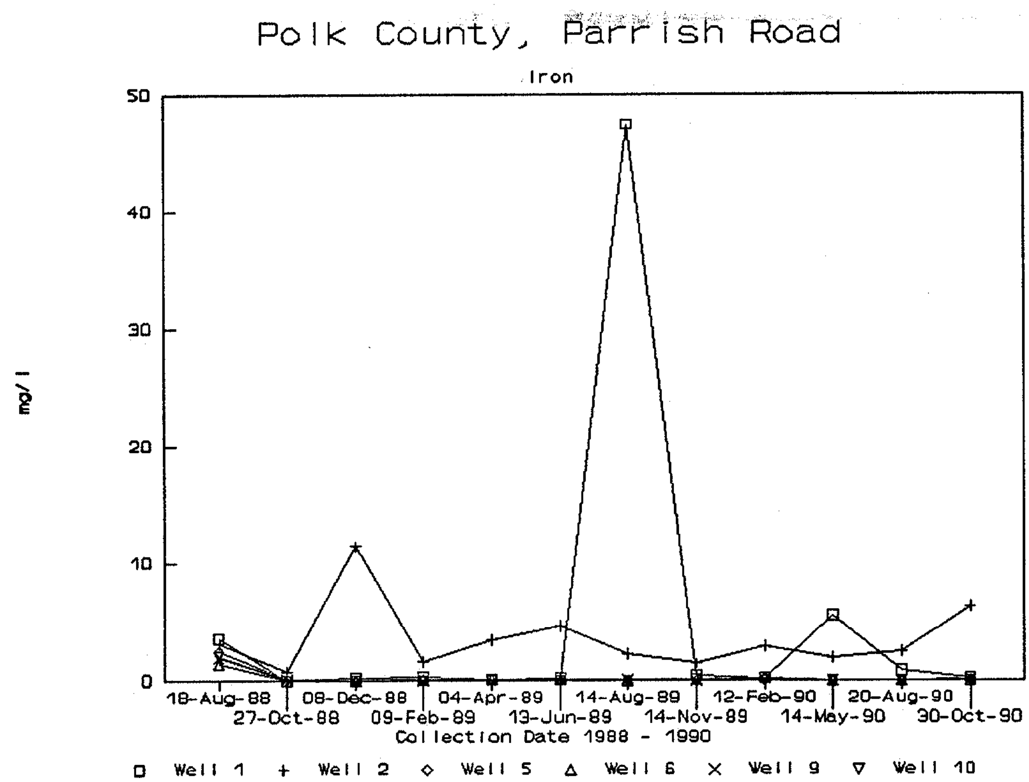

Polk County, Parrish Road
Calcium
mg/l
0
10
20
30
40
50
60
70
80
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 39


Polk County, Parrish Road
Iron
mg/l
50
40
30
20
10
0
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6
Well 9
Well 10

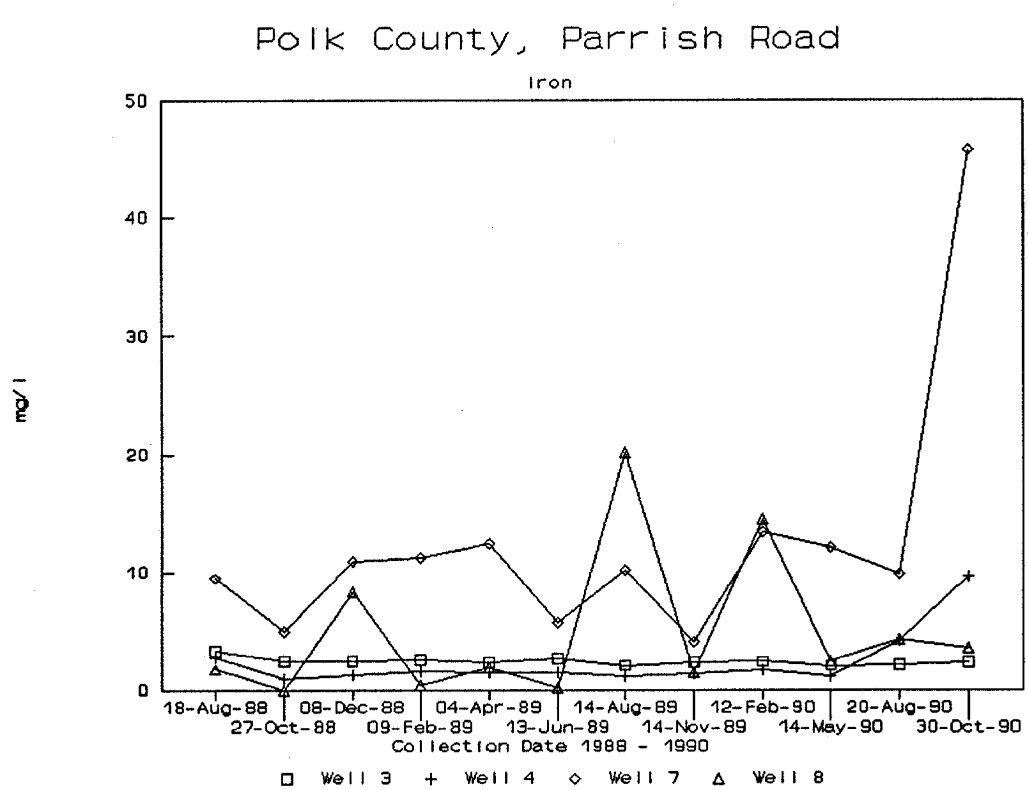
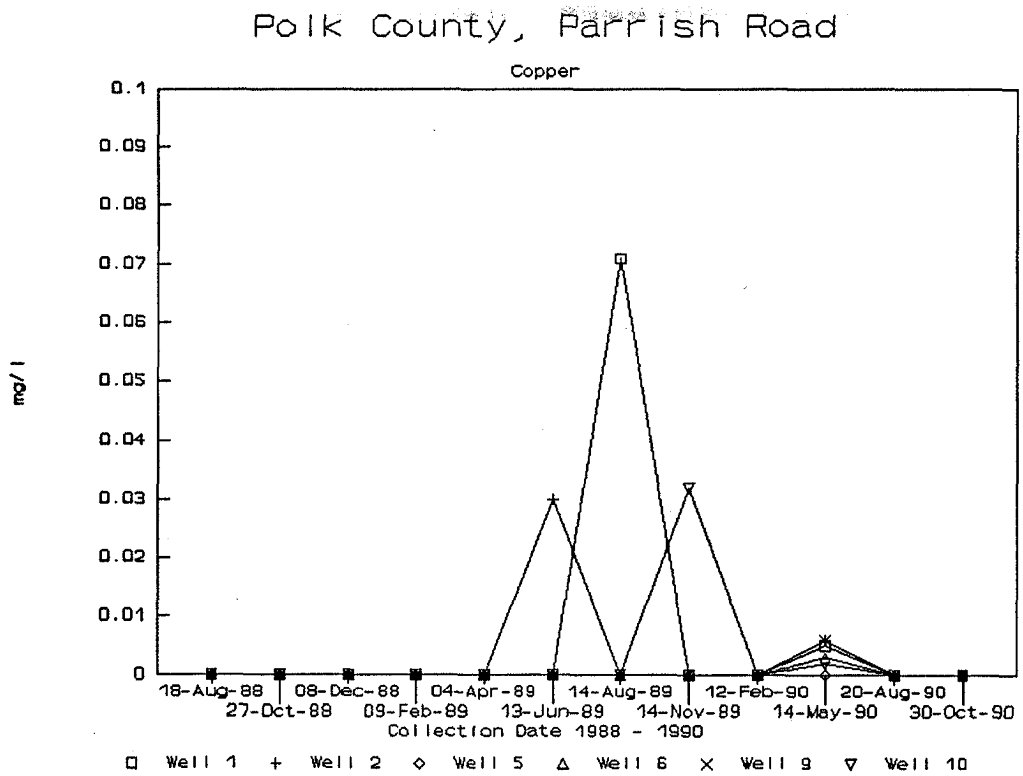
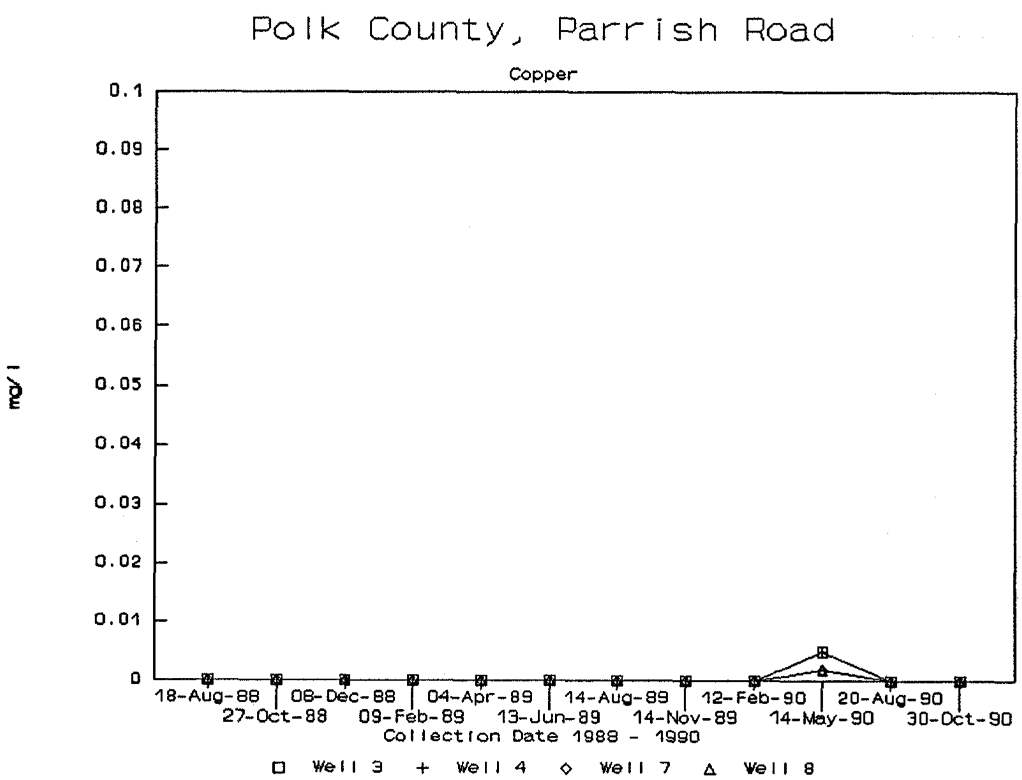

Polk County, Parrish Road
Iron
mg/l
50
40
30
20
10
0
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 40

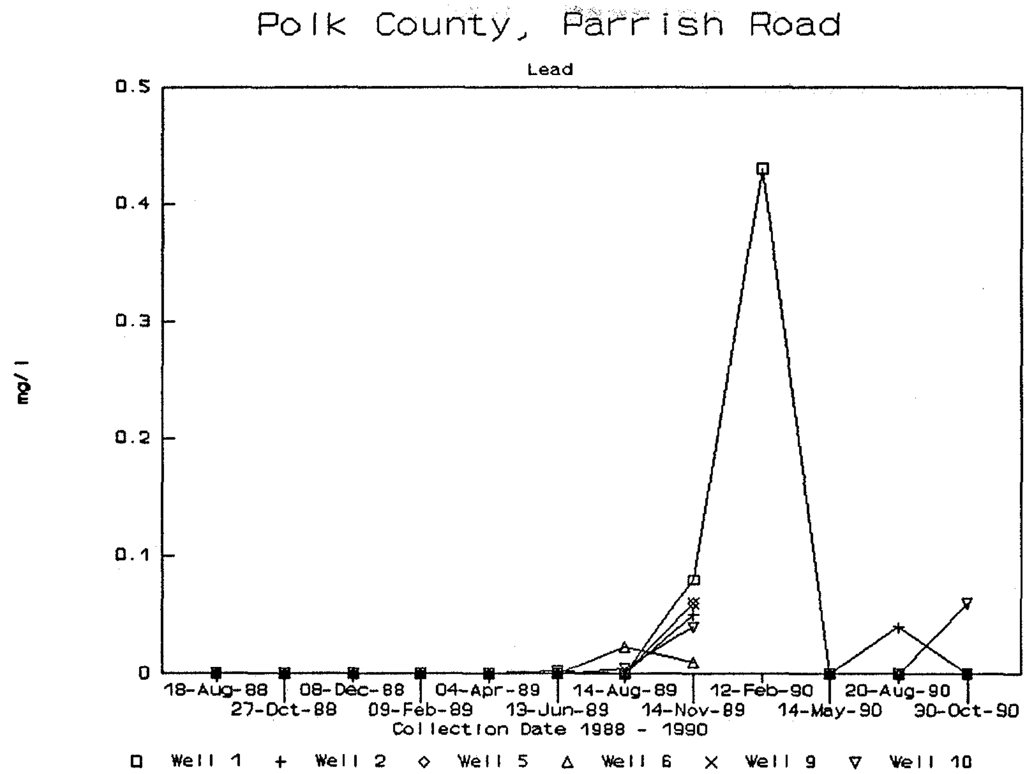


Polk County, Parrish Road
Copper
mg/l
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6
Well 9
Well 10



Polk County, Parrish Road
Copper
mg/l
0.1
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 41


Polk County, Parrish Road
Lead
mg/l
0.5
0.4
0.3
0.2
0.1
0
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6
Well 9
Well 10

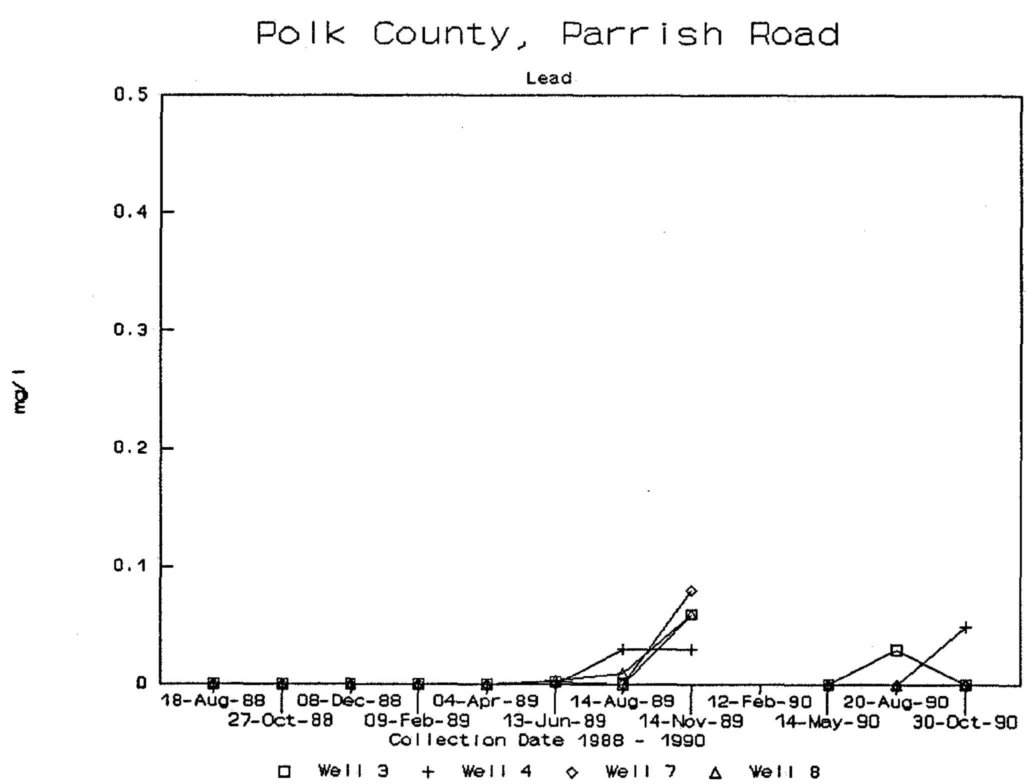
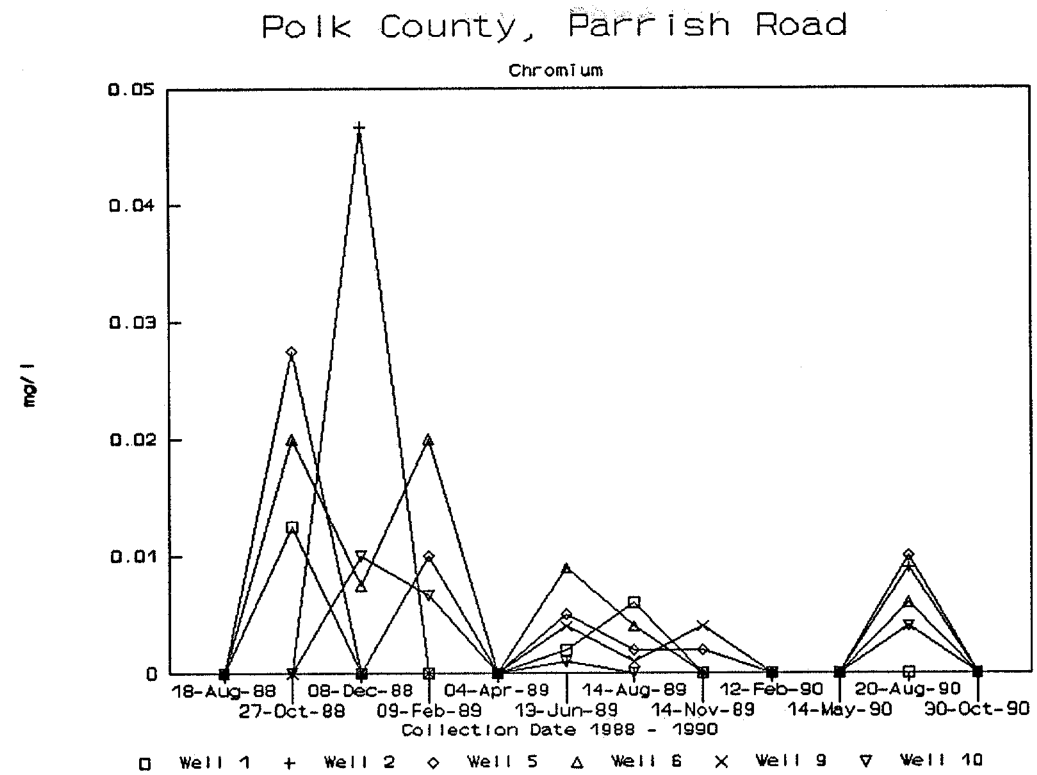

Polk County, Parrish Road
Lead
mg/l
0.5
0.4
0.3
0.2
0.1
0
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 42


Polk County, Parrish Road
Chromium
mg/l
0.05
0.04
0.03
0.02
0.01
0
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6
Well 9
Well 10

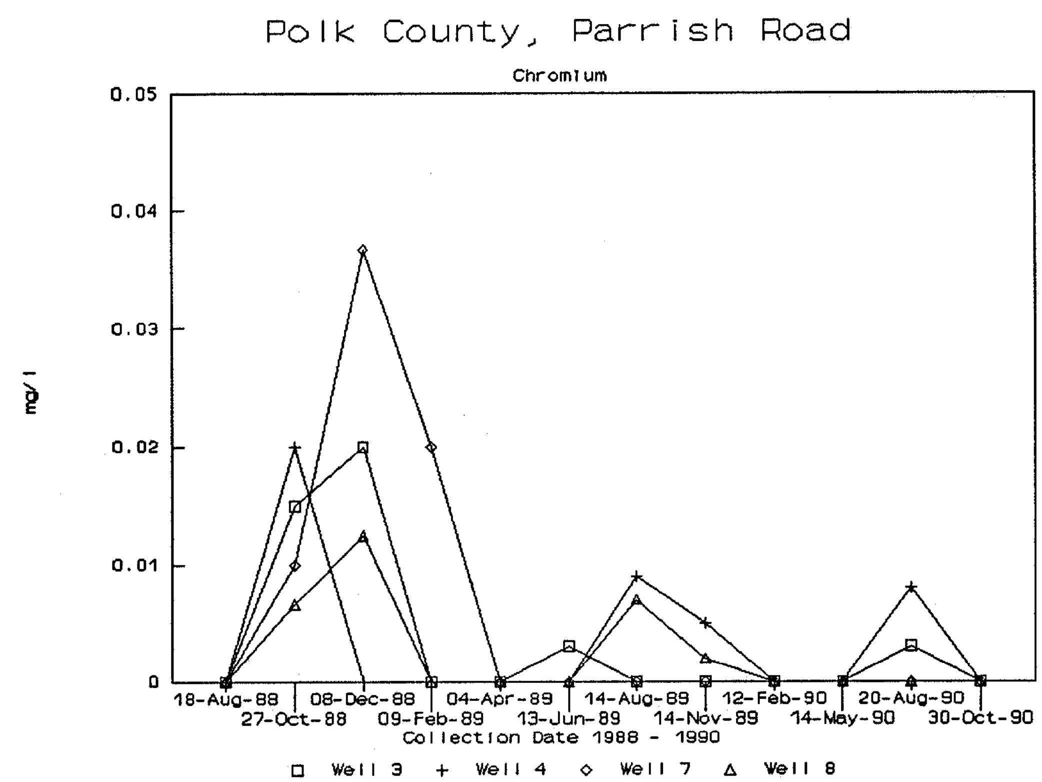
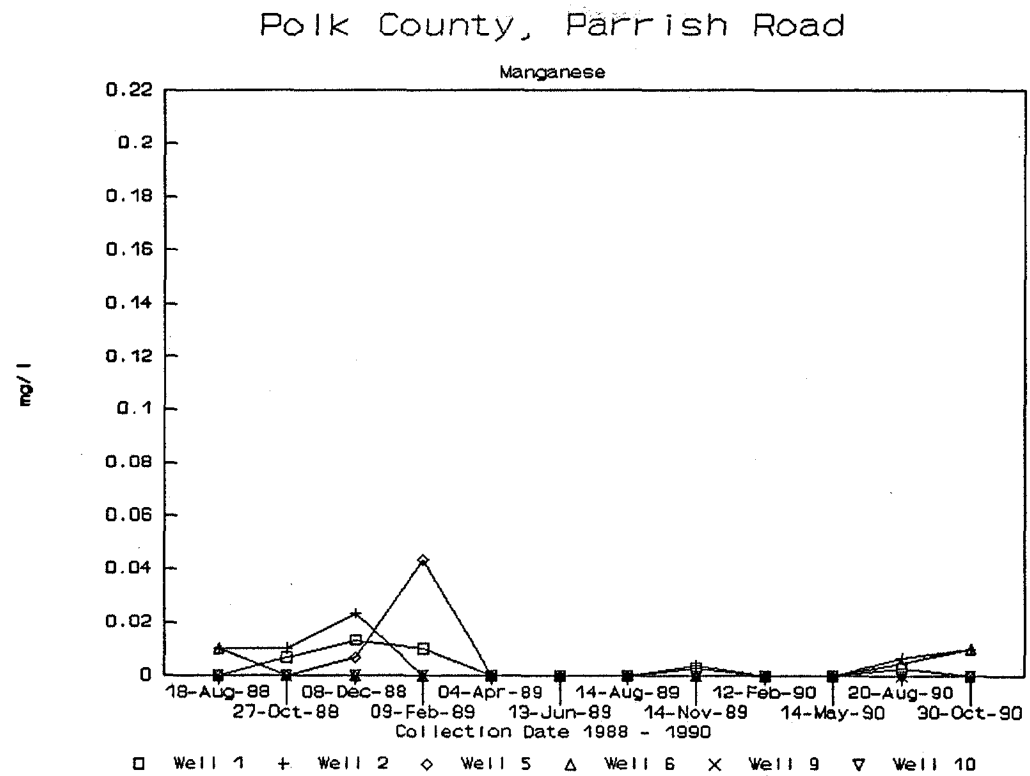
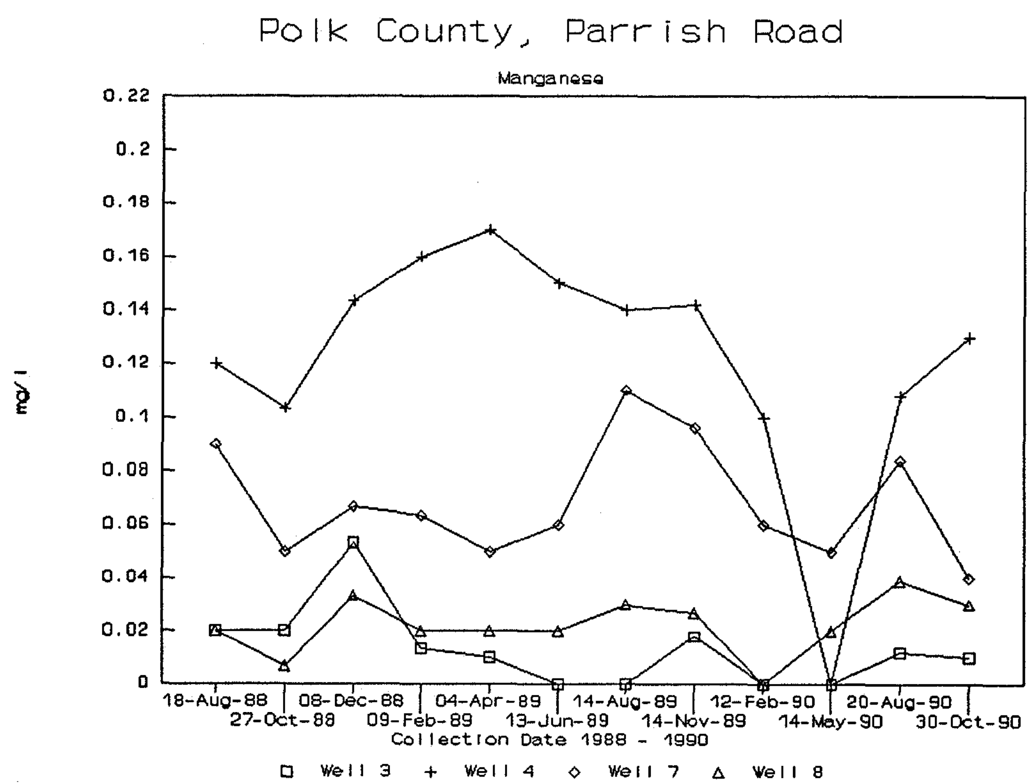

Polk County, Parrish Road
Chromium
mg/l
0.05
0.04
0.03
0.02
0.01
0
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 43

