GE Corporate
Environmental Programs

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19 May 2000

U S Nuclear Regulatory Commission
Thomas H. Essig, Branch Chief
Uranium Recovery Branch
Division of Waste Management
Office of Nuclear Material Safety and Safeguards
Mail Stop T-7J9
Washington, D.C. 20555

40-8907

Re: License Amendment Request
Shut down of remaining Zone 3 Extraction wells
Source Materials License SUA-1475

Dear Mr. Essig:

United Nuclear (UNC) requests an amendment to Source Materials License SUA-1475, Condition 30.C to discontinue pumping in the remaining active extraction wells in Zone 3. This request is substantiated on the findings of USEPAs Five-year Review Report (September 1988) and by UNCs interpretation of recent groundwater monitoring data in which continued groundwater extraction in Zone 3 is counterproductive to the goals of the corrective action program. Ceasing pumping the remaining Zone 3 extraction wells will actually minimize the migration of seepage-impacted groundwater.

As of September 1997 UNC became a wholly-owned, indirect subsidiary of General Electric Company. GE Corporate Environmental Programs has been retained through a separate administrative services agreement to assist UNC both technically and administratively with environmental issues at the Church Rock site.

Existing Conditions

30. The licensee shall implement a compliance monitoring program containing the following:
    C. Implement a corrective action program in Zone 1 in accordance with the June 14, 1990, and July 1, 1991 amendment requests, with EPA-7 as a water quality and water level monitoring well. Implement a correective program in Zone 3 in

accordance with "Amendment 1, Reclamation Plan, License No. SUA-1475" submitted by letter dated July 26, 1988 with the exception that wells 608, 702, 720, 712, 713, 714 and 715 may be used a water level monitoring wells rather than seepage collection wells. Implement a corrective action program in the alluvium in accordance with "Amendment 2, Reclamation Plan, License No. SUA-1475" submitted by letter date March 29, 1989, with the objective of returning the concentrations of arsenic, beryllium, cadmium, chloroform, gross alpha, lead, lead-210, nickel, redium-226 and 228, selenium, thorium-230, uranium and vanadium to the concentration limits specified in Subsection (B). No corrective action component, meeting the abandonment criteria stated in the March 29, 1989 submittal, shall be decommissioned without obtaining prior NRC approval. Additionally, a fourth seepage collection well shall be installed and operated in the alluvial aquifer as stated in the April 1, 1991, submittal.

Justification

Please refer to the attached data analysis performed by our consultant, Earth Tech. Also note that the corrective action in Zone 1 was terminated previously because all of the wells met the decommissioning criteria of yielding less than one gallon per minute (see NRC correspondence from John Surmeier to Roy Blickwedel of GE dated July 30, 1999). The Zone 1 termination did not require a license amendment request because the license specified by reference the decommissioning criteria. The proposed amendment text therefore eliminates references to the corrective action obligation for both Zone 1 and Zone 3.

A license amendment is required for this request to shut-off the remaining Zone 3 extraction wells because they do not meet the decommissioning criteria.

Please also note that the proposed amendment text reflects UNCs March 2, 2000 proposed license amendment text regarding revisions to the proposed monitoring program.

Proposed Amendment Text

30. The licensee shall implement a compliance monitoring program containing the following:
    C. Implement a monitoring program in Zone 3 in accordance with "Amendment 2, Reclamation Plan, License No. SUA-1475" submitted by letter dated July 26, 1988 with the exception that wells 701, 702, 706, 707, 710, 712, 713, 714, 717, and 719 may be used a water level monitoring wells rather than seepage collection wells. Implement a corrective action program in the alluvium in

accordance with "Amendment 2, Reclamation Plan, License No. SUA-1475" submitted by letter date March 29, 1989, with the objective of returning the concentrations of arsenic ,beryllium, cadmium, chloroform, gross alpha, lead, lead-210, nickel, redium-226 and 228, selenium, thorium-230, uranium and vanadium to the concentration limits specified in Subsection (B). No corrective action component, meeting the abandonment criteria stated in the March 29, 1989 submittal, shall be decommissioned without obtaining prior NRC approval.

If you have any questions or if you have need of more information, please contact me.

Sincerely,

Roy S. Blickwedel

Roy S. Blickwedel, P.G.
Remedial Project Manager

enclosure.

cc: Ken Hooks, NRC
NRC Region IV
Greg Lyssy
Larry Bush
Suzie du Pont (w/out enclosure)

Technical Memorandum

Support for Shutting Off Remaining Zone 3 Pumping Wells
United Nuclear Church Rock Site
Gallup, New Mexico

May 2000

Prepared for:
UNC Mining and Milling
A Division of United Nuclear Corporation
Gallup, New Mexico

Prepared by:

EARTH TECH
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Englewood, Colorado 80111

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Earth Tech	Earth Tech, Inc.
gpm	gallons per minute
EPA	U.S. Environmental Protection Agency
United Nuclear	United Nuclear Corporation
mg/L	milligrams per liter
meq/L	milliequivalents per liter
Mgal	million gallons

1.0 INTRODUCTION

As requested by Mr. Roy Blickwedel of the General Electric Company, Earth Tech, Inc. (Earth Tech) is providing the following technical analysis in support of a license amendment to shut off the remaining Zone 3 pumping wells. The three wells, 716, 717 and 718, continue to pump because their yields are greater than the 1 gallon per minute (gpm) decommissioning criterion specified in the approved *Remedial Design Report* (Canonie Environmental Services Corp., 1989). The rest of the Zone 3 wells have met the decommissioning criteria: a portion of the wells were turned off in 1993 and the remainder were turned off in August 1999. United Nuclear Corporation (United Nuclear) is reluctant to continue pumping the remaining three wells because they are enhancing the migration of tailings seepage downgradient in the Zone 3 formation. Concern about potential enhanced migration was voiced in the U.S. Environmental Protection Agency's (EPA's) *Five-Year Review Report* (1998), as noted in Bullet 1 of Section 5.3 on page 26:

"• The downgradient Stage II wells are recovering over 75% of the ground water that is being produced in Zone 3. The analytical results indicate that the downgradient Stage II wells are producing ground water whose constituent concentrations are very similar to probable background concentrations. In order to avoid the potential of having contamination drawn downgradient by the Stage II extraction wells, the downgradient extraction wells should be turned off and converted to ground water monitoring wells."

Review of the water quality and system operation data provides evidence that the remaining three Stage II wells are enhancing the downgradient migration of the tailings seepage. Changes in water quality in Well EPA 14 over the last year indicate that the rate of tailings seepage migration to this well has increased. This rate change is due to the increased rate of production at Well 716, located adjacent to EPA 14, relative to the declining production in the remaining Zone 3 extraction wells.

The neutralizing capacity of the formation has thus far prevented hazardous constituent concentrations from increasing dramatically at Well EPA 14. However, continued pumping may overwhelm the natural attenuating mechanisms. Turning off the wells will allow the locally increased hydraulic gradient to return to natural conditions of lower hydraulic gradient, thereby slowing the downgradient movement of the water. This slower movement will allow the natural neutralization processes to work more effectively in reducing constituent concentrations related to the tailings seepage.

The water quality and system operation data are evaluated in this technical memorandum. The evaluation focused on Well EPA 14 because it is located closest to the remaining Stage II wells and, until recently, has had background water quality. As a result, Well EPA 14 is most likely to provide evidence of the changes in water quality resulting from pumping wells drawing seepage-impacted groundwater downgradient.

2.0 EVALUATION

The evaluation consisted of reviewing the water quality data from all the monitoring wells to identify patterns in constituent concentrations or concentration trends that could be used to delineate between seepage-impacted and background water. The patterns were then compared to the operational pumping data to determine whether changes in water quality correlated with the operational data. The water quality data used included historical data collected prior to the start of the corrective action program in 1989. The historical data were helpful in identifying the range of background water quality that evolved as the mine water discharge percolated from the alluvium into Zone 3 and for recognizing the movement of seepage-impacted water over time.

2.1 WATER QUALITY

Figure 1 shows the wells that were used in this water quality evaluation. Wells 402, 424, and 446, which are not part of the current performance monitoring program, were included because they provide information on the background water quality. The water quality data review consisted of four primary steps:

- Identify the wells known to be impacted or unimpacted based on the constituents known to be associated with tailings seepage;
- Prepare Stiff diagrams to identify water types and delineate between seepage-impacted and background water;
- Prepare a matrix of the constituent concentration patterns for each well to provide a basis for delineating seepage impacts at wells over time; and
- Graph constituents to identify trends and whether seepage impacts are evident.

The water quality data were then plotted with the pumping data to determine whether the trends correlated with changes in well operation.

2.1.1 Initial Delineation of Impacted versus Unimpacted Wells

The time-series monitoring well water quality data indicate four wells that are clearly seepage impacted. These wells, 518, 517, 501 B, and 502 B, all have acidic pH (less than 5.0), very low bicarbonate (typically 0 milligrams per liter [mg/L]), and elevated concentrations of metals and radionuclides. Chloroform, which is associated only with the main part of the seepage, is reported in detectable concentrations only at Wells 518 and 517. In contrast, the unimpacted wells typically have neutral pH (greater than 6.0), higher bicarbonate (in the range of 100 to 500 mg/L) and lower concentrations of metals and radionuclides.

Delineating wells, such as EPA 14, that have been partially impacted required a more detailed review of the data. Stiff diagrams were selected for the first step in the more detailed review to identify differences in the general patterns or trends in the major constituent concentrations between impacted and unimpacted water.

2.1.2 Stiff Diagrams

Stiff diagrams were plotted for several different sampling events over time for each well. Review of these diagrams did identify several constituent concentrations and concentration trends that were helpful in further delineating seepage impacts.

Figure 2 presents the Stiff diagrams for five unimpacted wells (402, 424, 411, 446, and EPA 1) located downgradient in Zone 3 and the four seepage impacted wells (Wells 518, 517, 501 B, and 502 B). As shown, the unimpacted background water ranges from a calcium-sulfate type in the west at Wells 402 and 424 to a calcium-magnesium-sulfate type with increasing distance to the east (Wells 411, 446 and EPA 1). This change in the background water type is probably related to the increased shale and coal in the formation from west to east.

The Stiff diagrams for Wells 518, 517, 501 B and 502 B indicate that the acidic seepage results in a magnesium sulfate water with very low bicarbonate concentrations and low calcium compared to the background water. These wells also had chloride concentrations that were typically greater than 60 mg/L as compared to the unimpacted wells where chloride concentrations were typically 40 mg/L or less.

Plots of the Stiff diagrams also showed when seepage impacts became evident in a well. For example, Figure 3 presents Stiff diagrams of Well 517 water over time. As shown, initially the water in this well was a calcium-sulfate type similar to Well 402 or 424. However, the water quality in this well changed over time from a calcium-sulfate type to a magnesium-sulfate type. Correspondingly, the pH became more acidic (from 6.0 to 4.0), bicarbonate concentrations decreased to 0 mg/L, metals and radionuclides increased to concentrations above the standards, and chloroform was detected. Also, chloride increased sharply to concentrations greater than 60 mg/L. Unlike Zone 1, chloride concentrations in the Zone 3 seepage are not 10 times greater than in unimpacted water. However, concentrations greater than about 60 mg/L are evident only in the seepage impacted wells.

2.1.3 Matrix of Patterns

Based on review of the Stiff diagrams, a pattern of constituent concentrations indicative of seepage impacts was identified that helped differentiate the partially impacted wells. Table 1 lists these constituent concentrations and also identifies how the water quality at each of the wells fits the different patterns. The constituent concentrations listed in Table 1 that were selected for use in the evaluation are discussed below.

pH: pH values less than 5 indicate the influence of low pH tailings seepage. The pH is less than 5 where significant seepage has entered the formation, but has not migrated far enough in the formation to have reacted sufficiently with the carbonate minerals to reach equilibrium (equilibration with the carbonate minerals produces a neutralized water). Where pH is greater than 5, either seepage has not entered the formation or the seepage has been neutralized to varying degrees depending mostly on the distance of migration from its entry into the formation.

Chloroform: Chloroform is detectable only within the seepage front because it is present in low concentrations and dissipates rapidly.

