FINAL CLOSURE REPORT

Mouat Industries Superfund Site
Columbus, Montana

Prepared for:
United States Environmental Protection Agency
Region VIII, Montana Office
Helena, Montana

Prepared by:
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November 2004

STATEMENT OF CERTIFICATION

Under penalty of law, I certify that to the best of my knowledge, after appropriate inquiries of all relevant persons involved in the preparation of the report, the information submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

Signature of Atlantic Richfield Company Project Manager

11/10/04
Date

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1.0 INTRODUCTION

This Site Closure Report was prepared in order to comply with the ground water monitoring portion of the EPA Docket No. CERCLA-VIII-96-22 Unilateral Administration Order (UAO) for Conduct of a Non-Time Critical Removal Action at the Mouat Industries National Priorities List (NPL) Site in Columbus, Montana (EPA, 1996b). A site description is given in Section 2.0 of this report, and Section 3.0 provides a summary of events. Effectiveness of the response actions are addressed in Section 4.0, while Section 5.0 discusses protectiveness of the Site. A data summary can be found in Section 4.1 and the 5-year review is summarized in Section 4.4.

From 1957 to approximately 1973, a chromium processing plant was operated by various owners and co-owners at the Mouat Site (the Site). The Site is located immediately southeast of Columbus, Montana, within the Yellowstone River floodplain. Currently, the local area consists of a variety of operations including an active air-strip, a municipal golf course and mining and lumber processing facilities. The chromium operation processed chromate ore into high-grade sodium dichromate, which produced sodium sulfate process wastes containing sodium chromate and sodium dichromate. These chromium compounds also contained hexavalent chromium. Previous investigations performed in 1977, 1980, 1983, 1984, 1985, 1989 and 1992 revealed elevated chromium levels in the soil, surface water and ground water within and adjacent to the site. Elevated concentrations of chromium in the ground water were detected moving southeast of the site toward the Yellowstone River (EPA, 1996a). In June of 1993, a full scale excavation and soil treatment was initiated. The program was completed in May 1995.

All response actions identified in UAO for Conduct of a Non-Time Critical Removal Action at the Mouat Industries NPL site have been successfully performed. The selected post-removal Site remedy was natural attenuation with ground water monitoring and institutional controls (ICs). ICs were maintained and continue to be in effect for the Site. Ground water and surface water monitoring was conducted in accordance with the Response Action Work Plan (RAWP) and the Sampling and Analysis Plan (SAP) included therein for a minimum period of five years. Semi-annual surface and ground water monitoring began in November 1996 and continued until October 2002. Monitoring continued semi-annually for a minimum of 5 years and until both of the following conditions were met:

1) It has been demonstrated that the MCL for chromium in ground water and the WQB-7 standards for chromium in ground water have not been exceeded for a period of three consecutive years.
2) It has been demonstrated that all remaining wells not included in the Monitoring Plan Well Network but within the Superfund Overlay District do not exceed the MCL for chromium in ground water and the WQB-7 standards for chromium in ground water as determined by a single sample taken after Item 1 above is satisfied (US EPA, 1996b).

Monitoring verified that natural attenuation continued to be effective in reducing chromium concentrations in surface and ground water within restrictive zones as prescribed by the Superfund Overlay District (SOD). The October 2002 monitoring event finalized the demonstration that the MCL for chromium in ground water and the WQB-7 standards for chromium in ground water have not been exceeded for a period of three consecutive years (Item 1).

In December 2003, non-network wells within the SOD were monitored. The December 2003 monitoring demonstrated that all remaining wells, not included in the Monitoring Plan Well Network but within the SOD, do not exceed the MCL for chromium in ground water and the WQB-7 standards for chromium in ground water as determined by a single sample taken (Item 2) after satisfying Item 1 above.

2.0 SITE DESCRIPTION SUMMARY

2.1 Site Location and Layout

The Mouat Industries site is located in the town of Columbus, Stillwater County, Montana, just north of the Columbus Airport, in the SW ¼ of the NW ¼ of Section 27, T2S, R20E, of the Columbus East Quadrangle (See Figure 1). Columbus is a town of approximately 1500 people, with residences, schools and businesses located within a mile of the Site. Currently, the Town of Columbus, along with Timberweld Manufacturing, owns the Site which is located immediately southeast of Columbus, approximately 0.6 miles north of the present Yellowstone River channel. Land use at the site is designated as light and heavy industrial, related industrial storage and airport expansion.

2.2 Site Characteristics

2.2.1 Site Geology

The land surface at the Site slopes gently to the southeast. Site stratigrify consists of alluvial deposits of the Quaternary period underlain by "nearly flat lying shale beds of the Upper Cretaceous Period" (Baker, 1996). Course gravel and sand, derived from igneous and sedimentary sources, overlay fine-grained sediments and localized fill deposits. Studies conducted by Baker Environmental (Baker, 1992; Baker, 1993b) and the Bureau of Reclamation (BOR) (Bureau of Reclamation, 1994) provided site-specific geological data. Based on the Baker and BOR data, bedrock at the Site ranges from 13.5 to more than 30 feet below the ground surface (bgs). These studies also indicated that alluvial gravels immediately overly the shale bedrock, in thickness ranging from 7.5 to 26 feet. The alluvium consists of "brown to gray, moderately dense to very dense gravels, and consist of clean, poorly sorted, and well-rounded gravel, containing some fine to coarse sand, a trace of some cobbles and boulders, and a trace of silt" (Baker, 1996). Fine-grained sediments, consisting of alluvial clay, silt and fine sand horizons overly the gravels. The Baker and BOR studies found this fine-grained sediment horizon to range from 0 to 10 feet in thickness.

Depth to ground water at the Site ranges from 3 to 11 feet bgs. Baker observed the saturated thickness of the sand and gravel formation to be 7.5 to 27 feet. The interface between the alluvial sand and gravel and the clay/shale bedrock defines the aquifer base. Generally, the aquifer is unconfined, although the overlying fines may create local confinements. The hydraulic gradient across the site averages 0.003 foot per foot (ft/ft). Slug tests conducted by the BOR estimated an average hydraulic conductivity of .038 centimeters per second (cm/sec), or 107 feet per day (ft/day). Average horizontal ground water velocity is estimated at 1.29 ft/day (Baker, 1996).

2.2.2 Site Chemicals of Potential Concern

In 1993, FMC Corporation, a past operator, commenced a removal action. Chromium containing soils were excavated, cleaned, solidified into blocks and placed back into the excavation. Non-treated, relatively clean soil was also used as fill. The blocks and non-treated soil were covered with two feet of clean fill and graded to a slight slope to facilitate run-off. A portion of the excavated and filled area was vegetated and the remainder of it was covered in gravel.

Ground water monitoring at the Site was performed as early as 1977, but data collected between 1977 and 1990 is limited and is of questionable quality. Quarterly ground water monitoring was initiated in June 1992 and continued through August 1995. In June 1992, the total chromium (Cr) concentration in Well RMIS-6, which is located in the Area of Concern, was 3.2 mg/L. When last sampled in October 2002, the total Cr concentration at RMIS-6 was .047 mg/L.

Total Cr concentrations were above the Maximum Contaminant Level (MCL) and Montana WQB-7 water quality standard of 0.1 mg/L at five of the 16 wells monitored in June 1992. In August 1995, 25 wells were monitored, and eight of these wells displayed total Cr concentrations greater than 0.1 mg/L. In 1996, the ground water monitoring network was reduced to twelve network wells. Total Cr concentrations have been below the MCL and WQB-7 standard since December 1999. Semi-annual ground water monitoring of network wells under the UAO for Conduct of a Non-Time Critical Removal Action at the Mouat Industries NPL Site began in November 1996. Furthermore, ten non-network wells lying within the SOD were sampled in December 2003 and all ten were found to have total Cr concentrations well below 0.1 mg/L.

3.0 SUMMARY OF EVENTS

3.1 Site Background

The Town of Columbus (Town) and the Timberweld Manufacturing Co, (Timberweld) are the current Site owners. The Town has owned the eastern portion of the Site since 1933. In 1960, the Town acquired the western portion of the Site which was later sold to Timberweld. Aerial photos of Columbus indicate industrialization of the area occurred between 1954 and 1957 (Baker, 1996). A chromium processing plant was constructed on the Site in 1957 by William G. Mouat and Mouat Industries. Under a leasing agreement with the Town, Mouat operated the plant from approximately 1957 to 1963. Mouat's operation processed chromite ore mined from the Stillwater Complex in south-central Montana into high-grade sodium dichromate, subsequently generating sodium sulfate process wastes containing sodium chromate and sodium dichromate. These hexavalent chromium containing compounds leached from the sodium sulfate waste piles into underlying soils and eventually into the Site ground water. Additionally, normal facility operations resulted in sodium dichromate spills. Figure 2 indicates the location of the chromium release. A 1992 study determined the area of affected soils at approximately 3.3 acres. It was estimated that 46,700 cubic yards (cy) of soil were in need of excavation.

The chromium processing plant was jointly operated by FMC Corporation and Mouat between September 1961 and April 1962. The plant was purchased in May 1963 by the Monte Vista Company (MVC), which acquired the leasehold interest in a portion of the Site. Records show that chromium operations were ceased before, or at the time of, the MVC transaction. MVC held the lease at the Site until the end of 1973.

In 1968, Mouat assigned its interest in the agreements it had with MVC to The Anaconda Minerals Company (AMC). AMC was involved with the Site until 1973 and during this time AMC took actions to address concerns the Town had about the site. In 1969, AMC removed approximately 468 tons of stockpiled chromium salts from the Site yard. A portion of these salts were drummed and placed in the manufacturing building. The remainder was simply placed on the building's floor. The Site was then graded and gravel was laid over a portion of the yard. In 1973, AMC responded to further clean-up requests by the Town. Drainage ditches were constructed around the manufacturing building to route storm water flow away from the building and yard. Approximately 100 tons of soil were removed from the Site and, in an attempt to address visible chromium salts, sulfuric acid and ferrous sulfate was applied to the soil and mixed into a portion of the yard west and south of the building. The acid addition was done with the intent of reducing the Cr VI to the more stable Cr III.

In March 1974, AMC removed the drummed and stockpiled material from the manufacturing building to an off-site location. Also in 1974, MVC removed equipment from the site and demolished the processing building. AMC merged into the Atlantic Richfield Company in 1981.

Timberweld entered into a lease with the Town for additional space on the site in 1975. To provide storage and a product yard, Timberweld covered the area where the processing plant had stood with two feet of gravel. A yellow mineral deposit appeared on the gravel in the fall of 1976. This deposit was characteristic of sodium chromate.

Site investigations were conducted in 1977, 1980, 1983 and 1984 leading to the Site being proposed for the NPL of the National Contingency Program (NCP) in 1984. In 1986, the Site was placed on the NPL pursuant to section 105 of CERCLA, 42 U.S.C. § 9605, set forth at 40 Code of Federal Regulations (CFR) Part 300, Appendix B, by publication in the Federal Register. Further studies at the Site led to EPA undertaking a removal action in 1990 which secured the site and addressed Site run-on and run-off. UAO Docket No. CERCLA VIII 92-05 was issued by EPA in 1991 to several potentially responsible parties (PRPs). The UAO directed that a removal action of contaminated soil was to be conducted. FMC responded to the order and commenced a full scale soil excavation and treatment at the Site in June, 1993 and completed the action in 1995.

3.2 Previous Response Actions

AMC undertook several actions to mitigate problems at the Site. In 1969, AMC removed approximately 468 tons of stockpiled chromium salts from the yard to the manufacturing building. In 1973, AMC constructed drainage ditches around the manufacturing building to route storm water flow away from the building and yard. Approximately 100 tons of soil were removed from the Site in 1973 and, in an attempt to address visible chromium salts, sulfuric acid and ferrous sulfate were applied to the soil and mixed into a portion of the yard west and south of the building.

A portion of the Site was enclosed with 6-foot industrial chain-link fencing by the EPA in 1990. At this same time, the Town altered drainage in the area to redirect storm water flow around the Site. FMC undertook a full scale soil excavation and treatment of approximately 14,000 cy of chromium containing Site soils between 1993 and 1995. Treatment consisted of soil screening, chromium reduction and soil fixation. EPA specified removal performance standards within the UAO as follows:

- *Soil inside the EPA perimeter fence for which total chromium concentration in the extract Toxicity Characteristic Leaching Procedure (TCLP chromium) was greater than 0.5 mg/L was to be excavated to elevation 3564 or to the clay-gravel interface, whichever was lower.*
- *Soil outside the EPA fence perimeter for which TCLP chromium was greater than 0.1 mg/L was to be excavated to elevation 3564 or to the clay-gravel interface, whichever was lower* (Baker, 1996).

Performance standards for treated soils were set forth by EPA as follows:

- *The TCLP chromium was to be equal to or less than 0.5 mg/L.*
- *The total chromium in any one extract obtained by the Multiple Extraction Procedure (MEP) was to be equal to or less than 5.0 mg/L.*
- *The unconfined compressive strength was to be equal to or greater than 50 pounds per square inch (psi).*
- *The permeability was to be equal to or less than that of the background soils* (Baker, 1996).

Excavation continued until all soil exhibiting chromium levels above the performance standards was removed. FMC's soil treatment train involved soil screening, chemical addition for chromium reduction and soil fixation by cement addition. The 14,000 cy of treated soil were formed into approximately 7000 blocks which were analyzed for compliance with treatment performance standards. Analytical results showed that all blocks met performance standards, thus the blocks were placed into the excavation. Additional excavations were made outside the area of elevated soil chromium levels to facilitate block placement within the specified elevations. Excavated soil from outside the perimeter fencing, exhibiting TCLP chromium concentrations between 0.1 and 0.5 mg/L, was placed in the fenced-in excavation, above the water table. Site cover consisted of clean gravel in the western portion of the Site. The remainder of the site was covered with two feet of clean, off-site soil and was vegetated. Soils in which TCLP chromium was greater than 0.5 mg/L were disposed of off-site.

3.3 Findings and Requirements of EPA's June 1996 Action Memorandum

An EPA Action Memorandum dated June 21, 1996 described findings for the Site and outlined remedial requirements. The memorandum is attached as Appendix A. A non-time-critical removal action at the Site was requested. The removal action, which was expected to be the final response action for the Site, relied upon natural attenuation, ground water monitoring and ICs to remediate ground water issues at the Site. The EPA memorandum cited factors for determining the appropriateness of initiating a removal action set forth in the NCP. Factors relevant to the Site were:

- *Actual or potential exposure to nearby human populations, animals, or food chains from hazardous substances or pollutants or contaminants.*
- *Actual or potential contamination of drinking water supplies or sensitive ecosystems.*(U.S. EPA, 1996a)

EPA went on to state that past chromium ore processing at the Site had released chromium to the environment. Chromium-containing soils at the Site had been successfully remediated; yet ground water at, and down gradient of, the Site continued to exhibit chromium concentrations above the MCL and State of Montana standards.

Three Chemicals of Potential Concern (COPCs) were identified through several sampling and analysis efforts. These were Cr VI in ground and surface water, Cr III in on- and off- site surface and subsurface soils and Cr III in sediments and surface waters. Physical entrainment and infiltration/percolation were identified as the contaminant release mechanisms at the Site.

A 1995 baseline risk assessment performed by EPA found COPCs of ecological concern (COPECs) to be Cr III and Cr VI in surface water and sediments in the golf course pond and ditches. Elevated chromium concentrations that appeared in golf course ponds and ditches resulted from these water bodies being hydraulically connected to area ground water. Potentially, the elevated chromium concentrations presented a risk to bottom feeding fish, as well as bottom dwelling invertebrates. However, it was determined that the man-made ditches and pond provided insufficient habitat to support aquatic receptors. It was found that ecological receptors in the Yellowstone River were not at risk.

After numerous post-removal studies, EPA concluded that:

There are no site features or characteristics, weather conditions, human events, or other conditions that would either cause, spread, or accelerate the release of chromium at the Site.

Chromium in the ground water medium at the Site exists in the dissolved state (Cr VI). It has been demonstrated that Cr VI would not, under naturally occurring conditions, be reduced to Cr III because of the highly oxidized ground water existing at the Site. Factors that can impact the geochemistry of chromium (e.g., iron and total organic carbon content) have been found to be low; therefore, it can be concluded that chromium would not be precipitated. An evaluation of sorption phenomena also indicate that these would not permanently retain chromium in ground water. They would, however, delay or retard the movement of dissolved chromium with respect to the ground water flow rate, suggesting that chromium may be present in the ground water for some time to come in the future. However, chromium concentrations in the ground water will also decline by natural dispersion and dilution mechanisms. Chromium concentrations in ground water have been declining in recent years, and the area within which elevated concentrations are found has been decreasing. (U.S. EPA, 1996a.)

EPA determined that:

Actual or threatened releases of chromium-contaminated ground water from this site, if not addressed by implementing the removal action selected in the Action Memorandum, may present an imminent and substantial endangerment to public health, or welfare, or the environment. (U.S. EPA, 1996a.)

Three actions were proposed. Alternative 1 was no action other than ICs, Alternative 2 was natural attenuation with ground water monitoring and ICs, and Alternative 3 was ground water pump and treat with ground water monitoring and ICs. Alternative 2 was the preferred option.

The Engineering and Cost Evaluation Report (Baker, 1996) proposed a Monitoring Plan Well Network. The proposed well network consisted of one well up gradient of the chromium plume, five wells within the plume, three wells laterally adjacent to the plume, and three wells near the leading edge of the plume as defined by the ground water chromium standard of 0.1 mg/L. The monitoring plan also specified one surface water sampling site within the golf course ditches, bringing the total number of sampling points to 13. Additionally, Alternative 2 in the Engineering Evaluation and Cost Analysis Report (EE/CA) required that ground water monitoring be conducted for a minimum period of five years. The EE/CA states that ground water monitoring could be terminated once the following conditions were met:

- *All ground water monitoring wells within the Monitoring Plan Well Network must exhibit total chromium concentrations equal to or less than 0.1 mg/L for two consecutive sampling events.*
- *All remaining wells not included in the Monitoring Plan Well Network would then be sampled to verify that total chromium in these wells is equal to or below 0.1 mg/L.* (Baker

1996 in U.S. EPA, 1996a.)

EPA modified the above criteria to be consistent with EPA Region VIII guidance. Under Region VIII guidance ground water monitoring must continue until "*...ground water protection standards have not been exceeded for a period of three consecutive years*" (U.S. EPA, 1996a.). EPA modified monitoring requirements as follows:

.....C. *The Monitoring Plan Well Network will continue to be monitored semiannually until both of the following conditions are met:*

1). It has been demonstrated that the MCL for chromium in ground water and the WQB-7 standards for chromium in ground water have not been exceeded for a period of three consecutive years.

2). It has been demonstrated that all remaining wells not included in the Monitoring Plan Well Network but within the Superfund Overlay District do not exceed the MCL for chromium in ground water and the WQB-7 standards for chromium in ground water as determined by a single sample taken after Item I above is satisfied (U.S. EPA, 1996a.).

Alternative 2 also included the implementation of land use and ground water ICs. Land use ICs are necessary to maintain the integrity of the soil removal and treatment effort. Land use ICs, enforced by the Town of Columbus, apply only to the block placement area and:

- *Prohibit excavation into the blocks of treated soil;*
- *Limit vehicle loads on the graveled portions of the block placement area;*
- *Prohibit any use of the soil-covered block placement area unless those areas are paved or covered with gravel;*
- *Require the property owner to maintain the site cover, drainage facilities, and fences; and*
- *Establish specifications for construction on the block placement area* (U.S. EPA, 1996a.).

Ground water ICs were put in place to protect human health and the environment and were applied to the entire SOD. Ground water ICs *prohibit new wells or other ground water extraction systems, prohibit ground water use from existing wells or other ground water extraction systems, except for lawn irrigation use, use of the existing golf course pond, and ground water monitoring* (U.S. EPA, 1996a). Other than temporary excavation work (footings, utilities), excavation below the water table was prohibited. EPA allowed that ground water ICs could be lifted once criteria set forth in ground water monitoring requirements were met.

3.4 Findings and Requirements of July 1996 Unilateral Administrative Order (UAO)

Findings of the UAO were nearly identical to those in the June 1996 Action Memorandum. EPA's July 1996 UAO is attached as Appendix B. The following "Findings of Fact" outline is excerpted from the UAO.

IV. FINDINGS OF FACT

Site Description and History

7. The Mouat Site, or the Site, is located in Columbus, Montana, just north of the Columbus airstrip. The eastern portion of the Site has been in Town ownership since 1933, and in 1960 the Town became owner of the western portion of the Site as well. Later, the Town sold the western portion of the Site to Timberweld Manufacturing. In 1957, William G. Mouat and Mouat Industries constructed, and then operated a chromium processing plant on the Site under a leasing agreement with the Town. Mouat operated the chromium processing facility from 1957 to 1963. The operation processed chromite ore into high-grade sodium dichromate. Sodium sulfate wastes generated from the process contained sodium chromate and sodium dichromate. These compounds contained hexavalent chromium (Cr VI), which leached into underlying soils, and eventually the ground water. Sodium dichromate spills which occurred as part of daily operations, also contributed Cr VI to underlying soils and ground water.

8. The plant was jointly operated by FMC Corporation and Mouat between September 1961 and April 1962.

9. In May 1963, the processing plant was purchased by the Monte Vista Company (MVC), who acquired a leasehold interest in Mouat's portion of the Site. In 1968, interest in agreements Mouat had with MVC was assigned to the Anaconda Minerals Company (AMC). AMC conducted some cleanup activities at the Site in 1969, and from 1973 to 1974. During the 1969 activity, Site waste materials were placed inside a building that had been used for sodium dichromate production. In 1973, at the Town's request, AMC made further cleanup efforts. AMC removed approximately 468 tons of material which had been stored inside the processing building to an off-site location, and an attempt was made to treat additional soil in place. In-place treatment consisted of spreading acid and ferrous sulfate over a portion of the Site in an attempt to reduce the Cr VI to its more stable form Cr III. AMC's interests in the Site ended in 1974. MVC held the lease until its expiration in 1973. MVC removed the chrome processing plant machinery, buildings, and equipment from the Site in 1974. AMC merged into the Atlantic Richfield Company in 1981.

10. In 1960, a portion of the Site was purchased from the Town by Timberweld Manufacturing. Timberweld leased additional Site property from the Town in 1975. Also in 1975, Timberweld graveled (nearly two feet deep) the area which had been occupied by the chromium processing plant and sodium sulfate waste piles. Yellow mineral deposits began to appear at the gravel surface in 1976. These deposits are characteristic of sodium chromate. Timberweld Manufacturing continues to operate at the Site.

11. Site investigations conducted in 1977, 1980, 1983, and 1984 led to the Site being proposed for the NPL in 1984, and subsequently placed on the NPL in 1986. Additional studies followed. In 1990, EPA undertook a removal action to secure the Site, as well as to control surface water run-on and run-off. In 1991, EPA issued a UAO to several PRPs directing a soil removal action. FMC responded to the UAO, and in 1993 commenced a full-scale soil excavation and treatment. FMC's soil removal action was completed in 1995.

12. Pursuant to section 105 of CERCLA, 42 U.S.C. § 9605, EPA placed the Site on the National Priorities List set forth at 40 Code of Federal Regulations (CFR) Part 300, Appendix B, by publication in the Federal Register (U.S. EPA, 1996b).

Release or Threatened Release

13. Ground water sampling was conducted at the Site in 1977 by HKM Associates. The ground water investigation indicated a hexavalent chromium plume migrating from the Site in a southeasterly direction towards the Yellowstone River. Further EPA investigations in 1980, 1983, 1984, 1985, 1989, and 1992 found elevated chromium levels in soil, and surface and ground water within and adjacent to the Site. The data also confirmed the southeasterly migration of the plume.

14. EPA established that a threat to public health, welfare, or the environment existed at the Site and within adjacent areas of plume migration. Chromium ore processing conducted by Mouat and other Respondents was found to have migrated into surface and ground water. The then-current primary threat was chromium in ground water. Ground water discharges to surface water at the golf course ponds and ditches. Within the pond and ditch sediments, hexavalent chromium was found to be reduced to trivalent chromium, thus resulting in chromium entrainment within ditch and pond sediments. Possible human exposure pathways were defined as direct contact with and ingestion of chromium containing surface and ground water.

Endangerment

15. The Site is located within the Yellowstone River floodplain, less than 0.6 miles north of the present river channel, and immediately southeast of the Town of Columbus. The Town population is approximately 1500, and residences, schools, and businesses are located within a mile of the Site. The Site land surface slopes gently to the southeast, and at the time the Town's surface storm drain passed through the Site toward the Yellowstone River. The ground water table is 3 to 11 feet bgs, and the potentiometric surface slopes southeasterly to the river. Site ground water chromium concentrations exceeded the MCL and Montana WQB-7 standard of 0.1 mg/L. Elevated chromium concentrations in ground water posed a clear threat to potential human consumers (EPA, 1996b). Site surface waters also displayed chromium concentrations elevated above WQB-7 standards.

16. Hexavalent chromium is a hazardous substance as defined by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Sec. 101 (14), and designated as such under 40 CFR 117 and 40 CFR 302. Ingestion of high levels of Cr (VI) can cause severe circulatory collapse and toxic nephritis; it can be fatal. Cr (VI) irritates skin and can cause ulcers. Prolonged contact with Cr (VI) can cause broken skin to develop "chrome sores", leaving the area vulnerable to infection (EPA, 1996b).

Respondents

17. The Town is a current Site owner, and has owned all or part of the Site since 1933. A small western portion of the Site is owned by Timberweld.

18. The Town leased the Site to Mouat in 1957, who subsequently built and operated a chrome *processing plant at the Site from 1958 to 1961. The plant processed and converted chromium ore into high-grade sodium dichromate, producing sodium sulfate wastes which contained Cr VI. The Cr VI leached from waste piles into underlying soils, surface and ground water. Daily plant operations led to dichromate spills which added to the Cr VI contamination.*

19. From September 1961 through April 1962, FMC jointly operated the chromium facility with Mouat. The plant processed and converted chromium ore into high-grade sodium dichromate, producing sodium sulfate wastes which contained Cr VI. The Cr VI leached from waste piles into underlying soils, surface and ground water. Daily plant operations led to dichromate spills which added to the Cr VI contamination.

20. MVC purchased the chromium processing plant and equipment in 1963. MVC acquired the leasehold interest in a portion of the Site from Mouat by assignment from Mouat to MVC.

21. Interest in the agreements Mouat had with MVC were assigned to AMC in 1968. In 1969, the Town issued a complaint to AMC concerning piles (approximately 200 tons) of chrome chemicals stored at the Site. AMC drummed a portion of the chemicals, and stored the steel drums inside the chromium processing plant building. Additional material from the chrome waste piles was stored openly on the building's concrete floor. After completing this effort, AMC observed that: (1) some of the chrome chemicals that had penetrated the ground where the piles had been located had again leached through to the surface; and (2) the chemicals stored on the plant floor would become a problem in the future since the building was located in a depression and had in the past, during periods of spring thaw or heavy storms, accumulated up to eight inches of water on the floor (EPA, 1996b).

22. At the Town's request, AMC removed approximately 450 tons of waste material from the Site in 1973. AMC also conducted in-situ soil treatments in this year. Treatment methods were evaluated through an investigation of the Site residual wastes. AMC chose treatment of sulfuric acid and ferrous sulfate addition. Approximately 500 gallons of the acid was spread over the site, which was then worked into the soil. "Hot spots" were treated with additional ferrous sulfate addition. After the chemical additions, the entire area was watered.

23. At the end of 1973, MVC's Site lease expired and was not renewed. MVC removed chrome processing plant machinery, buildings, and equipment in 1974.

24. A notice of termination of the lease agreement that had been assigned to AMC by Mouat, was served upon MVC in October 1980, by AMC, as lessor. Precipitated by this action, MVC filed a lawsuit, which was resolved against MVC by the Montana Supreme Court in 1988. In 1981, AMC merged into ARCO (the Atlantic Richfield Company).

25. Timberweld leased a western portion of the Site in 1975 for use in its laminated wood business. Also in 1975, Timberweld graveled (nearly two feet deep) the area which had been occupied by the chromium processing plant and sodium sulfate waste piles. Yellow mineral deposits began to appear at the gravel surface in 1976. These deposits are characteristic of sodium chromate. Timberweld Manufacturing continues to operate at the Site.

Response Actions

26. In March and April 1990, EPA Region VIII's Emergency Response Branch secured the Site by surrounding it with 1400 feet of six-foot industrial chain link fencing with two 20-foot wide locked gates. At the same time, at the request of EPA's on-site coordinator, the Town re-routed the drainage ditch that had carried storm water through the Site.

27. A consistency exemption under Section 104 (c)(1)(C) of CERCLA, 42 U.S.C. § 9604 (c)(1)(C), was granted on September 20, 1991 by the Assistant Administrator for EPA's Office of Solid Waste and Emergency Response. The consistency exemption allowed for continued response action at the Site. Negotiations to instigate the removal action were held with Site PRPs, but these failed. Therefore on November 12, 1991, EPA issued an Administrative Order for Removal Action, Docket No. CERCLA-VIII-92-05 to FMC, MVC, Mouat, Timberweld, and the Town. FMC responded to the order and commenced full-scale Site soil excavation and treatment in 1993. FMC's removal and treatment action was completed in 1995.

Based upon the "Findings of Fact", EPA identified the provisions with which the Respondents were to comply. The UAO is included in Appendix B and provides the details of additional provisions not described here including Notice of Intent to Comply, Designation of Contractor, Project Coordinator and On-Scene Coordinator.

Work to be Performed

The work to be performed included semi-annual surface and ground water monitoring at selected wells, designated as the Monitoring Plan Network. The Monitoring Plan Well Network is identified in the RAWP, which is an attachment to the UAO. Provisions of the monitoring included:

- A ground water monitoring network consisting of 12 wells and one surface water site from the golf course ditches. Well samples will be analyzed for total chromium and the surface water site will be analyzed for Cr VI and Cr III.
- A sampling frequency of semi-annually for five years.
- Monitoring would continue until the following conditions are met:
    1. The MCL and Montana WQB-7 ground water chromium standard has not been exceeded for three consecutive years.
    2. After Condition 1 is met, a single sampling round of all non-network wells within the SOD would demonstrate that there are no exceedences of the MCL and Montana WQB-7 ground water chromium standards.

Institutional Controls

By way of a zoning ordinance, the Town of Columbus created a SOD. ICs for land use and ground water use within the SOD have been established and were to be enforced.

Land use restrictions are applicable specifically to the block placement and include: no excavation into treatment blocks; limited vehicle loads on graveled portions of the block placement area; use of only paved or graveled portions of the block placement area; site cover, drainage facility and fences must be maintained by the owner; and establishment of applicable construction restrictions and specifications.

Ground water use restrictions apply to the entire SOD and include: no new ground water wells, ponds or channels fed by ground water, or other ground water extraction or recovery systems; no ground water use from existing wells, ponds, springs, or other ground water recovery or extraction systems other than that used for lawn irrigation, use of the existing golf course pond, or ground water monitoring; and no excavation below the water table (static ground water level) other than temporary excavation necessary for placement of footings and utilities.

Land and ground water use restrictions within the block placement area will stay in place in order to maintain integrity of the block placement area. Ground water use restrictions in the remainder of the SOD may be lifted once response action objectives are met.

Quality Assurance

All sampling and analyses were to conform with EPA direction and guidance regarding quality assurance and data validation including the requirements identified in the RAWP.

Reporting

As identified in the RAWP, A Health and Safety Plan and Annual Reports was to be submitted to EPA and MDEQ. Every fifth annual report will support EPA's five-year review of the response action. The RAWP identifies requirements for information to be included in Annual and Five Year Reports. Table 1 identifies the documents that have been submitted consistent with the requirements of the Order (Docket No. CERCLA-VIII-96-22). A Final Report was to be prepared after completion criteria were achieved and include information identified in the RAWP. This Closure Report meets the requirements set forth for the Final Report. The 2003 Non-Network Well Data Summary Report is provided as Attachment 1 to this Closure Report.

3.5 Response Action Construction Activities

3.5.1 Soil Removal Action

3.5.1.1 Design Criteria

Between 1977 and 1992 several investigations revealed elevated levels of chromium in Site soils and ground water. In 1989 EPA's laboratory contractor, PEI Associate's Inc., began bench scale treatment tests. PEI investigated (1) soil treatment with reducing agents, followed by solidification and (2) soil treatment with sulfuric acid, soil pH adjustment to 7.0, followed by soil treatment with reducing agents and then solidification. The bench scale investigations led to proposals for pilot scale investigations utilizing chromium reduction, stabilization and solidification. Site specific criteria for soil removal and treatment were:

- The removal action must be implementable and cost effective;
- The removal action must be carried out in a timely manner, with a target start date of May 15, 1992;

- Target performance levels for treated soil were:
  - TCLP chromium of $\leq$ 0.5 mg/L;
  - Total Chromium in any one extract obtained by MEP $\leq$ 5 mg/L;
  - Permeability $\leq$ background soil;
  - Unconfined comprehensive strength $\geq$ 50 psi; and
  - 35% average volumetric increase.

3.5.1.2 Resources Committed

In January 1992, FMC's contractor, Baker Environmental, submitted soil samples to four vendors for treatability studies. The vendors were Geo-Con, Inc/Kiber Associates; Emtech Environmental Services, Inc./Funderburk Associates; Westinghouse-Science and Technology Center; and Chemfix Technologies, Inc. All four of these firms possessed proven, full-scale soil treatment technologies. Data analysis of completed treatability studies indicated that only one of the four technologies attained target clean-up levels. However, that process was evaluated as being both too costly and lengthy. At that point, Baker undertook extensive bench-scale tests to find a treatment technology which would meet design criteria.

Prior to proceeding with treatment, Baker conducted further site characterization. Drilling and sampling served to delineate both the vertical and aerial extent of the impacted area. From June 1992 to March 1993, the BOR conducted quarterly ground water sampling at the Site. The BOR sampling served to determine the extent of impacted ground water, determine ground water chromium concentrations and characterize Site ground water.

3.5.1.3 Treatment Approach Pursued and Followed

At the completion of Baker's site characterization, work began on treatment process development, treatment facility design, procurement of equipment and materials, site preparation and preparation of the RAWP (Baker, 1993). The chosen treatment process consisted of soil screening, chemical addition for chromium reduction and soil fixation by cement addition. Once soil underwent treatment, it was formed into blocks for curing, testing and placement.

By November 1992, design, construction and treatment facility testing were completed. Full-scale soil treatment testing began in November 1992 and continued through February 1993. Modifications to the treatment train were made between March and June 1993. In June 1993, full-scale treatment began and continued through October 31, 1993.

The Site consisted of two areas. One of these areas was inside the perimeter fencing which EPA erected in 1990, the other was outside the fenced perimeter. Soil inside the perimeter exhibiting TCLP total chromium concentrations greater than 0.5 mg/L was excavated and treated. Soil outside the fenced perimeter which displayed TCLP total chromium between 0.1 and 0.5 mg/L was excavated and used as fill inside the perimeter. The soil treatment facility operated 24 hours per day, seven days per week between June and October 1993. In this time period, approximately 14,000 cy of soil were treated producing approximately 7000 soil blocks. After analytical testing, it was found that all of the soil blocks met performance criteria.

Soil excavation continued through October 1, 1994 and was conducted 10 hours per day, seven days per week. Remaining soils exhibiting TCLP total chromium greater than 0.5 mg/L were disposed of off-site. Off-site removal actions were conducted 10 hours per day, seven days per week from July 1994 until October 1, 1994. In this time period, approximately 19,500 cy were disposed of off-site at appropriately permitted facilities.

Upon excavation completion, the treated blocks were placed in the excavation. Non-treated soil with chromium levels below the performance criteria was also used as fill. It was necessary to make additional excavations, in non-impacted areas, to place all of the treated blocks. Once block placement and backfill were completed, the site was covered with clean soil and/or gravel. The western portion of the Site occupied by Timberweld manufacturing was covered with clean, off-site gravel. The remaining Site area was covered with two feet of clean, off-site soil. Site cover was completed in December 1994 and the Site was seeded in May 1995. Figure 3 identifies locations of the block placement areas.

Site demobilization was completed in December 1994. Demobilization included decontamination of the treatment facility, all mobile equipment, asphalt and day bin areas. At that time, treatment and support facilities were removed. Perimeter fencing was expanded to include the area of additional block placement.

3.5.2 Ground Water Response Action

3.5.2.1 Design Criteria for Site Wide Ground Water

Upon completion of the soil removal action, response action alternatives for Site ground water were evaluated. The alternative chosen for Site ground water was natural attenuation with ground water monitoring. Existing ground water and land use controls would stay in place until total chromium concentrations were reduced to 0.1 mg/L or less. The primary objectives of the ground water response action were to protect human health and the environment; attain ground water chromium standards in affected ground water; comply with all ARARs; and attain surface water chromium standards and risk-based chromium levels in the golf course water bodies.

3.5.2.2 Resources Committed for Site Wide Ground Water

Ground water monitoring has taken place at the Mouat Site, both prior to and following soil removal actions. The earliest data set of ground water quality date to 1977. Further investigations were conducted by the EPA in 1980, 1983, 1984, 1989 and 1992. Quarterly sampling was conducted between June 1992 and August 1995 by the BOR. Then in November of 1996, following completion of the soil removal action, semi-annual ground water monitoring of selected wells began as required in the RAWP. The selected wells are referred to as the Monitoring Plan Well Network.

