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Marathon Oil Company

Evaluation of Natural Attenuation

Indian Basin Remediation Project

Eddy County, New Mexico

May 12, 2008

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HAND DELIVERED

May 15, 2008

Mr. Wayne Price
Environment Bureau - Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, New Mexico 87504

**RE: Evaluation of Natural Attenuation
Indian Basin Remediation Project/GW-21,
Eddy County, NM**

Dear Mr. Price:

Please find enclosed the Evaluation of Natural Attenuation Report for Indian Basin Remediation Project. The report, which was prepared by ARCADIS G&M, Inc., summarizes the groundwater monitoring and remediation activities associated with the Indian Basin Remediation Project. Based on the the information reviewed and presented in this report, ARCADIS believes that closure of the Indian Basin Remediation Project is warranted.

If you have any questions or need any additional information, please contact me at (713) 296-3510 or at TCPersaud@MarathonOil.com.

Sincerely,

Terry Persaud

Terry Persaud, P.E.
Senior HES Professional

NM-IBRP-2504

VKK\TCP\
Enclosures

cc: Gail Chenoweth, Oil Asset Team Manager - w\o Encls
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Evaluation of Natural Attenuation

Indian Basin Remediation Project

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May 12, 2008

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Executive Summary

ARCADIS U.S., Inc., on behalf of Marathon Oil Company conducted a review of site biogeochemistry to evaluate the on-going natural attenuation processes at the Indian Basin Remediation Project (IBRP) Site located at the Indian Basin Gas Plant, Eddy County, New Mexico (Site) for the purpose of determining if closure of the IBRP is warranted. Based on the review and evaluation, several conclusions were reached.

Using data from wells monitored, it appears that the natural attenuation rates in the Shallow Zone under the influence of Rocky Arroyo (Shallow Zone 1) have been sufficient to degrade the mass of petroleum hydrocarbons that impacted this vertical zone and area in the past. The average benzene half life in this zone is on the order of 6.5 months. In Shallow Zone 2 (Shallow Zone area outside the influence of Rocky Arroyo) and in the Lower Queen there is a sufficient source of sulfate in the dissolved phase or available as gypsum in the mineral matrix to provide a natural attenuation capacity, with a calculated average half-life on the order of 2.5 to 3 months. Using these half-life values, and considering the hydraulic gradient, effective porosity and hydraulic conductivity, the average dissolved phase hydrocarbon transport distances range from approximately 241 feet in the Lower Queen to approximately 1,283 feet in Shallow Zone 1. Even in the worst case scenario, with the longest half life in an area with the greatest hydraulic conductivity, the potential transport distance as a dissolved phase is still less than 1 mile. In zones where free-phase hydrocarbons have been successfully removed these attenuation processes have been sufficient to completely degrade remaining dissolved-phase hydrocarbons. The transport of liquid hydrocarbons in areas of concern are ultimately limited by absorption processes within the mineral matrix. Migration of dissolved-phase benzene, toluene, ethyl benzene and xylenes (BTEX) constituents originating from these bound up free phase hydrocarbons is controlled by the significant natural attenuation processes described in this report. Even with detectable hydrocarbons present in source areas, the migration distances are tightly constrained.

In the core zone of hydrocarbon impact, within the free phase hydrocarbon source area of the Lower Queen, there are continued sources of dissolved phase BTEX hydrocarbons. The presence of sulfate in the mineral matrix in the form of gypsum continues to provide for significant and undiminished degradation capacity of dissolved phase hydrocarbons due to sulfate-driven natural attenuation. The sulfate-driven attenuation capacity of the Lower Queen is also present in zones outside of and peripheral to the free phase hydrocarbon source area. The capacity to degrade dissolved-phase hydrocarbons as they migrate from source areas is sufficient to

adequately control and confine the migration of dissolved-phase BTEX hydrocarbons over very long (literally geologic) time frames.

Significant hydrocarbon mass has been removed by the on-going remediation program. The relatively small volume of residual free-phase hydrocarbon (compared to the volume of impacted geologic matrix and adjacent mineral matrix) is effectively absorbed by fracture surfaces in the bedrock subsurface. Biogeochemical attenuation processes are then adequate to degrade dissolved-phase hydrocarbons that may elute into groundwater in contact with the absorbed free-phase liquids.

Based on the information reviewed and presented in this report, ARCADIS believes that closure of the Indian Basin Remediation Project is warranted. Upon concurrence by the NMOCD, a plan for formally closing the project (including well plugging and abandonment, and equipment decommissioning) will be prepared and submitted for approval.

Introduction and Background

A review of the site biogeochemistry was performed to evaluate the on-going natural attenuation processes at the Indian Basin Remediation Project (IBRP) site located at the Indian Basin Gas Plant, Eddy County, New Mexico (Site). Figure 1 shows the location of the site. A long term monitoring program has been on-going at the site. That data has been used as part of this review and is available in other historical and recent documentation associated with the monitoring and operation of the environmental programs at the site. A report prepared by IT Corporation (IT Corporation, 1998) presented the results of a detailed inorganic biogeochemical screening of monitor wells at the site. Source data and figures from the IT Corporation 1998 report and a report by ARCADIS in 2007 that was used for this evaluation are included in Appendix A.

There are two dominant groundwater systems at the Site, an upper groundwater zone (Figure 4, ARCADIS, 2007), and a lower groundwater zone (Figure 7, ARCADIS, 2007 and Figure 2-7, IT, 1998). The upper is termed the Shallow Zone, and the deeper is termed the Lower Queen. The Shallow Zone can be classified into two sub-zones based on inorganic chemistry. One sub-zone (Shallow Zone 1, Figure 2) is low in sulfate and is associated with Rocky Arroyo. The low sulfate zone is likely dominated by surface water runoff that infiltrates when there is surface water discharge in the Rocky Arroyo. The second Shallow Zone sub-zone (Shallow Zone 2, Figure 2) is high in sulfate and is associated with areas that are more distant, and largely north of the Rocky Arroyo. Based on groundwater flow direction, the high sulfate zone groundwater has a history of long term horizontal migration through alluvial sediments and shallow bedrock outcrops upgradient of the site. Figure 2-6 from the 1998 IT Corporation report and Figure 4 from the ARCADIS 2007 report illustrate the configuration of the groundwater table in the shallow-water bearing unit. Figure 3-14 of the IT report illustrates the relationship of sulfate to the groundwater table (and its inferred flow direction) with Rock Arroyo. The Lower Queen is similar to Shallow Zone 2 with regard to its biogeochemical dynamics (Figure 3).

In April, 1991 a subsurface release along a pipeline where it crosses Rocky Arroyo was detected 0.2 miles south of the plant. Based on production records it was estimated that the leak began in November, 1990 and that an estimated 35,000 barrels of condensate were reportedly released. At the point of the release the pipeline was located five feet below the Rocky Arroyo channel bed. Since that time assessment and remediation has been performed at the site. Remediation records dating back to April 1991 show that approximately 24,600 barrels of condensate has been removed as free product, as vapor phase, through stimulated aerobic biodegradation. Additionally, substantial degradation from natural anaerobic bio-oxidation by sulfate or iron-reducing microbial activity has occurred, but the volume has not been quantified.

An important issue is how free product was able to migrate from the release point into the Lower Queen. The location of the pipeline five feet below the bottom of Rocky Arroyo may have been a contributing factor. Others include:

- There is a USGS gauging station located on Rocky Arroyo where it meets the Pecos River. In the 47 years the station has been active there has been at least one measurable discharge per year for 39 of those years. Prior to the release in November, 1990 there had been no measurable discharge in Rocky Arroyo between November, 1988 and September, 1990. The event in September, 1990 was a very small one with a flow of 2.21 cubic feet per minute (The maximum recorded flow was 615.5 cubic feet per minute in August, 1966 and the mean discharge for August and September respectively is 19 and 17 cubic feet per second.) Another measurable discharge did not take place for another eight months. This could have attenuated the water levels in the shallow water bearing unit, especially in Rocky Arroyo, allowing for direct conduits of the released condensate to the deeper Lower Queen water bearing unit.

- In addition, given those dry conditions the contour of the upper bedrock surface (Figure 2-1, IT, 1998) would direct fluids at the soil bed rock interface first north towards the plant, then East and Southeast into the area where the impact of condensate has been observed.

As the remediation program has been implemented at the Site the dissolved and free-phase light non-aqueous phase liquids (LNAPL) impacts have declined over time. Following is a brief summary of those changes for the Shallow Zone and the Lower Queen.

Shallow Zone

History

- Over the history of the Site, a total of 29 Shallow Zone wells that have been sampled had at least one sample with BTEX above regulatory limits.

- A total of seven wells out of 81 wells with historical gauging data had at least one gauging event with condensate recorded.

- Past VES remediation in the Shallow Zone had limited hydrocarbon recovery and effectiveness.

- A new sampling program was established in 2000 that limited the number of Shallow Zone wells that were sampled. Wells included in sampling program were selected based on their location and whether they contained BTEX compounds. A number of "clean" wells along the perimeter of the impacted area were selected in order to provide a line of compliance monitoring.

- With NMOCD approval, in March 2003, 39 Shallow Zone wells were plugged and abandoned because they were dry and/or were not necessary to continue monitoring the Shallow Zone.

Today / Recent History

- A total of four Shallow Zone wells (MW-14, MW-46, MW-49 and MW-55) in the current monitoring program contain dissolved benzene above regulatory limits.

- Only one Shallow Zone well (MW-126) has contained measurable condensate over the last three years.

- The benzene trend indicates that MW-14 is fairly stable; MW-46 and MW-49 are up slightly in the last year; and MW-55 is generally declining as a result of natural attenuation processes discussed in this report.

- Between 2000 and 2004, active remediation of some shallow zone wells was performed using a soil vapor extraction system (VES). There has been no active remediation required in the shallow zone during the past three years.

Lower Queen

History

- A total of 32 Lower Queen wells that have been monitored had at least one sample with benzene above the regulatory limit (10 parts per billion (ppb)) over the entire monitoring history. Many of the wells had only one sample that exceeded the regulatory limit, and those exceedences were generally just above the regulatory limit.

- A total of 38 wells out of 72 wells with historical gauging data had at least one gauging event with condensate recorded.

- Active remediation using VES has been ongoing since 2000. Over time, volatilization has declined, but biological degradation is still significant.

- A new sampling program was established in 2000 that limited the number of Lower Queen wells that were sampled. Wells included in sampling program were selected based on their location and whether they contained BTEX compounds. A number of "clean" wells along the perimeter of the impacted area were selected in order to provide a line of compliance monitoring.

Today / Recent History

- No Lower Queen wells in the current sampling program have contained dissolved benzene above regulatory limits since 2005. In 2005, only one well (MW-74) contained benzene, but it was just above the regulatory limit at 11 ppb.

- A total of five wells contained measurable condensate in 2007. Over the last three years, a total of 13 wells have had condensate reported at least once. By year, there were 12 wells with condensate in 2005, eight wells with condensate in 2006 and five wells with condensate in 2007.

- Biological degradation of hydrocarbons via the VES system is still removing significant hydrocarbons. However, volatilization has decreased from a high of approximately 416 barrels in 2003 to approximately 150 barrels in 2007. Over the last three years, the volatilization fraction is generally showing an asymptotic trend.

Review of Important Site Specific Natural Attenuation Processes

Natural attenuation of petroleum hydrocarbons via biodegradation requires the stimulation of indigenous microbial populations with requisite electron acceptors. The setting of the site appears to provide for three dominant electron acceptor systems and degradation pathways:

- Aerobic supported by oxygen supplied by the atmosphere.

- Sulfate reduction supported by sulfate available in most of the groundwater at the site, and from gypsum present in the mineral matrix of the water bearing units at the site.

- Iron reduction supported by bio-available iron minerals present in the mineral matrix of the water-bearing units at the site.

Natural aerobic biodegradation is supported by dissolved oxygen present in groundwater at the site. In the case of the Shallow Zone, hydraulic influence from surface water infiltrating from Rocky Arroyo is a point of recharge for oxygen-rich water. Potential hydraulic interaction of those shallow aerated waters via potential-fracture pathways may provide a means of introducing oxygenated water into the deeper Lower Queen water-bearing unit as well. The aerobic degradation pathway is well demonstrated at the site and is exploited as an integral part of the on-going remediation program using soil vapor extraction, bio-venting, and limited air sparging. The demonstrated domination of hydrocarbon removal by the remediation system in the form of carbon dioxide (the degradation product of the aerobic biodegradation of petroleum hydrocarbons) clearly illustrates the robust nature of the indigenous-aerobic microbial populations.

However, while the stimulation of the mass transport of air and oxygen in the unsaturated zone is very effective, the relatively low solubility of oxygen in water (approximately 8 mg/L) limits the stoichiometric efficiency of aerobic biodegradation within the groundwater system in bulk. In the groundwater system the data indicates that the dominant natural attenuation pathway is sulfate reduction. Sulfate reduction is an effective degrader of petroleum (Kleikemper, 2003) and BTEX hydrocarbons (Lovley et al, 1995; and Weiner et al, 1998). Compared to oxygen the solubility limits of sulfate in water are higher by several orders of magnitude. At the Site, the ultimate source of sulfate in the groundwater systems resides with gypsum present in the mineral matrix. A detailed discussion concerning the volume of gypsum in the mineral matrix of the bedrock in the area is presented in Ball et al (1985) based on field work done near Indian Basin, several miles east of the Site. Cox (1967), Sarg (1988) and Weiss (1997) also discuss the presence gypsum within the Queen formation in the area of the site.

Sulfate is consumed and converted to sulfide when petroleum hydrocarbons are degraded by sulfate reducing micro-organisms. The hydrogen sulfide may be removed from the system as gas or it may react with available iron to form pyrite. Limited amounts of the sulfide may be reconverted to sulfate through reaction with available oxygen.

The biodegradation of petroleum hydrocarbons by iron-reducing bacteria is also well understood. The overall process dynamic is keyed into the mineral matrix, the required ferric iron is insoluble in water. But the mineral matrix has the potential to contain substantial amounts of mineralized ferric iron. Sandstones with red coloration are likely to have more abundant ferric iron mineralization than carbonates. But carbonates may also contain some mineralized ferric oxides as well as siderite (iron carbonate). However, for utilization the iron in the minerals must be bioavailable, in circumstances where iron reduction is the dominant available metabolic pathway (when sulfate or oxygen are not available) microbes will excrete extracellular siderophores (biological iron chelators) to aid in the solubilization of iron from the mineral matrix. Lastly, the stoichiometry of hydrocarbon degradation via the iron reduction pathway is about four to five times less efficient than the oxygen or sulfate pathways. The presence of dissolved iron in groundwater is the key indicator that some degree of hydrocarbon degradation via the ferric iron reduction pathway is taking place. Biodegradation through iron reduction is taking place at the site, but it is not a dominant pathway. The ready availability of sulfate from gypsum in the mineral matrix allows indigenous sulfate-reducing microbial populations to dominate the in situ microbial ecology in the presence of petroleum hydrocarbons. In rare instances where sulfate is not available, biodegradation by iron-reducing microbial consortia does take place as well.

Aside from evaluation of the biogeochemical dynamics of oxygen, sulfate and iron at the site, there is a second largely empirical basis to evaluate natural attenuation processes. Monitoring of dissolved phase BTEX hydrocarbon concentrations in monitor wells at the Site over time allows for the observation and quantification of the decay rate of BTEX hydrocarbons. As previously discussed, there are two major types of hydrocarbon impact at the Site. One type is dominated by the presence of dissolved-phase BTEX hydrocarbons; it is not directly associated with the presence of free-phase hydrocarbons and tends to attenuate without any rebound of BTEX concentrations. The second type is also a dissolved-phase impact, but is associated with the presence of free-phase hydrocarbons. In that case attenuation takes place as well, but due to the presence of free-phase hydrocarbons to act as a continuing source there is a greater likelihood for the rebound of dissolved-BTEX concentrations.

Observed Site Specific Natural Attenuation

In some cases there have been measured impacts of dissolved-phase BTEX hydrocarbons that subsequently attenuated with no history of return. In other cases, likely more closely associated with the presence of free-phase hydrocarbons, there are instances of hydrocarbon decay then rebound or instances of relatively continued presence of dissolved-phase hydrocarbons likely coming from the continuous dissolution of BTEX from proximal sources of liquid hydrocarbons. The BTEX hydrocarbon history at each of the appropriate monitor wells at the Site has been evaluated to make an estimate of BTEX decay rate in terms of half-life. Half-life is simply the time it takes for half of an initially-observed concentration to be removed by attenuation processes. A short half-life means more rapid degradation, a longer half-life slower degradation. In most instances the decay rate follows near first order kinetics. First order kinetics is associated with a wide variety of natural processes such as radioactive decay and microbial processing. In essence the degradation processes are associated purely with the material that is being decayed. Other physical processes such as adsorption or volatilization do not play a role. The absolute concentration of the decaying material does not affect the kinetic rate or half-life either. Concentration only effects the total time it will take a series of half-life intervals to cause a concentration decline from an initial to a lower targeted concentration. In the case of 1^{st} order kinetics the half-life is the time required for half of the material to decay. Once half has decayed it will take another half-life for the remaining half to decay and so on at ever decreasing absolute concentrations. The half-life value and rate will be valid over the entire course of the attenuation process.

The history and setting of this Site is complex because of the bedrock geology and interactions of surface water from Rocky Arroyo with the groundwater systems. This has resulted in a large number of wells being installed and sampled over a period of a decade or more. The historical database associated with the on-going site-wide monitoring program was used to evaluate BTEX hydrocarbon half-lives. In most instances the half life was based on the half-life of benzene, which is typically the longest of the BTEX hydrocarbons. In a few cases the data was limited and the half-life was calculated using concentrations of total xylenes. The graphs from which the half-lives were calculated are included in Appendix B. Much of the inorganic biogeochemical data evaluated came from the IT report prepared in 1998 and is included in Appendix A. Specifically:

- Sulfate data was presented for the Shallow Zone in Figure 3-14 and for the Lower Queen in Figure 3-19.
- Dissolved iron data was presented for the Shallow Zone in Figure 3-20 and for the Lower Queen in Figure 3-23.
- Detailed tabulations of the data used to prepare the referenced figures are also included in the IT report. This includes:
    - Table 3-5 for Sulfate in the Shallow Zone.
    - Table 3-7 for Dissolved Iron in the Shallow Zone.
    - Table 3-6 for Sulfate in the Lower Queen.
    - Table 3-8 for Dissolved Iron in the Lower Queen.

The 22 wells used for the purposes of this evaluation had both inorganic data reported in the 1998 IT report and a history of detectable BTEX hydrocarbons. There were 52 wells not used for this evaluation, largely because of limited sampling history. There are 24 wells with no history of hydrocarbon impact that also are not discussed.

The results of the natural attenuation review are summarized as follows:

Shallow Zone

For Shallow Zone 1, groundwater influenced by Rocky Arroyo (MW-14, 69, 78, and 79) the benzene half-life ranged from 90 to 390 days with an average of 194 days. No sulfate was detected in these wells, but dissolved iron concentrations averaged 3.1 mg/L. This information is summarized in Table 1.

The natural attenuation processes in the Rock Arroyo portion of the Shallow Zone appear to not be governed by sulfate reduction. In the absence of sulfate and low levels of oxygen, iron reduction does appear to be taking place. It is likely that physical flushing by periodic flow in Rocky Arroyo may be playing a role in the attenuation process as well as temporary aerobic degradation following such events. The degradation half-lives are the longest at the Site. However, due to the removal of hydrocarbon source zones the wells monitored in this area have all been clean for a number of years. The natural attenuation capacity due to anaerobic bio-oxidation is limited in this area. However, bio-attenuation via aerobic pathways and limited amount of hydrocarbon impact in this area create a condition where attenuation processes have been sufficient to remove hydrocarbon to levels below concern.

For Shallow Zone 2, groundwater outside of the influence of Rocky Arroyo (MW-43, 46, 49, 54, 55, 61 and 90) the benzene half-life ranges from 25 days to 210 days with an average of 81 days. The average sulfate concentration is 562 mg/L and average dissolved iron 0.7 mg/L. This information is summarized in Table 1.

Due to the availability of sulfate, the benzene half-life in this area is much shorter than in the adjacent Shallow Zone 1. There are a limited number of wells that appear to have permanently attenuated dissolved-phase BTEX impacts (MW-60, 61A, and 67). The remaining wells in this zone have a history of the presence of free-phase hydrocarbons on a periodic basis. When BTEX is present the natural attenuation capacity represented by the available sulfate and highly-viable sulfate reducing microbial populations rapidly attenuate the residual dissolved-phase hydrocarbon mass. In many instances this has only been required once, in others where periodic dissolved-phase impacts due to the effects of residual free-phase hydrocarbons causes a reoccurrence, the attenuation process is always sufficient to rapidly degrade the BTEX constituents to levels below concern.

Lower Queen

For the Lower Queen (MW-57, 59, 60, 61A, 62, 63, 64, 67, 70, 73, 74, and 98) had a minimum benzene half-life of 20 days, a maximum of 140 days, and an average half-life of 69 days. The average sulfate concentration was 527 mg/L and the average dissolved-iron concentration 0.25 mg/L. This information is summarized in Table 2.

The Lower Queen also appears to be dominated by sulfate-driven natural attenuation processes. Of interest is that a limited number of wells (MW-63, 64, and 74) had sulfate measured at 20 mg/L or less. But the average benzene half-life (83 Days) in those wells is not significantly different than the benzene half-life (63 Days) in wells with more elevated levels of dissolved sulfate. Groundwater in which the only available sulfate is in the dissolved phase will not support sulfate reduction if the initial-dissolved sulfate concentration is 20 mg/L or lower. This is an indication of the ability of the *indigenous microbial population of sulfate reducers to exploit sulfate that is present in* the mineral matrix. With available carbon and high microbial populations, the sulfate that is provided to the dissolved phase by the gypsum reservoir is rapidly utilized to support hydrocarbon degradation, producing the short-observed benzene half-lives.

Natural Attenuation and Groundwater Flow Dynamics

The empirically derived half life for benzene can in turn be used to calculate a theoretical transport distance from a source area. With a half-life, a groundwater velocity and an initial source area concentration, the distance that a dissolved plume can theoretically travel can be calculated. The shallow groundwater bearing unit has flow through shallow alluvium on top of bedrock and through shallow bedrock. Flow in the Lower Queen is all in bedrock. Groundwater flow in alluvium is via intergranular transport through soil matrix.

Groundwater flow responsible for significant transport is dominated by fractures in the Lower Queen and bedrock portions of the shallow zone. Some intergranular flow does occur through the walls of fractures into the mineral matrix of the Lower Queen. However, that flow does not dominate transport; it has effect on long term releases of free and dissolved-phase hydrocarbons in the source areas into the fracture flow pathways. In general fracture flow responsible for transport must have two critical components. Fractures must exist with some open aperture, and since all fractures have finite length they must be of sufficient length and fracture density must be high enough to allow individual fractures to connect and support transport over significant distance. The flow in a fracture increases in a ratio that increases with the cube of the fracture aperture. The overall effect of physical distribution and connectivity of fractures with the effects of fracture aperture creates a very high degree of heterogeneity in flow conditions. This effect is seen in all fractured bed rock sites, including Indian Basin.

To calculate the groundwater velocity, three parameters are required: the hydraulic conductivity, the gradient of the water table, and the effective porosity of the respective water bearing unit. Values for groundwater velocity, hydraulic conductivity, gradient and effective porosity are summarized in Table 2.

- Values of hydraulic conductivity for both water bearing zones were reported in the 1998 IT report.
    - For the Shallow Zone, the hydraulic conductivity was 9.8 feet/day.
    - For the Lower Queen, the average hydraulic conductivity is 97 feet/day. This is based on a range of hydraulic conductivity values.

- The dimensionless gradients of the groundwater tables are based on groundwater gauging data collected in October 2006 and are approximately 0.015 ft/ft for the Shallow water bearing unit and approximately 0.0002 ft/ft in the Lower Queen.

- Porosity data is not available; however experience with other sites in similar settings can be used to make reasonable estimates.

    - In the Shallow Zone effective porosity in the alluvial sediments is likely to be in the range of 20% with a possible low of 10% and a high of 30%. For the purpose of this evaluation a value of 20% porosity will be used.
    - In the Lower Queen the dominant transport hydraulic flow regime is fracture flow. It is anticipated that the effective porosity in the Lower Queen will range between approximately 2% and 10%. For the purposes of this evaluation a porosity value of 5% is used (Clark, 1966).

The maximum observed benzene concentration since 1991 was in MW-33 in September, 1991 at 6,300 ppb. Using 6,300 ppb, a transport evaluation was completed with a targeted goal of reducing benzene to less than the regulatory limit of 10 ppb. For the purposes of this evaluation the average and maximum half-life in each of the three dynamic natural attenuation zones are used to calculate a potential range of transport distance. Details of this evaluation are presented in Table 2, but the following is a summary of the range of potential transport distances that result from using the above range of hydrodynamic and biogeochemical values:

- For the Shallow Zone influenced by Rocky Arroyo (Shallow Zone 1)
  - The average travel distance is 1,283 feet in 1,746 days.
  - The maximum travel distance is 5,159 feet in 3,510 days.

- For the Shallow Zone away from Rocky Arroyo (Shallow Zone 2)
  - The average travel distance is 534 feet in 729 days.
  - The maximum travel distance is 2,778 feet in 1,890 days.

- For the Lower Queen
  - The average travel distance ranges from 241 feet in 621 days.
  - The maximum travel distance is 3,465 feet in 1,260 days.

In each of the above cases the distance at which the complete attenuation of the maximum dissolved phase benzene concentration would be attenuated is proximal to the site and the existing monitor well network.

The transport of free-phase hydrocarbons presents a different issue than the transport of the dissolved-phase in an attenuating matrix. As dissolved constituents migrate out of the free-phase hydrocarbons they immediately enter into the attenuation pathway. Dissolution of the free-phase liquid is a physical attenuation pathway as well. Additional physical attenuation processes include the effects of hydrocarbon wetting on mineral surfaces and the effects of other interfacial forces between the liquid hydrocarbon, mineral surfaces, groundwater and air that tend to physically retard the transport of liquid-phase hydrocarbons and bind them to mineral surfaces. The degree of interconnectivity driven by fracture length and density also play a role.

The specific physical character of the fracture-system migration pathways in the Lower Queen are to a large degree unknown, and without an assessment program requiring another significant level of effort over and above the extensive assessment done to date at the Site, this will likely remain unknown. Empirically, the limited extent of free phase and dissolved-phase hydrocarbon migration between the time of the release and the implementation of the full-scale remediation program in the late 1990's indicates that the potential of significant migration of free-phase hydrocarbons from the source area is limited.

One further purely physical example of a site conceptual model may be of value to illustrate the lack of migration potential of the free phase hydrocarbons:

- Conservatively assume that 10,000 barrels of the original 35,000 barrels of released condensate remains.
- As the condensate migrates along fracture pathways, due to physical wetting of the hydrocarbon on to mineral surfaces as it interacts with the walls of the fractures, further assume that an irreducible coating of hydrocarbon that is 0.05 inches thick is formed.
- *The volume of 10,000 barrels of oil is 56,150 cubic feet. Within a fracture the* total-liquid hydrocarbon thickness would be 0.1 inch (with 0.05 inches on each side along the walls of the fracture).
    - The 56,100 cubic feet of liquid hydrocarbon spread out in a layer 0.1 inch thick would occupy would an area of approximately 2,600 square feet.
    - A rough estimate of the size of the historical free-product source area is 1,800 feet by 3600 feet, or approximately 6,500,000 square feet.
    - If fractures are spaced 10 feet apart and present a vertical interval of 1 foot *for the support of advective flow containing hydrocarbons that* presents approximately 650,000 square feet of surface area within the fracture matrix an area that is 250 times greater than the potential spreading surface.

The history of the site has shown that limited amounts of free-phase hydrocarbons do appear in a limited number of wells. However, those wells are distributed over a relatively wide area. In recent years the on-going VES program has likely accentuated the mobilization of free-phase hydrocarbon by the generation of bio-surfactants. Cessation of the operations of the VES system would stop aerobic microbial activity and the bulk of the production of biosurfactants likely limiting the capacity to mobilize absorbed hydrocarbon from the surfaces of the mineral matrix within the hydrocarbon impacted area.

The site conceptual transport model likely includes multiple zones of volumetrically limited fractures with relatively wide apertures that may preferentially contain volumes of hydrocarbon. These isolated storage pockets have limited connectivity via fracture pathways of much less connectivity and with limited aperture width. Another absorption mechanism at work but not accounted for in the above conceptual assessment is the absorption into the walls of zones in which fractures transect granular or semi-granular bedrock, further enhancing physical immobility under flow conditions.

The empirical history of the Site and the geometric analysis of the Site above indicate that the residual volumes of hydrocarbon that reside within the geologic matrix of the source area are relatively widely distributed within the source area, localized, and immobilized by physical interaction with surfaces in that matrix. Isolated measurable levels of hydrocarbon are occasionally detected in monitor wells, but that is not indicative of the physical state of the liquid hydrocarbons in the bulk matrix. The bioventing program is ideal to remove this residual hydrocarbon mass, but that mass does not present a significant potential for long distance migration as a free-phase hydrocarbon fluid.

Conclusions

In summary, based on wells monitored, it appears that the natural attenuation rates in the Shallow Zone under the influence of Rocky Arroyo (Shallow Zone 1) have been sufficient to degrade the mass of petroleum hydrocarbons that impacted this vertical zone and area in the past. The average benzene half-life in this zone is on the order of 6.5 months. In Shallow Zone 2 (Shallow Zone area outside the influence of Rocky Arroyo) and in the Lower Queen there is a sufficient source of sulfate in the dissolved phase or available as gypsum in the mineral matrix to provide a natural attenuation capacity, with an average half-life on the order of 2.5 to 3 months. Using these half-life values, and considering the hydraulic gradient, effective porosity and hydraulic conductivity, the average dissolved-phase hydrocarbon transport distances range from approximately 241 feet in the Lower Queen to approximately 1,283 feet in Shallow Zone 1. Even in the worst case scenario, with the longest half-life in an area with the greatest hydraulic conductivity, the potential transport distance as a dissolved phase is still less than one mile. In zones where free-phase hydrocarbons have been successfully removed these attenuation processes have been sufficient to completely degrade remaining dissolved-phase hydrocarbons. The transport of liquid hydrocarbons in areas of concern are ultimately limited by absorption processes within the mineral matrix. Migration of dissolved-phase BTEX constituents originating from these bound up free-phase hydrocarbons is controlled by the significant natural attenuation processes described in this report. Even with detectable hydrocarbons present in source areas, the migration distances are tightly constrained.

In the core zone of hydrocarbon impact, within the free-phase hydrocarbon source area of the Lower Queen, there are continued sources of dissolved-phase BTEX hydrocarbons. The presence of sulfate in the mineral matrix in the form of gypsum continues to provide for significant and undiminished degradation capacity of dissolved-phase hydrocarbons due to sulfate-driven natural attenuation. The sulfate-driven attenuation capacity of the Lower Queen is also present in zones outside of and peripheral to the free-phase hydrocarbon source area. The capacity to degrade dissolved-phase hydrocarbons as they migrate from source areas is sufficient to adequately control and confine the migration of dissolved-phase BTEX hydrocarbons over very long (literally geologic) time frames.