Bicarbonate: Bicarbonate concentrations less than 100 mg/L indicate the influence of low pH tailings seepage. This is because bicarbonate (HCO_3^-) is initially consumed by contact of the acidic seepage-impacted water with carbonate minerals, such as calcite ($CaCO_3$), according to the following reactions:

$$CaCO_3 + H^+ \text{------>} Ca^{2+} + HCO_3 \quad (1)$$

$$HCO_3^- + H^+ \text{------>} H_2CO_3 \quad (2)$$

$$H_2CO_3 \text{------>} H_2O + CO_2 \quad (3)$$

During the initial contact, bicarbonate and protons (H^+) are consumed by these reactions, which produce carbonic acid (H_2CO_3) and then carbon dioxide (CO_2). As the water continues to migrate through Zone 3 rocks, the consumption of protons results in a gradual increase in pH. As a result, only reaction 1 occurs and bicarbonate is produced but not consumed. This causes the bicarbonate concentrations to increase. Eventually, bicarbonate concentrations will stabilize as the acidic seepage reaches equilibrium with the carbonate minerals in the formation.

The resulting pattern is that as the acidic seepage-impacted water enters the formation it is lacking any bicarbonate (e.g., Wells 518, 517, 501 B and 502 B). Once the water migrates very far from its point of entry, bicarbonate is generated, causing an increase in the bicarbonate to greater than background concentrations (e.g., Well EPA 14). In the unimpacted areas, the background water has reached approximate equilibrium conditions with the minerals, and bicarbonate concentrations range from approximately 100 mg/L to 500 mg/L.

Chloride: Chloride was present in the acid seepage in high concentrations. Chloride is a nonreactive constituent that moves with the plume and therefore provides clear evidence of the plume migration. The chloride level of 60 mg/L was chosen to distinguish the plume from background concentrations that are typically between 20 and 40 mg/L.

Manganese: Manganese acts conservatively in Zone 3 because there is no (or very little) mechanism for its removal from water. Unlike Zone 1, bicarbonate concentrations in Zone 3 are less than 700 mg/L, which is insufficient for precipitating manganese carbonate minerals. As a result, manganese travels further with the plume than other metals, such as aluminum, cobalt, and nickel, which are attenuated as pH increases. Therefore, increasing manganese concentrations can indicate the arrival of the plume front before pH drops. A manganese level of 10 mg/L was chosen to distinguish the plume from background concentrations that are typically less than 6 mg/L.

Calcium-to-Magnesium Ratio: Calcium is fairly stable within the Zone 3 water because its concentration is more or less fixed by the presence of two calcium-bearing phases, calcite and gypsum. Magnesium is much more variable and is present in much higher concentrations in the seepage than in background water. This may be due to acid dissolution of dolomite and silicate minerals (including clays) at the low pH levels of the seepage. As a result, as seepage mixes with background water, the magnesium concentration increases relative to calcium and the calcium-to-magnesium ratio drops. A calcium-to-magnesium ratio of less than 1.0 was found to be typical for the seepage-impacted water.

Water Type: As illustrated by the Stiff diagrams on Figures 2 and 3, a magnesium-sulfate water type indicates impacts from acidic seepage. Therefore, the presence (or absence) of this water type was included as a pattern in the matrix.

Potassium: Potassium usually occurs in groundwater at low levels (a few milligrams per liter) because potassium is adsorbed by clays. When the acid front contacts clays, the exchange sites are flooded with protons (H^+) and magnesium, which replace the potassium ions. Potassium may also result from acid dissolution of feldspars. The result is an increase in potassium concentrations in water. The potassium level of 10 mg/L was chosen to distinguish the plume from background levels, which are typically 10 mg/L or less.

Aluminum: Aluminum concentrations greater than 5.0 mg/L are a clear indication of the presence of the seepage front because aluminum hydroxide precipitates at a pH of about 5.5. Therefore, the occurrence of aluminum indicates that pH values are dropping to levels low enough to dissolve minerals containing aluminum and too low to permit precipitation of aluminum hydroxide. Typically, aluminum concentrations in the background water are less than 1.0 mg/L. The monitoring wells in Table 1 were grouped into background, partially impacted, or seepage-impacted wells based on the patterns of constituent concentration or concentration trend. Red indicates wells with strong seepage impacts. Pink and orange indicate wells with partial seepage impacts. White or no color indicates wells with unimpacted background water quality.

Well EPA 14, which is the focus of this evaluation, is a partially impacted well that had background water quality until about 1996. Since 1996, water quality has been changing in this well as indicated by increasing concentrations of bicarbonate, chloride, potassium and manganese and a decrease in the calcium-to-magnesium ratio. These changes are indicators that seepage has begun to impact this well. These changes are most evident in the last few sampling events where chloride was greater than 60 mg/L.

2.1.4 Graphs of Water Quality

Figures 4 through 8 are graphs of water quality for EPA 14 and other partially impacted or impacted wells. These figures show constituents listed in Table 1 that indicate EPA-14 is being impacted by seepage, including bicarbonate (Figure 4), chloride (Figure 5), manganese (Figure 6), calcium-to-magnesium ratio (Figure 7), and potassium (Figure 8). As shown, the bicarbonate concentrations in Well EPA 14 have increased to greater than the maximum background concentration of 500 mg/L since about 1996. Similarly, the chloride concentration has been increasing since 1996 and, in the last two quarters in 1999, exceeded the 60 mg/L concentration level indicative of seepage impacts. The other constituents exhibit similar trends with increasing concentrations of manganese, a decrease in the calcium-to-magnesium ratio, and increasing potassium.

2.2 PUMPING DATA

The Zone 3 pumping data were evaluated in conjunction with the changes in the water quality at Well EPA 14 to determine whether the two are related. Figure 9 summarizes the volumes pumped for all three pumping systems operated since 1989: Northeast Pump-Back (Wells 600, 608, 610, 613, and 672 shown as red triangles on Figure 1), Stage I (Wells 701 – 703 and 705-713 shown as green triangles on Figure 1), and Stage II (Wells 714-720 shown as blue triangles on Figure 1). The locations of these wells are shown on Figure 1.

For the first two years, only the Northeast and Stage I wells were operating. The Stage II wells were added in 1991 to maximize removal of the seepage-impacted water as the saturated thickness, and correspondingly the well efficiency, declined in the vicinity of the Northeast and

Stage I wells. As shown on Figure 9, by 1992 the Stage II wells were pumping over 50 percent of the total volume extracted from Zone 3. This percentage continued to increase as the formation was dewatered and some of the Northeast and Stage I wells were decommissioned. By 1996 the Stage II wells were responsible for extracting over 80 percent of the total volume pumped. This is also the time period when changes in the water quality at EPA 14 first became evident.

Figure 10 presents the annual pumped volumes for the Stage II wells over time. Three of the wells, 716, 717 and 718, produced most of the water since 1995 with Well 716 being the biggest contributor. As shown on Figure 1, Well 716 is located adjacent to Well EPA 14 and so could be expected to have an effect in drawing seepage towards this area. Figure 11 provides further evidence that Well 716 could draw seepage towards Well EPA 14. Since 1998, Well 716 has produced 50 percent or more of the total pumping rate for all three systems combined.

Review of the pumping data shows that, especially in the past two years, most of the water pumped from Zone 3 has been from the three Stage II wells located downgradient from the seepage-impacted water and near EPA 14. Also, review of the water quality data for EPA 14 indicates that seepage has been migrating into this area since about 1996 when Well 716 became the major producer for the Zone 3 remedial action system. Comparison of the Well 716 pumping data and Well EPA 14 water quality data confirms that there is a correlation between the changes in water quality and the pumping.

Figures 12, 13, 14, 15 and 16 are graphs of bicarbonate, chloride, manganese, potassium and calcium-to-magnesium ratio versus Well 716 annual pumped volume, respectively. Figure 12 shows that bicarbonate concentrations were stable until 1991 when they began to fluctuate in response to pumping from Well 716. Bicarbonate concentrations remained well within background concentrations until 1996 when the bicarbonate concentrations began to increase sharply in parallel with increased pumping from the well. By 1997 bicarbonate concentrations were greater than the 500 mg/L background concentration.

Figure 13 shows that chloride concentrations were also well within background concentrations until 1996 when the chloride concentrations began to increase in parallel with increased pumping from Well 716. Chloride concentrations exceeded the 60 mg/L seepage-impacted concentration in 1999, indicating that the front of the seepage has recently migrated downgradient to this point. Figures 14 and 15 show similar trends for manganese and potassium. Figure 16 shows that the calcium-to-magnesium ratio initially increased, but since 1997 has been on a decreasing trend, indicating that magnesium from seepage water is changing the ratio of these two constituents.

3.0 SUMMARY AND RECOMMENDATIONS

The data for well EPA 14 and the pumping wells indicate that water quality at well EPA 14 is changing as a result of continued operation of the remaining three Stage II extraction wells. Although hazardous constituent concentrations have not exceeded the standards, constituents such as chloride, which are indicators of seepage, have increased since the Stage II wells, particularly Well 716, became the primary producers in the Zone 3 extraction system. Operation of these wells increases the hydraulic gradient and thereby enhances downgradient seepage migration.

United Nuclear requests that the remaining Zone 3 extraction wells be shut off so that the seepage migration rate is reduced and more time is available for the formation and background water to neutralize the seepage and attenuate the hazardous constituents. Currently these wells are pumping background quality water and so serve no purpose in reducing seepage-impacted water mass.

4.0 REFERENCES

Canonie Environmental Services Corp. 1989. *Remedial Design Report, Church Rock Site, Gallup, New Mexico.* April.

U.S. Environmental Protection Agency. 1998. *Five-Year Review Report, United Nuclear Corporation Ground Water Operable Unit, McKinley County, New Mexico.* EPA, Region VI, Dallas, Texas. September.

TABLE

TABLE 1
CONSTITUENT CONCENTRATION PATTERNS
FOR EVALUATING ZONE 3 SEEPAGE IMPACTS

Well	Constituent Concentration or Concentration Trend										Time Period Impacts First Evident	Remarks
	pH <5	Chloroform Detected	Bicarbonate <100	Bicarbonate > 500	Chloride > 60	Manganese >10	Ca/Mg Ratio <1	$Mg-SO_4$ Water Type	Potassium >10	Aluminum > 5		
402												Monitored 7/81 - 7/82
424												Monitored 7/81 - 6/85
446												Monitored 7/81 - 6/83
EPA 1												Well dry January 1998
411												Well filled with oil April 1998
420												
EPA 14											3rd Qtr 1996	Cl greater than 60 mg/L - 2nd Qtr 99
EPA 12											1991	Well dry in October 1992
504 B											1995	Well lost 68% of saturated thickness
EPA 13											1988-1989	
EPA 15											3rd Qtr 1995	Well dry in January 1996
501 B											1982	Well dry in October 1993
502 B											1982	
517											1991	
518											1982	

Notes:
= Partially impacted
= Increased impacts
= Impacted
< = less than
> = greater than