3.5.2.3 Ground Water Treatment Approach Pursued and Followed

A ground water monitoring plan was developed with the primary objective of evaluating when the ground water chromium standards were met, thus enabling ground water use restrictions to be lifted. A contingency plan was included, allowing restrictions to be lifted early if ground water chromium standards within the SOD were met before the expected time frame.

Semi-annual monitoring was to continue for a minimum period of five years. Monitoring could not be terminated until:

1) Total chromium concentrations at sites within the monitoring network were at or below the standard of 0.1 mg/L for three consecutive years; and
2) The sampling round of non-network wells within the SOD yielded total chromium concentrations at or below the standard of 0.1 mg/L.

From November of 1996 through October 2002, the Monitoring Plan Well Network, consisting of twelve wells and one surface water station, was monitored semiannually. The Network included one up gradient well, five down gradient wells, three wells laterally adjacent to the plume and three wells near the leading edge of the plume. Additionally, one surface water site, within the golf course ponds and ditches, was included. The semiannual monitoring occurred once in the spring (high water table) and one in the autumn or early winter (low water table). Ground water samples were analyzed for total chromium. Surface water was analyzed for total and hexavalent chromium. The October 2002 monitoring event met criteria 1) with Total chromium concentrations for network wells below the standard of 0.1 mg/L for three consecutive years.

Following completion of criteria 1), in December 2003, monitoring of the non-network wells lying within the SOD occurred. This monitoring was implemented in order to meet criteria 2). The December 2003 event consisted of monitoring ten non-network wells. Monitoring confirmed that concentrations in these wells were below the 0.1 mg\L standard meeting criteria 2).

4.0 EFFECTIVENESS OF RESPONSE ACTIONS TAKEN

4.1 Ground Water Response Action – Presentation of Analytical Results

In November 1996, semi-annual network monitoring was begun. Network monitoring continued through 2002. Annual reports for network monitoring are identified in Table 1. In December 2003, a single round of non-network sampling was implemented. The 2003 Non-Network Well Data Summary Report can be found as Attachment 1 to this Closure Report. Results for sampling conducted from 1996 through 2003 can be found on Table 2 and are discussed in the following sections.

Section 4.1.1 discusses ground water and surface water monitoring conducted between November 1996 and December 2003. Section 4.1.2 discusses deviations from the RAWP (Jacobs Engineering, 1996), Memorandum of Sampling and Analysis Protocol (SAP) and Health and Safety Plan for the Mouat Industries NPL Site (ESE, 1996). Section 4.1.3 presents field Quality Assurance and Quality Control (QA/QC) results.

4.1.1 Post-Removal Ground Water and Surface Water Sampling

From November 1996 through October 2002, the monitoring network consisted of twelve monitoring wells and one surface water monitoring station as identified in the RAWP. Also, in accordance with the RAWP, because monitoring of the network wells during the 1996 to 2002 period met completion criteria 1) with all network wells below the 0.1 mg/L standard for three consecutive years, non-network monitoring was to be implemented. Non-network monitoring would consist of monitoring all wells within the SOD that were not included in the network. Eleven non-network wells were initially present within the SOD. However, well W-10, located on property owned by the City of Columbus, was under a pile of gravel at the time of sampling (see Section 4.1.2) and thus was not sampled. EPA was notified of the situation and indicated that it was acceptable for this well to be eliminated from the non-network monitoring. Therefore, the December 2003 monitoring consisted of monitoring ten non-network wells to confirm that chromium levels at the Mouat facility have reached the cleanup goal of less than 0.1 mg/L.

Figure 4 displays all wells monitored between November 1996 and December 2003. All ground water and surface water monitoring was performed consistent with the scope of work presented in the SAP for the following:

- Field Logbook/Sampling Documentation
- Water Level and Well Depth Measurement
- Field Meter Calibration
- Ground Water Sample Collection
- Surface Water Sample Collection
- Decontamination
- QA/QC Field Samples

- Chain-of-Custody Records
- Data Validation

Field observations were documented in a logbook and on field data sheets throughout the life of the monitoring project. Copies of these field notes and data sheets are provided in the appropriate annual data summary reports.

Water quality field parameters were measured with a YSI® Water Quality Monitoring System, a Fischer Scientific® pH meter, and a HACH® portable turbidity meter, or equivalents, which were calibrated each day in accordance to the manufacturers' instructions and the SAP.

Sample collection utilized a submersible Grundfos Redi-Flow pump for purging and sampling each well. With the Grundfos pump, discharge can be controlled by adjusting the revolutions per minute (RPMs) from a control panel rather than increasing the head. This allows samples to be collected without excessively agitating the sample. The ground water sampling procedures included the following basic steps:

- Measure depth to water in the wells from the surveyed reference point on the top of the well casing using an electronic depth to water tape.

- Based on the water level and total well depth, three casing volumes were calculated and purged prior to sampling.

- A minimum of three casing volumes were purged from each well, and purging continued until field parameter readings were stabilized to within 20 percent over one casing volume. Field parameters were measured using a calibrated YSI® Water Quality Monitoring System, a Fischer Scientific® pH meter, and a HACH® portable turbidity meter, or equivalents. Parameters measured included temperature, pH, specific conductance, and turbidity.

- Ground water samples were collected directly from the Grundfos pump discharge line. Sample bottles were filled, preserved, labeled, packaged, stored, and shipped under chain-of-custody procedures in accordance with the SAP.

- All sampling equipment was decontaminated prior to sampling each well. Decontamination procedures included liberally flushing with deionized water and non-phosphate laboratory grade detergent, rinsing with deionized water, rinsing with dilute nitric acid, and rinsing with deionized water.

- All purge water and liquid wastes were properly disposed of.

4.1.1.1 Network Ground Water Monitoring

The ground water network wells consist of one well up gradient (RMIS-1) of the study area, five wells within the area of concern (RMIS-4, RMIS-6, MIS-11A, MIS-15 and MIS-16), three wells laterally adjacent to the area of concern (R-1, RMIS-7 and RMIS-9) and three wells near the leading edge of the plume (MIS-12, MIS-13 and MIS-14) as defined by the ground water chromium standard of 0.1 mg/L. In addition to collecting water quality samples, field parameters (temperature, pH, specific conductance, turbidity, and the static water level) were measured during each round of sampling.

It should be noted that not all twelve network wells were monitored during each sampling event. In November 1997, well MIS-12 could not be located because of snow cover, thus it was not sampled. In December 1998, wells RMIS-6 and MIS-11A could not be located because of then recent construction on and around the Columbus airstrip. Therefore the two wells were not sampled. During the May 1999 sampling event, well RMIS-6 again could not be located because of the airstrip construction. A site contact later located the well, thus Atlantic Richfield's contractor returned to the site on June 3, 1999 to collect a sample from RMIS-6. In October 2002, well R-1 could not be located, thus it was not sampled. The R-1 well casing was gone, thus it is assumed that the well, which was located on private property, had been abandoned.

Network Ground Water Sampling Results

Field parameters and laboratory results for the November 1996 through October 2002 sampling events are presented in Table 3. Both pH and specific conductance values were similar throughout the site, throughout the life of the monitoring project. Values of pH ranged from 6.97-7.67 standard units. Specific conductance (SC) values ranged from 0.95-3.03 mmhos/cm. It was noted that SC values less than 2.0 mmhos/cm occurred on only three occasions and SC values greater than 3.00 mmhos/cm occurred only two times. Otherwise, all SC values were between 2.00 and 3.00 mmhos/cm. Concentration contours for total and dissolved chromium values for the October 2002 sampling can be found on Figures 5 and 6, respectively. Time series diagrams of total and dissolved chromium concentrations for each network well are presented as Figures 7a through 7l and 8a through 8l, respectively.

Network monitoring wells were last sampled in October 2002 and at that time chromium levels in all wells monitored were significantly below the 0.1 mg/L ground water standard. In 2002, total chromium concentrations ranged from less than 0.010 mg/L (RMIS-1 and MIS-12) to a maximum of 0.047 mg/L at RMIS-6. This compares to the November 1996 total chromium concentration range from less than 0.009 mg/L (RMIS-1 and RMIS-9) to a maximum of 0.206 mg/L at RMIS-6. Figure 5 presents a total chromium concentration contour map based on the most recent monitoring results.

Dissolved chromium concentrations in October 2002 ranged from less than 0.010 mg/L (RMIS-1, RMIS-9 and MIS-12) to maximum of 0.044 mg/L at RMIS-6. In November of 1996, dissolved chromium values ranged from less than 0.009 mg/L (MIS-12, R-1 duplicate and RMIS-9) to a maximum of 0.200 mg/L at RMIS-6. Figure 6 displays a dissolved chromium concentration contour based on recent monitoring data. The significant drop in both total and dissolved chromium concentrations in the seven year period indicates that the removal action, along with natural attenuation, has been successful in meeting ground and surface water cleanup standards at the Mouat site.

Appendix C provides all historic data for network and non-network wells. As shown in the time series plots in Figures 7a through 7l, from November 1996 to October 2002, total chromium concentrations have decreased or remained unchanged at 10 wells. At the down gradient well, MIS-13, total chromium concentrations appeared to be increasing between October 2000 and October 2001, but remained well below the standard of 0.1 mg/L. During May 2001 the total chromium concentration at MIS-13 was below the instrument detection limit (IDL). Additionally, in October 2002, the total chromium concentration at MIS-13 had decreased in comparison to the October 2001 value. Total chromium concentrations have also been sporadic at well RMIS-4. The total chromium concentration has generally decreased at RMIS-4, although in December 1999, October 2001 and October 2002 total chromium concentrations were anomalous to the decreasing trend. It is noted that, as with well MIS-13, the total chromium concentration found in October 2002 at RMIS-4 was considerably less than that found in that same well during the October 2001 monitoring.

In the initial 1996 monitoring event, two wells had total chromium concentrations greater than the 0.1 mg/L ground water quality standard for chromium. These wells included MIS-11A (0.177 mg/L) and RMIS-6 (0.206 mg/L). Based on this data, these well locations defined the central portion of the ground water chromium plume. In October 2002 the total chromium concentration at MIS-11A and RMIS-6 had dropped to 0.044 mg/L and 0.047 mg/L respectively.

Dissolved chromium concentrations have decreased or remained relatively unchanged in eleven wells as Figures 8a through 8l show. Dissolved chromium concentrations in the down gradient well, MIS-13, appeared to be increasing slightly between May 1998 and October 2002. However, during the May 2000 and 2001 monitoring events, dissolved chromium concentrations were near or below the IDL at MIS-13. Even with the fluctuations at this location, the 0.030 mg/L of dissolved chromium detected in MIS-13 during the October 2002 monitoring is significantly lower than the 0.1 mg/L ground water standard for chromium.

In the initial monitoring event during 1996, two wells had dissolved chromium concentrations greater than the MCL and WQB-7 standard of 0.1 mg/L dissolved chromium. These wells were MIS-11A (0.149 mg/L) and RMIS-6 (0.200 mg/L). In October 2002, the dissolved chromium concentrations at MIS-11A had dropped to 0.040 mg/L. At RMIS-6 the dissolved chromium concentration was 0.044 mg/L in October 2002. Thus, all wells at the Mouat site now display chromium concentrations, both total and dissolved, that are significantly below the MCL and WQB-7 standard.

4.1.1.2 Non-Network Ground Water Monitoring

Eleven non-network wells were scheduled for sampling in December 2003. These wells were identified as being within the SOD, but not part of the Site ground water monitoring network. Included in the non-network well list was one well up gradient of the study area (W-9), four wells within the area of concern (RMIS-2, MIS-4B, MIS-8B and MIS-11B) and six wells laterally adjacent to the area of concern (W-10, W-11, W-13, RMIS-3, RMIS-5 and RMIS-10). During the 2003 monitoring, it was observed that well W-13 is a hand dug domestic well which was used for irrigation in the past. According to the owner, this well has not been used to withdraw water for over two years, but is being used as a drain for the homeowner's water softening system. Appropriate purging and sampling procedures were followed for well W-13 and it is anticipated that a representative sample was obtained from this location.

Field parameters measured during the 2003 non-network monitoring included temperature, pH, specific conductance, turbidity and the static water level. All field observations were documented in a logbook and on field data sheets, which are provided in Attachment 1, Appendices B and C, respectively. The December 2003 ground water sampling consisted of collecting a total of thirteen samples, which included ten ground water, 1 duplicate, 1 external contamination and cross contamination blank and 1 field blank. Deviations from the SAP for the 2003 monitoring event are discussed in Section 4.1.2. Well W-10 was not sampled due to access issues which are explained further in Section 4.1.2.

Non-Network Ground Water Sampling Results

Field parameters and laboratory results for the December 2003 non-network well sampling event are presented in Table 4. Both pH and specific conductance values were similar throughout the site. Values of pH ranged from 7.21-7.44 standard units and specific conductance values ranged from 2.31-2.69 mmhos/cm. For the December 2003 non-network monitoring event, chromium levels in all wells were significantly below the 0.1 mg/L ground water standard. Total chromium concentrations ranged from less than 0.009 mg/L (W-9, MIS-4B, RMIS-3 and W-13) to a maximum of 0.044 mg/L at RMIS-2. Dissolved chromium concentrations in the non-network wells monitored during the December 2003 event ranged from less than 0.009 mg/L (W-9, RMIS-10, MIS-4B, W-11, and W-13) to a maximum of 0.049 mg/L at RMIS-2.

Figure 5 presents dissolved chromium concentrations and contours based on data from the 2003 monitoring event. Total chromium concentrations and contours based on the 2003 monitoring event are illustrated on Figure 6.

Time-series plots of total and dissolved chromium concentrations for each well are presented in Figures 9a through j and 10a through j, respectively. When the non-network wells were last sampled in May 1995, total chromium concentrations ranged from less than 0.005 mg/L (W-13) to a maximum of 1.180 mg/L at MIS-8B. Dissolved chromium concentrations in May of 1995 ranged from less than 0.005 mg/L (W-13) to a maximum of 1.220 mg/L at MIS-8B. Chromium concentrations at W-13 have not changed from less than the IDL during the 1995 to 2003 period. However, both total and dissolved chromium concentrations have decreased by nearly two orders of magnitude at MIS-8B (0.031 mg/L total chromium and 0.030 mg/L dissolved chromium in 2003).

Appendix C provides all historic data for network and non-network wells. Generally, total chromium concentrations have been similar to dissolved chromium concentrations throughout the monitoring period. The chromium concentration has remained below the detection limit at well W-13 in the eight year period. There has been a significant chromium decrease in four wells, and there has been a slight decrease in chromium concentrations in five wells. In January 1995, four wells had dissolved chromium concentrations greater than, or near, the MCL and WQB-7 standard of 0.1 mg/L dissolved chromium. These wells were RMIS-2, MIS-4B, MIS-8B and MIS-11B. In December 2003 the dissolved chromium concentrations at RMIS-2 had dropped from 0.166 to 0.049 mg/L. At

MIS-4B the dissolved chromium concentration was less than 0.009 mg/L compared to 0.096 mg/L in January 1995. At MIS-8B the dissolved chromium concentration fell from 1.240 mg/L in 1995 to .030 mg/L in 2003. In January 1995, the dissolved chromium concentration at MIS-11B was 1.730 mg/L compared to 0.023 mg/L in December 2003. To conclude, all of the non-network wells sampled in December 2003 were below the ground water standard of 0.1 mg/L, verifying that the original extent of impacts from the chromium plume has decreased substantially and that natural attenuation has been successful at the Mouat site.

4.1.1.3 Surface Water Monitoring

The surface water monitoring network consists of one location (GDSURF-1), as shown on Figure 4. Throughout the monitoring period, a sample was collected in this golf course spring/seep by immersing the sample container directly into the water. A peristaltic pump and disposable 0.45 micron filter were utilized to obtain the dissolved fraction. Care was taken to minimize sediment disturbance during sample collection. Surface water laboratory analysis consisted of total chromium, dissolved chromium and hexavalent chromium, while field parameters included pH, specific conductance, temperature and turbidity.

Surface Water Sampling Results

Field parameters and laboratory results for the November 1996 through October 2002 monitoring events are presented in Table 3. In October 2002, pH and SC were 7.48 standard units and 2.42 mmhos/cm, respectively. No exceedances of MCL and WQB-7 human health standards of 0.1 mg/L for dissolved chromium have ever been observed at Station GDSURF-1. When last sampled in October 2002, the hexavalent chromium level at GDSURF-1 was below the IDL of 0.006 mg/L and the chronic (0.011 mg/L) and acute standards (0.016 mg/L). Time series diagrams of total, dissolved and hexavalent chromium concentrations for station GDSURF-1 can be found on Figures 11, 12 and 13.

As stated above, total and dissolved trivalent chromium values have been below the standard of 0.1 mg/L at GDSURF-1 since sampling began in November 1996. This complies with the criteria for completion as stated in Section 5.0 of the RAWP. Completion criteria also require that the concentration of hexavalent chromium at the surface water site remain below the standard of 0.011 mg/L for three consecutive years. Hexavalent chromium values at GDSURF-1 have dropped dramatically since May 1999. Between November 1996 and May 1999, hexavalent chromium values fluctuated between 0.049 and 0.023 mg/L, generally decreasing with time. However, in December 1999, the hexavalent chromium concentration at GDSURF-1 dropped to 0.014 mg/L and has continued to drop since that time. Since October 2000, the hexavalent chromium concentration has consistently been below the WQB-7 aquatic life chronic standard of 0.011 mg/L. When last sampled during the October 2002 monitoring event, the hexavalent chromium concentration at GDSURF-1 was less than the IDL of 0.006 mg/L.

4.1.2 Difficulties Encountered and Deviations Required

The following is a list of deviations from the SAP for December 2003 monitoring and reporting activities:

- Samples were not collected with a bailer but with the submersible Grundfos Redi-Flow pump. After purging was complete, the flow rate was cut back to less than 0.5 gallons per minute for minimal turbulence during sample collection.

- Wells were not sampled in the exact order specified by the SAP. However, sampling was performed roughly from lowest to highest concentration wells. The order in which sampling was performed, combined with decontamination procedures assure the highest quality sample results.

- Well W-10 was not sampled because it was under a large gravel stockpile, apparently utilized by and owned by the City of Columbus. Since adjacent well RMIS-5 is in relatively close proximity to W-10, the decision to not sample the well (and not request the gravel to be moved) was made.

Prior deviations from the SAP are as follows:

- On November 11, 1996, the Model DRT-15C portable turbidity meter failed to operate properly. Therefore; a Hach Model 2100P turbidity meter was used as a substitute.

- During the November 19 and 20, 1997 site visit, Well MIS-12 could not be located due to significant snow accumulations at the site. As a result, this well was not sampled during that event.

- During the December 1998 sampling event, wells RMIS-6 and MIS-11A could not be located because of then-recent construction on the Columbus airstrip and were not sampled.

- During the May 1999 sampling event, well RMIS-6 could not be located as a result of then-recent construction activities on and around the Columbus airstrip. A site contact later located the well and a monitoring crew returned to the site on June 3, 1999 to collect a sample from RMIS-6.

- In December 1999, the surface water duplicate sample was analyzed for hexavalent chromium only.

- During the October 2002 sampling event, well R-1 was not sampled because it had been removed/abandoned. This well was located on private property. The area around the former well site and eastward towards the golf course had been leveled and seeded. A new irrigation well was present at the former R-1 site, but the screened interval of the irrigation well is unknown. A five horse power pump present in the irrigation well suggests that the screened interval is deeper than that of well R-1. Additionally, the well owner could not be located to obtain permission to sample the well.

4.1.3 Quality Assurance/Quality Control Results

This monitoring program required both laboratory and field quality assurance (QA) samples be prepared and analyzed. Three types of QA samples were prepared in the field: sample duplicate (D), field blanks (FB) and equipment rinsate blanks (ECB/CCB). Section III, part B of the *USEPA Functional Guidelines for Evaluating Inorganic Analyses* specifies that no contaminants should be present in field blanks. As stated in the *RAWP*, the relative percent difference (RPD) for field duplicate samples should be less than or equal to 25 percent. Quality assurance/quality control results for November 1996 through October 2003 sampling can be found on Table 5.

All laboratory QA values were within contract laboratory limits. Refer to individual annual reports (see Table 1) for copies of laboratory QA/QC result tables.

4.2 Institutional Controls Required and Implemented

The Town of Columbus established ICs in 1995, creating a SOD. A copy of Chapter 17.76 of the Official Code of the Town of Columbus, Montana which creates zoning laws pertinent to the SOD is attached as Appendix D. ICs pertain to land and ground water use within the SOD. Land use restrictions apply only to the block placement area and buffer zones surrounding the block placement area. Specifically, land use restrictions are:

1. Excavation into the block placement areas is prohibited, other than that required for sewer maintenance or replacement, or building or utility construction;
2. The graveled portions of the block placement area may be used for vehicle parking, material storage and related vehicle traffic. Maximum gross vehicle weight and axel loads for trucks is that which is allowed under Montana Department of Highways adopted "Federal Bridge Formula"; allowable forklifts are those with up to 50,000 pounds gross weight with up to 37,000 pounds on a single axel with four tires; and construction equipment with up to 7200 pounds per square foot under the actual tire or track contact area;
3. Vegetated areas cannot be used for any purpose, unless the areas are covered with gravel or a gravel and asphalt overlay. Gravel covers must meet the following criteria:
   a) Only select road stone from a local source is permissible. On-site gravel must be used to the extent possible. If sufficient on-site gravel is not available, off-site gravel may be used. Gravel must be well sorted with a particle size range that facilitates quick compaction and minimizes cover permeability once the gravel is placed and compacted;
   b) A woven geotextile must separate the underlying blocks and soils from any gravel placed over the vegetated area. The geotextile must be designed to reduce migration of gravels downward into the block layer and upward migration of the blocks into the

gravel layer;

c) The gravel layer must be approximately 24 inches thick.
d) Gravel must be placed in 6 to 12 inch lifts, with compaction of each lift with a road construction type roller;
e) The finished gravel surface must be graded to promote runoff to perimeter diversion ditches. The elevation at the center of the gravel surface must be approximately one foot higher than that at the perimeter of the gravel surface. Slope of the gravel surface must average one percent.
f) The graveled area must be designed and installed for vehicle traffic and material storage;
g) The landowner or lessee will be responsible for maintenance of the graveled surface.

4. The property owner or lessee must maintain any soil or gravel covers constructed pursuant to (3) above. Prompt repairs must be made to any area damaged by wind, erosion, burrowing animals, vehicles, or any other causes.
5. The City of Columbus Public Works Department must maintain perimeter drainage culverts and ditches in open, free-flowing condition.
6. In the event that any building or structure (including related utilities) is constructed on the block placement area, soil sufficient to prevent penetration of the placed blocks must be placed over the existing cover of the block placement area. Any building or structure (including related utilities) must meet applicable requirements set forth in Montana State Building Code and City of Columbus Zoning Code. Loads for the building or structure are limited to 6000 pounds per square foot.
7. Asphalt paving may be substituted for the topmost six inches of gravel cover. The asphalt must be placed in a four inch base course followed by a two inch surface wearing course.
8. The property owners must maintain the fences surrounding the soil cover areas, and gates must be kept locked. Other than soil cover and vegetation maintenance, wheeled vehicles are prohibited on the soil cover areas.

Ground water use restrictions apply to the entire SOD, and they are:

1. New ground water wells, ponds or channels fed by ground water, or other ground water extraction or recovery systems are prohibited;
2. Ground water use from existing wells, ponds, springs, or other ground water recovery or extraction systems is prohibited other than that used for lawn irrigation, use of the existing golf course pond, or ground water monitoring;
3. Excavation below the water table (static ground water level) is prohibited other than temporary excavation necessary for placement of footings and utilities. A permit must be obtained from the Town of Columbus for any such temporary excavations.

Ground water use restrictions outside the block placement area may be lifted once response action objectives are met (the MCL and Montana WQB-7 standard for chromium in ground water has been met for a period of three consecutive years). Land and ground water use restrictions within the block placement area will stay in place in order to maintain integrity of the block placement area.

4.3 Operation and Maintenance Required

Operation and maintenance pertains mainly to the block placement area ICs. As explained above, the landowner or lessee is responsible for maintenance of the graveled surface. Gravel and soil surfaces must be maintained and prompt repairs must be made to any area damaged by wind, erosion, burrowing animals, vehicles, or any other causes. Property owners must maintain the fences surrounding the soil cover areas and gates must be kept locked. Other than soil cover and vegetation maintenance, wheeled vehicles are prohibited on the soil cover areas. The Town of Columbus Public Works Department must maintain perimeter drainage culverts and ditches in open, free-flowing condition. Currently, site maintenance is performed by the City of Columbus Public Works Department and consists mainly of irrigating and mowing vegetated areas within the block placement area.

It is the responsibility of the Town to maintain the ICs. ICs are on record as Chapter 17.76 of the Official Code of the Town of Columbus, Montana. Appendix D provides the complete zoning ordinance and describes ICs.

4.4 Five Year Review

4.4.1 Analytical Summary

Natural attenuation with ground water monitoring was the selected remedy at the Mouat Site. A review of ground water data collected since 1996 demonstrates that this remedy has functioned as intended. Section 4.1.1 provides detailed discussion of time-trends and analytical data. Table 2 provides data collected under the Order during the period of 1996 through 2003.

<u>Network Wells</u>

The ground water network wells consist of one well up gradient (RMIS-1) of the study area, five wells within the area of concern (RMIS-4, RMIS-6, MIS-11A, MIS-15 and MIS-16), three wells laterally adjacent to the area of concern (R-1, RMIS-7 and RMIS-9) and three wells near the leading edge of the plume (MIS-12, MIS-13 and MIS-14), as defined by the ground water chromium standard of 0.1 mg/L. Network monitoring wells were last sampled in October 2002. At that time, chromium levels in all wells monitored were significantly below the 0.1 mg/L ground water standard.

In 2002, total chromium concentrations ranged from less than 0.01 mg/L (RMIS-1 and MIS-12) to a maximum of 0.047 mg/L at RMIS-6. This compares to the November 1996 total chromium concentration range of less than 0.009 mg/L (RMIS-1 and RMIS-9) to 0.206 mg/L at RMIS-6. Dissolved chromium concentrations in October 2002 ranged from less than 0.01 mg/L (RMIS-1, RMIS-9 and MIS-12) to a maximum of 0.044 mg/L at RMIS-6. In November of 1996, dissolved chromium values ranged from less than 0.009 mg/L (MIS-12, R-1 duplicate, and RMIS-9) to a maximum of 0.20 mg/L at RMIS-6. The significant drop in both total and dissolved chromium concentrations in the seven year period indicates that the removal action, along with natural attenuation, has been successful in meeting ground water cleanup standards at the Mouat site.

For the initial 1996 monitoring event, two wells had total chromium concentrations greater than the 0.10 mg/L water quality standard for chromium and defined the central portion of the ground water chromium plume. These wells were MIS-11A (0.177 mg/L) and RMIS-6 (0.206 mg/L). Between November 1996 and May 1997, chromium concentrations at these two wells decreased dramatically. After the initial drop-off, ground water approached the target level more slowly, as judged by chromium concentrations at MIS-11A and RMIS-6. December 1999 was the first sampling event in which ground water chromium concentrations were below the MCL and WQB-7 standard at all network wells, including MIS-11A and RMIS-6. In October 2002 the total chromium concentration at MIS-11A and RMIS-6 had dropped to 0.044 mg/L and 0.047 mg/L, respectively. Thus is can be said that ground water chromium concentrations approached criteria for completing the response action within four years.

Non-Network Wells

Eleven non-network wells were scheduled for sampling in December 2003. These wells were identified as being within the SOD, but not part of the Site ground water monitoring network. Included in the non-network well list was one well up gradient of the study area (W-9), four wells within the area of concern (RMIS-2, MIS-4B, MIS-8B, and MIS-11B) and six wells laterally adjacent to the area of concern (W-10, W-11, W-13, RMIS-3, RMIS-5, and RMIS-10).

For the December 2003 non-network monitoring event, chromium levels in all wells were significantly below the 0.1 mg/L ground water standard. Total chromium concentrations ranged from less than 0.009 mg/L (W-9, MIS-4B, RMIS-3 and W-13) to a maximum of 0.044 mg/L at RMIS-2. Dissolved chromium concentrations in the non-network wells monitored during the December 2003 event ranged from less than 0.009 mg/L (W-9, RMIS-10, MIS-4B, W-11 and W-13) to a maximum of 0.049 mg/L at RMIS-2.

Surface Water

Total and dissolved trivalent chromium values have been below the standard of 0.1 mg/L at GDSURF-1 since sampling began in November 1996. This complies with the criteria for completion as stated in Section 5.0 of the RAWP. Completion criteria also require that the concentration of hexavalent chromium at the surface water site remain below the standard of 0.011 mg/L for three consecutive years. Hexavalent chromium values at GDSURF-1 have dropped dramatically since May 1999. Between November 1996 and May 1999, hexavalent chromium values fluctuated between 0.049 and 0.023 mg/L, generally decreasing with time. In December 1999, the hexavalent chromium concentration at GDSURF-1 dropped to 0.014 mg/L and has continued to drop since that time. Since October 2000, the hexavalent chromium concentration has consistently been below the WQB-7 aquatic life chronic standard of 0.011 mg/L. When last sampled during the October 2002 monitoring event, the hexavalent chromium concentration at GDSURF-1 was less than the IDL of 0.006 mg/L.

4.4.2 Estimate of Total Costs Incurred in Complying With UAO

The initial response action at the Mouat site consisted of a full scale soil excavation and removal. Once removal was completed, monitoring of natural attenuation was used to assess the success of the soil removal. This section provides an estimate of the total costs associated with surface and ground water monitoring of natural attenuation at the Mouat site.

ICs, which prohibited the installation of new wells and limited the use of existing wells within the SOD, were in place at the Mouat site prior to implementing the monitoring program. Furthermore, several monitoring wells were present at the site and a ground water monitoring program had been in place for several years. The in-place ground water monitoring program was refined to better monitor natural attenuation at the site.

Ground and surface water monitoring costs include the costs associated with semi-annual and annual (where applicable) monitoring along with annual reporting costs. As shown in Table 6, the total cost of maintenance, monitoring, analytical and reporting for the period of November 1996 through February 2004 is approximately $150,000. Costs in Table 6 are based on Atlantic Richfield invoices received and paid for the monitoring project.

5.0 SUMMARY OF PROTECTIVENESS

5.1 Description of How Site Meets Site Completion Criteria

5.1.1 Cleanup Objectives and Requirements Specified in Action Memo and UAO Have Been Met

Criteria for completion of the response action at the Mouat site are set forth in Section 5.0 of the RAWP (provided in Appendix B as part of the UAO). Section 5.0 states:

The Monitoring Plan Well Network will be monitored semiannually for a minimum of five years, and will continue to be monitored until both of the following conditions are met:

> *1. It has been demonstrated that the maximum contaminant level (MCL) for chromium in ground water (0.1 mg/L total chromium in unfiltered samples) and the Montana numeric water quality standards set forth in Montana Department of Environmental Quality (MDEQ) circular WQB-7 (WQB-7 standards, MDEQ 1995) for chromium in ground water (0.1 mg/L hexavalent chromium and 0.1 mg/L trivalent chromium in filtered samples) have not been exceeded for a period of three consecutive years. Because neither the hexavalent nor the trivalent chromium concentration can be greater than the total chromium concentration, and because the MCL and WQB-7 standards all have the same numerical values, compliance with the WQB-7 standards can be demonstrated with total chromium data for filtered samples.*
>
> *2. It has been demonstrated that all remaining wells not included in the Monitoring Plan Well Network but within the SOD do not exceed the MCL for chromium in ground water and the WQB-7 standards for chromium in ground water as determined by samples from a single sampling round after the conditions of Item 1 above are met.*
>
> *If the conditions of Items 1 and 2 above are met after the initial five years of monitoring, the response action objectives for ground water will have been achieved.*

In addressing the completion criteria stated above, all of the network sampling locations at the Site were below the ground water standard of 0.1 mg/L from December 1999 to October 2002, or for more than three consecutive years. December 2003 sampling indicates that all non-network wells within the SOD comply with the Montana WQB-7 standard and MCL of 0.1 mg/L, *as determined from a single sampling round.* Therefore, the response action objectives for ground water at the Site have been achieved.

Section 5.0 of the RAWP sets criteria for completion of the response action at the Site pertaining to surface water as follows:

Chromium concentrations in surface water in the golf course pond and ditches exceed WQB-7 standards (0.011 mg/L hexavalent chromium and 0.1 mg/L trivalent chromium) as a result of ground *water that discharges into the pond and ditches. When response action objectives are met for ground water (the MCL for chromium in ground water and the WQB-7 standards for chromium in ground water have not been exceeded for a period of three consecutive years), EPA will review chromium levels in surface water to determine whether further action is warranted. If chromium levels in surface water achieve WQB-7 standards as expected, no further response action would be required.*

Total and dissolved trivalent chromium values have been below the standard of 0.1 mg/L at GDSURF-1 since sampling began in November 1996. Additionally, the hexavalent chromium concentration has consistently been below the WQB-7 aquatic life chronic standard of 0.011mg/L since October 2000, or three consecutive years. Therefore, surface water at the Site complies with the criteria for completion as stated in Section 5.0 of the RAWP.

Both ground water and surface water at the Mouat site have met compliance criteria; therefore, completion of the response action has been achieved.

5.1.2 ICs Have Been Implemented

ICs have been described above in Section 4.2 and a detailed description of the ICs is attached as Appendix D. Ordinance Number 267, on record at the Town of Columbus City Hall, repealed the Town's then present zoning ordinances and adopted "Town of Columbus Zoning Regulations, Amended 1995", which institutes zoning laws pertinent to the SOD. Zoning laws pertinent to the SOD are codified as Chapter 17.76 of the Official Code of the Town of Columbus, Montana. Section 17.76.030 outlines ICs for the block placement area. Section 17.76.040 outlines ground water ICs.

5.1.3 Site is Protective of Human Health and the Environment

5.1.3.1 Human Health

Three chemicals of potential concern (COPCs) were identified through several sampling and analysis efforts (PTI, 1995). These were Cr VI in ground and surface water, Cr III in on- and off-site surface and subsurface soils and Cr III in sediments and surface waters. Physical entrainment and infiltration/percolation were identified as the contaminant release mechanisms at the Site. Potential human exposure pathways were ingestion of soil displaying elevated chromium concentrations, consumption of surface or ground water displaying elevated chromium concentrations and inhalation of airborne particulates. Potential environmental receptors include indigenous aquatic life in golf course ponds and ditches and the Yellowstone River.

In 1990, the EPA enclosed a portion of the Site with 6-foot industrial chain-link fencing. At this same time, the Town altered drainage in the area to redirect storm water flow around the Site. FMC undertook a full scale soil excavation and treatment of approximately 14,000 cy of chromium containing Site soils between 1993 and 1995. EPA specified performance standards as follows:

- *Soil inside the EPA perimeter fence for which total chromium concentration in the extract Toxicity Characteristic Leaching Procedure (TCLP chromium) was greater than 0.5 mg/L* *was to be excavated to elevation 3564 or to the clay-gravel interface, whichever was lower.*

- *Soil outside the EPA fence perimeter for which TCLP chromium was greater than 0.1 mg/L was to be excavated to elevation 3564 or to the clay-gravel interface, whichever was lower* (Baker, 1996).

FMC continued excavation until all soil exhibiting chromium levels above the performance standards was removed. Approximately 7000 blocks were formed from the 14,000 cy of treated soil. Analytical results showed that all blocks met performance standards, thus the blocks were placed into the excavation. Additional excavations were made outside the area of elevated soil chromium levels to facilitate block placement within the specified elevations. Excavated soil from outside the perimeter fencing, in which TCLP chromium was between 0.1 and 0.5 mg/L, was placed above the water table in the fenced-in excavation. Site cover consisted of clean gravel in the western portion of the Site. The remainder of the site was covered with two feet of clean, off-site soil and vegetated. Site soils in which TCLP chromium was greater than 0.5 mg/L were disposed of at appropriate off-site facilities.

EPA's June 1996 Action Memorandum states:

The soil removal action rendered the chromium in soils non-toxic and immobile and eliminated the source of chromium contamination of ground water. Currently, the only potential threat is from chromium in the ground water medium.

The chosen response remedy for chromium in ground water was natural attenuation combined with ground water monitoring and ICs. EPA noted that, *......chromium concentrations in the ground water will also decline by natural dispersion and dilution mechanisms. Chromium concentrations in ground water have been declining in recent years, and the area within which elevated concentrations are found has been decreasing (U.S. EPA, 1996a).*

Ground water monitoring has demonstrated that chromium concentrations have continued to decline at the Site. The MCL and Montana WQB-7 ground water standard for total chromium is 0.1 mg/L. Total chromium concentrations at all monitoring wells at the Site have been below 0.1 mg/L since December 1999. When non-network wells within the SOD were monitored in December 2003, all of the wells yielded total chromium concentrations well below the ground water chromium standard.