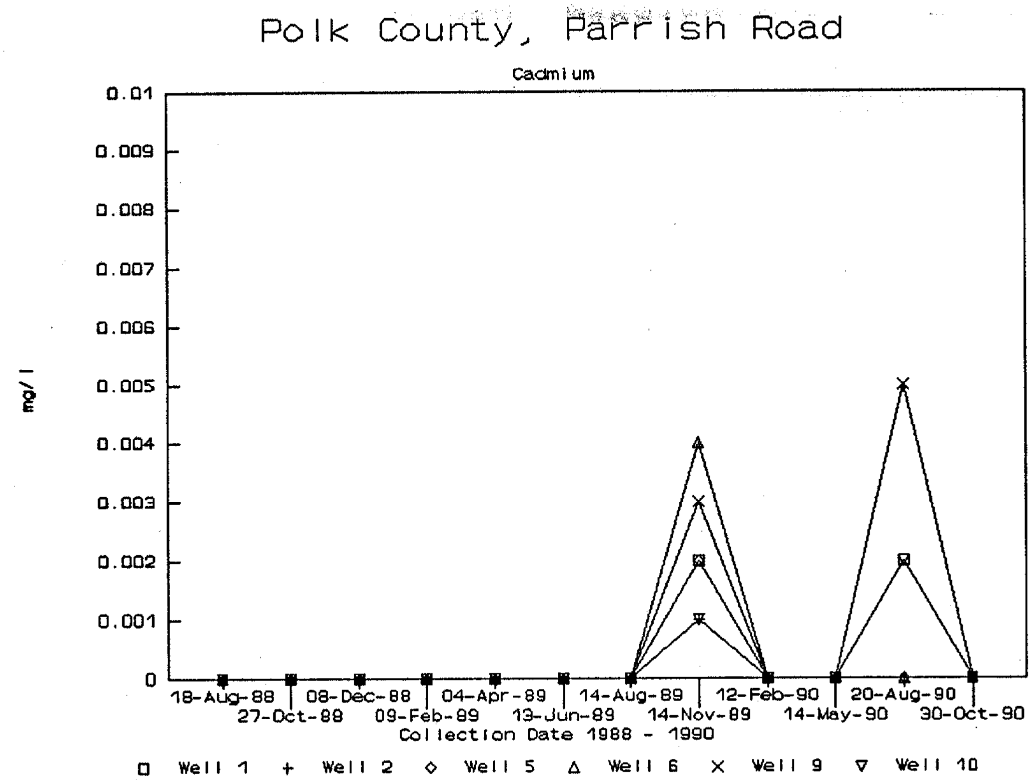


Polk County, Parrish Road
Manganese
mg/l
0.22
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6
Well 9
Well 10



Polk County, Parrish Road
Manganese
mg/l
0.22
0.2
0.18
0.16
0.14
0.12
0.1
0.08
0.06
0.04
0.02
0
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 44


Polk County, Parrish Road
Cadmium
mg/l
0.01
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6
Well 9
Well 10

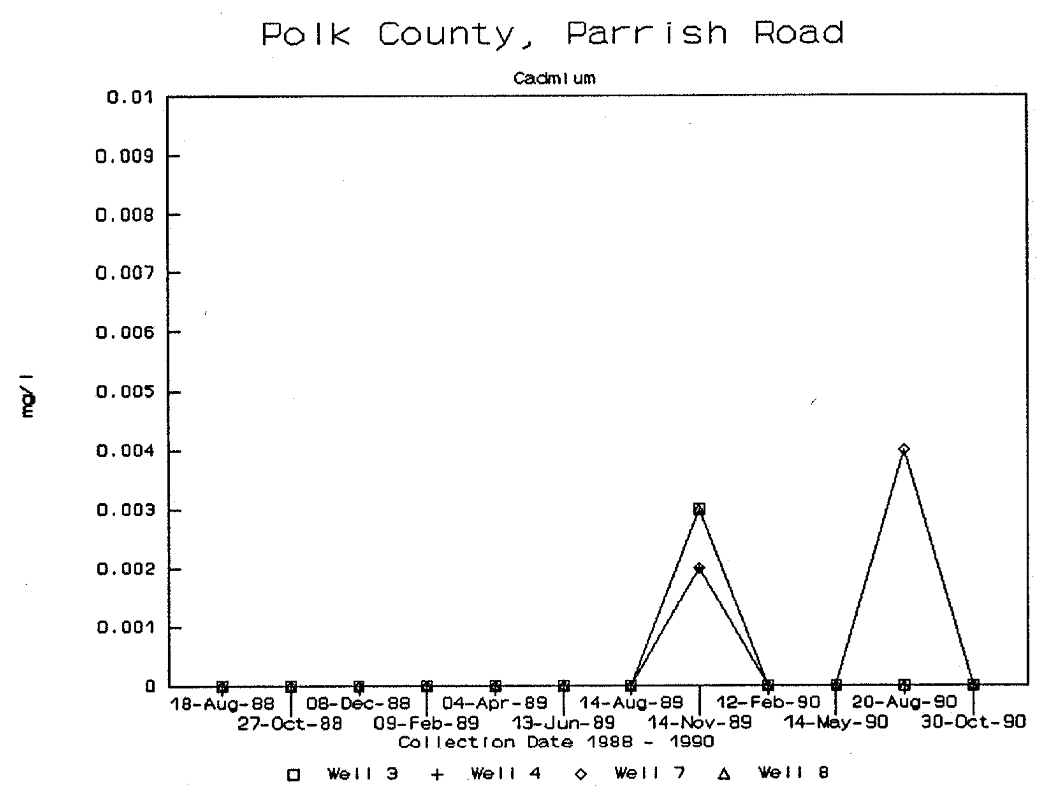
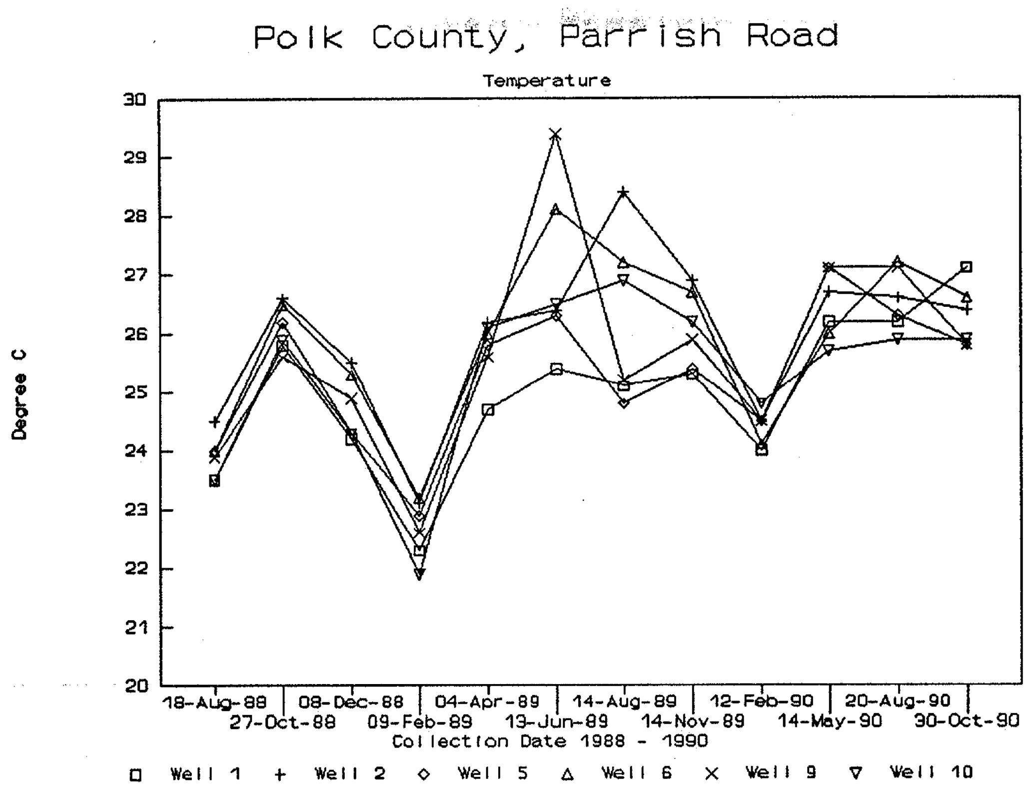

Polk County, Parrish Road
Cadmium
mg/l
0.01
0.009
0.008
0.007
0.006
0.005
0.004
0.003
0.002
0.001
0
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 45


Polk County, Parrish Road
Temperature
Degree C
30
29
28
27
26
25
24
23
22
21
20
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6
Well 9
Well 10

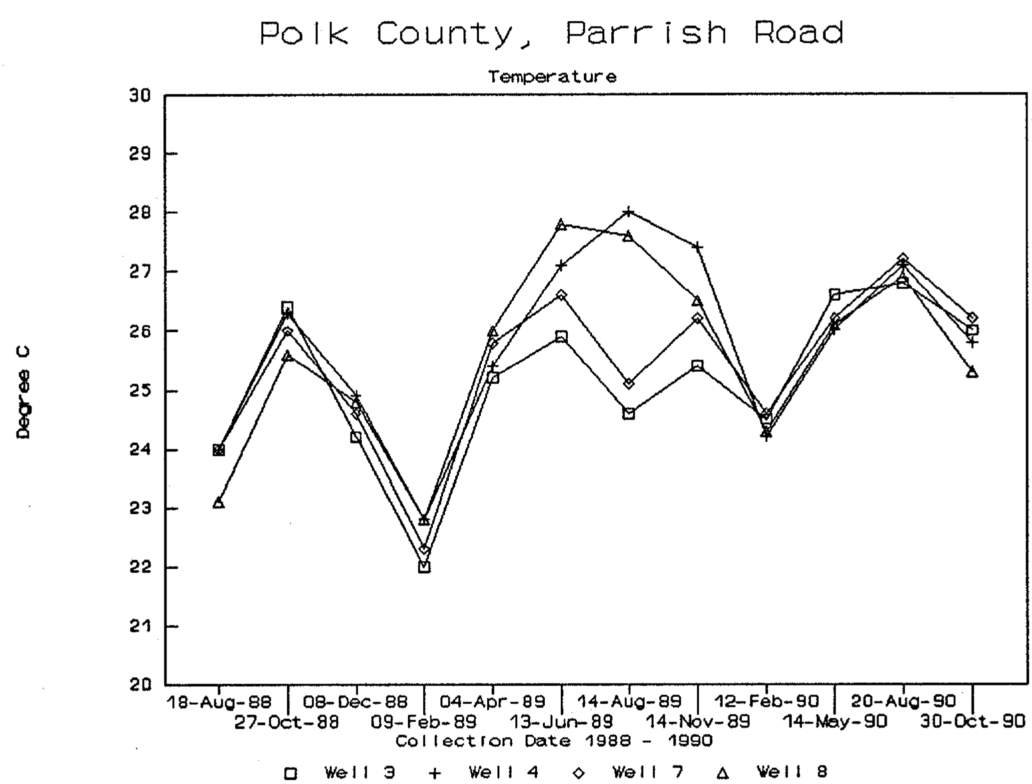
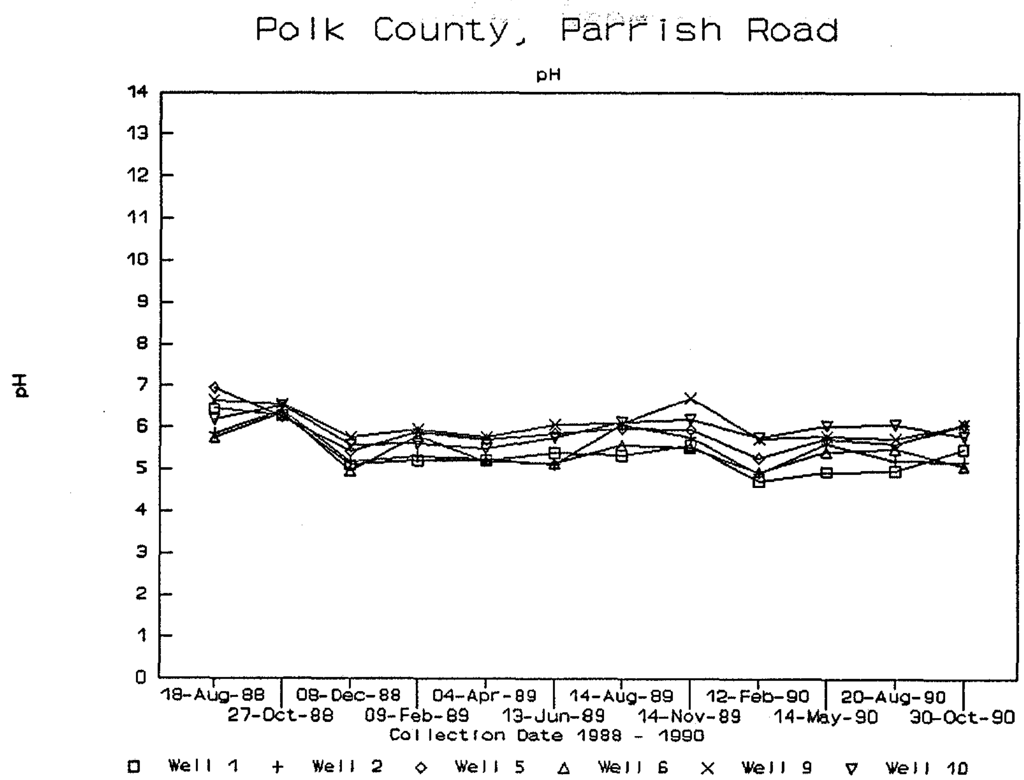

Polk County, Parrish Road
Temperature
Degree C
30
29
28
27
26
25
24
23
22
21
20
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 46


Polk County, Parrish Road
pH
pH
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6
Well 9
Well 10

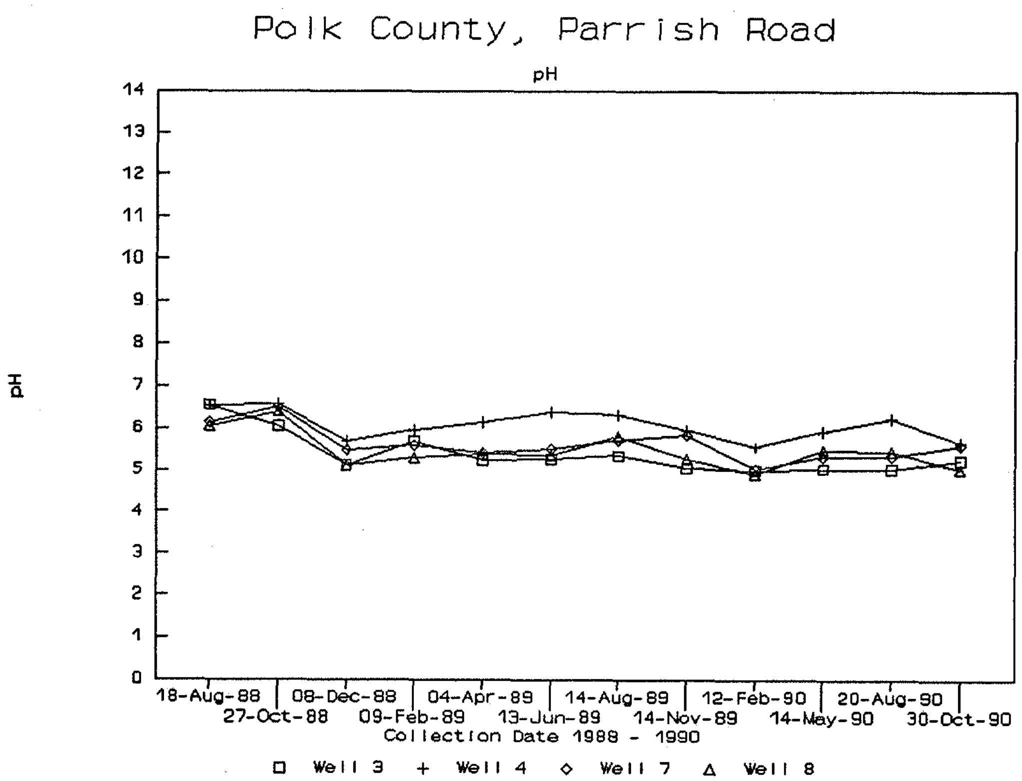
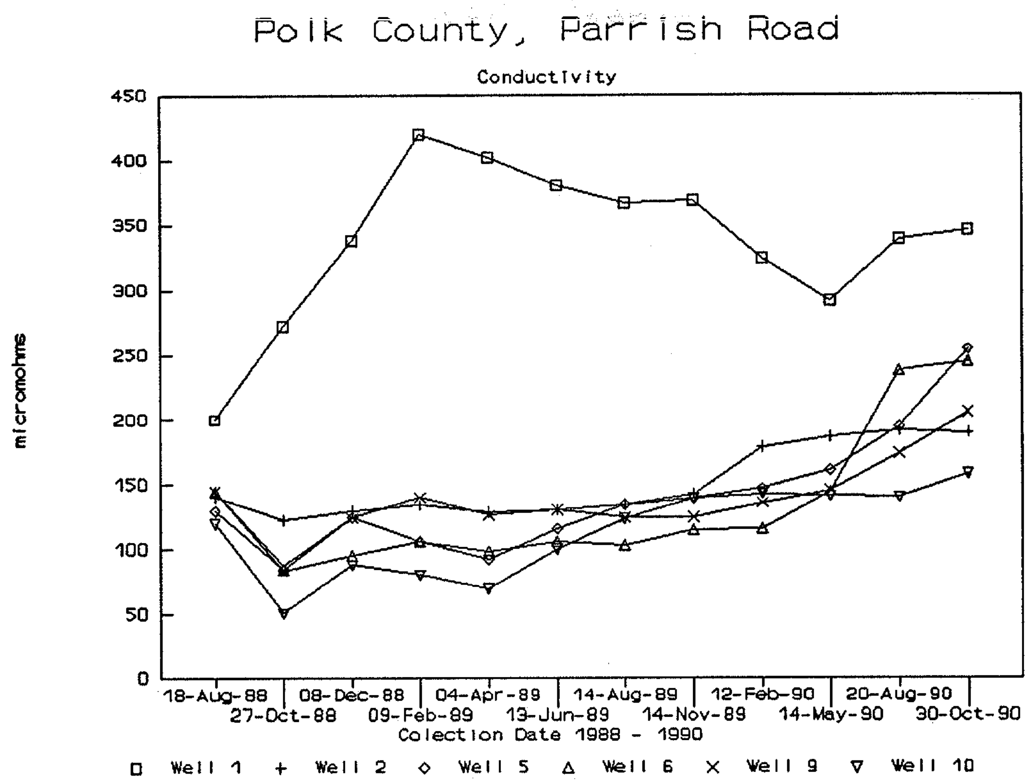

Polk County, Parrish Road
pH
pH
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 47


Polk County, Parrish Road
Conductivity
micromohms
450
400
350
300
250
200
150
100
50
0
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Colection Date 1988 - 1990
Well 1
Well 2
Well 5
Well 6
Well 9
Well 10

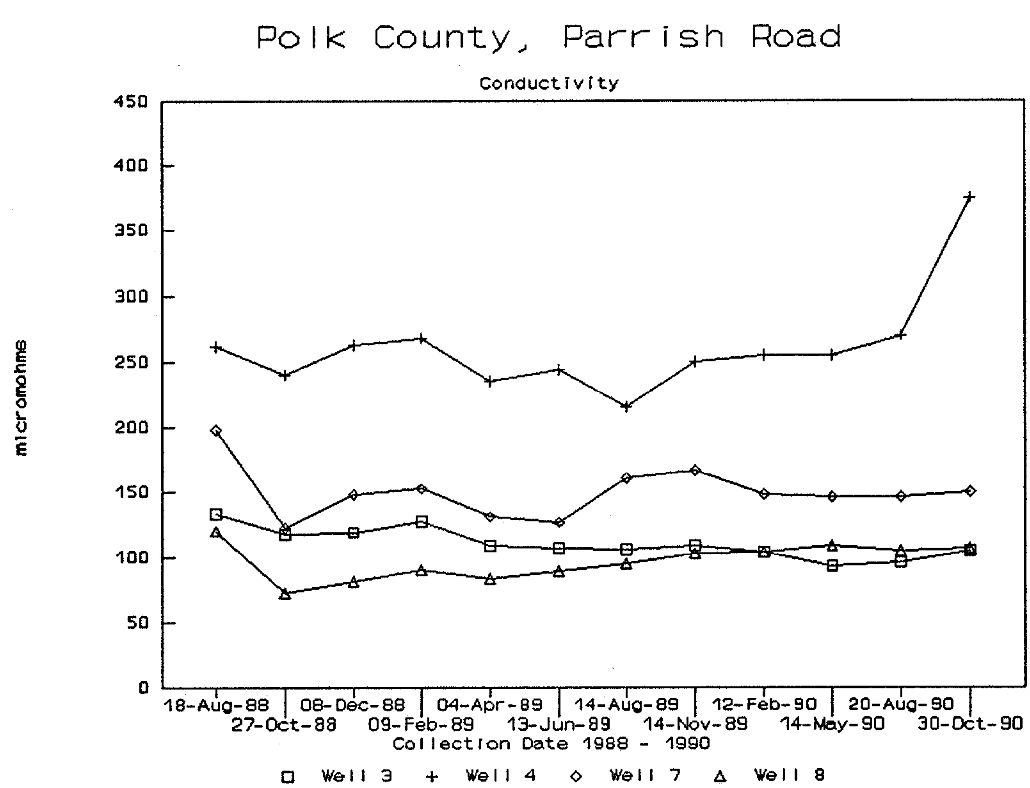
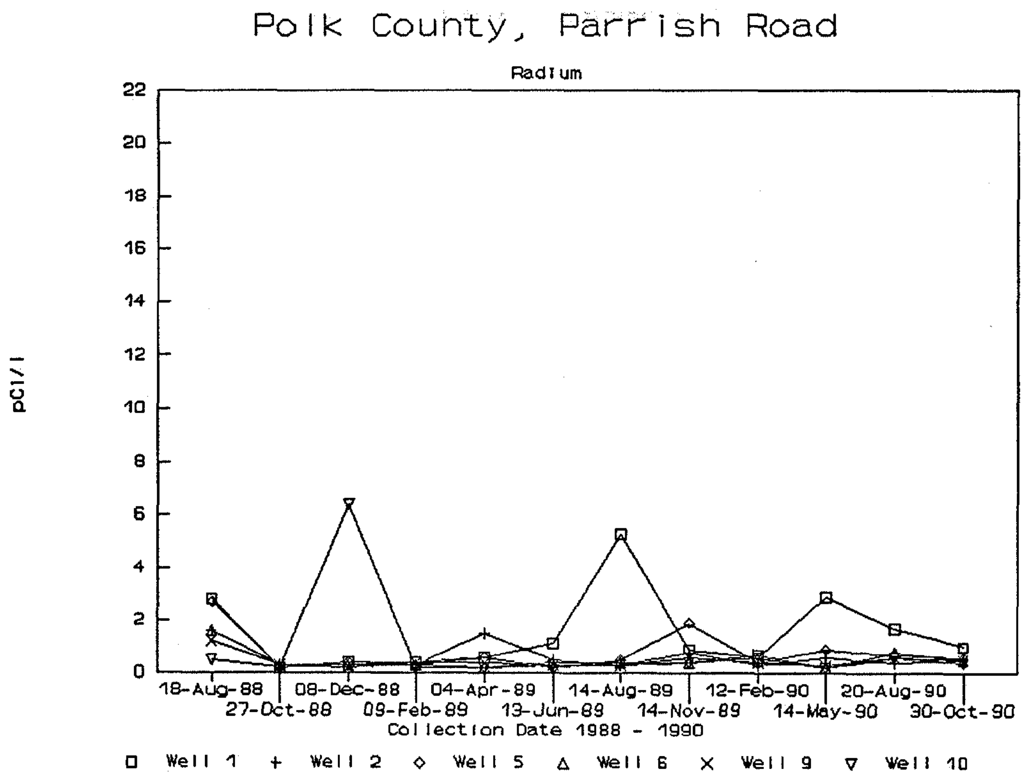

Polk County, Parrish Road
Conductivity
micromohms
450
400
350
300
250
200
150
100
50
0
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Well 3
Well 4
Well 7
Well 8

Figure 48


Polk County, Parrish Road
Radium
pCi/l
Collection Date 1988 - 1990
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Well 1
Well 2
Well 5
Well 6
Well 9
Well 10

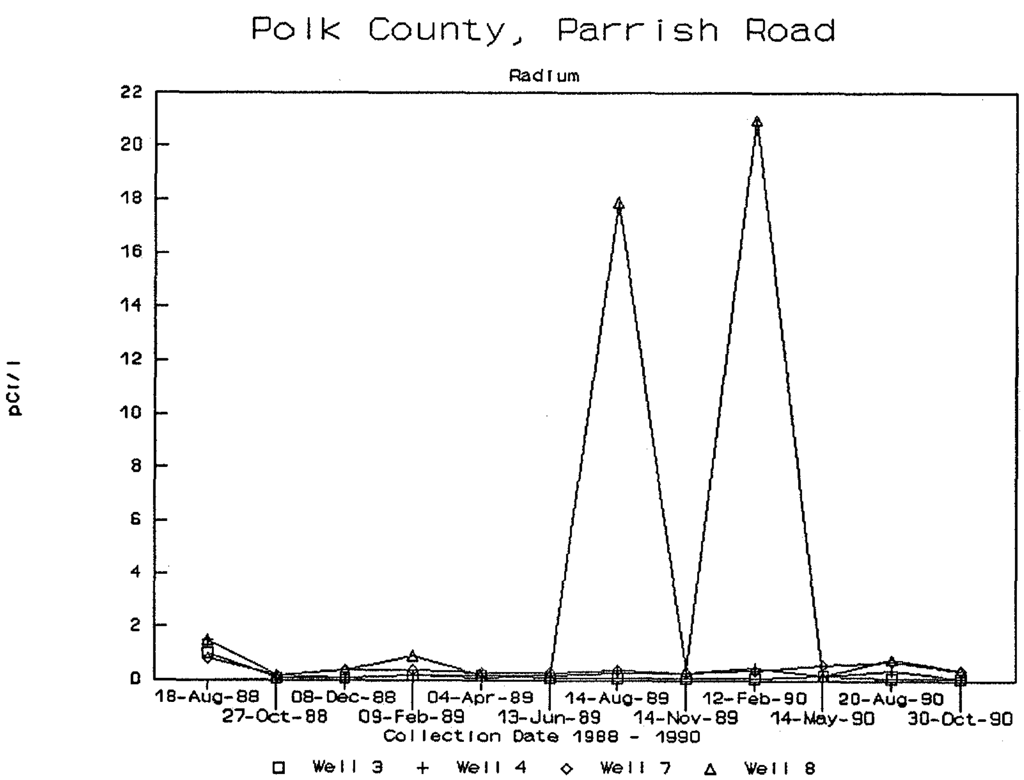
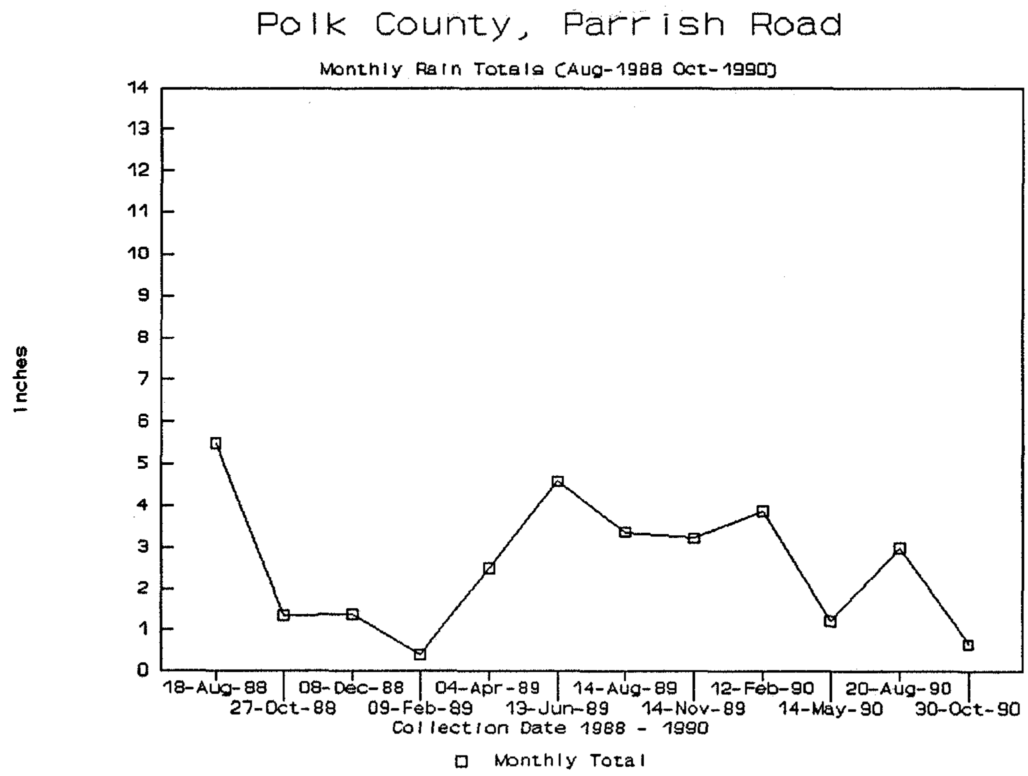