Ca = calcium
Mg = magnesium
SO_4 = sulfate
mg/L = milligrams per liter

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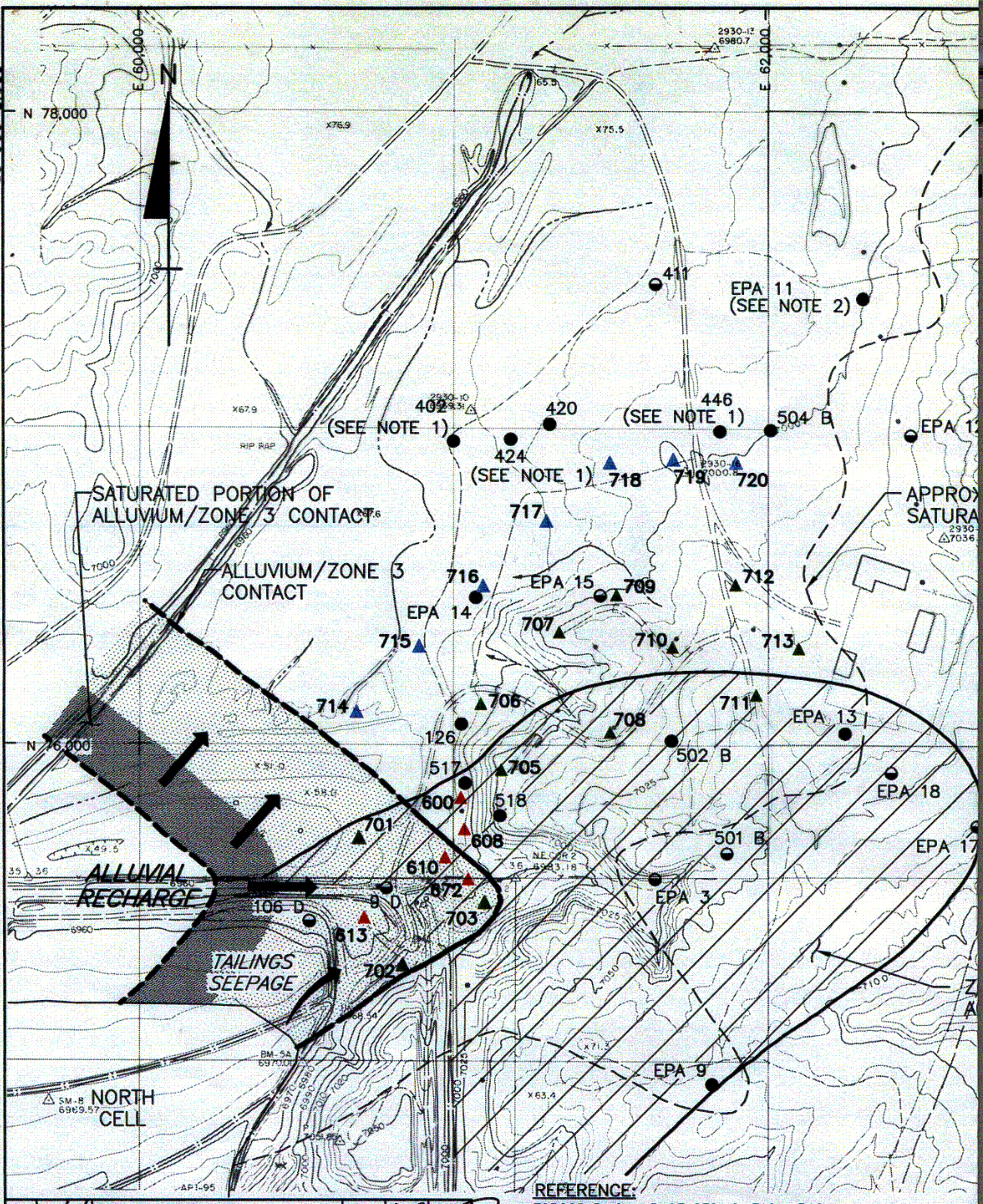

No.	DATE	ISSUE / REVISION	DWN. BY	CK'D BY	AP'D BY
1	05/17/00	ISSUED FOR NRC ZONE 3 WELL SHUTOFF TECH SUPPORT MEMO	EMH		

REFERENCE:
TOPOGRAPHIC MAP OF SEC. 2, T16N, R16W N.M.P.M. & VICINITY PROVIDED BY UNITED NUCLEAR CORPORATION, GALLUP, N.M. DATED: 8-1-96. SCALE: 1" = 400'.

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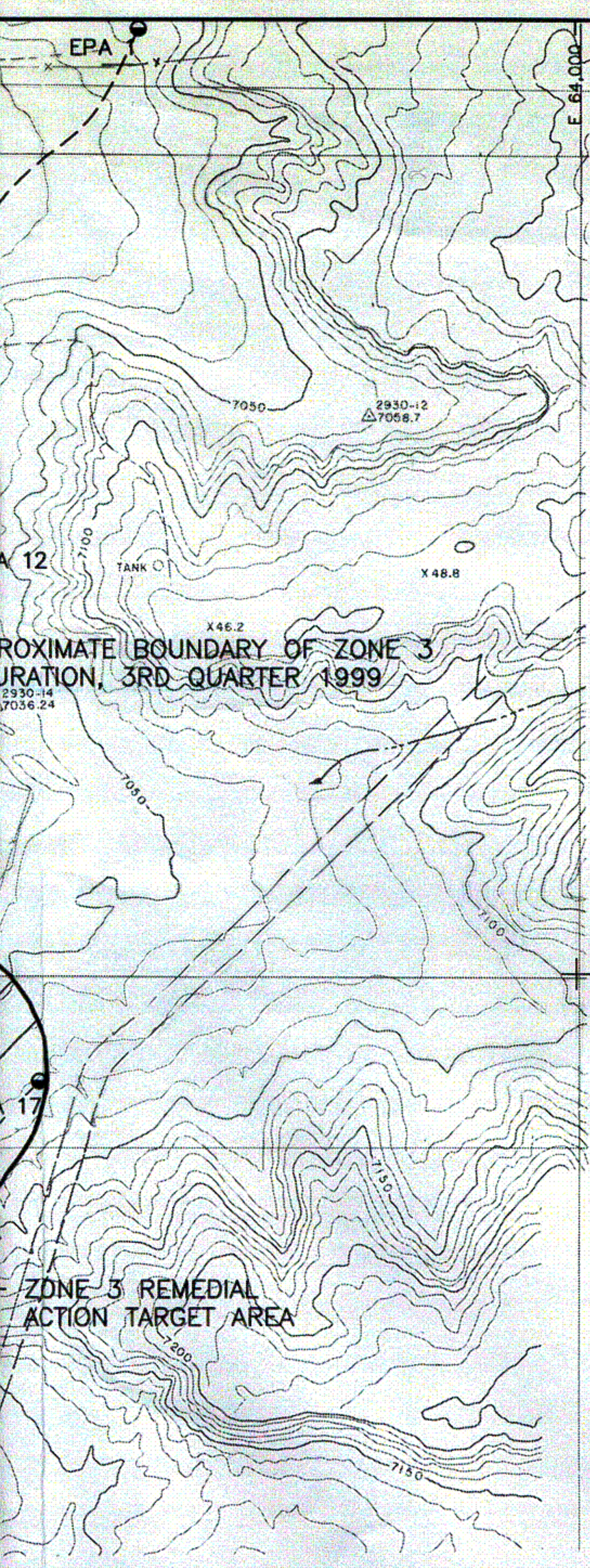

LEGEND:

- 608 ▲ NORTHEAST PUMP-BACK WELL LOCATION AND DESIGNATION
- 708 ▲ ZONE 3-STAGE 1 EXTRACTION WELL LOCATION AND DESIGNATION
- 714 ▲ ZONE 3-STAGE II EXTRACTION WELL LOCATION AND DESIGNATION
- 420 ● ZONE 3 MONITORING WELL LOCATION AND DESIGNATION (CONTAINS WATER)
- EPA 17 ◒ ZONE 3 MONITORING WELL LOCATION AND DESIGNATION (DRY OR CONTAINS INSUFFICIENT WATER FOR SAMPLE COLLECTION)

NOTES:

1. ZONE 3 WELL NOT INCLUDED IN ORIGINAL PERFORMANCE MONITORING PROGRAM.
2. WELL EPA 11 WAS NOT USABLE AS OF THIRD QUARTER 1990. THE WATER LEVEL DROPPED BELOW THE PUMP INTAKE. THE PUMP COULD NOT BE LOWERED BECAUSE IT IS CEMENTED IN THE WELL.

SCALE

400 0 400 FEET

FIGURE 1

ZONE 3
WELL LOCATIONS

PREPARED FOR:

UNC MINING AND MILLING
GALLUP, NEW MEXICO

EARTH TECH

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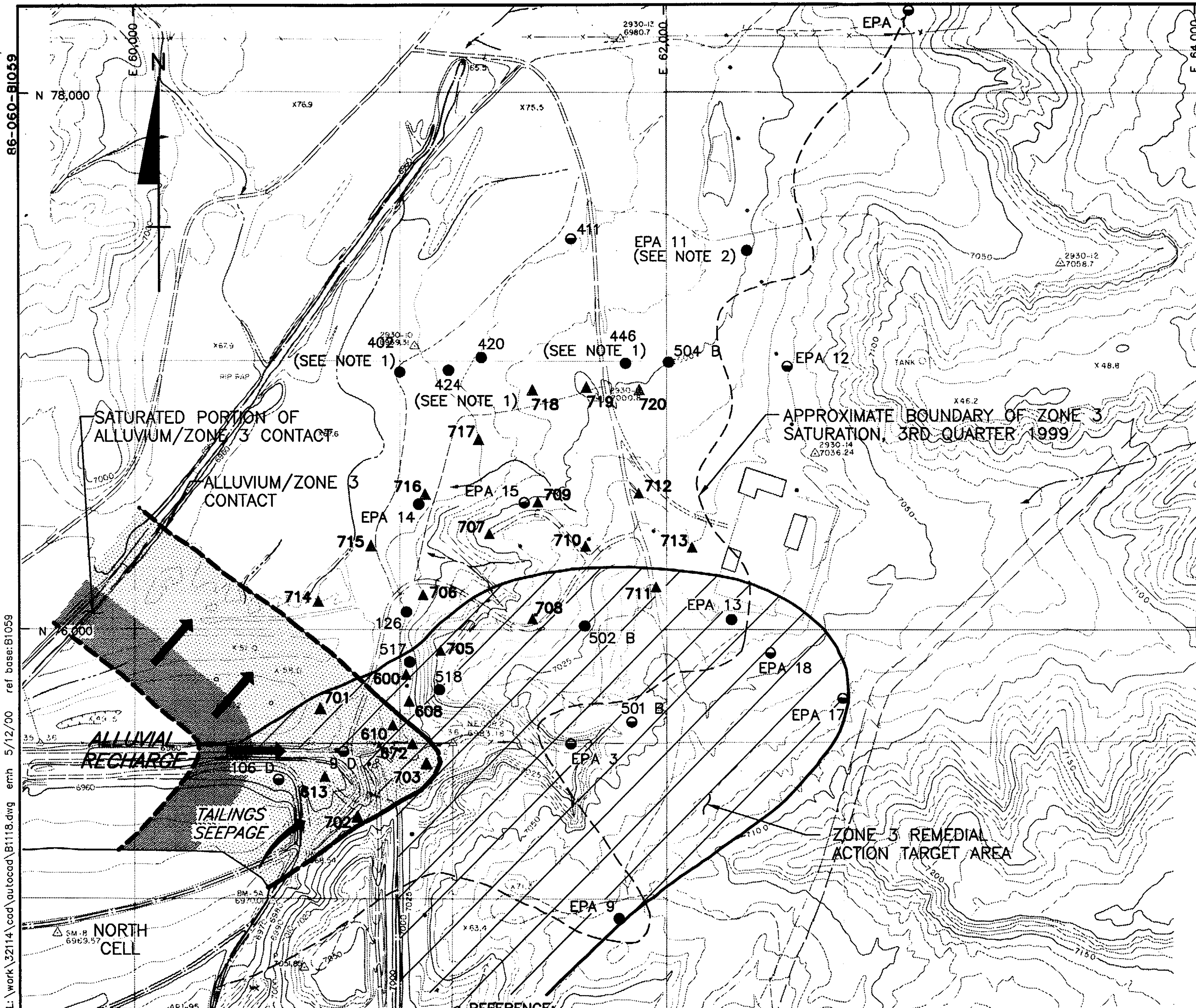

LEGEND:

608 ▲ NORTHEAST PUMP-BACK WELL LOCATION AND DESIGNATION

708 ▲ ZONE 3-STAGE 1 EXTRACTION WELL LOCATION AND DESIGNATION

714 ▲ ZONE 3-STAGE II EXTRACTION WELL LOCATION AND DESIGNATION

420 ● ZONE 3 MONITORING WELL LOCATION AND DESIGNATION (CONTAINS WATER)

EPA 17 ◒ ZONE 3 MONITORING WELL LOCATION AND DESIGNATION (DRY OR CONTAINS INSUFFICIENT WATER FOR SAMPLE COLLECTION)

NOTES:

1. ZONE 3 WELL NOT INCLUDED IN ORIGINAL PERFORMANCE MONITORING PROGRAM.
2. WELL EPA 11 WAS NOT USABLE AS OF THIRD QUARTER 1990. THE WATER LEVEL DROPPED BELOW THE PUMP INTAKE. THE PUMP COULD NOT BE LOWERED BECAUSE IT IS CEMENTED IN THE WELL.