Ambient air quality data was collected at the Site perimeter during the Soil Removal Action. Air monitors were positioned to provide upwind, downwind, and crosswind monitoring for all wind directions. Analytical results for total chromium indicated that airborne chromium was below the Site Specific standard of 0.39 $\mu g/m^3$, as defined in the Site Specific Health and Safety Plan. These samples represent worst case scenarios, as they were collected at times of excavation, handling, and loose storage of chromium containing soils. Since the Soil Removal Action, chromium containing soils have either been removed or treated to immobilize soil particles. Additionally, the Site is now surfaced with clean soil or gravel. After the Soil Removal Activity, EPA concluded in the June 1996 Action Memorandum that, *There are no site features or characteristics, weather conditions, human events, or other conditions that would either cause, spread, or accelerate the release of chromium at the Site.*

5.1.3.2 Environmental Risk

A 1995 baseline risk assessment performed by PTI found COPCs of ecological concern (COPECs) to be Cr III and Cr VI in surface water and sediments in the golf course pond and ditches. Elevated chromium concentrations that appeared in golf course ponds and ditches resulted from these water bodies being hydraulically connected to area ground water. Potentially, the elevated chromium concentrations presented a risk to bottom feeding fish, as well as bottom dwelling invertebrates. However, it was determined that the man-made golf course ditches and pond provide insufficient habitat to support aquatic receptors. Surface water sampling conducted in 1993 indicated that the Yellowstone River, located approximately a half mile south of the site, was not impacted by chromium-containing site soils (PTI, 1995). Appendix E provides investigative results of the surface water sampling.

Sediment samples collected from the Yellowstone River in 1993 indicated the range of detectable total chromium concentrations as 14.7 to 28.1 mg/kg. Two locations (one up-stream, far bank, one down-stream, near bank) had detectable hexavalent chromium concentrations of 0.082 mg/kg. The reported chromium range for Montana soils is 15 to 150 mg/kg with an average of 64 mg/kg (Dragun and Chaisson, 1991). South central Montana soils exhibit a chromium range of 25 to 35 mg/kg (Shacklette et al., 1971). Based on analytical results for Yellowstone River sediments, it can be concluded that Yellowstone River sediments were not impacted by chromium at the Site.

Both surface water and sediment samples from the Yellowstone River indicated that the Site did not impact the Yellowstone River. Thus, ecological receptors in the Yellowstone River were not at risk. Golf course ponds and ditches were affected by chromium at the Site, but these ponds and ditches are not of sufficient quality to provide aquatic habitat. Furthermore, total and dissolved chromium concentrations at the golf course pond, GDSURF-1, have been below the Montana WQB-7 standard of 0.1 mg/L at GDSURF-1 since sampling began in November 1996. Additionally, the hexavalent chromium concentration at the golf course pond has consistently been below the WQB-7 aquatic life chronic standard of 0.011mg/L since October 2000, or three consecutive years. In view of this, there are no ecological risks at the Site.

5.1.4 Remaining Activities

Maintenance of ICs is the only activity remaining at the Site. As detailed above, soil removal and treatment actions have removed the chromium source. Natural attenuation has reduced chromium concentrations to acceptable levels. With the ICs in place, the Site does not pose a risk to human health or the environment. Ground water use restrictions were outlined in Section 4.2 and can be found in Appendix D. Now that response action objectives have been met, ground water use restrictions within the SOD but outside the block placement area may be lifted at the Town's discretion.

Land use restrictions were explained in Section 4.2 and can be found in Appendix D. Land use restrictions pertain to the block placement area, and must stay in place. It is the responsibility of the Town to administer land use restrictions through Chapter 17.76 of the Official Code of the Town of

Columbus, Montana.

5.2 Site Deletion Criteria

Once no further response is necessary at an NPL site, the site can be deleted from the NPL. Operation and Maintenance is not defined as a response by the NCP, thus a site with continuing O&M can be considered for deletion. Under 40 CFR 300.425(e) of the NCP, an NPL site is eligible for deletion if:

- ❖ The responsible or other parties have implemented all appropriate and required response actions; or
- ❖ The release of hazardous substances poses no significant threat to the public health, welfare, or the environment, thereby eliminating the need for remedial action.

A site with surface and/or ground water restoration remedies can be considered for deletion once cleanup goals are met.

Site ground water cleanup goals are that all monitoring wells display total chromium concentrations at or below the MCL and Montana WQB-7 standard 0.1 mg/L for three consecutive years. Additionally, once these goals have been met, a single round of sampling must confirm that ground water chromium concentrations in non-network wells within the SOD are at or below the standards. Clearly, these goals have been met. Total chromium concentrations at all monitoring wells at the Mouat Site have been below 0.1 mg/L since December 1999. When non-network wells within the SOD were monitored in December 2003, all of the wells yielded total chromium concentrations well below the ground water chromium standard.

Surface water cleanup standards at the Site require that once ground water cleanup criteria have been met, surface water chromium concentrations will be reviewed. If surface water chromium concentrations meet the Montana WQB-7 standard, then no further action is needed. Total and dissolved trivalent chromium values have been below the standard of 0.1 mg/L at GDSURF-1 since sampling began in November 1996. The hexavalent chromium concentration at GDSURF-1 has consistently been below the WQB-7 aquatic life chronic standard of 0.011 mg/L since October 2000, or three consecutive years. Therefore, surface water cleanup goals at the Site have been attained.

The Mouat Site meets the criteria for deletion:

- ❖ All appropriate and required response actions have been implemented at the Site. The required response action was natural attenuation with ground water monitoring and ICs. This requirement has been fulfilled.
- ❖ The release of hazardous substances poses no significant threat to the public health, welfare, or the environment, thereby eliminating the need for remedial action. It has been demonstrated that releases from the Site do not pose a threat to human health or the environment.

Finally, surface and ground water cleanup goals have been attained. Therefore, the Mouat Site meets the requirements for deletion from the NPL.

6.0 REFERENCES

Baker, 1992, *Draft Additional Delineation of Chromium Containing Soils at the Mouat Industries Site.*

Baker, 1993, *Response Action Work Plan.*

Baker, 1993b, *Draft Report of Estimated Hydraulic Conductivities for the Mouat Industries Site, Alluvial Aquifer, Columbus, Montana.*

Baker, 1995, *Historical Data Assessment and Evaluation Report.* April, 1995.

Baker, 1996, *Engineering Evaluation and Cost Analysis Report*, May 1996.

Bureau of Reclamation, 1994, *Quarterly Groundwater Monitoring Investigation at the Mouat Industries Site.*

Dragun, James, Ph.D., and Andrew Chaisson, 1991, Elements in North American Soils. Hazardous Materials Control Resources Institute, Greenbelt, Maryland.

ESE, 1996, *Memorandum of Sampling Protocol and Health and Safety Plan for Mouat Industries NPL Site*, November, 1996.

HKM, 1977, *Water Quality Study for Middle Yellowstone Areawide Wastewater Management Program; Task 4 – Generate Short-term Subsurface Water Monitoring Program.*

Jacobs Engineering Group Inc.,1994, *Draft Statement of Work Remedial Investigation/Feasibility Study Mouat Industries Site Columbus, Montana, July 1994.*

Jacobs Engineering Group Inc., 1996a, *Mouat Industries Superfund Site Columbus, Montana, Groundwater Removal Action Response Action Work Plan*, July 1996.

Jacobs Engineering Group Inc., 1996b, *Baseline Human Health Risk and Ecological Risk Assessment for Mouat Industries Site Columbus, Montana.* U.S. EPA Contract No. 68-W8-0122. January, 1996.

PTI, 1995, *Human Health and Ecological Screening Level Risk Assessments for the Mouat Industries Site.* April, 1995.

Shacklette, H.T., J.C. Hamilton, J.G. Boerngn, and J.M. Bowles, 1971, Elemental Composition of Surficial Materials in the Conterminous United States. U.S. Department of the Interior. Washington, D.C., (Shacklette, 1971).

U.S. EPA, 1988, USEPA Functional Guidelines for Evaluating Inorganic Analyses, *1988, Viar* *and Co. for the United States Environmental Protection Agency, Washington, D.C.*

U.S. EPA, 1996a, *Enforcement/Action Memorandum, Request for Non-Time Critical Removal Action Approval at Mouat Industries Site, Columbus, Stillwater County, Montana.* June 21, 1996.

U.S. EPA, 1996b, *Unilateral Administrative Order (UOA) for conduct of a Non-Time-Critical Removal Action at the Mouat Industries NPL Site in Columbus, Montana*, July 1996.

TABLES

Mouat Industries NPL Site - Columbus, MT

Table 1. Documents Submitted in Accordance with Unilateral Action Order, Docket No. CERCLA-VIII-96-22

Title	Date
Memorandum of Sampling Protocol and Health and Safety Plan	November 1996
Mouat Industries Superfund Site Columbus, MT 1997 Annual Data Summary Report	September 1997
Mouat Industries Superfund Site Columbus, MT 1998 Annual Data Summary Report	February 1999
Mouat Industries Superfund Site Columbus, MT 1999 Annual Data Summary Report	December 1999
Mouat Industries Superfund Site Columbus, MT 2000 Annual Data Summary Report	December 2000
Mouat Industries Superfund Site Columbus, MT 2001 Annual Data Summary Report	December 2001
Mouat Industries Superfund Site Columbus, MT 2002 Annual Data Summary Report	December 2002
Mouat Industries Superfund Site Columbus, MT 2003 Non-Network Well Data Summary Report	October 2004

Mouat Industries NPL Site - Columbus, MT

Table 2. Water Quality Field Parameters and Chromium Concentrations, Network and Non-Network Wells 1996 through 2003

Sample	Date	Hexavalent		Total		Dissolved		Temp	pH	SC	Turbidity	SWL
Location		Q	Cr (mg/L)	Q	Cr (mg/L)	Q	Cr (mg/L)	(°C)	(SU)	mmhos/cm	(NTU)	Ft
GDSURF-1	Nov-96		0.044		0.053		0.044		7.36	2.68	2.50	
GDSURF-1	Nov-96		0.049		0.057		0.056					
GDSURF-1	May-97		0.030		0.042		0.043	10.57	7.33	2.55	3.60	
GDSURF-1	May-97		0.030		0.041		0.041					
GDSURF-1	Nov-97		0.030		0.033		0.031	8.49	7.32	2.23		
GDSURF-1	Nov-97		0.030		0.035		0.032	8.49	7.32	2.23		
GDSURF-1	May-98		0.033		0.041		0.039	10.62	7.13	2.47		
GDSURF-1	May-98		0.036		0.035		0.030	10.62	7.13	2.47		
GDSURF-1	Dec-98		0.030		0.030		0.016	8.92	7.13	2.56		
GDSURF-1	Dec-98		0.023		0.028		0.023	8.92	7.13	2.56		
GDSURF-1	May-99		0.030		0.023		0.024	12.74	7.56	2.53	4	
GDSURF-1	May-99		0.030		0.024		0.023	12.74	7.56	2.53	4	
GDSURF-1	Dec-99		0.014		0.014		0.014	8.33	7.46	2.49	6.92	
GDSURF-1	Dec-99		0.017					8.33	7.46	2.49	6.92	
GDSURF-1	May-00		0.013		0.017		0.011	10.93	7.60	2.52	2.20	
GDSURF-1	May-00	<	0.007		0.026		0.011	10.93	7.60	2.52	2.20	
GDSURF-1	Oct-00	<	0.007		0.038	<	0.009	11.59	7.45	2.63	33.00	
GDSURF-1	Oct-00	<	0.007		0.036	<	0.009	11.59	7.45	2.63	33.00	
GDSURF-1	May-01		0.010		0.027		0.019	8.57	7.38	2.58	27.00	
GDSURF-1	May-01	<	0.007		0.026		0.027	8.57	7.38	2.58	27.00	
GDSURF-1	Oct-01		0.009	<	0.009	<	0.009	9.97	7.45	2.55	34.00	
GDSURF-1	Oct-01		0.010	<	0.009	<	0.009	9.97	7.45	2.55	34.00	
GDSURF-1	Oct-02	<	0.007		0.012	<	0.010	7.10	7.48	2.42	8.90	
GDSURF-1	Oct-02	<	0.007	<	0.010		0.013	7.10	7.48	2.42	8.90	
MIS-11A	Nov-96				0.177		0.149	12.07	7.39	2.75	1.10	9.14
MIS-11A	May-97				0.128		0.124	9.27	7.31	2.63	0.80	8.8
MIS-11A	Nov-97				0.102		0.098	12.29	7.33	2.26	1.70	8.80
MIS-11A	May-98				0.106		0.094	9.80	7.30	2.56	1.80	9.20
MIS-11A	May-99				0.059		0.062	9.3	7.32	2.74	3	9.27
MIS-11A	Dec-99				0.075		0.068	12.79	7.51	2.7	2	9.27

Mouat Industries NPL Site - Columbus, MT

Table 2. Water Quality Field Parameters and Chromium Concentrations, Network and Non-Network Wells 1996 through 2003

Sample	Date		Hexavalent		Total		Dissolved	Temp	pH	SC	Turbidity	SWL
Location		Q	Cr (mg/L)	Q	Cr (mg/L)	Q	Cr (mg/L)	(°C)	(SU)	mmhos/cm	(NTU)	Ft
MIS-11A	May-00				0.044		0.039	9.67	7.60	2.60	1.00	9.30
MIS-11A	Oct-00				0.059		0.044	14.20	7.41	2.84	1.10	9.40
MIS-11A	May-01				0.030		0.036	9.44	7.38	2.68	0.98	9.81
MIS-11A	Oct-01				0.058		0.046	14.11	7.40	2.80	0.88	9.60
MIS-11A	Oct-02				0.044		0.040	13.24	7.38	2.78	0.90	9.39
MIS-11B	Dec-03				0.022		0.023	12.64	7.38	2.66	0.31	9.78
MIS-12	Nov-96				0.009	<	0.009	11.85	7.22	2.68	1.09	3.98
MIS-12	May-97			<	0.009	<	0.009	7.63	7.14	2.5	2.20	3.2
MIS-12	May-97			<	0.009	<	0.009					
MIS-12	May-98			<	0.010	<	0.010	8.26	6.99	3.03	1.43	3.55
MIS-12	May-98			<	0.010	<	0.010	8.26	6.99	3.03	1.43	3.55
MIS-12	Dec-98			<	0.010	<	0.010	12.31	7.16	2.99	1.6	4.04
MIS-12	May-99			<	0.010	<	0.010	8.86	7.07	2.96	2.2	3.54
MIS-12	Dec-99			<	0.008	<	0.008	12.01	7.36	2.8	1.1	4.2
MIS-12	May-00			<	0.009	<	0.009	8.62	7.43	2.68	0.90	3.18
MIS-12	Oct-00			<	0.009	<	0.009	13.37	7.15	2.87	0.89	4.10
MIS-12	May-01			<	0.008	<	0.008	7.46	7.21	2.76	0.92	3.71
MIS-12	Oct-01			<	0.009	<	0.009	13.35	7.14	2.84	0.91	4.07
MIS-12	Oct-02			<	0.010	<	0.010	11.47	7.11	2.81	1.10	4.06
MIS-13	Nov-96				0.016		0.023	11.2	7.27	2.28	1.20	7.04
MIS-13	May-97				0.017		0.020	7.95	7.18	2.15	0.50	5.71
MIS-13	Nov-97				0.016		0.016	11.36	7.09	2.05	1.40	6.78
MIS-13	Nov-97				0.017		0.016	11.36	7.09	2.05	1.40	6.78
MIS-13	Dec-98				0.026		0.014	11.57	7.15	2.44	1.3	7.04
MIS-13	May-99				0.023		0.014	8.91	7.11	2.4	2	7.33
MIS-13	Dec-99				0.017		0.019	11.54	7.38	2.01	1	8.48
MIS-13	May-00				0.012	<	0.009	9.40	7.48	1.90	1.10	6.45
MIS-13	Oct-00				0.024		0.022	12.63	7.25	2.30	1.06	8.53
MIS-13	May-01				0.008		0.013	8.45	7.27	1.75	0.98	8.14
MIS-13	Oct-01				0.037		0.033	12.68	7.24	2.34	1.10	8.98

Mouat Industries NPL Site - Columbus, MT

Table 2. Water Quality Field Parameters and Chromium Concentrations, Network and Non-Network Wells 1996 through 2003

Sample Location	Date	Hexavalent Q	Hexavalent Cr (mg/L)	Total Q	Total Cr (mg/L)	Dissolved Q	Dissolved Cr (mg/L)	Temp (°C)	pH (SU)	SC mmhos/cm	Turbidity (NTU)	SWL Ft
MIS-13	Oct-02				0.028		0.030	11.74	7.23	2.37	1.20	8.61
MIS-13	May-98				0.014	<	0.010	8.64	7.01	2.63	1.80	5.84
MIS-14	Nov-96				0.019		0.021	11.86	7.14	2.88	0.14	9.84
MIS-14	May-97				0.016		0.016	8.95	7.06	2.76	0.08	9.22
MIS-14	Nov-97				0.015		0.015	11.90	7.00	2.38	0.04	9.42
MIS-14	May-98				0.011		0.010	9.26	6.97	2.64	0.29	9.58
MIS-14	Dec-98				0.012		0.013	12.35	7.14	2.65	0.12	9.18
MIS-14	Dec-98				0.021	<	0.010	12.35	7.14	2.65	0.12	9.18
MIS-14	May-99				0.011		0.015	9.4	7.06	2.79	0.2	10.24
MIS-14	Dec-99				0.015		0.015	12.81	7.31	2.56	1	10.64
MIS-14	May-00				0.034		0.023	9.75	7.35	2.53	0.13	10.40
MIS-14	Oct-00				0.012		0.015	13.75	7.09	2.66	0.11	10.52
MIS-14	Oct-00				0.026		0.013	13.75	7.09	2.66	0.11	10.52
MIS-14	May-01				0.027		0.027	9.44	7.11	2.55	0.21	10.40
MIS-14	Oct-01				0.023		0.015	13.80	7.12	2.57	0.22	10.55
MIS-14	Oct-02				0.014		0.017	12.94	7.16	2.63	0.31	10.45
MIS-15	Nov-96				0.032		0.031	12.97	7.29	2.74	1.80	6.43
MIS-15	May-97				0.038		0.036	10.43	7.27	2.71	1.90	6.1
MIS-15	Nov-97				0.026		0.024	12.99	7.22	2.32	1.67	5.92
MIS-15	May-98				0.027		0.027	10.62	7.23	2.54	0.85	6.46
MIS-15	Dec-98				0.019		0.016	13.09	7.31	2.72	0.42	6.23
MIS-15	May-99				0.025		0.023	11.05	7.32	2.77	5	6.44
MIS-15	Dec-99				0.020		0.016	13.16	7.53	2.74	1	6.56
MIS-15	May-00				0.023		0.019	11.10	7.60	2.70	1.20	6.66
MIS-15	Oct-00				0.027		0.023	14.43	7.41	2.86	1.12	6.76
MIS-15	May-01				0.017		0.011	10.29	7.38	2.66	0.98	7.29
MIS-15	Oct-01				0.016		0.016	14.40	7.38	2.84	0.89	7.02
MIS-15	Oct-02				0.013		0.016	12.68	7.36	2.79	0.90	6.75
MIS-16	Nov-96				0.019		0.016	11.16	7.34	2.74	1.20	6.55
MIS-16	May-97				0.018		0.016	10.12	7.32	2.58	3.30	6.3

Mouat Industries NPL Site - Columbus, MT

Table 2. Water Quality Field Parameters and Chromium Concentrations, Network and Non-Network Wells 1996 through 2003

Sample Location	Date	Q	Hexavalent Cr (mg/L)	Q	Total Cr (mg/L)	Q	Dissolved Cr (mg/L)	Temp (°C)	pH (SU)	SC mmhos/cm	Turbidity (NTU)	SWL Ft
MIS-16	Nov-97				0.010		0.009	11.49	7.25	2.22	2.05	6.13
MIS-16	May-98				0.012	<	0.010	10.26	7.30	2.29	1.90	6.62
MIS-16	Dec-98				0.015	<	0.010	11.44	7.34	2.52	2.1	6.48
MIS-16	May-99				0.012	<	0.010	10.63	7.31	2.62	2	6.72
MIS-16	Dec-99				0.013		0.015	11.58	7.5	2.53	5	6.8
MIS-16	Dec-99				0.013		0.015	11.58	7.5	2.53	5	6.8
MIS-16	May-00			<	0.009	<	0.009	10.69	7.60	2.45	0.80	6.84
MIS-16	Oct-00			<	0.009	<	0.009	12.35	7.39	2.60	0.60	6.89
MIS-16	May-01			<	0.008	<	0.008	9.98	7.33	2.64	0.80	7.41
MIS-16	May-01			<	0.008	<	0.008	9.98	7.33	2.64	0.80	7.41
MIS-16	Oct-01			<	0.009	<	0.009	12.41	7.41	2.46	0.8	7.1
MIS-16	Oct-02				0.017		0.011	12.12	7.38	2.49	1.00	6.88
MIS-4B	Dec-03			<	0.009	<	0.009	12.6	7.44	2.52	4.54	7.07
MIS-8B	Dec-03				0.031		0.030	12.81	7.4	2.69	0.31	8.35
R-1	Nov-96				0.054		0.021	11.85	7.15	2.63	2.80	12.19
R-1	Nov-96				0.040	<	0.009					
R-1	May-97				0.017	<	0.009	9.46	7.15	2.52	1.25	11.77
R-1	Nov-97				0.009		0.007	11.96	7.06	2.25	0.15	11.80
R-1	May-98				0.015		0.012	9.51	7.05	2.38	2.65	12.22
R-1	Dec-98				0.012	<	0.010	12.61	7.17	2.47	0.42	12.04
R-1	May-99				0.027	<	0.010	9.89	7.11	2.52	3	12.2
R-1	Dec-99				0.011		0.010	12.84	7.4	2.47	6	12.3
R-1	May-00			<	0.009	<	0.009	10.02	7.49	2.44	2.40	12.27
R-1	May-00			<	0.009	<	0.009	10.02	7.49	2.44	2.40	12.27
R-1	Oct-00			<	0.009	<	0.009	12.98	7.16	2.65	2.00	12.46
R-1	May-01			<	0.008	<	0.008	9.84	7.21	2.59	2.20	12.75
R-1	Oct-01				0.032	<	0.009	13.30	7.25	2.49	2.18	12.61
RMIS-1	Nov-96			<	0.009		0.012	12.17	7.43	0.95	3.44	9.71
RMIS-1	May-97			<	0.009	<	0.009	9.33	7.33	2.59	3.50	9.56
RMIS-1	Nov-97				0.001	<	0.001	12.71	7.29	2.25	1.15	9.08

Mouat Industries NPL Site - Columbus, MT

Table 2. Water Quality Field Parameters and Chromium Concentrations, Network and Non-Network Wells 1996 through 2003

Sample Location	Date	Q	Hexavalent Cr (mg/L)	Q	Total Cr (mg/L)	Q	Dissolved Cr (mg/L)	Temp (°C)	pH (SU)	SC mmhos/cm	Turbidity (NTU)	SWL Ft
RMIS-1	May-98			<	0.010	<	0.010	9.84	7.22	2.43	2.64	9.82
RMIS-1	Dec-98			<	0.010		0.010	13.28	7.39	2.5	2.18	9.44
RMIS-1	May-99			<	0.010	<	0.010	10.76	7.23	2.59	1.8	9.79
RMIS-1	Dec-99			<	0.008	<	0.008	13.11	7.52	2.41	3	9.98
RMIS-1	May-00			<	0.009	<	0.009	10.39	7.65	2.47	3.21	10.09
RMIS-1	Oct-00			<	0.009	<	0.009	14.05	7.41	2.54	2.80	10.05
RMIS-1	May-01			<	0.008	<	0.008	9.35	7.41	2.57	1.14	10.92
RMIS-1	Oct-01			<	0.009	<	0.009	14.11	7.45	2.3	1.1	10.42
RMIS-1	Oct-02			<	0.010	<	0.010	13.88	7.46	2.28	1.40	10.11
RMIS-1	Oct-02				0.015	<	0.010	13.88	7.46	2.28	1.40	10.11
RMIS-10	Dec-03				0.015	<	0.009	12.6	7.36	2.56	2.37	7.6
RMIS-2	Dec-03				0.044		0.049	12.68	7.41	2.41	4	11.24
RMIS-3	Dec-03			<	0.009		0.009	12.97	7.21	2.31	2.73	8.63
RMIS-4	Nov-96				0.091		0.095	12.26	7.3	2.89	4.70	6.79
RMIS-4	May-97				0.041		0.042	9.92	7.32	2.8	2.20	6.53
RMIS-4	May-97				0.045		0.043					
RMIS-4	Nov-97				0.073		0.035	12.10	7.22	2.45	2.40	6.35
RMIS-4	May-98				0.047		0.030	10.12	7.29	2.61	4.85	6.85
RMIS-4	Dec-98				0.057		0.039	11.92	7.31	2.8	3.5	6.66
RMIS-4	May-99				0.051		0.016	10.61	7.32	2.76	22	6.85
RMIS-4	Dec-99				0.098		0.040	12.3	7.52	2.78	10	6.93
RMIS-4	May-00				0.025		0.025	11.16	7.60	2.73	1.80	7.04
RMIS-4	Oct-00				0.020	<	0.009	13.96	7.38	2.89	1.60	7.09
RMIS-4	May-01				0.017		0.015	9.72	7.35	2.73	1.60	7.57
RMIS-4	Oct-01				0.076		0.023	13.41	7.38	2.74	1.40	7.30
RMIS-4	Oct-02				0.035		0.020	12.22	7.28	2.70	1.30	7.08
RMIS-5	Dec-03				0.018		0.023	11.81	7.39	2.54	3.3	7.15
RMIS-6	Nov-96				0.206		0.200	13.24	7.36	2.86	0.40	8.16
RMIS-6	May-97				0.140		0.133	8.94	7.37	2.77	0.50	7.82
RMIS-6	Nov-97				0.113		0.108	13.12	7.27	2.38	0.18	7.76

Mouat Industries NPL Site - Columbus, MT

Table 2. Water Quality Field Parameters and Chromium Concentrations, Network and Non-Network Wells 1996 through 2003

Sample Location	Date	Q	Hexavalent Cr (mg/L)	Q	Total Cr (mg/L)	Q	Dissolved Cr (mg/L)	Temp (°C)	pH (SU)	SC mmhos/cm	Turbidity (NTU)	SWL Ft
RMIS-6	Nov-97				0.117		0.107	13.12	7.27	2.38	0.18	7.76
RMIS-6	May-98				0.152		0.141	9.07	7.32	2.59	1.90	8.22
RMIS-6	Jun-99				0.115		0.109	9.17	7.38	2.75	4	8.21
RMIS-6	Dec-99				0.090		0.091	13.29	7.54	2.71	3	8.36
RMIS-6	May-00				0.087		0.065	9.08	7.65	2.67	0.30	8.46
RMIS-6	Oct-00				0.078		0.071	14.06	7.47	2.86	0.22	8.57
RMIS-6	May-01				0.068		0.060	8.81	7.40	2.76	0.26	9.01
RMIS-6	Oct-01				0.050		0.058	14.66	7.50	2.69	0.33	8.76
RMIS-6	Oct-02				0.047		0.044	13.22	7.44	2.57	0.51	8.56
RMIS-7	Nov-96				0.021		0.018	11.77	7.22	2.56	0.90	9.57
RMIS-7	Nov-96				0.037		0.029					
RMIS-7	May-97				0.017		0.016	9.44	7.2	2.4	1.30	9.16
RMIS-7	Nov-97				0.015		0.014	11.97	7.06	2.00	2.32	9.24
RMIS-7	May-98				0.017		0.013	9.34	7.11	2.29	1.25	9.60
RMIS-7	Dec-98			<	0.010		0.011	12.46	7.13	2.4	0.66	9.43
RMIS-7	May-99				0.013		0.011	9.88	7.13	2.45	3.4	9.6
RMIS-7	May-99				0.016		0.013	9.88	7.13	2.45	3.4	9.6
RMIS-7	Dec-99				0.014		0.010	12.51	7.34	2.41	3	9.74
RMIS-7	May-00			<	0.009	<	0.009	10.10	7.47	2.38	1.00	9.68
RMIS-7	Oct-00				0.022		0.018	13.47	7.24	2.60	0.90	9.84
RMIS-7	May-01			<	0.008	<	0.008	9.84	7.20	2.56	0.82	10.14
RMIS-7	Oct-01				0.016		0.016	13.46	7.23	2.59	0.88	10.00
RMIS-7	Oct-02				0.020		0.017	12.28	7.26	2.54	0.90	9.87
RMIS-9	Nov-96			<	0.009	<	0.009	11.74	7.41	2.87	0.70	7.74
RMIS-9	May-97				0.010	<	0.009	8.78	7.38	2.73	0.88	7.35
RMIS-9	Nov-97				0.005		0.005	11.75	7.27	2.40	0.32	7.38
RMIS-9	May-98			<	0.010	<	0.010	9.04	7.31	2.56	0.77	7.76
RMIS-9	Dec-98			<	0.010	<	0.010	12.02	7.31	2.76	0.4	7.41
RMIS-9	May-99			<	0.010		0.011	9.26	7.32	2.73	1	7.68
RMIS-9	Dec-99			<	0.008	<	0.008	12.33	7.57	2.64	0.4	7.8

Mouat Industries NPL Site - Columbus, MT

Table 2. Water Quality Field Parameters and Chromium Concentrations, Network and Non-Network Wells 1996 through 2003

Sample Location	Date	Hexavalent Q	Hexavalent Cr (mg/L)	Total Q	Total Cr (mg/L)	Dissolved Q	Dissolved Cr (mg/L)	Temp (°C)	pH (SU)	SC mmhos/cm	Turbidity (NTU)	SWL Ft
RMIS-9	May-00			<	0.009	<	0.009	9.95	7.67	2.55	0.70	7.75
RMIS-9	Oct-00			<	0.009	<	0.009	13.97	7.43	2.69	0.55	7.78
RMIS-9	May-01			<	0.008	<	0.008	9.03	7.41	2.53	0.62	8.32
RMIS-9	Oct-01			<	0.009	<	0.009	14.23	7.45	2.60	0.63	8.05
RMIS-9	Oct-01				0.012	<	0.009	14.23	7.45	2.60	0.63	8.05
RMIS-9	Oct-02				0.011	<	0.010	12.23	7.36	2.62	0.80	7.81
W-11	Dec-03				0.014	<	0.009	12.38	7.34	2.39	0.63	8.87
W-13	Dec-03			<	0.009	<	0.009	11.87	7.34	2.52	2.27	5.03
W-9	Dec-03			<	0.009	<	0.009	10.34	7.42	2.32	0.7	6.65

SWL = Static water level measured from measuring point on well casing

< = less than instrument detection limit

Mouat Industries NPL Site - Columbus, MT

Table 3. Network Sites Water Quality Field Parameters and Chromium Concentrations 1996 through 2002

Sample Location	Sample ID	Date	Hexavalent Q	Hexavalent Cr (mg/L)	Total Q	Total Cr (mg/L)	Dissolved Q	Dissolved Cr (mg/L)	Temp (°C)	pH (SU)	SC mmhos/cm	Turbidity (NTU)	SWL Ft
GDSURF-1	SW001	Nov-96		0.044		0.053		0.044		7.36	2.68	2.50	
GDSURF-1D	SW002	Nov-96		0.049		0.057		0.056					
GDSURF-1	SW003	May-97		0.030		0.042		0.043	10.57	7.33	2.55	3.60	NA
GDSURF-1D	SW004	May-97		0.030		0.041		0.041					
GDSURF-1	SW005	Nov-97		0.030		0.033		0.031	8.49	7.32	2.23		NA
GDSURF-1D	SW006	Nov-97		0.030		0.035		0.032	8.49	7.32	2.23		NA
GDSURF-1	SW007	May-98		0.033		0.041		0.039	10.62	7.13	2.47		N/A
GDSURF-1D	SW008	May-98		0.036		0.035		0.030	10.62	7.13	2.47		N/A
GDSURF-1	SW009	Dec-98		0.030		0.030		0.016	8.92	7.13	2.56		N/A
GDSURF-1D	SW010	Dec-98		0.023		0.028		0.023	8.92	7.13	2.56		N/A
GDSURF-1	SW011	May-99		0.030		0.023		0.024	12.74	7.56	2.53	4	NA
GDSURF-1D	SW012	May-99		0.030		0.024		0.023	12.74	7.56	2.53	4	NA
GDSURF-1	SW013	Dec-99		0.014		0.014		0.014	8.33	7.46	2.49	6.92	NA
GDSURF-1D	SW014	Dec-99		0.017					8.33	7.46	2.49	6.92	NA
GDSURF-1	SW016	May-00		0.013		0.017		0.011	10.93	7.60	2.52	2.20	NA
GDSURF-1D	SW017	May-00	<	0.007		0.026		0.011	10.93	7.60	2.52	2.20	NA
GDSURF-1	SW018	Oct-00	<	0.007		0.038	<	0.009	11.59	7.45	2.63	33.00	NA
GDSURF-1D	SW019	Oct-00	<	0.007		0.036	<	0.009	11.59	7.45	2.63	33.00	NA
GDSURF-1	SW020	May-01		0.010		0.027		0.019	8.57	7.38	2.58	27.00	NA
GDSURF-1D	SW021	May-01	<	0.007		0.026		0.027	8.57	7.38	2.58	27.00	NA
GDSURF-1	SW022	Oct-01		0.009	<	0.009	<	0.009	9.97	7.45	2.55	34.00	NA
GDSURF-1D	SW023	Oct-01		0.010	<	0.009	<	0.009	9.97	7.45	2.55	34.00	NA
GDSURF-1	SW024	Oct-02	<	0.007		0.012	<	0.010	7.10	7.48	2.42	8.90	NA
GDSURF-1D	SW025	Oct-02	<	0.007	<	0.010		0.013	7.10	7.48	2.42	8.90	NA
MIS-11A	GW112	Nov-96				0.177		0.149	12.07	7.39	2.75	1.10	9.14
MIS-11A	GW127	May-97				0.128		0.124	9.27	7.31	2.63	0.80	8.8
MIS-11A	GW142	Nov-97				0.102		0.098	12.29	7.33	2.26	1.70	8.80
MIS-11A	GW157	May-98				0.106		0.094	9.80	7.30	2.56	1.80	9.20
MIS-11A	GW186	May-99				0.059		0.062	9.3	7.32	2.74	3	9.27
MIS-11A	GW203	Dec-99				0.075		0.068	12.79	7.51	2.7	2	9.27
MIS-11A	GW215	May-00				0.044		0.039	9.67	7.60	2.60	1.00	9.30
MIS-11A	GW229	Oct-00				0.059		0.044	14.20	7.41	2.84	1.10	9.40

Mouat Industries NPL Site - Columbus, MT

Table 3. Network Sites Water Quality Field Parameters and Chromium Concentrations 1996 through 2002

Sample Location	Sample ID	Date	Hexavalent Q	Hexavalent Cr (mg/L)	Total Q	Total Cr (mg/L)	Dissolved Q	Dissolved Cr (mg/L)	Temp (°C)	pH (SU)	SC mmhos/cm	Turbidity (NTU)	SWL Ft
MIS-11A	GW241	May-01				0.030		0.036	9.44	7.38	2.68	0.98	9.81
MIS-11A	GW260	Oct-01				0.058		0.046	14.11	7.40	2.80	0.88	9.60
MIS-11A	GW276	Oct-02				0.044		0.040	13.24	7.38	2.78	0.90	9.39
MIS-12	GW101	Nov-96				0.009	<	0.009	11.85	7.22	2.68	1.09	3.98
MIS-12	GW116	May-97			<	0.009	<	0.009	7.63	7.14	2.5	2.20	3.2
MIS-12D	GW117	May-97			<	0.009	<	0.009					
MIS-12	GW147	May-98			<	0.010	<	0.010	8.26	6.99	3.03	1.43	3.55
MIS-12D	GW148	May-98			<	0.010	<	0.010	8.26	6.99	3.03	1.43	3.55
MIS-12	GW161	Dec-98			<	0.010	<	0.010	12.31	7.16	2.99	1.6	4.04
MIS-12	GW176	May-99			<	0.010	<	0.010	8.86	7.07	2.96	2.2	3.54
MIS-12	GW191	Dec-99			<	0.008	<	0.008	12.01	7.36	2.8	1.1	4.2
MIS-12	GW217	May-00			<	0.009	<	0.009	8.62	7.43	2.68	0.90	3.18
MIS-12	GW221	Oct-00			<	0.009	<	0.009	13.37	7.15	2.87	0.89	4.10
MIS-12	GW242	May-01			<	0.008	<	0.008	7.46	7.21	2.76	0.92	3.71
MIS-12	GW262	Oct-01			<	0.009	<	0.009	13.35	7.14	2.84	0.91	4.07
MIS-12	GW268	Oct-02			<	0.010	<	0.010	11.47	7.11	2.81	1.10	4.06
MIS-13	GW102	Nov-96				0.016		0.023	11.2	7.27	2.28	1.20	7.04
MIS-13	GW118	May-97				0.017		0.020	7.95	7.18	2.15	0.50	5.71
MIS-13	GW132	Nov-97				0.016		0.016	11.36	7.09	2.05	1.40	6.78
MIS-13D	GW133	Nov-97				0.017		0.016	11.36	7.09	2.05	1.40	6.78
MIS-13	GW162	Dec-98				0.026		0.014	11.57	7.15	2.44	1.3	7.04
MIS-13	GW177	May-99				0.023		0.014	8.91	7.11	2.4	2	7.33
MIS-13	GW192	Dec-99				0.017		0.019	11.54	7.38	2.01	1	8.48
MIS-13	GW218	May-00				0.012	<	0.009	9.40	7.48	1.90	1.10	6.45
MIS-13	GW222	Oct-00				0.024		0.022	12.63	7.25	2.30	1.06	8.53
MIS-13	GW243	May-01				0.008		0.013	8.45	7.27	1.75	0.98	8.14
MIS-13	GW263	Oct-01				0.037		0.033	12.68	7.24	2.34	1.10	8.98
MIS-13	GW269	Oct-02				0.028		0.030	11.74	7.23	2.37	1.20	8.61
MIS-13	GW149	May-98				0.014	<	0.010	8.64	7.01	2.63	1.80	5.84
MIS-14	GW103	Nov-96				0.019		0.021	11.86	7.14	2.88	0.14	9.84
MIS-14	GW119	May-97				0.016		0.016	8.95	7.06	2.76	0.08	9.22
MIS-14	GW134	Nov-97				0.015		0.015	11.90	7.00	2.38	0.04	9.42