Significant hydrocarbon mass has been removed by the on-going remediation program. The relatively small volume of residual free-phase hydrocarbon (compared to the volume of impacted geologic matrix and adjacent mineral matrix) is effectively absorbed by fracture surfaces in the bedrock subsurface. Biogeochemical attenuation processes are then adequate to degrade dissolved-phase hydrocarbons that may elute into groundwater in contact with the absorbed free-phase liquids.

Based on the information reviewed and presented in this report, ARCADIS believes that closure of the Indian Basin Remediation Project is warranted. Upon concurrence by the NMOCD, a plan for formally closing the project (including well plugging and abandonment, and equipment decommissioning) will be prepared and submitted for approval.

References

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Table 1. Key Natural Attenuation Parameters
Marathon Oil Company, Indian Basin Remediation Project, Eddy County, New Mexico

Benzene Half-Life in Days

Groundwater Unit	Minimum Value and Well in Which it was Detected	Maximum Value and Well in Which it was Detected	Average Value and the Number of Wells Used for Calculation
Shallow Zone 1	90 in MW-78	390 in MW-69	194 in 4 Wells
Shallow Zone 2	25 in MW-90	210 in MW-55	81 in 7 Wells
Lower Queen	20 in MW-63	140 in MW-98	69 in 12 Wells

Sulfate Concentration in mg/L

Groundwater Unit	Minimum Value and Well in Which it was Detected	Maximum Value and Well in Which it was Detected	Average Value and the Number of Wells Used for Calculation
Shallow Zone 1	< 5 in all evaluated wells	< 5 in all evaluated wells	< 5 in all evaluated wells
Shallow Zone 2	22 in MW-46	1,600 in MW-61	562 in 7 Wells
Lower Queen	< 5 in MW-64	2,800 in MW-73	527 in 12 Wells

Dissolved Iron Concentration in mg/L

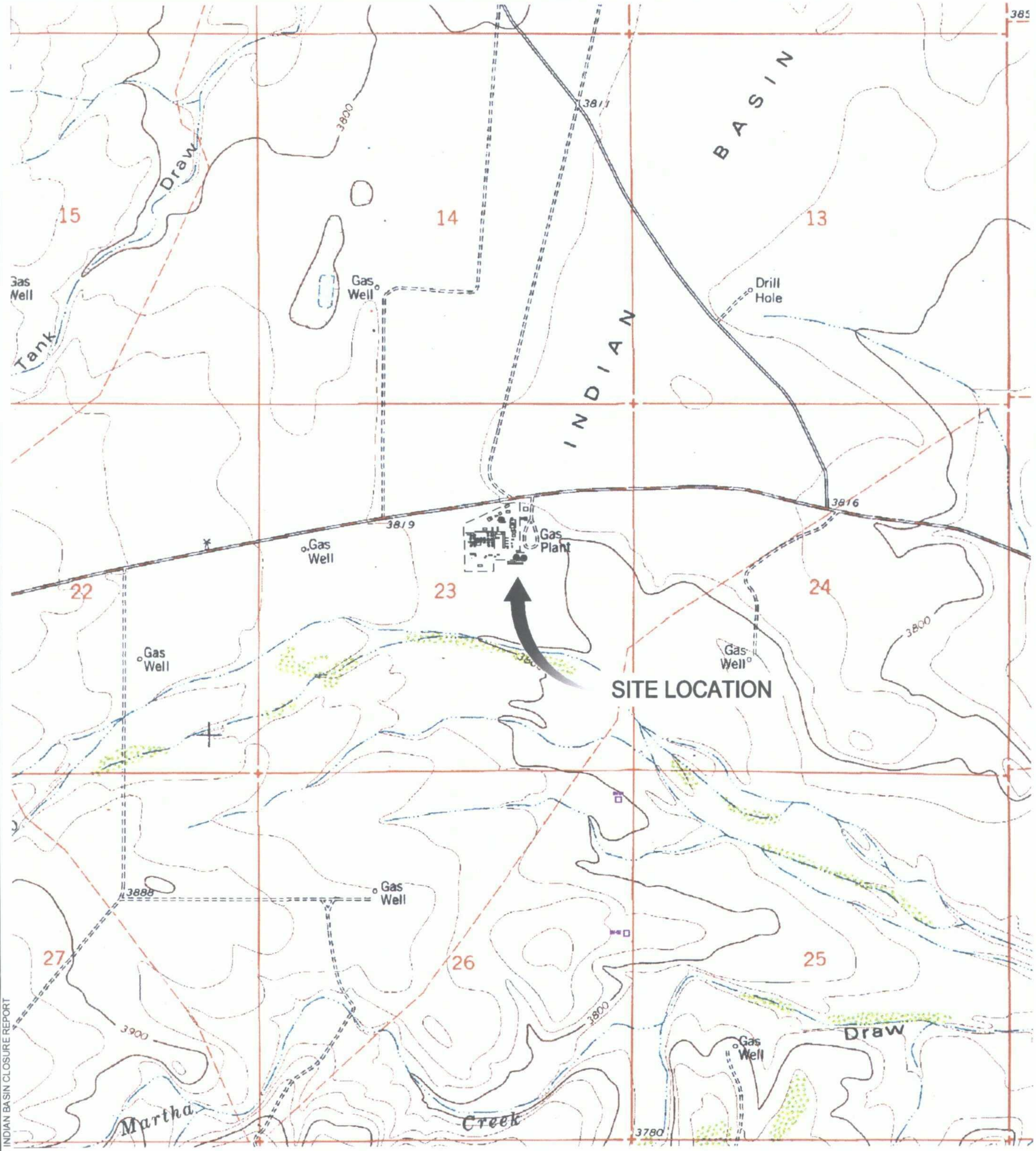
Groundwater Unit	Minimum Value and Well in Which it was Detected	Maximum Value and Well in Which it was Detected	Average Value and the Number of Wells Used for Calculation
Shallow Zone 1	1.6 in MW-78	4.7 in MW-14	3.1 in 4 Wells
Shallow Zone 2	<0.013 in MW-54, 90	2.6 in MW-43	0.7 in 7 Wells
Lower Queen	<0.013 MW-60, 63, 70	1.3 in MW-74	0.25 in 12 Wells

Table 2. Hydrogeologic Parameters, Groundwater Flow Velocity, and Potential Transport Distance Versus Benzene[a] Half-Life Decay Rate
Marathon Oil Company, Indian Basin Remediation Project, Eddy County, New Mexico

		Hydraulic Conductivty (K)			Effective Porosity (% of Total Volume)			Benzene Half-Life Decay Rate			Groundwater Velocity			Benzene Transport Distance and Time		
Groundwater Unit	Gradient (ft/ft)	Maximum Value for K (feet/day)	Minimum Value for K (feet/day)	Average Value for K (feet/day)	Porosity High Value (%)	Porosity Low Value (%)	Porosity Used for Calculation (%)	Maximum Half-Life (days)	Minimum Half-Life (days)	Average Half-Life (days)	Maximum Groundwater Velocity (feet/day)	Minimum Groundwater Velocity (feet/day)	Average Groundwater Velocity (feet/day)	Maximum Transport Distance and Time	Minimum Transport Distance and Time	Average Transport Distance and Time
Shallow Zone 1	0.015			9.8	30%	10%	20%	390	90	194	537	179	268	5,159 Feet in 3,510 Days	397 Feet in 810 Days	1,283 Feet in 1,746 Days
Shallow Zone 2	0.015			9.8	30%	10%	20%	210	25	81	537	179	268	2,778 Feet in 1,890 Days	110 Feet in 225 Days	534 Feet in 729 Days
Lower Queen	0.0002	275	0.8	97	10%	2%	5%	140	20	69	1004	0.6	142	3,465 Feet in 1,260 Days	0.29 Feet in 180 Days	241 Feet in 621 Days

Notes:

(a) For the determination of the number of half lives required for natural attenuation to degrade benzene to less than 0.01 mg/L. An initial benzene concentration of 6.3 mg/L (6,300 ppb) is used (The highest observed historical benzene concentration in MW-33 in September 1991).



SOURCE: U.S. GEOLOGICAL SURVEY 7½ MINUTE TOPOGRAPHIC SERIES, MARTHA CREEK, NEW MEXICO QUADRANGLE, PUBLISHED 1978.

0 2000' 4000'

APPROXIMATE SCALE: 1" = 2000'

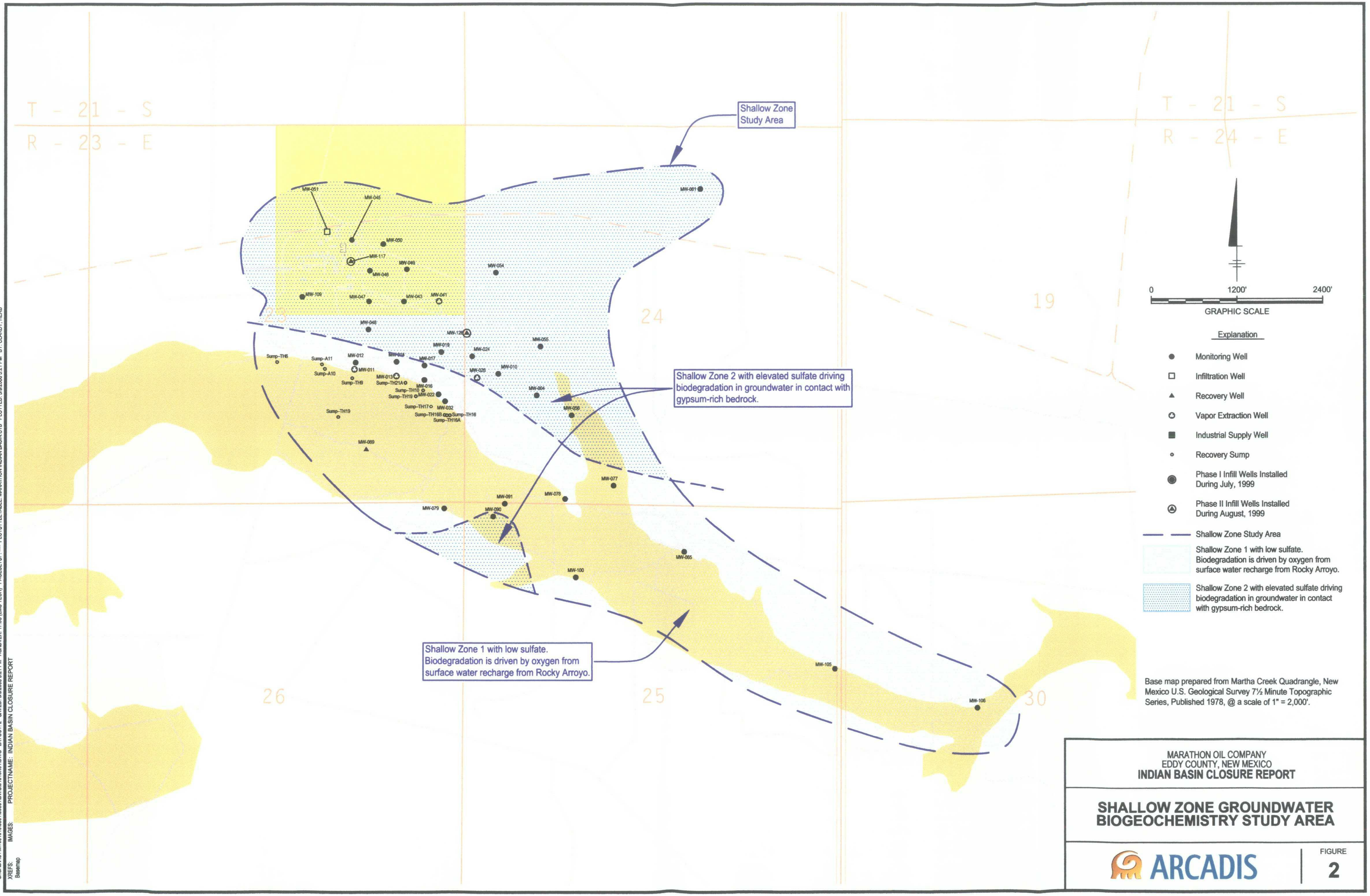
MARATHON OIL COMPANY
EDDY COUNTY, NEW MEXICO
INDIAN BASIN CLOSURE REPORT

SITE LOCATION MAP

ARCADIS

FIGURE
1

CITY: MID-TX DIV 85/GROUP: ENV DB: HC LD: AM: BG PD: AJR2 TM: AJR TR: LYR:ON=*;OFF=*REF* UN: 31-009-00408
G:\CAD\ACT\MT001010\0001\00001\DWG\01010B01.DWG LAYOUT: 1 SAVED: 5/9/2008 3:18 PM ACADVER: 17.0S (LMS TECH) PAGESETUP: — PLOTSTYLETABLE: AGANDM.CTB PLOTTED: 5/9/2008 3:18 PM BY: CLARDY, HERB
PROJECTNAME: INDIAN BASIN CLOSURE REPORT
XREFS: IMAGES: 32104d5.tif

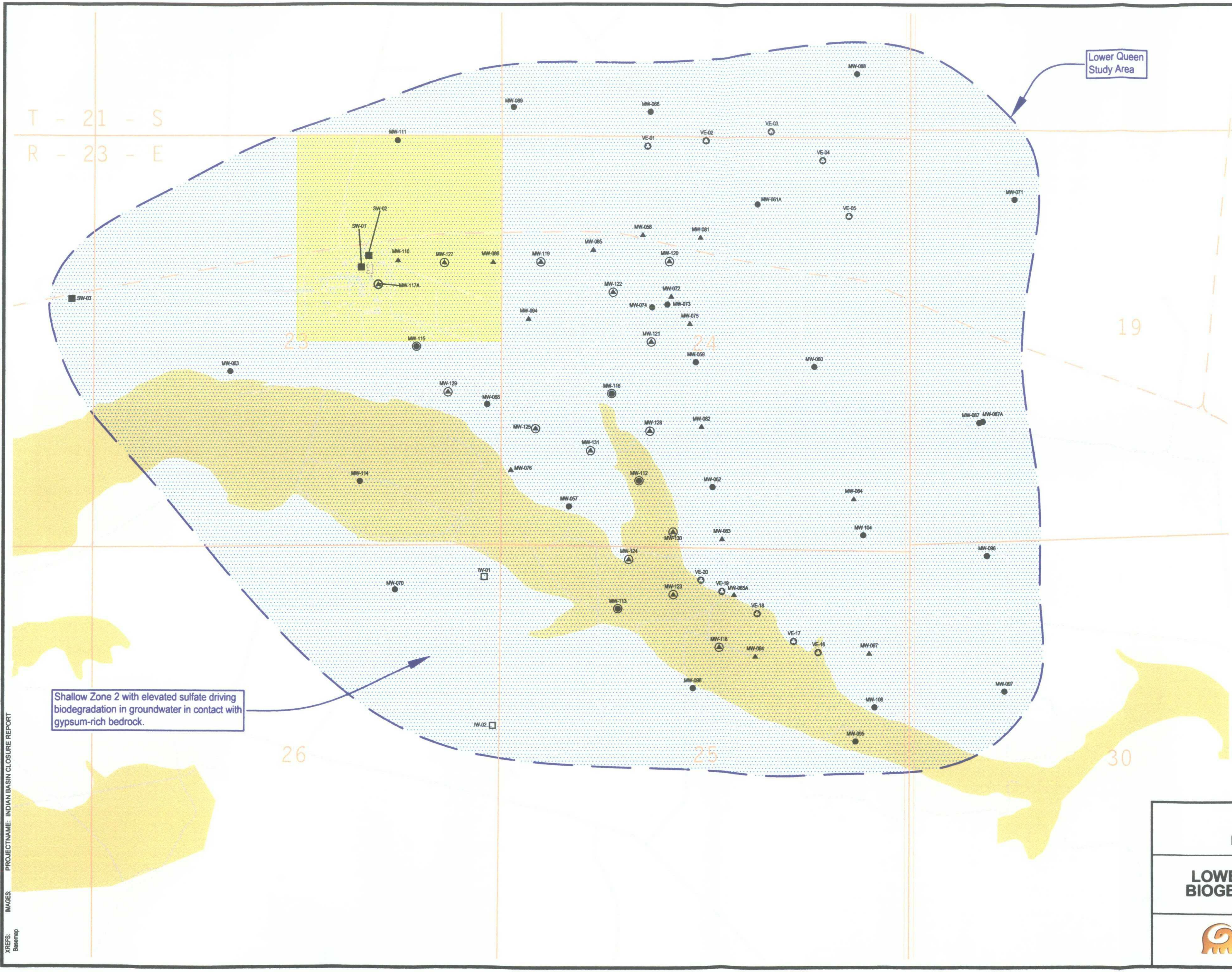


MARATHON OIL COMPANY
EDDY COUNTY, NEW MEXICO
INDIAN BASIN CLOSURE REPORT

SHALLOW ZONE GROUNDWATER BIOGEOCHEMISTRY STUDY AREA

ARCADIS

FIGURE 2



0 1200' 2400'
GRAPHIC SCALE

Explanation

- Monitoring Well
- Infiltration Well
- Recovery Well
- Vapor Extraction Well
- Industrial Supply Well
- Recovery Sump
- Phase I Infill Wells Installed During July, 1999
- Phase II Infill Wells Installed During August, 1999
- Lower Queen Study Area
- Lower Queen with elevated sulfate driving biodegradation in groundwater in contact with gypsum-rich bedrock.

Base map prepared from Martha Creek Quadrangle, New Mexico U.S. Geological Survey 7½ Minute Topographic Series, Published 1978, @ a scale of 1" = 2,000'.

MARATHON OIL COMPANY
EDDY COUNTY, NEW MEXICO
INDIAN BASIN CLOSURE REPORT

LOWER QUEEN GROUNDWATER BIOGEOCHEMISTRY STUDY AREA

ARCADIS

FIGURE
3

ARCADIS

Appendix A

Source Data from 1998 IT Corporation and 2007 ARCADIS Reports

TABLE 3-5

DISSOLVED-PHASE INORGANIC COMPOUNDS (JUNE 1998)
SHALLOW ZONE

Indian Basin Remediation Project
Eddy County, NM

SITE	DATE	Chloride (mg/l)	Cyanide (mg/l)	Fluoride (mg/l)	NITRITE NITROGEN (mg/l)	Nitrate/Nitrite (mg/l)	NITRATE NITROGEN (mg/l)	pH (mg/l)	Phenols, total (mg/l)
LYMAN	06/29/98	13	<0.005	0.6	<0.1	0.6	0.6	7.4	<0.005
MW-013	06/21/98	230	<0.005	0.3	<0.1	0.1	0.1	7.0	0.023
MW-014	06/22/98	330	<0.005	0.4	<0.1	0.1	0.1	7.0	0.008
MW-041	06/19/98	120	<0.005	1.5	<0.1	<0.1	<0.1	7.5	0.024
MW-043	06/22/98	210	<0.005	0.8	<0.1	<0.1	<0.1	7.3	0.007
MW-044	06/22/98	260	<0.005	0.8	<0.1	<0.1	<0.1	7.2	0.040
MW-046	06/21/98	140	<0.005	1.1	<0.1	<0.1	<0.1	7.2	0.034
MW-049	06/21/98	630	0.050	1.3	<0.1	<0.1	<0.1	7.0	0.012
MW-050	06/19/98	340	<0.005	1.2	<0.1	0.5	0.5	8.2	<0.005
MW-054	06/25/98	110	<0.005	1.8	<0.1	<0.1	<0.1	7.1	<0.005
MW-055	06/25/98	300	<0.005	1.5	<0.1	0.1	0.1	7.0	0.016
MW-061	06/18/98	480	<0.005	2.2	<0.1	<0.1	<0.1	6.9	<0.005
MW-069	06/29/98	120	<0.005	0.3	<0.1	<0.1	<0.1	6.9	0.015
MW-078	06/19/98	47	<0.005	<0.2	<0.1	<0.1	<0.1	7.1	<0.005
MW-090	06/17/98	35	<0.005	0.5	<0.1	7.1	7.1	7.5	<0.005
MW-106	06/18/98	4	<0.005	0.3	<0.1	1.9	1.9	7.3	<0.005
UIHS_ARROYO	06/26/98	13	<0.005	0.7	<0.1	<0.1	<0.1	7.2	0.006

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL INORGANICS

TABLE 3-5

DISSOLVED-PHASE INORGANIC COMPOUNDS (JUNE 1998)
SHALLOW ZONE

Indian Basin Remediation Project
Eddy County, NM

SITE	DATE	Sulfate (mg/l)	Total dissolved solids (TDS) (mg/l)
LYMAN	06/29/98	670	1000
MW-013	06/21/98	<5	1000
MW-014	06/22/98	<5	1400
MW-041	06/19/98	190	1200
MW-043	06/22/98	53	1500
MW-044	06/22/98	66	1000
MW-046	06/21/98	22	940
MW-049	06/21/98	780	2800
MW-050	06/19/98	3800	5900
MW-054	06/25/98	1300	2200
MW-055	06/25/98	55	1500
MW-061	06/18/98	1600	3200
MW-069	06/29/98	<5	860
MW-078	06/19/98	<5	490
MW-090	06/17/98	130	530
MW-106	06/18/98	33	380
UIHS_ARROYO	06/26/98	590	940

Values represent total concentrations unless noted   < = Not detected at indicated reporting limit   --- = Not analyzed

For RCL INORGANICS

TABLE 3-6

DISSOLVED-PHASE INORGANIC COMPOUNDS (JUNE 1998)
LOWER QUEEN

Indian Basin Remediation Project
Eddy County, NM

SITE	DATE	Chloride (mg/l)	Cyanide (mg/l)	Fluoride (mg/l)	NITRITE NITROGEN (mg/l)	Nitrate/Nitrite (mg/l)	NITRATE NITROGEN (mg/l)	pH (mg/l)	Phenols, total (mg/l)
MW-057	06/25/98	50	<0.005	0.5	<0.1	<0.1	<0.1	7.3	0.006
MW-058	06/22/98	42	<0.005	0.9	<0.1	<0.1	<0.1	7.4	<0.005
MW-059	06/24/98	560	<0.005	0.6	<0.1	0.1	0.1	7.5	0.022
MW-060	06/21/98	12	<0.005	1.4	<0.1	0.3	0.3	7.3	<0.005
MW-061A	06/18/98	4	0.025	0.8	<0.1	<0.1	<0.1	7.3	<0.005
MW-062	06/26/98	91	<0.005	0.8	<0.1	<0.1	<0.1	7.1	<0.005
MW-063	06/25/98	10	<0.005	0.4	<0.1	7.1	7.1	7.4	0.005
MW-064	06/23/98	15	<0.005	0.7	<0.1	0.7	0.7	7.3	<0.005
MW-065A	06/25/98	24	<0.005	0.7	<0.1	<0.1	<0.1	7.2	0.005
MW-066	06/17/98	13	0.761	0.8	<0.1	0.3	0.3	7.2	<0.005
MW-067	06/24/98	11	<0.005	0.7	<0.1	<0.1	<0.1	7.3	0.005
MW-068	06/26/98	29	<0.005	0.6	<0.1	1.7	1.7	7.3	0.025
MW-070	06/16/98	12	<0.005	0.6	<0.1	2.7	2.7	7.5	<0.005
MW-071	06/19/98	4	<0.005	2.2	<0.1	<0.1	<0.1	7.2	<0.005
MW-072	06/30/98	49	<0.005	0.8	<0.1	<0.1	<0.1	6.9	0.015
MW-073	06/30/98	320	<0.005	1.3	<0.1	<0.1	<0.1	6.9	<0.005
MW-074	06/24/98	340	<0.005	1.1	<0.1	<0.1	<0.1	7.0	0.025
MW-075	06/30/98	54	<0.005	1.2	<0.1	0.1	0.1	7.3	0.077
MW-076	06/29/98	23	<0.005	0.5	<0.1	1.3	1.3	7.3	0.008
MW-081	06/29/98	16	<0.005	0.7	<0.1	<0.1	<0.1	7.4	<0.005
MW-082	06/25/98	72	<0.005	0.7	<0.1	0.14	0.14	7.1	0.006
MW-083	06/25/98	49	<0.005	0.7	<0.1	<0.1	<0.1	7.2	<0.005
MW-084	06/23/98	7	<0.005	0.5	<0.1	<0.1	<0.1	7.5	0.008
MW-085	06/23/98	120	<0.005	1.3	<0.1	0.1	0.1	7.5	0.034
MW-086	06/26/98	330	<0.005	1.1	<0.1	0.1	0.1	7.0	0.068
MW-087	06/19/98	13	<0.005	0.9	<0.1	0.8	0.8	7.4	<0.005
MW-087A	06/19/98	160	<0.005	2.4	<0.1	<0.1	<0.1	7.7	<0.005

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL INORGANICS

TABLE 3-6

DISSOLVED-PHASE INORGANIC COMPOUNDS (JUNE 1998)
LOWER QUEEN

Indian Basin Remediation Project
Eddy County, NM

SITE	DATE	Sulfate (mg/l)	Total dissolved solids (TDS) (mg/l)
MW-057	06/25/98	110	490
MW-058	06/22/98	<5	760
MW-059	06/24/98	2300	4100
MW-060	06/21/98	390	720
MW-061A	06/18/98	300	690
MW-062	06/26/98	140	650
MW-063	06/25/98	39	370
MW-064	06/23/98	<5	600
MW-065A	06/25/98	250	550
MW-066	06/17/98	430	760
MW-067	06/24/98	140	480
MW-068	06/26/98	100	480
MW-070	06/16/98	80	370
MW-071	06/19/98	650	1100
MW-072	06/30/98	530	890
MW-073	06/30/98	2800	3700
MW-074	06/24/98	13	1500
MW-075	06/30/98	390	870
MW-076	06/29/98	51	400
MW-081	06/29/98	450	800
MW-082	06/25/98	390	730
MW-083	06/25/98	270	640
MW-084	06/23/98	<5	370
MW-085	06/23/98	<5	1100
MW-086	06/26/98	29	1500
MW-087	06/19/98	360	710
MW-087A	06/19/98	2200	3100

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL INORGANICS

TABLE 3-6

DISSOLVED-PHASE INORGANIC COMPOUNDS (JUNE 1998)
LOWER QUEEN

Indian Basin Remediation Project
Eddy County, NM

SITE	DATE	Chloride (mg/l)	Cyanide (mg/l)	Fluoride (mg/l)	NITRITE NITROGEN (mg/l)	Nitrate/Nitrite (mg/l)	NITRATE NITROGEN (mg/l)	pH (mg/l)	Phenols, total (mg/l)
MW-088	06/18/98	22	<0.005	1.1	<0.1	<0.1	<0.1	7.2	<0.005
MW-089	06/17/98	61	0.247	0.7	<0.1	<0.1	<0.1	7.1	<0.005
MW-094	06/26/98	24	<0.005	0.7	<0.1	2.5	2.5	7.3	0.008
MW-095	06/22/98	5	<0.005	0.4	<0.1	3.2	3.2	7.5	<0.005
MW-096	06/21/98	14	<0.005	0.4	<0.1	0.5	0.5	7.2	<0.005
MW-097	06/21/98	8	<0.005	0.7	<0.1	1.6	1.6	7.2	<0.005
MW-098	06/29/98	14	<0.005	0.3	<0.1	2.5	2.5	7.6	0.010
MW-104	06/21/98	14	<0.005	1.4	<0.1	0.5	0.5	7.3	<0.005
MW-108	06/22/98	5	<0.005	0.4	<0.1	2.4	2.4	7.4	<0.005
MW-110	06/30/98	54	<0.005	0.7	<0.1	1.4	1.4	7.2	0.010
MW-111	06/29/98	100	<0.005	0.7	<0.1	0.4	0.4	7.2	<0.005
SW-01	06/30/98	23	<0.005	0.6	<0.1	2.5	2.5	7.3	<0.005
SW-02	06/24/98	150	<0.005	0.5	<0.1	0.9	0.9	7.2	<0.005
SW-03	06/24/98	9	<0.005	0.7	<0.1	5.9	5.9	7.5	<0.005

Values represent total concentrations unless noted   < = Not detected at indicated reporting limit   --- = Not analyzed

For RCL INORGANICS

TABLE 3-6

DISSOLVED-PHASE INORGANIC COMPOUNDS (JUNE 1998)
LOWER QUEEN

Indian Basin Remediation Project
Eddy County, NM

SITE	DATE	Sulfate (mg/l)	Total dissolved solids (TDS) (mg/l)
MW-088	06/18/98	450	840
MW-089	06/17/98	340	780
MW-094	06/26/98	240	600
MW-095	06/22/98	21	360
MW-096	06/21/98	210	560
MW-097	06/21/98	190	520
MW-098	06/29/98	32	310
MW-104	06/21/98	230	560
MW-108	06/22/98	35	340
MW-110	06/30/98	130	600
MW-111	06/29/98	310	900
SW-01	06/30/98	230	550
SW-02	06/24/98	120	730
SW-03	06/24/98	110	410

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL INORGANICS

TABLE 3-7

DISSOLVED-PHASE METALS (JUNE 1998)
SHALLOW ZONE

Indian Basin Remediation Project
Eddy County, NM

SITE	DATE	Aluminum (mg/l)	Arsenic (mg/l)	Barium (mg/l)	Boron (mg/l)	Cadmium (mg/l)	Calcium (mg/l)	Chromium (mg/l)	Cobalt (mg/l)
LYMAN	06/29/98	---	---	---	---	---	---	---	---
MW-013	06/21/98	---	---	---	---	---	---	---	---
MW-014	06/22/98	---	---	---	---	---	---	---	---
MW-041	06/19/98	---	---	---	---	---	---	---	---
MW-043	06/22/98	---	---	---	---	---	---	---	---
MW-044	06/22/98	---	---	---	---	---	---	---	---
MW-046	06/21/98	---	---	---	---	---	---	---	---
MW-049	06/21/98	---	---	---	---	---	---	---	---
MW-050	06/19/98	---	---	---	---	---	---	---	---
MW-054	06/25/98	---	---	---	---	---	---	---	---
MW-055	06/25/98	---	---	---	---	---	---	---	---
MW-061	06/18/98	---	---	---	---	---	---	---	---
MW-069	06/29/98	---	---	---	---	---	---	---	---
MW-078	06/19/98	---	---	---	---	---	---	---	---
MW-090	06/17/98	---	---	---	---	---	---	---	---
MW-106	06/18/98	---	---	---	---	---	---	---	---
UIHS_ARROYO	06/26/98	---	---	---	---	---	---	---	---