SCALE

400 0 400 FEET

FIGURE 1

ZONE 3 WELL LOCATIONS

PREPARED FOR:

UNC MINING AND MILLING
GALLUP, NEW MEXICO

EARTH TECH

REFERENCE:
TOPOGRAPHIC MAP OF SEC. 2, T16N, R16W N.M.P.M. & VICINITY PROVIDED BY UNITED NUCLEAR CORPORATION, GALLUP, N.M. DATED: 8-1-96. SCALE: 1" = 400'.

No.	DATE	ISSUE / REVISION	DWN. BY	CK'D BY	AP'D BY
1	05/17/00	ISSUED FOR NRC ZONE 3 WELL SHUTOFF TECH SUPPORT MEMO	EMH		

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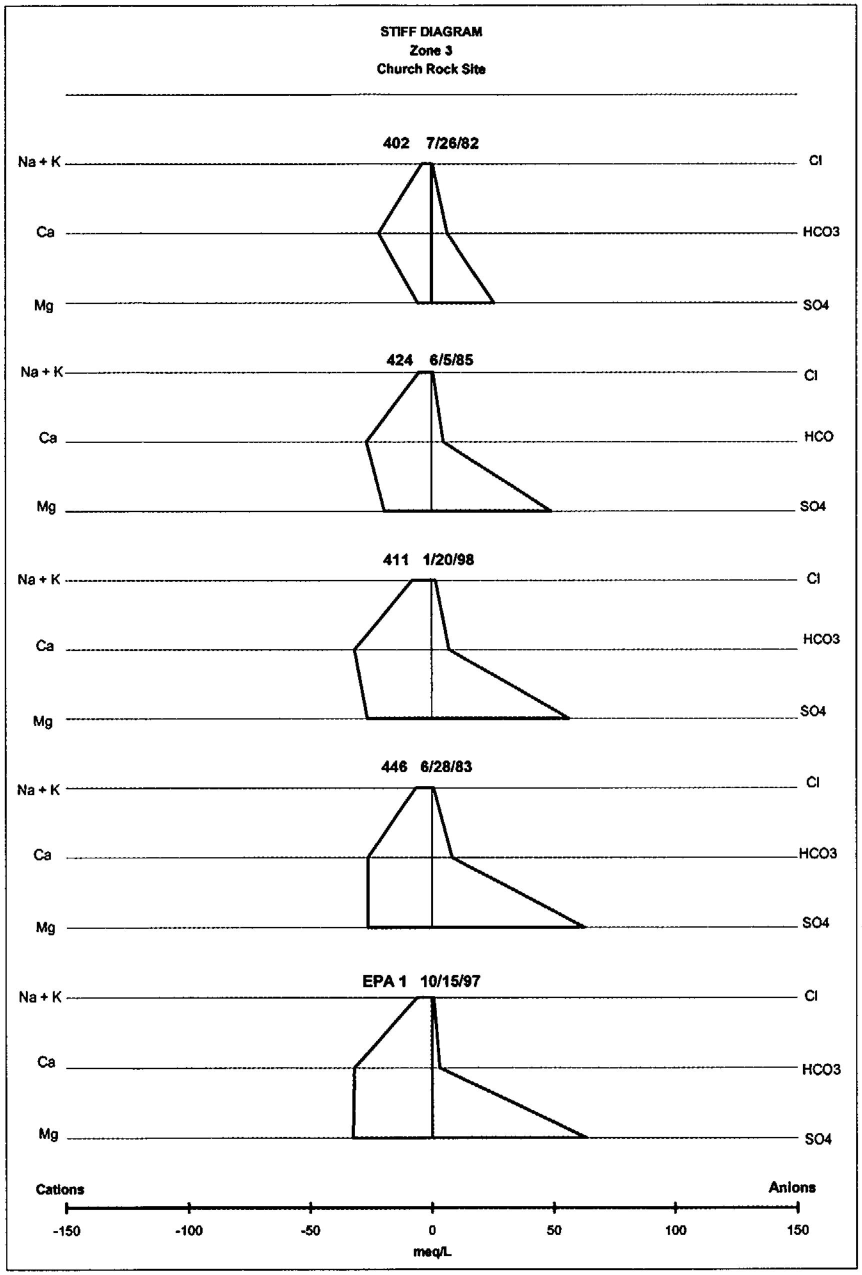
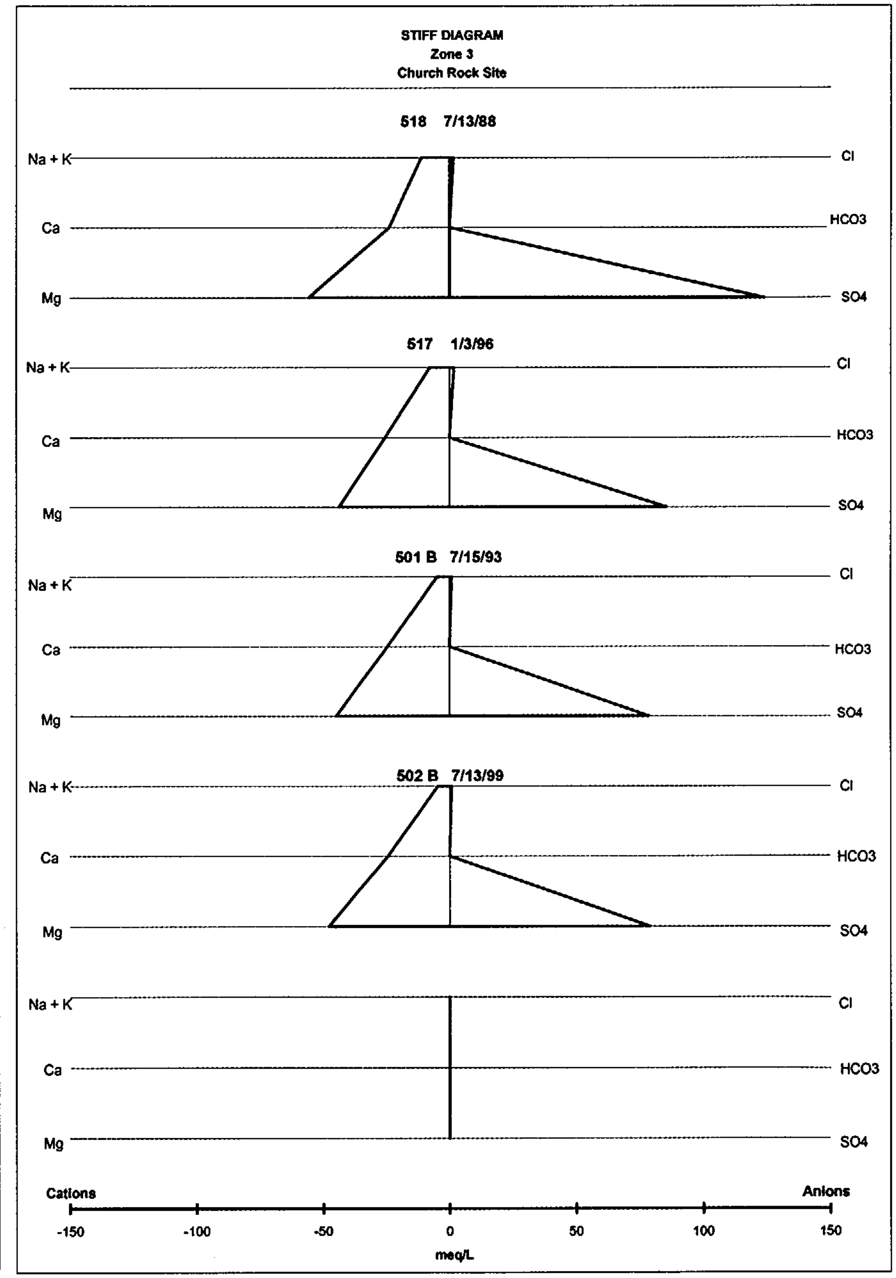


Background Water



Seepage-Impacted Water

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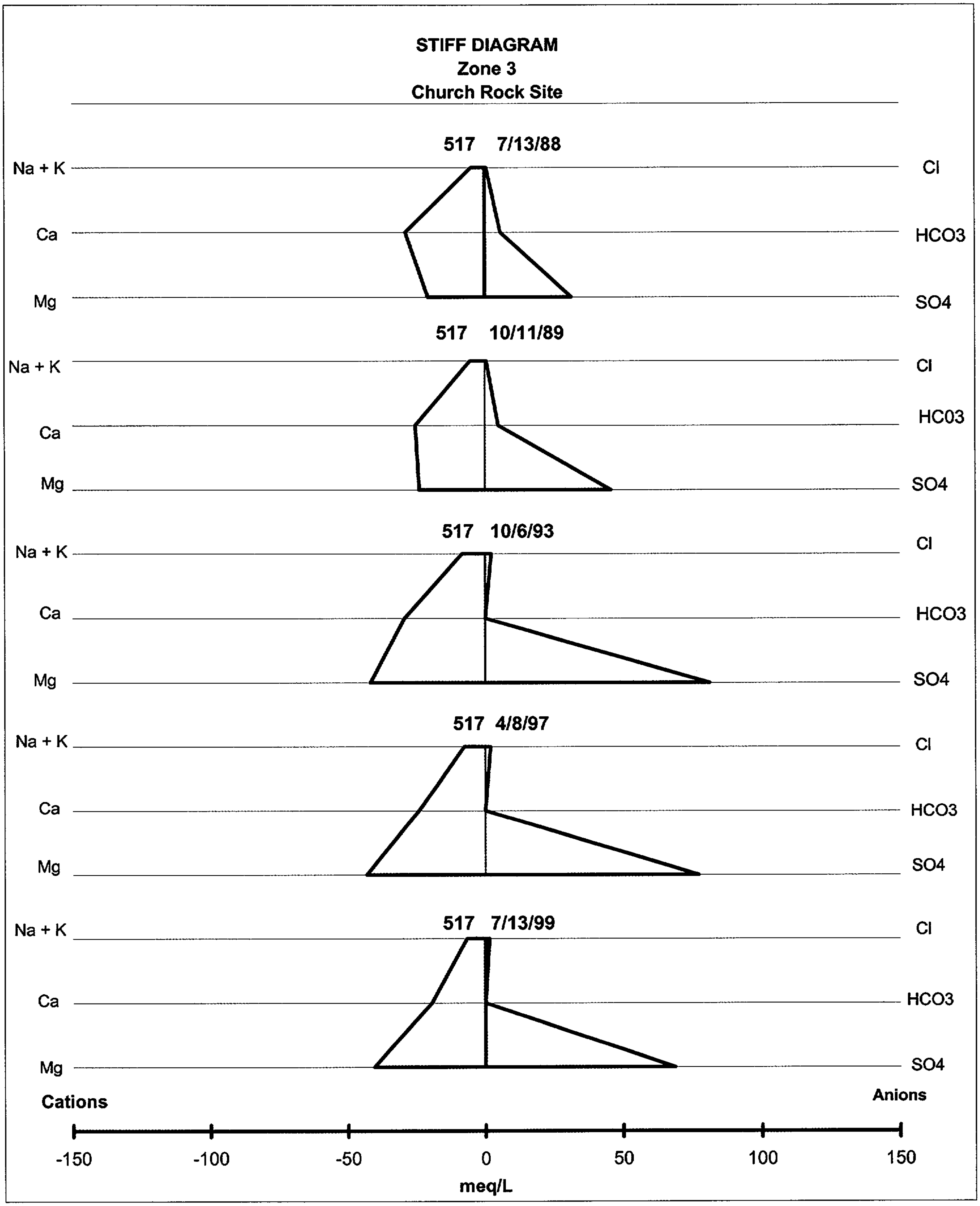
Stiff Diagrams of Background and Seepage-Impacted Water