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Table 3. Network Sites Water Quality Field Parameters and Chromium Concentrations 1996 through 2002

Sample Location	Sample ID	Date	Hexavalent		Total		Dissolved		Temp	pH	SC	Turbidity	SWL
			Q	Cr (mg/L)	Q	Cr (mg/L)	Q	Cr (mg/L)	(°C)	(SU)	mmhos/cm	(NTU)	Ft
MIS-14	GW150	May-98				0.011		0.010	9.26	6.97	2.64	0.29	9.58
MIS-14	GW163	Dec-98				0.012		0.013	12.35	7.14	2.65	0.12	9.18
MIS-14D	GW164	Dec-98				0.021	<	0.010	12.35	7.14	2.65	0.12	9.18
MIS-14	GW178	May-99				0.011		0.015	9.4	7.06	2.79	0.2	10.24
MIS-14	GW193	Dec-99				0.015		0.015	12.81	7.31	2.56	1	10.64
MIS-14	GW205	May-00				0.034		0.023	9.75	7.35	2.53	0.13	10.40
MIS-14	GW223	Oct-00				0.012		0.015	13.75	7.09	2.66	0.11	10.52
MIS-14D	GW224	Oct-00				0.026		0.013	13.75	7.09	2.66	0.11	10.52
MIS-14	GW244	May-01				0.027		0.027	9.44	7.11	2.55	0.21	10.40
MIS-14	GW249	Oct-01				0.023		0.015	13.80	7.12	2.57	0.22	10.55
MIS-14	GW271	Oct-02				0.014		0.017	12.94	7.16	2.63	0.31	10.45
MIS-15	GW113	Nov-96				0.032		0.031	12.97	7.29	2.74	1.80	6.43
MIS-15	GW128	May-97				0.038		0.036	10.43	7.27	2.71	1.90	6.1
MIS-15	GW143	Nov-97				0.026		0.024	12.99	7.22	2.32	1.67	5.92
MIS-15	GW158	May-98				0.027		0.027	10.62	7.23	2.54	0.85	6.46
MIS-15	GW171	Dec-98				0.019		0.016	13.09	7.31	2.72	0.42	6.23
MIS-15	GW187	May-99				0.025		0.023	11.05	7.32	2.77	5	6.44
MIS-15	GW201	Dec-99				0.020		0.016	13.16	7.53	2.74	1	6.56
MIS-15	GW216	May-00				0.023		0.019	11.10	7.60	2.70	1.20	6.66
MIS-15	GW232	Oct-00				0.027		0.023	14.43	7.41	2.86	1.12	6.76
MIS-15	GW247	May-01				0.017		0.011	10.29	7.38	2.66	0.98	7.29
MIS-15	GW261	Oct-01				0.016		0.016	14.40	7.38	2.84	0.89	7.02
MIS-15	GW274	Oct-02				0.013		0.016	12.68	7.36	2.79	0.90	6.75
MIS-16	GW114	Nov-96				0.019		0.016	11.16	7.34	2.74	1.20	6.55
MIS-16	GW129	May-97				0.018		0.016	10.12	7.32	2.58	3.30	6.3
MIS-16	GW144	Nov-97				0.010		0.009	11.49	7.25	2.22	2.05	6.13
MIS-16	GW159	May-98				0.012	<	0.010	10.26	7.30	2.29	1.90	6.62
MIS-16	GW172	Dec-98				0.015	<	0.010	11.44	7.34	2.52	2.1	6.48
MIS-16	GW188	May-99				0.012	<	0.010	10.63	7.31	2.62	2	6.72
MIS-16	GW197	Dec-99				0.013		0.015	11.58	7.5	2.53	5	6.8
MIS-16D	GW198	Dec-99				0.013		0.015	11.58	7.5	2.53	5	6.8
MIS-16	GW212	May-00			<	0.009	<	0.009	10.69	7.60	2.45	0.80	6.84

Mouat Industries NPL Site - Columbus, MT

Table 3. Network Sites Water Quality Field Parameters and Chromium Concentrations 1996 through 2002

Sample Location	Sample ID	Date	Hexavalent Q	Hexavalent Cr (mg/L)	Total Q	Total Cr (mg/L)	Dissolved Q	Dissolved Cr (mg/L)	Temp (°C)	pH (SU)	SC mmhos/cm	Turbidity (NTU)	SWL Ft
MIS-16	GW233	Oct-00			<	0.009	<	0.009	12.35	7.39	2.60	0.60	6.89
MIS-16	GW235	May-01			<	0.008	<	0.008	9.98	7.33	2.64	0.80	7.41
MIS-16D	GW236	May-01			<	0.008	<	0.008	9.98	7.33	2.64	0.80	7.41
MIS-16	GW256	Oct-01			<	0.009	<	0.009	12.41	7.41	2.46	0.8	7.1
MIS-16	GW272	Oct-02				0.017		0.011	12.12	7.38	2.49	1.00	6.88
R-1	GW104	Nov-96				0.054		0.021	11.85	7.15	2.63	2.80	12.19
R-1D	GW105	Nov-96				0.040	<	0.009					
R-1	GW120	May-97				0.017	<	0.009	9.46	7.15	2.52	1.25	11.77
R-1	GW135	Nov-97				0.009		0.007	11.96	7.06	2.25	0.15	11.80
R-1	GW151	May-98				0.015		0.012	9.51	7.05	2.38	2.65	12.22
R-1	GW165	Dec-98				0.012	<	0.010	12.61	7.17	2.47	0.42	12.04
R-1	GW179	May-99				0.027	<	0.010	9.89	7.11	2.52	3	12.2
R-1	GW195	Dec-99				0.011		0.010	12.84	7.4	2.47	6	12.3
R-1	GW207	May-00			<	0.009	<	0.009	10.02	7.49	2.44	2.40	12.27
R-1D	GW208	May-00			<	0.009	<	0.009	10.02	7.49	2.44	2.40	12.27
R-1	GW220	Oct-00			<	0.009	<	0.009	12.98	7.16	2.65	2.00	12.46
R-1	GW246	May-01			<	0.008	<	0.008	9.84	7.21	2.59	2.20	12.75
R-1	GW254	Oct-01				0.032	<	0.009	13.30	7.25	2.49	2.18	12.61
RMIS-1	GW100	Nov-96			<	0.009		0.012	12.17	7.43	0.95	3.44	9.71
RMIS-1	GW115	May-97			<	0.009	<	0.009	9.33	7.33	2.59	3.50	9.56
RMIS-1	GW130	Nov-97				0.001	<	0.001	12.71	7.29	2.25	1.15	9.08
RMIS-1	GW146	May-98			<	0.010	<	0.010	9.84	7.22	2.43	2.64	9.82
RMIS-1	GW160	Dec-98			<	0.010		0.010	13.28	7.39	2.5	2.18	9.44
RMIS-1	GW175	May-99			<	0.010	<	0.010	10.76	7.23	2.59	1.8	9.79
RMIS-1	GW190	Dec-99			<	0.008	<	0.008	13.11	7.52	2.41	3	9.98
RMIS-1	GW204a	May-00			<	0.009	<	0.009	10.39	7.65	2.47	3.21	10.09
RMIS-1	GW219	Oct-00			<	0.009	<	0.009	14.05	7.41	2.54	2.80	10.05
RMIS-1	GW248	May-01			<	0.008	<	0.008	9.35	7.41	2.57	1.14	10.92
RMIS-1	GW255	Oct-01			<	0.009	<	0.009	14.11	7.45	2.3	1.1	10.42
RMIS-1	GW264	Oct-02			<	0.010	<	0.010	13.88	7.46	2.28	1.40	10.11
RMIS-1D	GW265	Oct-02				0.015	<	0.010	13.88	7.46	2.28	1.40	10.11
RMIS-4	GW110	Nov-96				0.091		0.095	12.26	7.3	2.89	4.70	6.79

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Table 3. Network Sites Water Quality Field Parameters and Chromium Concentrations 1996 through 2002

Sample Location	Sample ID	Date	Hexavalent Q	Hexavalent Cr (mg/L)	Total Q	Total Cr (mg/L)	Dissolved Q	Dissolved Cr (mg/L)	Temp (°C)	pH (SU)	SC mmhos/cm	Turbidity (NTU)	SWL Ft
RMIS-4	GW123	May-97				0.041		0.042	9.92	7.32	2.8	2.20	6.53
RMIS-4D	GW124	May-97				0.045		0.043					
RMIS-4	GW138	Nov-97				0.073		0.035	12.10	7.22	2.45	2.40	6.35
RMIS-4	GW154	May-98				0.047		0.030	10.12	7.29	2.61	4.85	6.85
RMIS-4	GW168	Dec-98				0.057		0.039	11.92	7.31	2.8	3.5	6.66
RMIS-4	GW184	May-99				0.051		0.016	10.61	7.32	2.76	22	6.85
RMIS-4	GW202	Dec-99				0.098		0.040	12.3	7.52	2.78	10	6.93
RMIS-4	GW211	May-00				0.025		0.025	11.16	7.60	2.73	1.80	7.04
RMIS-4	GW230	Oct-00				0.020	<	0.009	13.96	7.38	2.89	1.60	7.09
RMIS-4	GW234	May-01				0.017		0.015	9.72	7.35	2.73	1.60	7.57
RMIS-4	GW258	Oct-01				0.076		0.023	13.41	7.38	2.74	1.40	7.30
RMIS-4	GW273	Oct-02				0.035		0.020	12.22	7.28	2.70	1.30	7.08
RMIS-6	GW111	Nov-96				0.206		0.200	13.24	7.36	2.86	0.40	8.16
RMIS-6	GW126	May-97				0.140		0.133	8.94	7.37	2.77	0.50	7.82
RMIS-6	GW139	Nov-97				0.113		0.108	13.12	7.27	2.38	0.18	7.76
RMIS-6D	GW140	Nov-97				0.117		0.107	13.12	7.27	2.38	0.18	7.76
RMIS-6	GW155	May-98				0.152		0.141	9.07	7.32	2.59	1.90	8.22
RMIS-6	GW189	Jun-99				0.115		0.109	9.17	7.38	2.75	4	8.21
RMIS-6	GW204	Dec-99				0.090		0.091	13.29	7.54	2.71	3	8.36
RMIS-6	GW213	May-00				0.087		0.065	9.08	7.65	2.67	0.30	8.46
RMIS-6	GW231	Oct-00				0.078		0.071	14.06	7.47	2.86	0.22	8.57
RMIS-6	GW239	May-01				0.068		0.060	8.81	7.40	2.76	0.26	9.01
RMIS-6	GW257	Oct-01				0.050		0.058	14.66	7.50	2.69	0.33	8.76
RMIS-6	GW277	Oct-02				0.047		0.044	13.22	7.44	2.57	0.51	8.56
RMIS-7	GW106	Nov-96				0.021		0.018	11.77	7.22	2.56	0.90	9.57
RMIS-7D	GW107	Nov-96				0.037		0.029					
RMIS-7	GW121	May-97				0.017		0.016	9.44	7.2	2.4	1.30	9.16
RMIS-7	GW136	Nov-97				0.015		0.014	11.97	7.06	2.00	2.32	9.24
RMIS-7	GW152	May-98				0.017		0.013	9.34	7.11	2.29	1.25	9.60
RMIS-7	GW166	Dec-98			<	0.010		0.011	12.46	7.13	2.4	0.66	9.43
RMIS-7	GW180	May-99				0.013		0.011	9.88	7.13	2.45	3.4	9.6
RMIS-7D	GW181	May-99				0.016		0.013	9.88	7.13	2.45	3.4	9.6

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Table 3. Network Sites Water Quality Field Parameters and Chromium Concentrations 1996 through 2002

Sample Location	Sample ID	Date	Hexavalent Q	Hexavalent Cr (mg/L)	Total Q	Total Cr (mg/L)	Dissolved Q	Dissolved Cr (mg/L)	Temp (°C)	pH (SU)	SC mmhos/cm	Turbidity (NTU)	SWL Ft
RMIS-7	GW196	Dec-99				0.014		0.010	12.51	7.34	2.41	3	9.74
RMIS-7	GW214	May-00			<	0.009	<	0.009	10.10	7.47	2.38	1.00	9.68
RMIS-7	GW228	Oct-00				0.022		0.018	13.47	7.24	2.60	0.90	9.84
RMIS-7	GW240	May-01			<	0.008	<	0.008	9.84	7.20	2.56	0.82	10.14
RMIS-7	GW259	Oct-01				0.016		0.016	13.46	7.23	2.59	0.88	10.00
RMIS-7	GW275	Oct-02				0.020		0.017	12.28	7.26	2.54	0.90	9.87
RMIS-9	GW109	Nov-96			<	0.009	<	0.009	11.74	7.41	2.87	0.70	7.74
RMIS-9	GW122	May-97				0.010	<	0.009	8.78	7.38	2.73	0.88	7.35
RMIS-9	GW137	Nov-97				0.005		0.005	11.75	7.27	2.40	0.32	7.38
RMIS-9	GW153	May-98			<	0.010	<	0.010	9.04	7.31	2.56	0.77	7.76
RMIS-9	GW167	Dec-98			<	0.010	<	0.010	12.02	7.31	2.76	0.4	7.41
RMIS-9	GW185	May-99			<	0.010		0.011	9.26	7.32	2.73	1	7.68
RMIS-9	GW194	Dec-99			<	0.008	<	0.008	12.33	7.57	2.64	0.4	7.8
RMIS-9	GW206	May-00			<	0.009	<	0.009	9.95	7.67	2.55	0.70	7.75
RMIS-9	GW227	Oct-00			<	0.009	<	0.009	13.97	7.43	2.69	0.55	7.78
RMIS-9	GW245	May-01			<	0.008	<	0.008	9.03	7.41	2.53	0.62	8.32
RMIS-9	GW250	Oct-01			<	0.009	<	0.009	14.23	7.45	2.60	0.63	8.05
RMIS-9D	GW251	Oct-01				0.012	<	0.009	14.23	7.45	2.60	0.63	8.05
RMIS-9	GW270	Oct-02				0.011	<	0.010	12.23	7.36	2.62	0.80	7.81

SWL = Static water level measured from measuring point on well casing
D = Duplicate Sample
< = less than instrument detection limit

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Table 4. Non-Network Wells Within SOD Water Quality Field Parameters and Chromium Concentrations, 2003

Sample Location	Date	Hexavalent Q	Hexavalent Cr (mg/L)	Total Q	Total Cr (mg/L)	Dissolved Q	Dissolved Cr (mg/L)	Temp (°C)	pH (SU)	SC mmhos/cm	Turbidity (NTU)	SWL Ft
MIS-11B	Dec-03				0.022		0.023	12.64	7.38	2.66	0.31	9.78
MIS-4B	Dec-03			<	0.009	<	0.009	12.6	7.44	2.52	4.54	7.07
MIS-8B	Dec-03				0.031		0.030	12.81	7.4	2.69	0.31	8.35
RMIS-10	Dec-03				0.015	<	0.009	12.6	7.36	2.56	2.37	7.6
RMIS-2	Dec-03				0.044		0.049	12.68	7.41	2.41	4	11.24
RMIS-3	Dec-03			<	0.009		0.009	12.97	7.21	2.31	2.73	8.63
RMIS-5	Dec-03				0.018		0.023	11.81	7.39	2.54	3.3	7.15
W-11	Dec-03				0.014	<	0.009	12.38	7.34	2.39	0.63	8.87
W-13	Dec-03			<	0.009	<	0.009	11.87	7.34	2.52	2.27	5.03
W-9	Dec-03			<	0.009	<	0.009	10.34	7.42	2.32	0.7	6.65

SWL = Static water level measured from measuring point on well casing
< = less than instrument detection limit

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TABLE 5. 1996-2003 Field Quality Assurance Results

Station ID	Sample ID	Date	Q	Hexavalent Cr (mg/L)	RPD	Q	Total Cr (mg/L)	RPD	Q	Dissolved Cr (mg/L)	RPD	Cr_3 IDL
RMIS-7	GW106	11/19/1996 0:00					0.021			0.018		
RMIS-7D	GW107	11/19/1996 0:00					0.037	13.8%		0.029	11.7%	
ECB/CCB	GW108	11/19/1996 0:00				<	0.009		<	0.009		9.0
MIS-12	GW116	5/12/1997 0:00					0.009		<	0.009		
MIS-12D	GW117	5/12/1997 0:00				<	0.009	0.0%	<	0.009	0.0%	
RMIS-4	GW123	5/13/1997 0:00					0.041			0.042		
RMIS-4D	GW124	5/13/1997 0:00					0.045	2.3%		0.043	0.6%	
ECB/CCB	GW125	5/13/1997 0:00				<	0.009		<	0.009		9.0
MIS-13	GW132	11/19/1997 0:00					0.016			0.016		
MIS-13D	GW133	11/19/1997 0:00					0.017	0.2%		0.016	0.2%	
RMIS-6	GW139	11/20/1997 0:00					0.113			0.108		
RMIS-6D	GW140	11/20/1997 0:00					0.117	0.9%		0.107	0.2%	
ECB/CCB	GW141	11/20/1997 0:00				<	0.001		<	0.001		0.8
FB	GW145	5/20/1998 0:00				<	0.010		<	0.010		0.8
MIS-12	GW147	5/20/1998 0:00				<	0.010		<	0.010		
MIS-12D	GW148	5/20/1998 0:00				<	0.010	0.0%	<	0.010	0.0%	
ECB/CCB	GW156	5/21/1998 0:00				<	0.010		<	0.010		9.5
MIS-14	GW163	12/1/1998 0:00					0.012			0.013		
MIS-14D	GW164	12/1/1998 0:00					0.021	13.1%	<	0.010	7.4%	
ECB/CCB	GW173	12/2/1998 0:00				<	0.010		<	0.010		9.8
FB	GW174	12/2/1998 0:00				<	0.010			0.015		
RMIS-7	GW180	5/24/1999 0:00					0.013			0.011		
RMIS-7D	GW181	5/24/1999 0:00					0.016	6.4%		0.013	3.1%	
ECB/CCB	GW182	5/24/1999 0:00				<	0.010		<	0.010		9.5
MIS-16	GW197	12/2/1999 0:00					0.013			0.015		
MIS-16D	GW198	12/2/1999 0:00					0.013	1.0%		0.015	0.8%	
FB	GW200	12/2/1999 0:00				<	0.008		<	0.008		8.0
R-1	GW207	5/30/2000 0:00				<	0.009		<	0.009		
R-1D	GW208	5/30/2000 0:00				<	0.009	0.0%	<	0.009	0.0%	
ECB/CCB	GW209	5/30/2000 0:00				<	0.009		<	0.009		8.8
FB	GW210	5/30/2000 0:00				<	0.009		<	0.009		8.8
MIS-14	GW223	10/17/2000 0:00					0.012			0.015		
MIS-14D	GW224	10/17/2000 0:00					0.026	18.2%		0.013	4.5%	
ECB/CCB	GW225	10/17/2000 0:00				<	0.009		<	0.009		9.2
MIS-16	GW235	5/9/2001 0:00				<	0.008		<	0.008		
MIS-16D	GW236	5/9/2001 0:00				<	0.008	0.0%	<	0.008	0.0%	
ECB/CCB	GW237	5/9/2001 0:00				<	0.008		<	0.008		8.0
FB	GW238	5/9/2001 0:00				<	0.008		<	0.008		

Mouat Industries NPL Site - Columbus, MT
TABLE 5. 1996-2003 Field Quality Assurance Results

Station ID	Sample ID	Date	Q	Hexavalent Cr (mg/L)	RPD	Q	Total Cr (mg/L)	RPD	Q	Dissolved Cr (mg/L)	RPD	Cr_3 IDL
RMIS-9	GW250	10/29/2001 0:00				<	0.009		<	0.009		
RMIS-9D	GW251	10/29/2001 0:00					0.012	6.7%	<	0.009	0.0%	
ECB/CCB	GW252	10/29/2001 0:00				<	0.009		<	0.009		9.4
FB	GW253	10/29/2001 0:00				<	0.009		<	0.009		
RMIS-1	GW264	10/22/2002 0:00				<	0.010		<	0.010		
RMIS-1D	GW265	10/22/2002 0:00					0.015	9.3%	<	0.010	0.0%	
ECB/CCB	GW266	10/22/2002 0:00				<	0.010		<	0.010		10.0
FB	GW267	10/22/2002 0:00				<	0.010		<	0.010		10.0
GDSURF-1	SW001	11/20/1996 0:00		0.044			0.053			0.044		
GDSURF-1D	SW002	11/20/1996 0:00		0.049	2.7%		0.057	1.8%		0.056	6.0%	
GDSURF-1	SW003	5/14/1997 0:00		0.030			0.042			0.043		
GDSURF-1D	SW004	5/14/1997 0:00		0.030	0.0%		0.041	0.6%		0.041	1.2%	
GDSURF-1	SW005	11/20/1997 0:00		0.030			0.033			0.031		
GDSURF-1D	SW006	11/20/1997 0:00		0.030	0.0%		0.035	1.7%		0.032	0.3%	
GDSURF-1	SW007	5/22/1998 0:00		0.033			0.041			0.039		
GDSURF-1D	SW008	5/22/1998 0:00		0.036	2.2%		0.035	3.8%		0.030	7.1%	
GDSURF-1	SW009	12/3/1998 0:00		0.030			0.030			0.016		
GDSURF-1D	SW010	12/3/1998 0:00		0.023	6.6%		0.028	1.6%		0.023	8.4%	
GDSURF-1	SW011	5/26/1999 0:00		0.030			0.023			0.024		
GDSURF-1D	SW012	5/26/1999 0:00		0.030	0.0%		0.024	0.6%		0.023	0.7%	
GDSURF-1	SW013	12/2/1999 0:00		0.014			0.014			0.014		
GDSURF-1D	SW014	12/2/1999 0:00		0.017	4.8%			50.0%			50.0%	
GDSURF-1	SW016	5/31/2000 0:00		0.013			0.017			0.011		
GDSURF-1D	SW017	5/31/2000 0:00	<	0.007	15.0%		0.026	10.7%		0.011	0.2%	
GDSURF-1	SW018	10/18/2000 0:00	<	0.007			0.038		<	0.009		
GDSURF-1D	SW019	10/18/2000 0:00	<	0.007	0.0%		0.036	1.9%	<	0.009	0.0%	
GDSURF-1	SW020	5/10/2001 0:00		0.010			0.027			0.019		
GDSURF-1D	SW021	5/10/2001 0:00	<	0.007	8.8%		0.026	0.9%		0.027	8.7%	
GDSURF-1	SW022	10/30/2001 0:00		0.009		<	0.009		<	0.009		
GDSURF-1D	SW023	10/30/2001 0:00		0.010	2.6%	<	0.009	0.0%	<	0.009	0.0%	
GDSURF-1	SW024	10/23/2002 0:00	<	0.007			0.012		<	0.010		
GDSURF-1D	SW025	10/23/2002 0:00	<	0.007	0.0%	<	0.010	4.5%		0.013	5.6%	

RPD = Relative Percent Difference
D = Duplicate Sample
ECB/CCB = External contamination blank, cross-contamination blank
FB = Field Blank
NA = Not Applicable
< = less than laboratory detection limit

Table 6. Monitoring and Reporting Costs, 1996-February 2004

Remediation Task	Pre-99	1999	2000	2001	2002	2003	2004	Subtotal (nearest $1000)
Site Characterization, Legal Oversight, Monitoring and Site Maintenance	$58,519	$14,078	$18,335					$91,000
Monitoring and Site Maintenance				$8,624	$7,351			$16,000
Legal Oversight				$2,829	$4,586	$3,460	$6,974	$18,000
Site Characterization							$9,207	$9,000
							Total	**$134,000**

FIGURES

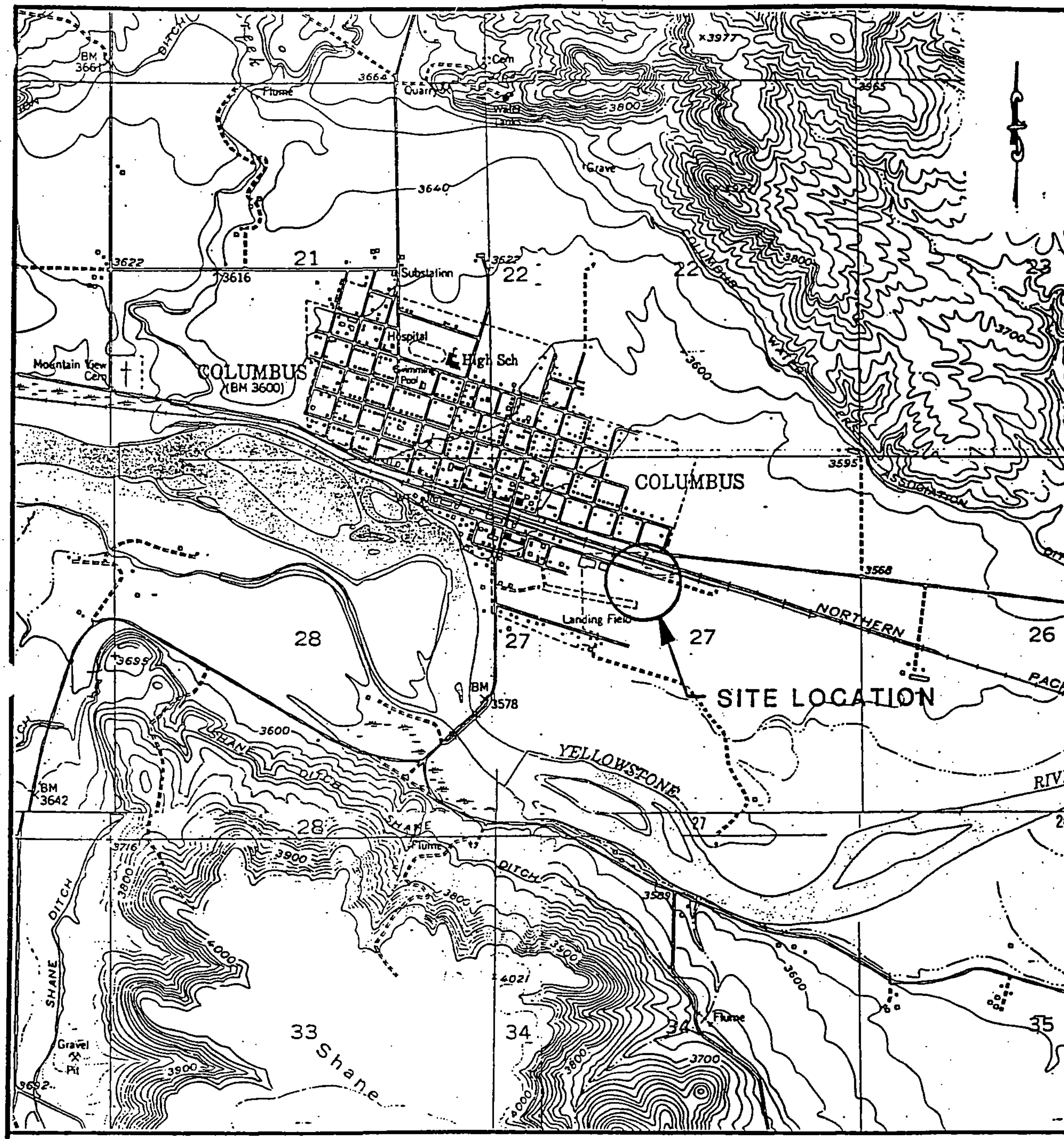

FIGURE 2-1

MOUAT INDUSTRIES – SITE LOCATION MAP

COLUMBUS, MONTANA

SCALE:	1" = 2000'	DATE:	3/30/95	Baker — BAKER ENVIRONMENTAL, INC. CORAOPOLIS, PENNSYLVANIA
S.O. NO.:	18978	FILE:	18978F22	
DSN/DWN:	EHR/CEB	CHK:		

REFERENCE:
USGS 7.5 MINUTE MINUTE QUADRANGLES, COLUMBUS WEST, COLUMBUS EAST, SHANE RIDGE AND WHITEBIRD SCHOOL

2000 0 1000 2000 4000

1 inch = 2000 ft

FIGURE 1. Mouat NPL Site Overview, From Baker 1996

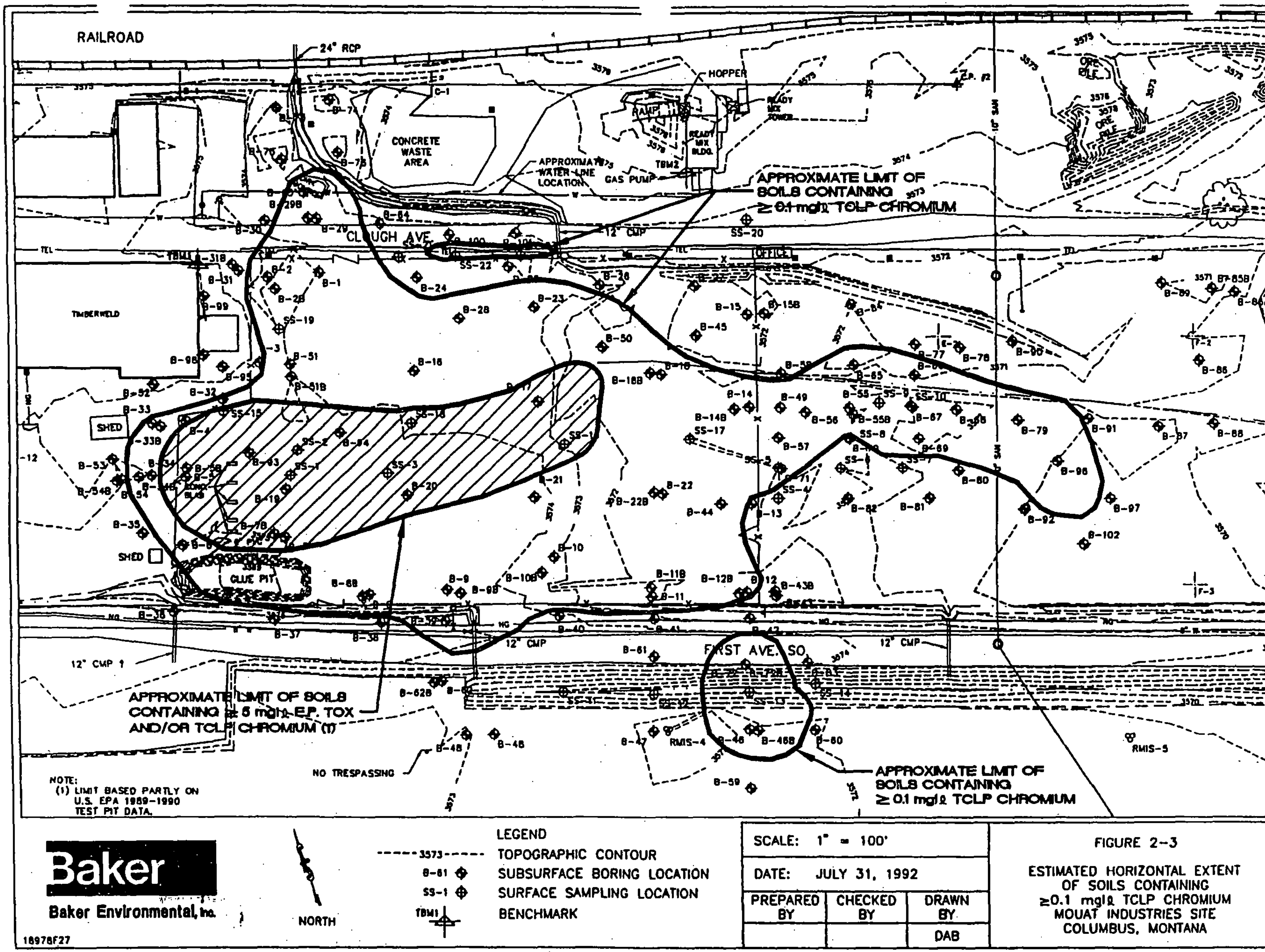

FIGURE 2. Estimated Aerial Extent of Chromium Containing Soils, Pre-Soil Removal Action, from Baker 1996