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL METALS

TABLE 3-7

DISSOLVED-PHASE METALS (JUNE 1998)
SHALLOW ZONE

Indian Basin Remediation Project
Eddy County, NM

SITE	DATE	Copper (mg/l)	Iron (mg/l)	Lead (mg/l)	Magnesium (mg/l)	Manganese (mg/l)	Mercury (mg/l)	Molybdenum (mg/l)	Nickel (mg/l)
LYMAN	06/29/98	---	---	---	---	---	---	---	---
MW-013	06/21/98	---	---	---	---	---	---	---	---
MW-014	06/22/98	---	---	---	---	---	---	---	---
MW-041	06/19/98	---	---	---	---	---	---	---	---
MW-043	06/22/98	---	---	---	---	---	---	---	---
MW-044	06/22/98	---	---	---	---	---	---	---	---
MW-046	06/21/98	---	---	---	---	---	---	---	---
MW-049	06/21/98	---	---	---	---	---	---	---	---
MW-050	06/19/98	---	---	---	---	---	---	---	---
MW-054	06/25/98	---	---	---	---	---	---	---	---
MW-055	06/25/98	---	---	---	---	---	---	---	---
MW-061	06/18/98	---	---	---	---	---	---	---	---
MW-069	06/29/98	---	---	---	---	---	---	---	---
MW-078	06/19/98	---	---	---	---	---	---	---	---
MW-090	06/17/98	---	---	---	---	---	---	---	---
MW-106	06/18/98	---	---	---	---	---	---	---	---
UIHS_ARROYO	06/26/98	---	---	---	---	---	---	---	---

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For. RCL METALS

TABLE 3-7

DISSOLVED-PHASE METALS (JUNE 1998)
SHALLOW ZONE

Indian Basin Remediation Project
Eddy County, NM

SITE	DATE	Potassium (mg/l)	Radium 226,228 (pCi/l)	Selenium (mg/l)	Silicon (mg/l)	Silver (mg/l)	Sodi (mg/l)	Uranium (pCi/l)	Zinc (mg/l)
LYMAN	06/29/98	---	3.50	---	---	---	---	No convert	---
MW-013	06/21/98	---	0.87	---	---	---	---	No convert	---
MW-014	06/22/98	---	13.72	---	---	---	---	<No convert	---
MW-041	06/19/98	---	6.24	---	---	---	---	No convert	---
MW-043	06/22/98	---	5.90	---	---	---	---	No convert	---
MW-044	06/22/98	---	0.63	---	---	---	---	<No convert	---
MW-046	06/21/98	---	13.60	---	---	---	---	No convert	---
MW-049	06/21/98	---	11.76	---	---	---	---	No convert	---
MW-050	06/19/98	---	10.46	---	---	---	---	No convert	---
MW-054	06/25/98	---	17.05	---	---	---	---	No convert	---
MW-055	06/25/98	---	9.95	---	---	---	---	No convert	---
MW-061	06/18/98	---	7.4	---	---	---	---	<No convert	---
MW-069	06/29/98	---	1.03	---	---	---	---	<No convert	---
MW-078	06/19/98	---	15.61	---	---	---	---	No convert	---
MW-090	06/17/98	---	3.60	---	---	---	---	No convert	---
MW-106	06/18/98	---	5.63	---	---	---	---	No convert	---
UIHS_ARROYO	06/26/98	---	2.82	---	---	---	---	<No convert	---

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL METALS

TABLE 3-7

DISSOLVED-PHASE METALS (JUNE 1998)
SHALLOW ZONE

Indian Basin Remediation Project
Eddy County, NM

SITE	DATE	Dissolved Aluminum (mg/l)	Dissolved Arsenic (mg/l)	Dissolved Barium (mg/l)	Dissolved Boron (mg/l)	Dissolved Cadmium (mg/l)	Dissolved Chromium (mg/l)	Dissolved Cobalt (mg/l)	Dissolved Copper (mg/l)
LYMAN	06/29/98	<0.026	<0.0018	0.018	0.090	0.0003	<0.0008	<0.0003	<0.0018
MW-013	06/21/98	<0.026	0.015	0.52	0.22	0.0004	<0.0008	0.0005	<0.0018
MW-014	06/22/98	<0.026	0.0062	0.56	0.31	0.0005	0.0009	<0.0003	<0.0018
MW-041	06/19/98	0.030	0.011	0.36	0.27	<0.0002	0.0038	0.0026	<0.0018
MW-043	06/22/98	<0.026	0.0052	0.28	0.30	0.0003	<0.0008	0.0082	<0.0018
MW-044	06/22/98	<0.026	<0.0018	0.23	0.33	<0.0002	<0.0008	<0.0003	<0.0018
MW-046	06/21/98	<0.026	0.0033	0.32	0.20	<0.0002	0.0016	<0.0003	<0.0018
MW-049	06/21/98	<0.026	<0.0018	0.048	0.054	<0.0002	0.0038	<0.0003	<0.0018
MW-050	06/19/98	<0.026	0.0052	0.028	0.48	<0.0002	0.0009	<0.0003	<0.0018
MW-054	06/25/98	<0.026	<0.0018	0.015	0.29	<0.0002	0.0008	0.0003	<0.0018
MW-055	06/25/98	<0.026	0.0094	0.40	0.34	0.0004	0.0013	0.0012	<0.0018
MW-061	06/18/98	0.090	0.0024	0.025	0.068	<0.0002	<0.0008	<0.0003	<0.0018
MW-069	06/29/98	<0.026	0.0062	1.2	0.16	0.0005	0.0010	0.0005	<0.0018
MW-078	06/19/98	<0.026	0.0097	0.93	0.10	0.0003	0.0031	0.0013	<0.0018
MW-090	06/17/98	<0.026	0.0044	0.14	0.11	<0.0002	0.0010	<0.0003	<0.0018
MW-106	06/18/98	<0.026	0.0035	0.22	0.074	<0.0002	<0.0008	<0.0003	0.0033
UIHS_ARROYO	06/26/98	<0.026	<0.0018	0.044	0.078	<0.0002	<0.0008	0.0004	<0.0018

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL METALS

TABLE 3-7

DISSOLVED-PHASE METALS (JUNE 1998)
SHALLOW ZONE

Indian Basin Remediation Project
Eddy County, NM

SITE	DATE	Dissolved Iron (mg/l)	Dissolved Manganese (mg/l)	Dissolved Mercury (mg/l)	Dissolved Molybdenum (mg/l)	Dissolved Nickel (mg/l)	Dissolved Lead (mg/l)	Dissolved Selenium (mg/l)	Dissolved Silicon (mg/l)
LYMAN	06/29/98	0.035	<0.0002	<0.0001	0.0034	<0.0009	<0.0022	<0.0023	---
MW-013	06/21/98	3.4	0.22	<0.0001	0.0031	0.014	<0.0022	<0.0023	---
MW-014	06/22/98	4.7	0.24	<0.0001	0.0039	0.0025	<0.0022	<0.0023	---
MW-041	06/19/98	0.93	0.20	<0.0001	0.0090	0.0054	<0.0022	<0.0023	---
MW-043	06/22/98	2.6	0.20	<0.0001	0.054	0.039	<0.0022	<0.0023	---
MW-044	06/22/98	<0.013	0.043	<0.0001	0.0007	<0.0009	<0.0022	<0.0023	---
MW-046	06/21/98	0.014	0.090	<0.0001	0.0007	0.0036	<0.0022	<0.0023	---
MW-049	06/21/98	0.055	0.079	<0.0001	0.0050	<0.0009	<0.0022	<0.0023	---
MW-050	06/19/98	<0.013	0.035	<0.0001	0.0055	0.0053	<0.0022	0.0037	---
MW-054	06/25/98	<0.013	0.0050	<0.0001	0.0026	<0.0009	<0.0022	<0.005	---
MW-055	06/25/98	2.2	0.12	<0.0001	0.0031	<0.0009	<0.0022	<0.005	---
MW-061	06/18/98	0.032	0.0010	0.0010	0.0011	<0.0009	<0.0022	<0.0023	---
MW-069	06/29/98	2.7	0.59	<0.0001	0.0033	<0.0009	<0.0022	<0.005	---
MW-078	06/19/98	1.6	0.82	<0.0001	0.0034	0.0065	<0.0022	0.0035	---
MW-090	06/17/98	<0.013	<0.0002	<0.0001	0.0025	0.0021	<0.0022	<0.0023	---
MW-106	06/18/98	<0.013	0.0066	0.0005	0.0019	<0.0009	<0.0022	<0.0023	---
UIHS_ARROYO	06/26/98	0.015	0.012	<0.0001	0.0021	<0.0009	<0.0022	<0.005	---

Values represent total concentrations unless noted   < = Not detected at indicated reporting limit   --- = Not analyzed

For RCL METALS

TABLE 3-7

DISSOLVED-PHASE METALS (JUNE 1998)
SHALLOW ZONE

Indian Basin Remediation Project
Eddy County, NM

SITE	DATE	Dissolved Silver (mg/l)	Dissolved Zinc (mg/l)
LYMAN	06/29/98	<0.0007	<0.014
MW-013	06/21/98	<0.0007	0.037
MW-014	06/22/98	<0.0007	<0.014
MW-041	06/19/98	<0.0007	0.037
MW-043	06/22/98	<0.0007	<0.014
MW-044	06/22/98	<0.0007	<0.014
MW-046	06/21/98	<0.0007	<0.014
MW-049	06/21/98	0.022	<0.014
MW-050	06/19/98	0.0075	0.039
MW-054	06/25/98	<0.0007	0.015
MW-055	06/25/98	<0.0007	<0.014
MW-061	06/18/98	0.0025	0.054
MW-069	06/29/98	<0.0007	0.024
MW-078	06/19/98	<0.0007	0.087
MW-090	06/17/98	<0.0007	0.018
MW-106	06/18/98	<0.0007	0.046
UIHS_ARROYO	06/26/98	<0.0007	0.024

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL METALS

TABLE 3-8

DISSOLVED-PHASE METALS (JUNE 1998)
LOWER QUEEN

Indian Basin Remediation Project
Eddy County, NM

SITE	DATE	Aluminum (mg/l)	Arsenic (mg/l)	Barium (mg/l)	Boron (mg/l)	Cadmium (mg/l)	Calcium (mg/l)	Chromium (mg/l)	Cobalt (mg/l)
MW-057	06/25/98	---	---	---	---	---	---	---	---
MW-058	06/22/98	---	---	---	---	---	---	---	---
MW-059	06/24/98	---	---	---	---	---	---	---	---
MW-060	06/21/98	---	---	---	---	---	---	---	---
MW-061A	06/18/98	---	---	---	---	---	---	---	---
MW-062	06/26/98	---	---	---	---	---	---	---	---
MW-063	06/25/98	---	---	---	---	---	---	---	---
MW-064	06/23/98	---	---	---	---	---	---	---	---
MW-065A	06/25/98	---	---	---	---	---	---	---	---
MW-066	06/17/98	---	---	---	---	---	---	---	---
MW-067	06/24/98	---	---	---	---	---	---	---	---
MW-068	06/26/98	---	---	---	---	---	---	---	---
MW-070	06/16/98	---	---	---	---	---	---	---	---
MW-071	06/19/98	---	---	---	---	---	---	---	---
MW-072	06/30/98	---	---	---	---	---	---	---	---
MW-073	06/30/98	---	---	---	---	---	---	---	---
MW-074	06/24/98	---	---	---	---	---	---	---	---
MW-075	06/30/98	---	---	---	---	---	---	---	---
MW-076	06/29/98	---	---	---	---	---	---	---	---
MW-081	06/29/98	---	---	---	---	---	---	---	---
MW-082	06/25/98	---	---	---	---	---	---	---	---
MW-083	06/25/98	---	---	---	---	---	---	---	---
MW-084	06/23/98	---	---	---	---	---	---	---	---
MW-085	06/23/98	---	---	---	---	---	---	---	---
MW-086	06/26/98	---	---	---	---	---	---	---	---
MW-087	06/19/98	---	---	---	---	---	---	---	---
MW-087A	06/19/98	---	---	---	---	---	---	---	---

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL METALS

TABLE 3-8

DISSOLVED-PHASE METALS (JUNE 1998)
LOWER QUEEN

Indian Basin Remediation Project
Eddy County, NM

SITE	DATE	Copper (mg/l)	Iron (mg/l)	Lead (mg/l)	Magnesium (mg/l)	Manganese (mg/l)	Mercury (mg/l)	Molybdenum (mg/l)	Nickel (mg/l)
MW-057	06/25/98	---	---	---	---	---	---	---	---
MW-058	06/22/98	---	---	---	---	---	---	---	---
MW-059	06/24/98	---	---	---	---	---	---	---	---
MW-060	06/21/98	---	---	---	---	---	---	---	---
MW-061A	06/18/98	---	---	---	---	---	---	---	---
MW-062	06/26/98	---	---	---	---	---	---	---	---
MW-063	06/25/98	---	---	---	---	---	---	---	---
MW-064	06/23/98	---	---	---	---	---	---	---	---
MW-065A	06/25/98	---	---	---	---	---	---	---	---
MW-066	06/17/98	---	---	---	---	---	---	---	---
MW-067	06/24/98	---	---	---	---	---	---	---	---
MW-068	06/26/98	---	---	---	---	---	---	---	---
MW-070	06/16/98	---	---	---	---	---	---	---	---
MW-071	06/19/98	---	---	---	---	---	---	---	---
MW-072	06/30/98	---	---	---	---	---	---	---	---
MW-073	06/30/98	---	---	---	---	---	---	---	---
MW-074	06/24/98	---	---	---	---	---	---	---	---
MW-075	06/30/98	---	---	---	---	---	---	---	---
MW-076	06/29/98	---	---	---	---	---	---	---	---
MW-081	06/29/98	---	---	---	---	---	---	---	---
MW-082	06/25/98	---	---	---	---	---	---	---	---
MW-083	06/25/98	---	---	---	---	---	---	---	---
MW-084	06/23/98	---	---	---	---	---	---	---	---
MW-085	06/23/98	---	---	---	---	---	---	---	---
MW-086	06/26/98	---	---	---	---	---	---	---	---
MW-087	06/19/98	---	---	---	---	---	---	---	---
MW-087A	06/19/98	---	---	---	---	---	---	---	---

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL METALS

TABLE 3-8

DISSOLVED-PHASE METALS (JUNE 1998)
LOWER QUEEN

Indian Basin Remediation Project
Eddy County, NM

SITE	DATE	Potassium (mg/l)	Radium 226,228 (pCi/l)	Selenium (mg/l)	Silicon (mg/l)	Silver (mg/l)	Sodi (mg/l)	Uranium (pCi/l)	Zinc (mg/l)
MW-057	06/25/98	---	3.06	---	---	---	---	<No convert	---
MW-058	06/22/98	---	4.14	---	---	---	---	<No convert	---
MW-059	06/24/98	---	1.36	---	---	---	---	No convert	---
MW-060	06/21/98	---	5.16	---	---	---	---	No convert	---
MW-061A	06/18/98	---	6.06	---	---	---	---	<No convert	---
MW-062	06/26/98	---	3.7	---	---	---	---	<No convert	---
MW-063	06/25/98	---	0.40	---	---	---	---	No convert	---
MW-064	06/23/98	---	4.47	---	---	---	---	No convert	---
MW-065A	06/25/98	---	0.67	---	---	---	---	<No convert	---
MW-066	06/17/98	---	0.47	---	---	---	---	No convert	---
MW-067	06/24/98	---	2.98	---	---	---	---	<No convert	---
MW-068	06/26/98	---	3.7	---	---	---	---	<No convert	---
MW-070	06/16/98	---	2.8	---	---	---	---	No convert	---
MW-071	06/19/98	---	0.79	---	---	---	---	No convert	---
MW-072	06/30/98	---	3.9	---	---	---	---	No convert	---
MW-073	06/30/98	---	13.25	---	---	---	---	No convert	---
MW-074	06/24/98	---	18.2	---	---	---	---	<No convert	---
MW-075	06/30/98	---	3.50	---	---	---	---	No convert	---
MW-076	06/29/98	---	5.46	---	---	---	---	No convert	---
MW-081	06/29/98	---	3.32	---	---	---	---	<No convert	---
MW-082	06/25/98	---	0.30	---	---	---	---	No convert	---
MW-083	06/25/98	---	0.25	---	---	---	---	No convert	---
MW-084	06/23/98	---	3.4	---	---	---	---	No convert	---
MW-085	06/23/98	---	12.2	---	---	---	---	<No convert	---
MW-086	06/26/98	---	1.75	---	---	---	---	No convert	---
MW-087	06/19/98	---	1.02	---	---	---	---	No convert	---
MW-087A	06/19/98	---	1.94	---	---	---	---	No convert	---

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL METALS

TABLE 3-8

DISSOLVED-PHASE METALS (JUNE 1998)
LOWER QUEEN

Indian Basin Remediation Project
Eddy County, NM

SITE	DATE	Dissolved Aluminum (mg/l)	Dissolved Arsenic (mg/l)	Dissolved Barium (mg/l)	Dissolved Boron (mg/l)	Dissolved Cadmium (mg/l)	Dissolved Chromium (mg/l)	Dissolved Cobalt (mg/l)	Dissolved Copper (mg/l)
MW-057	06/25/98	<0.026	0.0018	0.42	0.075	0.0002	0.0008	0.0005	<0.0018
MW-058	06/22/98	0.088	0.019	0.062	0.12	<0.0002	<0.0008	<0.0003	<0.0018
MW-059	06/24/98	<0.026	0.026	0.24	0.23	<0.0002	0.038	0.0008	<0.0018
MW-060	06/21/98	<0.026	<0.0018	0.016	0.057	<0.0002	<0.0008	<0.0003	<0.0018
MW-061A	06/18/98	0.25	0.0047	0.054	0.073	<0.0002	<0.0008	<0.0003	<0.0018
MW-062	06/26/98	<0.026	0.0093	0.36	0.12	0.0002	0.0024	0.0006	<0.0018
MW-063	06/25/98	<0.026	0.0028	0.32	0.064	<0.0002	0.0012	0.0005	<0.0018
MW-064	06/23/98	0.066	(0.0015)	0.035	0.071	<0.0002	0.0008	<0.0003	<0.0018
MW-065A	06/25/98	<0.026	0.0087	0.095	0.066	0.0002	0.0008	0.0052	<0.0018
MW-066	06/17/98	0.048	0.0024	0.014	0.085	<0.0002	0.0022	<0.0003	0.0024
MW-067	06/24/98	<0.026	<0.0018	0.29	0.054	<0.0002	<0.0008	0.0027	<0.0018
MW-068	06/26/98	<0.026	0.0085	0.15	0.10	0.0002	0.0014	0.0019	<0.0018
MW-070	06/16/98	0.036	<0.0018	0.057	0.073	<0.0002	<0.0008	<0.0003	<0.0018
MW-071	06/19/98	<0.026	<0.0018	0.013	0.24	<0.0002	<0.0008	<0.0003	<0.0018
MW-072	06/30/98	<0.026	0.0027	0.14	0.086	0.0002	0.0077	0.0004	<0.0018
MW-073	06/30/98	<0.026	0.0032	0.034	0.31	<0.0002	0.0084	<0.0003	<0.0018
MW-074	06/24/98	<0.026	0.011	0.57	0.28	<0.0002	<0.0008	0.0024	<0.0018
MW-075	06/30/98	0.033	0.0045	0.082	0.11	<0.0002	0.0068	<0.0003	<0.0018
MW-076	06/29/98	<0.026	0.0031	0.27	0.066	<0.0002	0.0010	<0.0003	<0.0018
MW-081	06/29/98	<0.026	0.011	0.054	0.087	0.0002	0.0010	<0.0003	<0.0018
MW-082	06/25/98	<0.026	0.010	0.063	0.11	0.0002	0.0009	0.0009	<0.0018
MW-083	06/25/98	<0.026	0.024	0.11	0.083	0.0002	0.0026	0.0013	<0.0018
MW-084	06/23/98	<0.026	0.019	0.25	0.062	<0.0002	<0.0008	0.0003	<0.0018
MW-085	06/23/98	<0.026	0.012	0.26	0.22	<0.0002	<0.0008	<0.0003	0.0018
MW-086	06/26/98	<0.026	0.0030	0.66	0.28	0.0002	0.0017	0.0020	<0.0018
MW-087	06/19/98	<0.026	<0.0018	0.016	0.060	<0.0002	<0.0008	<0.0003	<0.0018
MW-087A	06/19/98	<0.026	0.0036	0.024	0.40	<0.0002	0.0013	0.0009	<0.0018

Values represent total concentrations unless noted   < = Not detected at indicated reporting limit   --- = Not analyzed
() = Less than Reporting Limit
For RCL METALS

TABLE 3-8

DISSOLVED-PHASE METALS (JUNE 1998)
LOWER QUEEN

Indian Basin Remediation Project
Eddy County, NM

SITE	DATE	Dissolved Iron (mg/l)	Dissolved Manganese (mg/l)	Dissolved Mercury (mg/l)	Dissolved Molybdenum (mg/l)	Dissolved Nickel (mg/l)	Dissolved Lead (mg/l)	Dissolved Selenium (mg/l)	Dissolved Silicon (mg/l)
MW-057	06/25/98	1.0	0.20	<0.0001	0.0017	<0.0009	<0.0022	<0.005	---
MW-058	06/22/98	0.29	0.28	<0.0001	0.0057	0.0015	<0.0022	<0.0023	---
MW-059	06/24/98	0.053	1.5	<0.0001	0.0074	0.074	<0.0022	<0.0023	---
MW-060	06/21/98	<0.013	0.0004	0.0003	0.0024	<0.0009	<0.0022	<0.0023	---
MW-061A	06/18/98	0.061	0.11	<0.0001	0.0013	0.0048	<0.0022	<0.0023	---
MW-062	06/26/98	0.25	0.39	0.0001	0.0040	<0.0009	<0.0022	<0.005	---
MW-063	06/25/98	<0.013	0.0015	<0.0001	0.0008	<0.0009	<0.0022	<0.005	---
MW-064	06/23/98	0.021	0.026	<0.0001	0.036	0.0028	<0.0022	<0.0023	---
MW-065A	06/25/98	0.59	0.44	<0.0001	0.0049	0.024	<0.0022	<0.005	---
MW-066	06/17/98	<0.013	0.0008	0.0005	0.0040	<0.0009	<0.0022	<0.0023	---
MW-067	06/24/98	0.017	0.82	<0.0001	0.0093	0.090	<0.0022	<0.0023	---
MW-068	06/26/98	0.080	0.10	0.0002	0.0046	<0.0009	<0.0022	<0.005	---
MW-070	06/16/98	<0.013	0.0026	0.0003	0.0023	<0.0009	<0.0022	<0.0023	---
MW-071	06/19/98	<0.013	0.0027	<0.0001	0.0005	<0.0009	<0.0022	<0.0023	---
MW-072	06/30/98	0.89	0.65	<0.0001	0.0035	0.0014	<0.0022	<0.0023	---
MW-073	06/30/98	0.26	0.065	<0.0001	0.0028	0.0015	<0.0022	<0.0023	---
MW-074	06/24/98	1.3	0.33	<0.0001	0.0033	0.0037	<0.0022	<0.0023	---
MW-075	06/30/98	0.18	0.26	<0.0001	0.0023	0.0039	<0.0022	<0.0023	---
MW-076	06/29/98	0.031	0.15	0.0003	0.0042	<0.0009	<0.0022	<0.005	---
MW-081	06/29/98	0.99	0.20	<0.0001	<0.0003	<0.0009	<0.0022	<0.005	---
MW-082	06/25/98	0.44	0.18	<0.0001	0.0040	0.0027	<0.0022	<0.005	---
MW-083	06/25/98	0.81	0.54	<0.0001	0.0045	0.0047	<0.0022	<0.005	---
MW-084	06/23/98	0.86	0.25	<0.0001	0.0043	0.0020	<0.0022	<0.0023	---
MW-085	06/23/98	1.0	0.19	<0.0001	0.0020	0.0020	<0.0022	<0.0023	---
MW-086	06/26/98	0.53	0.17	0.0001	0.0012	<0.0009	<0.0022	<0.005	---
MW-087	06/19/98	<0.013	0.0012	<0.0001	0.0025	<0.0009	<0.0022	<0.0023	---
MW-087A	06/19/98	0.24	0.012	<0.0001	0.0053	0.0099	<0.0022	0.0025	---

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL METALS

TABLE 3-8

DISSOLVED-PHASE METALS (JUNE 1998)
LOWER QUEEN

Indian Basin Remediation Project
Eddy County, NM

SITE	DATE	Dissolved Silver (mg/l)	Dissolved Zinc (mg/l)
MW-057	06/25/98	<0.0007	0.020
MW-058	06/22/98	0.0007	0.091
MW-059	06/24/98	<0.0007	0.028
MW-060	06/21/98	<0.0007	0.026
MW-061A	06/18/98	0.0007	0.17
MW-062	06/26/98	<0.0007	0.015
MW-063	06/25/98	<0.0007	0.042
MW-064	06/23/98	0.0013	0.086
MW-065A	06/25/98	<0.0007	0.030
MW-066	06/17/98	<0.0007	0.045
MW-067	06/24/98	<0.0007	0.026
MW-068	06/26/98	<0.0007	0.10
MW-070	06/16/98	<0.0007	0.051
MW-071	06/19/98	0.0011	<0.014
MW-072	06/30/98	<0.0007	<0.014
MW-073	06/30/98	0.008	0.052
MW-074	06/24/98	<0.0007	0.037
MW-075	06/30/98	<0.0007	0.041
MW-076	06/29/98	<0.0007	0.041
MW-081	06/29/98	<0.0007	<0.014
MW-082	06/25/98	<0.0007	<0.014
MW-083	06/25/98	<0.0007	<0.014
MW-084	06/23/98	<0.0007	0.014
MW-085	06/23/98	<0.0007	0.067
MW-086	06/26/98	<0.0007	0.039
MW-087	06/19/98	<0.0007	0.014
MW-087A	06/19/98	0.0030	0.014

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL METALS

TABLE 3-8

DISSOLVED-PHASE METALS (JUNE 1998)
LOWER QUEEN

Indian Basin Remediation Project
Eddy County, NM

SITE	DATE	Aluminum (mg/l)	Arsenic (mg/l)	Barium (mg/l)	Boron (mg/l)	Cadmium (mg/l)	Calcium (mg/l)	Chromium (mg/l)	Cobalt (mg/l)
MW-088	06/18/98	---	---	---	---	---	---	---	---
MW-089	06/17/98	---	---	---	---	---	---	---	---
MW-094	06/26/98	---	---	---	---	---	---	---	---
MW-095	06/22/98	---	---	---	---	---	---	---	---
MW-096	06/21/98	---	---	---	---	---	---	---	---
MW-097	06/21/98	---	---	---	---	---	---	---	---
MW-098	06/29/98	---	---	---	---	---	---	---	---
MW-104	06/21/98	---	---	---	---	---	---	---	---
MW-108	06/22/98	---	---	---	---	---	---	---	---
MW-110	06/30/98	---	---	---	---	---	---	---	---
MW-111	06/29/98	---	---	---	---	---	---	---	---
SW-01	06/30/98	---	---	---	---	---	---	---	---
SW-02	06/24/98	---	---	---	---	---	---	---	---
SW-03	06/24/98	---	---	---	---	---	---	---	---

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL METALS

TABLE 3-8

DISSOLVED-PHASE METALS (JUNE 1998)
LOWER QUEEN

Indian Basin Remediation Project
Eddy County, NM

SITE	DATE	Copper (mg/l)	Iron (mg/l)	Lead (mg/l)	Magnesium (mg/l)	Manganese (mg/l)	Mercury (mg/l)	Molybdenum (mg/l)	Nickel (mg/l)
MW-088	06/18/98	---	---	---	---	---	---	---	---
MW-089	06/17/98	---	---	---	---	---	---	---	---
MW-094	06/26/98	---	---	---	---	---	---	---	---
MW-095	06/22/98	---	---	---	---	---	---	---	---
MW-096	06/21/98	---	---	---	---	---	---	---	---
MW-097	06/21/98	---	---	---	---	---	---	---	---
MW-098	06/29/98	---	---	---	---	---	---	---	---
MW-104	06/21/98	---	---	---	---	---	---	---	---
MW-108	06/22/98	---	---	---	---	---	---	---	---
MW-110	06/30/98	---	---	---	---	---	---	---	---
MW-111	06/29/98	---	---	---	---	---	---	---	---
SW-01	06/30/98	---	---	---	---	---	---	---	---
SW-02	06/24/98	---	---	---	---	---	---	---	---
SW-03	06/24/98	---	---	---	---	---	---	---	---

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL METALS

TABLE 3-8

DISSOLVED-PHASE METALS (JUNE 1998)
LOWER QUEEN

Indian Basin Remediation Project
Eddy County, NM

SITE	DATE	Potassium (mg/l)	Radium 226,228 (pCi/l)	Selenium (mg/l)	Silicon (mg/l)	Silver (mg/l)	Sodi (mg/l)	Uranium (pCi/l)	Zinc (mg/l)
MW-088	06/18/98	---	1.07	---	---	---	---	<No convert	---
MW-089	06/17/98	---	0.19	---	---	---	---	No convert	---
MW-094	06/26/98	---	4.8	---	---	---	---	No convert	---
MW-095	06/22/98	---	8.73	---	---	---	---	No convert	---
MW-096	06/21/98	---	10.95	---	---	---	---	No convert	---
MW-097	06/21/98	---	3.21	---	---	---	---	No convert	---
MW-098	06/29/98	---	2.43	---	---	---	---	No convert	---
MW-104	06/21/98	---	0.13	---	---	---	---	No convert	---
MW-108	06/22/98	---	0.21	---	---	---	---	<No convert	---
MW-110	06/30/98	---	0.76	---	---	---	---	No convert	---
MW-111	06/29/98	---	4.45	---	---	---	---	No convert	---
SW-01	06/30/98	---	0.17	---	---	---	---	No convert	---
SW-02	06/24/98	---	ND	---	---	---	---	<No convert	---
SW-03	06/24/98	---	3.06	---	---	---	---	No convert	---

Values represent total concentrations unless noted   < = Not detected at indicated reporting limit   --- = Not analyzed
ND = Not Detected
For RCL METALS

TABLE 3-8

DISSOLVED-PHASE METALS (JUNE 1998)
LOWER QUEEN

Indian Basin Remediation Project
Eddy County, NM

SITE	DATE	Dissolved Aluminum (mg/l)	Dissolved Arsenic (mg/l)	Dissolved Barium (mg/l)	Dissolved Boron (mg/l)	Dissolved Cadmium (mg/l)	Dissolved Chromium (mg/l)	Dissolved Cobalt (mg/l)	Dissolved Copper (mg/l)
MW-088	06/18/98	0.055	<0.0018	0.016	0.11	<0.0002	<0.0008	<0.0003	<0.0018
MW-089	06/17/98	<0.026	<0.0018	0.018	0.074	<0.0002	<0.0008	<0.0003	<0.0018
MW-094	06/26/98	<0.026	<0.0018	0.040	0.058	<0.0002	0.0066	<0.0003	<0.0018
MW-095	06/22/98	<0.026	<0.0018	0.28	0.049	<0.0002	<0.0008	<0.0003	<0.0018
MW-096	06/21/98	<0.026	<0.0018	0.015	0.064	<0.0002	0.0016	<0.0003	<0.0018
MW-097	06/21/98	<0.026	<0.0018	0.054	0.056	<0.0002	0.0009	<0.0003	<0.0018
MW-098	06/29/98	<0.026	0.0047	0.20	0.055	0.0003	0.0010	<0.0003	<0.0018
MW-104	06/21/98	<0.026	<0.0018	0.017	0.066	<0.0002	<0.0008	<0.0003	<0.0018
MW-108	06/22/98	<0.026	0.0019	0.11	0.046	<0.0002	<0.0008	<0.0003	<0.0018
MW-110	06/30/98	<0.026	0.0046	0.18	0.071	<0.0002	0.0010	<0.0003	<0.0018
MW-111	06/29/98	<0.026	<0.0018	0.035	0.13	<0.0002	0.0010	<0.0003	<0.0018
SW-01	06/30/98	<0.026	<0.0018	0.027	0.056	<0.0002	0.0011	<0.0003	<0.0018
SW-02	06/24/98	<0.026	<0.0018	0.072	0.084	<0.0002	<0.0008	<0.0003	<0.0018
SW-03	06/24/98	<0.026	0.0022	0.044	0.11	0.0003	0.0010	0.0004	<0.0018