FIGURE 2



Well 517 Change in Water Type Over Time **FIGURE 3**

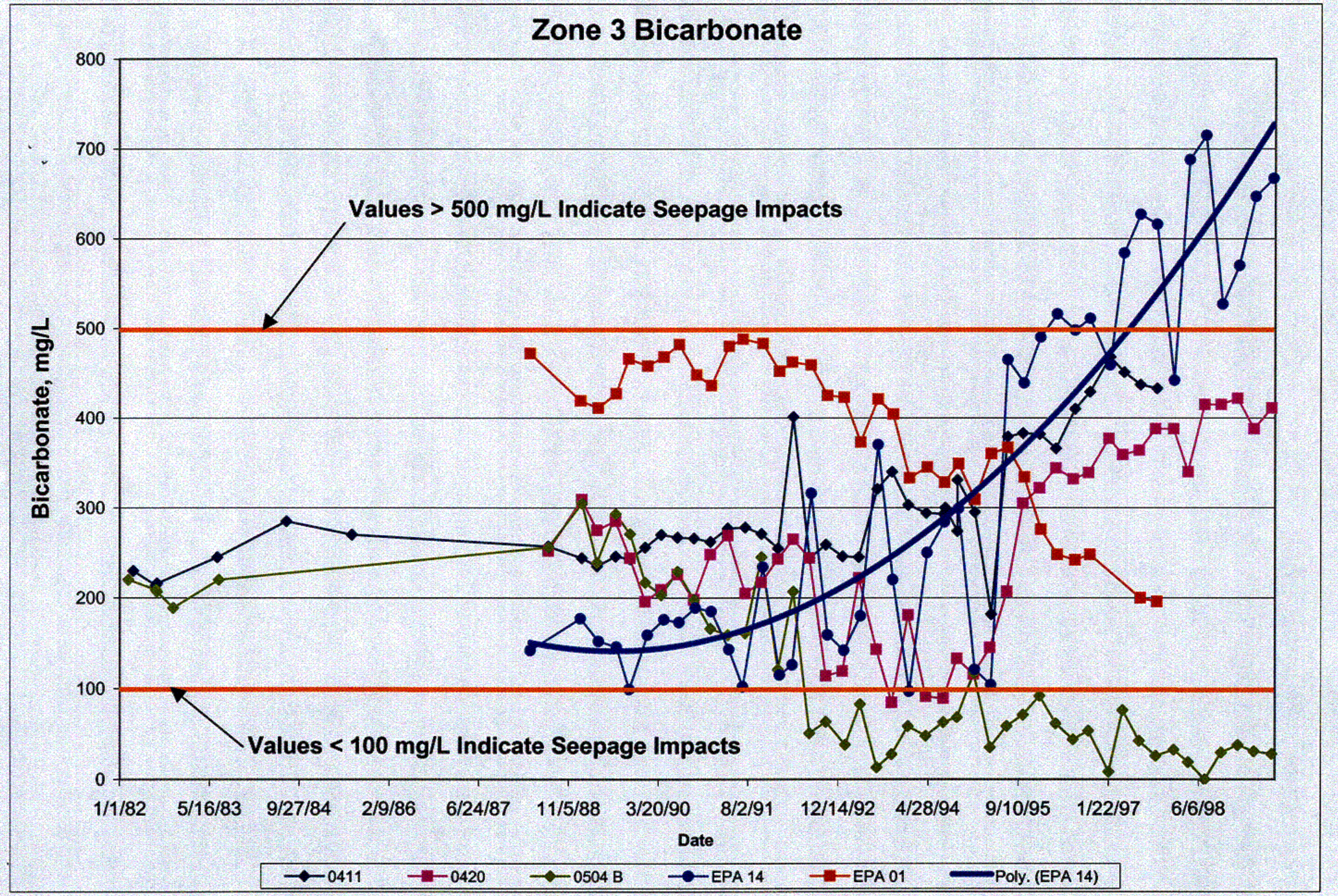


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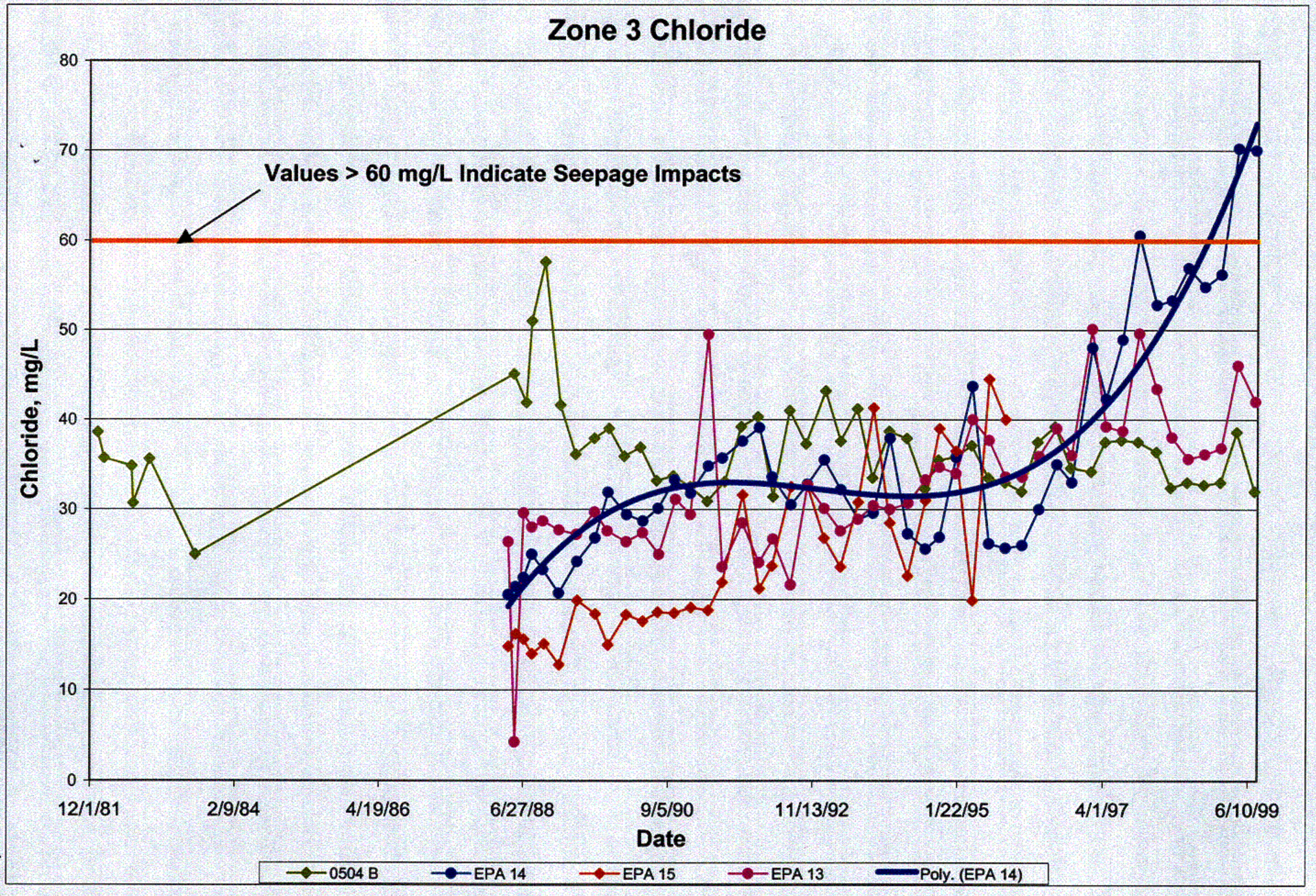
FIGURE 4



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L:\Work\32114\Work\Product\Z3 NRC Tech Eval Rept\Figures\Figure Files\FIGURE 5 Chart 1