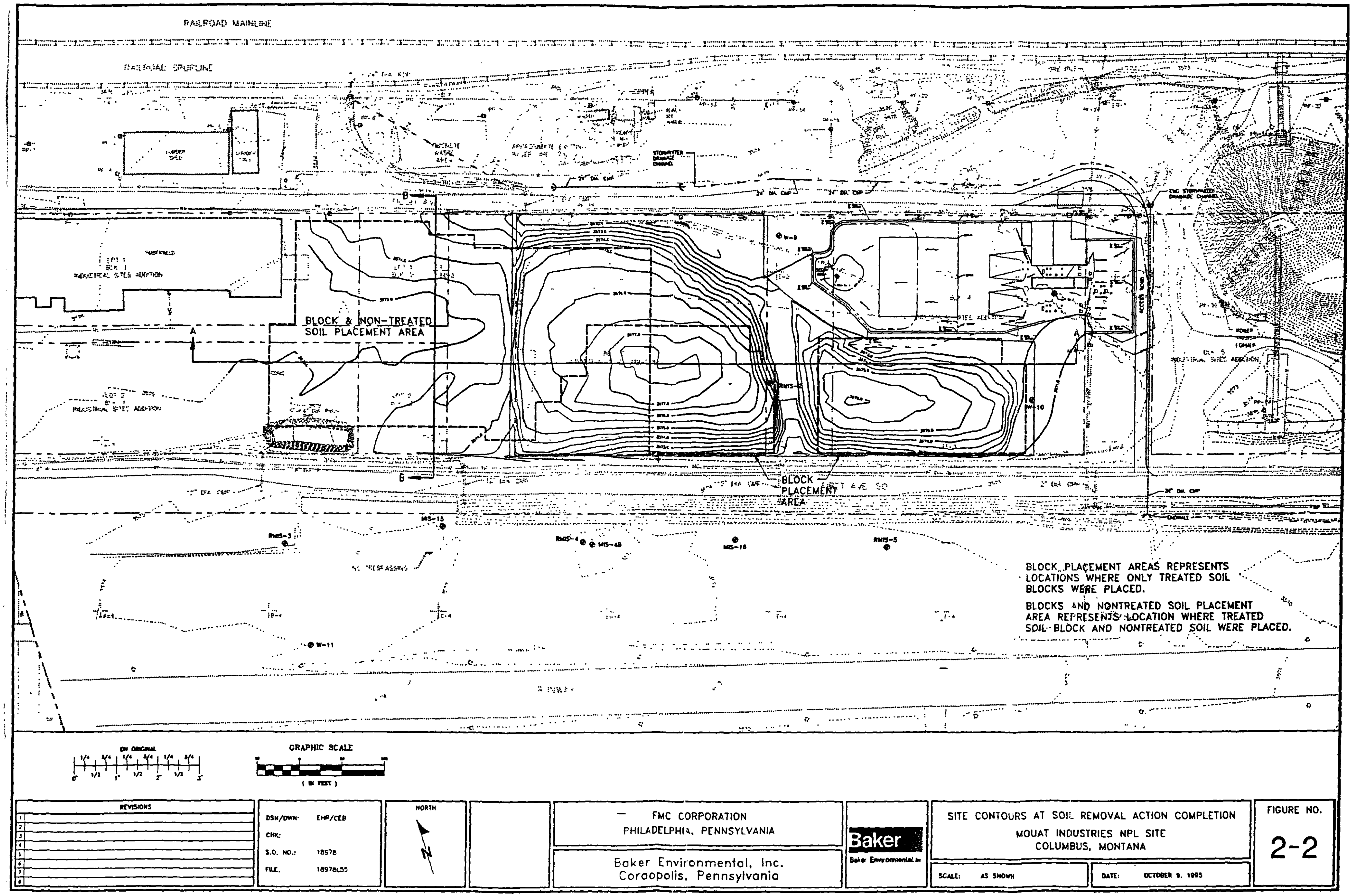

FIGURE 3. Block Placement Area, from Baker 1996

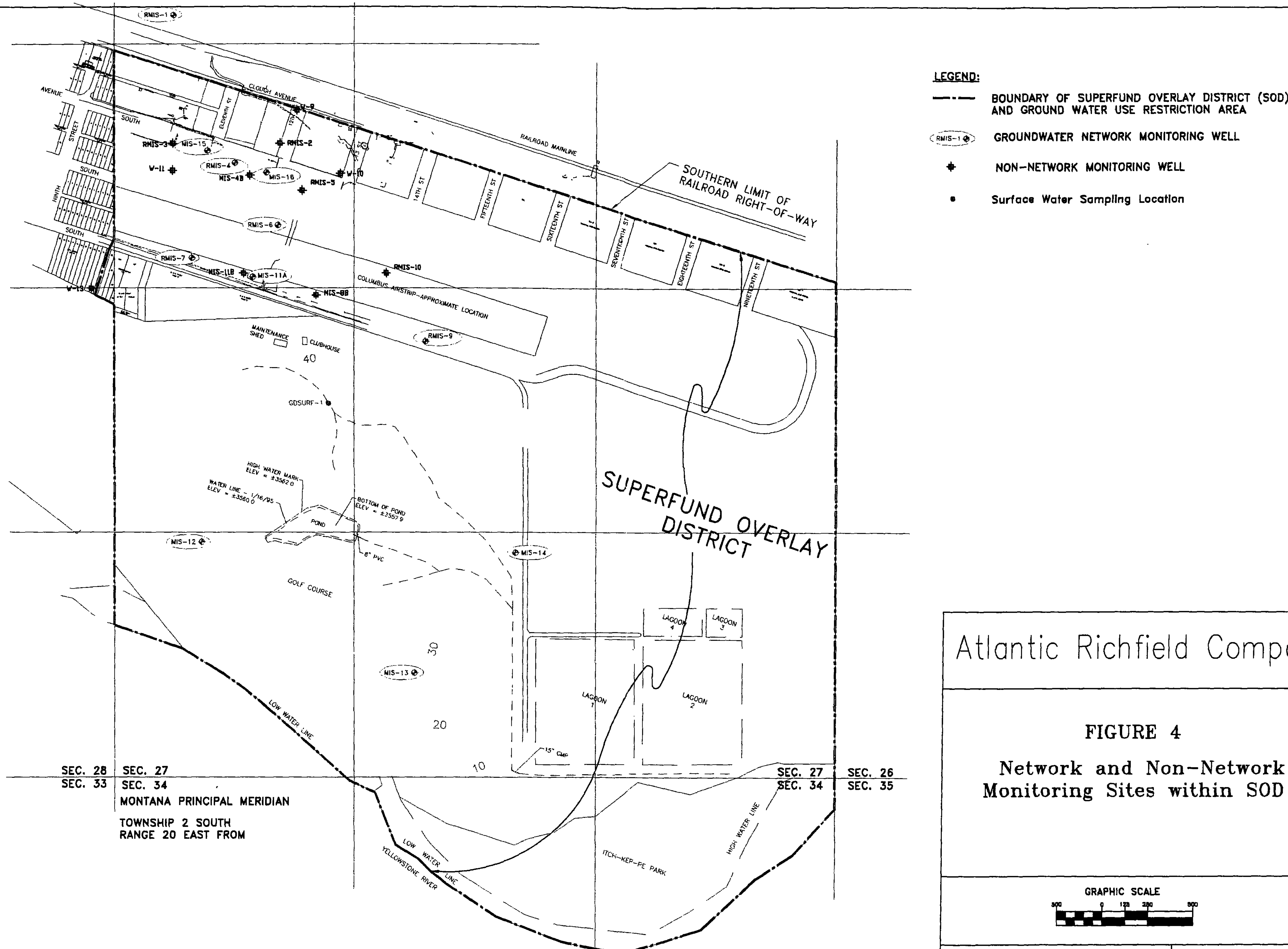

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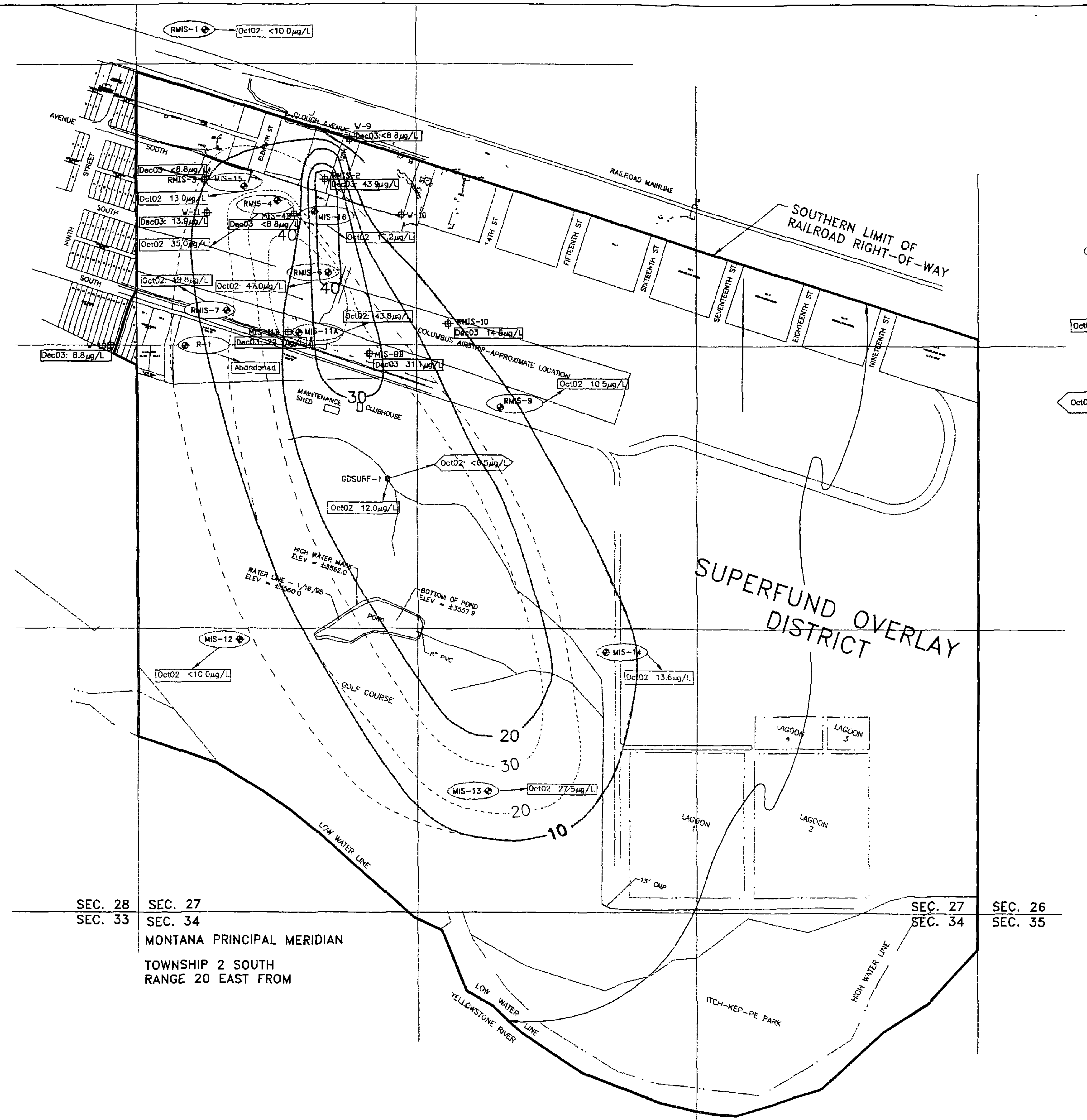
FIGURE 4

Network and Non-Network Monitoring Sites within SOD

GRAPHIC SCALE

Date: 13 October 2004



LEGEND:

- BOUNDARY OF SUPERFUND OVERLAY DISTRICT AND GROUND WATER USE RESTRICTION AREA
- --20-- October 2002 Total Chromium Concentration Contour (μg/L)
- —20— December 2003 Total Chromium Concentration Contour (μg/L)
- RMIS-1 GROUNDWATER NETWORK MONITORING WELL
- NON-NETWORK MONITORING WELL
- Oct02 <9.4μg/L Date and Micrograms of Total Chromium
- Surface Water Sampling Location
- Oct02: 9μg/L Date and Concentration in Micrograms per Liter of Total Hexavalent Chromium

Atlantic Richfield Company

FIGURE 5

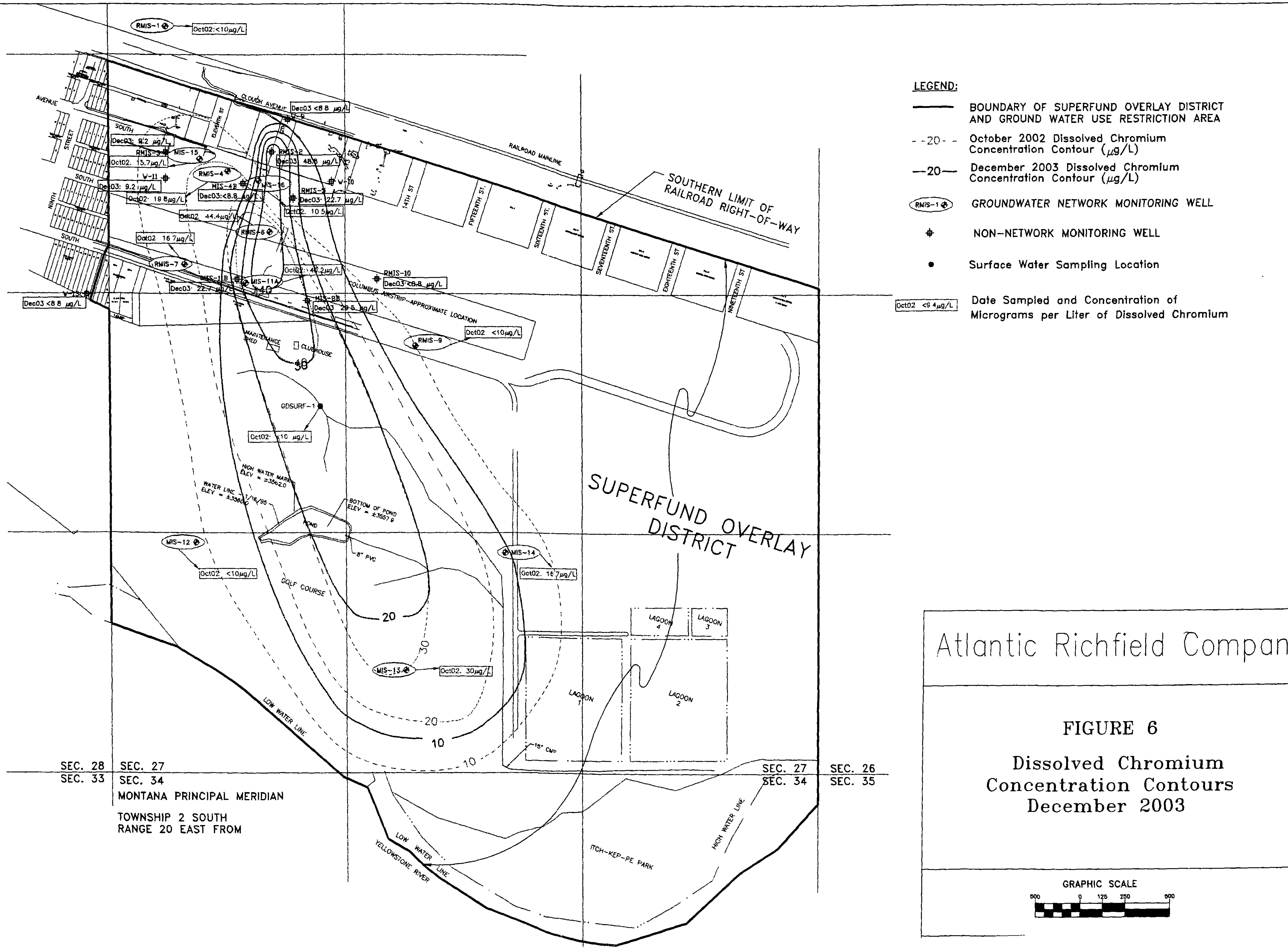
Total Chromium Concentration Contours December 2003

GRAPHIC SCALE

250 0 125 250 500

Path:F:\02110 Mount\Acad\Tree\2003TotCont2004LT.Dwg

DATE: 27 January 2004



Atlantic Richfield Compan

FIGURE 6

Dissolved Chromium Concentration Contours December 2003

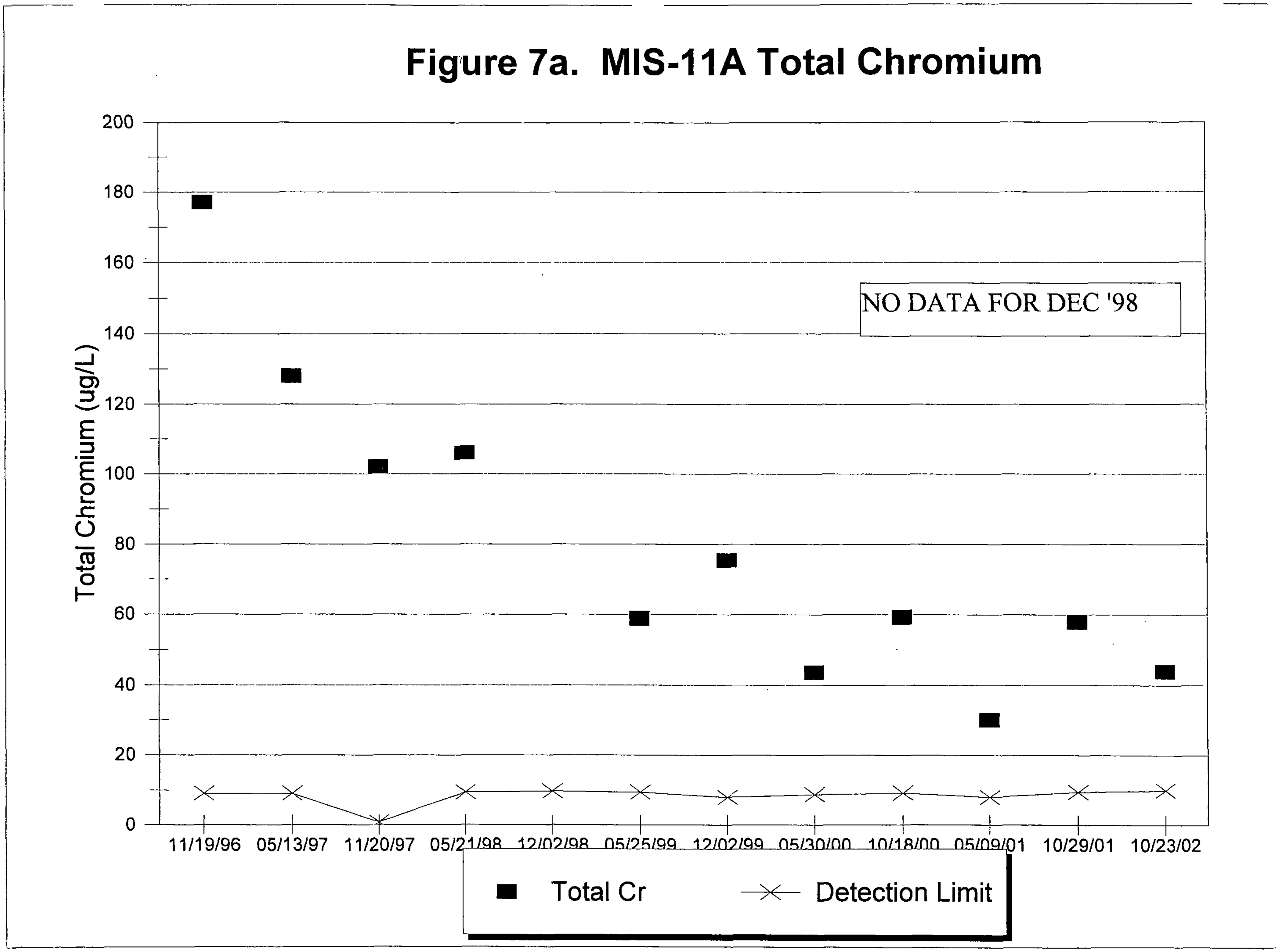


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Figure 7b. MIS-12 Total Chromium

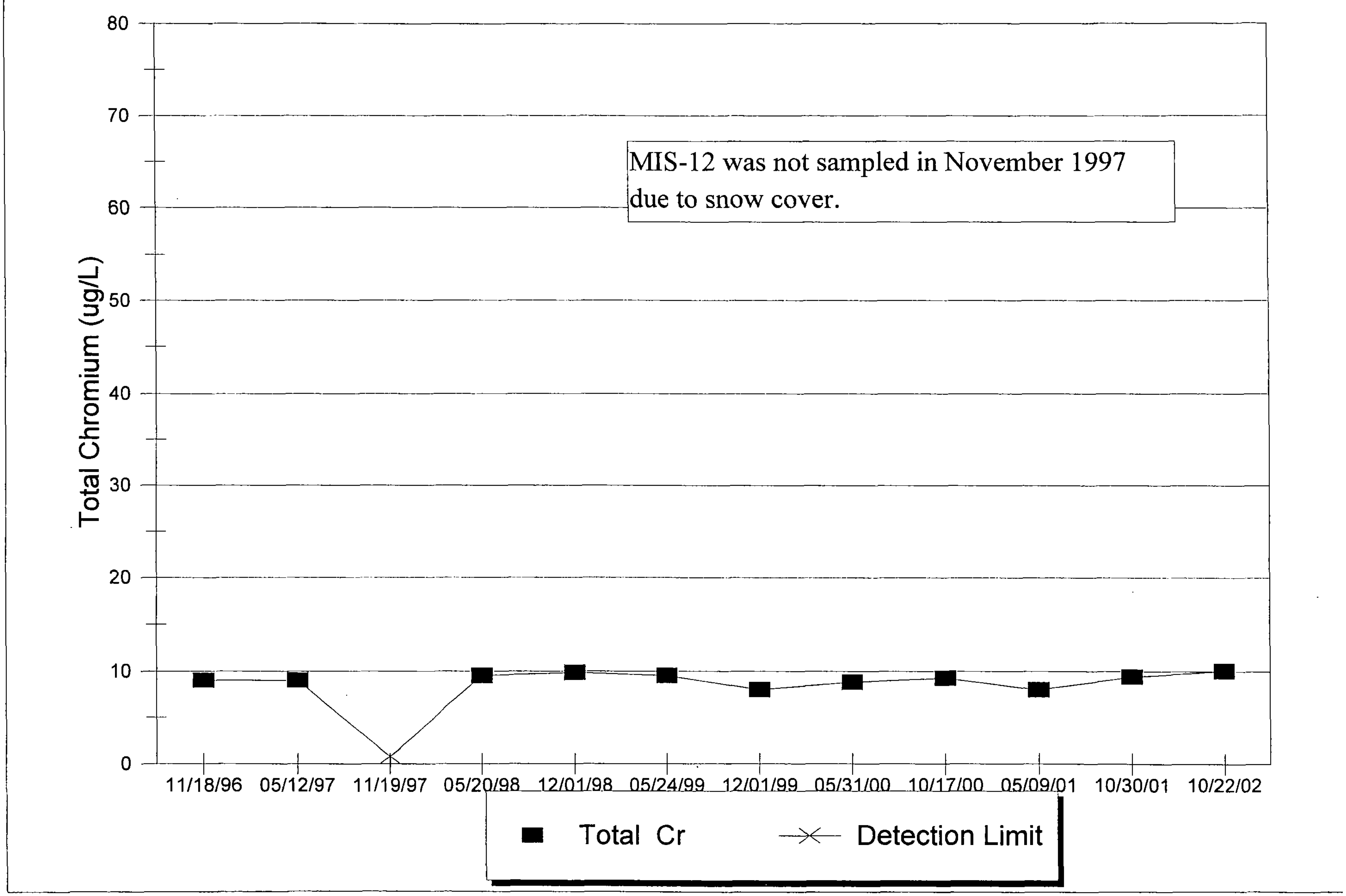

Figure 7c. MIS-13 Total Chromium

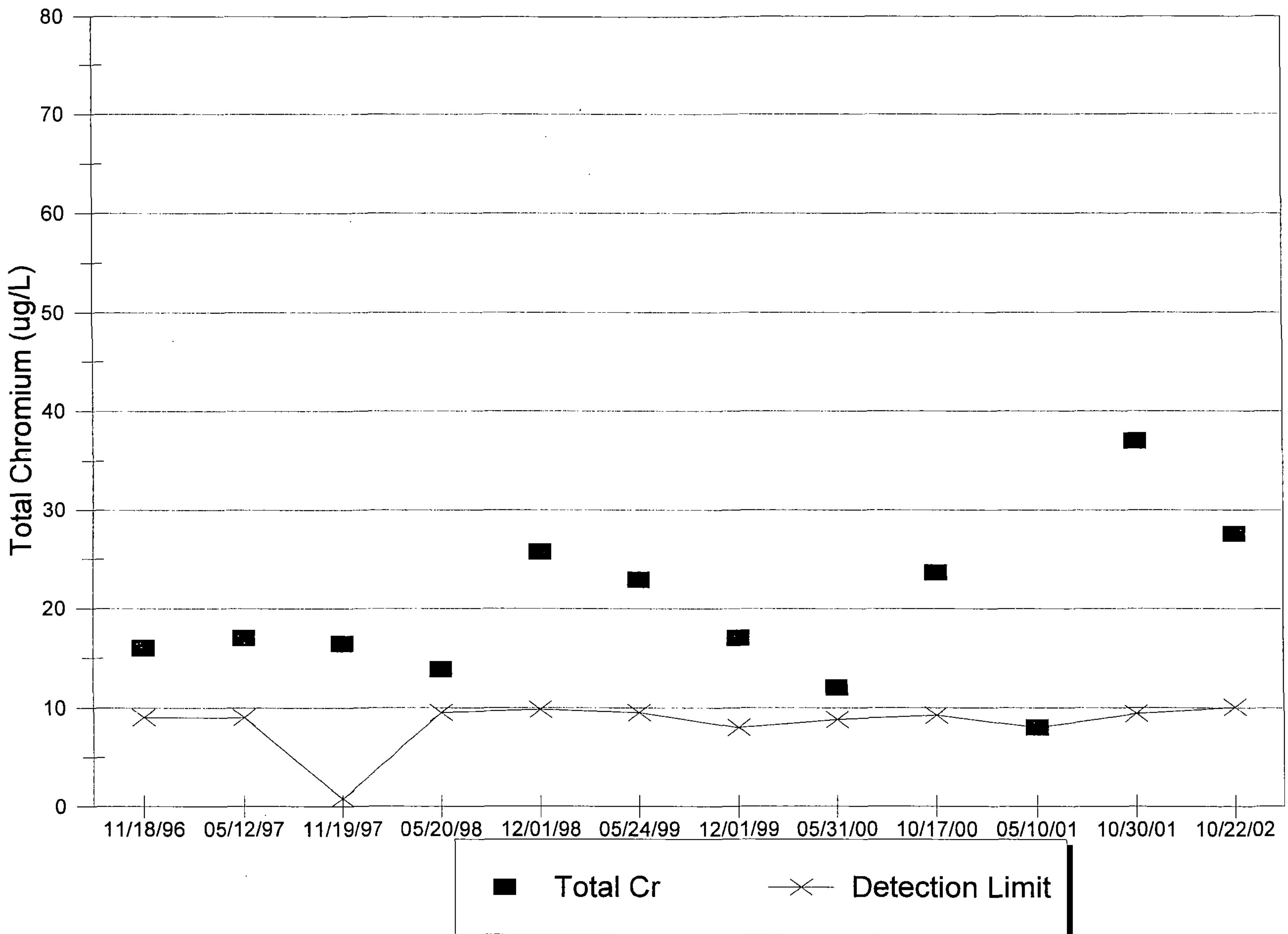

Figure 7d. MIS-14 Total Chromium

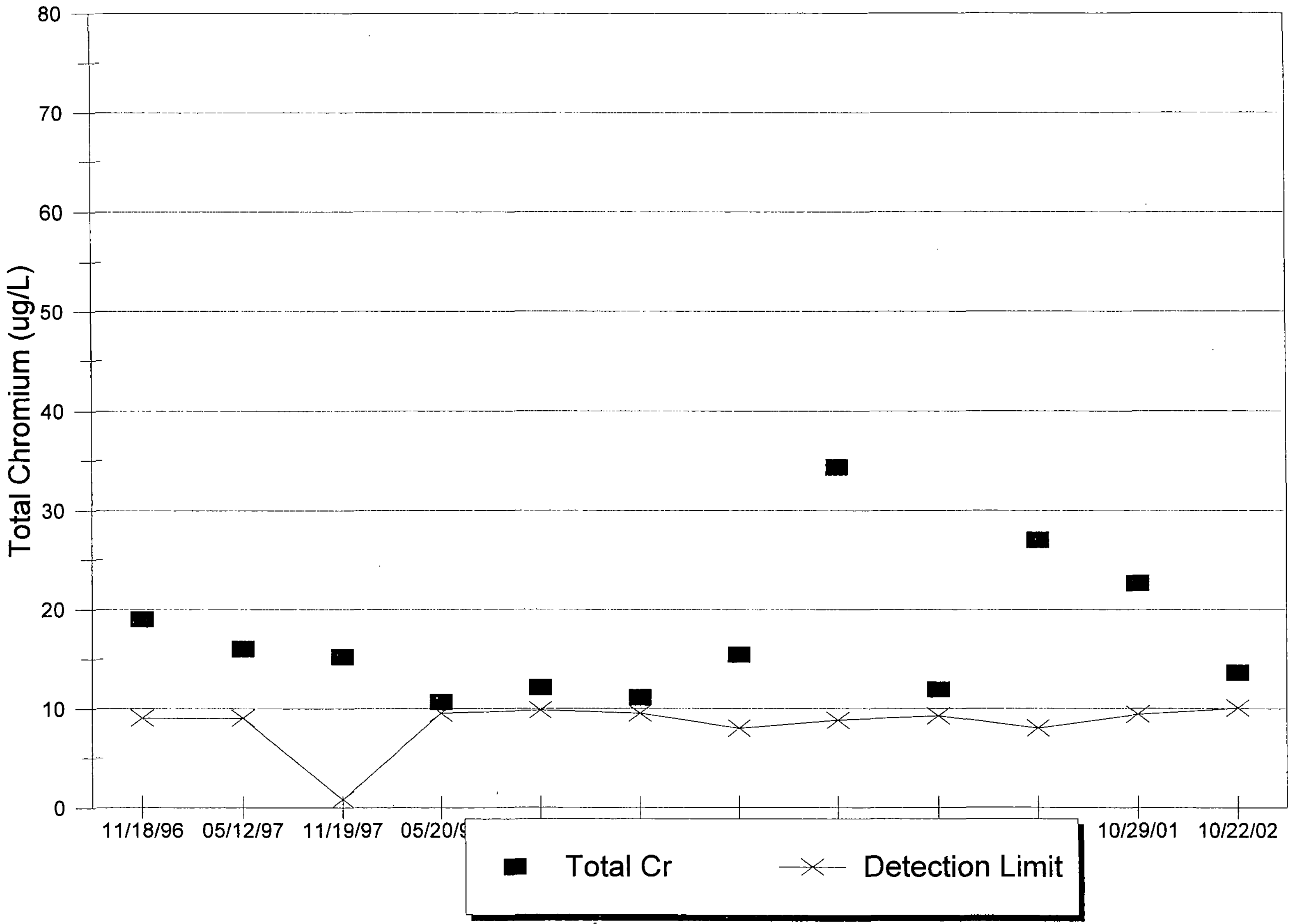

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Figure 7e. MIS-15 Total Chromium

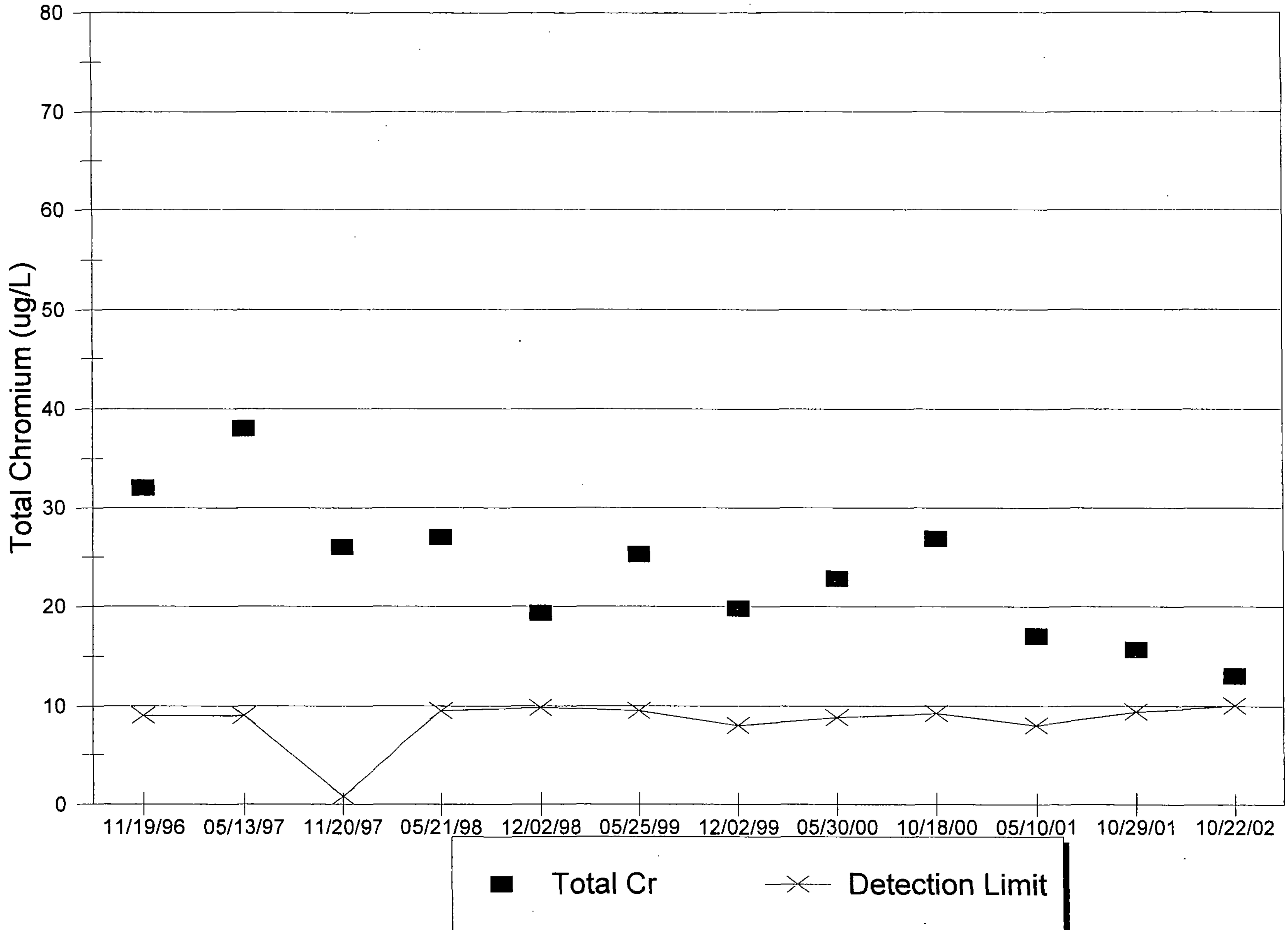
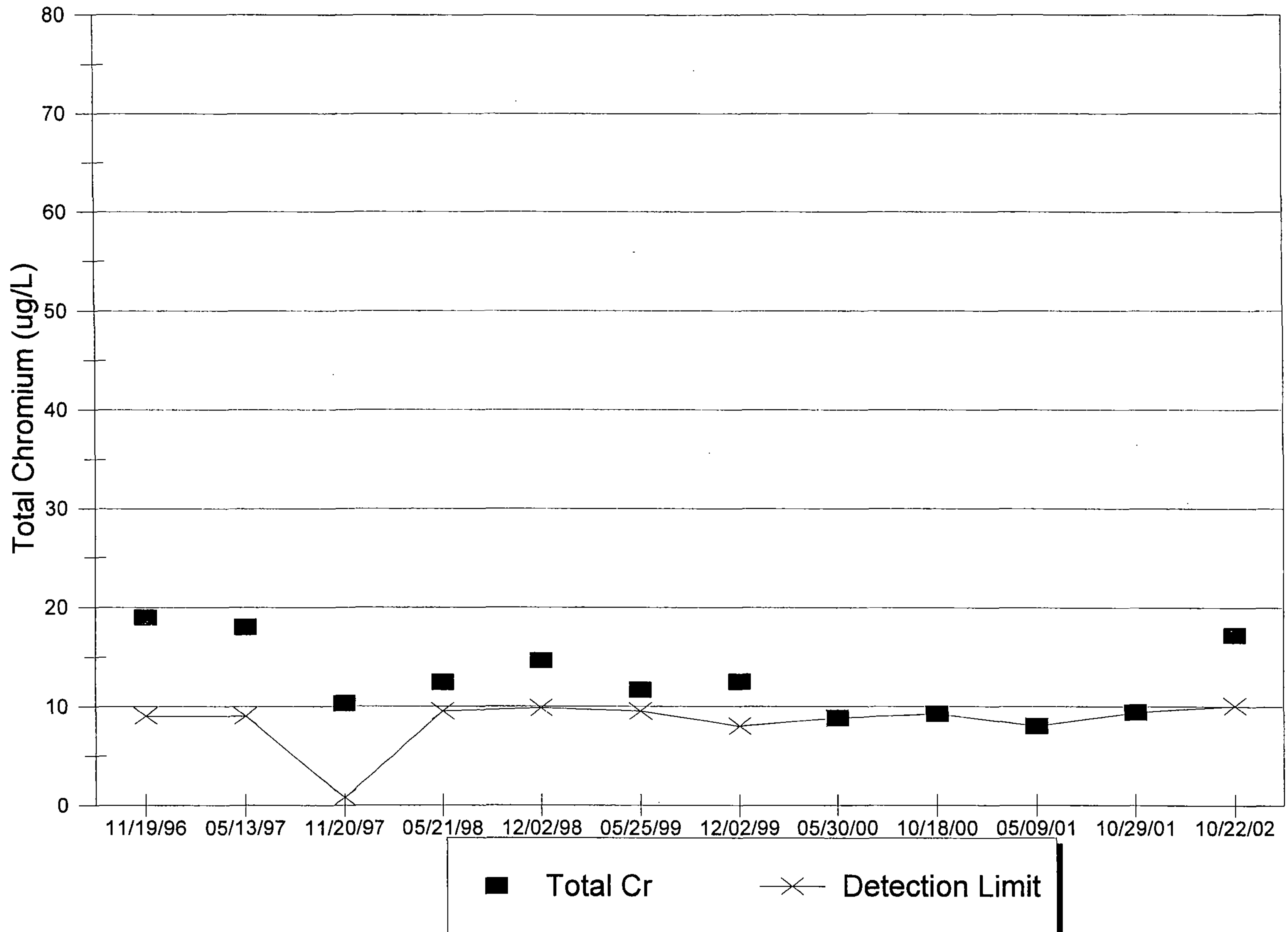


Figure 7f. MIS-16 Total Chromium



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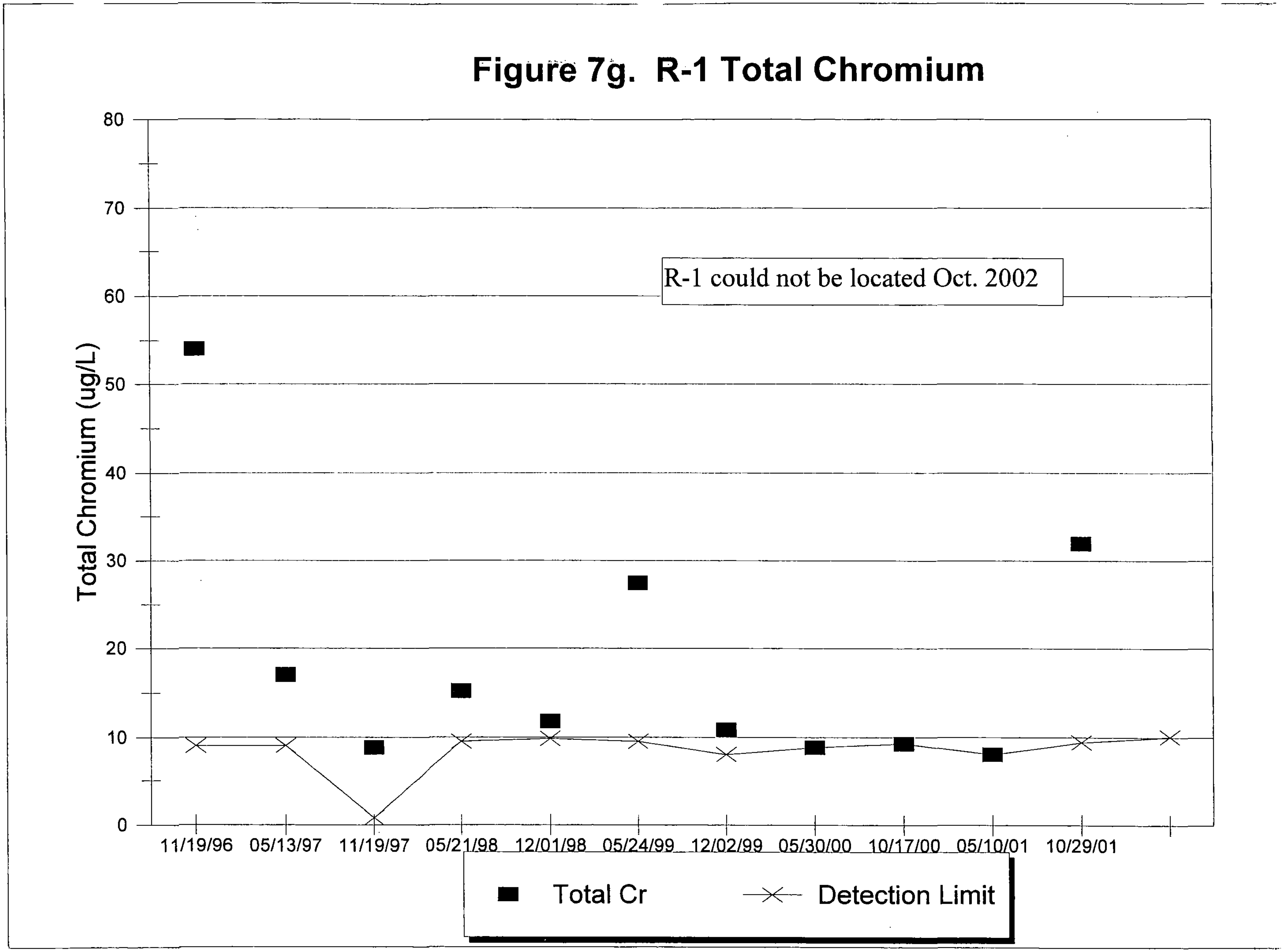
Figure 7g. R-1 Total Chromium
Total Chromium (ug/L)
80
70
60
50
40
30
20
10
0
R-1 could not be located Oct. 2002
11/19/96
05/13/97
11/19/97
05/21/98
12/01/98
05/24/99
12/02/99
05/30/00
10/17/00
05/10/01
10/29/01
Total Cr
Detection Limit