Values represent total concentrations unless noted   < = Not detected at indicated reporting limit   --- = Not analyzed

For RCL METALS

TABLE 3-8

DISSOLVED-PHASE METALS (JUNE 1998)
LOWER QUEEN

Indian Basin Remediation Project
Eddy County, NM

SITE	DATE	Dissolved Iron (mg/l)	Dissolved Manganese (mg/l)	Dissolved Mercury (mg/l)	Dissolved Molybdenum (mg/l)	Dissolved Nickel (mg/l)	Dissolved Lead (mg/l)	Dissolved Selenium (mg/l)	Dissolved Silicon (mg/l)
MW-088	06/18/98	0.064	0.0062	<0.0001	0.0041	<0.0009	<0.0022	<0.0023	---
MW-089	06/17/98	0.014	0.046	0.0003	0.0033	0.0040	<0.0022	<0.0023	---
MW-094	06/26/98	<0.013	0.0023	0.0001	0.0023	<0.0009	<0.0022	<0.005	---
MW-095	06/22/98	<0.013	0.019	<0.0001	0.0025	<0.0009	<0.0022	<0.0023	---
MW-096	06/21/98	<0.013	0.0071	0.0003	0.0026	<0.0009	<0.0022	<0.0023	---
MW-097	06/21/98	<0.013	<0.0002	<0.0001	0.0021	0.0009	<0.0022	0.0026	---
MW-098	06/29/98	0.034	<0.0002	<0.0001	0.0034	<0.0009	<0.0022	<0.005	---
MW-104	06/21/98	<0.013	<0.0002	<0.0001	0.0034	<0.0009	<0.0022	<0.0023	---
MW-108	06/22/98	<0.013	0.0004	<0.0001	0.0028	<0.0009	<0.0022	<0.0023	---
MW-110	06/30/98	0.043	0.065	<0.0001	0.0038	<0.0009	<0.0022	<0.0023	---
MW-111	06/29/98	0.092	0.22	<0.0001	0.0044	<0.0009	<0.0022	<0.005	---
SW-01	06/30/98	0.060	0.0032	<0.0001	0.0019	<0.0009	0.0031	<0.0023	---
SW-02	06/24/98	<0.013	0.060	<0.0001	0.0020	<0.0009	0.018	<0.0023	---
SW-03	06/24/98	0.015	0.0015	<0.0001	0.0024	<0.0009	<0.0022	<0.005	---

Values represent total concentrations unless noted < = Not detected at indicated reporting limit --- = Not analyzed

For RCL METALS

TABLE 3-8

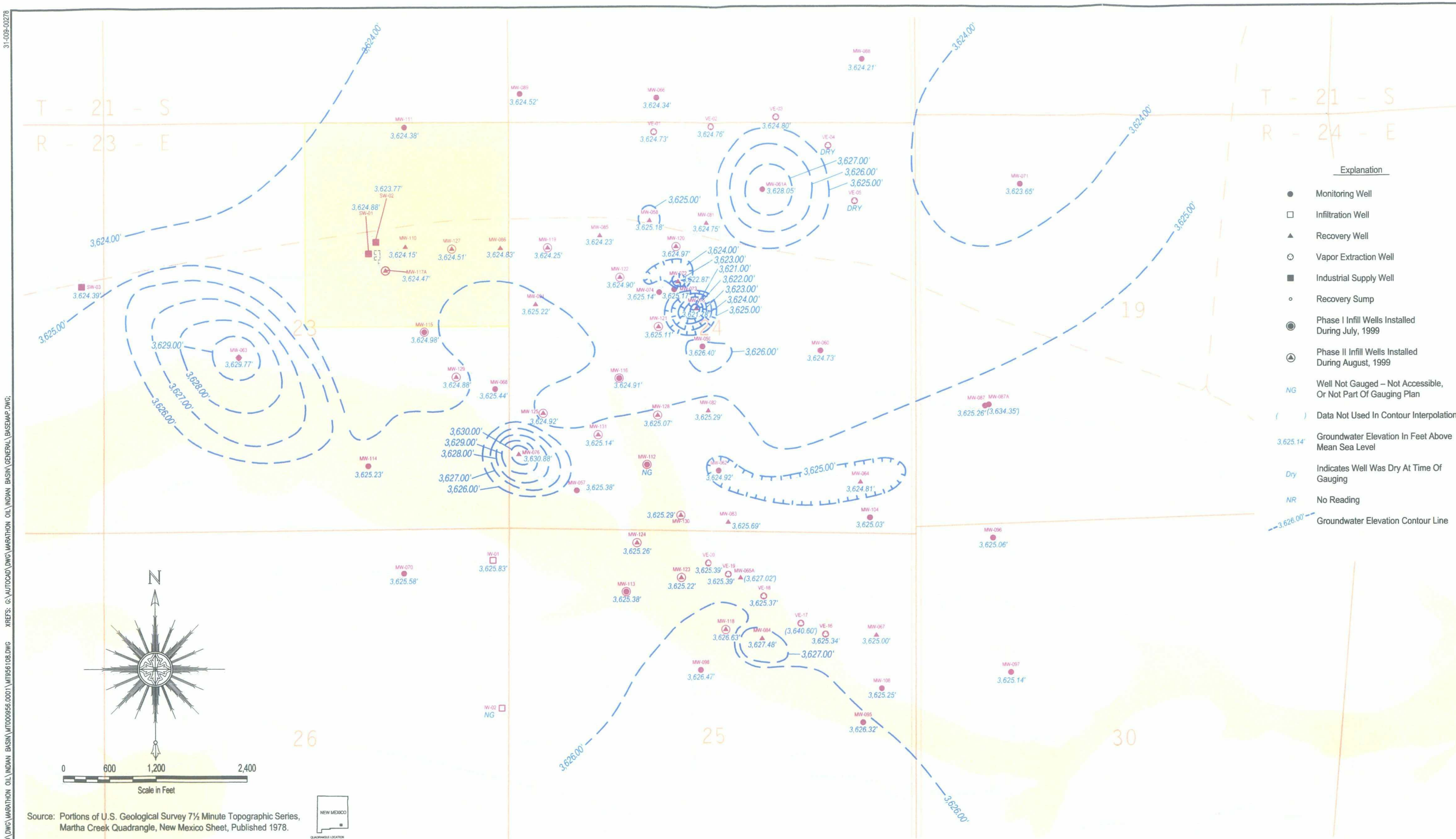
DISSOLVED-PHASE METALS (JUNE 1998)
LOWER QUEEN

Indian Basin Remediation Project
Eddy County, NM

SITE	DATE	Dissolved Silver (mg/l)	Dissolved Zinc (mg/l)
MW-088	06/18/98	0.0007	0.055
MW-089	06/17/98	0.0009	0.026
MW-094	06/26/98	<0.0007	0.022
MW-095	06/22/98	<0.0007	0.017
MW-096	06/21/98	<0.0007	<0.014
MW-097	06/21/98	<0.0007	<0.014
MW-098	06/29/98	<0.0007	0.022
MW-104	06/21/98	<0.0007	0.022
MW-108	06/22/98	<0.0007	<0.014
MW-110	06/30/98	<0.0007	0.024
MW-111	06/29/98	<0.0007	<0.014
SW-01	06/30/98	<0.0007	0.090
SW-02	06/24/98	<0.0007	0.028
SW-03	06/24/98	<0.0007	0.048

Values represent total concentrations unless noted   < = Not detected at indicated reporting limit   --- = Not analyzed

For RCL METALS



Source: Portions of U.S. Geological Survey 7½ Minute Topographic Series, Martha Creek Quadrangle, New Mexico Sheet, Published 1978.

Area Manager	A. Schmidt
Project Manager	A.J. Reed, Jr.
Task Manager	B. Kolb
Technical Review	S. Tischer

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www.arcadis-us.com

Marathon Oil Company
Indian Basin Remediation Project

Lower Queen Groundwater Elevation Contours
October 2006

Eddy County, New Mexico

Project Number	MT000956.0001
Drawing Date	2 March 2007
Figure	7

6/11/07 08:36 HCLARDY R16 G:\AUTOCAD\DWG\MARATHON OIL\INDIAN BASIN\MT000956.0001\MT956108.DWG XREFS: G:\AUTOCAD\DWG\MARATHON OIL\INDIAN BASIN\GENERAL\BASEMAP.DWG;

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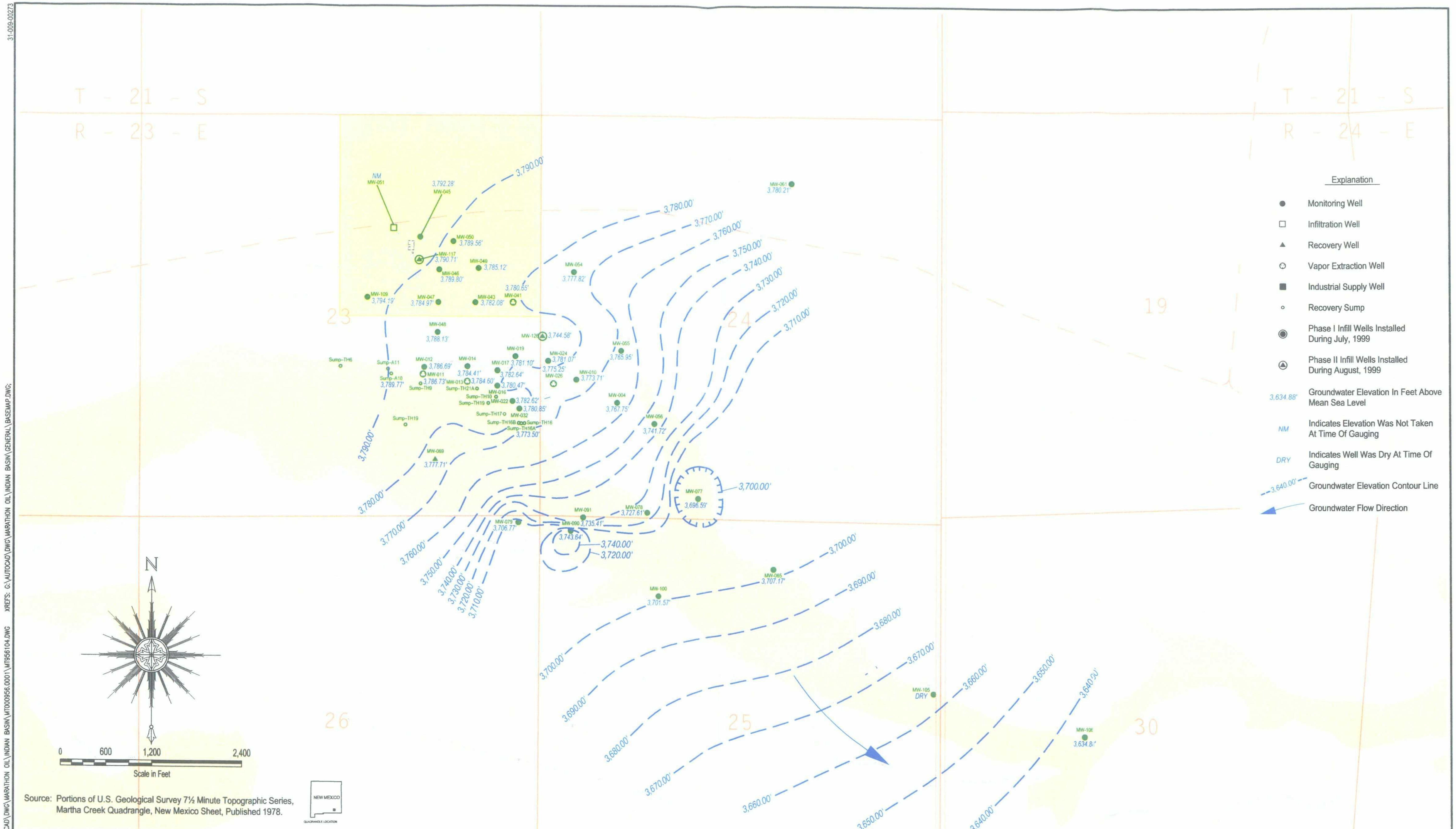

Source: Portions of U.S. Geological Survey 7½ Minute Topographic Series, Martha Creek Quadrangle, New Mexico Sheet, Published 1978.

NEW MEXICO

QUADRANGLE LOCATION

Area Manager	A. Schmidt
Project Manager	A.J. Reed, Jr.
Task Manager	B. Kolb
Technical Review	S. Tischer

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Marathon Oil Company
Indian Basin Remediation Project

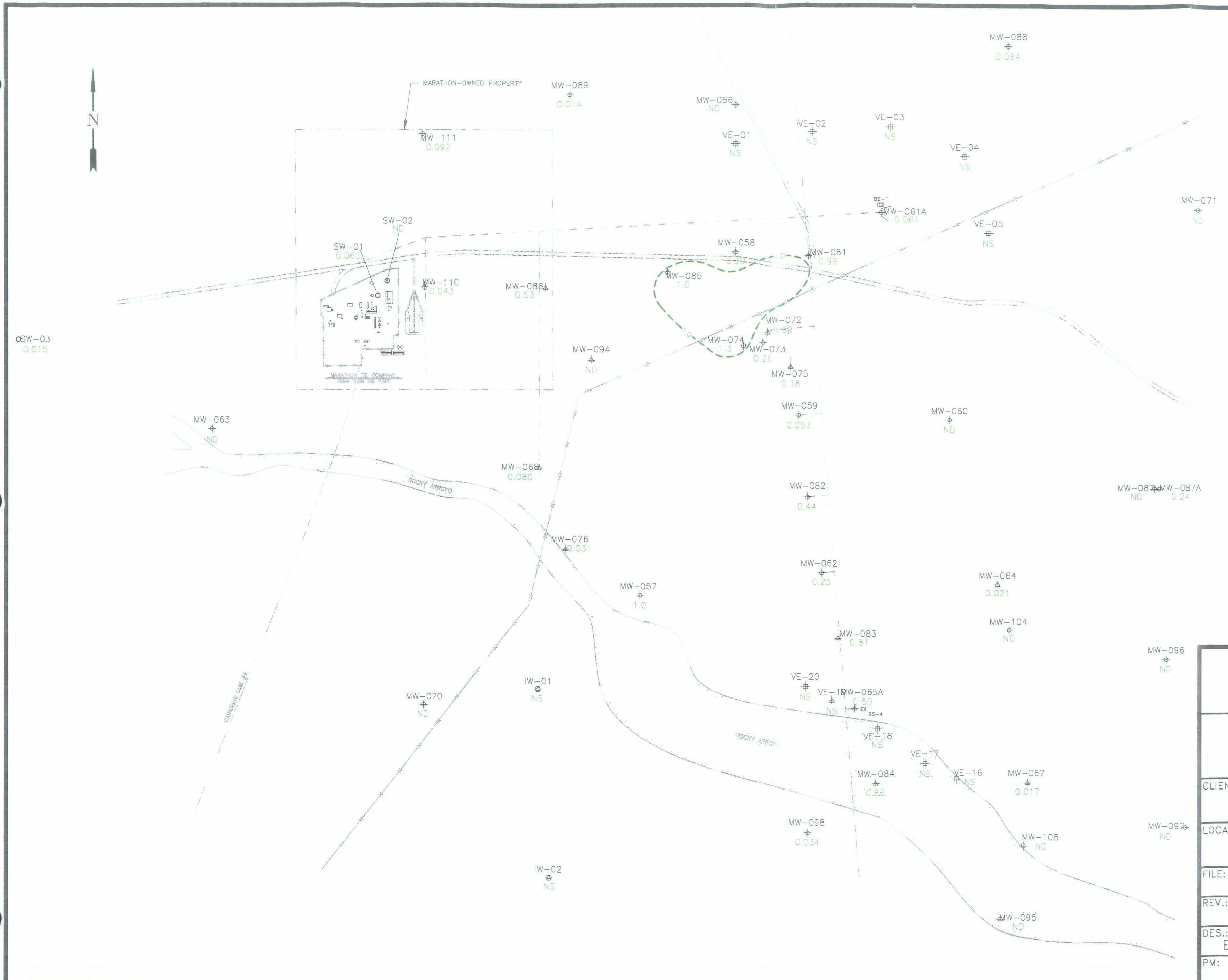
Shallow Zone Groundwater Elevation Contours
October 2006

Eddy County, New Mexico

Project Number MT000956.0001
Drawing Date 2 March 2007
Figure 4

6/11/07 08:29 HCLARDY R16 G:\AUTOCAD\DWG\MARATHON OIL\INDIAN BASIN\MT000956.0001\MT956104.DWG XREFS: G:\AUTOCAD\DWG\MARATHON OIL\INDIAN BASIN\GENERAL\BASEMAP.DWG;

31-009-00273



LEGEND

⌖	MONITORING WELL (LOWER QUEEN)
⊚	INFILTRATION WELL (LOWER QUEEN)
○	INDUSTRIAL SUPPLY WELL (LOWER QUEEN)
	RECOVERY WELL (LOWER QUEEN)
	VAPOR EXTRACTION WELL (LOWER QUEEN)
1.3	DISSOLVED IRON CONCENTRATION IN mg/L
ND	NOT DETECTED ABOVE METHOD DETECTION LIMIT
NS	NOT SAMPLED
1.0	WQCC STANDARD FOR DISSOLVED IRON (ISOPLETH INTERPRETED) IN mg/L
	BLOWER STATION
	FENCE
	POWER LINES

FLUOR DANIEL GTI

0 FEET 1000
SCALE

LOWER QUEEN DISSOLVED IRON DISTRIBUTION MAP JUNE 1998

CLIENT: MARATHON OIL COMPANY

LOCATION: INDIAN BASIN REMEDIATION PROJECT
EDDY COUNTY, NEW MEXICO

FILE: IRON_LQ (1:1000)

PROJECT NO.: 105469

REV.:

DES.: ES

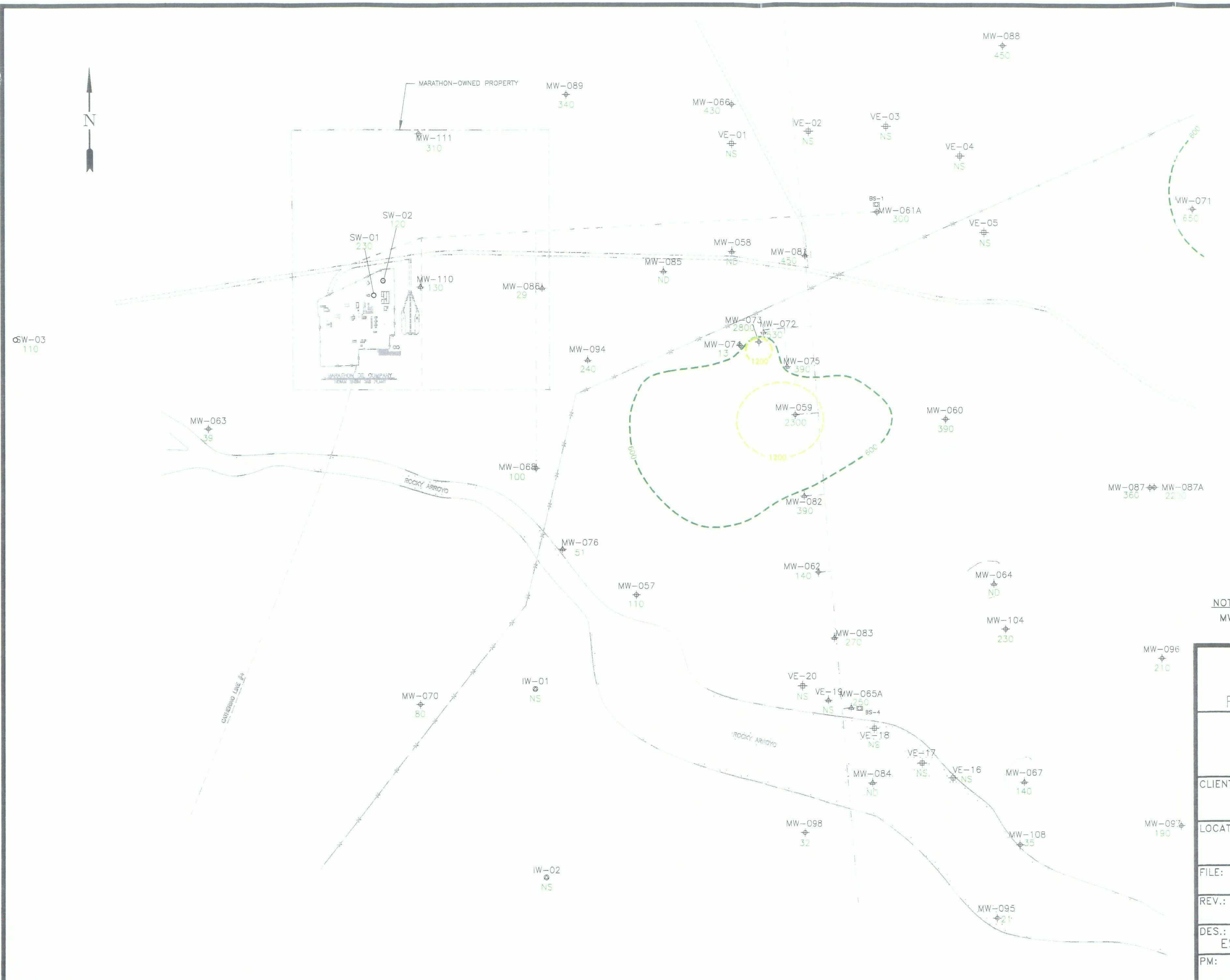
DET.: SWL

DATE: 10/12/98

FIGURE: 3-23

PM:

PE/RG:



LEGEND

- MONITORING WELL (LOWER QUEEN)
- INFILTRATION WELL (LOWER QUEEN)
- INDUSTRIAL SUPPLY WELL (LOWER QUEEN)
- RECOVERY WELL (LOWER QUEEN)
- VAPOR EXTRACTION WELL (LOWER QUEEN)
- 390 SULFATE CONCENTRATION IN mg/L
- ND NOT DETECTED ABOVE METHOD DETECTION LIMIT
- NS NOT SAMPLED
- 1200 INTERPRETED CONCENTRATION ISOPLETH FOR SULFATE
- 600 WQCC STANDARD FOR SULFATE (ISOPLETH INTERPRETED) IN mg/L
- BLOWER STATION
- FENCE
- POWER LINES

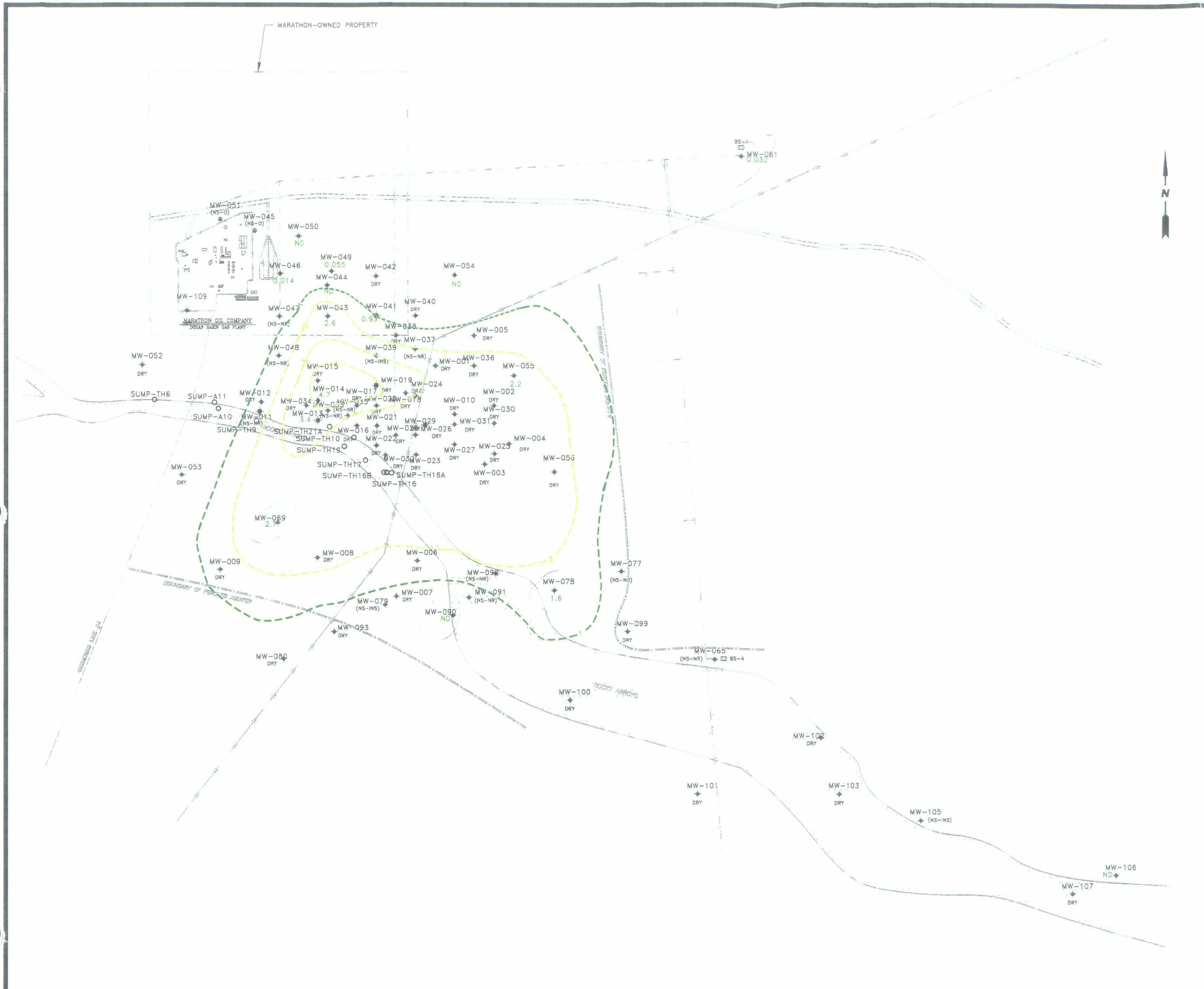
NOTE:
MW-087A NOT USED FOR CONTOURING

FLUOR DANIEL GTI

0 FEET 1000
SCALE

LOWER QUEEN SULFATE DISTRIBUTION MAP JUNE 1998

CLIENT: MARATHON OIL COMPANY			
LOCATION: INDIAN BASIN REMEDIATION PROJECT EDDY COUNTY, NEW MEXICO			
FILE: SULF_LQ (1:1000)		PROJECT NO.: 105469	
REV.:			
DES.: ES	DET.: SWL	DATE: 11/18/98	FIGURE: 3-19
PM:		PE/RG:	



LEGEND

	MONITORING WELL (SHALLOW ZONE)
	INFILTRATION WELL (SHALLOW ZONE)
	RECOVERY SUMP (SHALLOW ZONE)
	RECOVERY WELL (SHALLOW ZONE)
	VAPOR EXTRACTION WELL (SHALLOW GROUNDWATER)
	BLOWER STATION
	FENCING
	POWER LINE
	INTERPRETED CONCENTRATION ISOPLETH FOR IRON
	WQCC STANDARD FOR IRON IN mg/L (ISOPLETH INTERPRETED)
0.22	IRON CONCENTRATION IN mg/L
ND	IRON NOT DETECTED ABOVE METHOD DETECTION LIMIT
DRY	WELL DRY
NS-O	NOT SAMPLED - OBSTRUCTED
NS-INS	NOT SAMPLED - INSUFFICIENT WATER IN WELL
NS-NR	NOT SAMPLED - GROUNDWATER DID NOT RECOVER AFTER PURGING

FLUOR DANIEL GTI

0 FEET 1000
SCALE

SHALLOW ZONE DISSOLVED IRON DISTRIBUTION MAP JUNE 1998

CLIENT: MARATHON OIL COMPANY

LOCATION: INDIAN BASIN REMEDIATION PROJECT EDDY COUNTY, NEW MEXICO

FILE: IRON_SH2 (1:1000)

PROJECT NO.: 105469

REV.:

DES.: ES

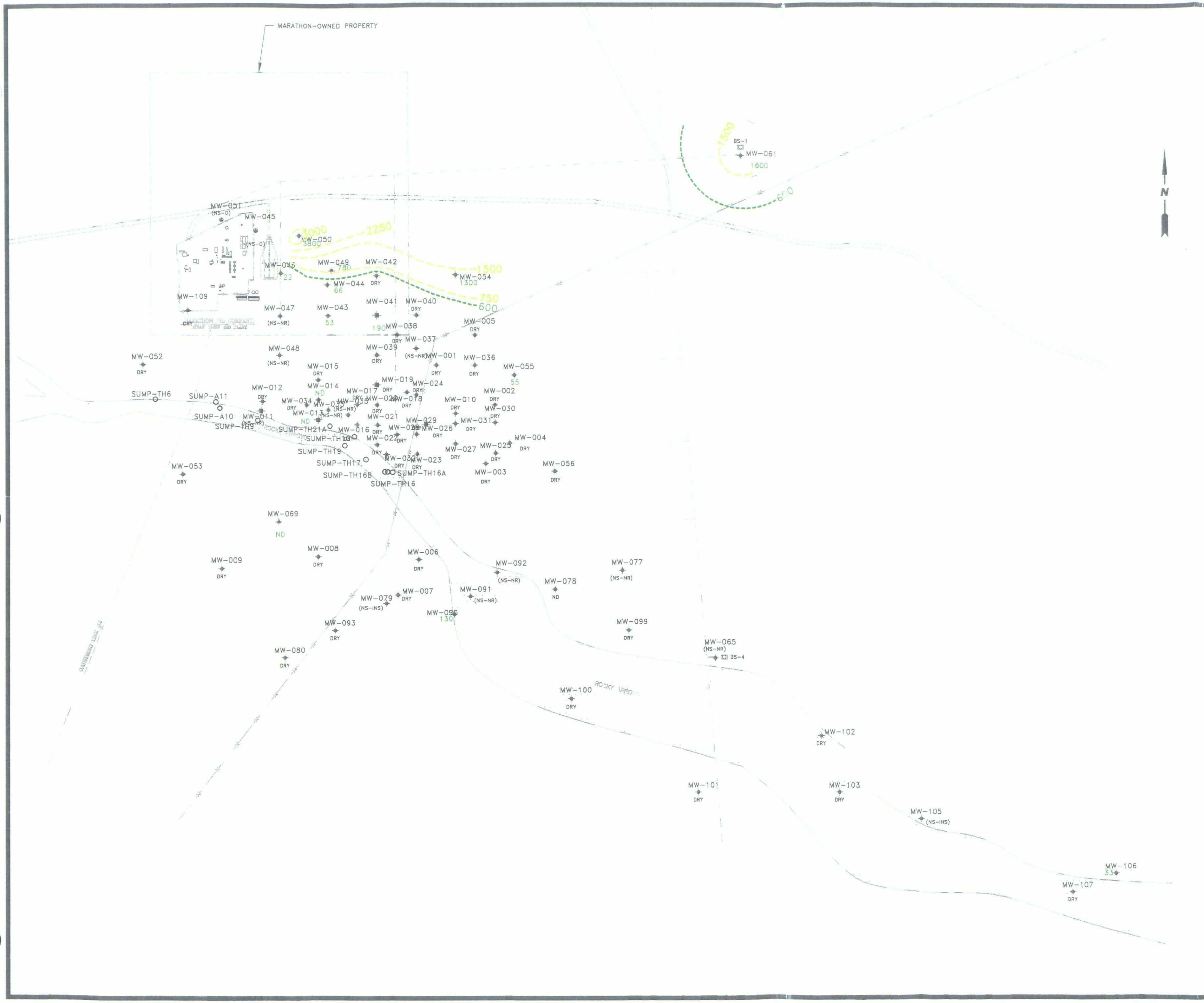
DET.: DH

DATE: 11/18/98

FIGURE: 3-20

PM:

PE/RG:



LEGEND

	MONITORING WELL (SHALLOW ZONE)
	INFILTRATION WELL (SHALLOW ZONE)
	RECOVERY SUMP (SHALLOW ZONE)
	RECOVERY WELL (SHALLOW ZONE)
	VAPOR EXTRACTION WELL (SHALLOW GROUNDWATER)
	BLOWER STATION
	FENCING
	POWER LINE
1500	INTERPRETED CONCENTRATION ISOPLETH FOR SULFATE
600	WQCC STANDARD FOR SULFATE IN mg/L (ISOPLETH INTERPRETED)
33	SULFATE CONCENTRATION IN mg/L
ND	NOT DETECTED ABOVE METHOD DETECTION LIMIT
DRY	WELL DRY
NS-0	NOT SAMPLED - OBSTRUCTED
NS-INS	NOT SAMPLED - INSUFFICIENT WATER IN WELL
NS-NR	NOT SAMPLED - GROUNDWATER DID NOT RECOVER AFTER PURGING

FLUOR DANIEL GTI

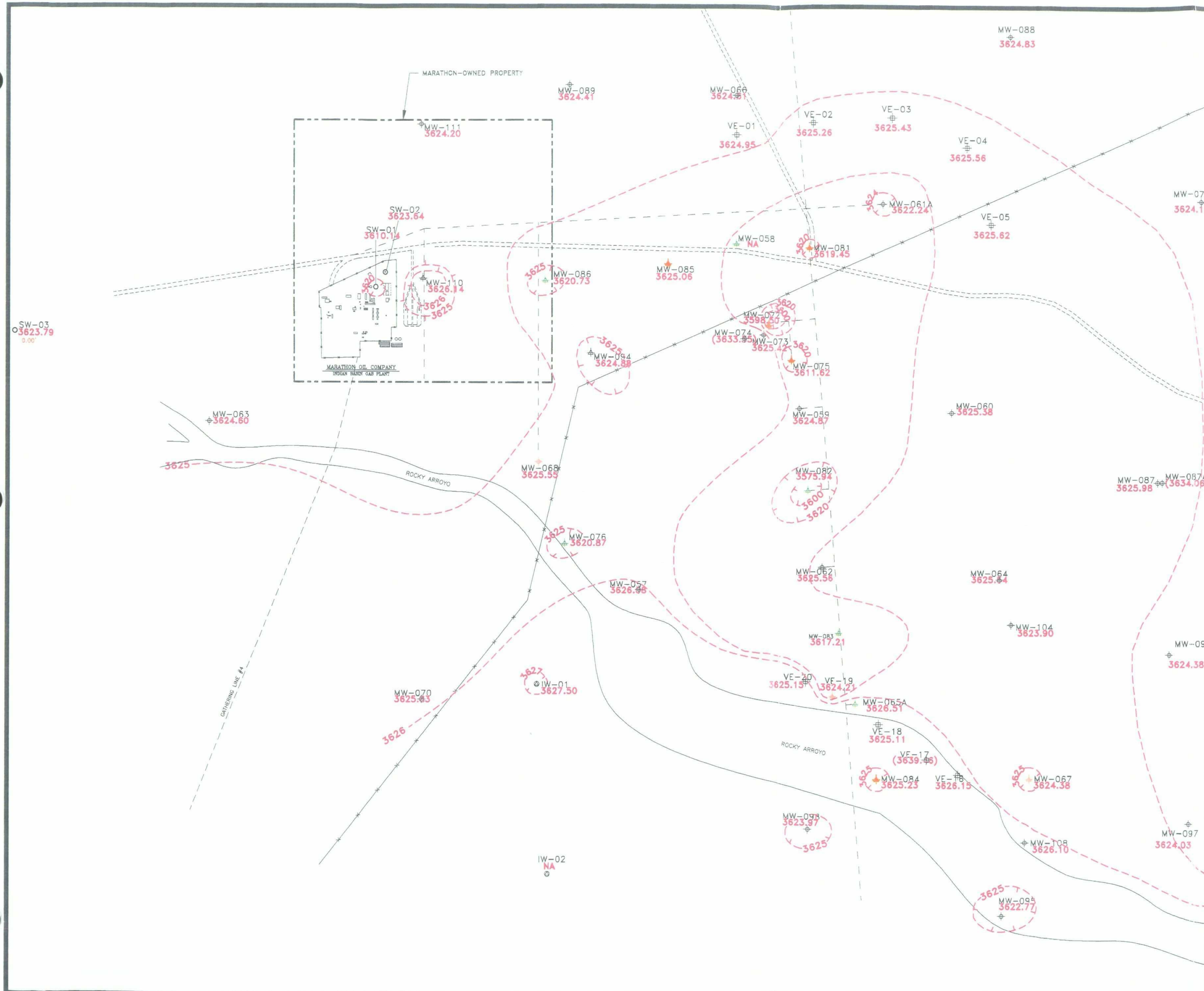
0 FEET 1000
SCALE

SHALLOW ZONE SULFATE DISTRIBUTION MAP JUNE 1998

CLIENT: MARATHON OIL COMPANY

LOCATION: INDIAN BASIN REMEDIATION PROJECT, EDDY COUNTY, NEW MEXICO

FILE: SULF_SH2 (1:1000)		PROJECT NO.: 105469	
REV.:			
DES.: ES	DET.: DH	DATE: 11/18/98	FIGURE: 3-14
PM:		PE/RG:	



LEGEND

	MONITORING WELL (SHALLOW ZONE)
	INFILTRATION WELL (SHALLOW ZONE)
	RECOVERY SUMP (SHALLOW ZONE)
	RECOVERY WELL (SHALLOW ZONE)
	VAPOR EXTRACTION WELL (SHALLOW GROUNDWATER
	BLOWER STATION
	FENCING
	POWER LINE
3624.58	GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL (CORRECTED FOR PRODUCT THICKNESS USING SPECIFIC GRAVITY OF 0.73)
NA	NOT AVAILABLE (OBSTRUCTED OR NO TOC)
( )	DATA NOT USED IN CONTOUR INTERPOLATION
	GROUNDWATER ELEVATION CONTOUR (CONTOUR INTERVAL = 1 FT EXCEPT AROUND INJECTION & RECOVERY WELLS)

FLUOR DANIEL GTI

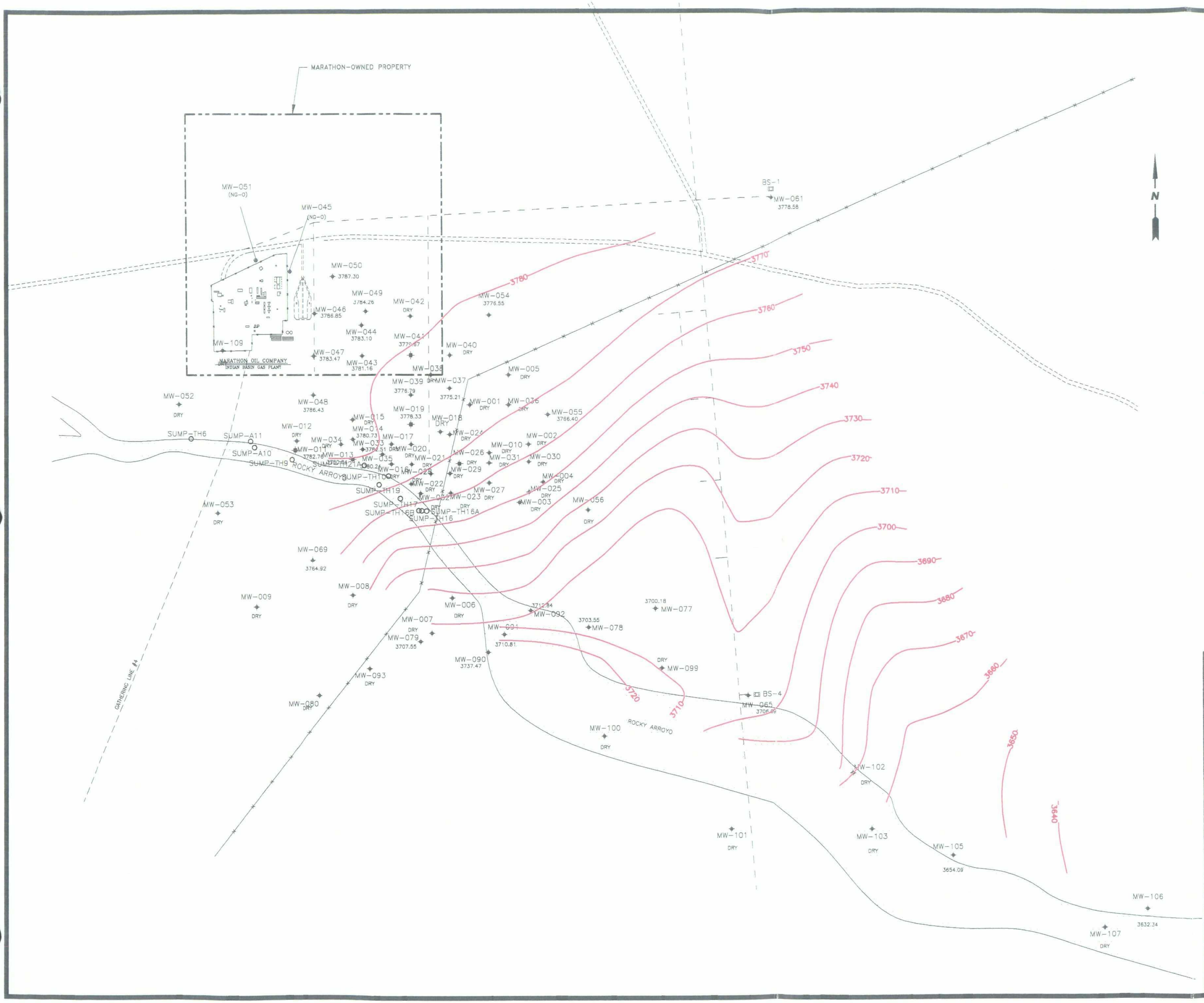
0 FEET 1000
SCALE

LOWER QUEEN CORRECTED GROUNDWATER ELEVATION MAP JUNE 15–17, 1998

CLIENT: MARATHON OIL COMPANY

LOCATION: INDIAN BASIN REMEDIATION PROJECT EDDY COUNTY, NEW MEXICO

FILE: 5669JUN98 (1:1000)		PROJECT NO.: 105469	
REV.:			
DES.: CL	DET.: DH	DATE: 11-24-98	FIGURE: 2-7
PM:		PE/RG:	



LEGEND

◆	MONITORING WELL (SHALLOW ZONE)
◬	INFILTRATION WELL (SHALLOW ZONE)
○	RECOVERY SUMP (SHALLOW ZONE)
▲	RECOVERY WELL (SHALLOW ZONE)
■	VAPOR EXTRACTION WELL (SHALLOW GROUNDWATER)
⊡	BLOWER STATION
—x—x—	FENCING
– – – –	POWER LINE
3654.09	GROUNDWATER ELEVATION IN FEET ABOVE MEAN SEA LEVEL
— 3660 —	GROUNDWATER ELEVATION CONTOUR (CONTOUR INTERVAL = 10 FEET)
DRY	WELL DRY
NG-0	NOT GAUGED - OBSTRUCTED

FLUOR DANIEL GTI

0 FEET 1000
SCALE

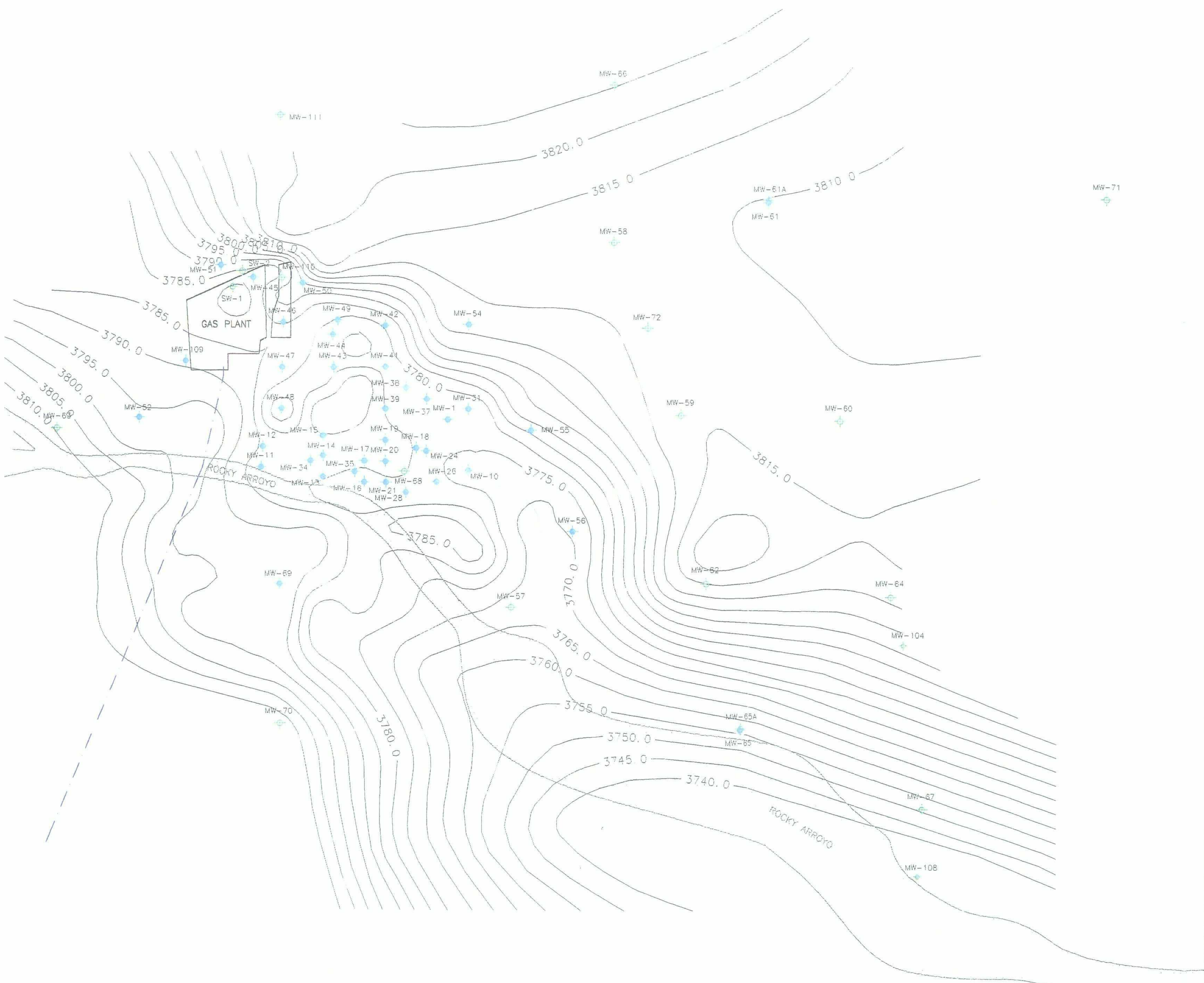
SHALLOW ZONE CORRECTED GROUNDWATER ELEVATION MAP
JUNE 15-17, 1998

CLIENT: MARATHON OIL COMPANY

LOCATION: INDIAN BASIN REMEDIATION PROJECT
EDDY COUNTY, NEW MEXICO

FILE: 5469SGW698 (1:1000)	PROJECT NO.: 105469
REV.:	

DES.: CL	DET.: DH	DATE: 11/17/98	FIGURE: 2-6
PM:		PE/RG:	



LEGEND

- MONITORING WELL (SHALLOW ZONE)
- MONITORING WELL (LOWER QUEEN)
- CONDENSATE LINE
- 3800.0 — DOLOMITE CONTOUR (CONTOUR INTERVAL = 5 FT))

FLUOR DANIEL GTI

0 FEET 1000
SCALE

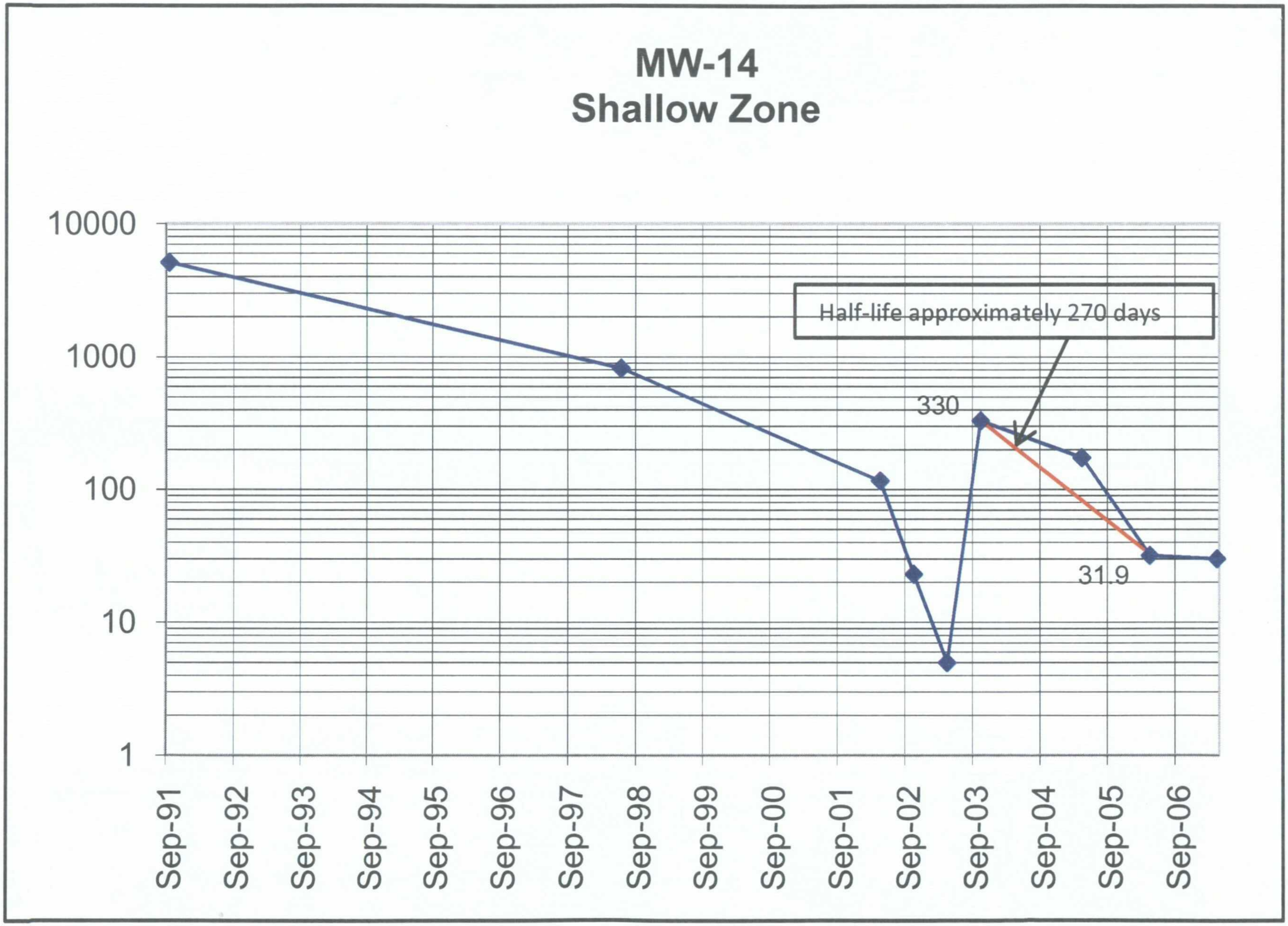
STRUCTURE CONTOUR MAP OF TOP OF BEDROCK

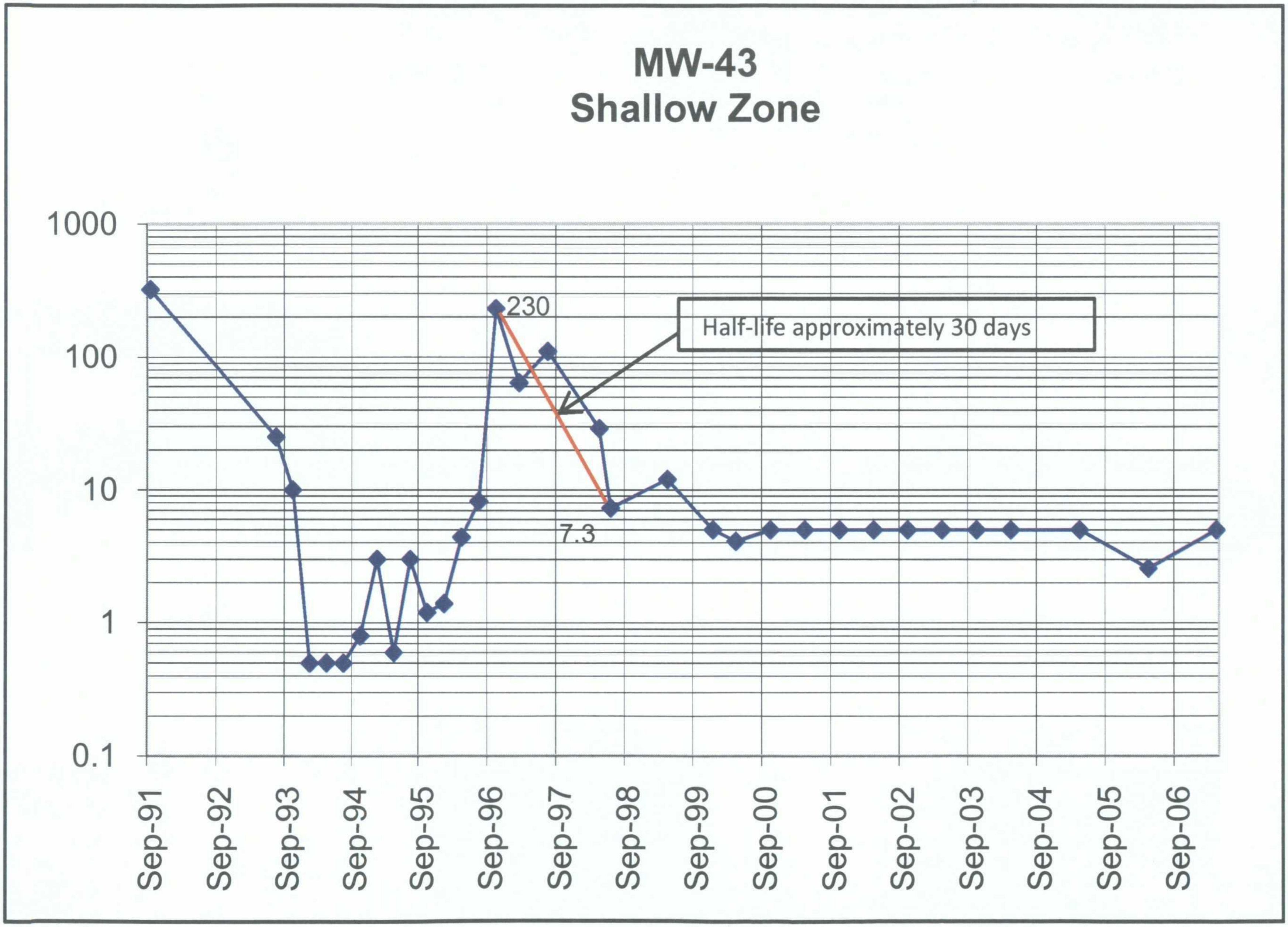
CLIENT: MARATHON OIL COMPANY	
LOCATION: INDIAN BASIN REMEDIATION PROJECT EDDY COUNTY, NEW MEXICO	
FILE: 5469-TOB (1:1000)	PROJECT NO.: 105469
REV.:	
DES.: CL / DET.: DH / DATE: 11/18/98	FIGURE: 2-1
PM: / PE/RG:	

ARCADIS

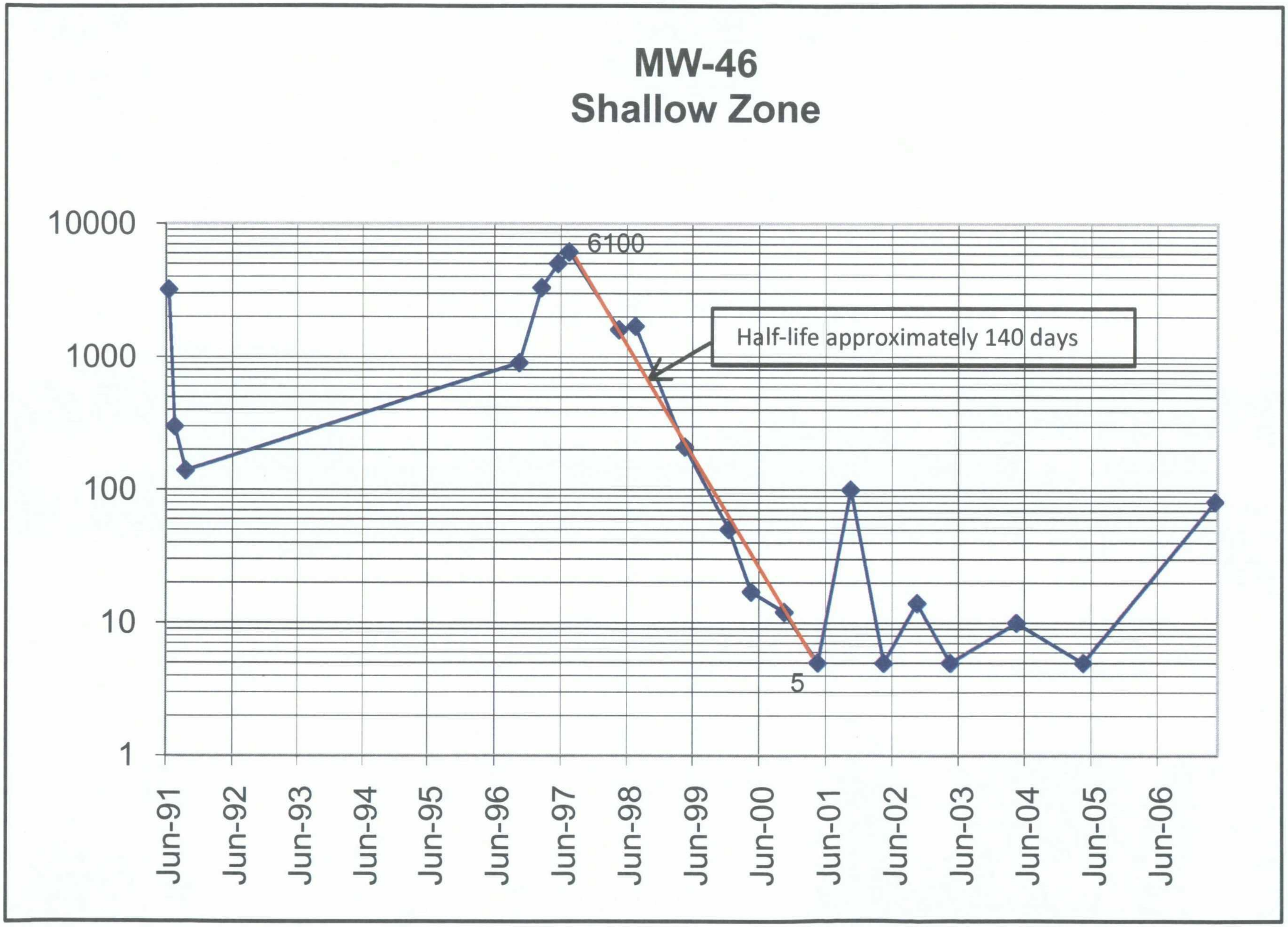
Appendix B

Benzene Half-Life Graphs

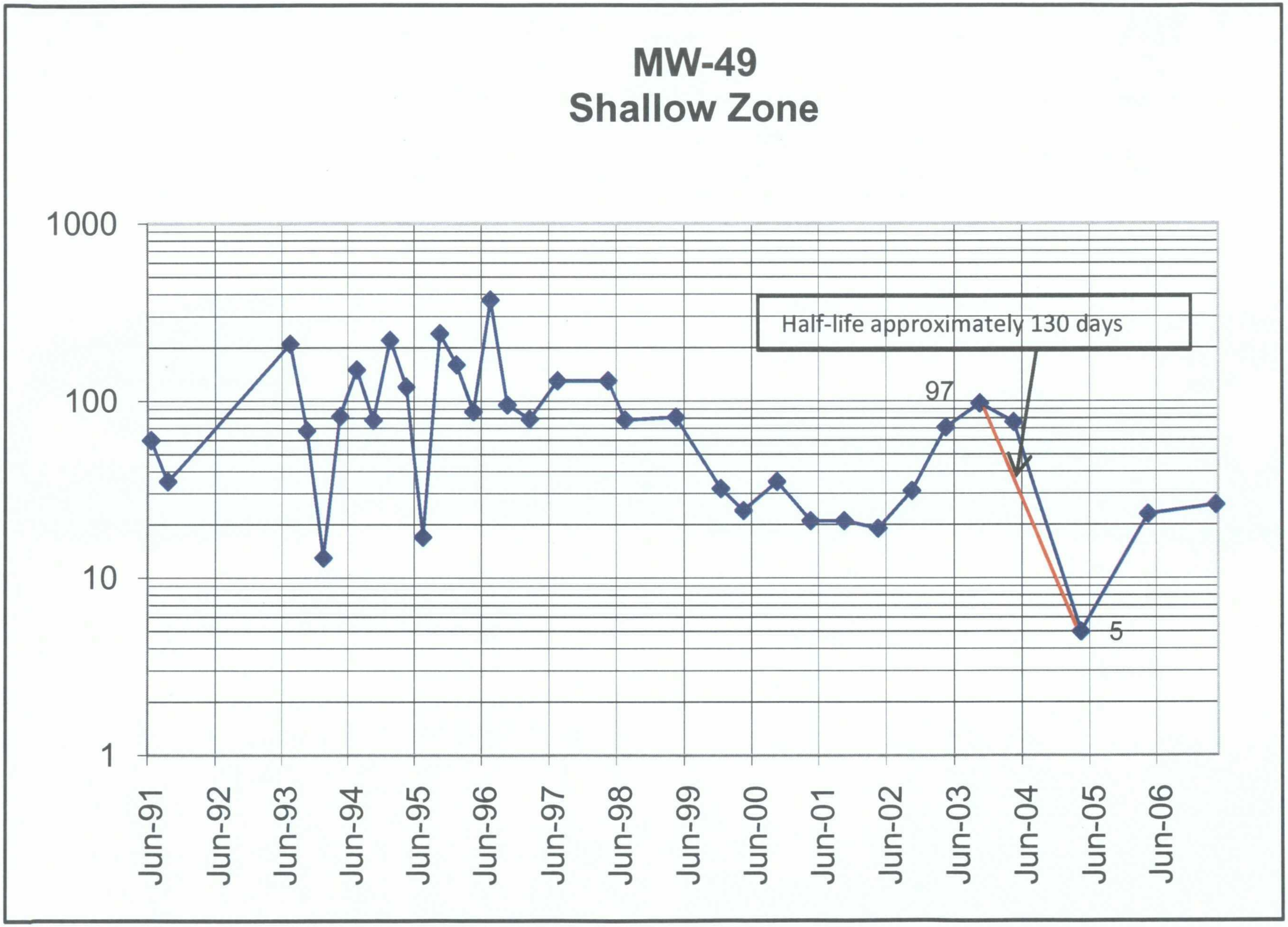

MW-14
Shallow Zone
10000
1000
100
10
1
Half-life approximately 270 days
330
31.9
Sep-91
Sep-92
Sep-93
Sep-94
Sep-95
Sep-96
Sep-97
Sep-98
Sep-99
Sep-00
Sep-01
Sep-02
Sep-03
Sep-04
Sep-05
Sep-06