FIGURE 5

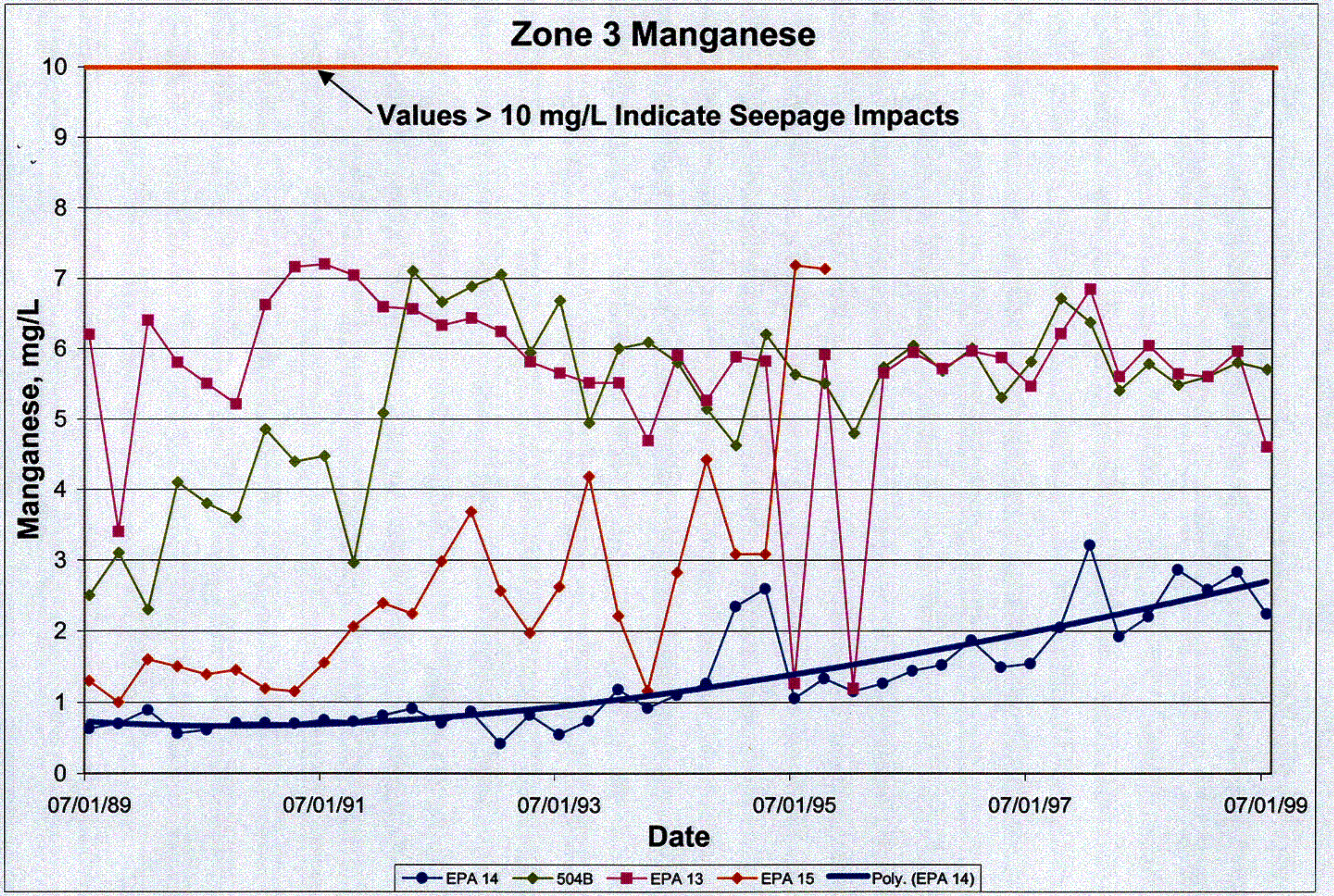

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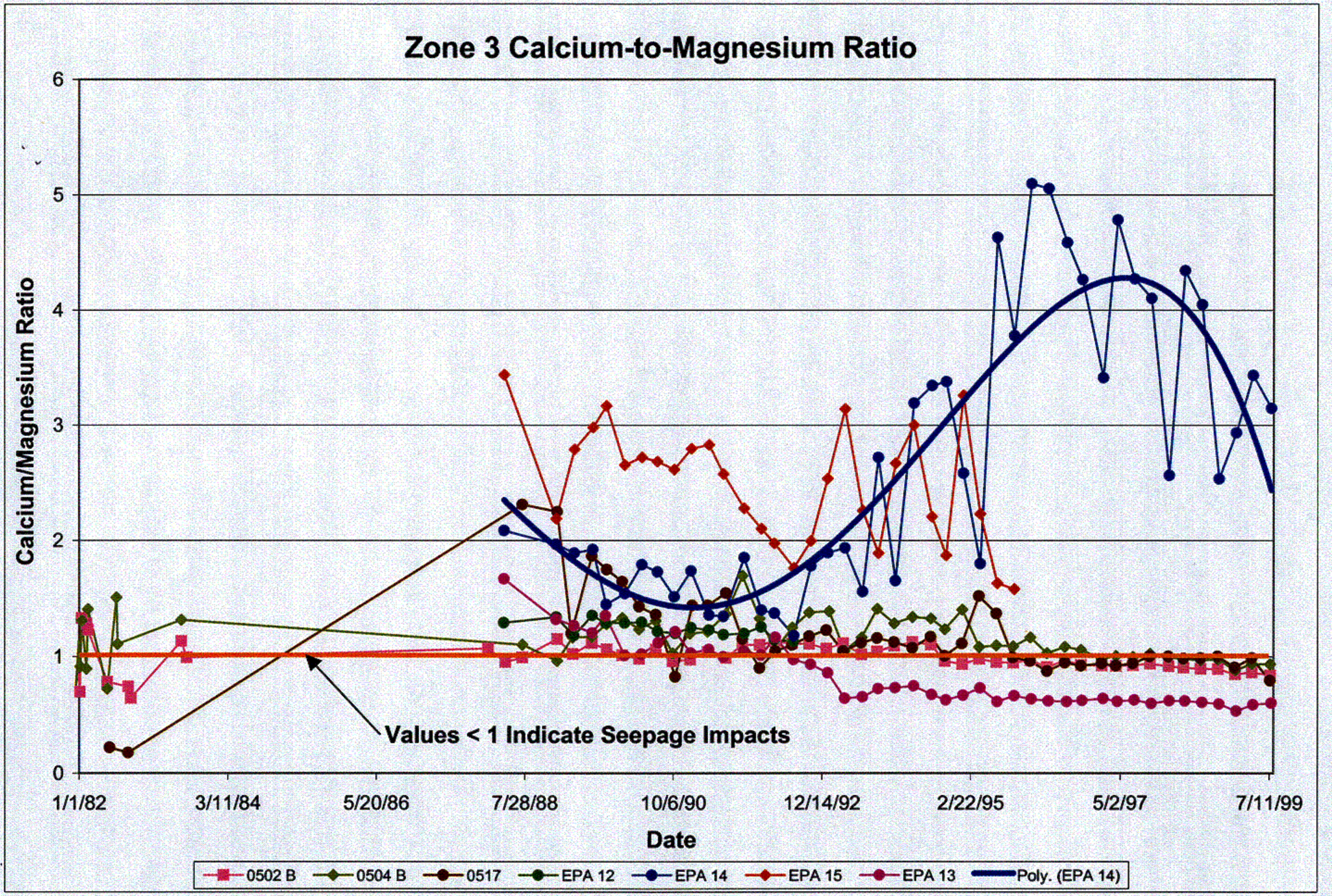
Figure 6



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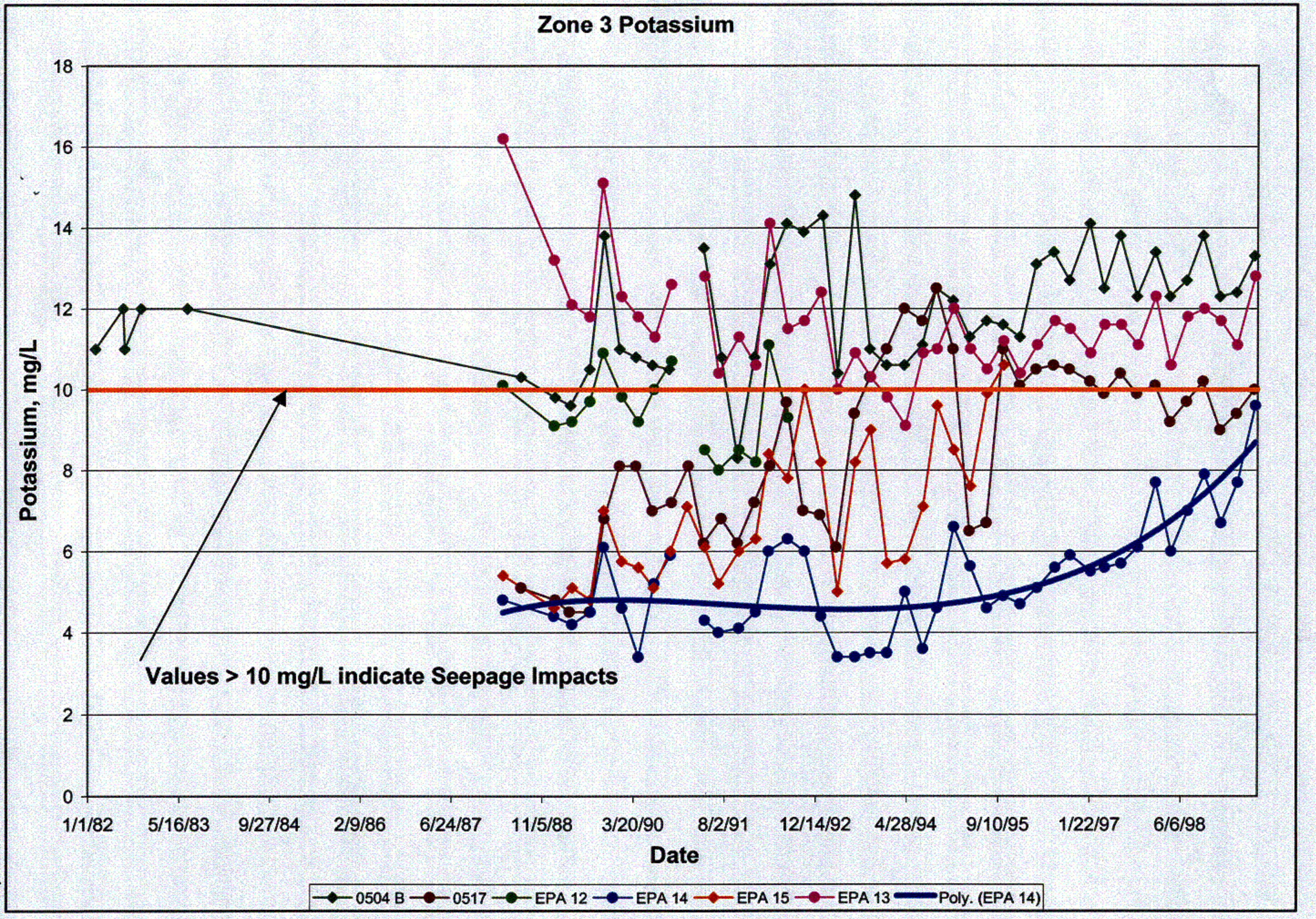