Figure 7h. RMIS-1 Total Chromium

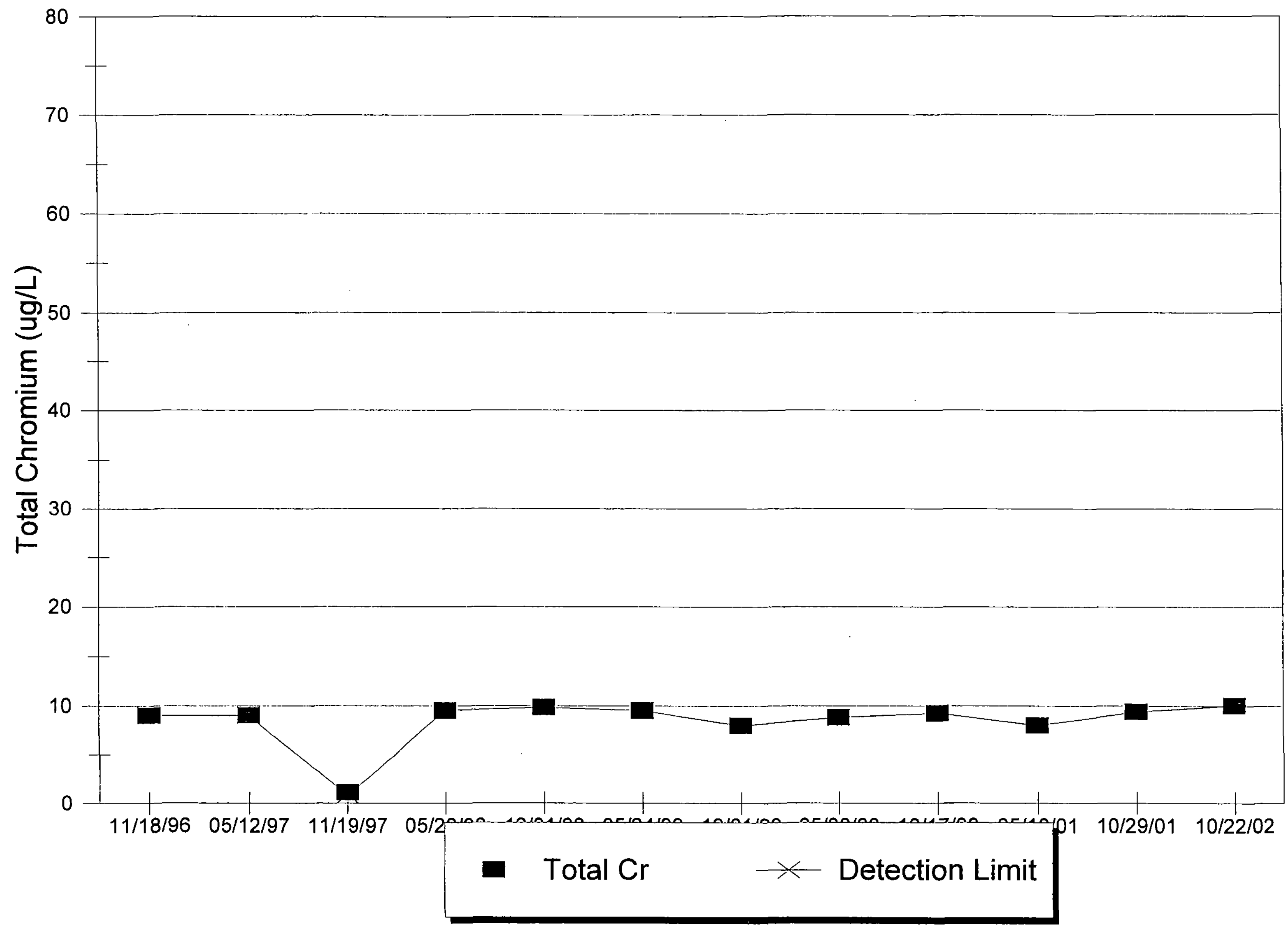

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Figure 7i. RMIS-4 Total Chromium

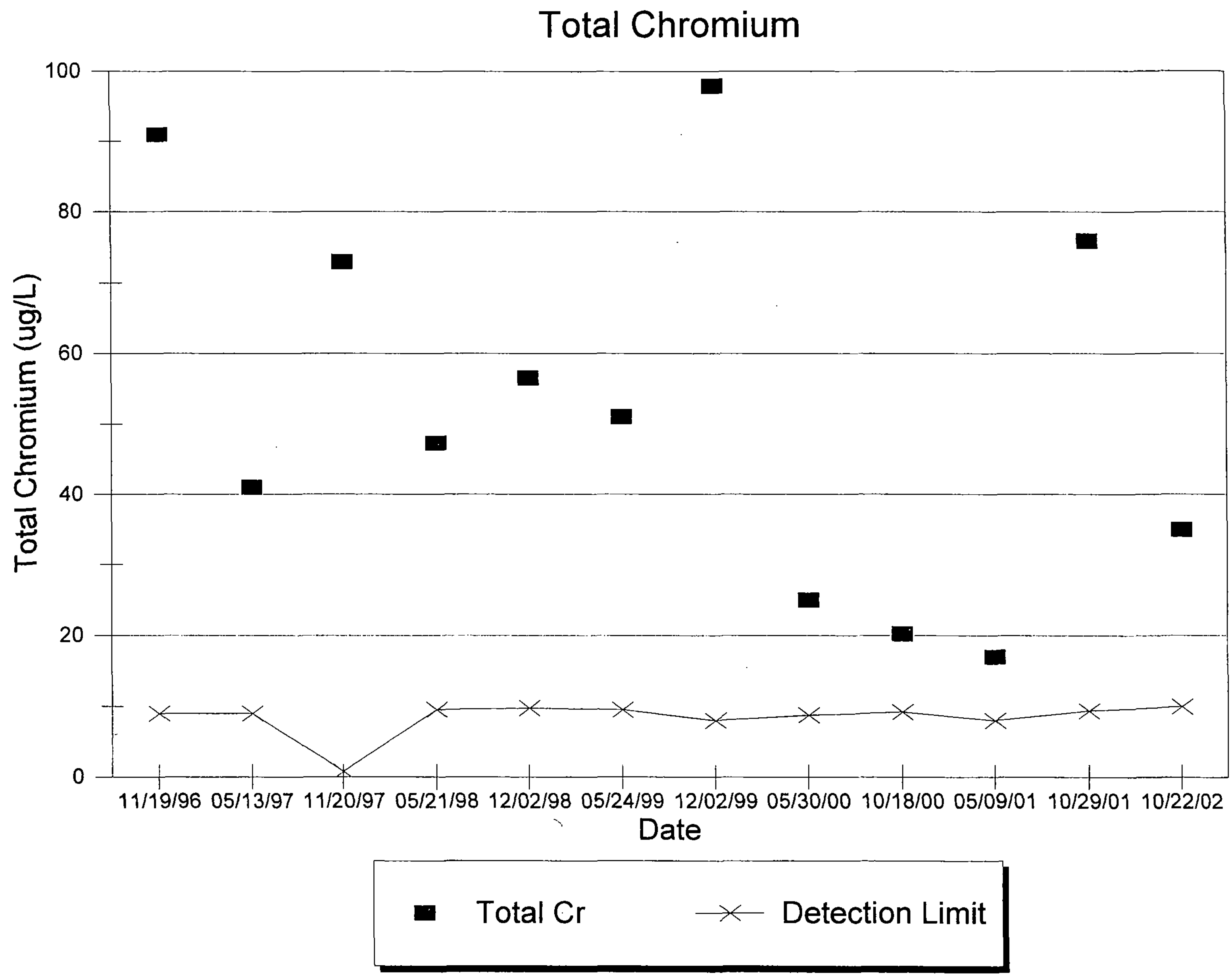


Figure 7j. RMIS-6 Total Chromium

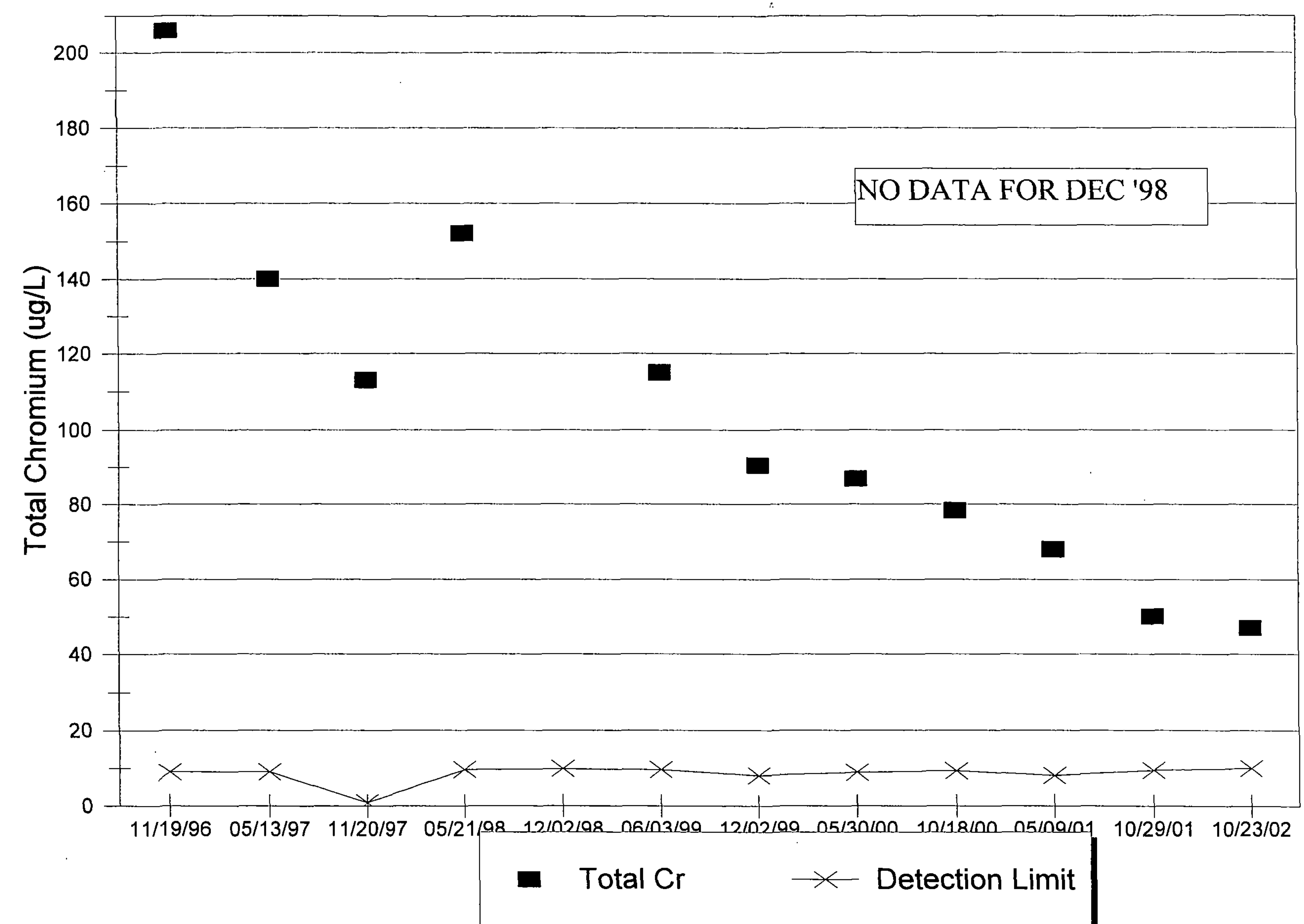
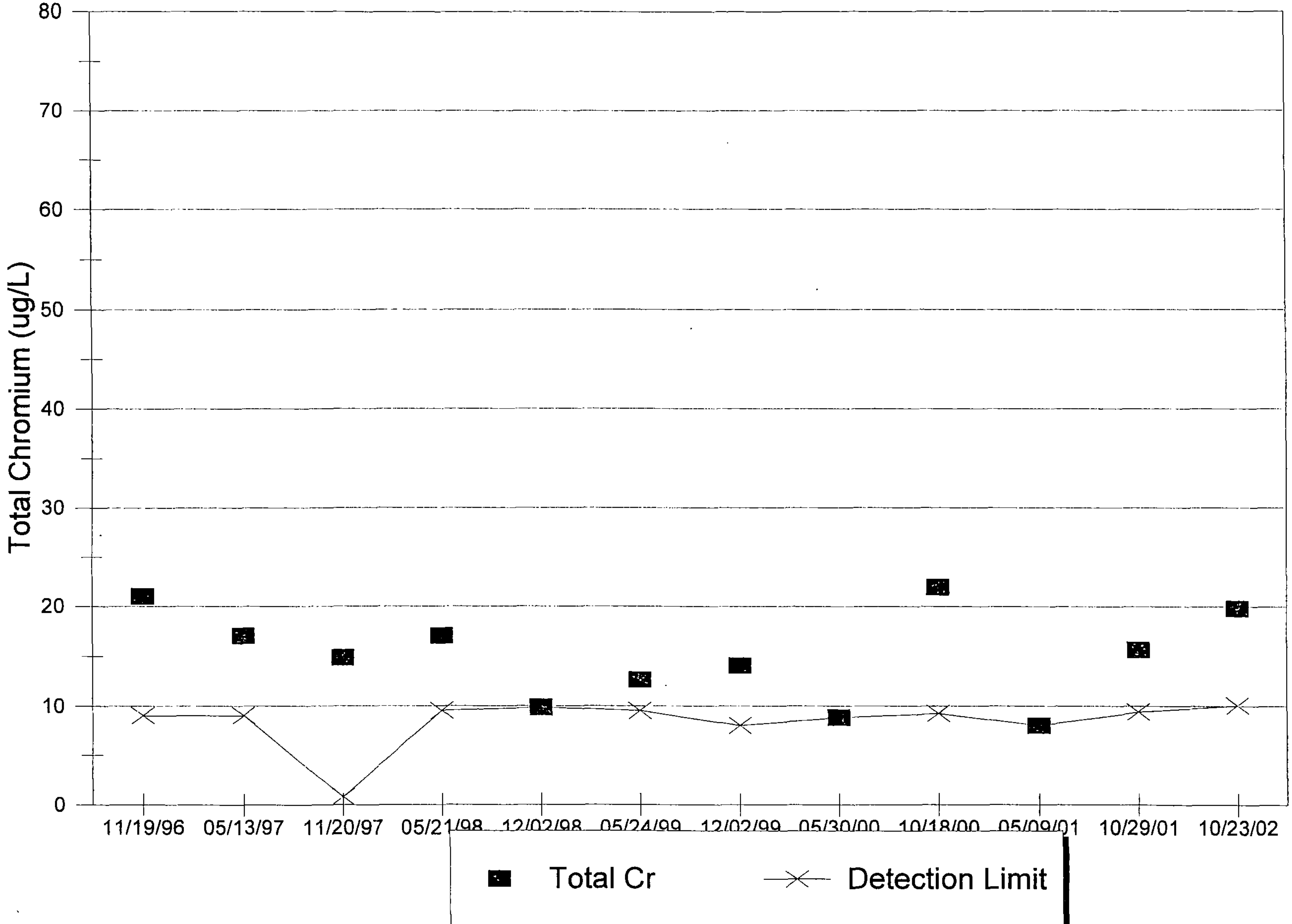


Figure 7k. RMIS-7 Total Chromium



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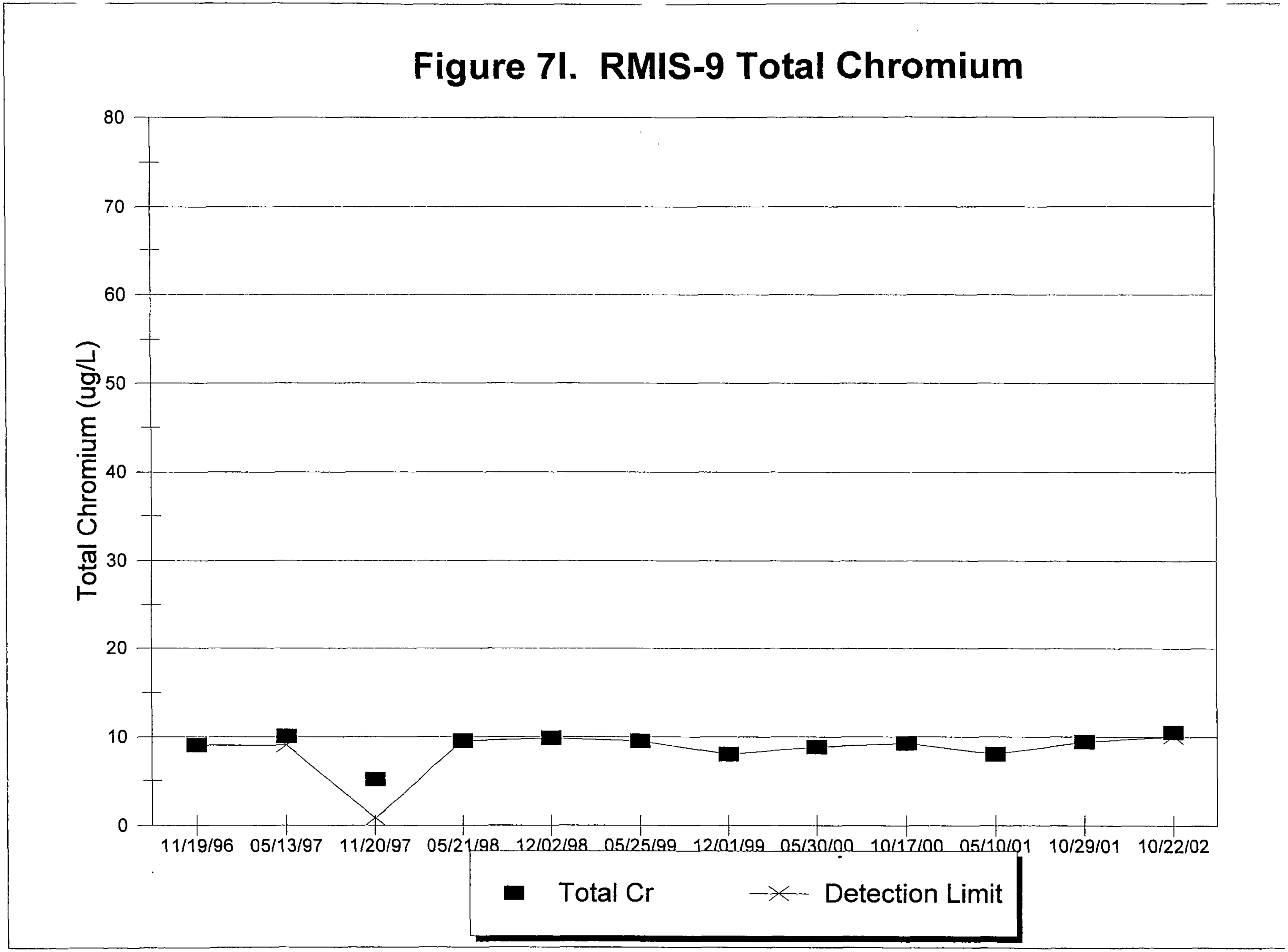
17-Aug-04



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17-Aug-04

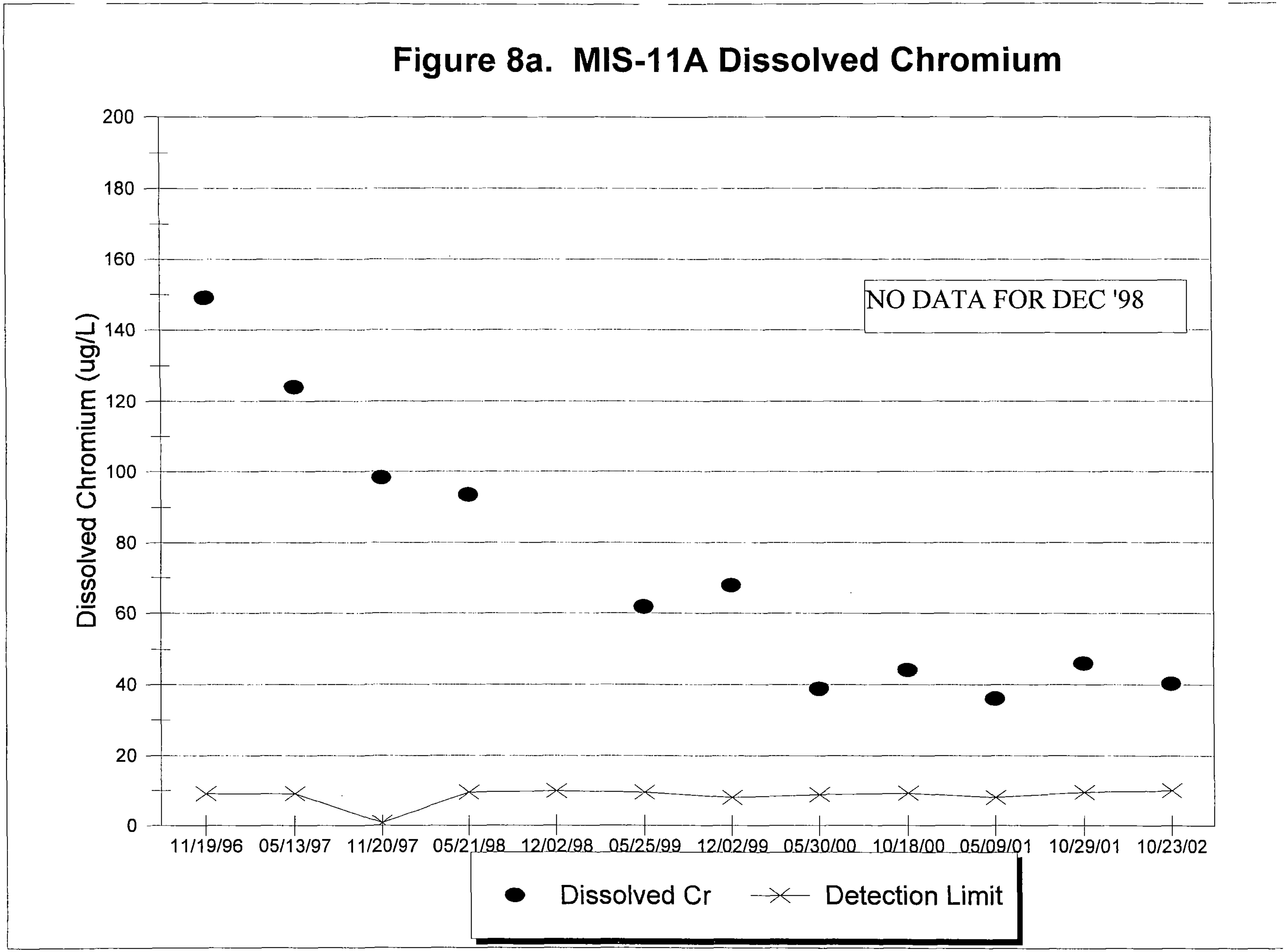

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Figure 8b. MIS-12 Dissolved Chromium

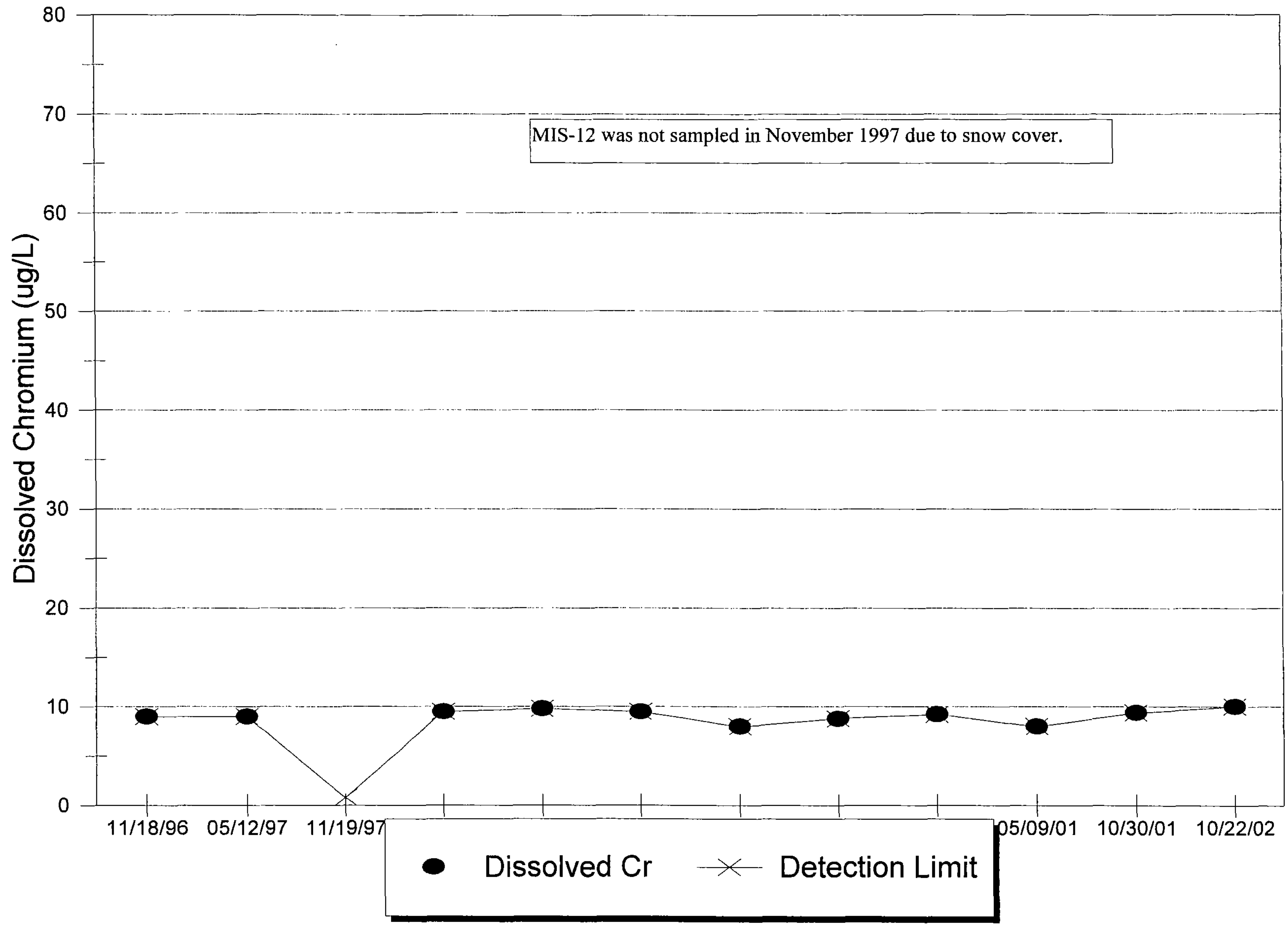


Figure 8c. MIS-13 Dissolved Chromium

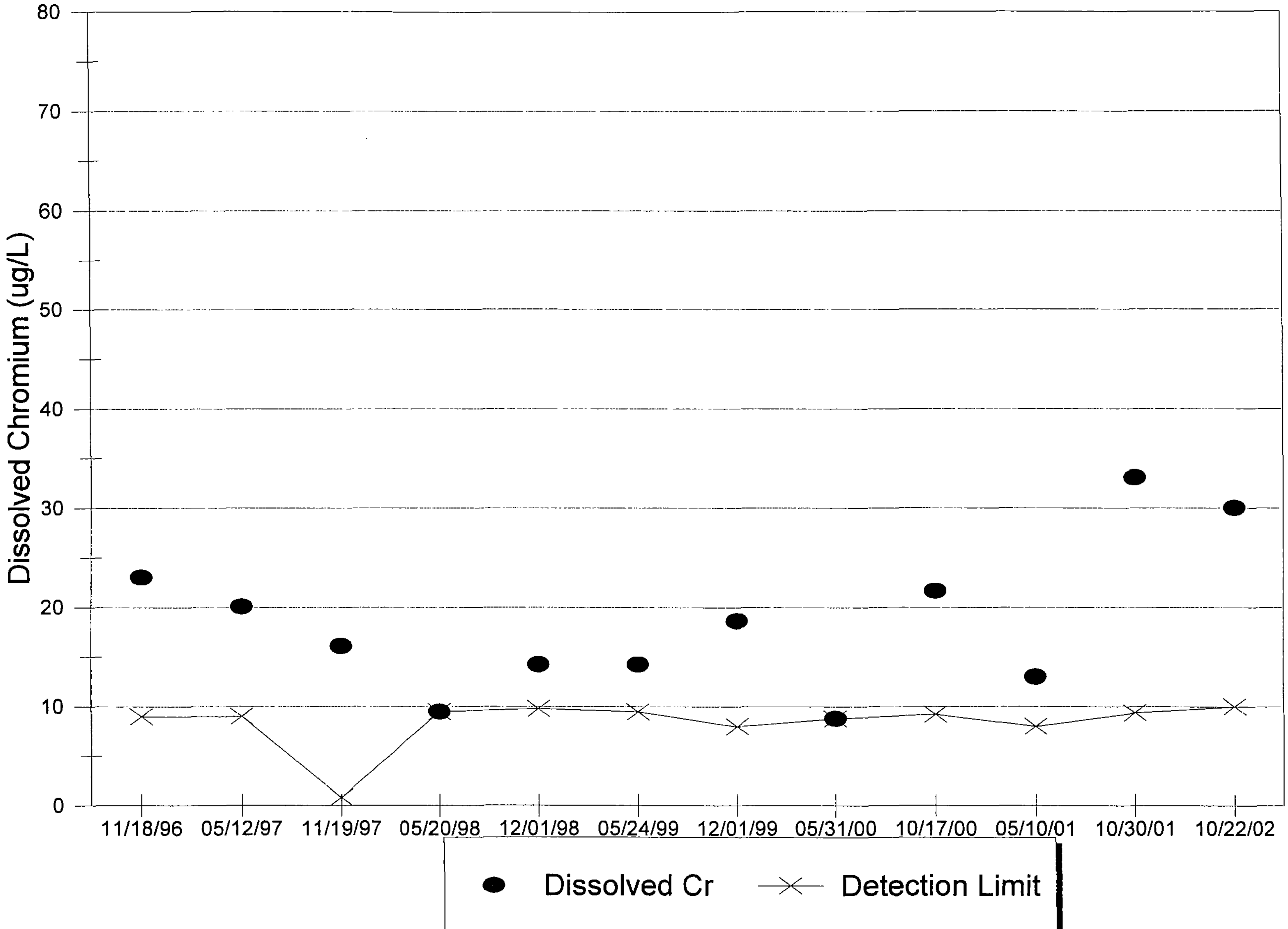
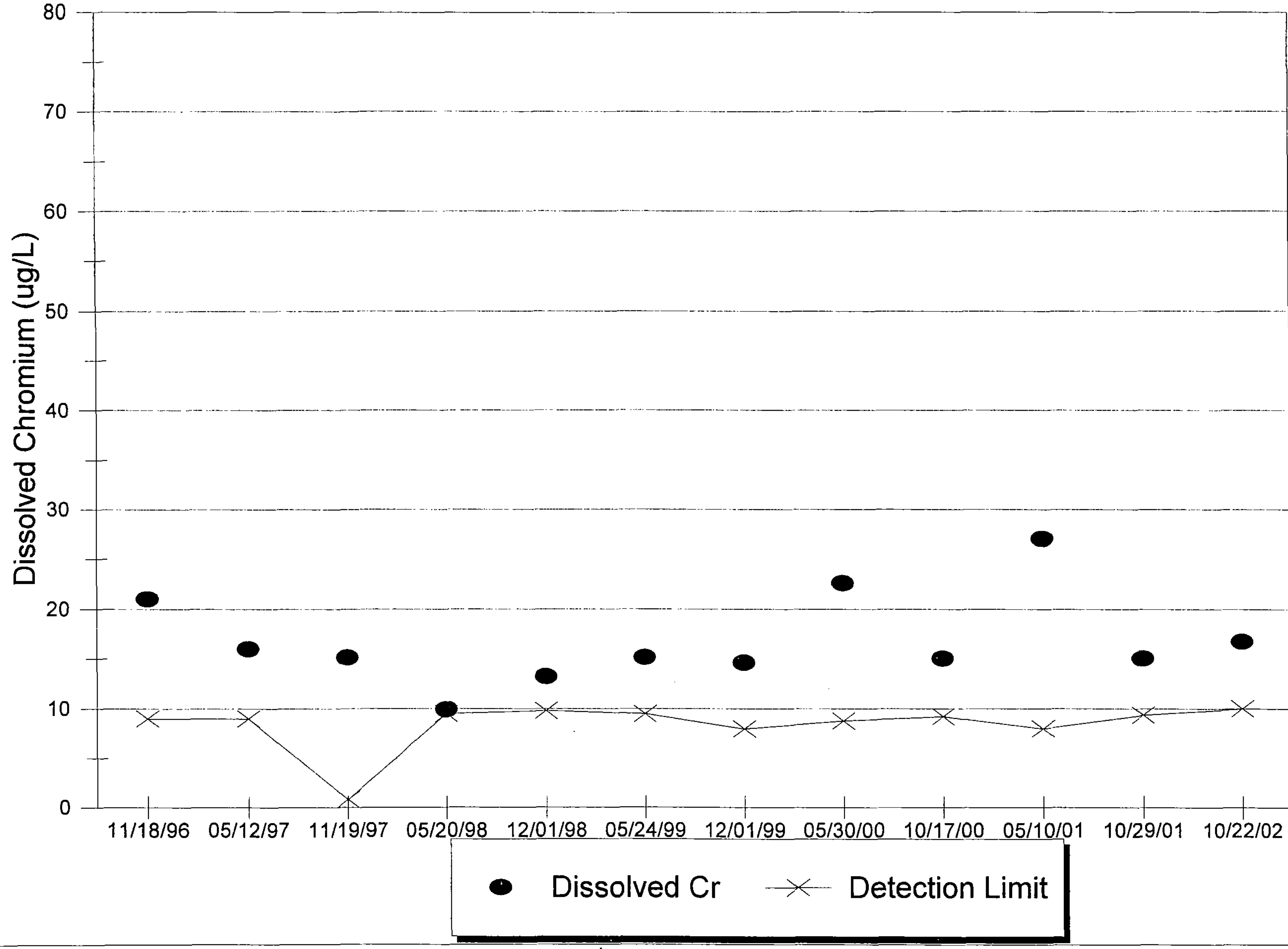