Polk County, Parrish Road
Radium
pCi/l
Collection Date 1988 - 1990
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Well 3
Well 4
Well 7
Well 8

Figure 49


Polk County, Parrish Road
Monthly Rain Totals (Aug-1988 Oct-1990)
Inches
14
13
12
11
10
9
8
7
6
5
4
3
2
1
0
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
14-May-90
20-Aug-90
30-Oct-90
Collection Date 1988 - 1990
Monthly Total

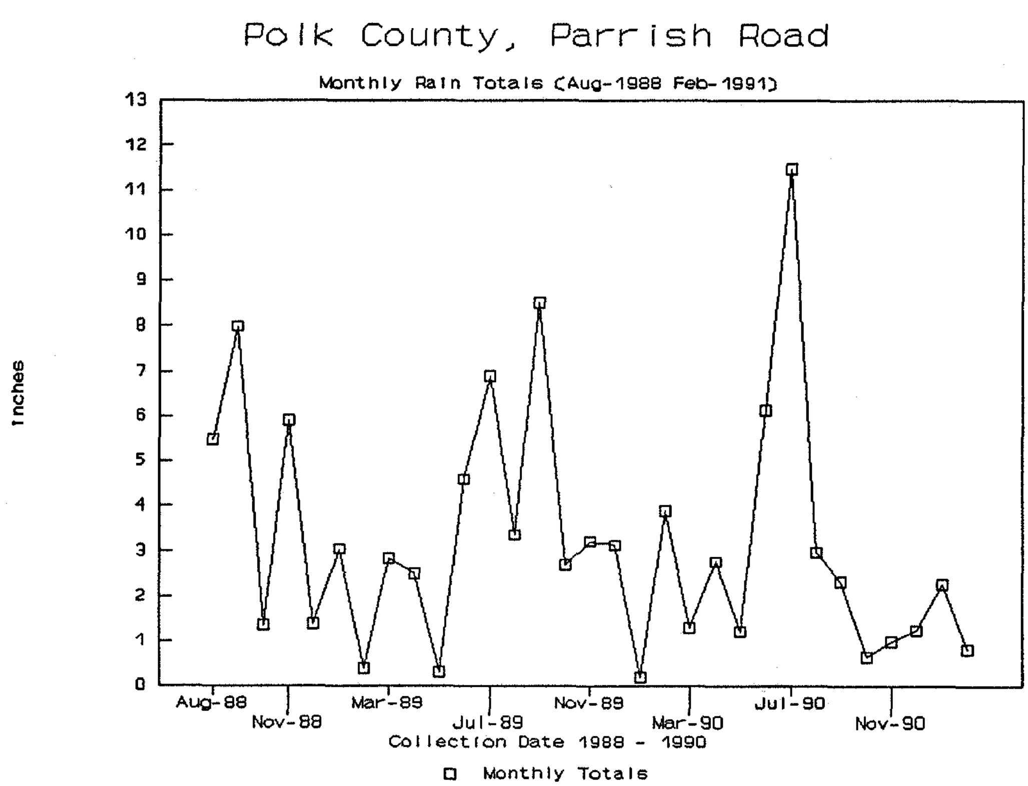
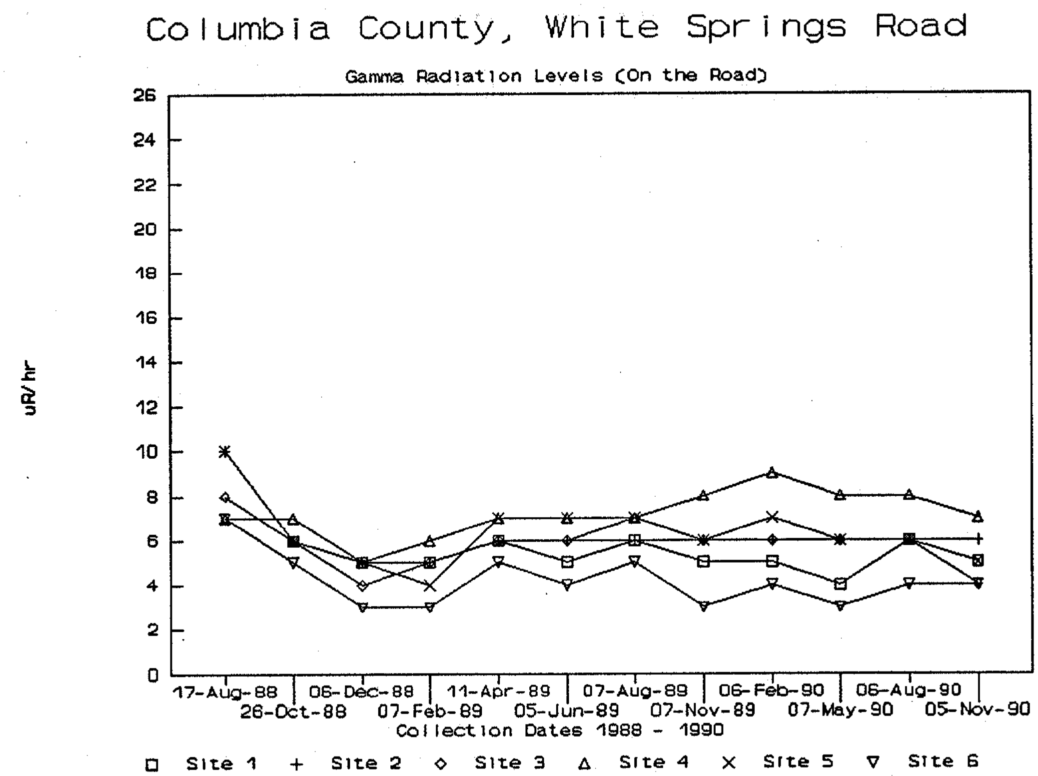

Polk County, Parrish Road
Monthly Rain Totals (Aug-1988 Feb-1991)
Inches
13
12
11
10
9
8
7
6
5
4
3
2
1
0
Aug-88
Nov-88
Mar-89
Jul-89
Nov-89
Mar-90
Jul-90
Nov-90
Collection Date 1988 - 1990
Monthly Totals

Figure 50


Columbia County, White Springs Road
Gamma Radiation Levels (On the Road)
uR/hr
26
24
22
20
18
16
14
12
10
8
6
4
2
0
17-Aug-88
26-Oct-88
06-Dec-88
07-Feb-89
11-Apr-89
05-Jun-89
07-Aug-89
07-Nov-89
06-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Dates 1988 - 1990
Site 1
Site 2
Site 3
Site 4
Site 5
Site 6

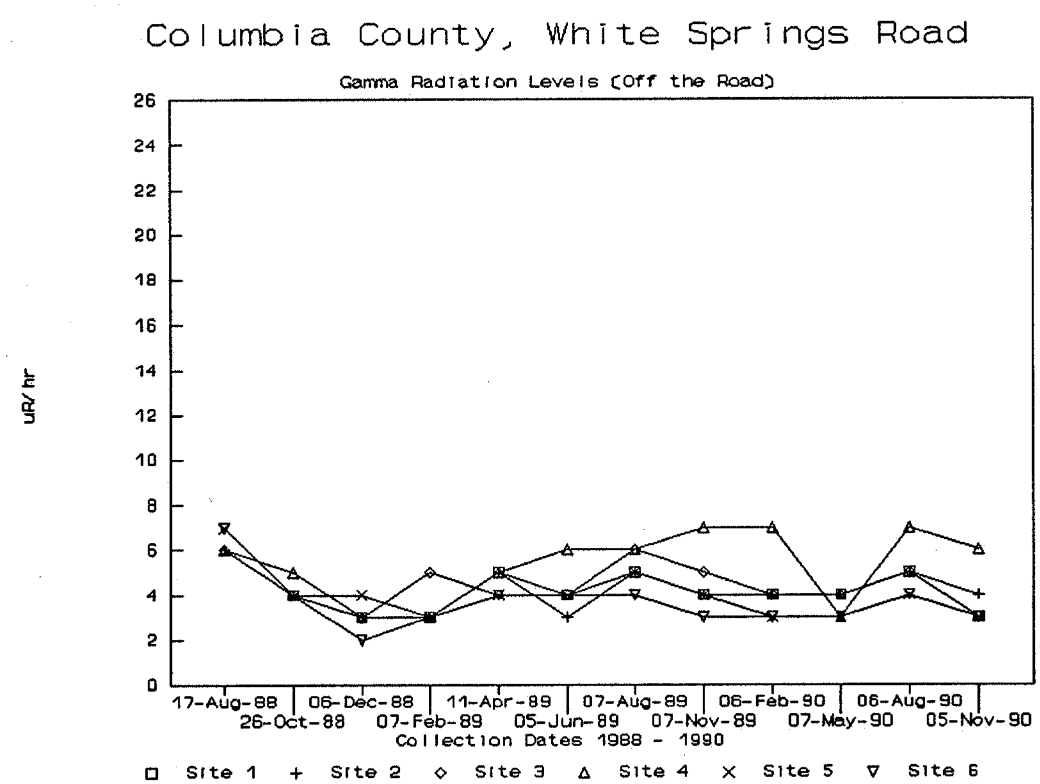
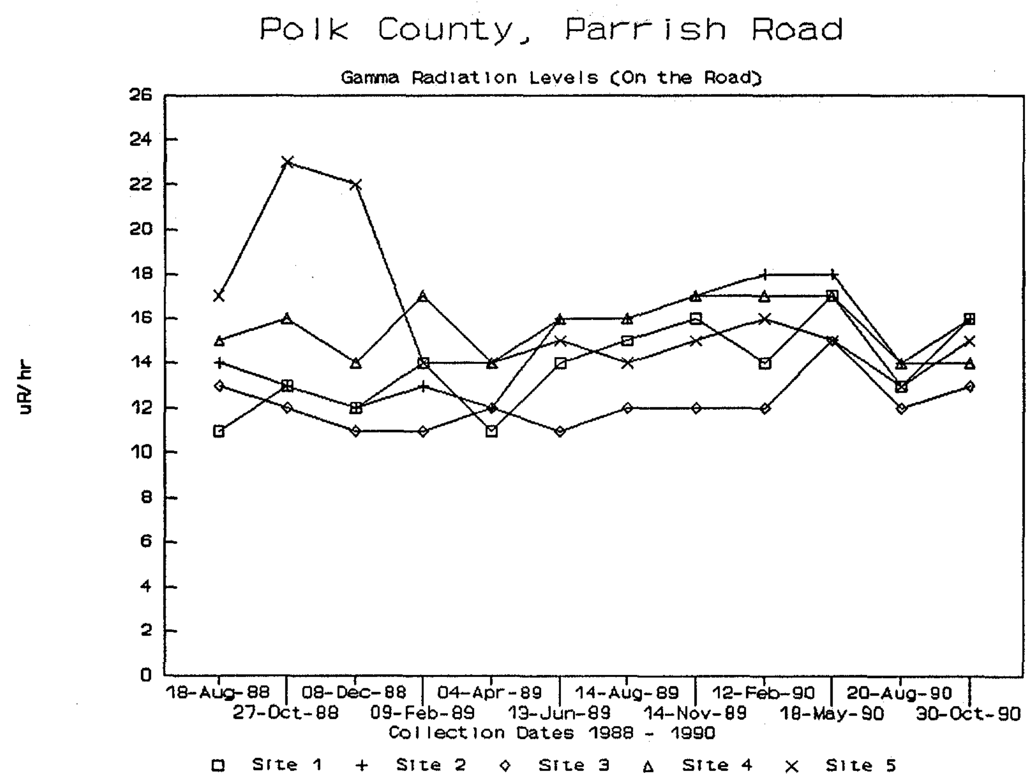

Columbia County, White Springs Road
Gamma Radiation Levels (Off the Road)
uR/hr
26
24
22
20
18
16
14
12
10
8
6
4
2
0
17-Aug-88
26-Oct-88
06-Dec-88
07-Feb-89
11-Apr-89
05-Jun-89
07-Aug-89
07-Nov-89
06-Feb-90
07-May-90
06-Aug-90
05-Nov-90
Collection Dates 1988 - 1990
Site 1
Site 2
Site 3
Site 4
Site 5
Site 6

Figure 51


Polk County, Parrish Road
Gamma Radiation Levels (On the Road)
uR/hr
26
24
22
20
18
16
14
12
10
8
6
4
2
0
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
18-May-90
20-Aug-90
30-Oct-90
Collection Dates 1988 - 1990
Site 1
Site 2
Site 3
Site 4
Site 5

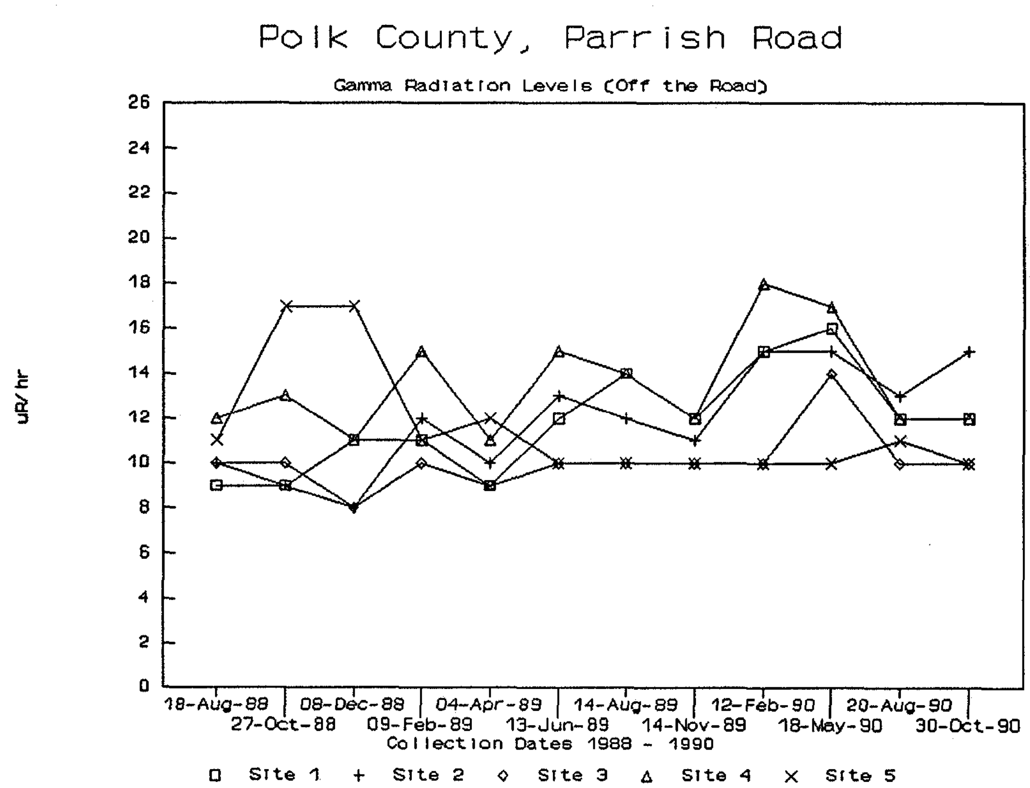

Polk County, Parrish Road
Gamma Radiation Levels (Off the Road)
uR/hr
26
24
22
20
18
16
14
12
10
8
6
4
2
0
18-Aug-88
27-Oct-88
08-Dec-88
09-Feb-89
04-Apr-89
13-Jun-89
14-Aug-89
14-Nov-89
12-Feb-90
18-May-90
20-Aug-90
30-Oct-90
Collection Dates 1988 - 1990
Site 1
Site 2
Site 3
Site 4
Site 5

Figure 52

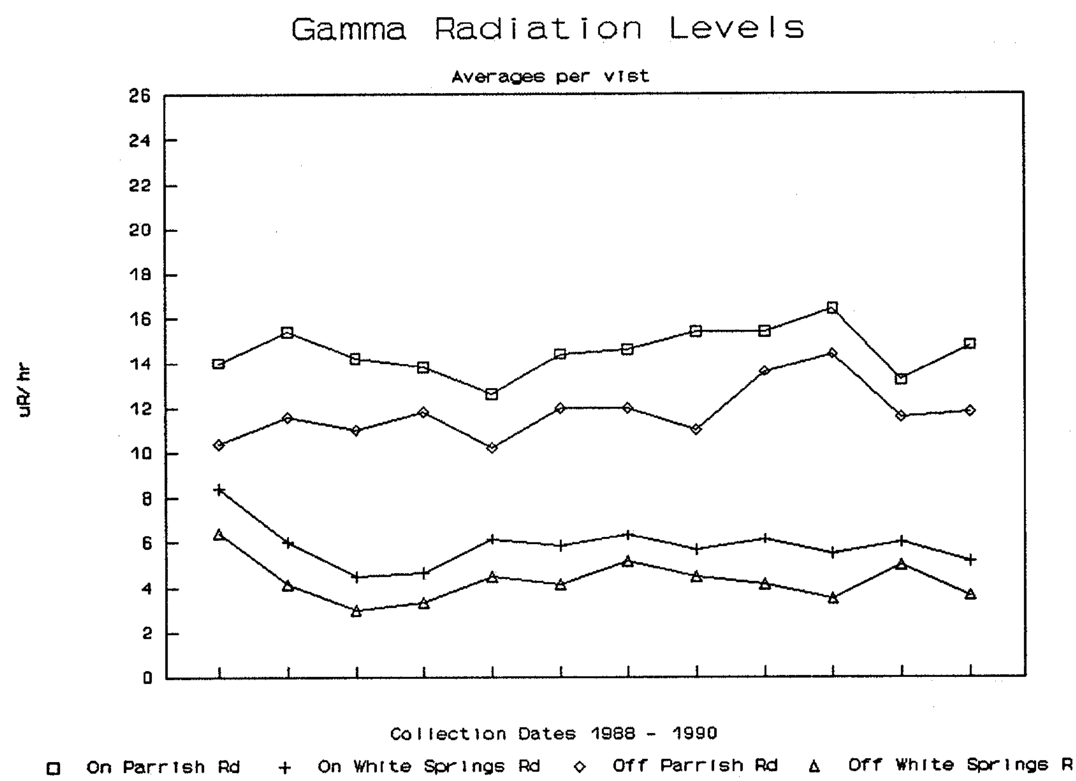
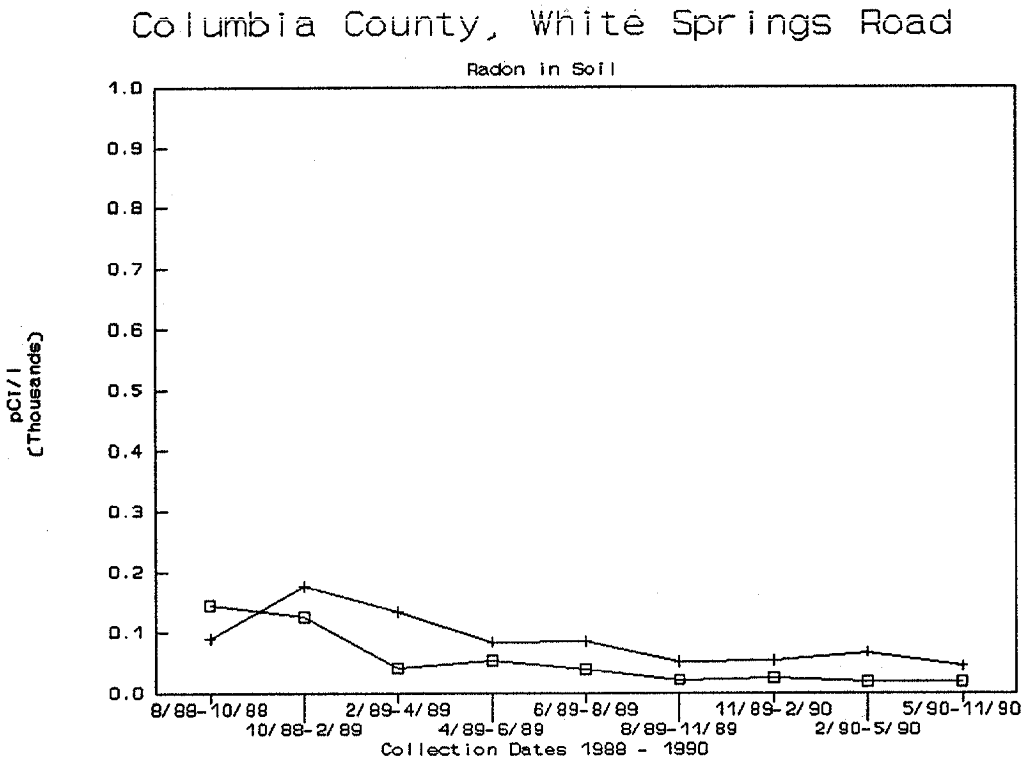
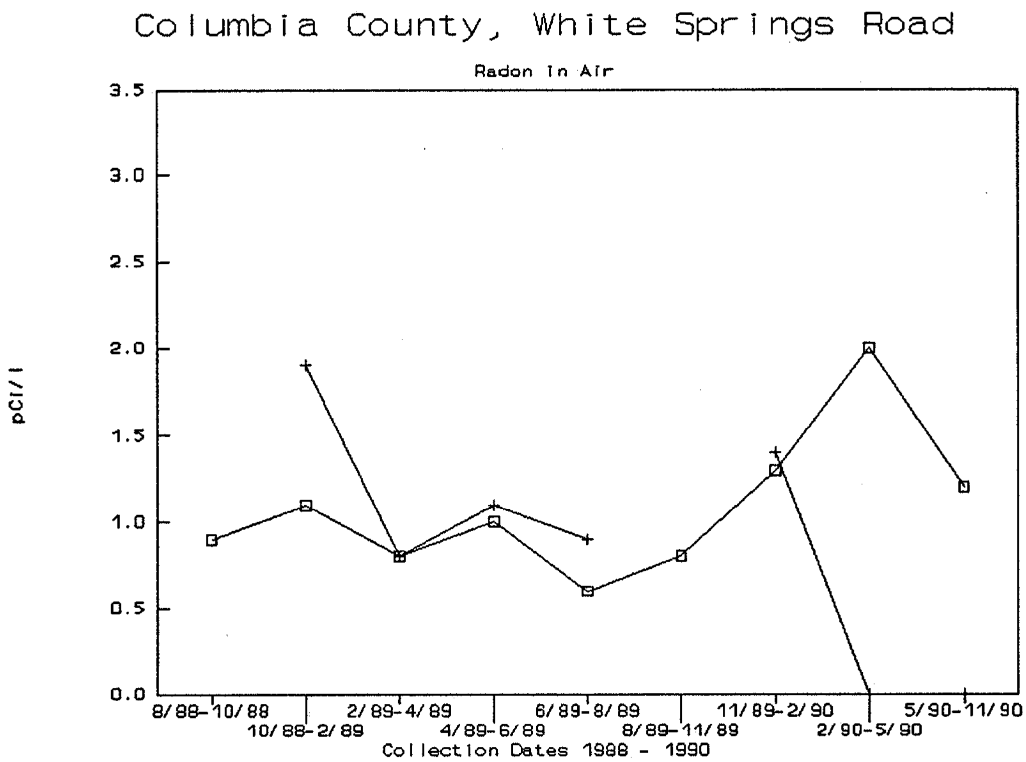

Gamma Radiation Levels
Averages per vist
26
24
22
20
18
16
14
12
10
8
6
4
2
0
uR/hr
Collection Dates 1988 - 1990
On Parrish Rd
On White Springs Rd
Off Parrish Rd
Off White Springs R