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FIGURE 8

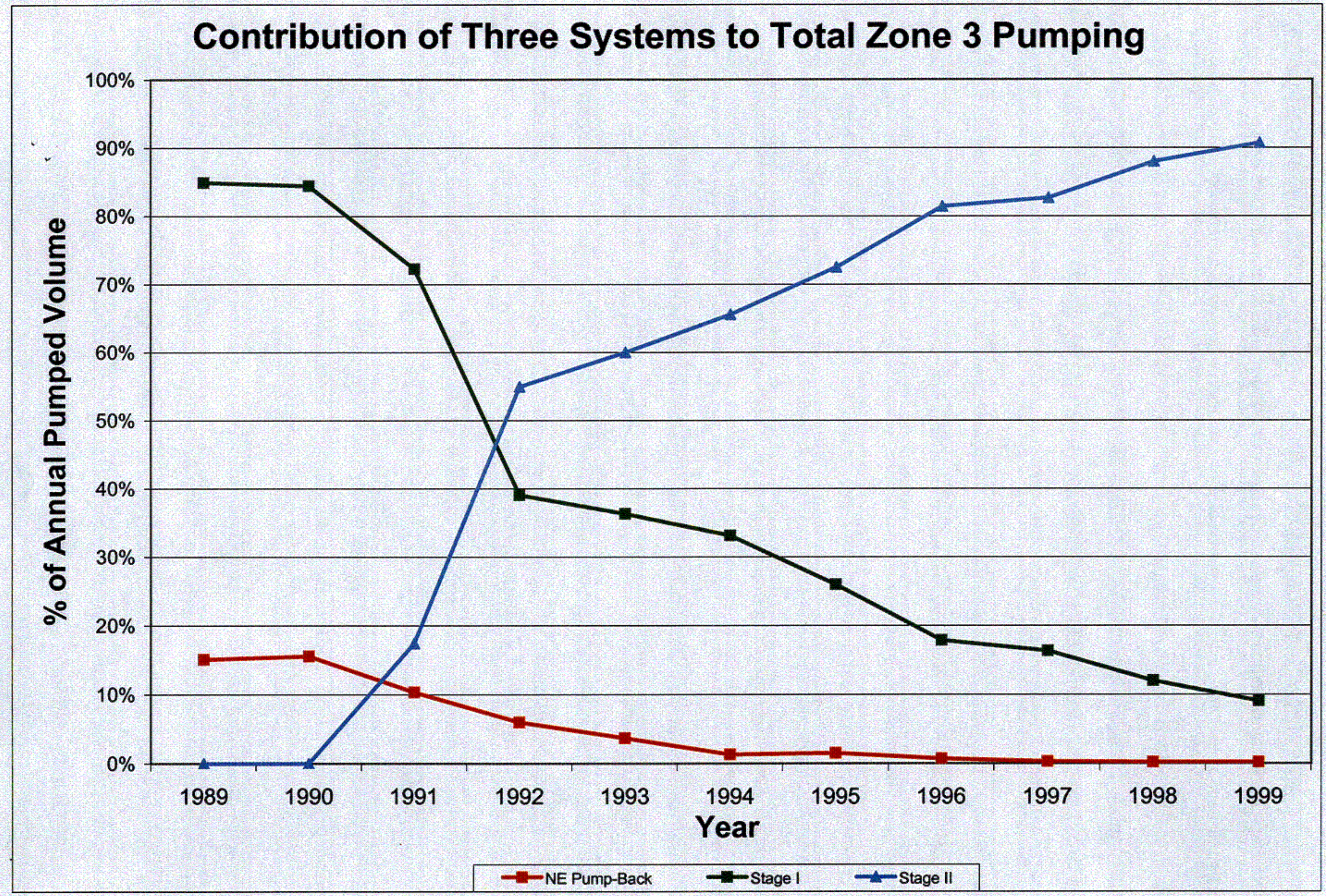

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FIGURE 9

C-10

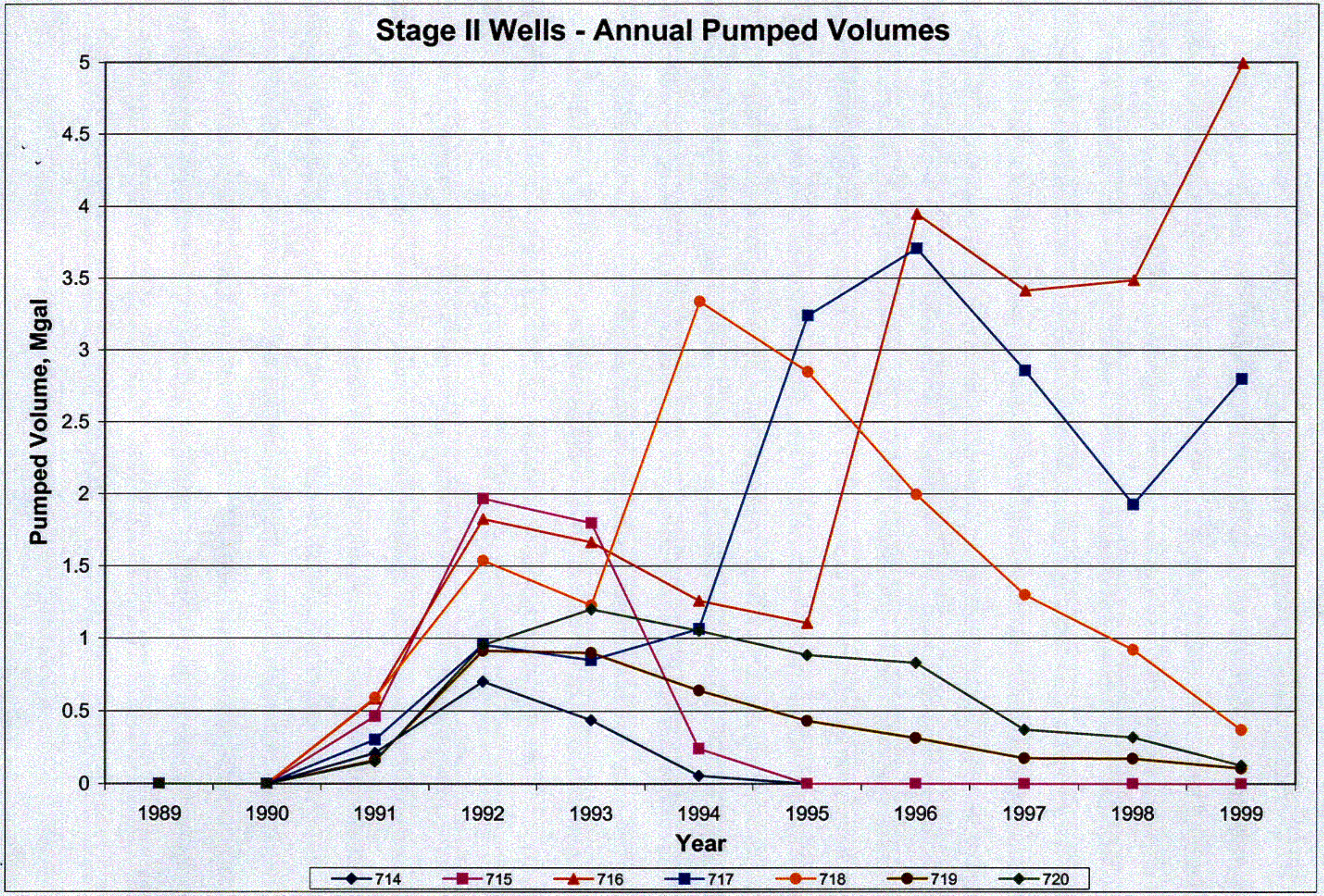

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Figure 10

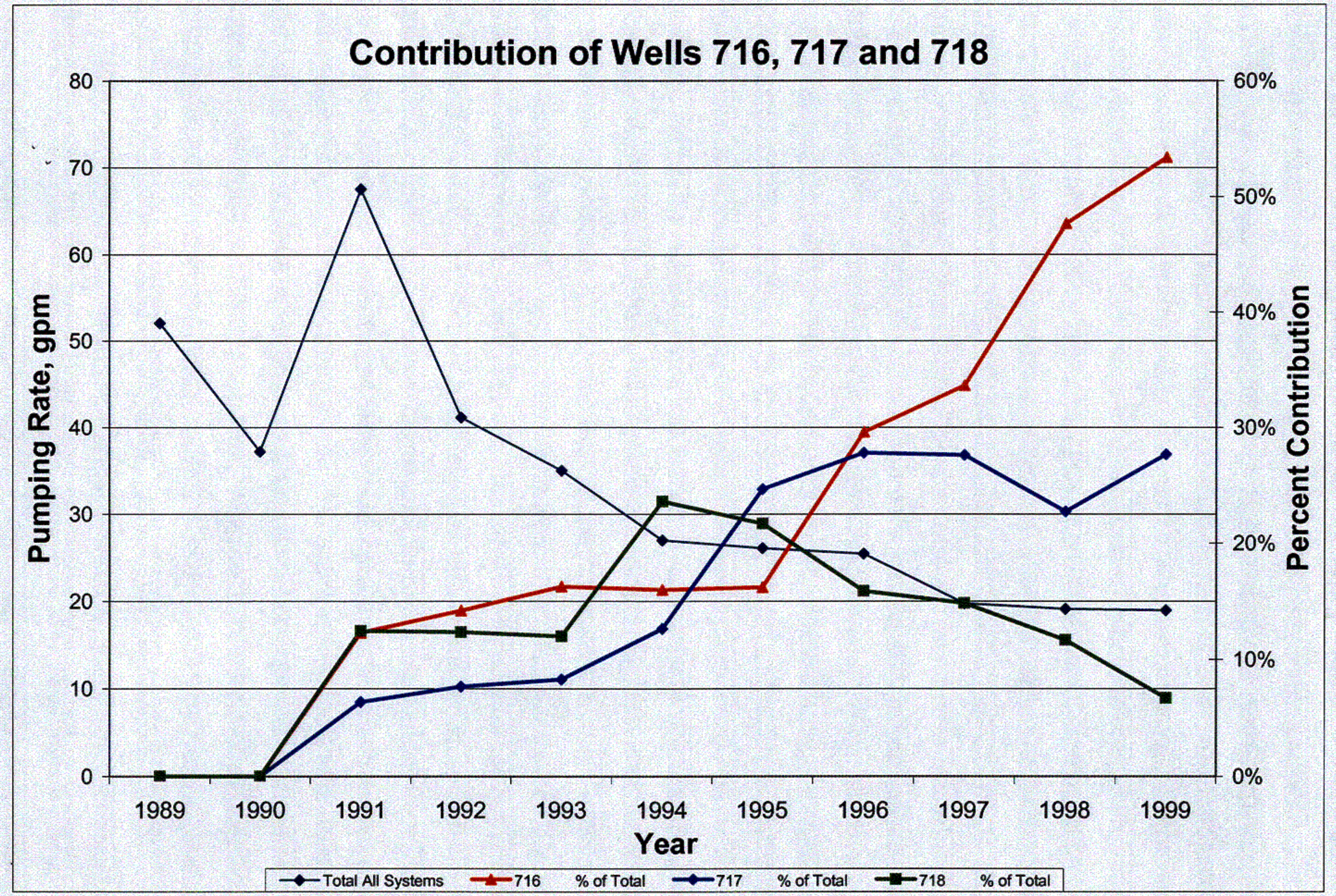

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FIGURE 11

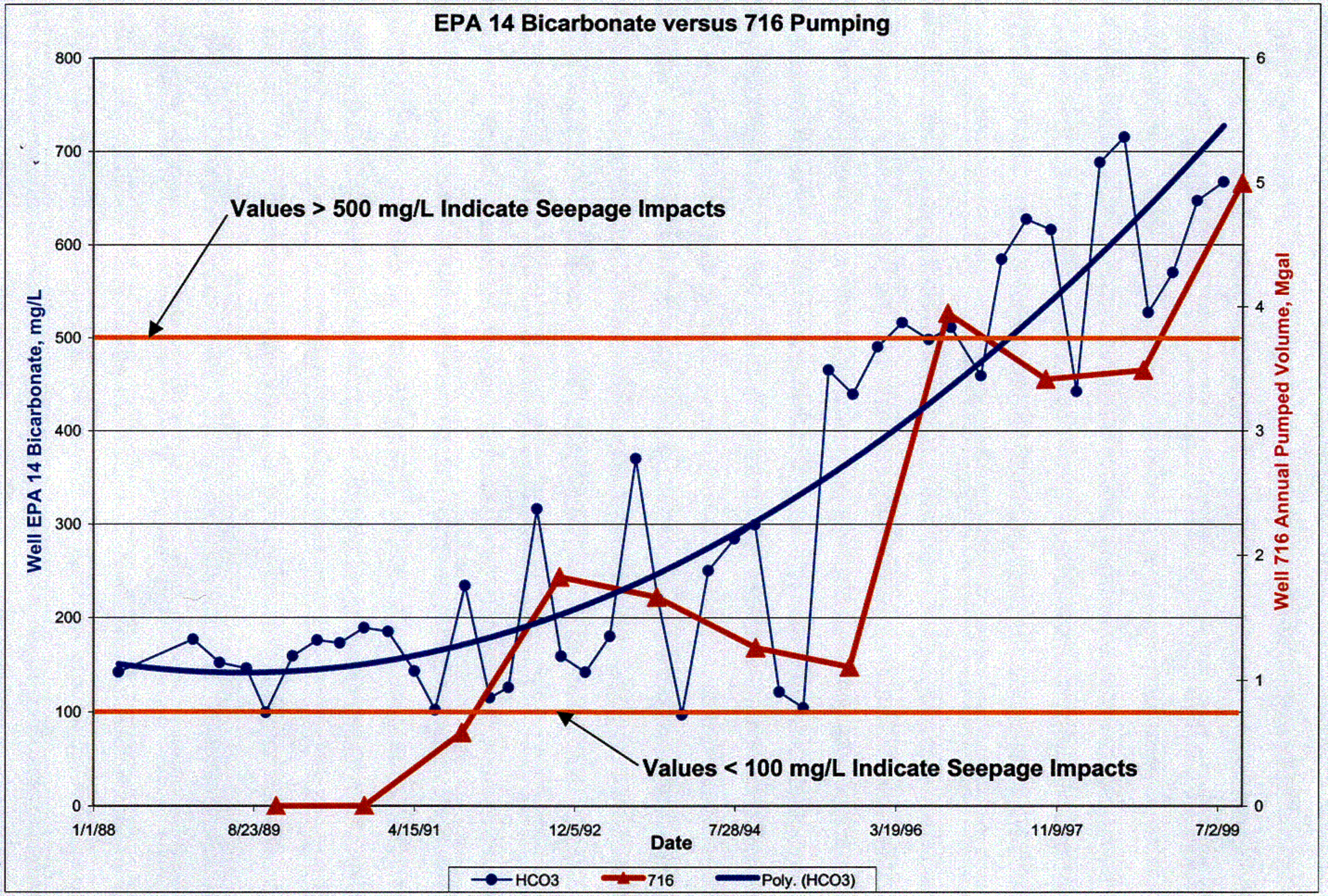

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Figure 12