Figure 8d. MIS-14 Dissolved Chromium



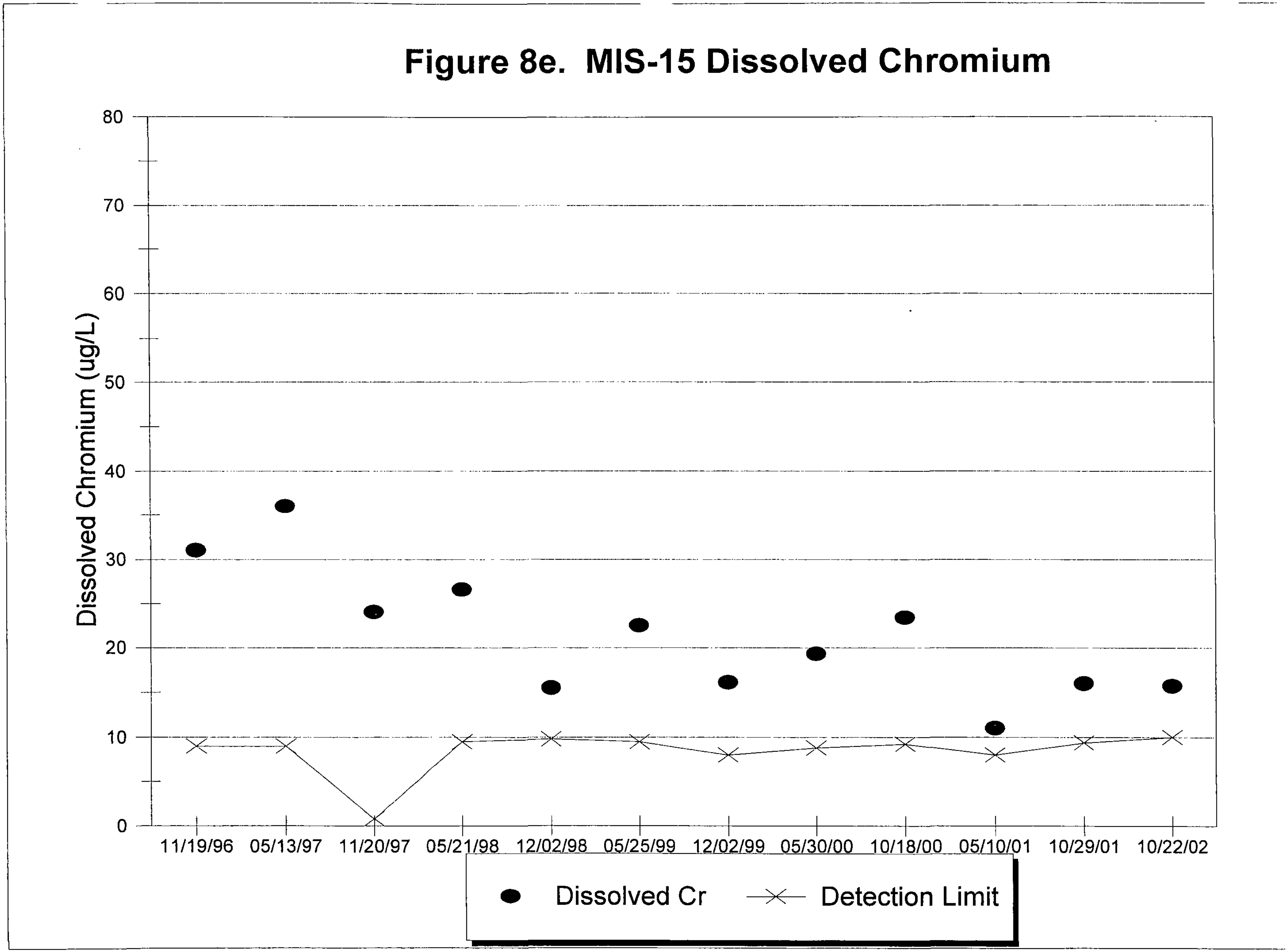


Figure 8e. MIS-15 Dissolved Chromium
Dissolved Chromium (ug/L)
0
10
20
30
40
50
60
70
80
11/19/96
05/13/97
11/20/97
05/21/98
12/02/98
05/25/99
12/02/99
05/30/00
10/18/00
05/10/01
10/29/01
10/22/02
Dissolved Cr
Detection Limit

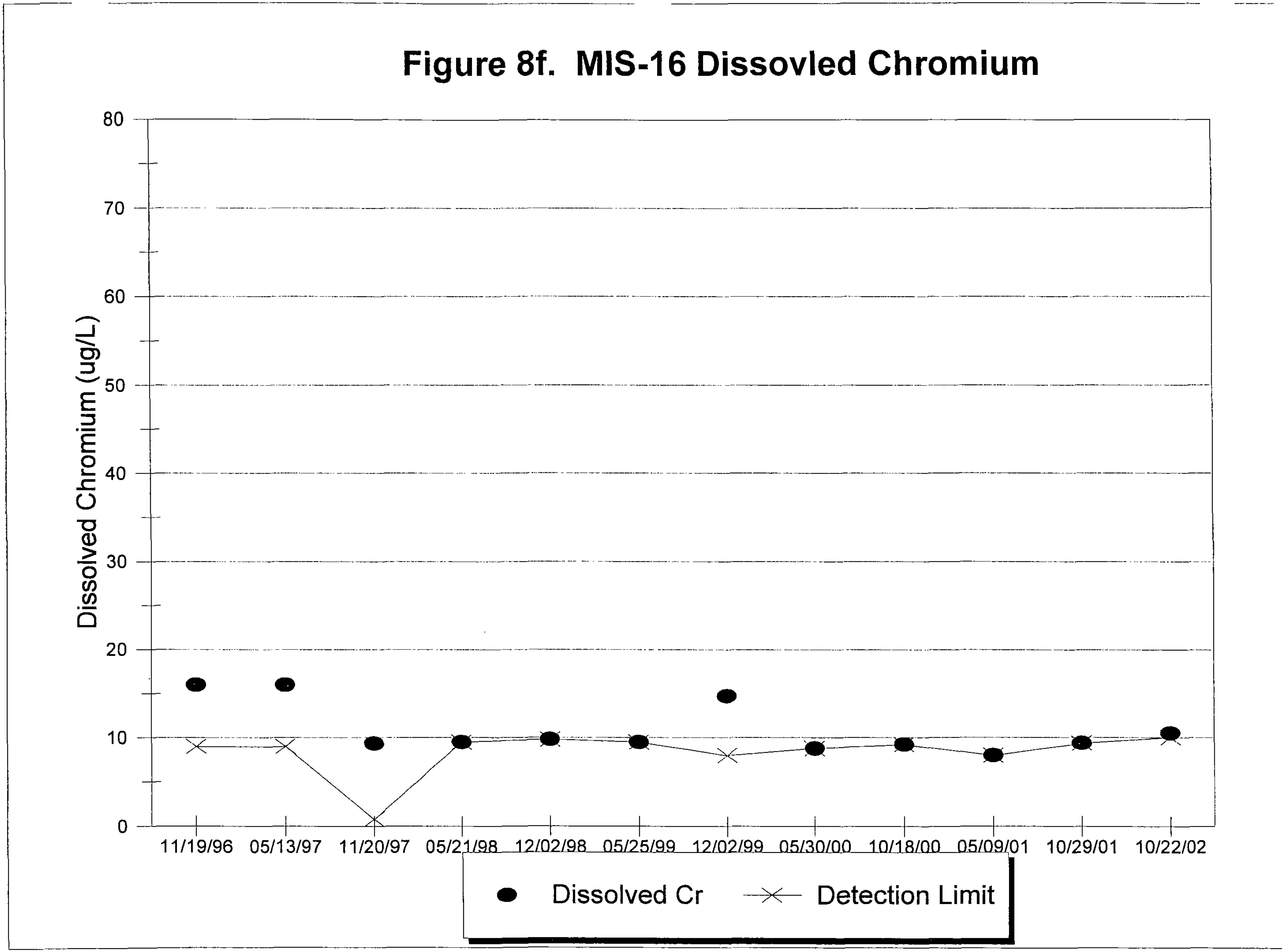


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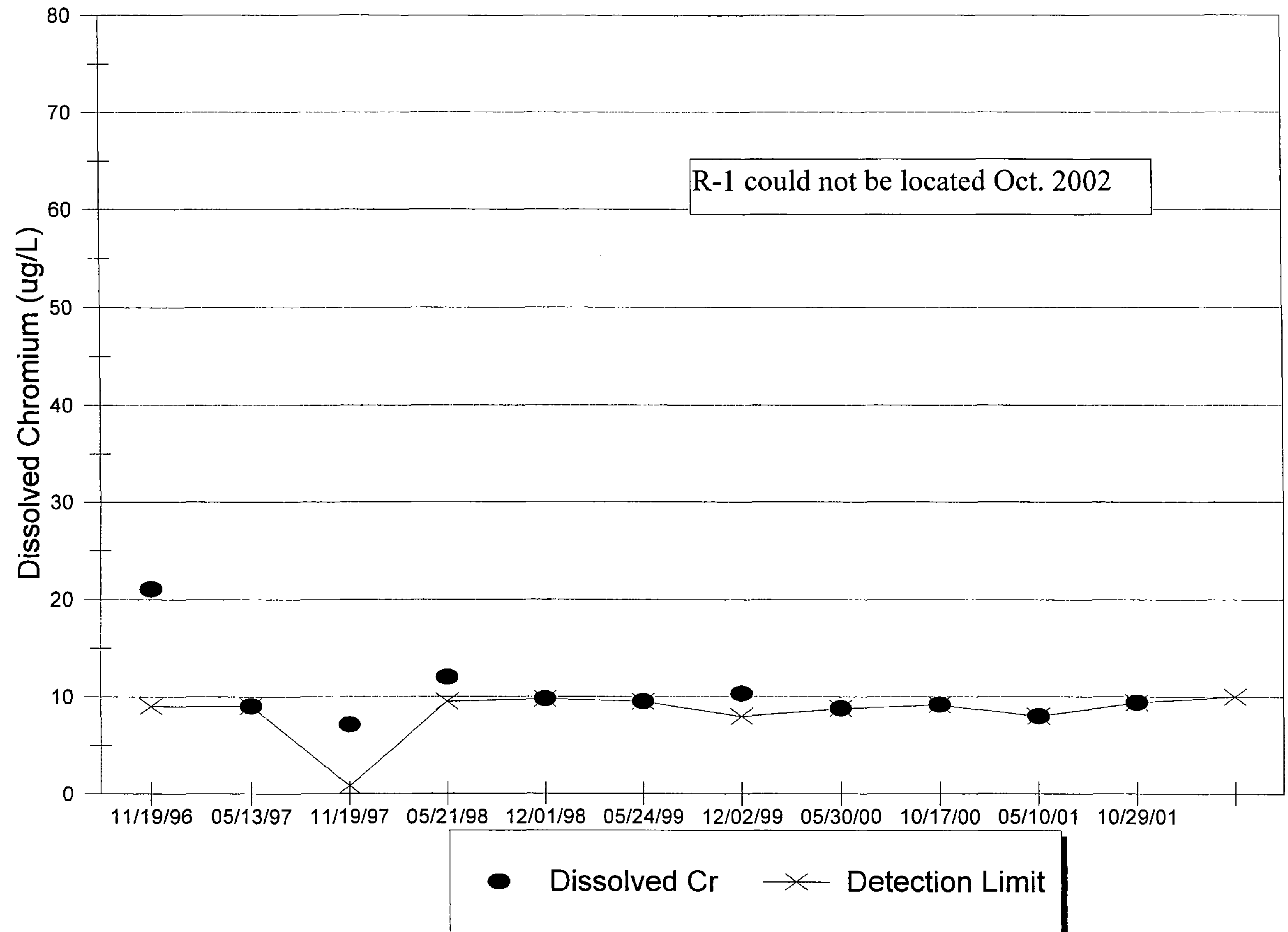
Figure 8g. R-1 Dissolved Chromium



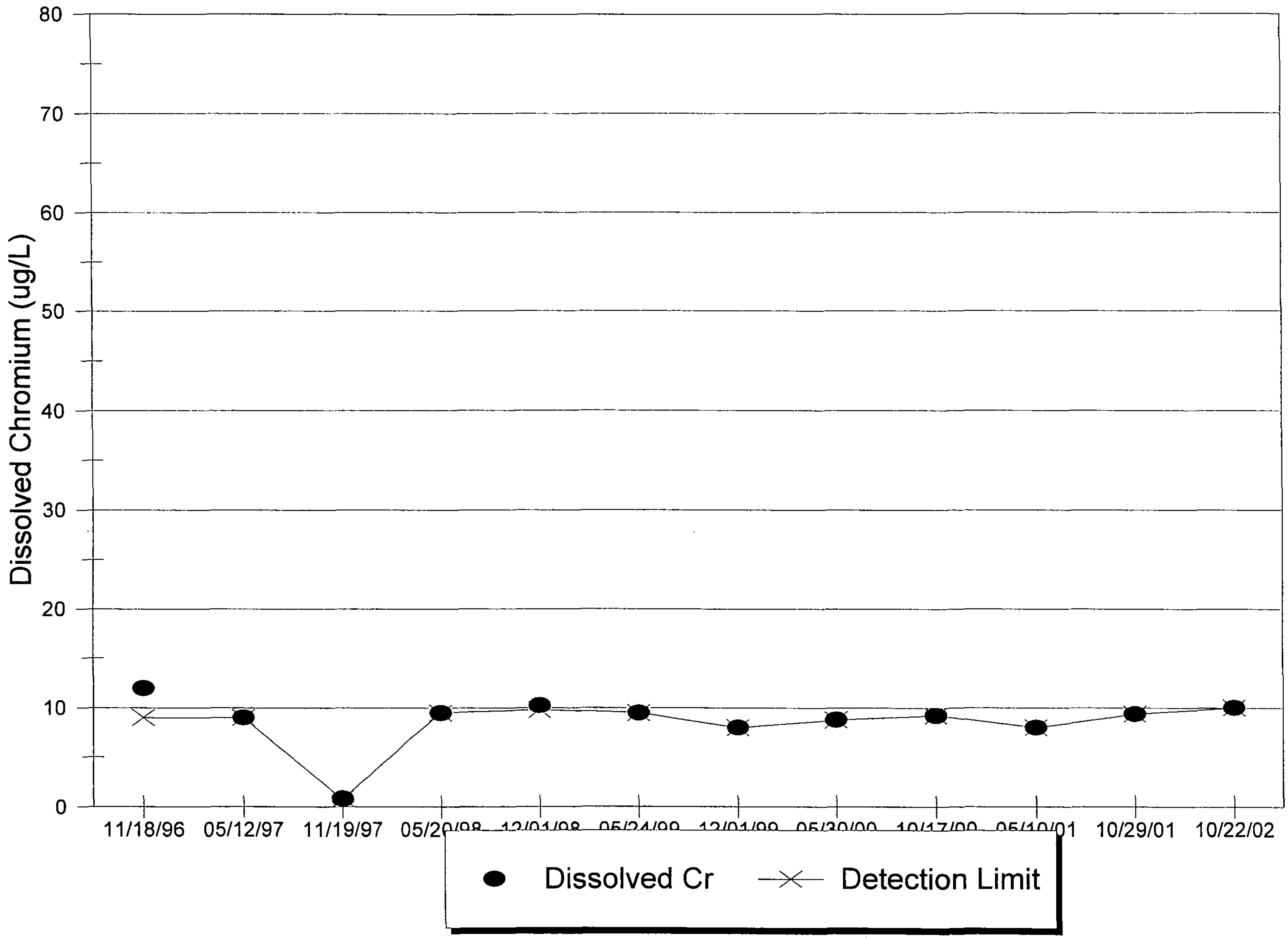


Figure 8h. RMIS-1 Dissolved Chromium

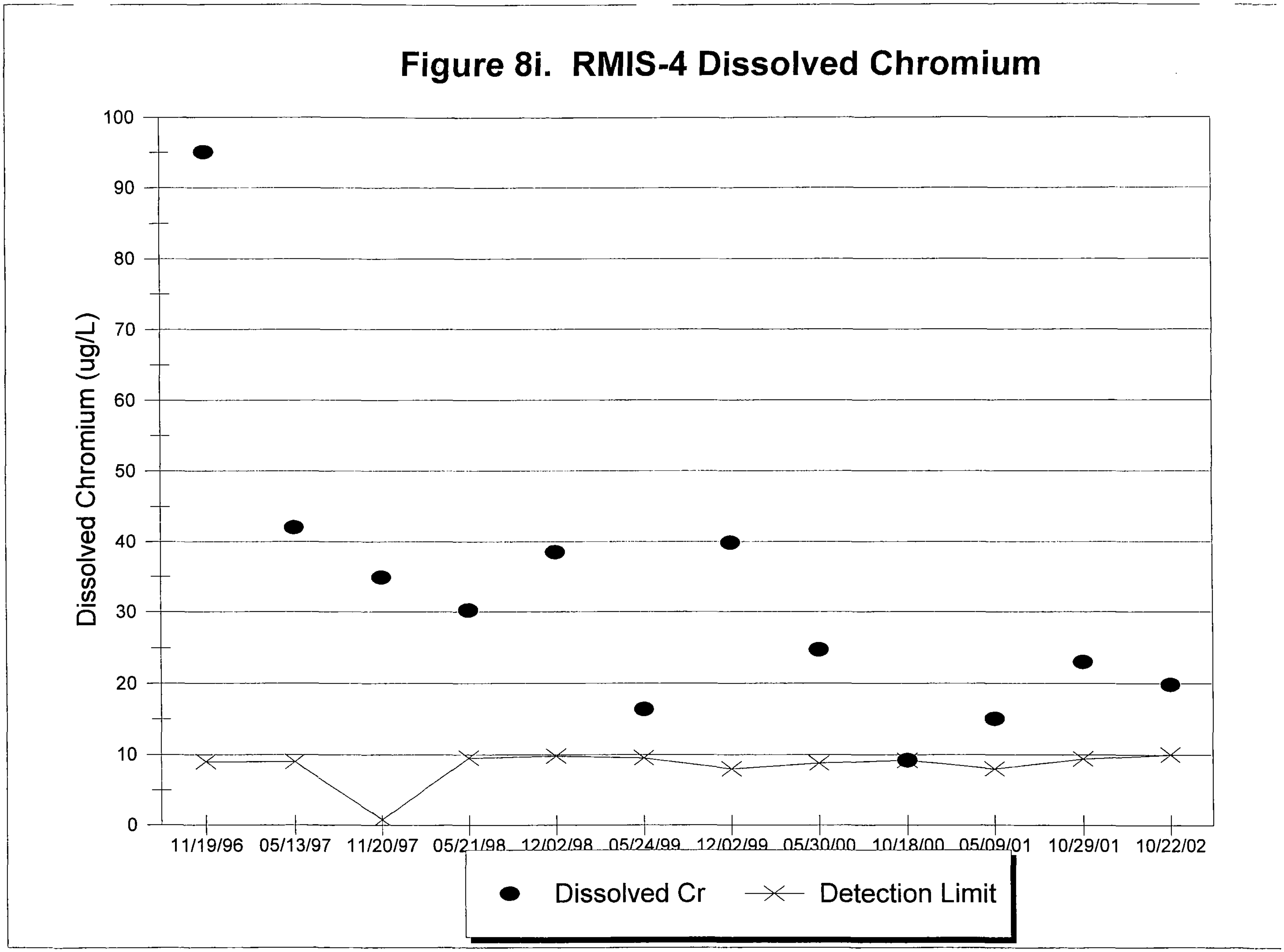


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Figure 8j. RMIS-6 Dissolved Chromium

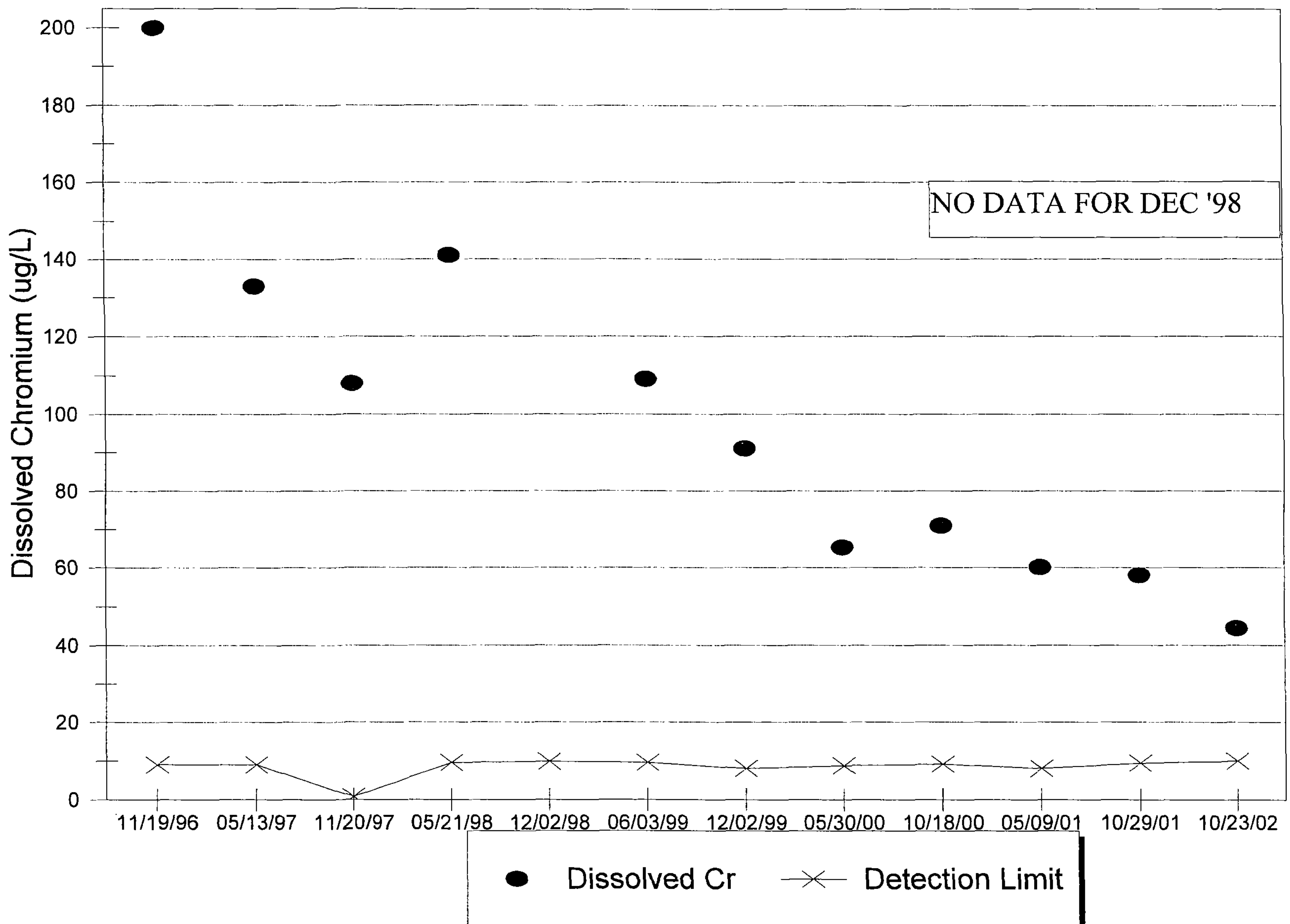

Figure 8k. RMIS-7 Dissolved Chromium

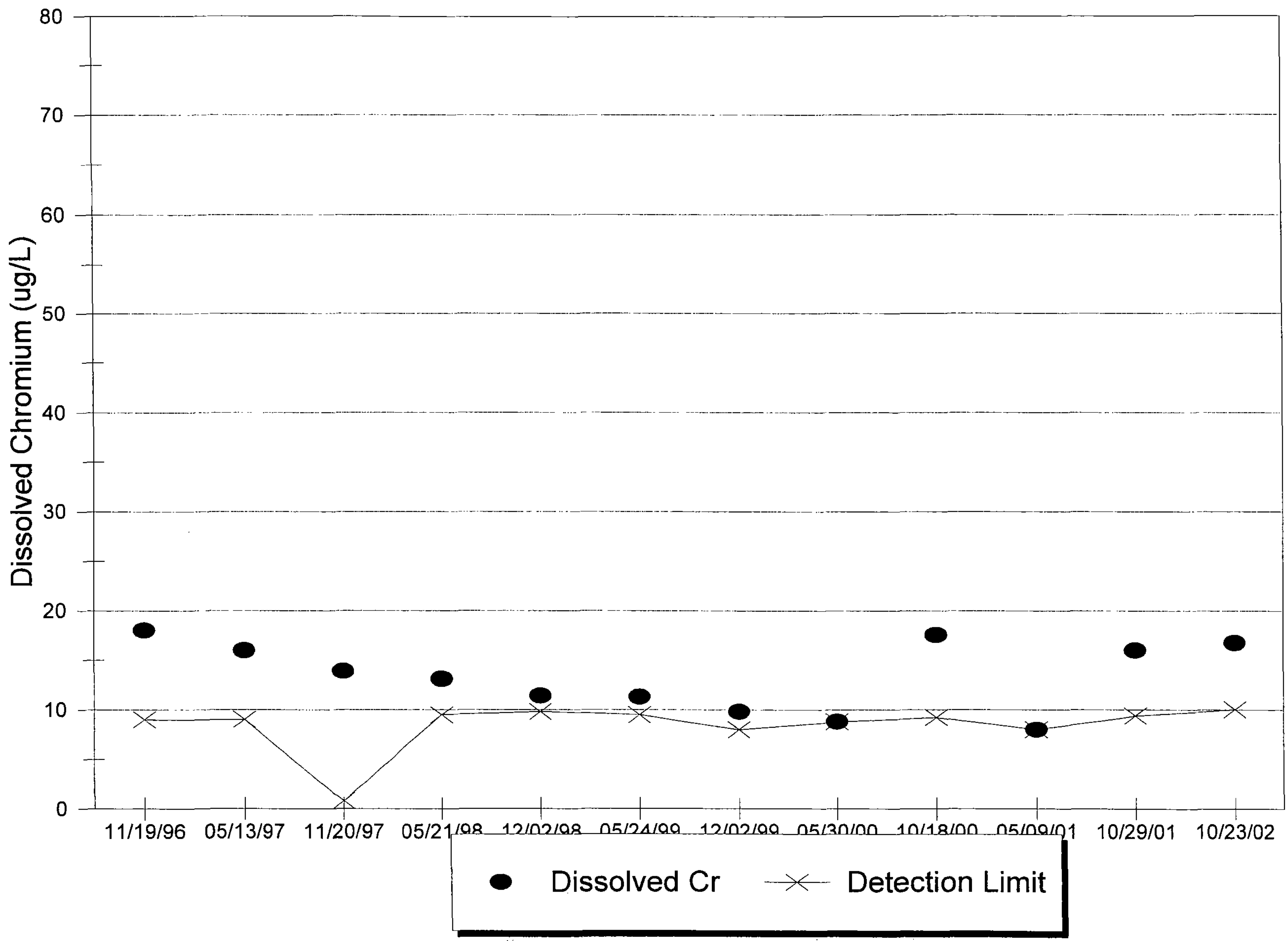

Figure 8I. RMIS-9 Dissolved Chromium

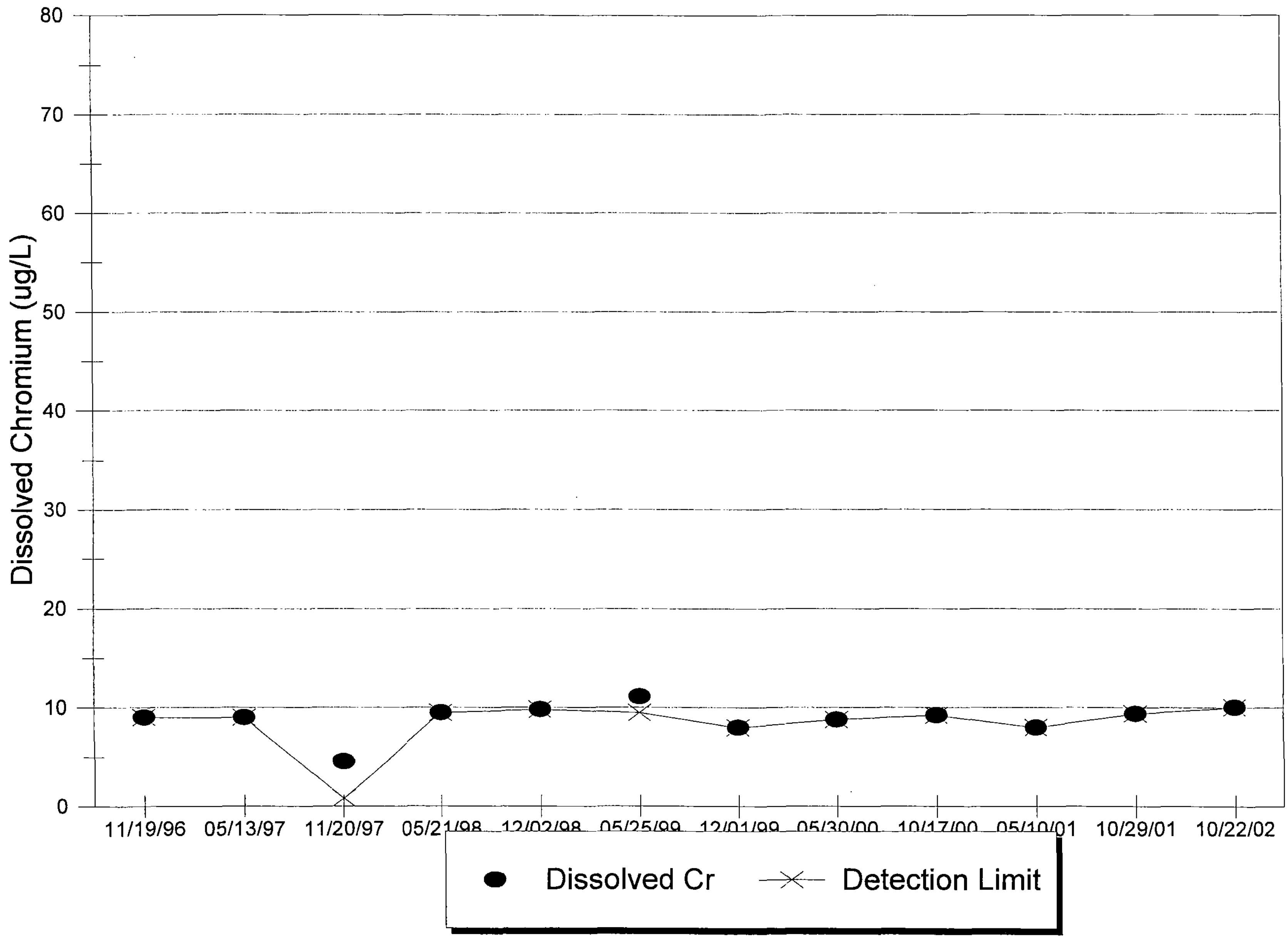

Figure 9a. MIS-4B Total Chromium

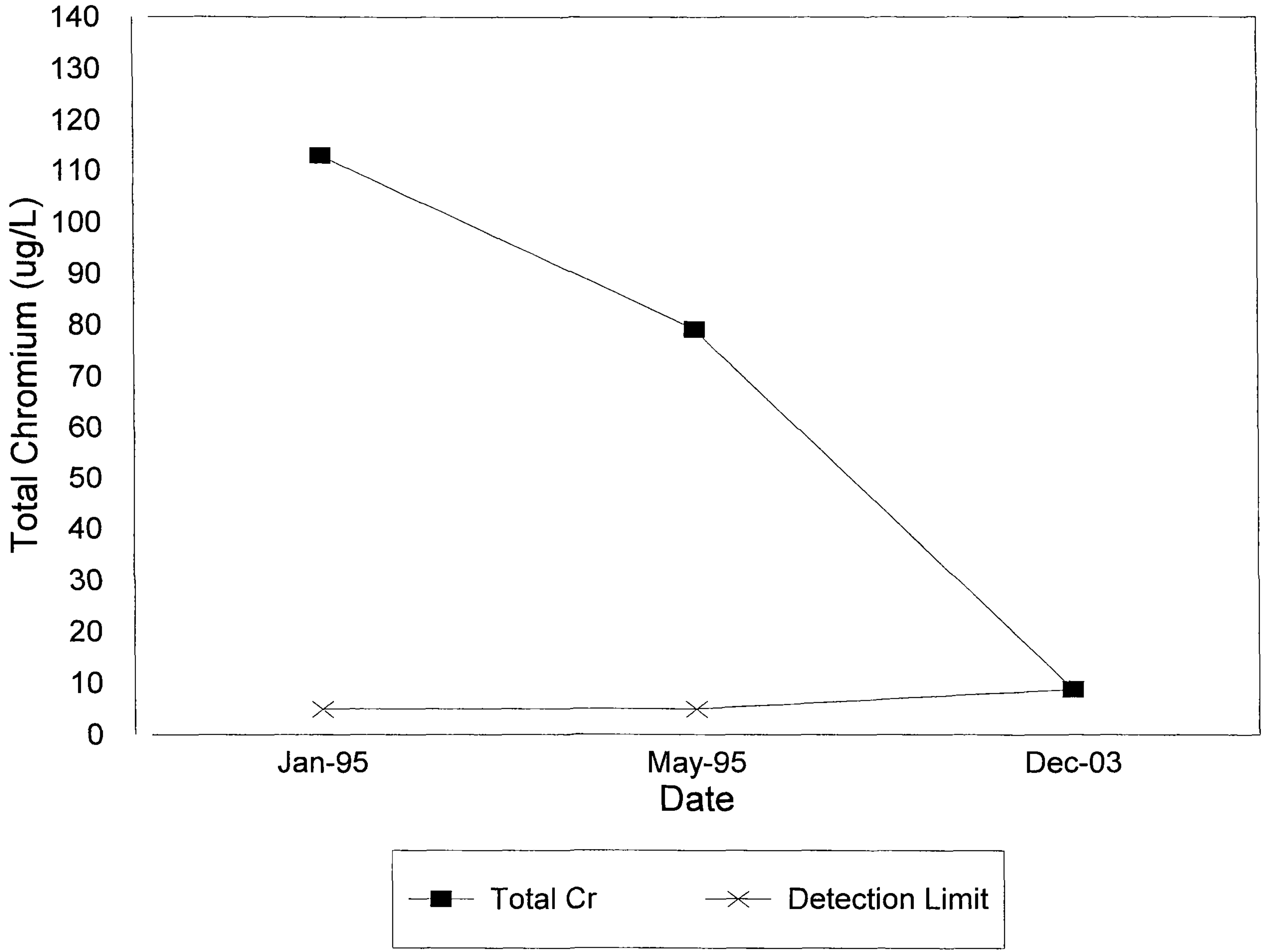

Figure 9b. MIS-8B Total Chromium

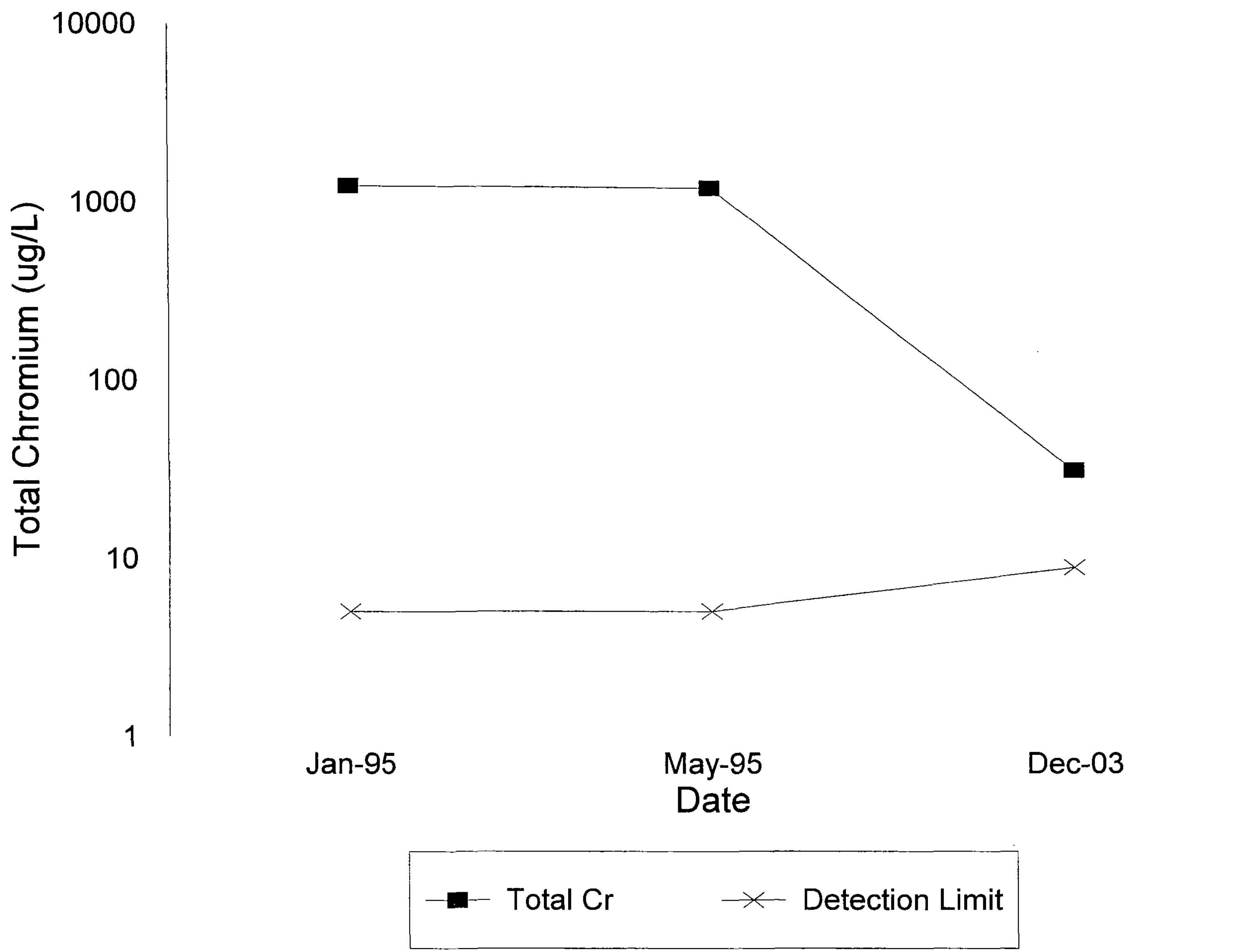

Figure 9c. MIS-11B Total Chromium

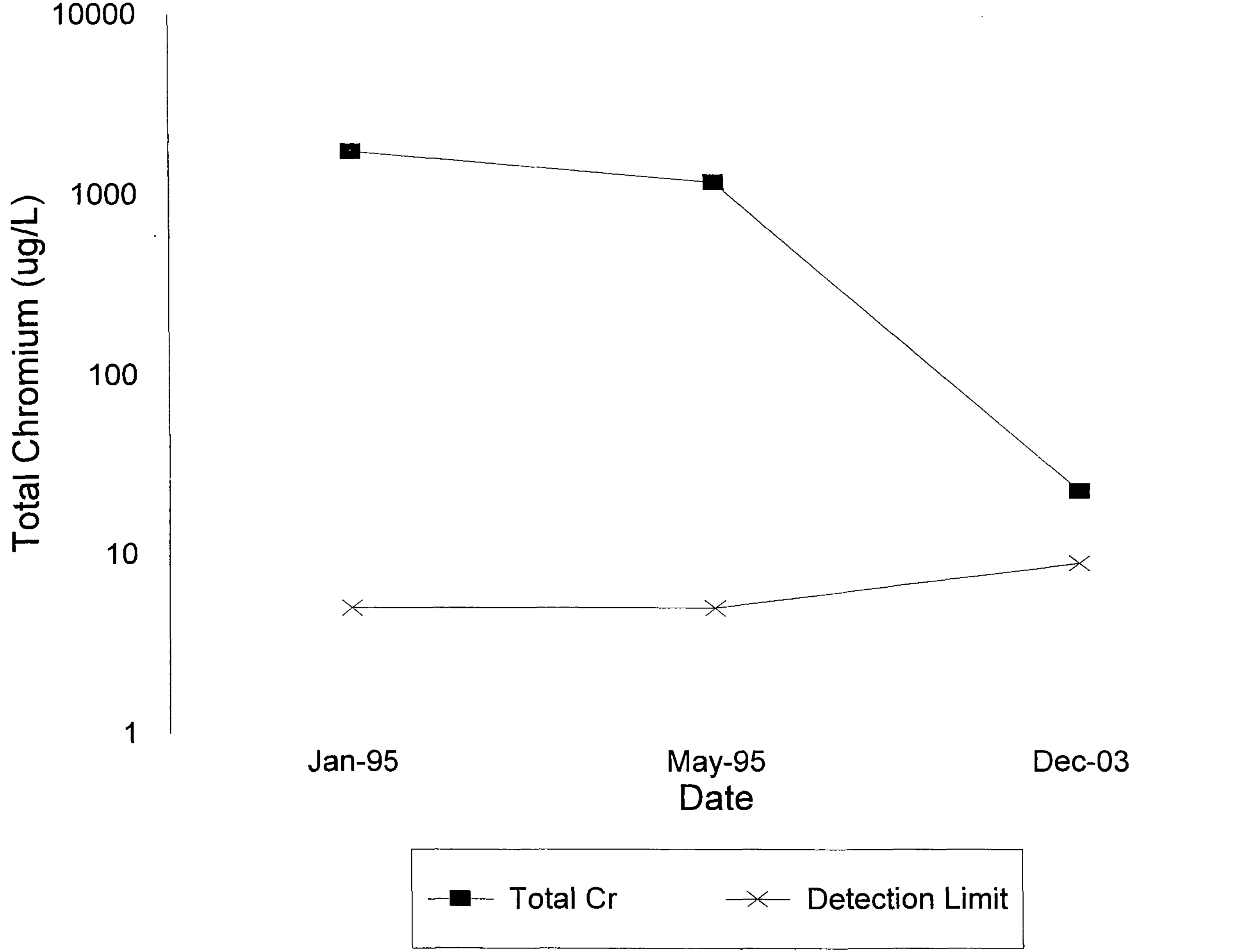

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Figure 9d. RMIS-2 Total Chromium