Figure 53

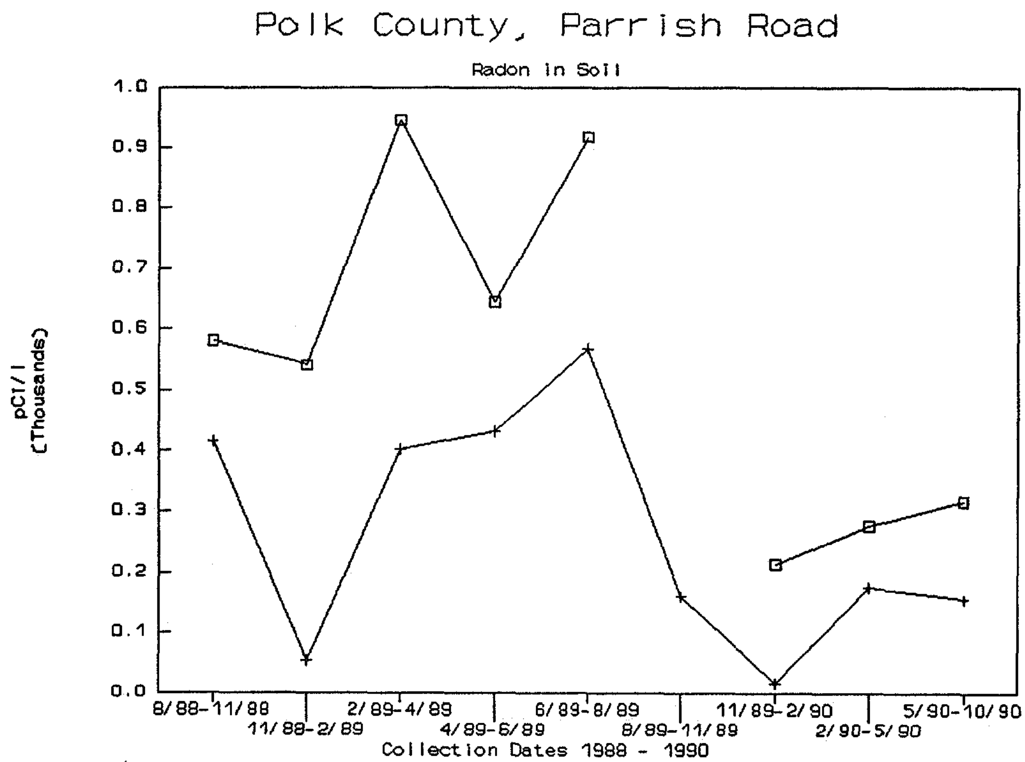


Location: ☐ Road Side of Fence near Well 7; ☐ Pole E 6-241-0-99

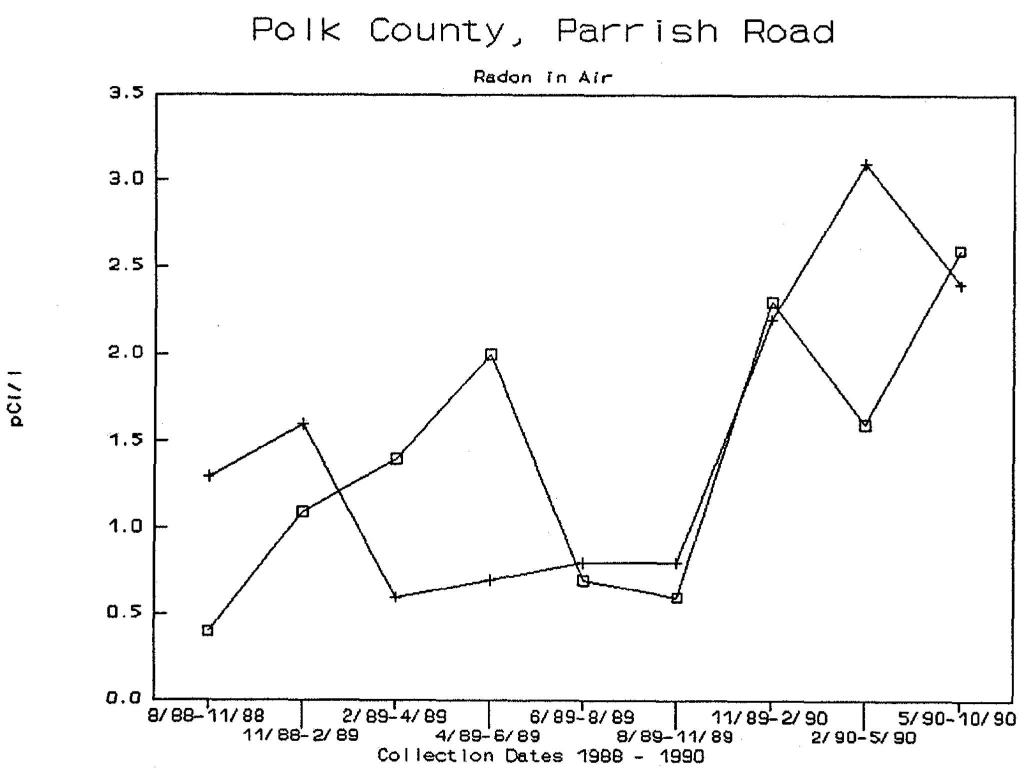


Location: ☐ Tree by Fence North end of Well Field; ☐ Pole E 6-241-0-99

Figure 54



Location □ Pole 5-123-6; □ Pole 5-123-1



Location: □ Pole 5-123-6; □ Pole 5-123-1

Figure 55

Table 1

Methods Used in Chemical Analyses

Parameter	Measurement Technique
Dissolved Solids (TDS)	Gravimetry
Alkalinity (CO_3, HCO_3)	Titrimetry
Nitrate (NO_3)	CAM[1]
Phosphorous (PO_4)	SCM / AAM[2]
Sulfate (SO_4)	Turbidimetry
Ammonia (NH_4)	Electrode
Chloride (Cl)	Electrode
Fluoride (F)	Electrode
Sodium (Na)	AASM / ICP[3]
Potassium (K)	AASM / ICP
Magnesium (Mg)	AASM / ICP
Calcium (Ca)	AASM / ICP
Iron (Fe)	AASM / ICP
Copper (Cu)	AASM / ICP
Lead (Pb)	AASM / ICP
Chromium (Cr)	AASM / ICP
Manganese (Mn)	AASM / ICP
Cadmium (Cd)	AASM / ICP
Arsenic (As)	AASM / ICP
Barium (Ba)	AASM / ICP
Mercury (Hg)	AASM / ICP
Selenium (Se)	AASM / ICP
Silver (Ag)	AASM / ICP
Zinc (Zn)	AASM / ICP
Temperature (TEMP)	Probe
pH	Electrode
Conductivity (COND)	Probe

[1] Chromotropic Acid Method

[2] Stannous Chloride Method / Ascorbic Acid Method

[3] Atomic Absorption Spectrophotometer / Inductive Coupled Plasma Spectrophotometer

Table 2

Results of Replicate Analyses[4]
(Columbia County, White Springs Road)

TDS	(19.73,14.06)
HCO_3	(7.26,11.83)
NO_3	(.58,1.45)
PO_4DIS	(.02,.03)
PO_4TOTAL	(.02,.01)
SO_4	(14.70,31.99)
NH_4	(.01,.03)
Cl	(.23,.31)
F	(.04,.09)
Na	(1.40,3.28)
K	(.64,.98)
Mg	(17.20,39.82)
Ca	(53.54,111.78)
Fe	(1.28,2.82)
Cu	(.02,.06)
Pb	(.01,.02)
Cr	(.01,.02)
Mn	(.05,.10)
Cd	(.00,.01)
TEMP	(.49,.60)
pH	(.29,.38)
COND	(20.13,37.83)

[4] Means and standard deviations of differences between reference and replicate samples.

Table 3

Results of Replicate Analyses[5]
(Polk County, Parrish Road)

TDS	(18.64,28.98)
HCO_3	(1.18,1.48)
NO_3	(.12,.22)
PO_4DIS	(.01,.01)
PO_4TOTAL	(.02,.02)
SO_4	(.64,.70)
NH_4	(.27,.76)
Cl	(.58,1.22)
F	(.13,.23)
Na	(.82,1.43)
K	(.08,.15)
Mg	(.96,1.54)
Ca	(7.11,17.63)
Fe	(.27,.47)
Cu	(.01,.02)
Pb	(.05,.13)
Cr	(.00,.00)
Mn	(.01,.01)
Cd	(.00,.00)
TEMP	(.69,.86)
pH	(.16,.29)
COND	(10.93,18.30)

[5] Means and standard deviations of differences between reference and replicate samples.

Table 4

Means, Standard Deviations, Ranges of Measured Constituents
(Columbia County, White Springs Road)

	Well 1	Well 2
TDS	(302.25,247.63,15.00-681.00)	(89.55,22.06,55.00-128.00)
CO_3	(.00,.00,.00-.00)	(.00,.00,.00-.00)
HCO_3	(.86,2.98,.00-10.34)	(52.13,8.28,47.25-75.48)
NO_3	(2.40,.47,1.70-3.14)	(5.36,.98,4.00-8.03)
PO_4DIS	(.02,.02,.00-.07)	(.03,.02,.01-.08)
PO_4TOTAL	(.08,.13,.01-.50)	(.20,.50,.01-1.70)
SO_4	(194.98,172.04,26.60-446.00)	(5.20,2.55,2.83-12.03)
NH_4	(.15,.13,.00-.37)	(.11,.08,.00-.23)
Cl	(1.72,2.26,.47-6.74)	(3.77,5.47,1.15-14.89)
F	(.21,.17,.00-.69)	(.25,.20,.14-.82)
Na	(2.32,.40,1.59-2.97)	(2.45,.37,2.01-3.10)
K	(2.01,.46,1.30-2.60)	(.56,.23,.26-.90)
Mg	(23.16,17.19,4.10-43.28)	(14.44,7.12,8.40-33.84)
Ca	(47.22,45.02,2.40-123.42)	(38.54,60.95,8.40-220.40)
Fe	(3.08,3.99,.88-15.45)	(.96,.73,.16-2.20)
Cu	(.02,.05,.00-.16)	(.01,.01,.00-.05)
Pb	(.00,.01,.00-.03)	(.00,.01,.00-.02)
Cr	(.01,.02,.00-.07)	(.02,.04,.00-.14)
Mn	(.13,.13,.00-.50)	(.04,.09,.00-.31)
Cd	(.01,.01,.00-.04)	(.00,.00,.00-.00)
TEMP	(23.65,2.54,19.90-28.10)	(22.45,1.33,19.80-24.10)
pH	(4.22,.85,3.49-6.69)	(7.53,.42,6.91-8.15)
COND	(375.84,240.11,103.0-730.0)	(138.90,9.15,116.0-149.0)
^{226}Ra	(3.21,.86,1.80-4.60)	(4.06,2.25,1.50-9.20)

	Well 3	Well 4
TDS	(41.57,38.58,.00-112.00)	(180.14,75.98,120.00-330.00)
CO_3	(.00,.00,.00-.00)	(.00,.00,.00-.00)
HCO_3	(1.72,5.97,.00-20.68)	(12.18,6.33,6.63-25.85)
NO_3	(.30,.11,.11-.52)	(3.39,.49,2.93-4.26)
PO_4DIS	(.03,.02,.00-.05)	(.07,.05,.02-.12)
PO_4TOTAL	(.10,.18,.01-.63)	(.16,.23,.02-.67)
SO_4	(29.06,23.97,10.69-92.00)	(81.96,73.43,28.78-238.35)
NH_4	(.12,.11,.00-.28)	(.04,.07,.00-.14)
Cl	(1.99,2.50,.69-7.44)	(3.08,4.49,.42-12.41)
F	(.08,.14,.00-.48)	(.12,.12,.00-.35)
Na	(3.25,.87,2.01-4.70)	(6.82,.80,5.34-7.67)
K	(.64,.25,.07-1.00)	(1.88,.39,1.47-2.34)
Mg	(3.33,5.09,.80-19.09)	(7.42,7.34,.83-23.08)
Ca	(2.75,4.58,.30-16.72)	(19.65,23.27,3.30-66.81)
Fe	(3.45,2.83,.85-9.59)	(2.20,2.47,.76-7.55)
Cu	(.00,.01,.00-.02)	(.00,.00,.00-.01)
Pb	(.01,.02,.00-.07)	(.00,.00,.00-.00)
Cr	(.01,.01,.00-.04)	(.02,.02,.00-.05)
Mn	(.01,.01,.00-.03)	(.26,.24,.09-.78)
Cd	(.00,.00,.00-.00)	(.00,.00,.00-.00)
TEMP	(22.60,1.19,20.50-24.10)	(21.34,2.85,16.00-23.90)
pH	(4.27,.65,3.62-5.92)	(5.99,.56,5.13-6.81)
COND	(67.69,42.90,23.0-172.0)	(196.53,119.36,110.2-455.0)
^{226}Ra	(.59,.35,.02-1.30)	(1.60,.98,1.00-3.80)

Table 4 (continued)

	Well 5	Well 6
TDS	(79.42,29.87,41.00-141.00)	(130.33,38.86,79.00-218.00)
CO_3	(.00,.00,.00-.00)	(.00,.00,.00-.00)
HCO_3	(69.61,6.97,61.92-82.72)	(63.21,4.99,54.39-70.02)
NO_3	(.18,.13,.00-.42)	(9.67,1.84,8.06-15.12)
PO_4DIS	(.06,.03,.03-.12)	(.13,.07,.09-.35)
PO_4TOTAL	(.16,.30,.02-1.11)	(.53,1.37,.07-4.89)
SO_4	(5.53,2.41,2.99-11.20)	(5.83,4.39,3.35-18.52)
NH_4	(.13,.13,.00-.37)	(.09,.10,.00-.34)
Cl	(2.65,3.66,.92-11.29)	(4.82,7.15,1.45-24.14)
F	(.15,.20,.00-.64)	(.27,.28,.11-.93)
Na	(4.12,6.23,1.21-23.80)	(2.83,.40,1.95-3.40)
K	(.74,.77,.25-3.10)	(1.31,.30,.90-1.80)
Mg	(1.88,1.33,.45-5.60)	(19.78,4.17,14.30-29.52)
Ca	(28.77,14.45,11.90-68.00)	(45.54,18.13,14.75-69.58)
Fe	(1.25,2.23,.00-8.15)	(1.59,1.07,.26-3.29)
Cu	(.00,.01,.00-.02)	(.00,.00,.00-.01)
Pb	(.01,.03,.00-.09)	(.02,.03,.00-.07)
Cr	(.01,.03,.00-.09)	(.01,.01,.00-.04)
Mn	(.02,.03,.00-.08)	(.06,.04,.00-.12)
Cd	(.00,.00,.00-.00)	(.00,.00,.00-.00)
TEMP	(22.64,1.45,20.40-25.00)	(22.19,.99,20.70-23.90)
pH	(6.79,.49,5.96-7.38)	(7.14,.50,6.50-8.01)
COND	(135.92,13.88,114.0-162.4)	(193.78,6.14,182.0-208.0)
^{226}Ra	(2.49,6.15,.10-22.00)	(1.23,.60,.60-2.70)

	Well 7	Well 8
TDS	(385.17,44.95,310.00-454.00)	(126.50,49.88,.00-191.00)
CO_3	(.00,.00,.00-.00)	(.00,.00,.00-.00)
HCO_3	(167.74,12.13,156.06-189.50)	(49.80,2.38,45.12-52.34)
NO_3	(21.88,6.08,8.93-30.58)	(10.03,.96,8.83-11.99)
PO_4DIS	(.17,.05,.10-.26)	(.26,.12,.10-.55)
PO_4TOTAL	(.83,2.25,.09-7.99)	(.96,2.41,.17-8.62)
SO_4	(2.06,.99,.00-3.78)	(3.14,1.20,.07-4.70)
NH_4	(.07,.09,.00-.26)	(.09,.09,.00-.24)
Cl	(16.26,25.21,5.40-92.30)	(5.53,8.55,1.65-30.18)
F	(.23,.33,.00-1.10)	(.31,.51,.00-1.50)
Na	(11.47,.79,10.12-13.25)	(2.45,.42,1.81-3.20)
K	(2.66,.51,1.96-3.40)	(1.78,.96,.78-4.30)
Mg	(11.10,3.16,8.40-18.54)	(36.27,32.79,10.48-135.35)
Ca	(184.78,246.26,34.62-957.10)	(78.19,108.69,15.45-412.20)
Fe	(1.72,1.66,.39-6.48)	(5.73,3.74,.42-14.49)
Cu	(.02,.05,.00-.18)	(.00,.00,.00-.01)
Pb	(.01,.02,.00-.06)	(.01,.01,.00-.04)
Cr	(.02,.03,.00-.11)	(.04,.04,.00-.12)
Mn	(.05,.10,.00-.35)	(.15,.11,.00-.42)
Cd	(.00,.00,.00-.00)	(.00,.01,.00-.02)
TEMP	(23.47,2.30,20.90-28.30)	(22.27,1.31,19.80-24.30)
pH	(7.23,.27,6.72-7.74)	(6.84,.52,6.08-7.85)
COND	(495.17,43.66,418.0-580.0)	(184.64,9.95,168.0-200.0)
^{226}Ra	(1.12,.45,.60-1.90)	(2.08,.93,.60-3.60)

Table 4 (continued)

	Inner Wells	Outer Wells
TDS	(151.68,153.83,15.00-681.00)	(183.72,143.88,.00-454.00)
CO_3	(.00,.00,.00-.00)	(.00,.00,.00-.00)
HCO_3	(46.33,28.24,.00-82.72)	(63.17,68.87,.00-189.50)
NO_3	(4.38,3.77,.00-15.12)	(9.54,9.18,.11-30.58)
PO_4DIS	(.06,.06,.00-.35)	(.14,.11,.00-.55)
PO_4TOTAL	(.24,.75,.01-4.89)	(.55,1.74,.01-8.62)
SO_4	(53.99,118.54,2.83-446.00)	(23.76,42.97,.00-238.35)
NH_4	(.12,.11,.00-.37)	(.08,.09,.00-.28)
Cl	(3.23,4.96,.47-24.14)	(7.14,15.00,.42-92.30)
F	(.22,.21,.00-.93)	(.19,.33,.00-1.50)
Na	(2.94,3.15,1.21-23.80)	(5.90,3.86,1.81-13.25)
K	(1.17,.74,.25-3.10)	(1.73,.97,.07-4.30)
Mg	(14.82,12.43,.45-43.28)	(15.36,21.93,.80-135.35)
Ca	(40.05,38.42,2.40-220.40)	(77.36,156.53,.30-957.10)
Fe	(1.74,2.47,.00-15.45)	(3.40,3.15,.39-14.49)
Cu	(.01,.03,.00-.16)	(.01,.03,.00-.18)
Pb	(.01,.02,.00-.09)	(.01,.02,.00-.07)
Cr	(.01,.03,.00-.14)	(.02,.03,.00-.12)
Mn	(.06,.09,.00-.50)	(.10,.15,.00-.78)
Cd	(.00,.01,.00-.04)	(.00,.00,.00-.02)
TEMP	(22.74,1.73,19.80-28.10)	(22.54,1.97,16.00-28.30)
pH	(6.40,1.43,3.49-8.15)	(6.09,1.31,3.62-7.85)
COND	(212.65,154.07,103.0-730.0)	(240.60,176.97,23.0-580.0)
^{226}Ra	(2.72,3.39,.10-22.00)	(1.31,.89,.02-3.80)

Table 5

Means, Standard Deviations, Ranges of Measured Constituents
(Polk County, Parrish Road)

	Well 1	Well 2
TDS	(242.33,80.10,62.00-357.00)	(86.17,52.54,.00-171.00)
CO_3	(.00,.00,.00-.00)	(.00,.00,.00-.00)
HCO_3	(19.00,1.28,16.69-20.68)	(33.72,4.15,31.28-46.53)
NO_3	(.41,.28,.05-.95)	(.11,.22,.00-.76)
PO_4DIS	(.86,.43,.12-2.00)	(1.18,.40,.10-1.88)
PO_4TOTAL	(1.41,1.99,.62-7.72)	(2.13,3.14,.69-12.08)
SO_4	(143.51,51.40,42.44-236.50)	(30.51,18.79,9.97-58.00)
NH_4	(.16,.17,.00-.52)	(.17,.17,.00-.55)
Cl	(3.06,4.28,1.00-14.11)	(7.78,10.84,2.35-41.27)
F	(.43,.42,.20-1.70)	(.55,.69,.23-2.70)
Na	(4.27,.61,3.49-5.53)	(4.31,.65,3.10-5.16)
K	(.52,.22,.18-1.00)	(.33,.22,.04-.80)
Mg	(4.15,.79, 2.70-5.20)	(2.19,.74,.94-3.53)
Ca	(51.65,17.19,22.73-73.88)	(18.14,9.28,2.41-31.10)
Fe	(4.95,13.49,.02-47.45)	(3.57,2.91,.75-11.50)
Cu	(.01,.02,.00-.07)	(.00,.01,.00-.03)
Pb	(.04,.12,.00-.43)	(.01,.02,.00-.05)
Cr	(.00,.00,.00-.01)	(.00,.01,.00-.05)
Mn	(.00,.00,.00-.01)	(.01,.01,.00-.02)
Cd	(.00,.00,.00-.00)	(.00,.00,.00-.00)
TEMP	(24.98,1.33,22.30-27.10)	(25.98,1.39,23.10-28.40)
pH	(5.40,.51,4.73-6.45)	(5.49,.45,4.92-6.40)
COND	(337.17,60.21,200.0-419.0)	(150.92,27.12,122.6-191.0)
^{226}Ra	(1.49,1.50,0-5)	(.62,.46,0-2)

	Well 3	Well 4
TDS	(72.08,38.47,11.00-122.00)	(143.92,57.48,34.00-226.00)
CO_3	(.00,.00,.00-.00)	(.00,.00,.00-.00)
HCO_3	(41.63,4.47,36.44-51.70)	(122.16,10.11,110.64-139.03)
NO_3	(.08,.08,.00-.29)	(.10,.12,.00-.41)
PO_4DIS	(2.70,.92,.17-3.60)	(.83,.30,.29-1.58)
PO_4TOTAL	(3.52,2.19,2.02-10.40)	(1.47,2.09,.48-8.08)
SO_4	(4.03,2.08,1.80-8.93)	(6.90,13.20,.04-46.00)
NH_4	(1.51,.57,.11-2.25)	(.64,.48,.18-1.94)
Cl	(6.08,9.66,1.35-31.90)	(15.56,21.01,3.80-67.49)
F	(.52,.59,.24-2.35)	(.93,1.17,.44-4.60)
Na	(3.28,.47,2.43-3.90)	(7.72,.60,6.80-8.57)
K	(.62,.28,.23-1.40)	(.18,.28,.00-1.00)
Mg	(2.56,.52,1.63-3.80)	(19.28,5.48,12.97-30.14)
Ca	(8.06,3.20,1.49-11.62)	(17.14,6.26,2.90-27.05)
Fe	(2.48,.34,2.11-3.40)	(2.42,2.44,1.01-9.64)
Cu	(.00,.00,.00-.01)	(.00,.00,.00-.01)
Pb	(.01,.02,.00-.06)	(.01,.02,.00-.05)
Cr	(.00,.01,.00-.02)	(.00,.01,.00-.02)
Mn	(.01,.01,.00-.05)	(.12,.04,.00-.17)
Cd	(.00,.00,.00-.00)	(.00,.00,.00-.00)
TEMP	(25.13,1.37,22.00-26.80)	(25.75,1.56,22.80-28.00)
pH	(5.38,.49,4.99-6.55)	(6.08,.34,5.55-6.56)
COND	(110.45,11.79,93.0-133.0)	(261.08,39.03,216.0-375.0)
^{226}Ra	(.20,.26,0-1)	(.34,.38,0-2)

Table 5 (continued)

	Well 5	Well 6
TDS	(87.92,49.52,.00-161.00)	(76.58,62.84,.00-214.00)
CO_3	(.00,.00,.00-.00)	(.00,.00,.00-.00)
HCO_3	(50.05,38.71,13.44-135.07)	(24.41,6.14,14.48-31.89)
NO_3	(1.19,.81,.00-2.22)	(.45,.36,.00-1.13)
PO_4DIS	(1.00,.51,.06-2.29)	(1.28,.49,.12-2.34)
PO_4TOTAL	(2.83,6.43,.76-23.23)	(2.23,3.10,1.12-12.08)
SO_4	(17.16,9.00,7.00-35.97)	(24.66,32.24,5.37-98.00)
NH_4	(.19,.17,.00-.62)	(.14,.14,.00-.52)
Cl	(4.47,6.04,1.40-22.07)	(7.45,10.34,2.40-39.47)
F	(.53,.67,.19-2.60)	(.57,.61,.25-2.40)
Na	(4.69,.75,3.36-6.08)	(5.33,.92,4.10-7.51)
K	(.25,.27,.00-1.00)	(.26,.22,.04-.90)
Mg	(6.48,4.31,2.00-15.68)	(1.63,1.34,.08-4.98)
Ca	(14.57,8.04,2.91-28.55)	(16.05,10.61,2.30-36.98)
Fe	(.25,.71,.00- 2.50)	(.18,.39,.00-1.40)
Cu	(.00,.00,.00-.00)	(.00,.00,.00-.00)
Pb	(.01,.02,.00-.06)	(.00,.01,.00-.02)
Cr	(.00,.01,.00-.03)	(.01,.01,.00-.02)
Mn	(.00,.01,.00-.04)	(.00,.00,.00-.01)
Cd	(.00,.00,.00-.00)	(.00,.00,.00-.00)
TEMP	(25.28,1.20,22.90-27.10)	(25.91,1.48,23.20-28.10)
pH	(5.89,.43,5.27-6.95)	(5.44,.40,4.95-6.33)
COND	(140.48,46.59,85.1-254.0)	(133.13,53.75,84.0-245.0)
^{226}Ra	(.78,.76,0-3)	(.50,.39,0-2)

	Well 7	Well 8
TDS	(80.03,43.22,10.00-139.00)	(47.17,27.64,.00-89.00)
CO_3	(.00,.00,.00-.00)	(.00,.00,.00-.00)
HCO_3	(55.50,17.57,31.02-93.06)	(28.90,8.11,15.51-40.69)
NO_3	(.07,.12,.00-.42)	(.47,.56,.00-1.70)
PO_4DIS	(.93,.51,.15-1.91)	(.34,.14,.11-.69)
PO_4TOTAL	(1.11,.54,.58-2.63)	(.90,1.95,.26-7.10)
SO_4	(7.33,5.65,.00-18.40)	(6.53,4.69,.00-18.41)
NH_4	(.82,.63,.13-2.10)	(.36,.59,.00-2.18)
Cl	(5.06,7.13,1.45-23.08)	(6.39,8.09,2.05-31.56)
F	(.37,.40,.14-1.55)	(.26,.25,.11-1.00)
Na	(4.08,.60,2.98-5.15)	(3.68,.46,2.90-4.20)
K	(.36,.24,.00-.90)	(.12,.09,.00-.26)
Mg	(4.52,1.74,2.30-7.20)	(1.95,.43,1.08-2.72)
Ca	(10.70,5.26,1.80-17.08)	(9.84,4.60,1.61-14.84)
Fe	(12.57,10.89,4.15-45.79)	(4.94,6.34,.04-20.17)
Cu	(.00,.00,.00-.00)	(.00,.00,.00-.00)
Pb	(.01,.02,.00-.08)	(.01,.02,.00-.06)
Cr	(.01,.01,.00-.04)	(.00,.00,.00-.01)
Mn	(.07,.02,.04-.11)	(.02,.01,.00-.04)
Cd	(.00,.00,.00-.00)	(.00,.00,.00-.00)
TEMP	(25.40,1.35,22.30-27.20)	(25.57,1.60,22.80-27.80)
pH	(5.62,.40,5.02-6.50)	(5.46,.44,4.89-6.40)
COND	(149.67,20.04,122.3-198.0)	(96.59,13.72,72.9-120.0)
^{226}Ra	(.43,.18,0-1)	(3.68,7.41,0-21)

Table 5 (continued)

	Well 9	Well 10
TDS	(75.33,44.36,.00-143.00)	(63.17,44.06,.00-127.00)
CO_3	(.00,.00,.00-.00)	(.00,.00,.00-.00)
HCO_3	(56.64,24.91,24.82-118.18)	(36.77,16.43,11.37-58.68)
NO_3	(1.13,.74,.18-2.20)	(.84,.37,.37-1.50)
PO_4DIS	(.81,.42,.04-1.95)	(1.05,.50,.43-2.40)
PO_4TOTAL	(1.17,1.31,.66-5.33)	(1.21,.79,.66-3.60)
SO_4	(7.35,3.32,3.00-12.27)	(9.37,3.99,6.82-21.00)
NH_4	(.16,.18,.00-.62)	(.12,.14,.00-.46)
Cl	(5.25,7.98,1.45-27.60)	(5.21,7.91,1.60-28.86)
F	(.42,.45,.17-1.75)	(.45,.51,.18-1.95)
Na	(4.31,.78,3.08-6.16)	(3.21,.43,2.44-3.83)
K	(.24,.27,.00-1.00)	(.21,.29,.00-1.00)
Mg	(6.34,2.38,4.10-12.98)	(3.79,2.30,.80-7.97)
Ca	(13.53,7.18,2.01-28.29)	(10.81,5.64,1.39-17.82)
Fe	(.24,.56,.00-2.00)	(.22,.59,.00-2.10)
Cu	(.00,.00,.00-.01)	(.00,.01,.00-.03)
Pb	(.01,.02,.00-.06)	(.01,.02,.00-.06)
Cr	(.00,.00,.00-.00)	(.00,.00,.00-.01)
Mn	(.00,.00,.00-.00)	(.00,.00,.00-.00)
Cd	(.00,.00,.00-.01)	(.00,.00,.00-.00)
TEMP	(25.63,1.73,22.60-29.40)	(25.30,1.44,21.90-26.90)
pH	(6.08,.37,5.74-6.70)	(5.93,.31,5.48-6.51)
COND	(138.78,28.85,87.5-205.0)	(112.90,34.31,50.8-158.3)
^{226}Ra	(.46,.26,0-1)	(.87,1.75,0-6)