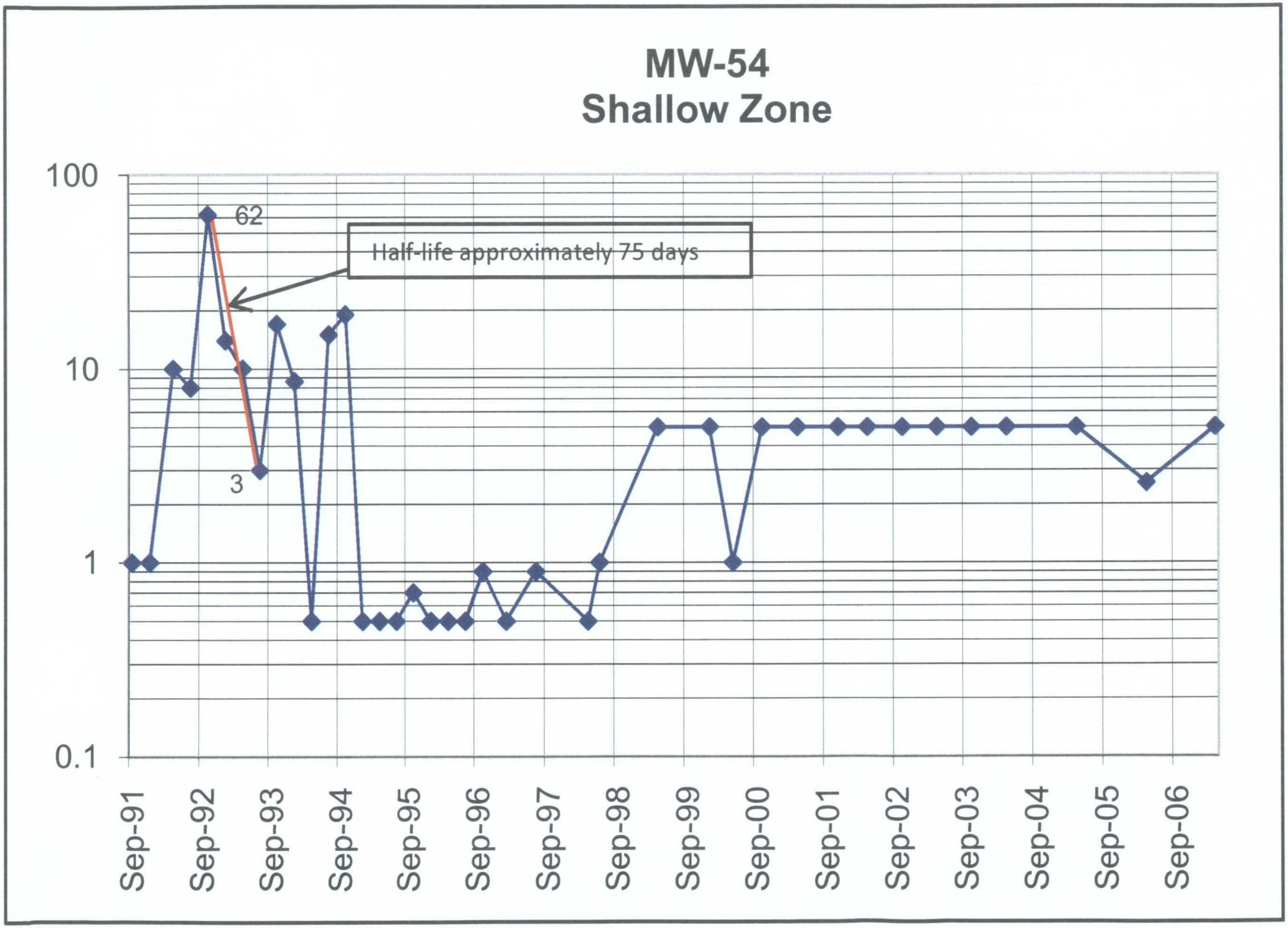


MW-43
Shallow Zone
1000
100
10
1
0.1
230
7.3
Half-life approximately 30 days
Sep-91
Sep-92
Sep-93
Sep-94
Sep-95
Sep-96
Sep-97
Sep-98
Sep-99
Sep-00
Sep-01
Sep-02
Sep-03
Sep-04
Sep-05
Sep-06



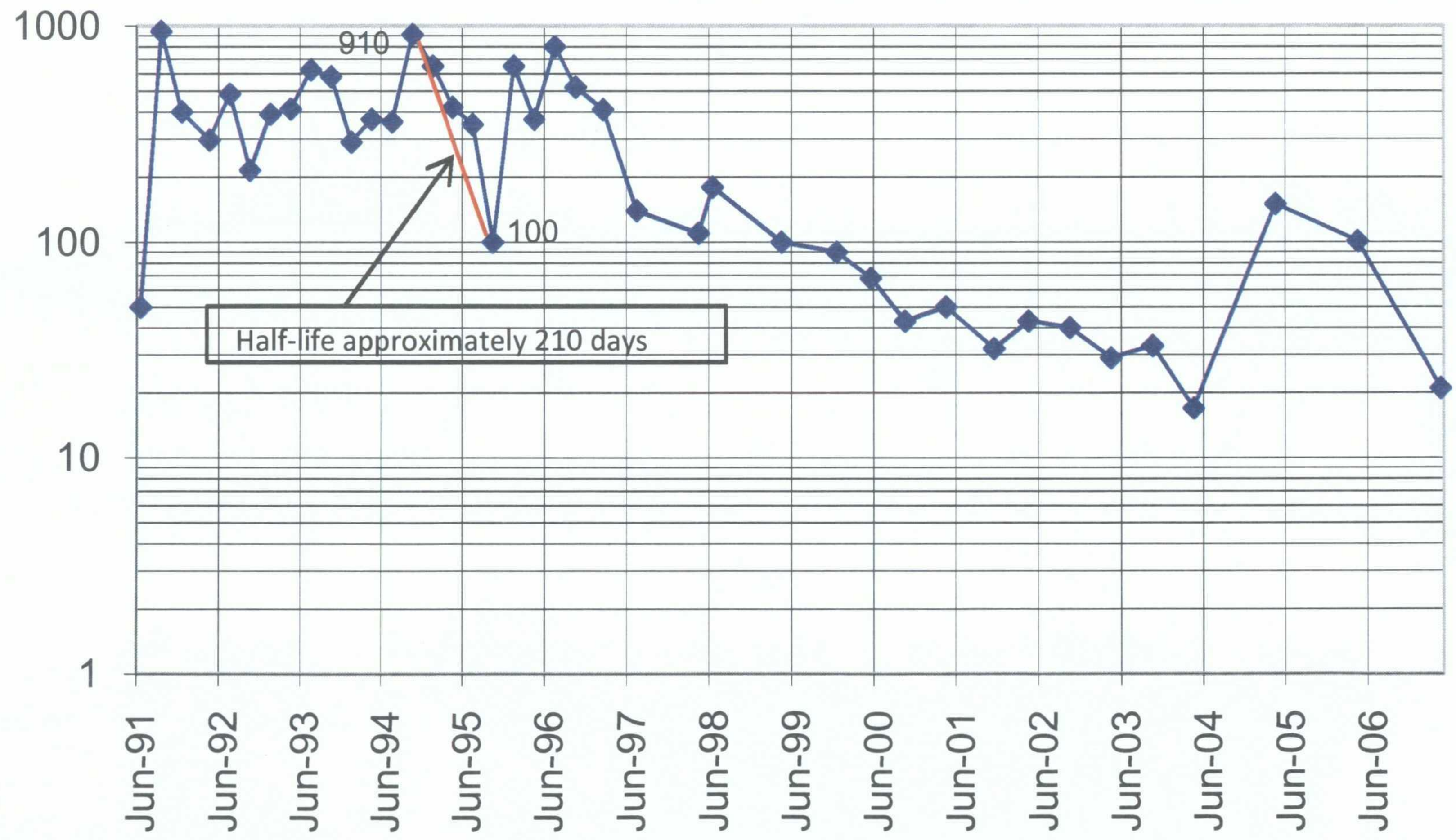
MW-46
Shallow Zone
10000
1000
100
10
1
6100
5
Half-life approximately 140 days
Jun-91
Jun-92
Jun-93
Jun-94
Jun-95
Jun-96
Jun-97
Jun-98
Jun-99
Jun-00
Jun-01
Jun-02
Jun-03
Jun-04
Jun-05
Jun-06

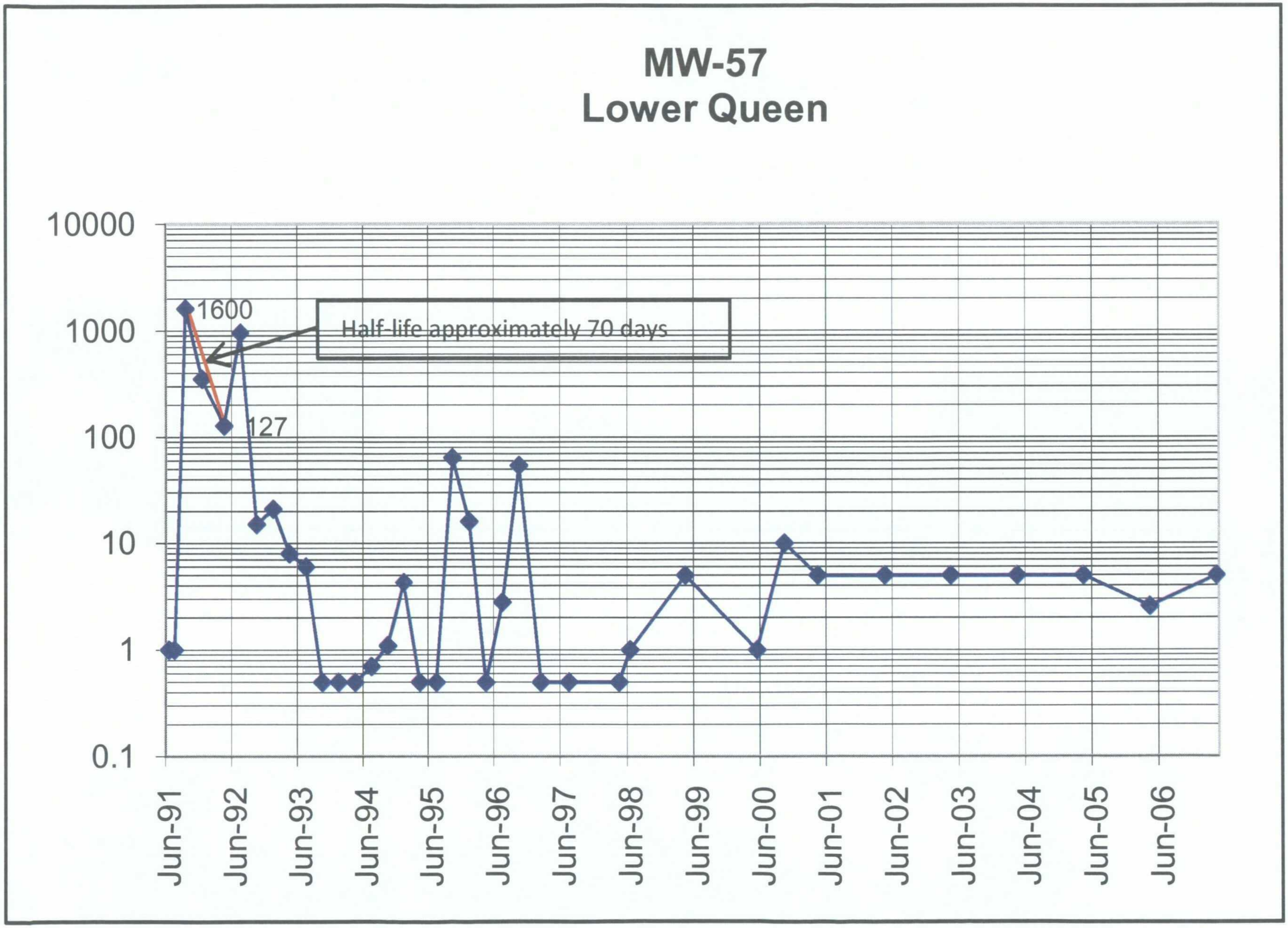

MW-49
Shallow Zone
1000
100
10
1
Half-life approximately 130 days
97
5
Jun-91
Jun-92
Jun-93
Jun-94
Jun-95
Jun-96
Jun-97
Jun-98
Jun-99
Jun-00
Jun-01
Jun-02
Jun-03
Jun-04
Jun-05
Jun-06

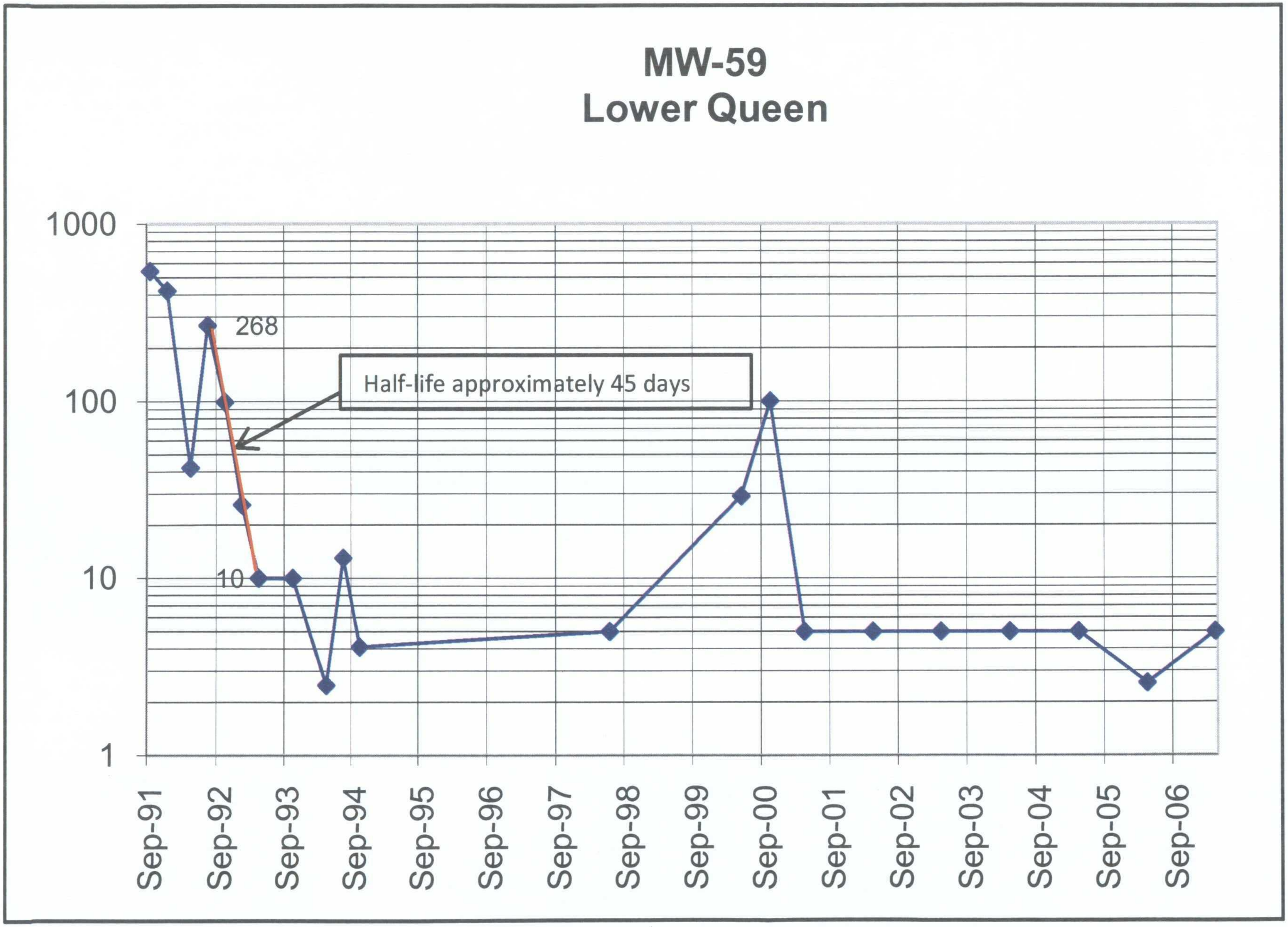


MW-54
Shallow Zone
100
10
1
0.1
62
3
Half-life approximately 75 days
Sep-91
Sep-92
Sep-93
Sep-94
Sep-95
Sep-96
Sep-97
Sep-98
Sep-99
Sep-00
Sep-01
Sep-02
Sep-03
Sep-04
Sep-05
Sep-06

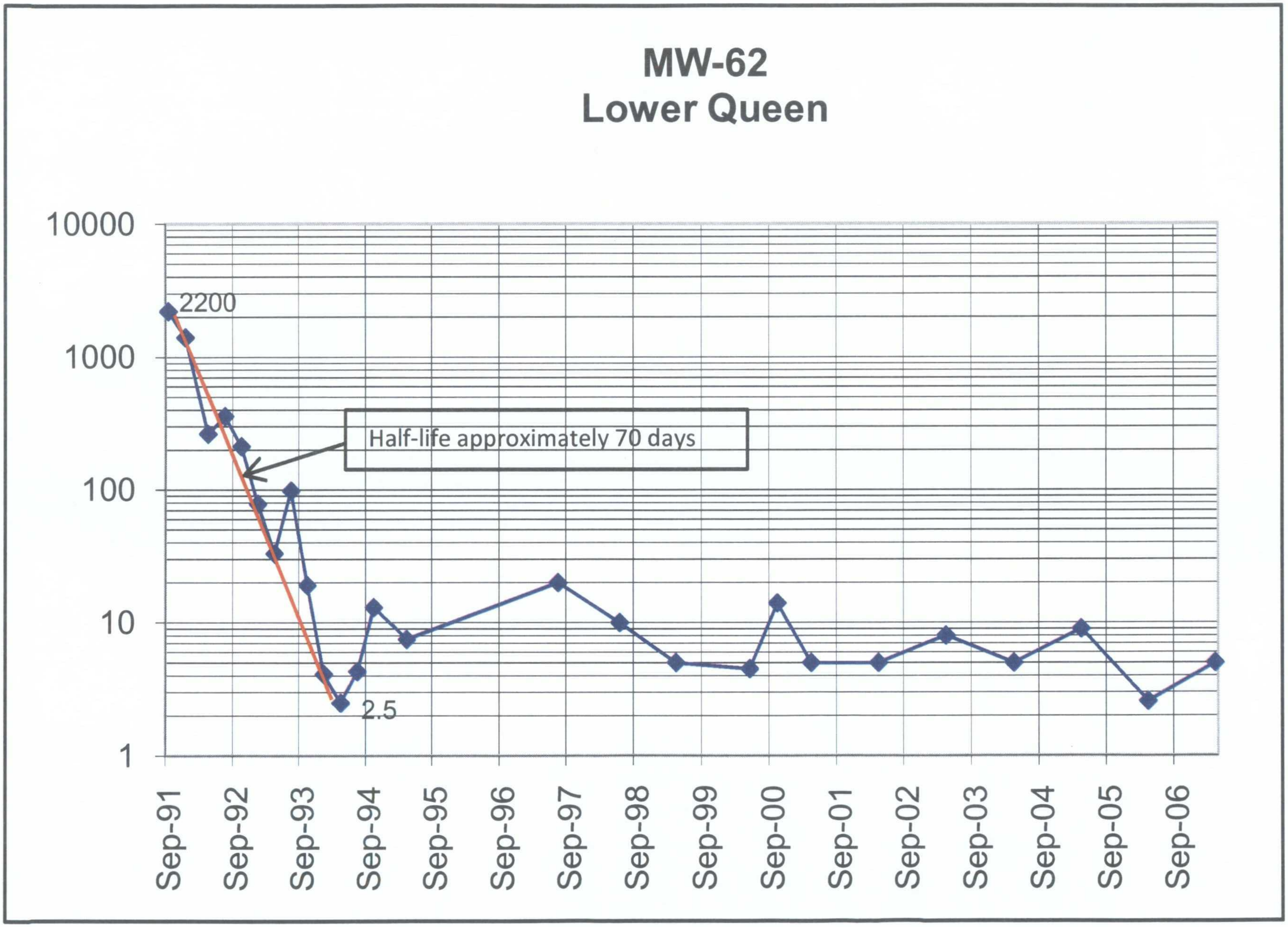
MW-55
Shallow Zone

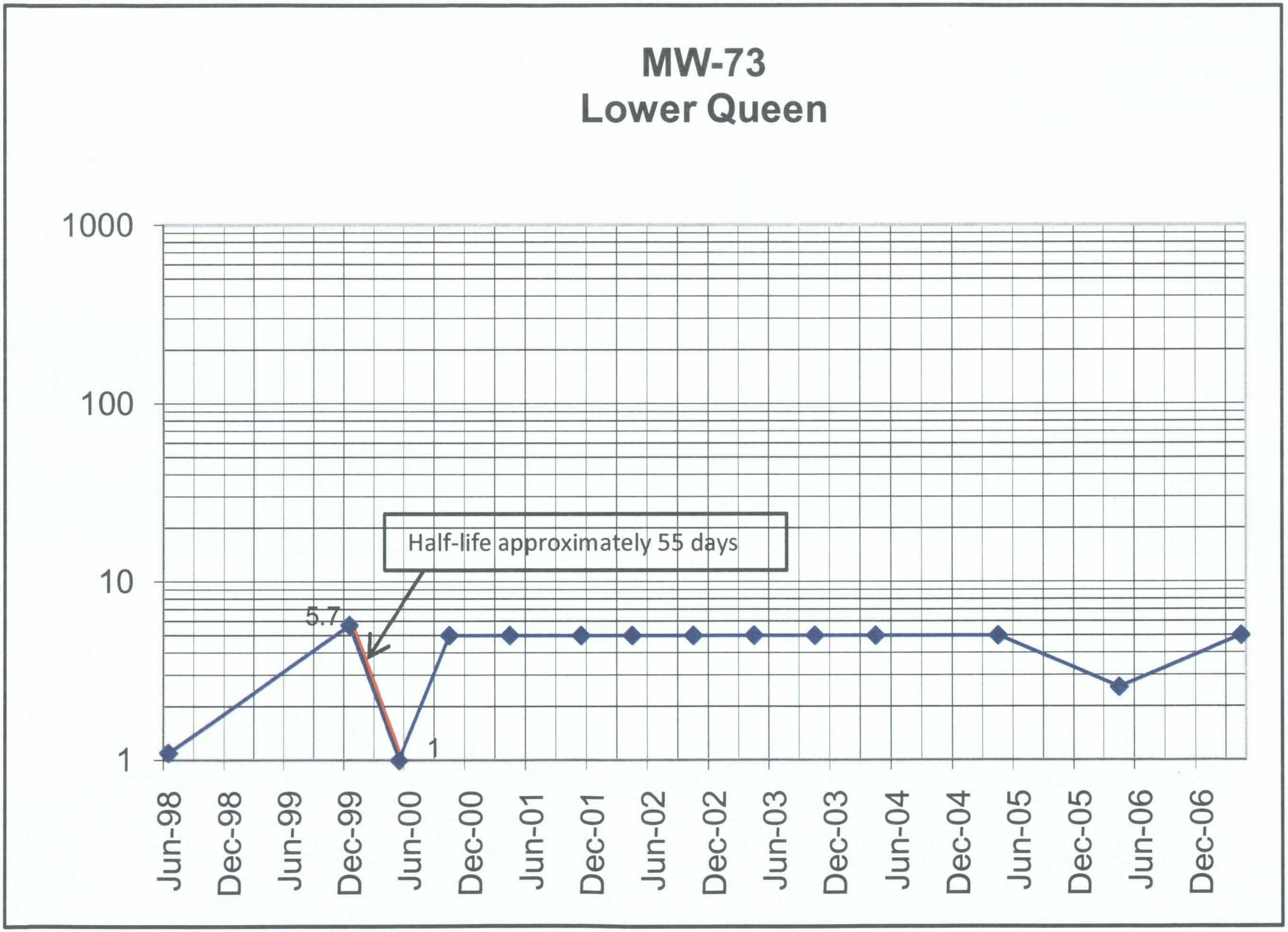


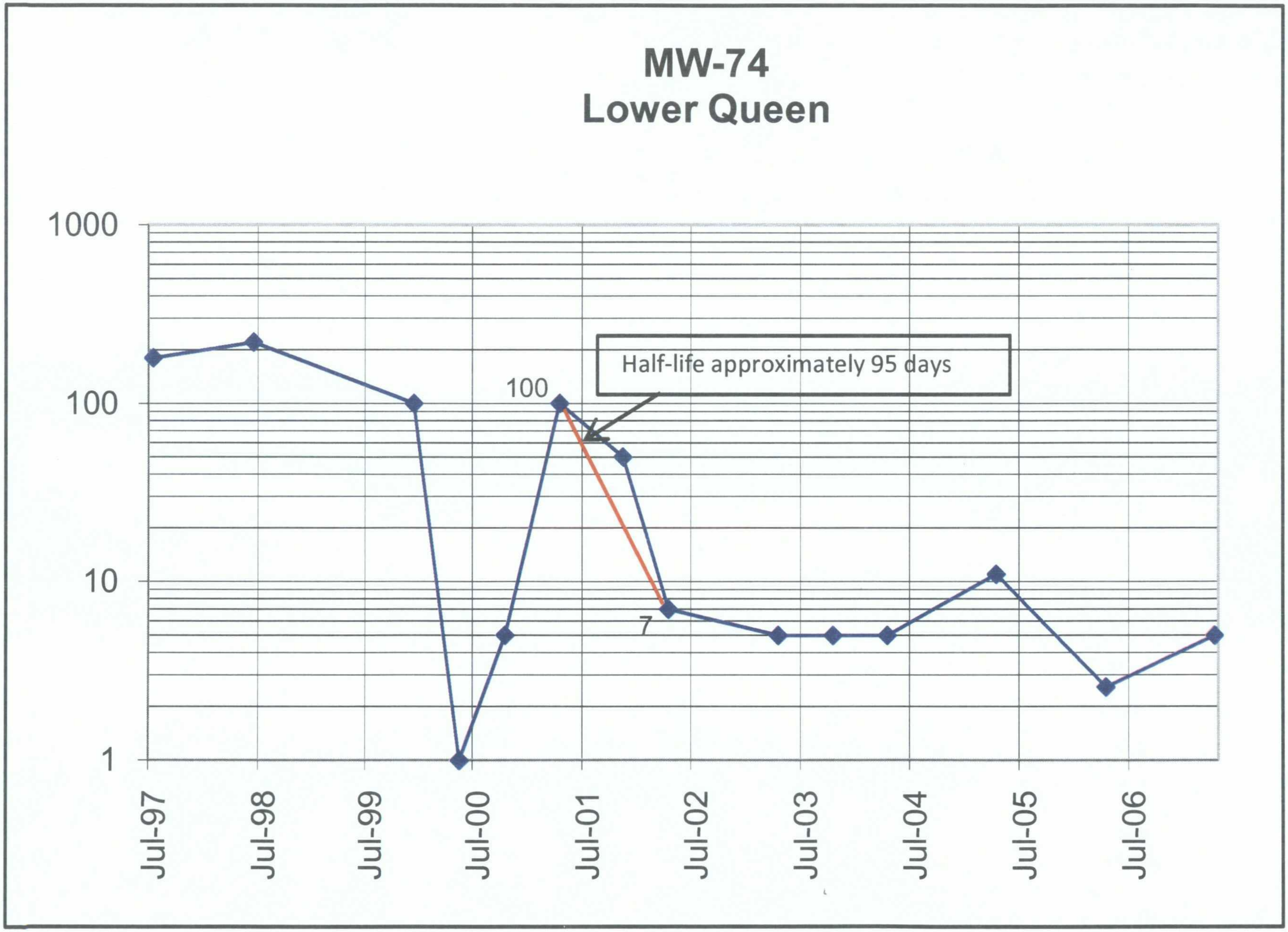

MW-57
Lower Queen
Half-life approximately 70 days
1600
127
10000
1000
100
10
1
0.1
Jun-91
Jun-92
Jun-93
Jun-94
Jun-95
Jun-96
Jun-97
Jun-98
Jun-99
Jun-00
Jun-01
Jun-02
Jun-03
Jun-04
Jun-05
Jun-06