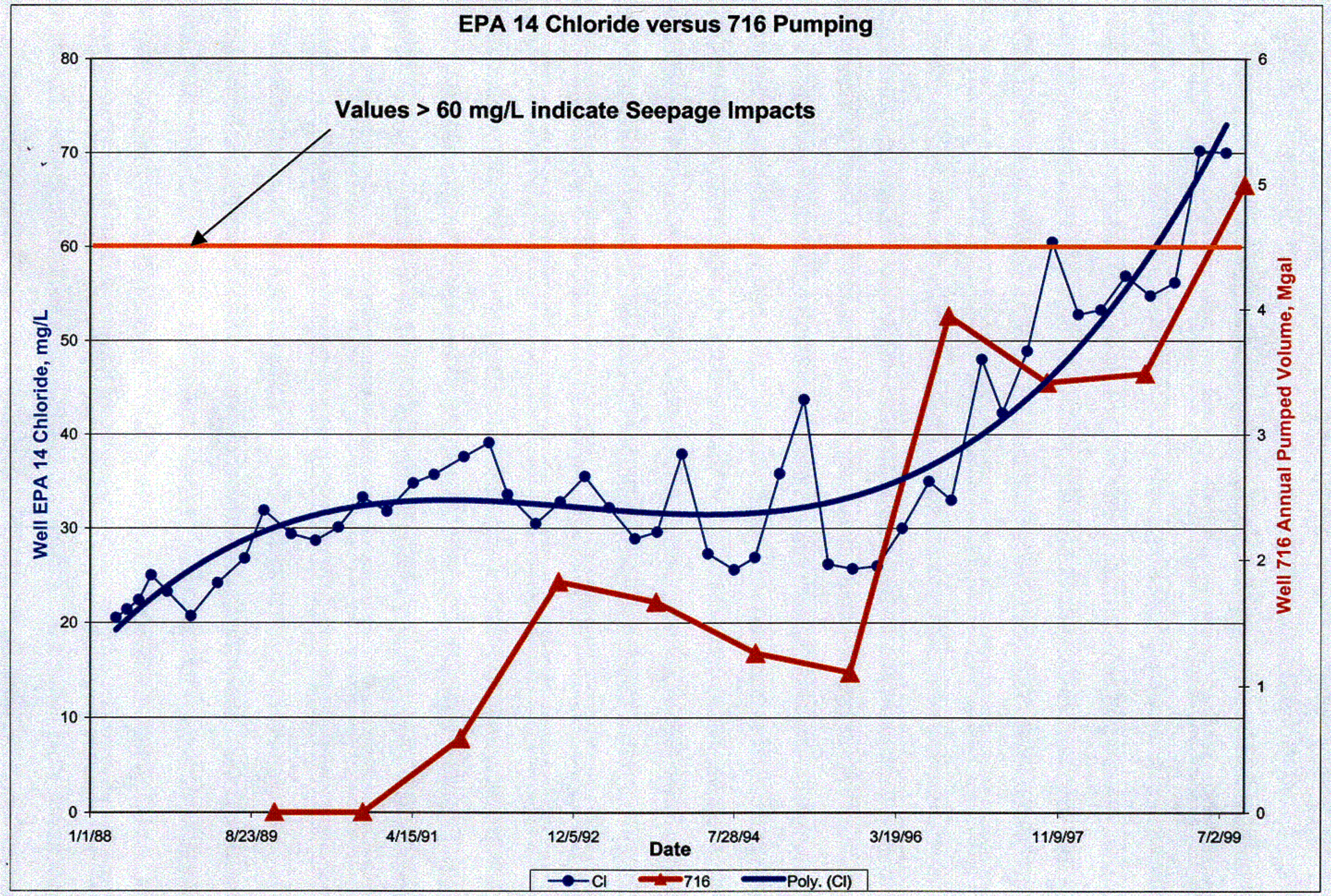

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Figure 13

C14

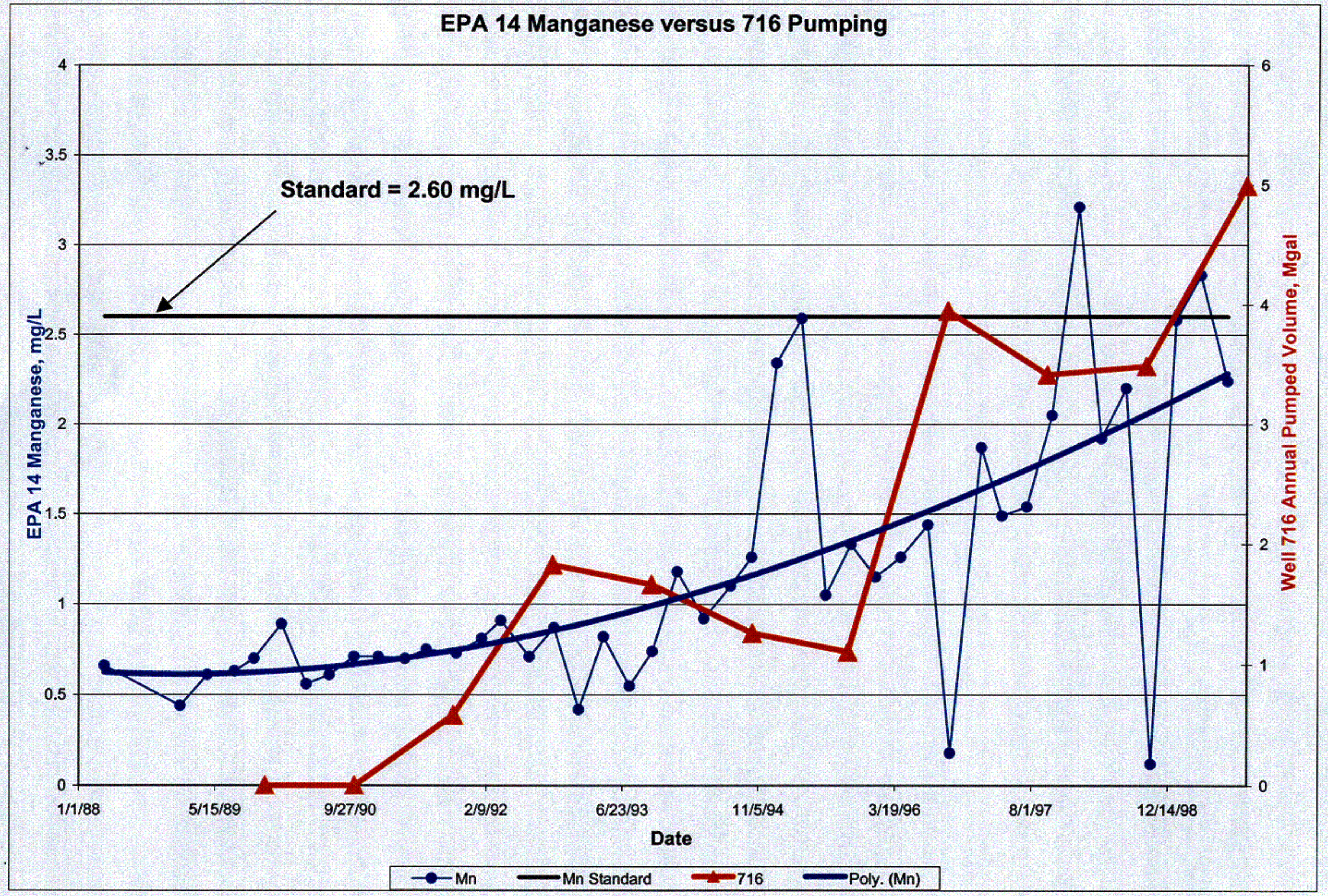

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FIGURE 14

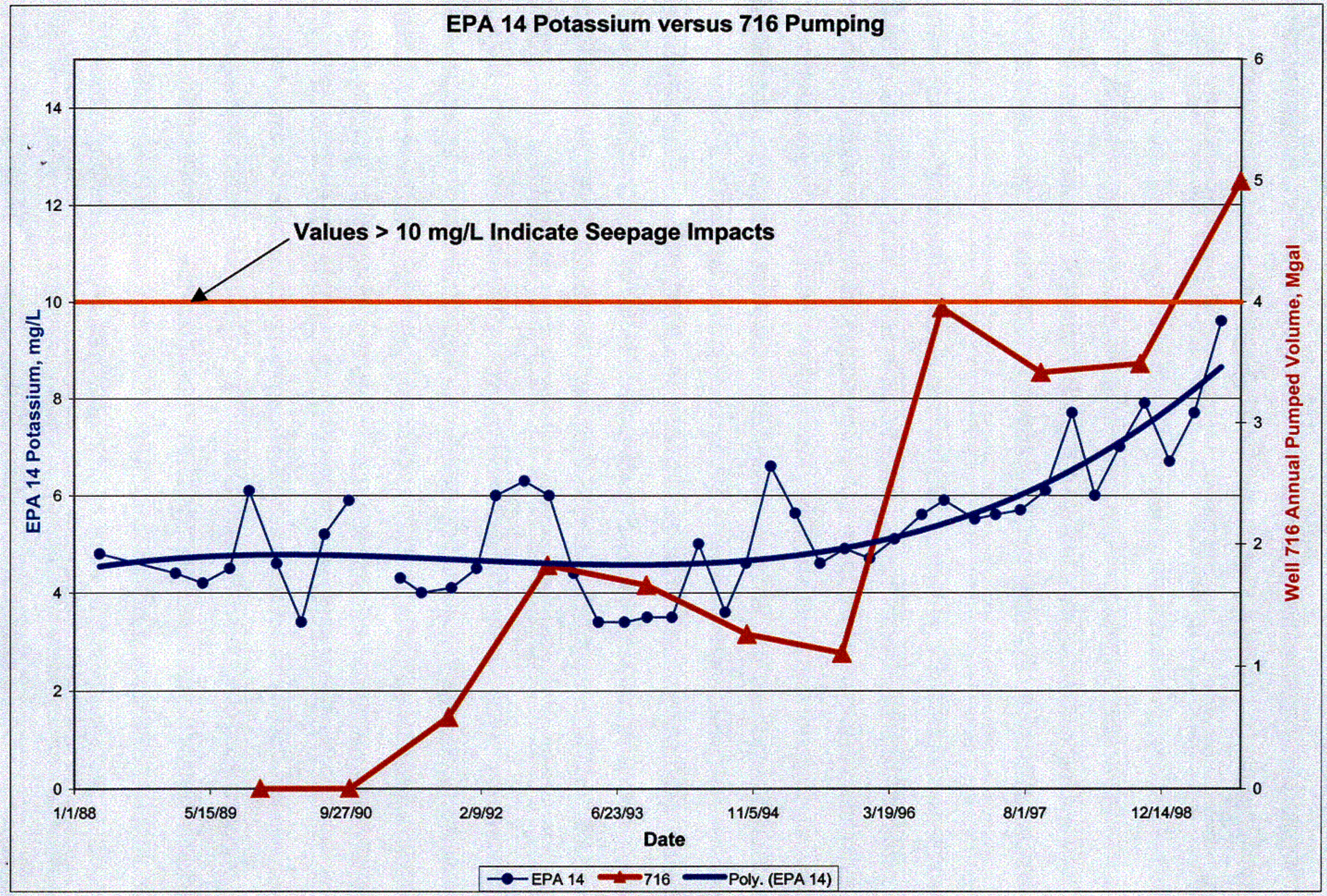

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FIGURE 15

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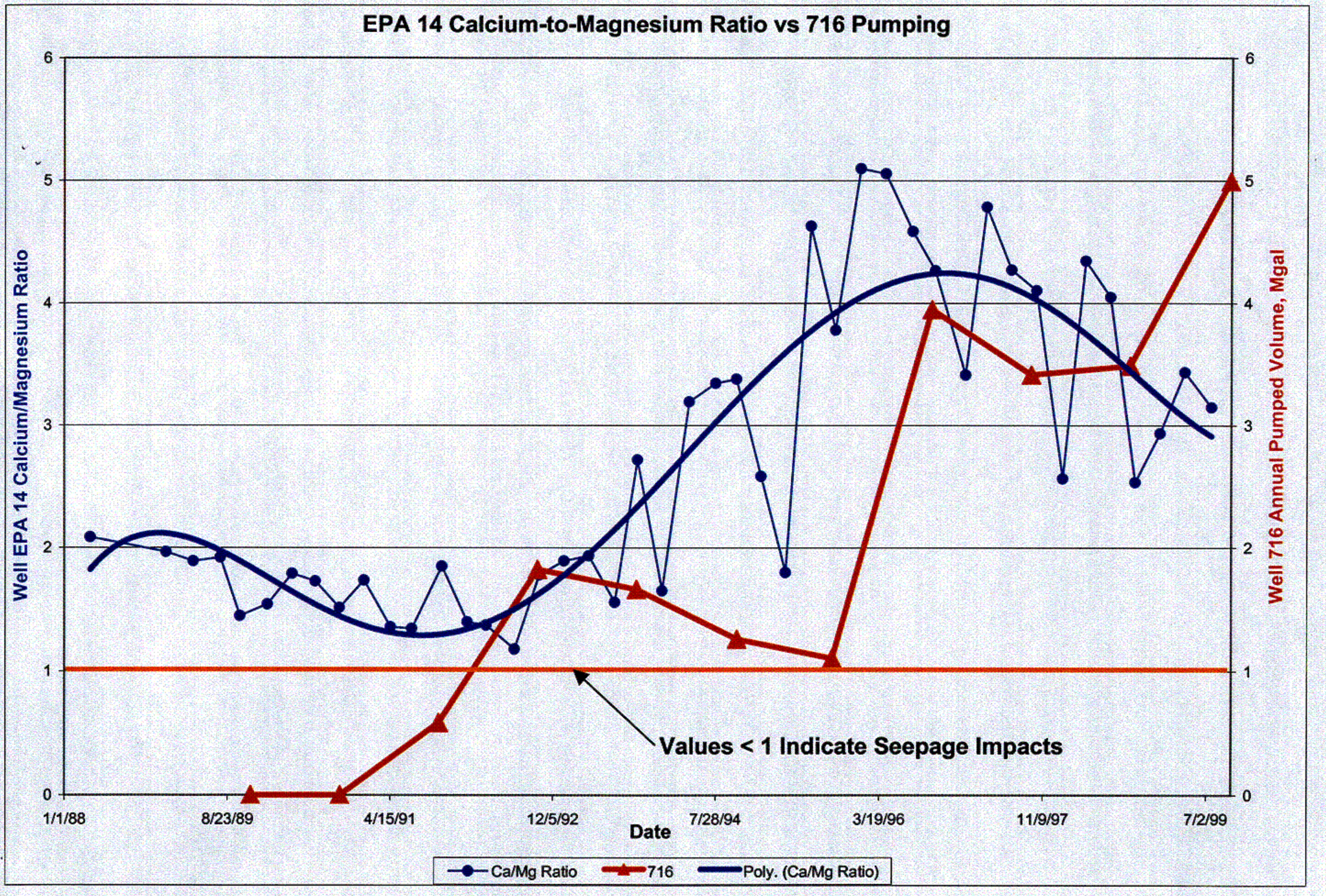

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FIGURE 16