	Inner Wells	Outer Wells
TDS	(105.25,83.05,.00-357.00)	(85.80,55.10,.00-226.00)
CO_3	(.00,.00,.00-.00)	(.00,.00,.00-.00)
HCO_3	(36.77,23.58,11.37-135.07)	(62.05,37.90,15.51-139.03)
NO_3	(.69,.64,.00-2.22)	(.18,.33,.00-1.70)
PO_4DIS	(1.03,.47,.04-2.40)	(1.20,1.05,.11-3.60)
PO_4TOTAL	(1.83,3.28,.62-23.23)	(1.75,2.05,.26-10.40)
SO_4	(38.76,54.14,3.00-236.50)	(6.20,7.47,.00-46.00)
NH_4	(.16,.16,.00-.62)	(.83,.70,.00-2.25)
Cl	(5.54,8.10,1.00-41.27)	(8.27,13.07,1.35-67.49)
F	(.49,.55,.17-2.70)	(.52,.72,.11-4.60)
Na	(4.36,.93,2.44-7.51)	(4.69,1.87,2.43-8.57)
K	(.30,.26,.00-1.00)	(.32,.30,.00-1.40)
Mg	(4.10,2.92,.08-15.68)	(7.08,7.71,1.08-30.14)
Ca	(20.79,17.26,1.39-73.88)	(11.43,5.92,1.49-27.05)
Fe	(1.57,5.79,.00-47.45)	(5.60,7.49,.04-45.79)
Cu	(.00,.01,.00-.07)	(.00,.00,.00-.01)
Pb	(.01,.05,.00-.43)	(.01,.02,.00-.08)
Cr	(.00,.01,.00-.05)	(.00,.01,.00-.04)
Mn	(.00,.01,.00-.04)	(.06,.05,.00-.17)
Cd	(.00,.00,.00-.01)	(.00,.00,.00-.00)
TEMP	(25.52,1.43,21.90-29.40)	(25.46,1.45,22.00-28.00)
pH	(5.70,.48,4.73-6.95)	(5.63,.49,4.89-6.56)
COND	(168.90,87.45,50.8-419.0)	(154.45,69.17,72.9-375.0)
^{226}Ra	(.79,1.05,0-6)	(1.16,3.88,0-21)

Table 6

Correlation Coefficients[6]

Columbia County, White Springs Road

Turbidity Versus:	Calcium	-0.08
	Sulfate	0.15
	^{226}Radium	-0.72
Conductivity versus:	Calcium	0.83
	Sulfate	0.33
	^{226}Radium	-0.03

Polk County, Parrish Road

Turbidity Versus:	Calcium	0.05
	Sulfate	0.11
	^{226}Radium	0.64
Conductivity versus:	Calcium	0.87
	Sulfate	0.79
	^{226}Radium	-0.10

6 Based on all available data pairs at each road site

Table 7

Average Coefficients of Variation
(Columbia County, White Springs Road)

TDS	45.01	
HCO_3	98.92	
NO_3	27.20	
PO_4DIS	60.52	
PO_4TOTAL	213.05	
SO_4	64.31	
NH_4	108.22	
Cl	143.00	
F	122.62	
Na	32.53	
K	40.48	
Mg	73.25	
Ca	112.60	
Fe	100.92	
Cu	75.00	3[7]
Pb	190.00	5[7]
Cr	156.25	
Mn	103.41	
Cd	100.00	1[7]
TEMP	7.73	
pH	9.48	
COND	27.77	
^{226}Ra	72.93	

7 Number of wells with reportable values

Table 8

Average Coefficients of Variation
(Polk County, Parrish Road)

TDS	56.70	
HCO_3	28.89	
NO_3	103.65	
PO_4DIS	43.89	
PO_4TOTAL	130.17	
SO_4	76.02	
NH_4	97.84	
Cl	141.84	
F	112.06	
Na	14.34	
K	89.46	
Mg	40.91	
Ca	48.31	
Fe	168.57	
Cu	20.00	1[8]
Pb	190.00	
Cr	20.00	2[8]
Mn	31.19	5[8]
Cd	-	
TEMP	5.67	
pH	7.35	
COND	21.38	
^{226}Ra	109.30	

[8] Number of wells with reportable values

Table 9

Ranges of Means
(Columbia County, White Springs Road)

TDS	(41.57-385.17)
CO_3	(.00-.00)
HCO_3	(.86-167.74)
NO_3	(.18-21.88)
PO_4DIS	(.02-.26)
PO_4TOTAL	(.08-.96)
SO_4	(2.06-194.98)
NH_4	(.04-.15)
Cl	(1.72-16.26)
F	(.08-.31)
Na	(2.32-11.47)
K	(.56-2.66)
Mg	(1.88-36.27)
Ca	(2.75-184.78)
Fe	(.96-5.73)
Cu	(.00-.02)
Pb	(.00-.02)
Cr	(.01-.04)
Mn	(.01-.26)
Cd	(.00-.01)
TEMP	(21.34-23.65)
pH	(4.22-7.53)
COND	(67.69-495.17)
^{226}Ra	(.59-4.06)

Table 10

Ranges of Means
(Polk County, Parrish Road)

TDS	(47.17-242.33)
CO_3	(.00-.00)
HCO_3	(19.00-122.16)
NO_3	(.07-1.19)
PO_4DIS	(.34-2.70)
PO_4TOTAL	(.90-3.52)
SO_4	(4.03-143.51)
NH_4	(.12-1.51)
Cl	(3.06-15.56)
F	(.26-.93)
Na	(3.21-7.72)
K	(.12-.62)
Mg	(1.63-19.28)
Ca	(8.06-51.65)
Fe	(.18-12.57)
Cu	(.00-.01)
Pb	(.00-.04)
Cr	(.00-.01)
Mn	(.00-.12)
Cd	(.00-.00)
TEMP	(24.98-25.98)
pH	(5.38-6.08)
COND	(96.59-337.17)
^{226}Ra	(.20-3.68)

Table 11

Trends Analyses (Columbia County, White Springs Road)[9]

Parameter	Y+	Y-	N
TDS	1	0	7
HCO_3	0	0	8
NO_3	0	0	8
PO_4DIS	0	1	7
PO_4TOTAL	0	0	8
SO_4	2	0	6
NH_4	2	0	6
Cl	0	0	8
F	0	1	7
Na	1	0	7
K	1	1	6
Mg	2	0	6
Ca	2	0	6
Fe	0	0	8
Cu	0	0	8
Pb	0	0	7[10]
Cr	0	0	8
Mn	0	0	8
Cd	0	0	5[10]
TEMP	3	0	5
pH	0	1	7
COND	2	3	3
^{226}Ra	0	0	8

[9] Number of wells showing Upward (Y+), or Downward (Y-), or No (N) Trend

[10] Insufficient data on some wells

Table 12

Comparison of Trends, Inner Versus Outer Wells
(Columbia County, White Springs Road)[11]

Parameter	Inner Wells Y+	Inner Wells Y-	Inner Wells N	Outer Wells Y+	Outer Wells Y-	Outer Wells N
TDS	1	0	3	0	0	4
HCO_3	0	0	4	0	0	4
NO_3	0	0	4	0	0	4
PO_4DIS	0	0	4	0	1	3
PO_4TOTAL	0	0	4	0	0	4
SO_4	1	0	3	1	0	3
NH_4	0	0	4	2	0	2
Cl	0	0	4	0	0	4
F	0	1	3	0	0	4
Na	1	0	3	0	0	4
K	1	1	2	0	0	4
Mg	1	0	3	1	0	3
Ca	1	0	3	1	0	3
Fe	0	0	4	0	0	4
Cu	0	0	4	0	0	4
Pb	0	0	4	0	0	3[12]
Cr	0	0	4	0	0	4
Mn	0	0	4	0	0	4
Cd	0	0	2[12]	0	0	3[12]
TEMP	2	0	2	1	0	3
pH	0	1	3	0	0	4
COND	1	1	2	1	2	1
^{226}Ra	0	0	4	0	0	4

[11] Number of wells showing Upward (Y+), or Downward (Y-), or No (N) Trend

[12] Insufficient data on some wells

Table 13

Comparison of Trends, West Versus East Side of Road
(Columbia County, White Springs Road)[13]

Parameter	West of Road Y+	West of Road Y-	West of Road N	East of Road Y+	East of Road Y-	East of Road N
TDS	1	0	3	0	0	4
HCO_3	0	0	4	0	0	4
NO_3	0	0	4	0	0	4
PO_4DIS	0	0	4	0	1	3
PO_4TOTAL	0	0	4	0	0	4
SO_4	2	0	2	0	0	4
NH_4	1	0	3	1	0	3
Cl	0	0	4	0	0	4
F	0	1	3	0	0	4
Na	1	0	3	0	0	4
K	1	0	3	0	1	3
Mg	2	0	2	0	0	4
Ca	2	0	2	0	0	4
Fe	0	0	4	0	0	4
Cu	0	0	4	0	0	4
Pb	0	0	4	0	0	3[14]
Cr	0	0	4	0	0	4
Mn	0	0	4	0	0	4
Cd	0	0	4	0	0	1[14]
TEMP	3	0	1	0	0	4
pH	0	0	4	0	1	3
COND	2	1	1	0	2	2
226_{Ra}	0	0	4	0	0	4

[13] Number of wells showing Upward (Y+), or Downward (Y-), or No (N) Trend

[14] Insufficient data on some wells

Table 14

Trends Data For Phosphogypsum Constituents
(Columbia County, White Springs Road)[15]

Well No.	Ca	SO_4	F	^{226}Ra
1	Y+	Y+	N	N
2	N	N	N	N
3	Y+	Y+	N	N
4	N	N	N	N
5	N	N	Y-	N
6	N	N	N	N
7	N	N	N	N
8	N	N	N	N
DW	N	N	N	N

15 Upward (Y+), Downward (Y-), or No (N) Trend

Table 15

Trends Analyses (Polk County, Parrish Road)[16]

Parameter	Y+	Y-	N
TDS	1	0	9
HCO_3	4	1	5
NO_3	1	3	6
PO_4DIS	0	0	10
PO_4TOTAL	0	0	10
SO_4	3	2	5
NH_4	1	0	9
Cl	0	1	9
F	0	0	10
Na	2	0	8
K	0	0	10
Mg	4	0	6
Ca	9	0	1
Fe	0	0	10
Cu	0	0	9[17]
Pb	0	0	10
Cr	0	0	10
Mn	0	0	8[17]
Cd	0	0	10
TEMP	1	0	9
pH	0	1	9
COND	5	1	4
^{226}Ra	0	0	10

[16] Number of wells showing Upward (Y+), or Downward (Y-), or No (N) Trend

[17] Insufficient data on some wells

Table 16

Comparison of Trends, Inner Versus Outer Wells
(Polk County, Parrish Road)[18]

Parameter	Inner Wells Y+	Inner Wells Y-	Inner Wells N	Outer Wells Y+	Outer Wells Y-	Outer Wells N
TDS	1	0	5	0	0	4
HCO_3	3	0	3	1	1	2
NO_3	1	3	2	0	0	4
PO_4DIS	0	0	6	0	0	4
PO_4TOTAL	0	0	6	0	0	4
SO_4	2	1	3	1	1	2
NH_4	0	0	6	1	0	3
Cl	0	0	6	0	1	3
F	0	0	6	0	0	4
Na	2	0	4	0	0	4
K	0	0	6	0	0	4
Mg	3	0	3	1	0	3
Ca	5	0	1	4	0	0
Fe	0	0	6	0	0	4
Cu	0	0	5[19]	0	0	4
Pb	0	0	6	0	0	4
Cr	0	0	6	0	0	4
Mn	0	0	4[19]	0	0	4
Cd	0	0	6	0	0	4
TEMP	1	0	5	0	0	4
pH	0	0	6	0	1	3
COND	5	0	1	0	1	3
^{226}Ra	0	0	6	0	0	4

[18] Number of wells showing Upward (Y+), or Downward (Y-), or No (N) Trend

[19] Insufficient data on some wells

Table 17

Comparison of Trends, West Versus East Side of Road
(Polk County, Parrish Road)[20]

Parameter	West of Road Y+	West of Road Y-	West of Road N	East of Road Y+	East of Road Y-	East of Road N
TDS	0	0	5	1	0	4
HCO_3	1	1	3	3	0	2
NO_3	0	3	2	1	0	4
PO_4DIS	0	0	5	0	0	5
PO_4TOTAL	0	0	5	0	0	5
SO_4	0	1	4	3	1	1
NH_4	1	0	4	0	0	5
Cl	0	0	5	0	1	4
F	0	0	5	0	0	5
Na	0	0	5	2	0	3
K	0	0	5	0	0	5
Mg	2	0	3	2	0	3
Ca	4	0	1	5	0	0
Fe	0	0	5	0	0	5
Cu	0	0	4[21]	0	0	5
Pb	0	0	5	0	0	5
Cr	0	0	5	0	0	5
Mn	0	0	4[21]	0	0	4[21]
Cd	0	0	5	0	0	5
TEMP	1	0	4	0	0	5
pH	0	1	4	0	0	5
COND	2	1	2	3	0	2
^{226}Ra	0	0	5	0	0	5

[20] Number of wells showing Upward (Y+), or Downward (Y-), or No (N) Trend

[21] Insufficient data on some wells

Table 18

Trends Data For Phosphogypsum Constituents
(Polk County, Parrish Road)[22]

Well No.	Ca	SO_4	F	^{226}Ra
1	N	N	N	N
2	Y+	Y+	N	N
3	Y+	N	N	N
4	Y+	Y+	N	N
5	Y+	Y-	N	N
6	Y+	Y+	N	N
7	Y+	N	N	N
8	Y+	Y-	N	N
9	Y+	N	N	N
10	Y+	N	N	N
DW	Y+	Y+	N	N

[22] Upward (Y+), Downward (Y-), or No (N) Trend

Table 19

Gamma Radiation Levels (μR/hr)
White Springs Road

On Road Site Number	1	2	3	4	5	6
17-Aug-88	-	10	8	7	10	7
26-Oct-88	6	6	6	7	6	5
06-Dec-88	5	5	4	5	5	3
07-Feb-89	5	5	5	6	4	3
11-Apr-89	6	6	6	7	7	5
05-Jun-89	5	6	6	7	7	4
07-Aug-89	6	6	7	7	7	5
07-Nov-89	5	6	6	8	6	3
06-Feb-90	5	6	6	9	7	4
07-May-90	4	6	6	8	6	3
06-Aug-90	6	6	6	8	6	4
05-Nov-90	5	6	4	7	5	4
Average	5	6	6	7	6	4

Off Road Site Number	1	2	3	4	5	6
17-Aug-88	-	6	6	6	7	7
26-Oct-88	4	4	4	5	4	4
06-Dec-88	3	3	3	3	4	2
07-Feb-89	3	3	5	3	3	3
11-Apr-89	5	5	4	5	4	4
05-Jun-89	4	3	4	6	4	4
07-Aug-89	5	5	6	6	5	4
07-Nov-89	4	4	5	7	4	3
06-Feb-90	4	4	4	7	3	3
07-May-90	4	4	4	3	3	3
06-Aug-90	5	5	5	7	4	4
05-Nov-90	3	4	3	6	3	3
Average	4	4	4	5	4	4

Site	Location
1	Pole E6241099
2	Abandoned block house
3	Nova Road
4	Mr. Connor's drive
5	By well #1
6	Service Road

Table 20

Gamma Radiation Levels (µR/hr)
Parrish Road

On Road

Site Number	1	2	3	4	5
18-Aug-88	11	14	13	15	17
27-Oct-88	13	13	12	16	23
08-Dec-88	12	12	11	14	22
09-Feb-89	14	13	11	17	14
04-Apr-89	11	12	12	14	14
13-Jun-89	14	16	11	16	15
14-Aug-89	15	16	12	16	14
14-Nov-89	16	17	12	17	15
12-Feb-90	14	18	12	17	16
18-May-90	17	18	15	17	15
20-Aug-90	13	14	12	14	13
30-Oct-90	16	16	13	14	15
Average	14	15	12	16	16

Off Road

Site Number	1	2	3	4	5
18-Aug-88	9	10	10	12	11
27-Oct-88	9	9	10	13	17
08-Dec-88	11	8	8	11	17
09-Feb-89	11	12	10	15	11
04-Apr-89	9	10	9	11	12
13-Jun-89	12	13	10	15	10
14-Aug-89	14	12	10	14	10
14-Nov-89	12	11	10	12	10
12-Feb-90	15	15	10	18	10
18-May-90	16	15	14	17	10
20-Aug-90	12	13	10	12	11
30-Oct-90	12	15	10	12	10
Average	12	12	10	14	12

Site	Location
1	Across from well #9
2	Pole 5-123-12-8
3	Patty Lane
4	Curve in road
5	Transformer pole near Keller Rd.

Table 21

Radon Levels (pCi/l) - White Springs Road

Radon in Air Results

Site	17-Aug-88	26-Oct-88	07-Feb-89	11-Apr-89	06-Jun-89	08-Aug-89	07-Nov-89	06-Feb-90	07-May-90	Average
C-1	0.9	1.1	0.8	1.0	0.6	0.8	1.3	2.0	1.2	1.1
C-4	-	1.9	0.8	1.1	0.9	-	1.4	-	-	1.2

Radon in Soil Results

Site	17-Aug-88	26-Oct-88	07-Feb-89	11-Apr-89	06-Jun-89	08-Aug-89	07-Nov-89	06-Feb-90	07-May-90	
C-2	144.7	125.4	40.9	54.0	39.1	21.1	25.2	18.2	18.6	54.1
C-3	89.7	175.3	133.4	84.0	85.5	51.7	53.4	67.5	44.4	87.2

Site	Location
C-1	Tree by Fence North End of Well Field
C-2	Road side of Fence near Well 7
C-3	Pole E 6-241-0-99
C-4	Pole E 6-241-0-99

Table 22

Radon Levels (pCi/l) - Parrish Road

Radon in Air Results

Site	18-Aug-88	15-Nov-88	09-Feb-89	04-Apr-89	13-Jun-89	14-Aug-89	14-Nov-89	12-Feb-90	18-May-90	Average
P-1	0.4	1.1	1.4	2.0	0.7	0.6	2.3	1.6	2.6	1.4
P-3	1.3	1.6	0.6	0.7	0.8	0.8	2.2	3.1	2.4	1.5

Radon in Soil Results

Site	18-Aug-88	15-Nov-88	09-Feb-89	04-Apr-89	13-Jun-89	14-Aug-89	14-Nov-89	12-Feb-90	18-May-90	
P-2	578.8	540.5	945.7	643.8	917.1	-	213.4	277.1	317.0	554.2
P-4	416.1	53.0	403.4	432.9	568.0	160.5	16.3	176.4	156.0	264.7

Site	Location
P-1	Pole 5-123-6
P-2	Pole 5-123-6
P-3	Pole 5-123-1
P-4	Pole 5-123-1

Table 23

Trends Analysis, Environmental Radiation (non-water)[23]
(Polk County, Parrish Road)

Parameter	Y+	Y-	N
Radon in Air	0	0	2
Radon in Soil	0	0	2
Gamma On-Road	1	0	4
Gamma Off-Road	2	0	3

Trends Analysis, Environmental Radiation (non-water)[23]
(Columbia County, White Springs Road)

Parameter	Y+	Y-	N
Radon in Air	0	0	2
Radon in Soil	0	1	1
Gamma On-Road	0	0	6
Gamma Off-Road	0	0	6

[23] Number Of sites showing Upward (Y+), or Downward (y-), or No (N) Trend.

Table 24

Radium in Soil
(picoCuries per gram)

Parrish Road

	13-Jun-89	30-Oct-90	Average
P-1	1.9	1.7	1.8
P-2	1.8	3.1	2.5
P-3	1.4	1.2	1.3
P-4	2.3	3.4	2.9

Locations:

P-1	Pole 5-123-1
P-2	Pole 5-123-12-6
P-3	Pole 5-123-12-8
P-4	Patty Lane

White Springs Road

	06-Jun-89	05-Nov-90	Average
C-1	0.4	0.6	0.5
C-2	1.2	0.3	0.8
C-3	0.8	1.4	1.1
C-4	0.6	0.4	0.5

Locations:

C-1	By Well 1
C-2	Nova Road
C-3	Conners Drive
C-4	Pole 5-24-10-99

Table 25

Lakewater Results - Parrish Rd. (Polk County)

Lake	Trip No.	Date	# of Day's From Start	T D S (mg/l)	Bicarb (mg/l)	Nitrate (mg/l)	Dissolved PO4 (mg/l)	Total PO4 (mg/l)	Sulfate (mg/l)	Ammonia (mg/l)	Chloride (mg/l)	Fluoride (mg/l)	Na (mg/l)	K (mg/l)	Mg (mg/l)	Ca (mg/l)	Fe (mg/l)	Cu (mg/l)
East	7	14-Aug-89	361	193.00	159.44					0.25	6.80	0.88	6.16	0.17	28.55	21.34	0.11	0.01
East	8	14-Nov-89	453	171.00	158.40					0.11	5.60	0.93						
East	10	14-May-90	634	220.00	168.72	0.12	0.39	0.40	10.60	0.46	6.90	0.84	7.69	0.38	30.90	27.05	0.00	0.00
East	11	20-Aug-90	732	331.00	122.64	0.00	0.26	0.34	8.00	0.70	6.40	0.86	6.94	0.25	10.90	46.08	0.00	0.00
East	12	30-Oct-90	803	169.00	137.32	0.00	0.58	0.68	11.00	0.14	5.80	0.94	8.02	0.54	25.59	26.52	0.03	0.00
East Average				216.80	149.30	0.04	0.41	0.47	9.87	0.33	6.30	0.89	7.20	0.34	23.99	30.25	0.04	0.00
West	8	14-Nov-89	453	109.00	111.55					0.00	6.20	1.20						
West	10	14-May-90	634	149.00	99.88	0.06	0.65	0.64	0.00	0.42	7.20	1.20	8.51	0.00	15.16	25.14	0.13	0.01
West	11	20-Aug-90	732	263.00	106.82	0.00	0.71	0.79	0.00	0.54	5.35	1.25	9.47	0.36	33.51	46.71	0.07	0.00
West	12	30-Oct-90	803	132.00	95.67	0.12	0.63	0.72	2.60	0.11	8.60	1.45	9.73	0.29	14.19	29.19	0.44	0.00
West Average				163.25	103.48	0.06	0.66	0.72	0.87	0.27	6.84	1.28	9.24	0.22	20.95	33.68	0.21	0.00
Wgt. Average				193.00	128.94	0.05	0.54	0.60	5.37	0.30	6.54	1.06	8.07	0.28	22.69	31.72	0.11	0.00

Table 25

Lakewater Results - Parrish Rd. (Polk County) (Cont.)