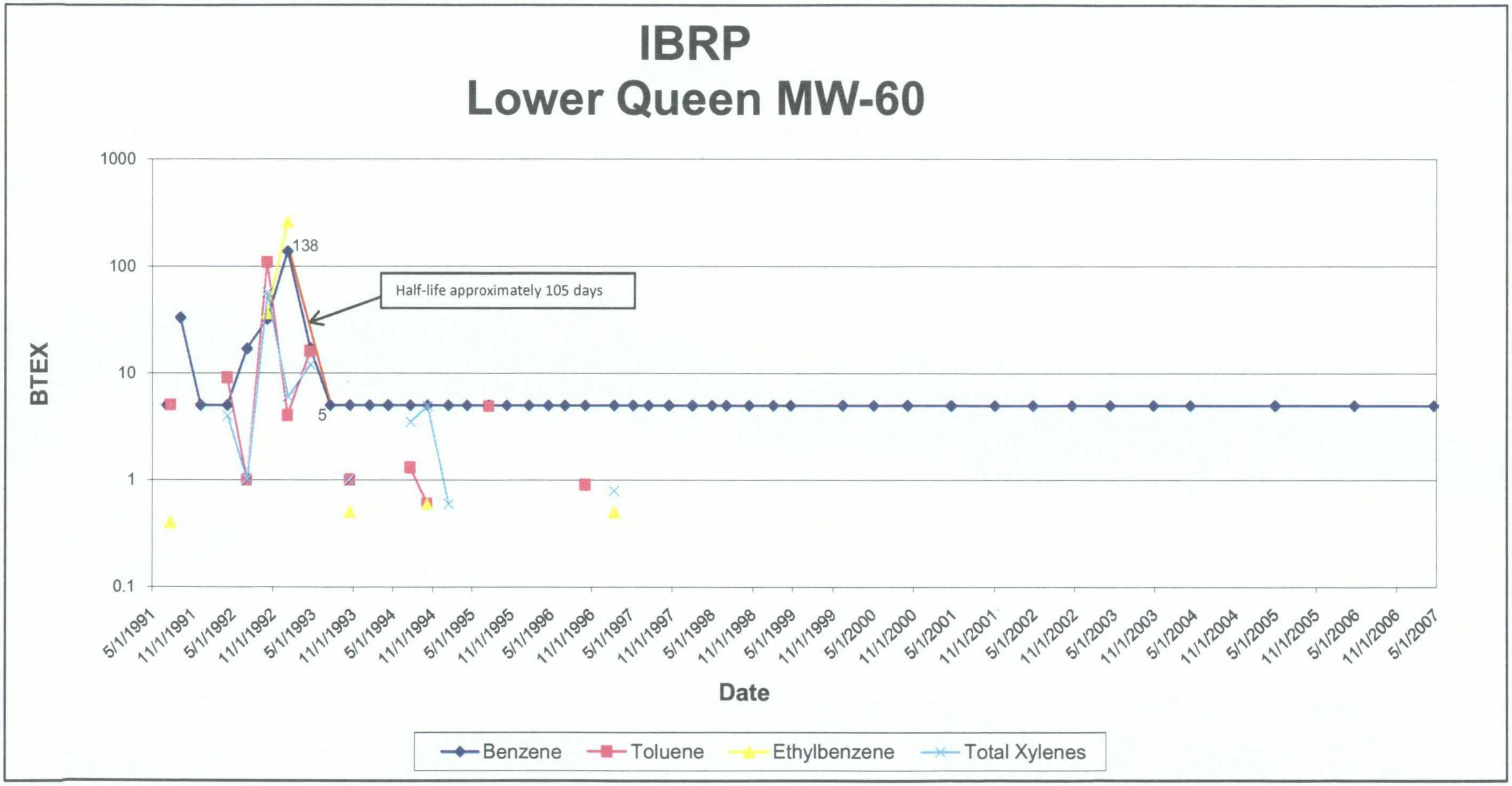


MW-59
Lower Queen
1000
100
10
1
268
10
Half-life approximately 45 days
Sep-91
Sep-92
Sep-93
Sep-94
Sep-95
Sep-96
Sep-97
Sep-98
Sep-99
Sep-00
Sep-01
Sep-02
Sep-03
Sep-04
Sep-05
Sep-06

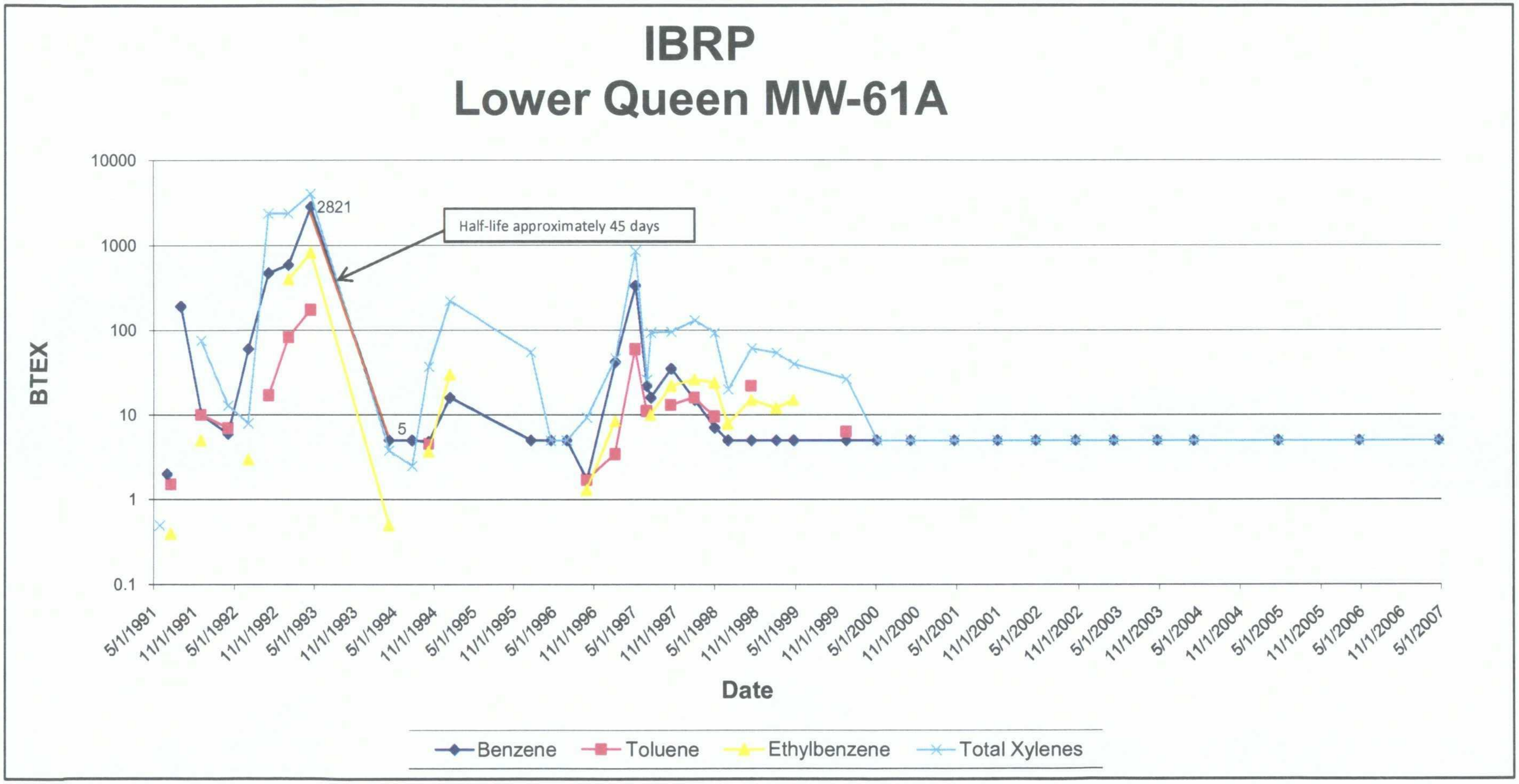

MW-62
Lower Queen
10000
1000
100
10
1
2200
2.5
Half-life approximately 70 days
Sep-91
Sep-92
Sep-93
Sep-94
Sep-95
Sep-96
Sep-97
Sep-98
Sep-99
Sep-00
Sep-01
Sep-02
Sep-03
Sep-04
Sep-05
Sep-06

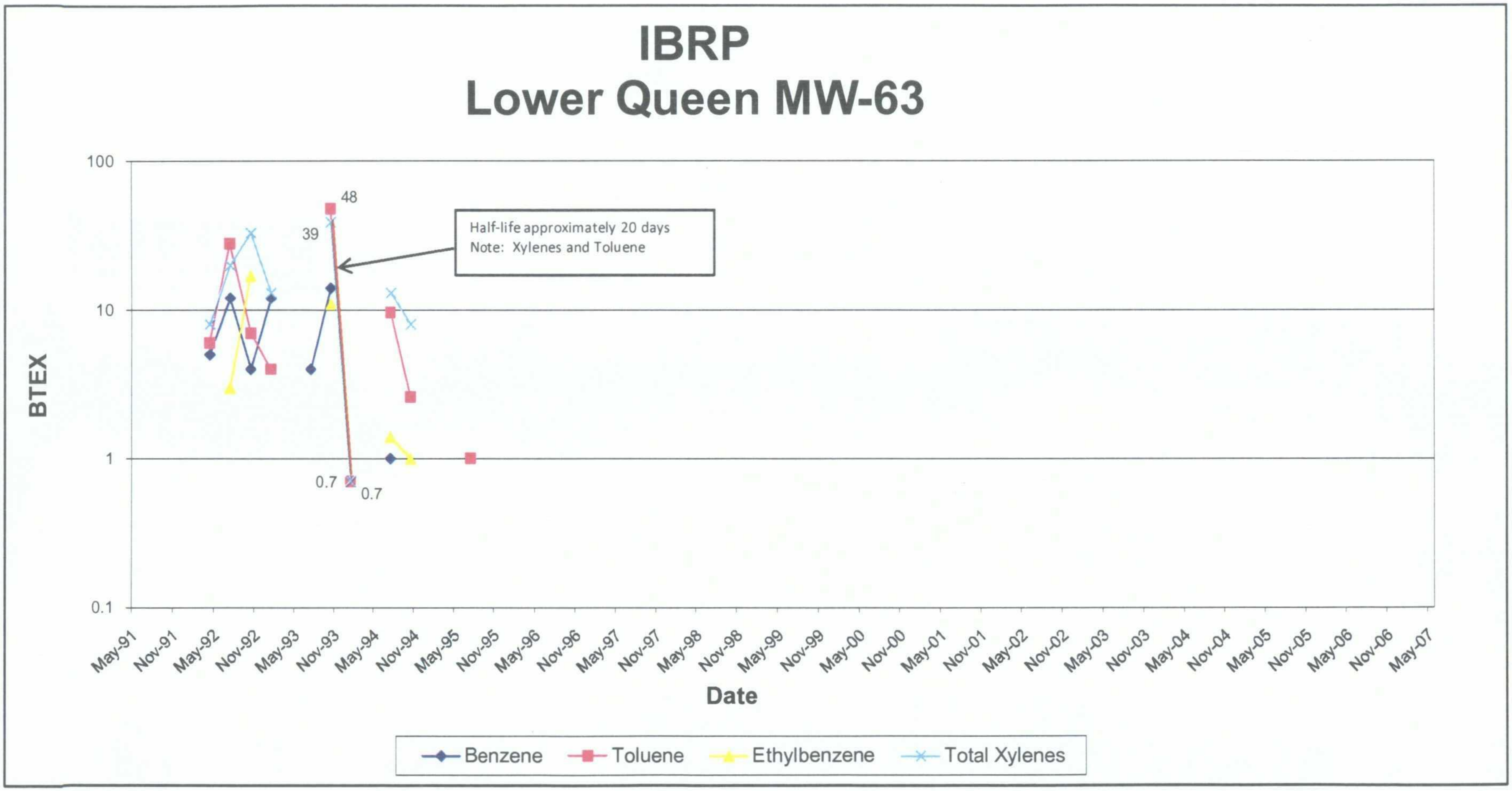

MW-73
Lower Queen
1000
100
10
1
Half-life approximately 55 days
5.7
1
Jun-98
Dec-98
Jun-99
Dec-99
Jun-00
Dec-00
Jun-01
Dec-01
Jun-02
Dec-02
Jun-03
Dec-03
Jun-04
Dec-04
Jun-05
Dec-05
Jun-06
Dec-06

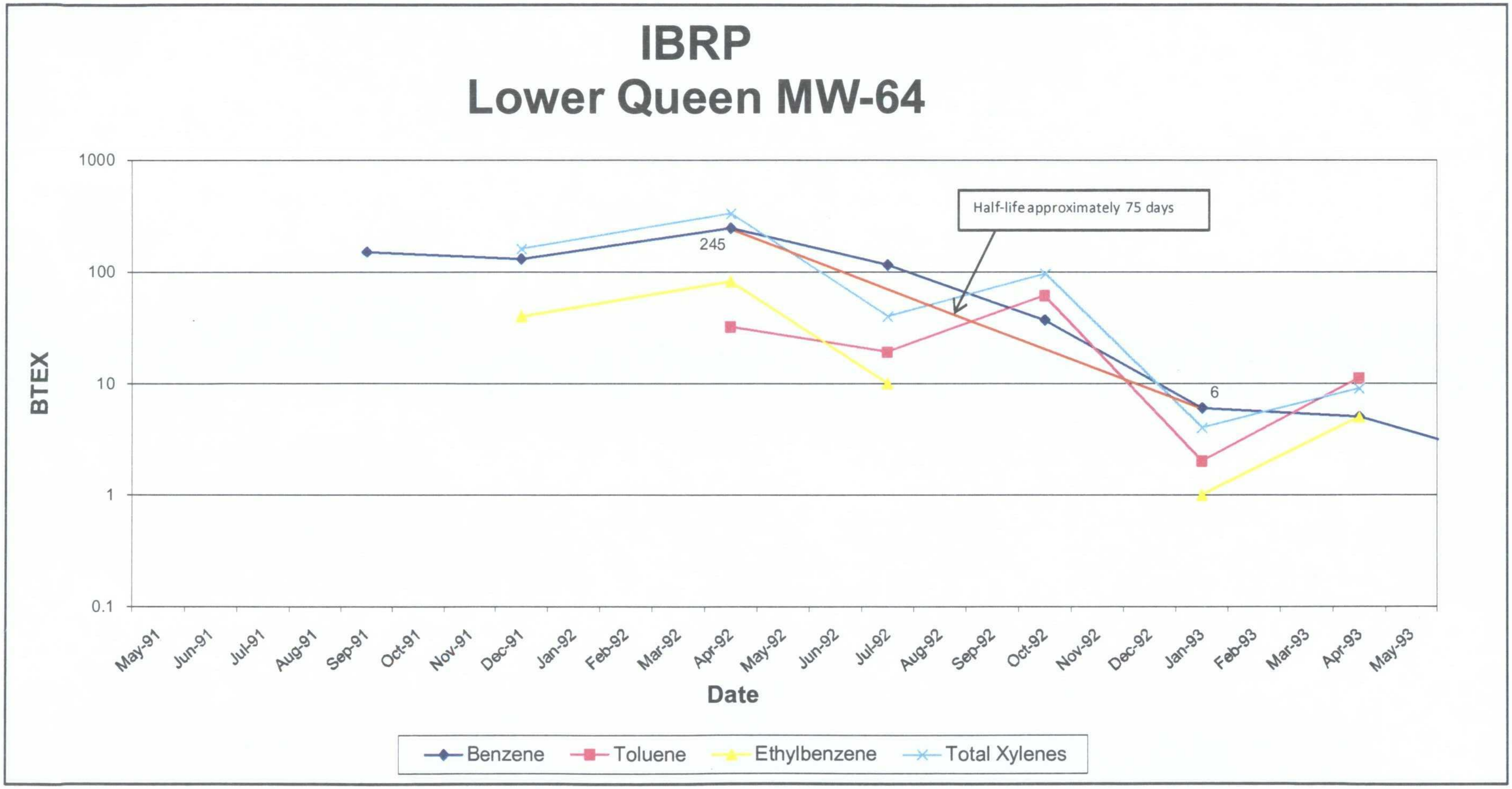

MW-74
Lower Queen
1000
100
10
1
Half-life approximately 95 days
100
7
Jul-97
Jul-98
Jul-99
Jul-00
Jul-01
Jul-02
Jul-03
Jul-04
Jul-05
Jul-06



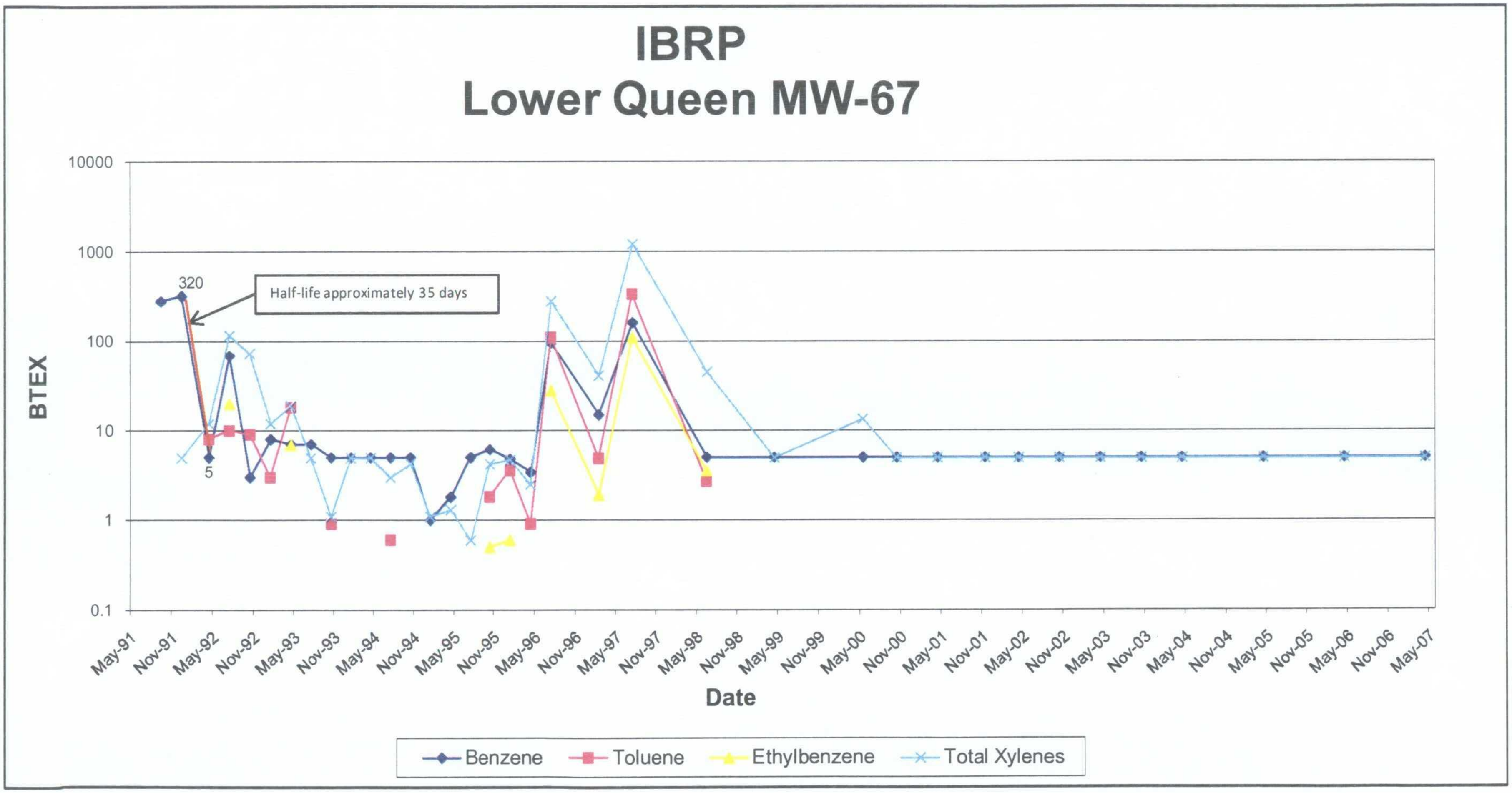
IBRP
Lower Queen MW-60
BTEX
1000
100
10
1
0.1
138
5
Half-life approximately 105 days
Date
Benzene
Toluene
Ethylbenzene
Total Xylenes


IBRP
Lower Queen MW-61A
BTEX
10000
1000
100
10
1
0.1
2821
5
Half-life approximately 45 days
5/1/1991
11/1/1991
5/1/1992
11/1/1992
5/1/1993
11/1/1993
5/1/1994
11/1/1994
5/1/1995
11/1/1995
5/1/1996
11/1/1996
5/1/1997
11/1/1997
5/1/1998
11/1/1998
5/1/1999
11/1/1999
5/1/2000
11/1/2000
5/1/2001
11/1/2001
5/1/2002
11/1/2002
5/1/2003
11/1/2003
5/1/2004
11/1/2004
5/1/2005
11/1/2005
5/1/2006
11/1/2006
5/1/2007
Date
Benzene
Toluene
Ethylbenzene
Total Xylenes

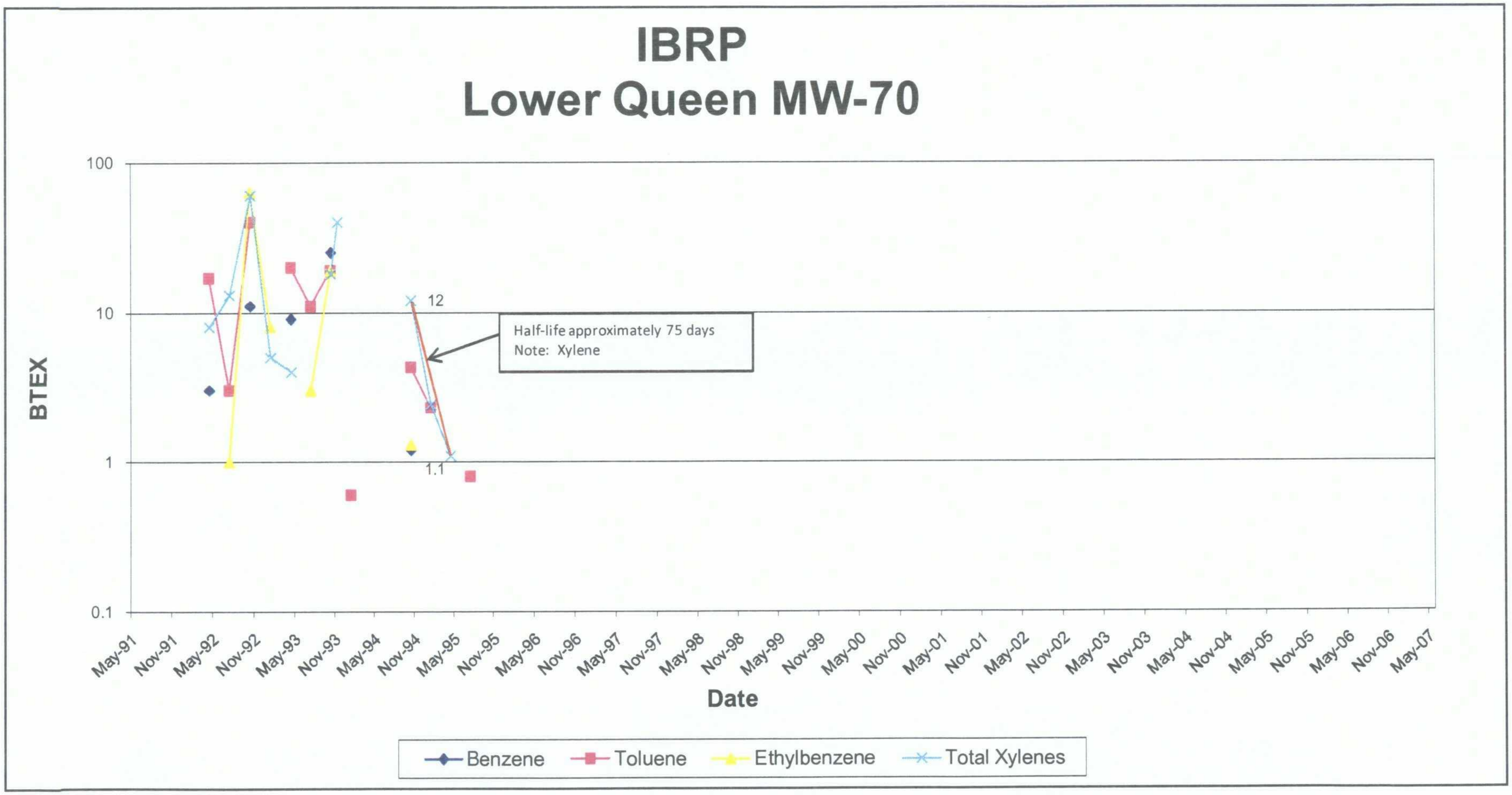

IBRP
Lower Queen MW-63
100
10
1
0.1
BTEX
48
39
0.7
0.7
Half-life approximately 20 days
Note: Xylenes and Toluene
May-91
Nov-91
May-92
Nov-92
May-93
Nov-93
May-94
Nov-94
May-95
Nov-95
May-96
Nov-96
May-97
Nov-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
Nov-01
May-02
Nov-02
May-03
Nov-03
May-04
Nov-04
May-05
Nov-05
May-06
Nov-06
May-07
Date
Benzene
Toluene
Ethylbenzene
Total Xylenes

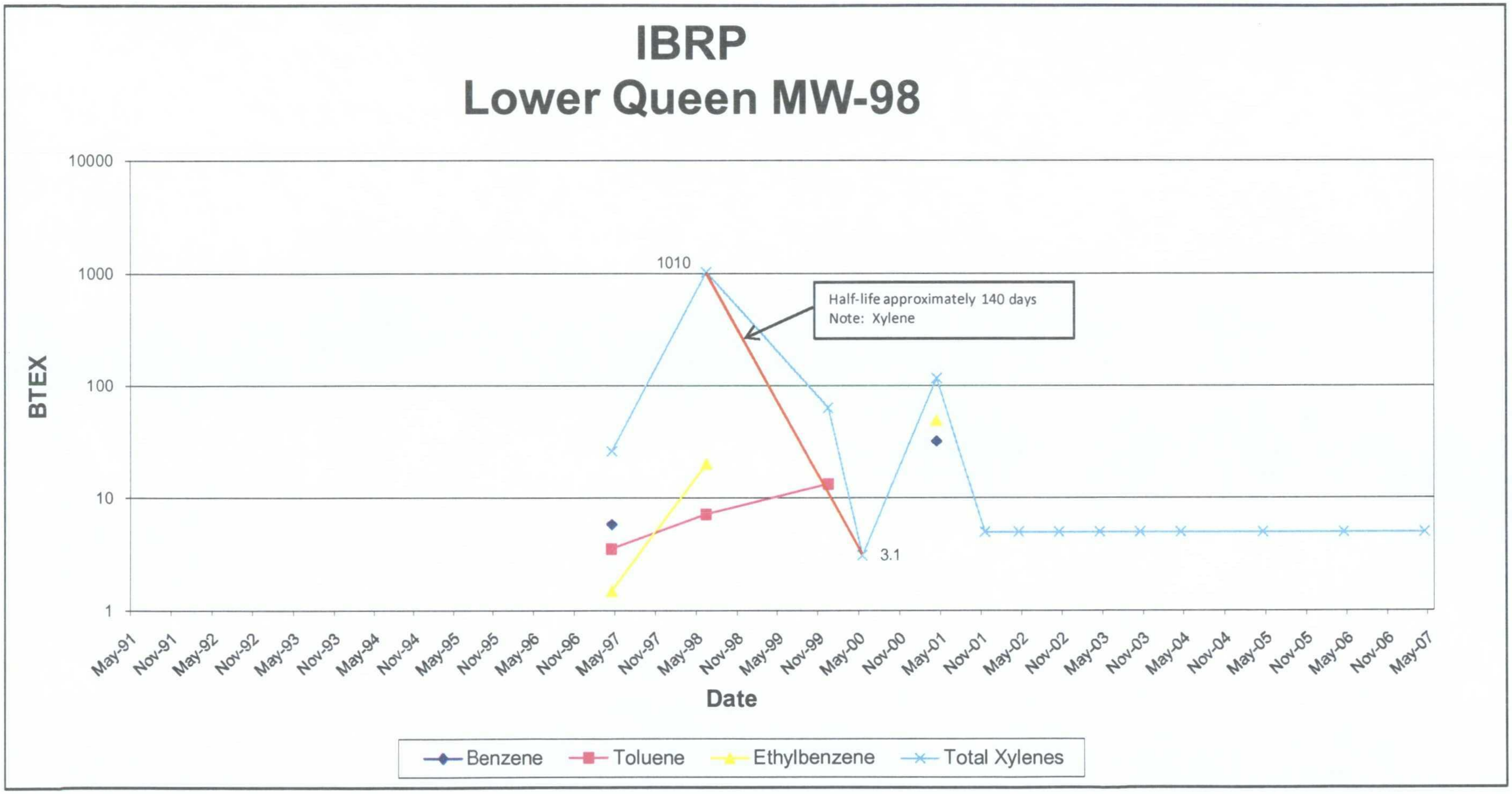


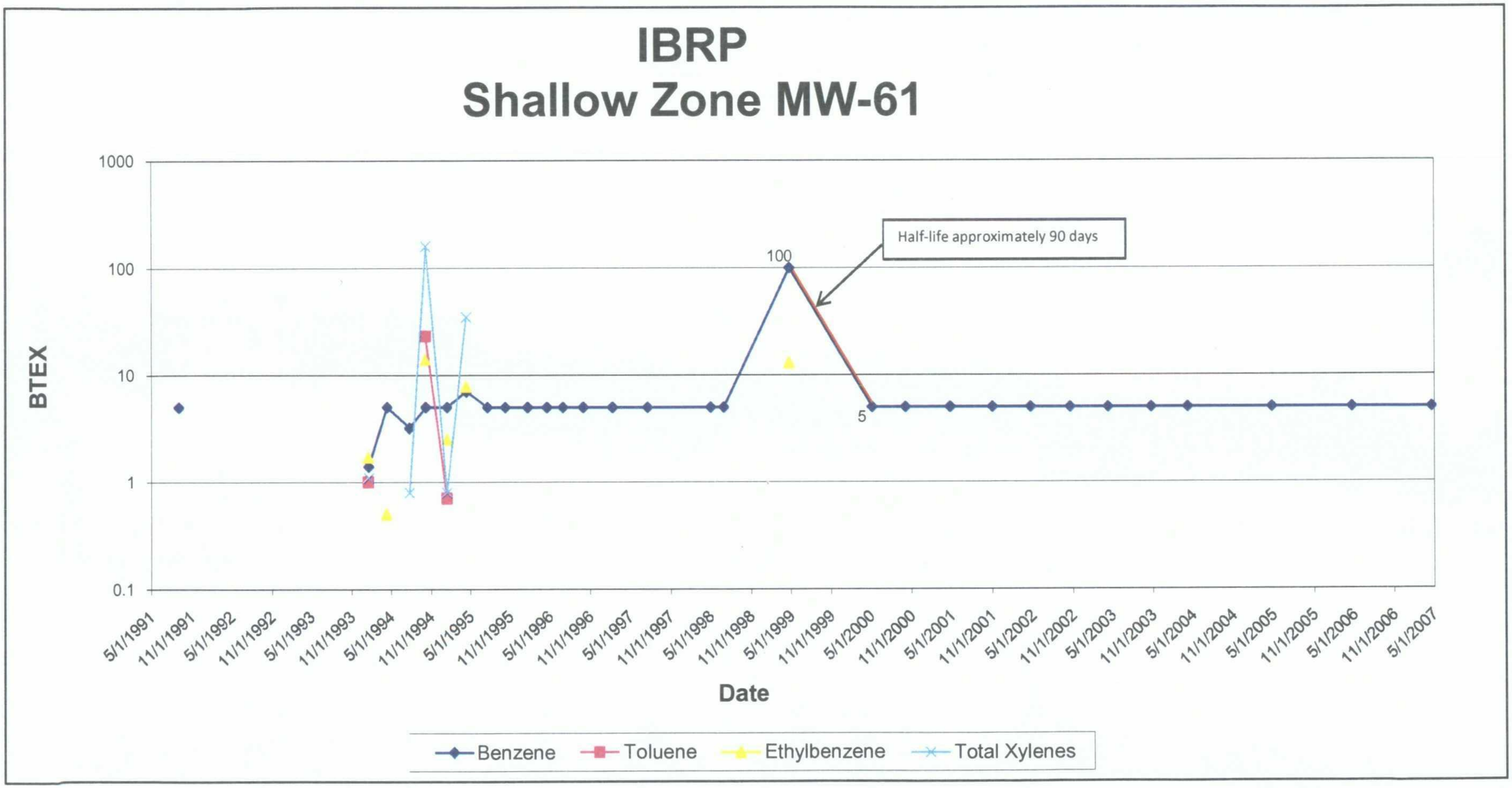
IBRP
Lower Queen MW-64
BTEX
1000
100
10
1
0.1
Half-life approximately 75 days
245
6
May-91
Jun-91
Jul-91
Aug-91
Sep-91
Oct-91
Nov-91
Dec-91
Jan-92
Feb-92
Mar-92
Apr-92
May-92
Jun-92
Jul-92
Aug-92
Sep-92
Oct-92
Nov-92
Dec-92
Jan-93
Feb-93
Mar-93
Apr-93
May-93
Date
Benzene
Toluene
Ethylbenzene
Total Xylenes



IBRP
Lower Queen MW-67
BTEX
10000
1000
100
10
1
0.1
320
5
Half-life approximately 35 days
May-91
Nov-91
May-92
Nov-92
May-93
Nov-93
May-94
Nov-94
May-95
Nov-95
May-96
Nov-96
May-97
Nov-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
Nov-01
May-02
Nov-02
May-03
Nov-03
May-04
Nov-04
May-05
Nov-05
May-06
Nov-06
May-07
Date
Benzene
Toluene
Ethylbenzene
Total Xylenes


IBRP
Lower Queen MW-70
BTEX
100
10
1
0.1
12
1.1
Half-life approximately 75 days
Note: Xylene
May-91
Nov-91
May-92
Nov-92
May-93
Nov-93
May-94
Nov-94
May-95
Nov-95
May-96
Nov-96
May-97
Nov-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
Nov-01
May-02
Nov-02
May-03
Nov-03
May-04
Nov-04
May-05
Nov-05
May-06
Nov-06
May-07
Date
Benzene
Toluene
Ethylbenzene
Total Xylenes


IBRP
Lower Queen MW-98
BTEX
10000
1000
100
10
1
1010
3.1
Half-life approximately 140 days
Note: Xylene
May-91
Nov-91
May-92
Nov-92
May-93
Nov-93
May-94
Nov-94
May-95
Nov-95
May-96
Nov-96
May-97
Nov-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
Nov-01
May-02
Nov-02
May-03
Nov-03
May-04
Nov-04
May-05
Nov-05
May-06
Nov-06
May-07
Date
Benzene
Toluene
Ethylbenzene
Total Xylenes



IBRP
Shallow Zone MW-61
BTEX
1000
100
10
1
0.1
Half-life approximately 90 days
100
5
5/1/1991
11/1/1991
5/1/1992
11/1/1992
5/1/1993
11/1/1993
5/1/1994
11/1/1994
5/1/1995
11/1/1995
5/1/1996
11/1/1996
5/1/1997
11/1/1997
5/1/1998
11/1/1998
5/1/1999
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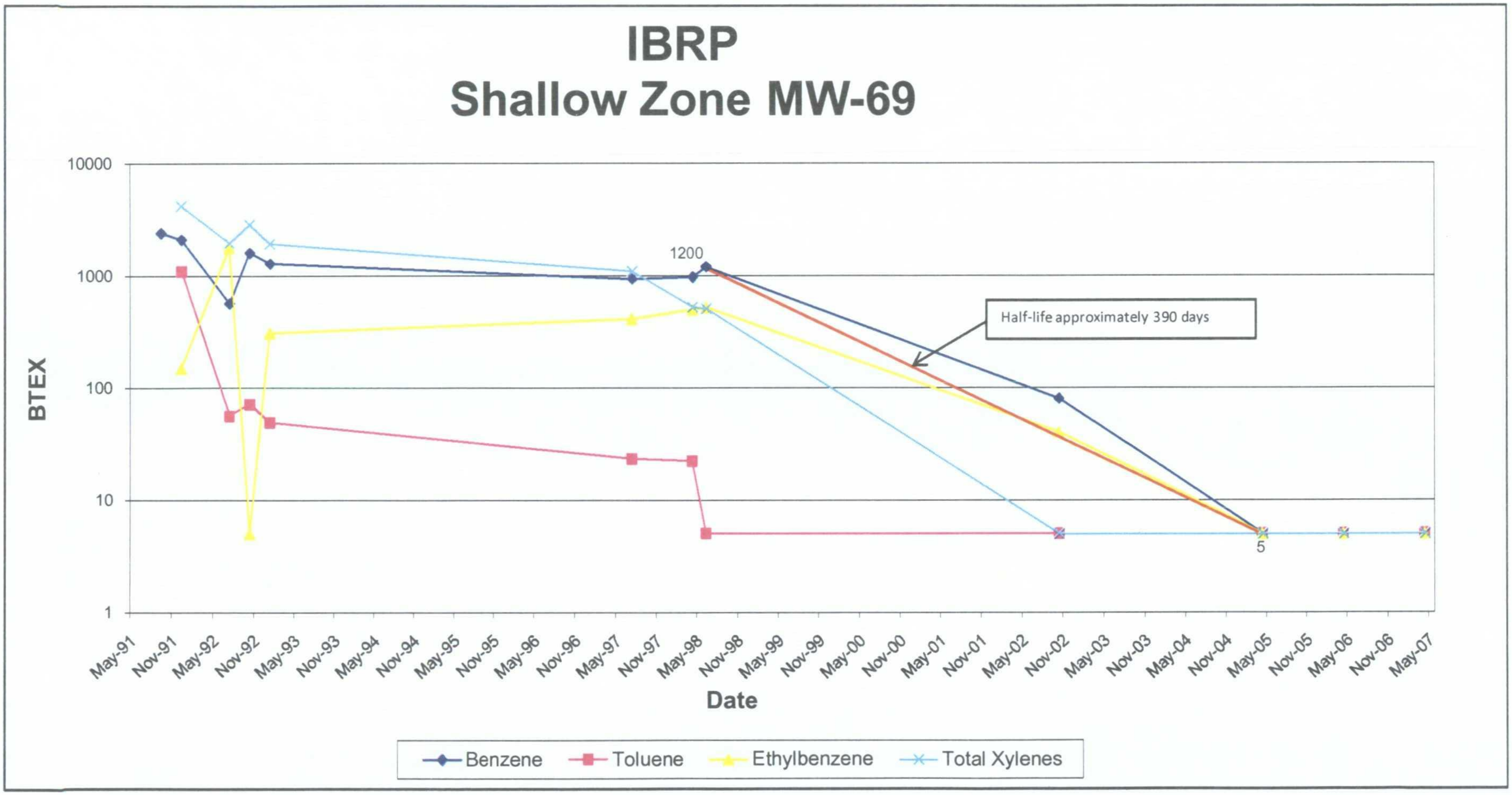
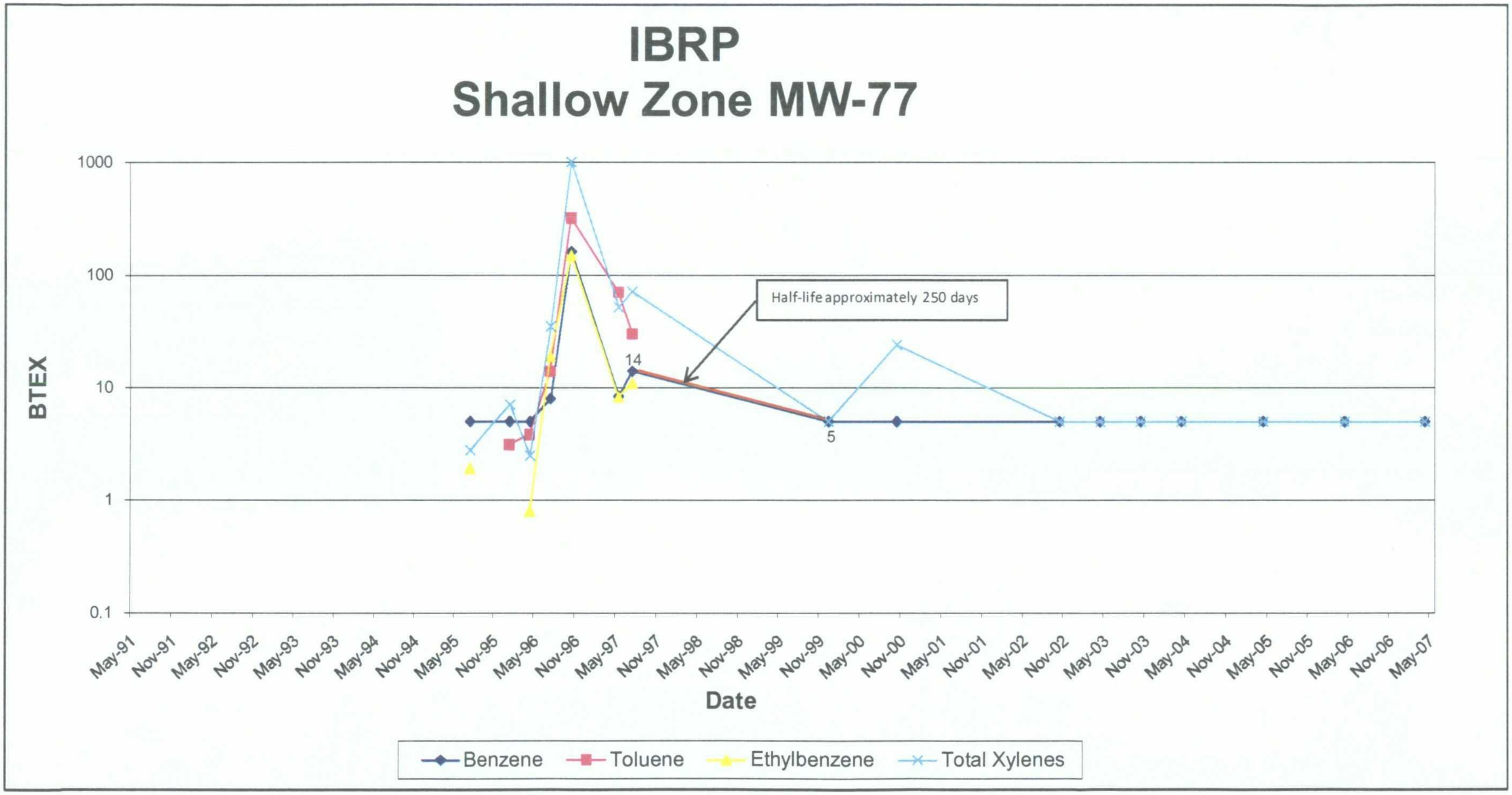
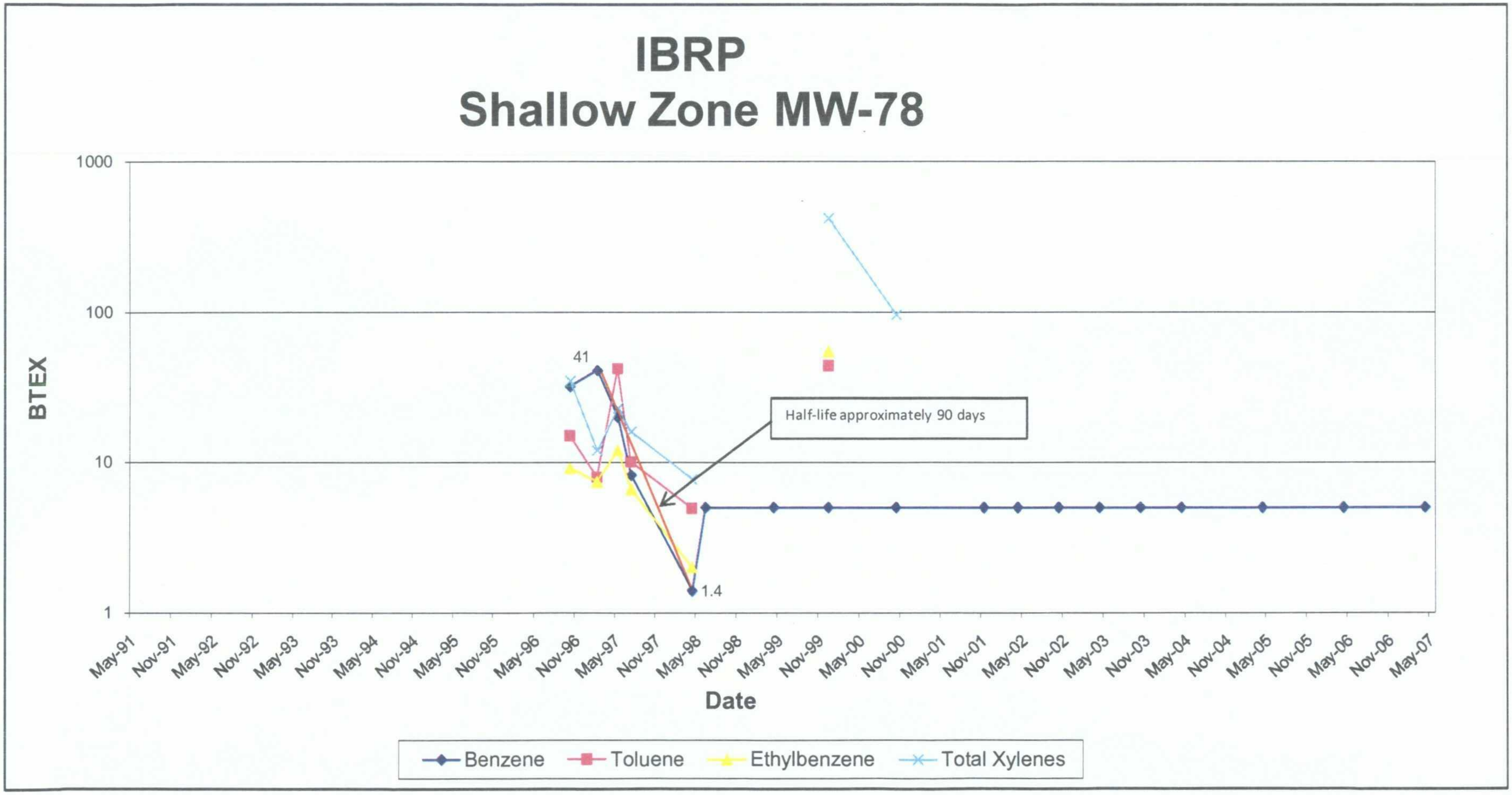
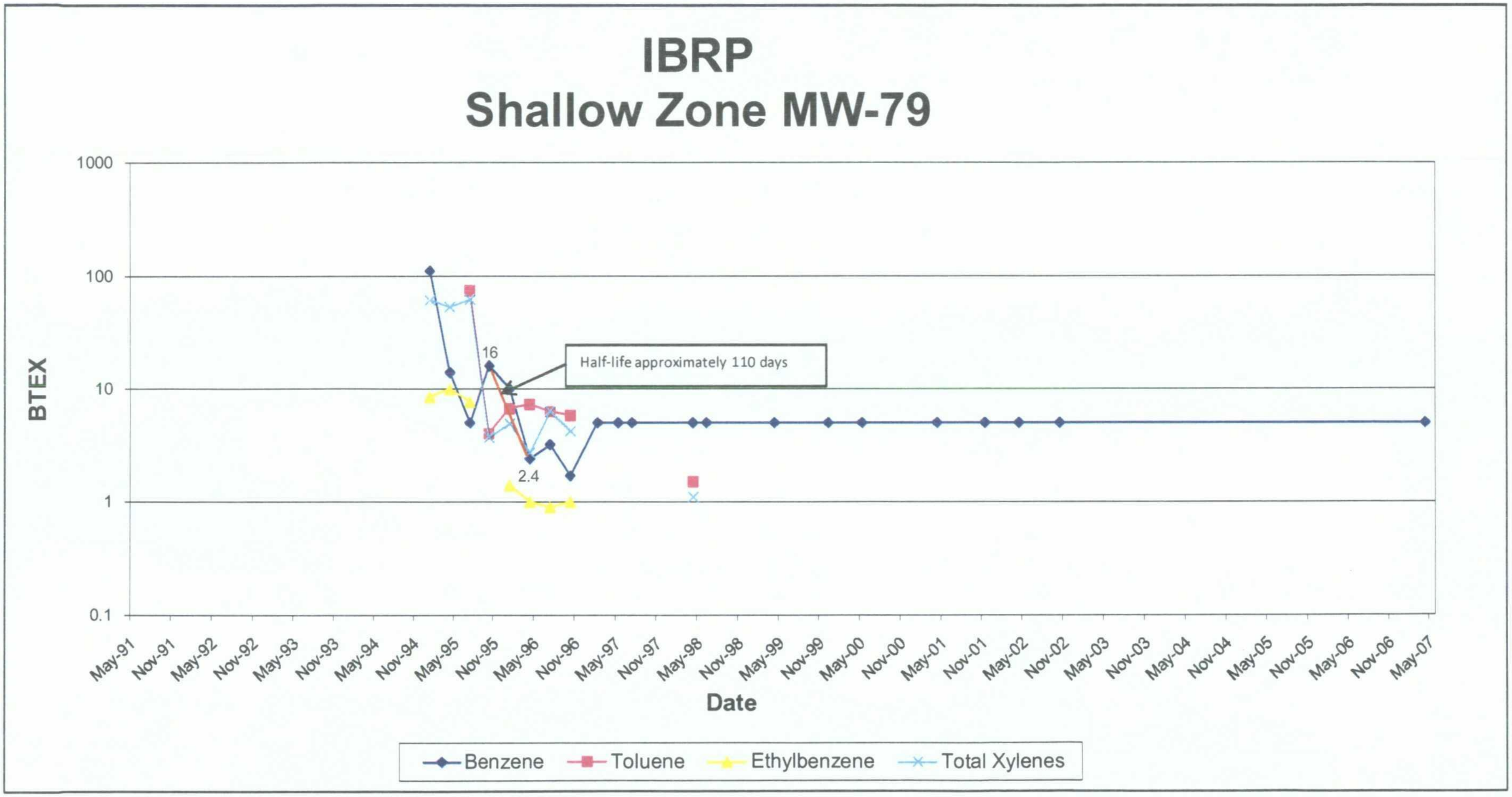
5/1/2000
11/1/2000
5/1/2001
11/1/2001
5/1/2002
11/1/2002
5/1/2003
11/1/2003
5/1/2004
11/1/2004
5/1/2005
11/1/2005
5/1/2006
11/1/2006
5/1/2007
Date
Benzene
Toluene
Ethylbenzene
Total Xylenes


IBRP
Shallow Zone MW-69
BTEX
10000
1000
100
10
1
1200
Half-life approximately 390 days
5
May-91
Nov-91
May-92
Nov-92
May-93
Nov-93
May-94
Nov-94
May-95
Nov-95
May-96
Nov-96
May-97
Nov-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
Nov-01
May-02
Nov-02
May-03
Nov-03
May-04
Nov-04
May-05
Nov-05
May-06
Nov-06
May-07
Date
Benzene
Toluene
Ethylbenzene
Total Xylenes



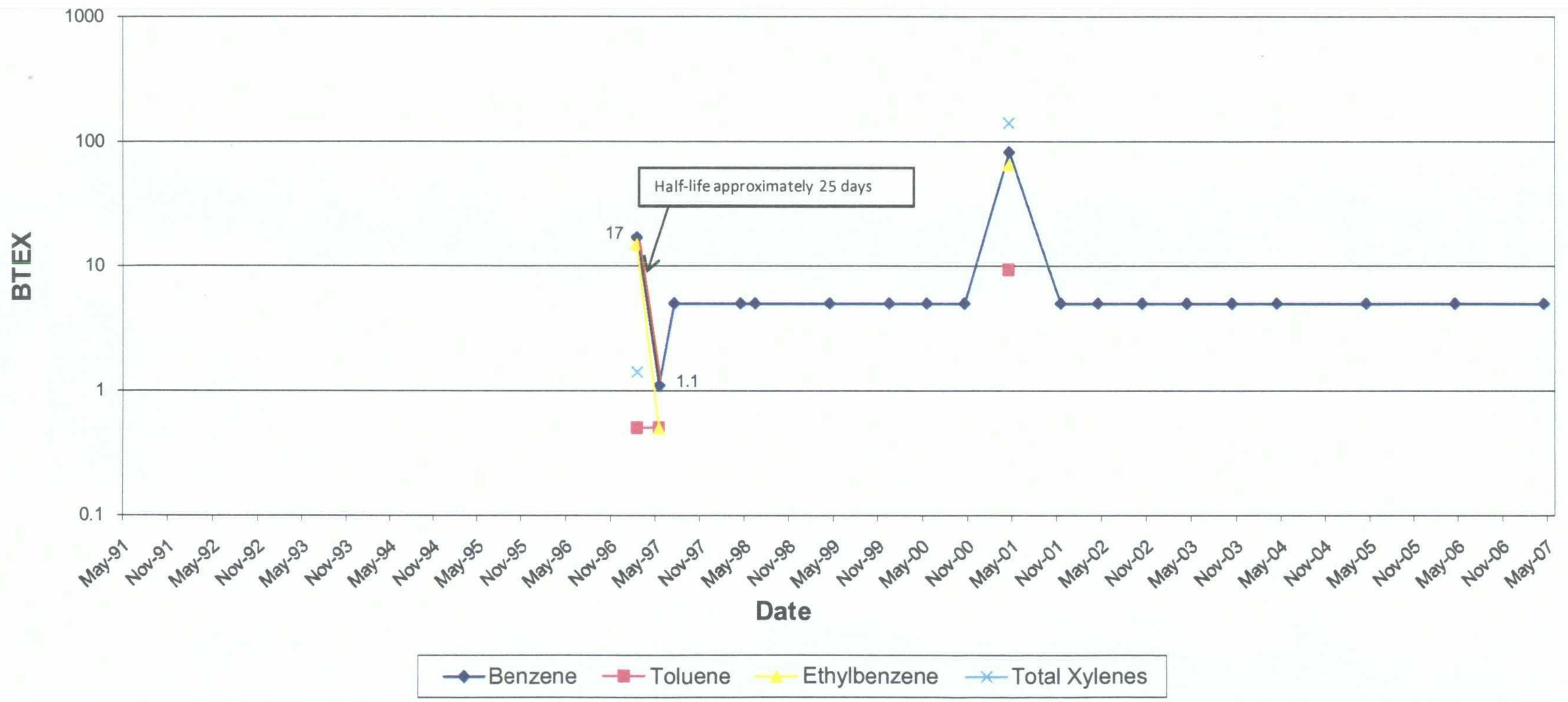
IBRP
Shallow Zone MW-77
BTEX
1000
100
10
1
0.1
Half-life approximately 250 days
14
5
May-91
Nov-91
May-92
Nov-92
May-93
Nov-93
May-94
Nov-94
May-95
Nov-95
May-96
Nov-96
May-97
Nov-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
Nov-01
May-02
Nov-02
May-03
Nov-03
May-04
Nov-04
May-05
Nov-05
May-06
Nov-06
May-07
Date
Benzene
Toluene
Ethylbenzene
Total Xylenes


IBRP
Shallow Zone MW-78
BTEX
1000
100
10
1
41
1.4
Half-life approximately 90 days
May-91
Nov-91
May-92
Nov-92
May-93
Nov-93
May-94
Nov-94
May-95
Nov-95
May-96
Nov-96
May-97
Nov-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
Nov-01
May-02
Nov-02
May-03
Nov-03
May-04
Nov-04
May-05
Nov-05
May-06
Nov-06
May-07
Date
Benzene
Toluene
Ethylbenzene
Total Xylenes



IBRP
Shallow Zone MW-79
BTEX
1000
100
10
1
0.1
16
2.4
Half-life approximately 110 days
May-91
Nov-91
May-92
Nov-92
May-93
Nov-93
May-94
Nov-94
May-95
Nov-95
May-96
Nov-96
May-97
Nov-97
May-98
Nov-98
May-99
Nov-99
May-00
Nov-00
May-01
Nov-01
May-02
Nov-02
May-03
Nov-03
May-04
Nov-04
May-05
Nov-05
May-06
Nov-06
May-07
Date
Benzene
Toluene
Ethylbenzene
Total Xylenes

IBRP
Shallow Zone MW-90



Indian Basin Remediation Project - Well Monitoring

Product Thickness in feet																															
	Former Groundwater Pumping wells must be gauged monthly											Vapor Extraction Wells should be gauged monthly																			
	MW-58	MW-65A	MW-72	MW-75	MW-81	MW-82	MW-83	MW-84	MW-85	MW-86	MW-11	MW-68	MW-69	MW-74	MW-112	MW-113	MW-120	MW-121	MW-123	MW-124	MW-125	MW-126	MW-129	MW-130	VE-19	VE-16	MW-117A	MW-14	MW-12	MW-79	MW-128
2/13/2003	0.00	0.00	0.32	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.40	0.00	0.00	0.00	0.00	0.08	0.00	0.00	0.00	0.00	0.00	0.00
3/10/2003	0.00	0.00	0.70	0.00	0.00	0.00	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	2.88	1.17	0.00	0.84	0.00	0.00	0.00	0.00	0.00	0.00
5/15/2003	0.00	0.35	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.37	0.00	0.00	0.00	0.00	0.01	0.00	3.22	0.00	0.00	0.37	0.00	0.00	0.00	0.00	0.00	0.00
6/5/2003	0.00	0.38	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	0.00	0.00	0.00	0.00	0.00	0.00
6/24/2003	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.10	0.00	0.02	0.00	1.28	0.00	0.00	0.00	0.00	3.12	3.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7/15/2003	0.00	0.42	0.25	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.21	0.00	0.00	0.48	1.19	0.58	0.00	0.00	0.00	0.00	1.94	0.00	2.56	0.00	0.00	0.00	0.00	0.00	0.00
7/31/2003	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8/6/2003	0.00	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8/8/2003	0.00	0.40	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.30	1.24	0.00	0.27	0.34	0.11	0.62	0.00	0.00	0.00	0.00	2.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9/10/2003	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9/12/2003	0.00	0.09	0.00	0.02	0.00	0.83	0.00	0.00	0.00	0.00	0.00	0.04	1.54	0.00	0.25	0.26	0.11	0.71	0.00	0.00	0.45	1.04	3.20	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00
11/07/03	0.00	0.00	0.01	0.09	0.00	0.63	0.00	0.00	0.00	0.00	0.00	0.00	0.44	0.00	0.16	0.19	0.00	0.01	0.00	0.00	0.48	0.00	2.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12/04/03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.22	0.00	0.05	0.15	0.00	0.02	0.00	0.38	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
01/08/04	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.00	0.42	0.01	0.00	0.00	0.00	0.38	0.24	0.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
02/12/04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.00	0.00	0.01	0.00	0.39	0.21	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3/25/04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.43	0.00	0.00	0.21	0.00	0.03	0.02	0.01	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5/27/04	0.01	0.00	0.00	0.00	0.21	0.00	0.14	0.00	0.00	0.00	0.00	0.00	0.36	0.00	0.00	0.00	0.00	0.00	0.05	0.05	0.00	0.00	0.37	0.00	0.00	0.00	0.26	0.00	0.00	0.00	0.00
6/17/04	0.00	0.00	0.00	0.00	2.47	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6/18/04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.91	0.00	0.00	0.00	0.00	0.00	-2.98	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6/19/04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.32	3.00	0.00	0.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.25	0.00	0.00	0.00	0.00
7/15/04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7/16/04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.42	1.60	0.00	0.00	0.00	0.00	1.49	0.00	0.00	0.31	0.00	0.00	0.00	0.00	0.00	0.00
8/19/04	0.06	0.00	0.00	0.00	5.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8/20/04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.11	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9/9/04	0.00	0.00	0.00	0.00	0.00	0.00	0.19	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9/10/04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11/19/04	0.28	0.00	0.00	0.00	2.85	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11/22/04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.39	0.00	0.03	0.02	0.07	0.55	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12/07/04	0.00	0.00	0.00	0.00	2.61	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.06	0.09	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/11/2005	0.58	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.08	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
02/08/05	0.00	0.00	0.00	0.00	0.39	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.05	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3/8/05	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.07	0.00	0.00	0.00	0.00	0.00	0.00
5/9/2005	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.12	0.00	0.00	0.00	0.00	0.00	0.00
6/21/2005	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7/19/2005	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.83	0.00	0.00	0.00	0.00	0.00	0.00
8/8/2005	0.00	0.00	0.00	0.00	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.21	0.16	0.03	0.00	0.00	0.02	0.00	0.00	0.00	0.22	0.00	0.00	0.00	0.00	0.00	0.00
9/20/2005	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.01	0.04	0.01	0.03	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11/14/2005	0.48	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12/15/2005	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.01	0.00	0.00	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/17/2006	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.03	0.03	0.00	0.11	0.00	0.00	0.00	0.00	0.00	#VALUE!	0.00	0.00	0.00	0.00
02/07/06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#VALUE!	0.00	0.00	0.00	0.00	0.00	#VALUE!	0.00	0.00	0.00	0.00
3/7/2006	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.38	0.02	0.02	0.00	0.00	#VALUE!	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5/25/2006	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.34	0.37	0.02	0.00	0.00	#VALUE!	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6/6/2006	0.01	0.00	0.00	0.00	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.48	0.42	0.01	0.00	0.00	#VALUE!	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7/19/2006	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.58	1.31	0.02	0.00	0.00	#VALUE!	0.84	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	-0.04
8/12/2006	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.33	0.74	0.02	0.00	0.00	#VALUE!	0.12	0.00	0.00	0.00	0.00	0.00	0.00	#VALUE!	0.00	0.00
9/14/2006	0.00	0.00	0.00	0.00	2.52	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.15	0.00	0.00	0.00	#VALUE!	0.02	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11/29/2006	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#VALUE!	0.09	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
12/28/2006	0.00	0.00	-0.02	0.00	0.72	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#VALUE!	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/30/2007	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#VALUE!	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#VALUE!	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2/13/2007	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#VALUE!	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#VALUE!	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
3/6/2007	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#VALUE!	0.00	0.00	0.00	0.00	0.00	0.00	0.04	0.00	0.00	0.00	0.00	#VALUE!	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arcadis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
5/15/2007	0.42	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#VALUE!	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.00	0.00	0.00	0.00	#VALUE!	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
6/19/2007	0.00	0.00	0.00	-0.20	0.00	0.00	0.00	0.00	#VALUE!	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#VALUE!	#VALUE!	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
7/25/2007	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#VALUE!	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#VALUE!	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
8/29/2007	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#VALUE!	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01	0.00	0.00	0.00	#VALUE!	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
9/20/2007	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#VALUE!	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#VALUE!	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Arcadis	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
11/20/2007	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#VALUE!	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#VALUE!	0.00	0.00	0.00	-0.11	0.00	0.00	0.00	0.00	0.00	0.00
12/5/2007	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#VALUE!	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#VALUE!	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
1/18/2008	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#VALUE!	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
2/20/2008	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	#VALUE!	0.00	0.54	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00