Lake	Trip No.	Pb (mg/l)	Cr (mg/l)	Mn (mg/l)	Cd (mg/l)	Temp (deg C)	pH	Conductivity (micromhos)	Color	Odor	Rain Data (inches)
East	7	0.02	0.00	0.00	0.00	31.00	8.86	274.0	clear 20	cow	3.37
East	8					23.70	9.19	288.0	clear 10	none	3.22
East	10	0.00	0.00	0.00	0.00	29.90	9.19	287.0	green cloudy 20	none	1.23
East	11	0.00	0.01	0.01	0.00	29.50	9.74	247.0	green cloudy 10	none	2.99
East	12	0.00	0.00	0.00	0.00	24.80	9.00	266.0	clear 10	none	0.66
East Average		0.00	0.00	0.00	0.00	27.78	9.20	272.4			
West	8					21.00	7.83	231.0	clear 10	none	3.22
West	10	0.00	0.00	0.00	0.00	27.80	9.20	210.0	clear 10	none	1.23
West	11	0.00	0.02	0.05	0.00	29.40	8.27	217.0	muddy cloudy 20	none	2.99
West	12	0.00	0.01	0.01	0.00	25.40	8.74	235.0	clear 10	none	0.66
West Average		0.00	0.01	0.02	0.00	25.90	8.51	223.3			
Wgt. Average		0.00	0.00	0.01	0.00	26.94	8.89	250.6			

Table 26

DRINKING WATER STANDARDS (milligrams/liter)

Contaminant	Maximum Contaminant Level
Total dissolved solids	500
Nitrate	10
Sulfate	250
Chloride	250
Fluoride	4
Sodium	160
Iron	0.3
Copper	1
Lead	0.05
Chromium	0.05
Manganese	0.05
Cadmium	0.01
pH	6.5 - 8.5 (units)
Radium	5 (picoCuries/liter)

APPENDIX

Site	Well No.	Trip No.	Date	# of Days From Start	T D S (mg/l)	Carbonate (mg/l)	Bicarb (mg/l)	Nitrate (mg/l)	Dissolved PO4 (mg/l)	Total PO4 (mg/l)	Sulfate (mg/l)	Ammonia (mg/l)	Chloride (mg/l)	Fluoride (mg/l)	Na (mg/l)	K (mg/l)	Mg (mg/l)	Ca (mg/l)	Fe (mg/l)	Cu (mg/l)
Columbia	1	1	17-Aug-88	1	64.00	0.00	10.34	1.80	0.00	0.50	31.60	0.00	6.31	0.26	2.00	1.50	5.20	8.00	3.00	0.00
Columbia	1	2	26-Oct-88	70	52.00	0.00	0.00	2.84	0.07	0.03	37.50	0.00	6.74	0.00	1.80	1.30	4.10	2.40	2.12	0.00
Columbia	1	3	05-Dec-88	110	15.00	0.00	0.00	2.99	0.02	0.10	46.65	0.37	1.58	0.22	2.30	1.67	7.27	3.50	4.00	0.00
Columbia	1	4	07-Feb-89	174	100.00	0.00	0.00	2.00	0.02	0.08	89.50	0.00	0.70	0.69	2.30	1.67	6.87	4.70	15.45	0.00
Columbia	1	5	10-Apr-89	236	186.00	0.00	0.00	1.70	0.01	0.02	26.60	0.27	0.82	0.11	2.20	1.69	5.88	4.88	1.43	0.00
Columbia	1	6	05-Jun-89	292	203.00	0.00	0.00	2.65	0.00	0.04	134.03	0.20	0.83	0.15	2.30	1.70	12.38	25.23	1.14	0.00
Columbia	1	7	07-Aug-89	355	283.00	0.00	0.00	3.14	0.03	0.02	173.95	0.12	0.67	0.14	1.59	2.53	36.96	54.90	2.59	0.00
Columbia	1	8	06-Nov-89	446	253.00	0.00	0.00	2.28	0.04	0.06		0.20	0.69	0.13	2.63	2.32	35.09	61.87	2.01	0.16
Columbia	1	9	05-Feb-90	537	561.00	0.00	0.00	2.40	0.02	0.04	326.00	0.00	0.62	0.19	2.37	2.50	38.86	75.88	1.50	0.00
Columbia	1	10	07-May-90	628	605.00	0.00	0.00	2.00	0.03	0.02	400.00	0.23	0.47	0.22	2.80	2.37	43.10	94.92	1.47	0.02
Columbia	1	11	06-Aug-90	719	624.00	0.00	0.00	2.30	0.02	0.05	446.00	0.25	0.63	0.20	2.57	2.30	43.28	123.42	0.88	0.02
Columbia	1	12	05-Nov-90	810	681.00	0.00	0.00	2.70	0.02	0.01	433.00	0.13	0.60	0.24	2.97	2.60	38.94	106.99	1.36	0.00
Columbia	2	1	17-Aug-88	1	104.00	0.00	51.70	4.00	0.08	1.70	4.05	0.00	14.76	0.82	3.00	0.90	12.10	20.80	2.20	0.00
Columbia	2	2	26-Oct-88	70	128.00	0.00	75.48	5.11	0.08	0.03	12.03	0.00	14.89	0.27	2.40	0.42	8.40	8.40	0.27	0.00
Columbia	2	3	05-Dec-88	110	65.00	0.00	48.63	4.96	0.03	0.12	2.83	0.18	1.35	0.31	2.50	0.59	11.73	10.97	0.88	0.00
Columbia	2	4		174																
Columbia	2	5	11-Apr-89	237	88.00	0.00	47.79	5.20	0.01	0.01	4.15	0.18	1.35	0.22	2.80	0.89	11.50	9.84	1.77	0.00
Columbia	2	6	06-Jun-89	293	88.00	0.00	47.25	5.10	0.02	0.03	4.26	0.11	1.40	0.17	3.10	0.80	33.84	220.40	1.95	0.02
Columbia	2	7	07-Aug-89	355	95.00	0.00	57.49	8.03	0.03	0.04	6.17	0.12	1.30	0.16	2.01	0.45	20.14	37.24	1.17	0.00
Columbia	2	8	06-Nov-89	446	72.00	0.00	48.61	5.00	0.03	0.06		0.15	1.30	0.15	2.32	0.67	12.87	28.45	1.00	0.05
Columbia	2	9	05-Feb-90	537	121.00	0.00	51.03	5.60	0.02	0.04	4.70	0.00	1.25	0.16	2.02	0.50	15.39	28.60	0.44	0.00
Columbia	2	10	07-May-90	628	85.00	0.00	47.27	5.40	0.04	0.06	4.80	0.17	1.25	0.17	2.29	0.39	10.83	17.76	0.27	0.01
Columbia	2	11	06-Aug-90	719	84.00	0.00	48.50	5.50	0.04	0.07	4.00	0.23	1.45	0.14	2.22	0.26	10.87	21.85	0.46	0.00
Columbia	2	12	05-Nov-90	810	55.00	0.00	49.66	5.10	0.01	0.01	5.00	0.11	1.15	0.16	2.29	0.26	11.12	19.60	0.16	0.00
Columbia	3	1	17-Aug-88	1	93.00	0.00	20.68	0.11	0.02	0.63	14.77	0.00	7.22	0.14	2.30	1.00	1.00	1.50	2.50	0.00
Columbia	3	2	26-Oct-88	70	0.00	0.00	0.00	0.39	0.05	0.04	10.69	0.00	7.44	0.00	3.30	0.55	0.80	0.30	0.85	0.00
Columbia	3	3	05-Dec-88	110	33.00	0.00	0.00	0.32	0.05	0.20	35.56	0.13	0.98	0.14	4.70	0.77	1.10	0.30	2.72	0.00
Columbia	3	4	07-Feb-89	174	0.00	0.00	0.00	0.20	0.03	0.04	20.80	0.00	0.69	0.48	3.57	0.75	1.33	0.30	3.60	0.00
Columbia	3	5	10-Apr-89	236	91.00	0.00	0.00	0.35	0.01	0.01	19.45	0.24	0.90	0.11	3.98	0.99	2.40	0.50	9.59	0.00

Site	Well No.	Trip No.	Date	# of Days From Start	T D S (mg/l)	Carbonate (mg/l)	Bicarb (mg/l)	Nitrate (mg/l)	Dissolved PO4 (mg/l)	Total PO4 (mg/l)	Sulfate (mg/l)	Ammonia (mg/l)	Chloride (mg/l)	Fluoride (mg/l)	Na (mg/l)	K (mg/l)	Mg (mg/l)	Ca (mg/l)	Fe (mg/l)	Cu (mg/l)
Columbia	3	6	05-Jun-89	292	22.00	0.00	0.00	0.52	0.02	0.04	21.16	0.29	0.95	0.00	3.10	0.55	1.93	2.04	1.75	0.00
Columbia	3	7	07-Aug-89	355	17.00	0.00	0.00	0.25	0.05	0.04	14.20	0.11	0.93	0.00	2.49	0.52	1.27	0.93	3.61	0.00
Columbia	3	8	06-Nov-89	446	0.80	0.00	0.00	0.37	0.05	0.08		0.17	0.92	0.00	2.54	0.63	1.72	1.78	8.51	0.02
Columbia	3	9	05-Feb-90	537	46.00	0.00	0.00	0.30	0.02	0.03	13.00	0.00	0.94	0.00	2.01	0.07	1.31	1.16	0.92	0.00
Columbia	3	10	07-May-90	628	34.00	0.00	0.00	0.37	0.03	0.02	26.70	0.16	1.00	0.00	2.83	0.53	3.35	2.87	4.14	0.01
Columbia	3	11	06-Aug-90	719	112.00	0.00	0.00	0.20	0.02	0.02	51.30	0.28	1.00	0.00	3.67	0.53	4.70	4.65	1.79	0.00
Columbia	3	12	05-Nov-90	810	50.00	0.00	0.00	0.20	0.00	0.01	92.00	0.12	0.86	0.15	4.52	0.81	19.09	16.72	1.46	0.00
Columbia	4	1	17-Aug-88	1	139.00	0.00	25.85	3.50	0.12	0.67	28.78	0.00	5.52	0.16	6.70	1.90	4.20	13.90	2.90	0.00
Columbia	4	2	26-Oct-88	70	132.00	0.00	12.41	4.26	0.12	0.04	35.49	0.00	12.41	0.00	6.60	1.50	3.20	3.30	0.87	0.00
Columbia	4	3	05-Dec-88	110	155.00	0.00	9.62	3.08	0.10	0.20	56.90	0.00	1.30	0.14	7.20	1.47	4.97	4.83	1.13	0.00
Columbia	4	4	07-Feb-89	174	120.00	0.00	11.96	3.80	0.05	0.08	83.20	0.00	0.75	0.35	7.67	2.20	7.47	5.27	7.55	0.00
Columbia	4	5	11-Apr-89	237	235.00	0.00	8.89	3.17	0.02	0.02	36.04	0.00	0.66	0.11	7.63	2.28	0.83	9.67	0.76	0.00
Columbia	4	6	06-Jun-89	293	150.00	0.00	9.89	3.01	0.02	0.04	94.93	0.14	0.52	0.11	6.58	1.50	8.23	33.78	0.88	0.01
Columbia	4	7	07-Aug-89	355	330.00	0.00	6.63	2.93	0.03	0.04	238.35	0.13	0.42	0.00	5.34	2.34	23.08	66.81	1.29	0.01
Columbia	4	8	06-Nov-89	446																
Columbia	4	9	05-Feb-90	537																
Columbia	4	10	07-May-90	628																
Columbia	4	11	06-Aug-90	719																
Columbia	4	12	05-Nov-90	810																
Columbia	5	1	17-Aug-88	1	107.00	0.00	82.72	0.00	0.06	1.11	7.07	0.00	11.29	0.43	2.90	1.00	2.90	35.00	1.60	0.00
Columbia	5	2	26-Oct-88	70	73.00	0.00	66.18	0.42	0.12	0.02	4.02	0.10	9.57	0.14	3.90	3.10	5.60	68.00	8.15	0.00
Columbia	5	3	05-Dec-88	110	76.00	0.00	62.00	0.13	0.05	0.16	2.99	0.37	1.80	0.26	2.37	0.70	2.20	15.20	1.38	0.00
Columbia	5	4	07-Feb-89	174	49.00	0.00	67.42	0.10	0.04	0.08	3.60	0.00	0.95	0.64	2.30	0.54	1.53	15.13	0.84	0.00
Columbia	5	5	10-Apr-89	236	141.00	0.00	68.91	0.16	0.04	0.03	4.15	0.16	1.15	0.11	2.43	0.69	1.40	11.90	0.85	0.00
Columbia	5	6	05-Jun-89	292	71.00	0.00	65.93	0.17	0.03	0.04	3.67	0.11	0.98	0.11	2.10	0.40	1.50	25.70	0.73	0.00
Columbia	5	7	07-Aug-89	355	67.00	0.00	61.92	0.10	0.05	0.06	6.83	0.12	1.00	0.11	1.21	0.41	0.45	24.36	0.30	0.00
Columbia	5	8	06-Nov-89	446	41.00	0.00	64.43	0.17	0.07	0.06		0.12	1.00	0.00	2.00	0.31	0.95	26.53	0.28	0.02
Columbia	5	9	05-Feb-90	537	119.00	0.00	80.51	0.10	0.07	0.08	11.20	0.00	1.05	0.00	1.92	0.54	1.66	32.98	0.03	
Columbia	5	10	07-May-90	628	90.00	0.00	77.66	0.40	0.10	0.14	4.30	0.30	0.92	0.00	23.80	0.57	1.88	31.29	0.01	0.02

Site	Well No.	Trip No.	Date	# of Days From Start	T D S (mg/l)	Carbonate (mg/l)	Bicarb (mg/l)	Nitrate (mg/l)	Dissolved PO4 (mg/l)	Total PO4 (mg/l)	Sulfate (mg/l)	Ammonia (mg/l)	Chloride (mg/l)	Fluoride (mg/l)	Na (mg/l)	K (mg/l)	Mg (mg/l)	Ca (mg/l)	Fe (mg/l)	Cu (mg/l)
Columbia	5	11	06-Aug-90	719	52.00	0.00	69.93	0.10	0.08	0.11	7.00	0.32	1.05	0.00	2.12	0.25	1.39	28.19	0.00	0.00
Columbia	5	12	05-Nov-90	810	67.00	0.00	67.71	0.30	0.07	0.08	6.00	0.00	1.05	0.00	2.34	0.42	1.06	31.00	0.82	0.00
Columbia	6	1	17-Aug-88	1	150.00	0.00	56.87	8.06	0.11	4.89	3.67	0.00	24.14	0.93	3.40	1.70	19.80	51.20	2.70	0.00
Columbia	6	2	26-Oct-88	70	79.00	0.00	67.21	15.12	0.09	0.07	3.53	0.00	14.89	0.19	3.10	1.80	22.40	40.00	3.29	0.00
Columbia	6	3	05-Dec-88	110	111.00	0.00	57.72	8.44	0.18	0.24	3.35	0.14	1.80	0.35	3.00	1.53	18.40	28.27	2.57	0.00
Columbia	6	4	07-Feb-89	174	100.00	0.00	65.25	9.20	0.11	0.12	3.70	0.00	1.75	0.76	2.90	1.13	15.13	23.13	1.09	0.00
Columbia	6	5	11-Apr-89	237	218.00	0.00	70.02	9.78	0.10	0.10	3.88	0.12	2.25	0.12	3.28	1.67	14.30	14.75	1.18	0.00
Columbia	6	6	06-Jun-89	293	142.00	0.00	54.39	9.28	0.35	0.32	18.52	0.34	1.85	0.14	2.80	0.90	18.23	57.55	1.55	0.00
Columbia	6	7	07-Aug-89	355	133.00	0.00	64.13	10.56	0.13	0.10	5.07	0.10	3.00	0.12	1.95	1.17	29.52	69.58	1.73	0.00
Columbia	6	8	06-Nov-89	446	96.00	0.00	59.91	9.00	0.10	0.12		0.10	1.60	0.12	2.63	1.20	24.50	61.76	0.98	0.00
Columbia	6	9	05-Feb-90	537	179.00	0.00	62.37	9.80	0.09	0.10	6.10	0.00	1.45	0.15	2.36	1.17	18.07	55.48	0.26	0.00
Columbia	6	10	07-May-90	628	137.00	0.00	65.28	8.92	0.10	0.11	7.30	0.12	1.45	0.14	2.62	0.99	17.70	34.47	0.47	0.01
Columbia	6	11	06-Aug-90	719	108.00	0.00	68.81	9.10	0.09	0.10	4.00	0.22	1.90	0.11	2.80	1.08	18.27	40.84	0.29	0.00
Columbia	6	12	05-Nov-90	810	111.00	0.00	66.58	8.80	0.10	0.10	5.00	0.00	1.75	0.12	3.13	1.40	21.02	69.50	2.96	0.00
Columbia	7	1	17-Aug-88	1	429.00	0.00	180.95	18.40	0.19	7.99	3.78	0.00	92.30	0.69	11.40	2.80	12.90	127.00	2.40	0.00
Columbia	7	2	26-Oct-88	70	380.00	0.00	181.98	8.93	0.26	0.09	1.81	0.00	34.03	0.16	11.80	2.70	10.40	92.00	2.08	0.00
Columbia	7	3	05-Dec-88	110	397.00	0.00	156.06	23.86	0.18	0.24	2.40	0.00	8.90	0.25	12.40	3.30	14.97	170.33	6.48	0.00
Columbia	7	4	07-Feb-89	174	336.00	0.00	159.31	26.70	0.18	0.18	2.40	0.00	7.00	1.10	11.77	2.30	8.40	74.67	0.39	0.00
Columbia	7	5	10-Apr-89	236	454.00	0.00	158.93	24.38	0.17	0.22	2.51	0.00	8.00	0.15	11.42	3.08	9.03	83.73	1.64	0.00
Columbia	7	6	05-Jun-89	292	405.00	0.00	157.12	25.90	0.11	0.14	1.50	0.15	7.85	0.11	13.25	3.40	18.54	957.10	1.95	0.02
Columbia	7	7	07-Aug-89	355	415.00	0.00	158.11	30.58	0.15	0.18	2.86	0.11	7.25	0.00	10.12	1.96	9.06	121.94	0.52	0.00
Columbia	7	8	06-Nov-89	446	370.00	0.00	157.12	24.80	0.10	0.16			6.35	0.10	11.03	2.03	8.74	123.09	0.43	0.18
Columbia	7	9	05-Feb-90	537	433.00	0.00	162.16	27.10	0.14	0.16	2.40	0.00	6.80	0.00	11.09	3.23	13.25	34.62	2.08	0.00
Columbia	7	10	07-May-90	628	363.00	0.00	174.46	18.70	0.22	0.22	0.00	0.11	5.80	0.11	11.22	2.08	9.64	149.80	0.93	0.01
Columbia	7	11	06-Aug-90	719	310.00	0.00	189.50	16.60	0.21	0.24	2.00	0.26	5.40	0.00	11.27	2.65	8.99	162.24	1.20	0.00
Columbia	7	12	05-Nov-90	810	330.00	0.00	177.18	16.60	0.16	0.18	1.00	0.14	5.40	0.10	10.92	2.43	9.26	120.86	0.60	0.00
Columbia	8	1	17-Aug-88	1	162.00	0.00	51.70	8.83	0.10	8.62	0.07	0.00	30.18	1.50	3.10	2.00	24.90	56.00	2.90	0.00
Columbia	8	2	26-Oct-88	70	0.00	0.00	49.63	9.88	0.55	0.17	4.02	0.00	14.53	0.14	2.20	1.53	20.73	15.45	4.11	0.00
Columbia	8	3	05-Dec-88	110	136.00	0.00	48.10	10.10	0.24	0.32	3.37	0.00	2.45	0.24	2.55	4.30	46.00	15.80	14.49	0.00

Site	Well No.	Trip No.	Date	# of Days From Start	T D S (mg/l)	Carbonate (mg/l)	Bicarb (mg/l)	Nitrate (mg/l)	Dissolved PO4 (mg/l)	Total PO4 (mg/l)	Sulfate (mg/l)	Ammonia (mg/l)	Chloride (mg/l)	Fluoride (mg/l)	Na (mg/l)	K (mg/l)	Mg (mg/l)	Ca (mg/l)	Fe (mg/l)	Cu (mg/l)
Columbia	8	4	07-Feb-89	174	114.00	0.00	48.39	10.20	0.36	0.38	3.20	0.13	1.65	1.25	2.37	1.97	19.40	19.47	6.92	0.00
Columbia	8	5	11-Apr-89	237	191.00	0.00	51.68	10.26	0.19	0.19	3.06	0.00	2.60	0.14	3.20	2.21	30.63	32.88	7.99	0.00
Columbia	8	6	06-Jun-89	293	148.00	0.00	51.64	10.14	0.20	0.22	2.30	0.10	2.25	0.11	2.25	0.78	14.00	48.13	3.10	0.00
Columbia	8	7	07-Aug-89	355	160.00	0.00	51.96	11.99	0.22	0.24	3.19	0.11	3.25	0.10	2.81	2.46	135.35	412.20	9.64	0.01
Columbia	8	8	06-Nov-89	446	106.00	0.00	49.74	9.60	0.15	0.30		0.12	2.00	0.10	2.15	1.85	31.70	72.13	4.30	0.00
Columbia	8	9	05-Feb-90	537	168.00	0.00	51.03	11.60	0.26	0.28	3.60	0.00	1.95	0.00	2.04	1.33	29.79	66.42	5.25	
Columbia	8	10	07-May-90	628	136.00	0.00	52.34	9.55	0.24	0.26	4.70	0.14	1.90	0.11	1.81	0.93	10.48	21.32	0.42	0.01
Columbia	8	11	06-Aug-90	719	111.00	0.00	45.12	9.30	0.32	0.32	4.00	0.24	1.95	0.00	2.34	1.07	38.13	89.02	3.20	0.00
Columbia	8	12	05-Nov-90	810	86.00	0.00	46.27	8.90	0.28	0.24	3.00	0.21	1.70	0.00	2.60	0.99	34.15	89.48	6.48	0.00
Columbia	99	1	17-Aug-88	1	146.00	0.00	108.57	0.58	0.09	0.42	22.06	0.00	22.07	0.44	3.30	1.20	3.50	47.80	1.20	0.00
Columbia	99	2	26-Oct-88	70	126.00	0.00	101.33	1.23	0.19	0.05	22.81	0.00	15.95	0.18	2.87	0.68	3.60	2.78	0.01	0.00
Columbia	99	3	05-Dec-88	110	119.00	0.00	101.54	0.45	0.08	0.30	23.36	0.40	2.45	0.26	2.90	0.66	3.60	25.97	0.01	0.00
Columbia	99	4	07-Feb-89	174	122.00	0.00	103.85	0.20	0.06	0.08	22.00	0.00	1.55	0.88	2.90	0.65	3.80	25.10	0.11	0.00
Columbia	99	5	10-Apr-89	236	213.00	0.00	101.14	0.36	0.07	0.06	22.68	0.00	1.90	0.11	3.30	0.79	4.28	20.93	0.08	0.00
Columbia	99	6	05-Jun-89	292	146.00	0.00	104.38	0.35	0.08	0.10	24.64	0.00	1.80	0.12	2.58	0.50	3.35	42.49	0.04	0.00
Columbia	99	7	07-Aug-89	355	158.00	0.00	105.59	0.58	0.10	0.10	17.95	0.00	2.90	0.11	1.94	0.55	3.19	44.47	0.00	0.00
Columbia	99	8	06-Nov-89	446	108.00	0.00	104.56	0.58	0.09	0.12			1.75	0.10						
Columbia	99	9	05-Feb-90	537	164.00	0.00	102.06	0.30	0.10	0.12	19.30	0.00	1.75	0.11	2.46	0.84	4.19	43.03	0.00	
Columbia	99	10	07-May-90	628	146.00	0.00	104.68	0.03	0.11	0.12	23.40	0.24	1.85	0.11	2.80	0.49	4.15	43.21	0.00	0.01
Columbia	99	11	06-Aug-90	719	150.00	0.00	102.64	0.70	0.10	0.09	21.90	0.25	2.15	0.00	2.72	0.51	3.65	44.23	0.00	0.01
Columbia	99	12	05-Nov-90	810	111.00	0.00	101.57	0.80	0.09	0.08	23.00	0.15	1.90	0.10	3.10	0.42	3.82	50.07	0.00	0.00

Site	Well No.	Trip No.	Pb (mg/l)	Cr (mg/l)	Mn (mg/l)	Cd (mg/l)	As (mg/l)	Se (mg/l)	Ba (mg/l)	Zn (mg/l)	Ag (mg/l)	Temp (deg C)	pH	Conductivity (micromhos)	Color	Odor	Ra-226 (pCi/l)	Rain Data (inches)
Columbia	1	1	0.00	0.00	0.50	0.02	0.00	0.00	0.08	0.04	0.00	22.1	4.65	103.0	s cloudy	none	1.80	5.57
Columbia	1	2	0.00	0.07	0.04	0.02						19.9	4.42	120.4	cloudy 15	none	1.80	1.89
Columbia	1	3	0.00	0.03	0.07	0.01						21.0	6.69	171.3	v cloudy	none	3.00	1.41
Columbia	1	4	0.00	0.03	0.06	0.00						21.7	3.89	208.0	s cloudy 10	none	4.60	1.88
Columbia	1	5	0.00	0.00	0.06	0.02						22.8	3.49	161.4	s cloudy 20	none	2.90	2.68
Columbia	1	6	0.00	0.01	0.06	0.01						26.0	3.79	269.0	v cloudy 40	none	3.60	11.13
Columbia	1	7	0.00	0.01	0.12	0.01						23.7	3.67	357.0	s cloudy 25	none	3.40	5.99
Columbia	1	8	0.03	0.01	0.14	0.02						24.6	3.87	424.0	s cloudy 10	none	4.20	1.34
Columbia	1	9		0.00	0.00	0.00	0.01	0.00	0.12	0.08	0.00	21.9	3.72	606.0	s cloudy	none	4.10	3.98
Columbia	1	10	0.00	0.00	0.16	0.00						24.8	4.07	658.0	cloudy 10	none	3.00	0.77
Columbia	1	11	0.00	0.00	0.17	0.02						28.1	4.32	702.0	clear 10	none	2.80	6.35
Columbia	1	12	0.00	0.00	0.18	0.04						27.2	4.08	730.0	s cloudy 10	none	3.30	1.05
Columbia	2	1	0.00	0.00	0.01	0.00						22.4	8.15	146.0	clear	none	2.50	5.57
Columbia	2	2	0.00	0.04	0.00	0.00	0.00	0.00	0.01	0.00	0.00	24.1	7.87	143.8	clear 10	none	1.50	1.89
Columbia	2	3	0.00	0.01	0.04	0.00						19.8	7.95	146.7	v s cloudy	none	2.30	1.41
Columbia	2	4																1.88
Columbia	2	5	0.00	0.02	0.04	0.00						20.8	7.25	141.8	cloudy 20	none	9.20	2.68
Columbia	2	6	0.00	0.14	0.31	0.00						22.7	7.48	139.2	cloudy 10	none	5.00	11.13
Columbia	2	7	0.00	0.01	0.04	0.00						22.8	7.13	149.0	s cloudy	none	5.70	5.99
Columbia	2	8	0.02	0.02	0.02	0.00						22.6	7.82	140.7	s cloudy 10	none	4.20	1.34
Columbia	2	9		0.00	0.00	0.00						21.4	6.91	138.0	clear	none	5.40	3.98
Columbia	2	10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	22.8	7.35	134.2	clear 10	none	3.50	0.77
Columbia	2	11	0.00	0.01	0.01	0.00						24.0	7.88	116.0	clear 10	none	3.90	6.35
Columbia	2	12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	23.6	7.08	132.5	clear 10	none	1.50	1.05
Columbia	3	1	0.00	0.00	0.01	0.00						23.0	4.95	23.0	v cloudy	none	0.20	5.57
Columbia	3	2	0.00	0.04	0.00	0.00						20.5	4.65	39.1	v cloudy 0	none	0.02	1.89
Columbia	3	3	0.00	0.00	0.01	0.00	0.00	0.00	0.06	0.02	0.00	21.1	5.92	38.8	v cloudy	none	0.40	1.41
Columbia	3	4	0.00	0.02	0.00	0.00						21.5	4.37	66.8	v cloudy 100	none	1.30	1.88
Columbia	3	5	0.00	0.01	0.01	0.00						21.8	3.86	61.8	v cloudy 65	none	0.40	2.68

Site	Well No.	Trip No.	Pb (mg/l)	Cr (mg/l)	Mn (mg/l)	Cd (mg/l)	As (mg/l)	Se (mg/l)	Ba (mg/l)	Zn (mg/l)	Ag (mg/l)	Temp (deg C)	pH	Conductivity (micromhos)	Color	Odor	Ra-226 (pCi/l)	Rain Data (inches)
Columbia	3	6	0.04	0.01	0.01	0.00						23.9	3.62	61.9	v cloudy 45	none	0.50	11.13
Columbia	3	7	0.00	0.01	0.01	0.00						23.6	3.96	51.3	vv cloudy 80	none	0.50	5.99
Columbia	3	8	0.07	0.01	0.01	0.00						23.5	4.31	45.9	d cloudy100	none	0.70	1.34
Columbia	3	9		0.00	0.00	0.00						21.9	4.18	49.0	v cloudy	none	0.40	3.98
Columbia	3	10	0.00	0.00	0.00	0.00						23.1	3.92	67.5	v cloudy100	none	0.80	0.77
Columbia	3	11	0.01	0.00	0.01	0.00						24.1	3.83	172.0	cloudy 40	none	0.90	6.35
Columbia	3	12	0.00	0.00	0.03	0.00						23.2	3.73	135.2	cloudy 75	none	0.90	1.05
Columbia	4	1	0.00	0.00	0.09	0.00						23.90	6.10	131.0	cloudy	none	1.00	5.57
Columbia	4	2	0.00	0.01	0.10	0.00						22.90	5.97	131.4	v cloudy 50	none	1.10	1.89
Columbia	4	3	0.00	0.02	0.17	0.00						18.80	6.81	161.1	cloudy	none	1.20	1.41
Columbia	4	4	0.00	0.05	0.78	0.00						22.70	6.10	167.0	v cloudy	none	3.80	1.88
Columbia	4	5	0.00	0.00	0.14	0.00						16.00	6.34	110.2	v cloudy 40	none	1.20	2.68
Columbia	4	6	0.00	0.03	0.30	0.00	0.00	0.00			0.00	22.40	5.45	220.0	v cloudy 45	none	1.50	11.13
Columbia	4	7	0.00	0.01	0.26	0.00						22.70	5.13	455.0	s cloudy 45	none	1.40	5.99
Columbia	4	8																1.34
Columbia	4	9																3.98
Columbia	4	10																0.77
Columbia	4	11																6.35
Columbia	4	12																1.05
Columbia	5	1	0.00	0.00	0.00	0.00						22.00	7.25	149.0	clear	none	0.70	5.57
Columbia	5	2	0.00	0.09	0.08	0.00						20.90	7.38	135.9	s cloudy 35	none	22.00	1.89
Columbia	5	3	0.00	0.00	0.03	0.00						20.40	7.29	127.7	s cloudy	none	1.20	1.41
Columbia	5	4	0.00	0.00	0.04	0.00						21.60	7.03	125.4	s cloudy 10	none	0.70	1.88
Columbia	5	5	0.00	0.00	0.00	0.00		0.00	0.01	0.00	0.00	21.60	6.11	141.6	s cloudy 5	none	0.90	2.68
Columbia	5	6	0.03	0.01	0.00	0.00						23.30	6.39	129.6	s cloudy 5	none	0.70	11.13
Columbia	5	7	0.00	0.00	0.00	0.00						23.30	6.55	121.0	clear 10	none	1.00	5.99
Columbia	5	8	0.09	0.01	0.00	0.00						23.30	6.40	114.0	clear	none	0.80	1.34
Columbia	5	9										21.90	7.22	162.4	clear	none	0.10	3.98
Columbia	5	10	0.00	0.00	0.00	0.00						25.00	7.11	153.0	clear 10	none	0.90	0.77

Site	Well No.	Trip No.	Pb (mg/l)	Cr (mg/l)	Mn (mg/l)	Cd (mg/l)	As (mg/l)	Se (mg/l)	Ba (mg/l)	Zn (mg/l)	Ag (mg/l)	Temp (deg C)	pH	Conductivity (micromhos)	Color	Odor	Ra-226 (pCi/l)	Rain Data (inches)
Columbia	5	11	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	24.40	6.83	136.0	clear 10	none	0.50	6.35
Columbia	5	12	0.00	0.00	0.01	0.00						24.00	5.96	135.5	clear 10	none	0.40	1.05
Columbia	6	1	0.00	0.00	0.03	0.00						22.60	7.70	193.0	cloudy	none	1.20	5.57
Columbia	6	2	0.00	0.04	0.10	0.00						22.40	7.35	188.0	v cloudy 10	none	1.50	1.89
Columbia	6	3	0.00	0.03	0.07	0.00						20.80	8.01	208.0	v v cloudy	none	1.10	1.41
Columbia	6	4	0.00	0.01	0.04	0.00	0.00	0.00	0.03	0.00	0.00	22.00	7.27	195.0	clear 5	none	1.00	1.88
Columbia	6	5	0.00	0.00	0.06	0.00						20.70	7.17	194.1	cloudy 25	none	2.00	2.68
Columbia	6	6	0.05	0.02	0.07	0.00						22.60	7.70	192.2	cloudy 15	none	2.70	11.13
Columbia	6	7	0.00	0.02	0.12	0.00						22.30	6.50	197.0	s cloudy 20	none	1.30	5.99
Columbia	6	8	0.07	0.03	0.07	0.00						21.90	6.77	196.1	s cloudy 10	none	0.60	1.34
Columbia	6	9		0.00	0.00	0.00						21.00	6.58	196.0	s cloudy	none	0.90	3.98
Columbia	6	10	0.00	0.00	0.03	0.00						22.70	6.50	194.0	s cloudy 10	none	0.70	0.77
Columbia	6	11	0.06	0.01	0.02	0.00						23.90	7.16	182.0	s cloudy 10	none	0.80	6.35
Columbia	6	12	0.00	0.01	0.10	0.00						23.40	6.92	189.9	s cloudy 20	none	0.90	1.05
Columbia	7	1	0.00	0.00	0.02	0.00						22.10	7.45	580.0	cloudy	none	1.20	5.57
Columbia	7	2	0.00	0.02	0.02	0.00						21.10	7.44	524.0	v cloudy 50	none	0.80	1.89
Columbia	7	3	0.00	0.04	0.09	0.00						20.90	7.29	522.0	cloudy	none	1.00	1.41
Columbia	7	4	0.00	0.02	0.01	0.00						21.90	7.74	516.0	clear 5	none	1.10	1.88
Columbia	7	5	0.00	0.01	0.03	0.00						21.10	7.16	521.0	s cloudy 10	none	1.20	2.68
Columbia	7	6	0.00	0.11	0.35	0.00						24.30	6.96	513.0	v cloudy 50	none	1.50	11.13
Columbia	7	7	0.00	0.00	0.00	0.00						23.80	6.72	493.0	s cloudy 20	none	0.70	5.99
Columbia	7	8	0.06	0.01	0.01	0.00						24.10	6.98	482.0	s cloudy 10	none	1.90	1.34
Columbia	7	9		0.00	0.00	0.00						22.50	7.30	475.0	v cloudy	none	0.80	3.98
Columbia	7	10	0.00	0.00	0.01	0.00						25.60	7.25	450.0	s cloudy 10	none	0.60	0.77
Columbia	7	11	0.00	0.01	0.02	0.00						28.30	7.40	448.0	s cloudy 10	none	0.70	6.35
Columbia	7	12	0.00	0.00	0.01	0.00						25.90	7.06	418.0	cloudy 10	none	1.90	1.05
Columbia	8	1	0.00	0.00	0.05	0.00						23.0	7.85	200.0	s cloudy	none	1.60	5.57
Columbia	8	2	0.00	0.03	0.10	0.00						22.4	7.06	190.2	v cloudy 10	none	1.30	1.89
Columbia	8	3	0.00	0.12	0.22	0.00						19.8	7.40	191.0	v v cloudy	none	3.60	1.41

Site	Well No.	Trip No.	Pb (mg/l)	Cr (mg/l)	Mn (mg/l)	Cd (mg/l)	As (mg/l)	Se (mg/l)	Ba (mg/l)	Zn (mg/l)	Ag (mg/l)	Temp (deg C)	pH	Conductivity (micromhos)	Color	Odor	Ra-226 (pCi/l)	Rain Data (inches)
Columbia	8	4	0.00	0.07	0.14	0.00						21.9	6.87	188.5	s cloudy 5	none	2.90	1.88
Columbia	8	5	0.00	0.03	0.11	0.00						20.5	6.77	195.3	v cloudy 30	none	2.60	2.68
Columbia	8	6	0.00	0.03	0.08	0.00						22.9	6.98	190.2	cloudy 40	none	2.50	11.13
Columbia	8	7	0.00	0.07	0.42	0.02						22.8	6.23	181.0	s cloudy	none	1.10	5.99
Columbia	8	8	0.04	0.03	0.15	0.01						21.5	6.65	186.5	s cloudy 10	none	1.20	1.34
Columbia	8	9										21.3	6.42	180.0	cloudy	none	2.20	3.98
Columbia	8	10	0.00	0.00	0.00	0.00						23.1	6.46	168.0	cloudy 40	none	0.60	0.77
Columbia	8	11	0.02	0.01	0.13	0.00						24.3	7.31	175.0	cloudy 10	none	3.20	6.35
Columbia	8	12	0.00	0.03	0.24	0.00						23.7	6.08	170.0	cloudy 40	none	2.10	1.05
Columbia	99	1	0.00	0.00	0.00	0.00											0.60	5.57
Columbia	99	2	0.00	0.00	0.01	0.00						21.6	7.80	240.0	clear 0	none	0.80	1.89
Columbia	99	3	0.00	0.00	0.00	0.00						19.3	7.27	238.0	clear	none	0.50	1.41
Columbia	99	4	0.00	0.00	0.00	0.00						21.7	7.35	235.0	clear 0	none	0.50	1.88
Columbia	99	5	0.00	0.00	0.00	0.00						22.6	6.92	228.0	clear 10	none	0.60	2.68
Columbia	99	6	0.00	0.00	0.00	0.00						22.8	6.80	231.0	clear 10	none	0.50	11.13
Columbia	99	7	0.02	0.00	0.00	0.00						24.3	6.96	237.0	clear 10	none	0.40	5.99
Columbia	99	8										23.9	6.75	225.0	clear 0	none	0.40	1.34
Columbia	99	9										21.6	6.66	232.0	clear	none	0.50	3.98
Columbia	99	10	0.00	0.00	0.00	0.00						24.0	6.82	211.0	clear 10	none	0.40	0.77
Columbia	99	11	0.00	0.00	0.00	0.00						24.1	7.29	224.0	clear 10	none	0.50	6.35
Columbia	99	12	0.00	0.00	0.00	0.00						24.8	7.18	212.0	clear 10	none	0.50	1.05

Site	Well No.	Trip No.	Date	# of Day's From Start	T D S (mg/l)	Carbonate (mg/l)	Bicarb (mg/l)	Nitrate (mg/l)	Dissolved PO4 (mg/l)	Total PO4 (mg/l)	Sulfate (mg/l)	Ammonia (mg/l)	Chloride (mg/l)	Fluoride (mg/l)	Na (mg/l)	K (mg/l)	Mg (mg/l)	Ca (mg/l)	Fe (mg/l)	Cu (mg/l)	Pb (mg/l)
Polk	1	1	18-Aug-88	1	177.00	0.00	20.68	0.73	0.12	7.72	82.88	0.00	14.11	0.64	4.20	1.00	2.70	4.33	3.60	0.00	0.00
Polk	1	2	27-Oct-88	70	62.00	0.00	20.68	0.95	2.00	0.62	42.44	0.00	9.93	0.48	4.25	0.40	2.90	22.73	0.02	0.00	0.00
Polk	1	3	08-Dec-88	112	238.00	0.00	19.42	0.72	1.01	1.10	134.77	0.32	1.10	0.50	4.87	0.49	3.73	29.07	0.21	0.00	0.00
Polk	1	4	09-Feb-89	175	231.00	0.00	18.49	0.50	0.97	0.98	190.00	0.00	1.25	1.70	5.07	0.50	4.10	32.17	0.30	0.00	0.00
Polk	1	5	04-Apr-89	229	357.00	0.00	17.56	0.43	0.94	0.98	236.50	0.00	1.45	0.32	5.53	0.61	5.20	44.83	0.17	0.00	0.00
Polk	1	6	13-Jun-89	299	326.00	0.00	16.69	0.48	0.69	0.72	176.30	0.18	1.10	0.23	4.03	0.68	4.50	71.34	0.25	0.00	0.00
Polk	1	7	14-Aug-89	361	323.00	0.00	18.22	0.32	0.86	0.86	144.68	0.12	1.70	0.23	3.88	0.28	3.85	69.38	47.45	0.07	0.00
Polk	1	8	14-Nov-89	453	218.00	0.00	20.08	0.20	0.90	0.94		0.14	1.20	0.24	4.42	0.49	4.83	73.88	0.44	0.00	0.08
Polk	1	9	12-Feb-90	543	205.00	0.00	19.27	0.20	0.76	0.78	127.00	0.14	1.35	0.22	3.49	0.48	3.92	58.95	0.24	0.00	0.43
Polk	1	10	14-May-90	634	222.00	0.00	18.62	0.14	0.64	0.66	145.00	0.41	1.25	0.22	3.62	0.18	4.30	53.15	5.59	0.01	0.00
Polk	1	11	20-Aug-90	732	310.00	0.00	18.09	0.20	0.72	0.78	160.00	0.52	1.25	0.24	3.83	0.35	5.14	61.26	0.88	0.00	0.00
Polk	1	12	30-Oct-90	803	239.00	0.00	20.26	0.05	0.68	0.74	139.00	0.14	1.00	0.20	4.12	0.76	4.59	59.78	0.22	0.00	0.00
Polk	2	1	18-Aug-88	1	101.00	0.00	46.53	0.00	0.10	12.08	9.97	0.00	41.27	0.71	3.10	0.80	2.10	2.41	3.20	0.00	0.00
Polk	2	2	27-Oct-88	70	0.00	0.00	32.05	0.76	1.88	0.69	50.07	0.00	12.00	0.47	3.73	0.32	1.70	10.60	0.75	0.00	0.00
Polk	2	3	08-Dec-88	112	94.00	0.00	31.28	0.12	1.17	1.28	17.74	0.34	4.15	0.52	4.20	0.34	1.97	9.70	11.50	0.00	0.00
Polk	2	4	09-Feb-89	175	2.00	0.00	32.08	0.30	1.07	1.08	18.60	0.00	3.60	2.70	4.30	0.33	2.00	12.40	1.66	0.00	0.00
Polk	2	5	04-Apr-89	229	96.00	0.00	34.03	0.05	1.06	1.16	15.13	0.35	4.80	0.31	4.80	0.44	2.20	9.00	3.48	0.00	0.00
Polk	2	6	13-Jun-89	299	103.00	0.00	32.26	0.07	1.29	1.28	14.54	0.12	3.95	0.36	3.63	0.33	1.80	18.85	4.73	0.03	0.00
Polk	2	7	14-Aug-89	361	127.00	0.00	34.16	0.01	1.35	1.42	13.22	0.11	6.20	0.27	3.66	0.05	0.94	18.89	2.29	0.00	0.00
Polk	2	8	14-Nov-89	453	24.00	0.00	32.91	0.02	1.21	1.28		0.11	3.45	0.28	4.61	0.31	1.57	21.58	1.48	0.00	0.05
Polk	2	9	12-Feb-90	543	76.00	0.00	31.73	0.00	1.20	1.24	36.30	0.12	4.50	0.24	4.69	0.20	2.17	27.13	2.99	0.00	
Polk	2	10	14-May-90	634	126.00	0.00	31.60	0.00	1.15	1.20	50.00	0.19	4.20	0.24	4.64	0.18	3.32	28.00	1.95	0.01	0.00
Polk	2	11	20-Aug-90	732	171.00	0.00	33.91	0.00	1.37	1.42	58.00	0.55	2.90	0.26	5.15	0.04	3.53	31.10	2.57	0.00	0.04
Polk	2	12	30-Oct-90	803	114.00	0.00	32.08	0.00	1.28	1.40	52.00	0.17	2.35	0.23	5.16	0.63	2.93	27.98	6.29	0.00	0.00
Polk	3	1	18-Aug-88	1	119.00	0.00	51.70	0.00	0.17	10.40	4.01	0.11	20.18	0.69	3.90	1.40	3.80	1.49	3.40	0.00	0.00
Polk	3	2	27-Oct-88	70	17.00	0.00	47.56	0.29	3.60	2.02	6.17	0.81	31.90	0.47	3.50	0.64	2.80	6.33	2.53	0.00	0.00
Polk	3	3	08-Dec-88	112	76.00	0.00	40.99	0.08	1.65	2.68	8.93	1.60	2.75	0.50	3.63	0.62	2.80	6.70	2.48	0.00	0.00
Polk	3	4	09-Feb-89	175	11.00	0.00	44.58	0.07	2.92	2.85	2.40	1.25	2.00	2.35	3.53	0.61	2.63	5.90	2.58	0.00	0.00
Polk	3	5	04-Apr-89	229	94.00	0.00	42.81	0.05	2.83	2.84	2.77	1.70	2.10	0.36	3.90	0.75	2.78	3.80	2.37	0.00	0.00

Site	Well No.	Trip No.	Cr (mg/l)	Mn (mg/l)	Cd (mg/l)	Temp (deg C)	pH	Conductivity (micromhos)	Color	Odor	Ra-226 (pCi/l)	Rain Data (inches)
Polk	1	1	0.00	0.00	0.00	23.50	6.45	200.0	clear	none	2.80	5.48
Polk	1	2	0.01	0.01	0.00	25.80	6.28	272.0	clear 10	none	0.20	1.35
Polk	1	3	0.00	0.01	0.00	24.20	5.11	338.0	clear 10	none	0.40	1.38
Polk	1	4	0.00	0.01	0.00	22.30	5.22	419.0	clear 10	none	0.40	0.40
Polk	1	5	0.00	0.00	0.00	24.70	5.23	402.0	clear 10	none	0.60	2.51
Polk	1	6	0.00	0.00	0.00	25.40	5.40	380.0	clear 10	none	1.10	4.59
Polk	1	7	0.01	0.00	0.00	25.10	5.33	366.0	clear 10	none	5.30	3.37
Polk	1	8	0.00	0.00	0.00	25.30	5.58	368.0	clear 10	none	0.90	3.22
Polk	1	9	0.00	0.00	0.00	24.00	4.73	324.0	clear 10	none	0.60	3.88
Polk	1	10	0.00	0.00	0.00	26.20	4.95	292.0	s cloud 10	none	2.90	1.23
Polk	1	11	0.00	0.00	0.00	26.20	4.98	339.0	clear 10	none	1.70	2.99
Polk	1	12	0.00	0.00	0.00	27.10	5.48	346.0	clear 10	none	1.00	0.66
Polk	2	1	0.00	0.01	0.00	24.50	5.85	140.0	clear	none	1.60	5.48
Polk	2	2	0.00	0.01	0.00	26.60	6.40	122.6	clear 10	none	0.30	1.35
Polk	2	3	0.05	0.02	0.00	25.50	5.19	130.0	clear 10	none	0.30	1.38
Polk	2	4	0.00	0.00	0.00	23.10	5.30	134.2	s cloudy	none	0.30	0.40
Polk	2	5	0.00	0.00	0.00	26.20	5.25	128.6	cloudy 10	H2S	1.50	2.51
Polk	2	6	0.00	0.00	0.00	26.40	5.12	130.6	s cloudy 20	H2S	0.50	4.59
Polk	2	7	0.00	0.00	0.00	28.40	6.06	135.0	clear 10	none	0.30	3.37
Polk	2	8	0.00	0.00	0.00	26.90	5.75	143.0	clear 10	s H2S	0.80	3.22
Polk	2	9	0.00	0.00	0.00	24.50	4.92	179.0	clear 10	cow dung	0.30	3.88
Polk	2	10	0.00	0.00	0.00	26.70	5.60	187.0	clear 10	t H2S	0.60	1.23
Polk	2	11	0.01	0.01	0.00	26.60	5.21	191.0	clear 10	none	0.40	2.99
Polk	2	12	0.00	0.01	0.00	26.40	5.18	190.0	clear 10	none	0.50	0.66
Polk	3	1	0.00	0.02	0.00	24.00	6.55	133.0	clear	H2S	1.00	5.48
Polk	3	2	0.02	0.02	0.00	26.40	6.06	117.3	clear 15	none	0.10	1.35
Polk	3	3	0.02	0.05	0.00	24.20	5.10	119.1	clear 10	H2S	0.10	1.38
Polk	3	4	0.00	0.01	0.00	22.00	5.70	127.1	clear 10	H2S	0.20	0.40
Polk	3	5	0.00	0.01	0.00	25.20	5.22	108.8	clear 10	H2S	0.20	2.51

Site	Well No.	Trip No.	Date	# of Day's From Start	T D S (mg/l)	Carbonate (mg/l)	Bicarb (mg/l)	Nitrate (mg/l)	Dissolved PO4 (mg/l)	Total PO4 (mg/l)	Sulfate (mg/l)	Ammonia (mg/l)	Chloride (mg/l)	Fluoride (mg/l)	Na (mg/l)	K (mg/l)	Mg (mg/l)	Ca (mg/l)	Fe (mg/l)	Cu (mg/l)	Pb (mg/l)
Polk	3	6	13-Jun-89	299	98.00	0.00	40.05	0.12	2.89	2.82	2.96	1.55	1.85	0.29	2.93	0.53	2.20	9.25	2.73	0.00	0.00
Polk	3	7	14-Aug-89	361	122.00	0.00	36.44	0.06	2.93	3.12	4.54	1.90	2.45	0.29	2.43	0.32	1.63	9.86	2.12	0.00	0.00
Polk	3	8	14-Nov-89	453	30.00	0.00	40.16	0.07	3.04	3.04		1.85	1.70	0.27	3.47	0.58	2.23	10.92	2.37	0.00	0.06
Polk	3	9	12-Feb-90	543	48.00	0.00	40.80	0.00	2.96	3.28	2.60	1.95	2.35	0.24	2.78	0.64	2.11	11.62	2.45	0.00	
Polk	3	10	14-May-90	634	69.00	0.00	36.68	0.00	2.92	3.02	1.80	1.60	2.55	0.25	2.75	0.51	2.69	9.51	2.11	0.01	0.00
Polk	3	11	20-Aug-90	732	108.00	0.00	39.56	0.10	3.24	3.08	3.00	2.25	1.75	0.29	3.13	0.23	2.50	10.23	2.18	0.00	0.03
Polk	3	12	30-Oct-90	803	73.00	0.00	38.27	0.12	3.22	3.10	5.10	1.55	1.35	0.24	3.46	0.61	2.55	11.09	2.40	0.00	0.00
Polk	4	1	18-Aug-88	1	179.00	0.00	134.42	0.00	0.29	8.08	0.04	1.94	67.49	1.14	7.70	1.00	18.60	2.90	2.80	0.00	0.00
Polk	4	2	27-Oct-88	70	34.00	0.00	110.64	0.24	1.58	0.48	1.26	0.18	51.40	0.80	8.03	0.15	12.97	14.63	1.01	0.00	0.00
Polk	4	3	08-Dec-88	112	133.00	0.00	114.34	0.12	0.90	0.92	1.42	0.62	16.00	0.80	8.57	0.11	14.30	15.50	1.29	0.00	0.00
Polk	4	4	09-Feb-89	175	92.00	0.00	121.79	0.05	0.74	0.92	1.50	0.28	6.00	4.60	8.30	0.10	14.70	15.23	1.62	0.00	0.00
Polk	4	5	04-Apr-89	229	163.00	0.00	120.74	0.07	0.54	0.92	1.13	0.88	6.60	0.44	7.95	0.13	15.85	9.98	1.51	0.00	0.00
Polk	4	6	13-Jun-89	299	166.00	0.00	114.60	0.14	0.81	0.86	1.44	0.58	4.80	0.44	6.80	0.11	14.32	21.15	1.55	0.00	0.00
Polk	4	7	14-Aug-89	361	176.00	0.00	113.31	0.04	0.94	0.96	3.55	0.40	6.80	0.46	6.89	0.02	17.40	19.16	1.16	0.00	0.03
Polk	4	8	14-Nov-89	453	60.00	0.00	115.46	0.02	0.88	0.92		0.44	5.00	0.56	8.21	0.28	20.22	19.65	1.41	0.00	0.03
Polk	4	9	12-Feb-90	543	124.00	0.00	116.74	0.00	0.85	0.90	7.10	0.44	6.80	0.52	7.89	0.00	21.90	21.18	1.74	0.00	
Polk	4	10	14-May-90	634	172.00	0.00	126.40	0.08	0.80	0.86	5.50	0.54	7.00	0.51	6.96	0.00	24.70	17.23	1.15	0.01	0.00
Polk	4	11	20-Aug-90	732	202.00	0.00	139.03	0.00	0.92	1.00	7.00	1.05	5.00	0.48	7.26	0.00	26.32	22.03	4.20	0.00	0.00
Polk	4	12	30-Oct-90	803	226.00	0.00	138.44	0.41	0.75	0.82	46.00	0.38	3.80	0.46	8.13	0.30	30.14	27.05	9.64	0.00	0.05
Polk	5	1	18-Aug-88	1	104.00	0.00	36.19	2.22	0.06	23.23	13.61	0.40	22.07	0.79	4.50	1.00	3.70	2.91	2.50	0.00	0.00
Polk	5	2	27-Oct-88	70	0.00	0.00	13.44	1.66	2.29	0.84	15.80	0.00	10.28	0.43	4.70	0.26	2.00	7.00	0.11	0.00	0.00
Polk	5	3	08-Dec-88	112	96.00	0.00	17.26	2.09	1.17	1.30	35.97	0.24	2.60	0.48	5.60	0.27	3.43	9.50	0.05	0.00	0.00
Polk	5	4	09-Feb-89	175	14.00	0.00	17.40	1.90	1.20	1.20	28.60	0.00	1.50	2.60	4.98	0.26	3.50	9.47	0.00	0.00	0.00
Polk	5	5	04-Apr-89	229	88.00	0.00	21.95	1.98	1.08	1.08	22.73	0.20	1.85	0.34	5.20	0.32	3.50	7.10	0.05	0.00	0.00
Polk	5	6	13-Jun-89	299	100.00	0.00	31.15	1.45	1.02	1.04	19.03	0.12	1.40	0.33	3.80	0.23	3.93	11.39	0.06	0.00	0.00
Polk	5	7	14-Aug-89	361	120.00	0.00	41.56	1.09	1.00	0.98	16.41	0.10	2.20	0.25	3.36	0.00	5.36	14.51	0.00	0.00	0.00
Polk	5	8	14-Nov-89	453	42.00	0.00	44.62	0.81	0.98	1.00		0.15	1.65	0.27	4.46	0.16	6.22	17.32	0.00	0.00	0.06
Polk	5	9	12-Feb-90	543	68.00	0.00	53.27	0.70	0.93	0.94	12.10	0.16	2.75	0.23	4.32	0.07	7.30	22.78	0.20	0.00	
Polk	5	10	14-May-90	634	112.00	0.00	80.13	0.24	0.84	0.82	10.50	0.24	3.20	0.21	4.32	0.06	10.07	19.30	0.00	0.00	0.00

Site	Well No.	Trip No.	Cr (mg/l)	Mn (mg/l)	Cd (mg/l)	Temp (deg C)	pH	Conductivity (micromhos)	Color	Odor	Ra-226 (pCi/l)	Rain Data (inches)
Polk	3	6	0.00	0.00	0.00	25.90	5.26	106.8	clear 10	H2S	0.10	4.59
Polk	3	7	0.00	0.00	0.00	24.60	5.34	106.0	clear 10	H2S	0.10	3.37
Polk	3	8	0.00	0.02	0.00	25.40	5.04	109.2	clear 10	st H2S	0.10	3.22
Polk	3	9	0.00	0.00	0.00	24.50	4.99	104.0	clear 10	st H2S	0.10	3.88
Polk	3	10	0.00	0.00	0.00	26.60	5.03	93.0	clear 10	H2S	0.20	1.23
Polk	3	11	0.00	0.01	0.00	26.80	5.02	96.0	clear 10	s H2S	0.10	2.99
Polk	3	12	0.00	0.01	0.00	26.00	5.24	105.1	clear 20	st H2S	0.10	0.66
Polk	4	1	0.00	0.12	0.00	24.00	6.55	262.0	clear	H2S	1.50	5.48
Polk	4	2	0.02	0.10	0.00	26.30	6.56	240.0	clear 10	H2S	0.20	1.35
Polk	4	3	0.00	0.14	0.00	24.90	5.68	263.0	clear 10	H2S	0.10	1.38
Polk	4	4	0.00	0.16	0.00	22.80	5.96	268.0	clear 10	none	0.20	0.40
Polk	4	5	0.00	0.17	0.00	25.40	6.13	235.0	clear 10	H2S	0.10	2.51
Polk	4	6	0.00	0.15	0.00	27.10	6.38	244.0	clear 10	H2S	0.20	4.59
Polk	4	7	0.01	0.14	0.00	28.00	6.32	216.0	clear 10	H2S	0.30	3.37
Polk	4	8	0.01	0.14	0.00	27.40	5.96	250.0	clear 10	s H2S	0.30	3.22
Polk	4	9	0.00	0.10	0.00	24.20	5.55	255.0	clear 10	H2S	0.50	3.88
Polk	4	10	0.00	0.00	0.00	26.00	5.94	255.0	clear 10	H2S	0.20	1.23
Polk	4	11	0.01	0.11	0.00	27.10	6.23	270.0	clear 10	none	0.40	2.99
Polk	4	12	0.00	0.13	0.00	25.80	5.65	375.0	clear 10	none	0.10	0.66
Polk	5	1	0.00	0.00	0.00	24.00	6.95	130.0	clear	none	2.70	5.48
Polk	5	2	0.03	0.00	0.00	26.20	6.25	85.1	clear 25	none	0.20	1.35
Polk	5	3	0.00	0.01	0.00	24.30	5.42	124.7	clear 10	none	0.40	1.38
Polk	5	4	0.01	0.04	0.00	22.90	5.90	106.0	s cloudy 10	none	0.30	0.40
Polk	5	5	0.00	0.00	0.00	25.80	5.69	92.4	clear 10	none	0.60	2.51
Polk	5	6	0.01	0.00	0.00	26.30	5.85	116.1	clear 0	none	0.20	4.59
Polk	5	7	0.00	0.00	0.00	24.80	5.98	135.0	clear 10	none	0.50	3.37
Polk	5	8	0.00	0.00	0.00	25.40	5.95	139.4	clear 10	none	1.90	3.22
Polk	5	9	0.00	0.00	0.00	24.50	5.27	147.0	clear 10	none	0.40	3.88
Polk	5	10	0.00	0.00	0.00	27.10	5.74	161.0	clear 10	none	0.90	1.23

Site	Well No.	Trip No.	Date	# of Day's From Start	T D S (mg/l)	Carbonate (mg/l)	Bicarb (mg/l)	Nitrate (mg/l)	Dissolved PO4 (mg/l)	Total PO4 (mg/l)	Sulfate (mg/l)	Ammonia (mg/l)	Chloride (mg/l)	Fluoride (mg/l)	Na (mg/l)	K (mg/l)	Mg (mg/l)	Ca (mg/l)	Fe (mg/l)	Cu (mg/l)	Pb (mg/l)
Polk	5	11	20-Aug-90	732	161.00	0.00	108.51	0.10	0.76	0.82	7.00	0.62	2.30	0.24	5.01	0.00	13.08	24.96	0.00	0.00	0.00
Polk	5	12	30-Oct-90	803	150.00	0.00	135.07	0.00	0.68	0.76	7.00	0.12	1.80	0.19	6.08	0.43	15.68	28.55	0.02	0.00	0.00
Polk	6	1	18-Aug-88	1	90.00	0.00	31.02	0.57	0.12	12.08	17.66	0.12	39.47	0.90	5.20	0.90	1.90	2.30	1.40	0.00	0.00
Polk	6	2	27-Oct-88	70	0.00	0.00	14.48	1.13	2.34	1.20	14.33	0.00	10.98	0.51	4.10	0.17	1.30	7.40	0.01	0.00	0.00
Polk	6	3	08-Dec-88	112	38.00	0.00	18.34	0.54	1.35	1.52	10.02	0.14	2.70	0.54	4.63	0.18	1.20	8.77	0.00	0.00	0.00
Polk	6	4	09-Feb-89	175	1.00	0.00	18.49	0.50	1.38	1.40	7.90	0.00	3.55	2.40	4.83	0.19	1.20	8.80	0.10	0.00	0.00
Polk	6	5	04-Apr-89	229	66.00	0.00	21.95	0.44	1.36	1.36	6.56	0.00	4.15	0.35	5.55	0.24	1.40	7.10	0.07	0.00	0.00
Polk	6	6	13-Jun-89	299	86.00	0.00	25.59	0.17	1.40	1.40	6.23	0.20	3.60	0.34	4.50	0.22	1.20	13.35	0.12	0.00	0.00
Polk	6	7	14-Aug-89	361	107.00	0.00	31.89	0.07	1.42	1.44	5.37	0.15	6.30	0.29	4.59	0.17	0.15	15.93	0.02	0.00	0.02
Polk	6	8	14-Nov-89	453	22.00	0.00	30.68	0.10	1.37	1.46		0.14	4.45	0.32	5.78	0.39	0.08	17.30	0.08	0.00	0.01
Polk	6	9	12-Feb-90	543	48.00	0.00	30.60	0.00	1.37	1.40	5.90	0.13	4.50	0.28	5.95	0.14	0.97	24.60	0.23	0.00	
Polk	6	10	14-May-90	634	92.00	0.00	29.34	0.19	1.22	1.20	20.30	0.23	4.60	0.28	5.45	0.04	1.99	17.70	0.00	0.00	0.00
Polk	6	11	20-Aug-90	732	214.00	0.00	20.91	0.90	1.08	1.12	79.00	0.52	2.70	0.34	5.92	0.15	4.98	36.98	0.07	0.00	0.00
Polk	6	12	30-Oct-90	803	155.00	0.00	19.70	0.82	1.01	1.18	98.00	0.14	2.40	0.25	7.51	0.38	3.21	32.37	0.07	0.00	0.00
Polk	7	1	18-Aug-88	1	118.00	0.00	93.06	0.03	0.15	2.63	2.45	0.13	23.08	0.67	4.50	0.90	7.20	1.80	9.50	0.00	0.00
Polk	7	2	27-Oct-88	70	10.00	0.00	31.02	0.42	1.91	0.62	13.71	0.14	17.02	0.28	4.07	0.30	2.30	6.73	5.03	0.00	0.00
Polk	7	3	08-Dec-88	112	58.00	0.00	57.17	0.11	0.48	0.88	3.89	2.10	2.50	0.38	4.00	0.50	3.73	6.00	10.97	0.00	0.00
Polk	7	4	09-Feb-89	175	22.00	0.00	77.75	0.09	1.64	1.46	0.00	1.80	1.45	1.55	4.03	0.47	3.80	6.20	11.33	0.00	0.00
Polk	7	5	04-Apr-89	229	93.00	0.00	42.81	0.04	1.09	1.02	4.14	1.15	2.05	0.34	4.00	0.42	3.30	5.85	12.51	0.00	0.00
Polk	7	6	13-Jun-89	299	96.00	0.00	37.83	0.06	0.68	0.98	10.82	0.42	1.45	0.19	3.10	0.28	2.45	10.06	5.76	0.00	0.00
Polk	7	7	14-Aug-89	361	139.00	0.00	65.48	0.01	0.95	1.08	3.08	1.30	2.40	0.17	2.98	0.32	6.91	12.58	10.23	0.00	0.00
Polk	7	8	14-Nov-89	453	25.00	0.00	46.85	0.02	1.19	1.20		0.56	1.90	0.22	4.63	0.42	6.01	16.18	4.15	0.00	0.08
Polk	7	9	12-Feb-90	543	84.40	0.00	41.93	0.00	0.85	1.00	18.40	0.58	2.25	0.16	4.00	0.24	3.28	14.93	13.48	0.00	
Polk	7	10	14-May-90	634	96.00	0.00	52.48	0.06	1.19	1.12	4.10	0.44	2.30	0.16	4.02	0.00	5.56	13.96	12.20	0.00	0.00
Polk	7	11	20-Aug-90	732	136.00	0.00	62.17	0.00	0.45	0.58	11.00	0.79	2.25	0.16	4.44	0.00	6.19	17.08	9.84	0.00	0.00
Polk	7	12	30-Oct-90	803	83.00	0.00	57.40	0.00	0.59	0.78	9.00	0.46	2.10	0.14	5.15	0.48	3.52	17.01	45.79	0.00	0.00
Polk	8	1	18-Aug-88	1	62.00	0.00	31.02	0.46	0.11	7.10	7.35	2.18	31.56	0.46	3.90	0.00	2.10	1.61	1.80	0.00	0.00
Polk	8	2	27-Oct-88	70	0.00	0.00	15.51	1.45	0.69	0.27	18.41	0.00	8.53	0.19	2.90	0.09	1.77	5.33	0.04	0.00	0.00
Polk	8	3	08-Dec-88	112	40.00	0.00	19.42	0.63	0.32	0.41	7.93	0.20	4.30	0.24	3.50	0.12	2.40	5.10	8.36	0.00	0.00

Site	Well No.	Trip No.	Cr (mg/l)	Mn (mg/l)	Cd (mg/l)	Temp (deg C)	pH	Conductivity (micromhos)	Color	Odor	Ra-226 (pCi/l)	Rain Data (inches)
Polk	5	11	0.01	0.00	0.00	26.30	5.60	195.0	clear 10	none	0.70	2.99
Polk	5	12	0.00	0.00	0.00	25.80	6.06	254.0	clear 10	none	0.60	0.66
Polk	6	1	0.00	0.01	0.00	24.00	5.75	145.0	clear	none	1.60	5.48
Polk	6	2	0.02	0.00	0.00	26.50	6.33	84.0	clear 0	none	0.30	1.35
Polk	6	3	0.01	0.00	0.00	25.30	4.96	95.8	clear 10	none	0.30	1.38
Polk	6	4	0.02	0.00	0.00	23.20	5.79	106.2	clear 5	none	0.30	0.40
Polk	6	5	0.00	0.00	0.00	26.00	5.20	98.7	clear 10	none	0.20	2.51
Polk	6	6	0.01	0.00	0.00	28.10	5.16	105.9	clear 10	H2S	0.40	4.59
Polk	6	7	0.00	0.00	0.00	27.20	5.58	103.0	clear 10	none	0.40	3.37
Polk	6	8	0.00	0.00	0.00	26.70	5.51	115.0	clear 10	none	0.40	3.22
Polk	6	9	0.00	0.00	0.00	24.10	4.95	116.0	clear 10	cow dun	0.60	3.88
Polk	6	10	0.00	0.00	0.00	26.00	5.43	145.0	clear 10	none	0.20	1.23
Polk	6	11	0.01	0.01	0.00	27.20	5.48	238.0	clear 10	none	0.80	2.99
Polk	6	12	0.00	0.01	0.00	26.60	5.08	245.0	clear 10	none	0.50	0.66
Polk	7	1	0.00	0.09	0.00	24.00	6.15	198.0	clear	H2S	0.80	5.48
Polk	7	2	0.01	0.05	0.00	26.00	6.50	122.3	clear 10	H2S	0.20	1.35
Polk	7	3	0.04	0.07	0.00	24.60	5.48	147.7	s cloud10	H2S	0.40	1.38
Polk	7	4	0.02	0.06	0.00	22.30	5.60	152.6	clear 10	none	0.40	0.40
Polk	7	5	0.00	0.05	0.00	25.80	5.41	130.9	clear 10	H2S	0.30	2.51
Polk	7	6	0.00	0.06	0.00	26.60	5.51	126.8	clear 10	H2S	0.30	4.59
Polk	7	7	0.00	0.11	0.00	25.10	5.71	161.0	clear 10	H2S	0.40	3.37
Polk	7	8	0.00	0.10	0.00	26.20	5.84	166.6	clear 10	s H2S	0.30	3.22
Polk	7	9	0.00	0.06	0.00	24.60	5.02	148.0	clear 10	s H2S	0.40	3.88
Polk	7	10	0.00	0.05	0.00	26.20	5.33	146.0	clear 10	s H2S	0.60	1.23
Polk	7	11	0.00	0.08	0.00	27.20	5.33	146.0	clear 10	s H2S	0.70	2.99
Polk	7	12	0.00	0.04	0.00	26.20	5.60	150.1	clear 10	s H2S	0.40	0.66
Polk	8	1	0.00	0.02	0.00	23.10	6.05	120.0	clear	none	1.50	5.48
Polk	8	2	0.01	0.01	0.00	25.60	6.40	72.9	clear 10	none	0.20	1.35
Polk	8	3	0.01	0.03	0.00	24.80	5.10	81.2	clear 10	none	0.40	1.38

Site	Well No.	Trip No.	Date	# of Day's From Start	T D S (mg/l)	Carbonate (mg/l)	Bicarb (mg/l)	Nitrate (mg/l)	Dissolved PO4 (mg/l)	Total PO4 (mg/l)	Sulfate (mg/l)	Ammonia (mg/l)	Chloride (mg/l)	Fluoride (mg/l)	Na (mg/l)	K (mg/l)	Mg (mg/l)	Ca (mg/l)	Fe (mg/l)	Cu (mg/l)	Pb (mg/l)
Polk	8	4	09-Feb-89	175	5.00	0.00	24.47	0.50	0.33	0.34	7.30	0.12	2.05	1.00	3.50	0.11	1.87	7.60	0.40	0.00	0.00
Polk	8	5	04-Apr-89	229	54.00	0.00	21.95	0.38	0.29	0.30	7.27	0.31	3.35	0.20	3.90	0.15	2.10	5.82	1.93	0.00	0.00
Polk	8	6	13-Jun-89	299	67.00	0.00	25.59	0.07	0.28	0.28	6.41	0.30	3.00	0.18	3.20	0.12	1.80	9.80	0.22	0.00	0.00
Polk	8	7	14-Aug-89	361	89.00	0.00	28.47	1.70	0.26	0.26	6.74	0.10	4.10	0.14	2.92	0.06	1.08	11.82	20.17	0.00	0.01
Polk	8	8	14-Nov-89	453	30.00	0.00	27.89	0.35	0.29	0.28		0.12	3.55	0.17	3.92	0.26	1.66	13.41	1.52	0.00	0.06
Polk	8	9	12-Feb-90	543	40.00	0.00	34.00	0.00	0.30	0.34	4.50	0.12	4.05	0.14	4.20	0.23	1.60	14.84	14.54	0.00	
Polk	8	10	14-May-90	634	56.00	0.00	37.24	0.05	0.37	0.37	4.00	0.24	5.40	0.12	4.17	0.00	2.72	13.50	2.48	0.00	0.00
Polk	8	11	20-Aug-90	732	85.00	0.00	40.69	0.00	0.42	0.44	0.00	0.50	3.75	0.15	4.00	0.00	1.97	14.82	4.31	0.00	0.00
Polk	8	12	30-Oct-90	803	38.00	0.00	40.52	0.00	0.42	0.46	1.90	0.17	3.05	0.11	4.00	0.25	2.33	14.43	3.57	0.00	0.00
Polk	9	1	18-Aug-88	1	85.00	0.00	51.70	1.72	0.04	5.33	5.06	0.12	27.60	0.79	4.50	1.00	6.30	2.01	2.00	0.00	0.00
Polk	9	2	27-Oct-88	70	0.00	0.00	24.82	0.96	1.95	0.66	12.27	0.00	14.89	0.32	4.00	0.22	4.10	9.20	0.17	0.00	0.00
Polk	9	3	08-Dec-88	112	58.00	0.00	43.15	2.06	0.90	1.02	4.13	0.37	2.25	0.42	4.07	0.16	4.70	8.90	0.03	0.00	0.00
Polk	9	4	09-Feb-89	175	3.00	0.00	45.67	2.20	0.73	0.76	10.10	0.12	1.50	1.75	4.17	0.19	5.23	9.30	0.00	0.00	0.00
Polk	9	5	04-Apr-89	229	89.00	0.00	43.91	1.61	0.79	0.76	8.40	0.14	1.60	0.26	4.63	0.22	5.43	6.70	0.08	0.00	0.00
Polk	9	6	13-Jun-89	299	99.00	0.00	44.50	1.60	0.74	0.72	11.87	0.20	1.55	0.23	3.43	0.17	4.68	12.78	0.09	0.00	0.00
Polk	9	7	14-Aug-89	361	110.00	0.00	45.55	0.40	0.77	0.76	8.93	0.13	1.45	0.23	3.08	0.02	5.32	13.09	0.16	0.00	0.00
Polk	9	8	14-Nov-89	453	45.00	0.00	47.97	1.54	0.71	0.71		0.00	1.70	0.24	3.92	0.09	5.75	14.68	0.00	0.00	0.06
Polk	9	9	12-Feb-90	543	56.00	0.00	54.40	0.80	0.78	0.80	8.50	0.00	2.10	0.20	4.20	0.15	6.30	17.96	0.16	0.00	
Polk	9	10	14-May-90	634	94.00	0.00	72.79	0.31	0.81	0.84	4.30	0.22	1.75	0.20	4.61	0.00	8.27	17.20	0.00	0.01	0.00
Polk	9	11	20-Aug-90	732	143.00	0.00	87.04	0.20	0.82	0.86	3.00	0.62	4.30	0.21	4.99	0.15	6.99	22.25	0.04	0.00	0.00
Polk	9	12	30-Oct-90	803	122.00	0.00	118.18	0.18	0.71	0.78	4.30	0.00	2.35	0.17	6.16	0.47	12.98	28.29	0.11	0.00	0.00
Polk	10	1	18-Aug-88	1	63.00	0.00	41.36	0.54	0.43	3.60	8.15	0.10	28.86	0.84	3.70	1.00	2.40	1.39	2.10	0.00	0.00
Polk	10	2	27-Oct-88	70	0.00	0.00	11.37	0.37	2.40	0.79	9.05	0.00	11.34	0.40	2.60	0.10	0.80	4.13	0.02	0.00	0.00
Polk	10	3	08-Dec-88	112	42.00	0.00	22.65	0.74	1.20	1.32	8.42	0.28	3.20	0.43	3.20	0.11	2.00	7.70	0.05	0.00	0.00
Polk	10	4	09-Feb-89	175	3.00	0.00	16.85	0.90	1.26	1.26	7.00	0.00	1.70	1.95	3.10	0.13	2.33	7.23	0.05	0.00	0.00
Polk	10	5	04-Apr-89	229	53.00	0.00	19.76	0.96	1.23	1.22	6.82	0.00	2.00	0.28	3.50	0.16	2.70	5.55	0.05	0.00	0.00
Polk	10	6	13-Jun-89	299	89.00	0.00	38.94	0.57	1.08	1.06	7.56	0.16	2.75	0.23	2.78	0.11	1.80	9.02	0.06	0.00	0.00
Polk	10	7	14-Aug-89	361	127.00	0.00	47.83	0.59	1.07	1.06	7.95	0.12	3.00	0.27	2.44	0.00	3.51	12.79	0.09	0.00	0.01
Polk	10	8	14-Nov-89	453	3.00	0.00	27.33	0.45	1.12	1.19		0.00	2.20	0.24	3.55	0.10	5.42	17.21	0.14	0.03	0.04

Site	Well No.	Trip No.	Cr (mg/l)	Mn (mg/l)	Cd (mg/l)	Temp (deg C)	pH	Conductivity (micromhos)	Color	Odor	Ra-226 (pCi/l)	Rain Data (inches)
Polk	8	4	0.00	0.02	0.00	22.80	5.28	89.9	s cloudy 15	none	0.90	0.40
Polk	8	5	0.00	0.02	0.00	26.00	5.39	83.0	cloudy 10	none	0.20	2.51
Polk	8	6	0.00	0.02	0.00	27.80	5.36	88.9	s cloudy 20	none	0.20	4.59
Polk	8	7	0.01	0.03	0.00	27.60	5.80	95.0	clear 10	none	17.90	3.37
Polk	8	8	0.00	0.03	0.00	26.50	5.25	103.0	clear 10	none	0.40	3.22
Polk	8	9	0.00	0.00	0.00	24.30	4.89	104.0	clear 10	none	21.00	3.88
Polk	8	10	0.00	0.02	0.00	26.10	5.49	109.0	clear 10	none	0.20	1.23
Polk	8	11	0.00	0.04	0.00	26.90	5.43	105.0	clear 10	none	0.80	2.99
Polk	8	12	0.00	0.03	0.00	25.30	5.02	107.2	clear 10	none	0.40	0.66
Polk	9	1	0.00	0.00	0.00	23.90	6.65	145.0	clear	none	1.20	5.48
Polk	9	2	0.00	0.00	0.00	25.60	6.57	87.5	clear 10	none	0.30	1.35
Polk	9	3	0.00	0.00	0.00	24.90	5.77	124.3	clear 10	none	0.20	1.38
Polk	9	4	0.00	0.00	0.00	22.60	5.95	140.1	clear 10	none	0.40	0.40
Polk	9	5	0.00	0.00	0.00	25.60	5.77	126.5	clear 10	none	0.40	2.51
Polk	9	6	0.00	0.00	0.00	29.40	6.06	130.8	clear 10	none	0.30	4.59
Polk	9	7	0.00	0.00	0.00	25.20	6.11	125.0	clear 10	none	0.30	3.37
Polk	9	8	0.00	0.00	0.00	25.90	6.70	125.2	clear 10	none	0.60	3.22
Polk	9	9	0.00	0.00	0.00	24.50	5.74	136.0	clear 10	none	0.40	3.88
Polk	9	10	0.00	0.00	0.00	27.10	5.79	146.0	clear 10	none	0.30	1.23
Polk	9	11	0.00	0.00	0.01	27.10	5.74	174.0	clear 10	none	0.60	2.99
Polk	9	12	0.00	0.00	0.00	25.80	6.08	205.0	clear 10	none	0.50	0.66
Polk	10	1	0.00	0.00	0.00	23.50	6.20	120.0	clear	none	0.50	5.48
Polk	10	2	0.00	0.00	0.00	25.90	6.51	50.8	clear 0	none	0.20	1.35
Polk	10	3	0.01	0.00	0.00	24.30	5.59	88.0	clear 10	none	6.40	1.38
Polk	10	4	0.01	0.00	0.00	21.90	5.60	80.1	clear 10	none	0.20	0.40
Polk	10	5	0.00	0.00	0.00	26.10	5.48	69.9	clear 10	none	0.20	2.51
Polk	10	6	0.00	0.00	0.00	26.50	5.77	100.0	clear 10	none	0.30	4.59
Polk	10	7	0.00	0.00	0.00	26.90	6.13	124.0	clear 10	none	0.30	3.37
Polk	10	8	0.00	0.00	0.00	26.20	6.18	139.7	clear 10	none	0.40	3.22

Site	Well No.	Trip No.	Date	# of Day's From Start	T D S (mg/l)	Carbonate (mg/l)	Bicarb (mg/l)	Nitrate (mg/l)	Dissolved PO4 (mg/l)	Total PO4 (mg/l)	Sulfate (mg/l)	Ammonia (mg/l)	Chloride (mg/l)	Fluoride (mg/l)	Na (mg/l)	K (mg/l)	Mg (mg/l)	Ca (mg/l)	Fe (mg/l)	Cu (mg/l)	Pb (mg/l)
Polk	10	9	12-Feb-90	543	71.00	0.00	54.40	0.90	0.87	0.90	8.50	0.00	2.10	0.21	3.17	0.22	4.10	15.10	0.00	0.00	
Polk	10	10	14-May-90	634	94.00	0.00	58.68	1.50	0.70	0.70	10.60	0.20	1.65	0.21	3.43	0.00	7.97	15.88	0.00	0.00	0.00
Polk	10	11	20-Aug-90	732	112.00	0.00	49.74	1.40	0.67	0.72	8.00	0.46	2.10	0.23	3.26	0.02	4.70	15.86	0.00	0.00	0.00
Polk	10	12	30-Oct-90	803	101.00	0.00	52.34	1.14	0.61	0.66	21.00	0.16	1.60	0.18	3.83	0.52	7.77	17.82	0.02	0.00	0.06
Polk	99	1	18-Aug-88	1	131.00	0.00	87.89	4.75	0.00	0.39	3.43	0.00	61.72	0.46	4.30	1.20	12.90	2.55	1.30	0.00	0.00
Polk	99	2	27-Oct-88	70	16.00	0.00	80.65	6.09	0.07	0.02	2.24	0.00	26.23	0.18	3.90	0.33	10.43	14.73	0.03	0.00	0.00
Polk	99	3	08-Dec-88	112	124.00	0.00	75.51	5.30	0.01	0.16	2.07	0.17	6.80	0.26	4.10	0.33	11.27	14.60	0.02	0.00	0.00
Polk	99	4	09-Feb-89	175	97.00	0.00	79.38	5.72	0.01	0.02	2.50	0.16	4.40	1.15	4.05	0.36	10.73	15.10	0.04	0.00	0.00
Polk	99	5	04-Apr-89	229	139.00	0.00	74.29	5.28	0.00	0.00	3.02	0.12	4.55	0.35	4.45	0.42	9.75	9.65	0.08	0.00	0.00
Polk	99	6	13-Jun-89	299	136.00	0.00	76.77	3.09	0.00	0.02	5.96	0.61	3.20	0.25	3.20	0.33	8.45	19.50	0.04	0.00	0.00
Polk	99	7	14-Aug-89	361	155.00	0.00	80.85	0.07	0.01	0.01	9.48	0.12	2.35	0.22	2.38	0.17	9.89	19.31	0.09	0.00	0.03
Polk	99	8	14-Nov-89	453	48.00	0.00	85.89	0.45	0.01	0.00		0.00	2.65	0.24	3.43	0.41	10.56	21.88	0.00	0.00	0.06
Polk	99	9	12-Feb-90	543	53.00	0.00	78.20	0.00	0.00	0.02	7.60	0.00	1.85	0.23	2.73	0.33	9.12	20.49	0.01		
Polk	99	10	14-May-90	634	106.00	0.00	81.26	0.36	0.01	0.02	9.70	0.19	2.40	0.20	3.45	0.00	10.49	19.48	0.00	0.02	0.00
Polk	99	11	20-Aug-90	732	130.00	0.00	81.39	0.10	0.01	0.06	7.00	0.52	2.00	0.27	3.07	0.00	6.61	20.06	0.00	0.00	0.00
Polk	99	12	30-Oct-90	803	97.00	0.00	78.79	0.06	0.01	0.04	10.00	0.00	2.20	0.23	3.18	0.66	9.63	20.17	0.01	0.00	0.02

Site	Well No.	Trip No.	Cr (mg/l)	Mn (mg/l)	Cd (mg/l)	Temp (deg C)	pH	Conductivity (micromhos)	Color	Odor	Ra-226 (pCi/l)	Rain Data (inches)
Polk	10	9	0.00	0.00	0.00	24.80	5.76	143.0	clear 10	none	0.70	3.88
Polk	10	10	0.00	0.00	0.00	25.70	6.05	141.0	clear 10	none	0.20	1.23
Polk	10	11	0.00	0.00	0.00	25.90	6.06	140.0	clear 10	none	0.60	2.99
Polk	10	12	0.00	0.00	0.00	25.90	5.79	158.3	clear 10	none	0.40	0.66
Polk	99	1	0.00	0.00	0.00						0.50	5.48
Polk	99	2	0.00	0.04	0.00	22.80	7.26	208.0	clear 0	none	0.40	1.35
Polk	99	3	0.02	0.01	0.00	18.70	7.64	217.0	clear 10	none	0.30	1.38
Polk	99	4	0.00	0.02	0.00	18.90	7.25	222.0	clear 10	none	0.50	0.40
Polk	99	5	0.00	0.00	0.00	23.60	7.36	204.0	clear 10	none	0.50	2.51
Polk	99	6	0.00	0.00	0.00	28.50	7.13	189.5	clear 0	none	0.60	4.59
Polk	99	7	0.00	0.00	0.00	26.20	7.72	172.0	clear 10	none	0.60	3.37
Polk	99	8	0.00	0.00	0.00	22.50	7.46	167.0	clear 10	none	0.90	3.22
Polk	99	9				19.80	6.92	158.0	clear 10	none	0.50	3.88
Polk	99	10	0.00	0.00	0.00	26.20	7.17	173.0	clear 10	none	0.20	1.23
Polk	99	11	0.01	0.00	0.00	28.00	7.68	165.0	clear 10	none	0.60	2.99
Polk	99	12	0.00	0.00	0.00	22.80	7.15	174.5	clear 10	none	0.80	0.66