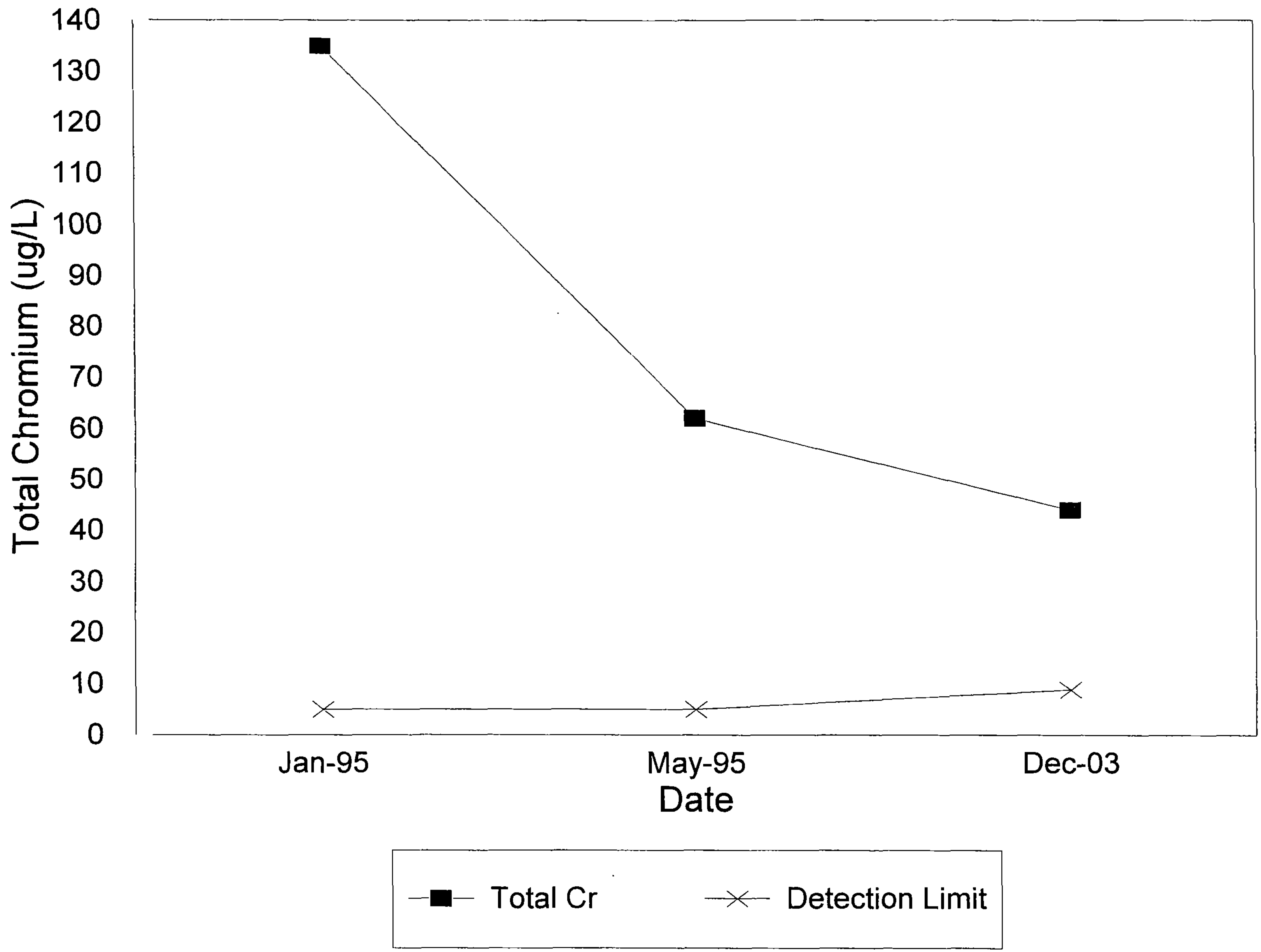


Figure 9e. RMIS-3 Total Chromium

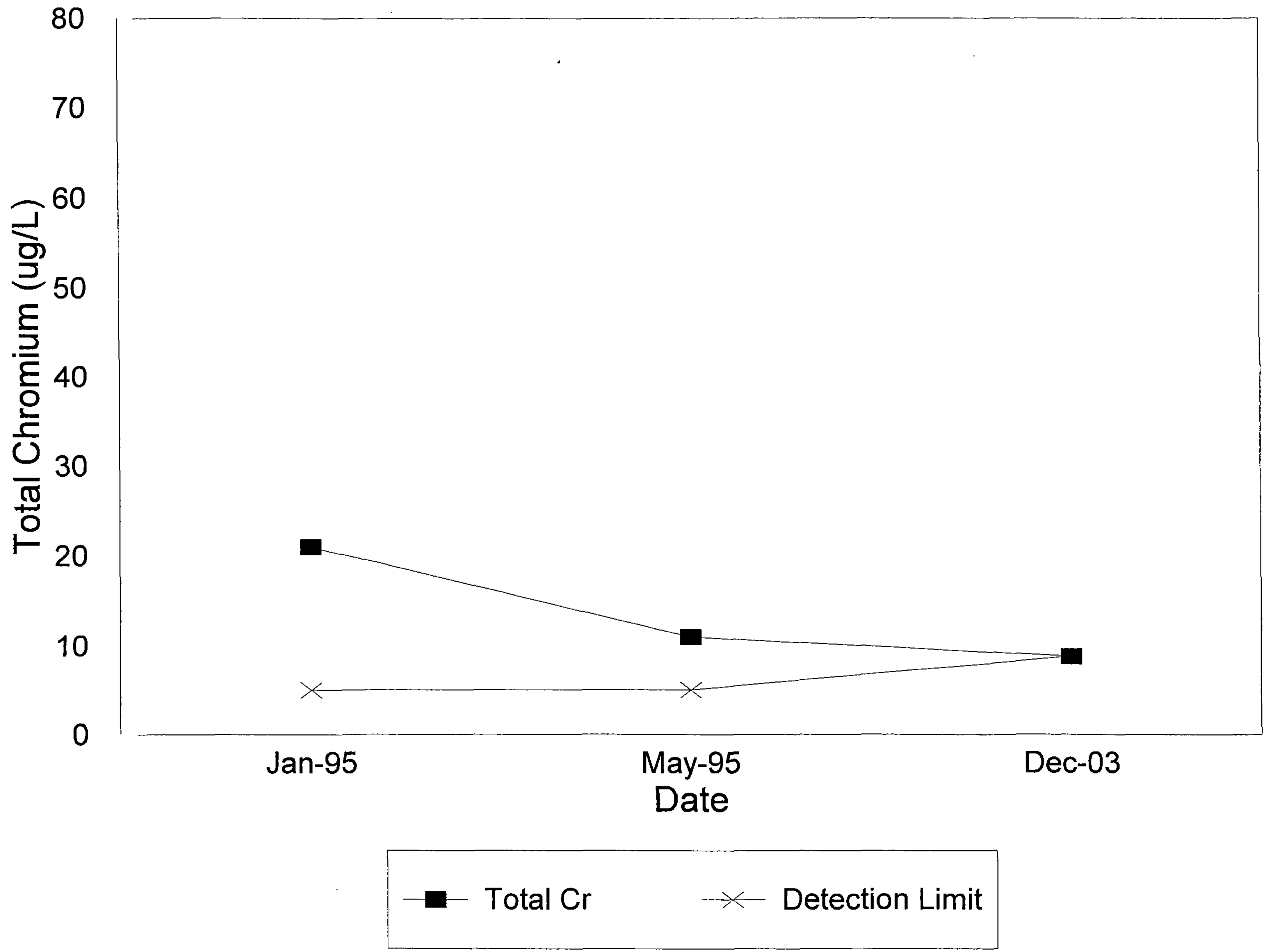
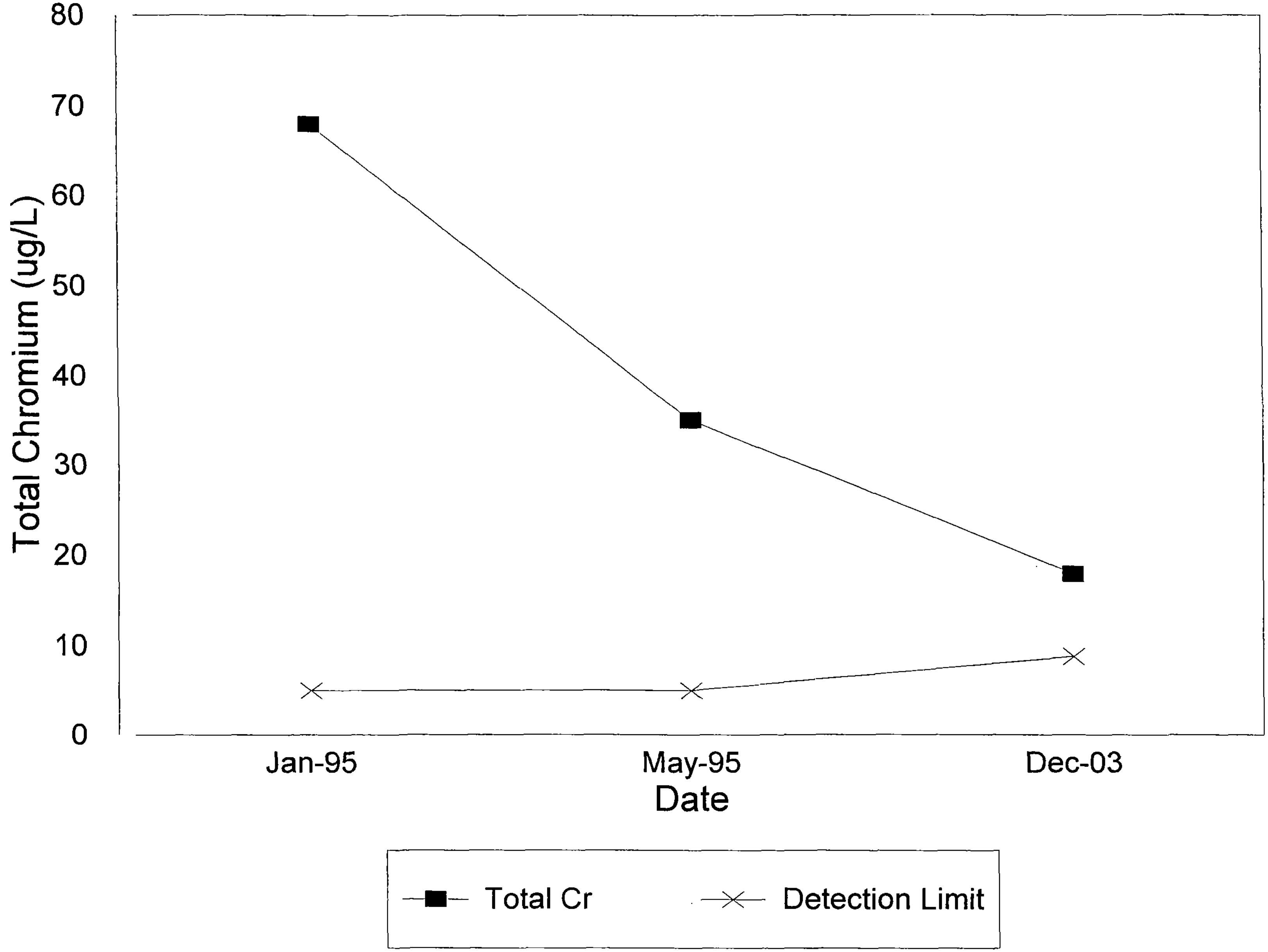


Figure 9f. RMIS-5 Total Chromium



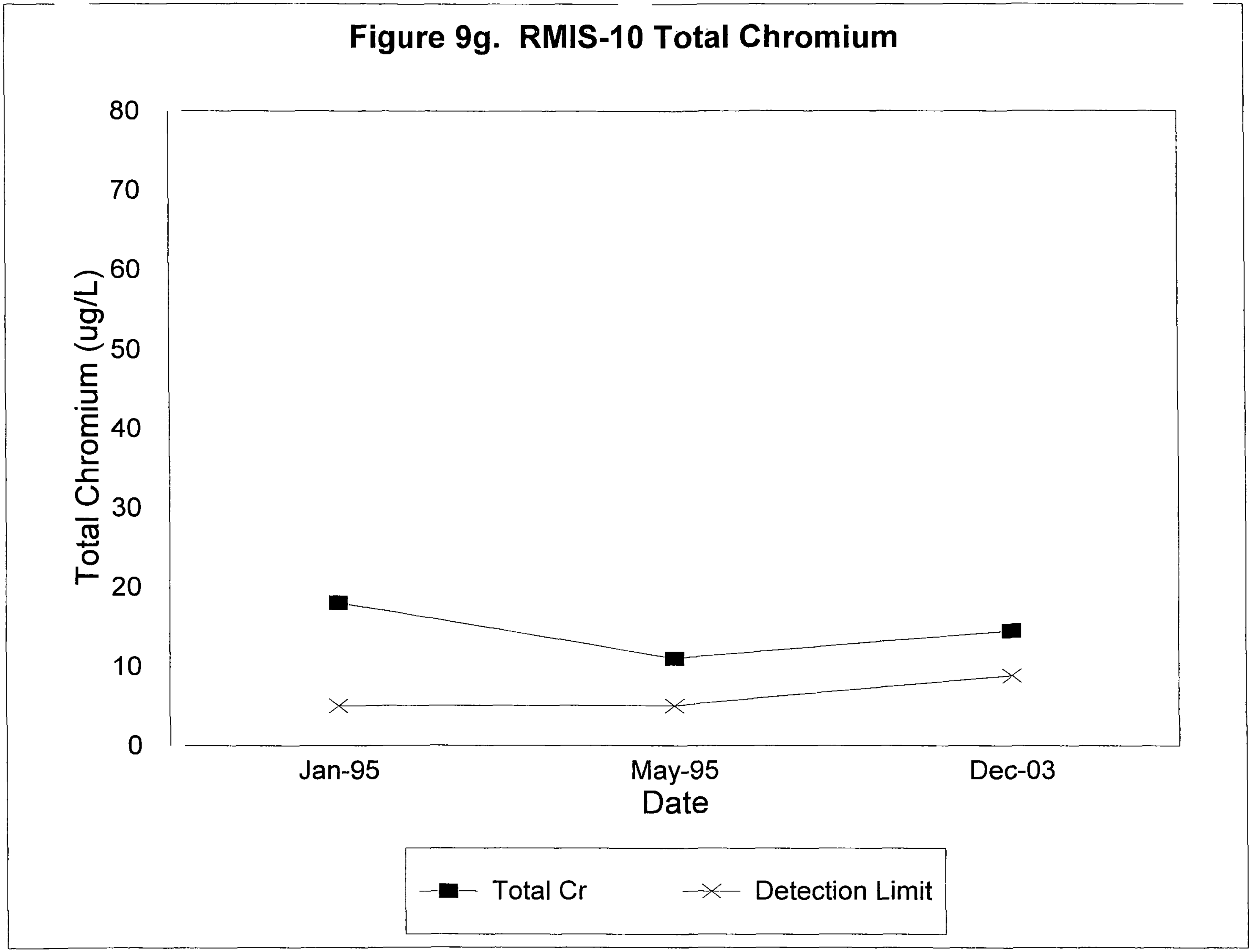


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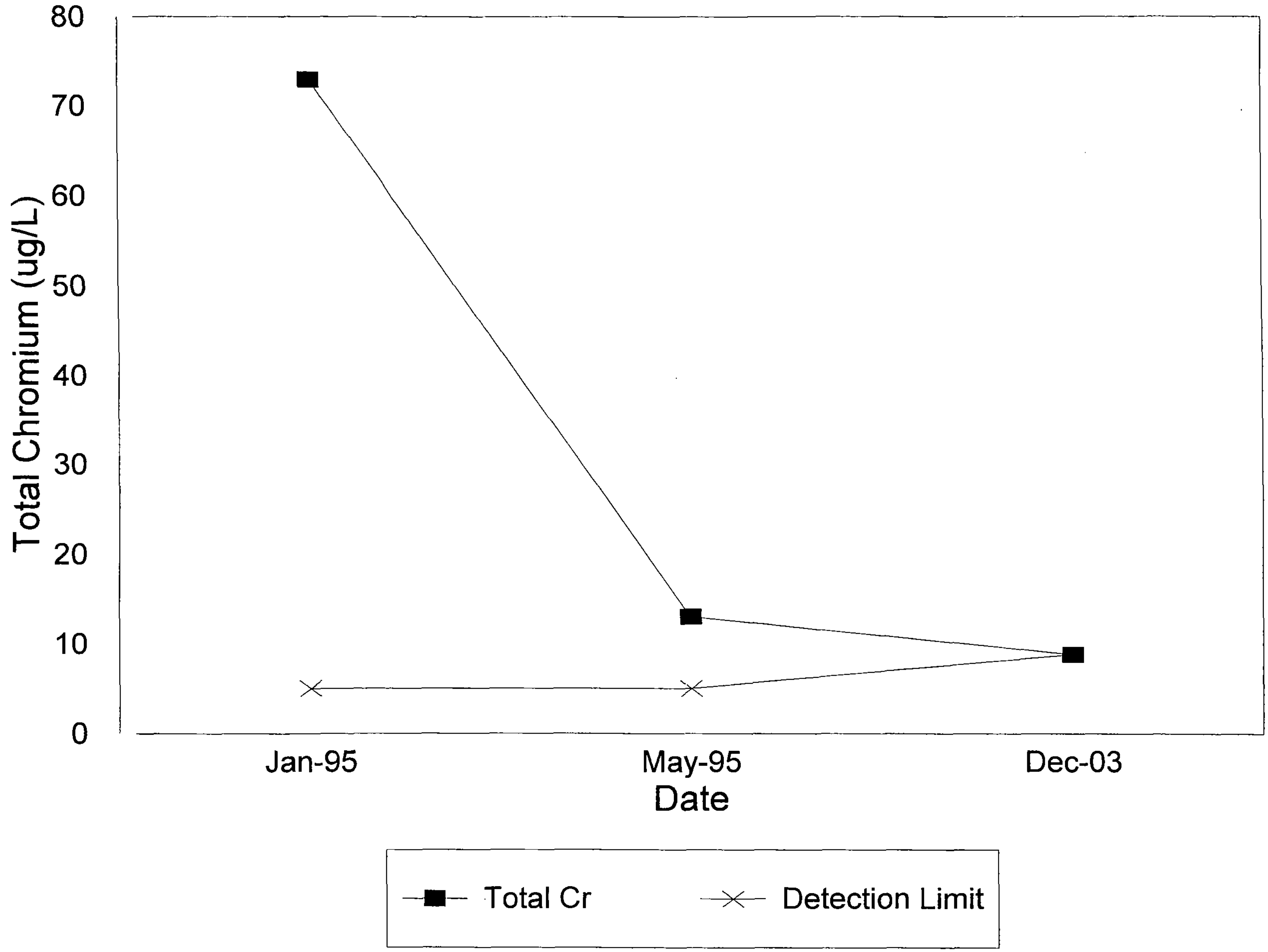
Figure 9h. W-9 Total Chromium



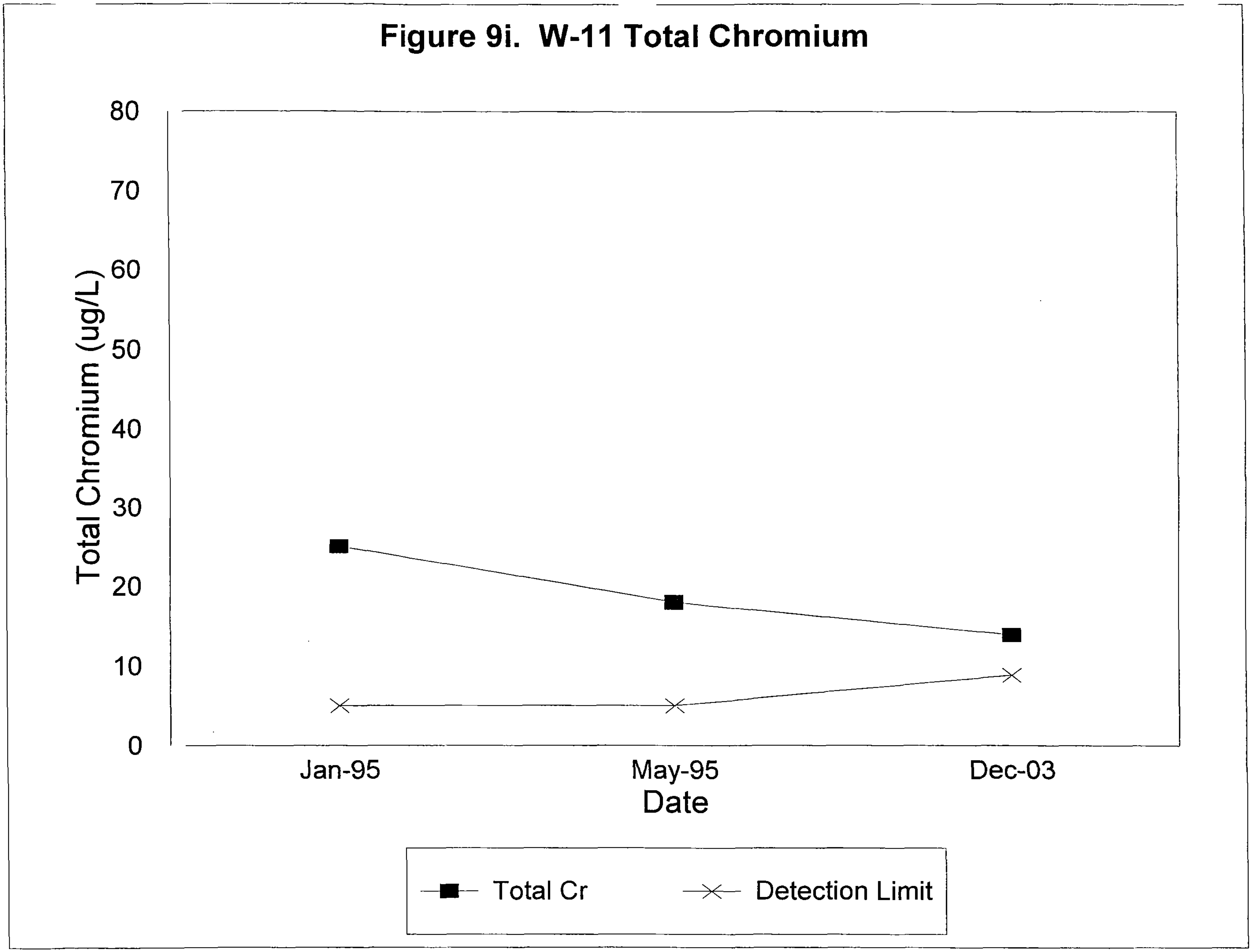


Figure 9i. W-11 Total Chromium
Total Chromium (ug/L)
80
70
60
50
40
30
20
10
0
Jan-95
May-95
Dec-03
Date
Total Cr
Detection Limit

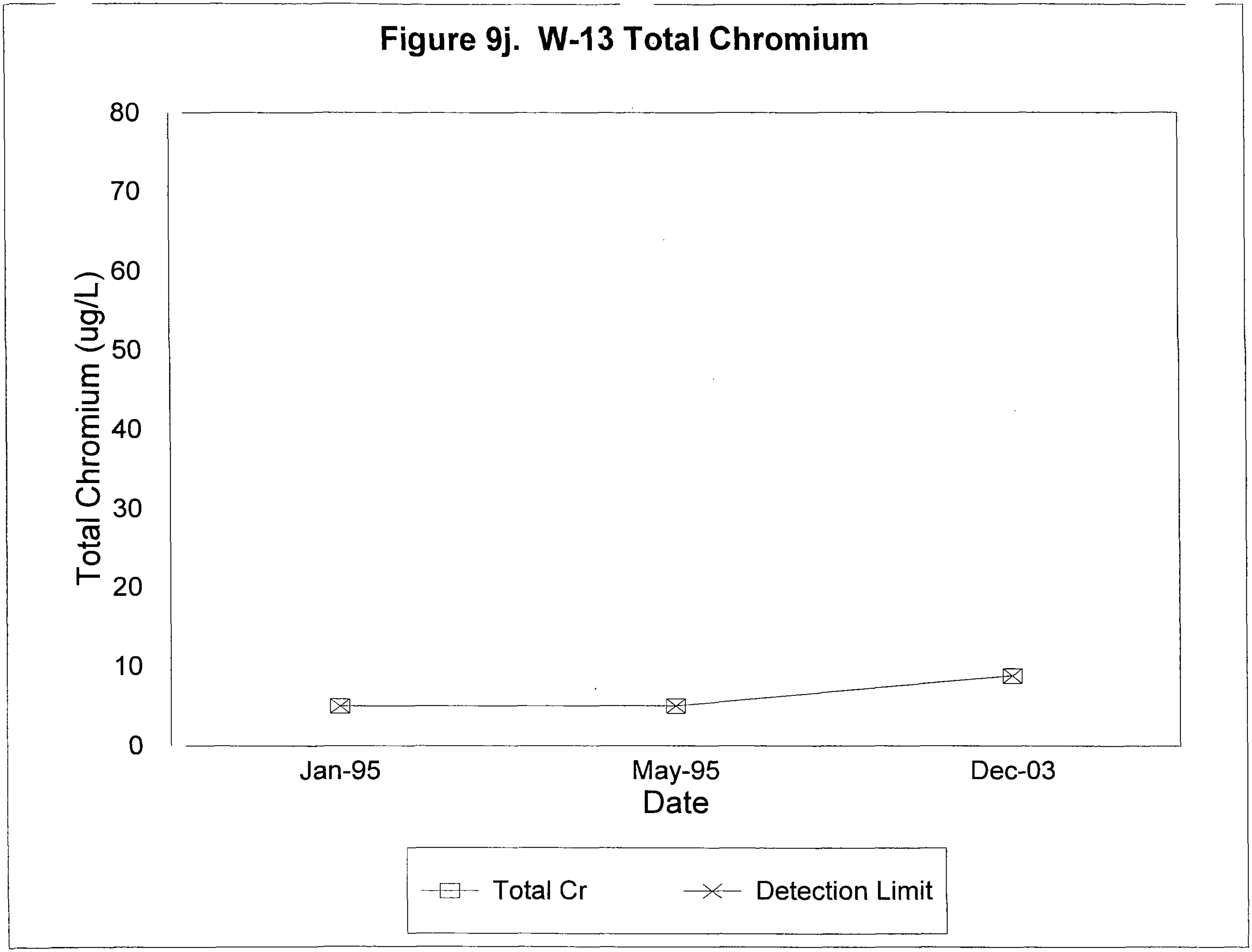


Figure 9j. W-13 Total Chromium
Total Chromium (ug/L)
80
70
60
50
40
30
20
10
0
Jan-95
May-95
Dec-03
Date
Total Cr
Detection Limit

Figure 10a. MIS-4B Dissolved Chromium

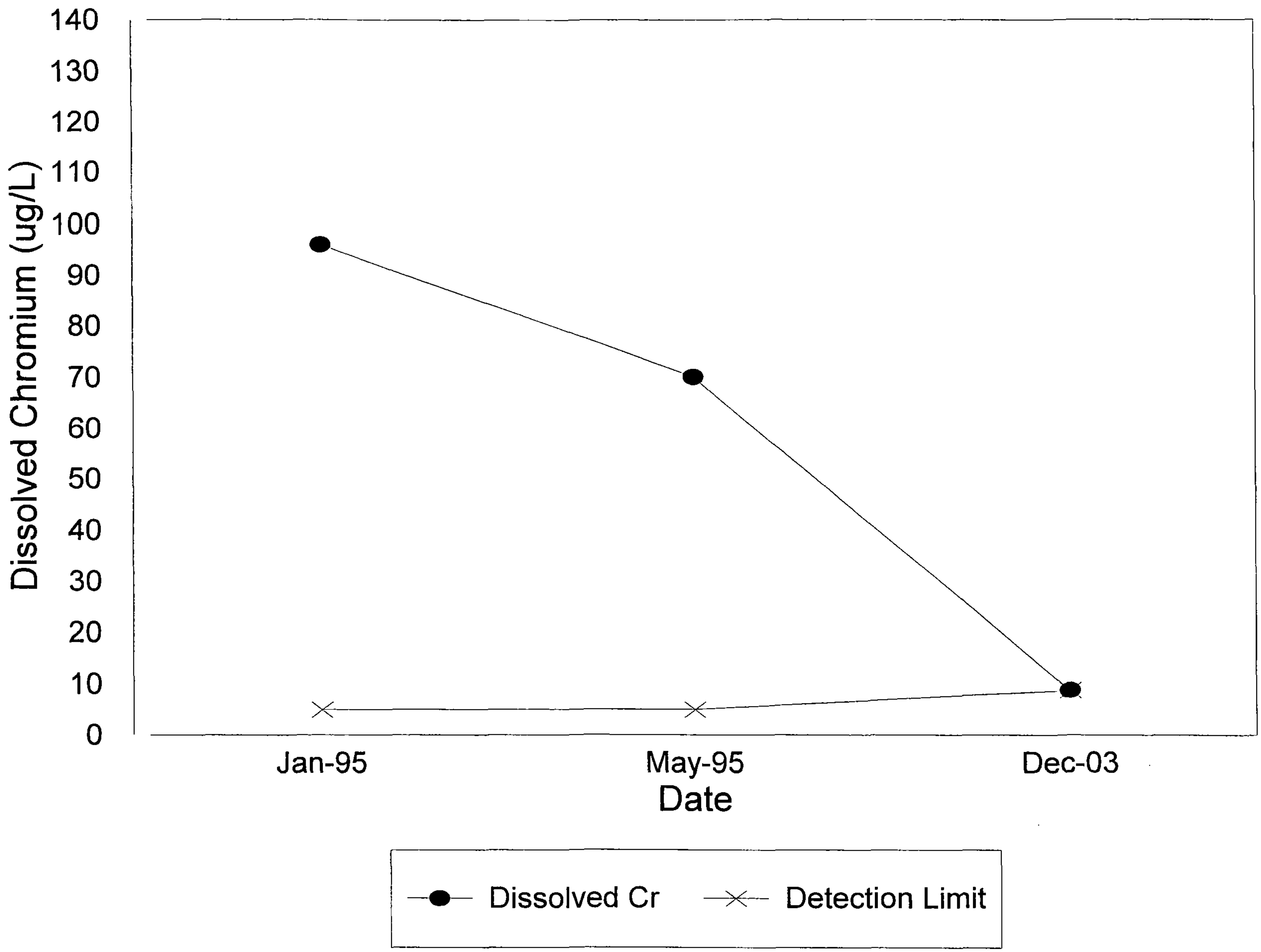


Figure 10b. MIS-8B Dissolved Chromium

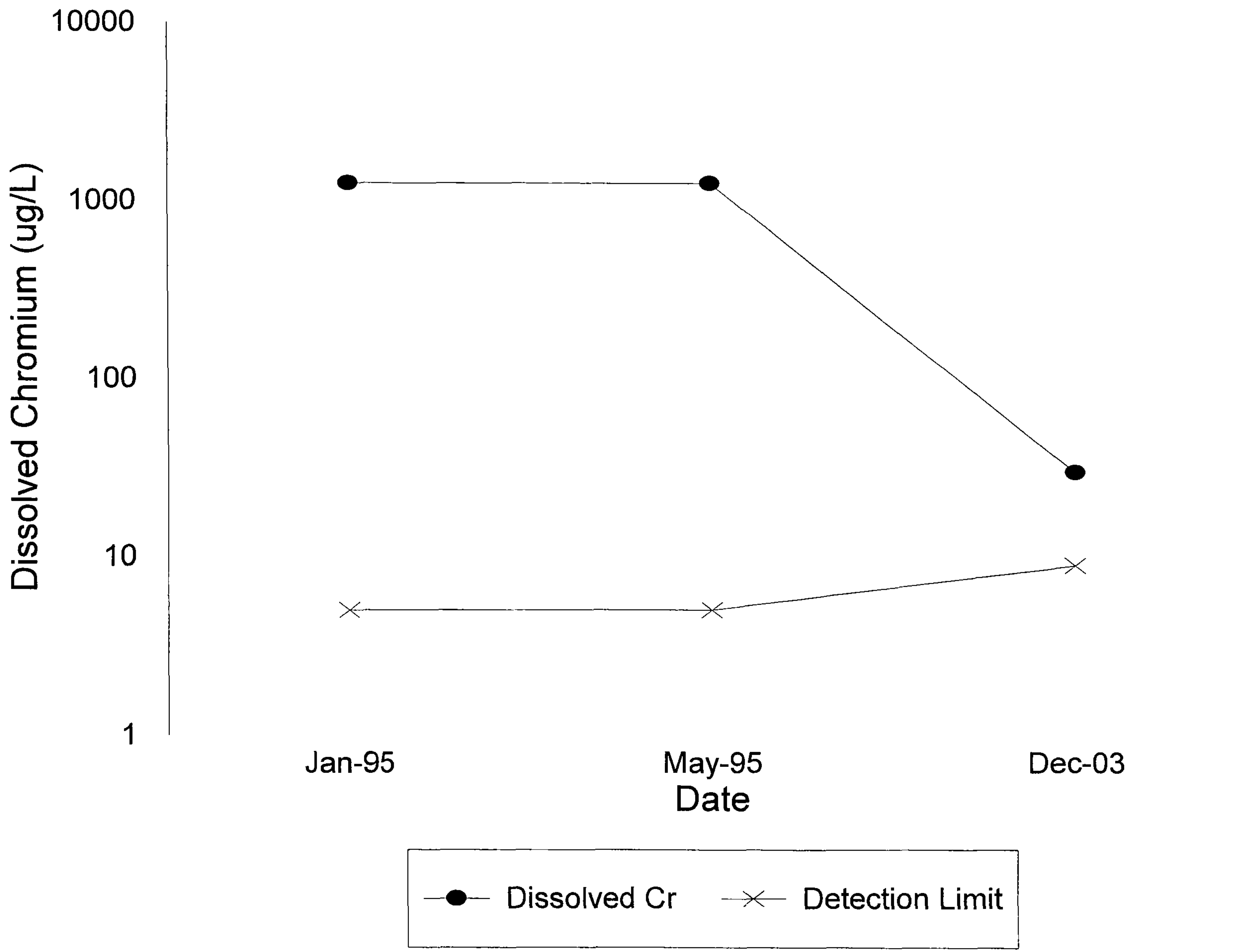


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Figure 10c. MIS-11B Dissolved Chromium

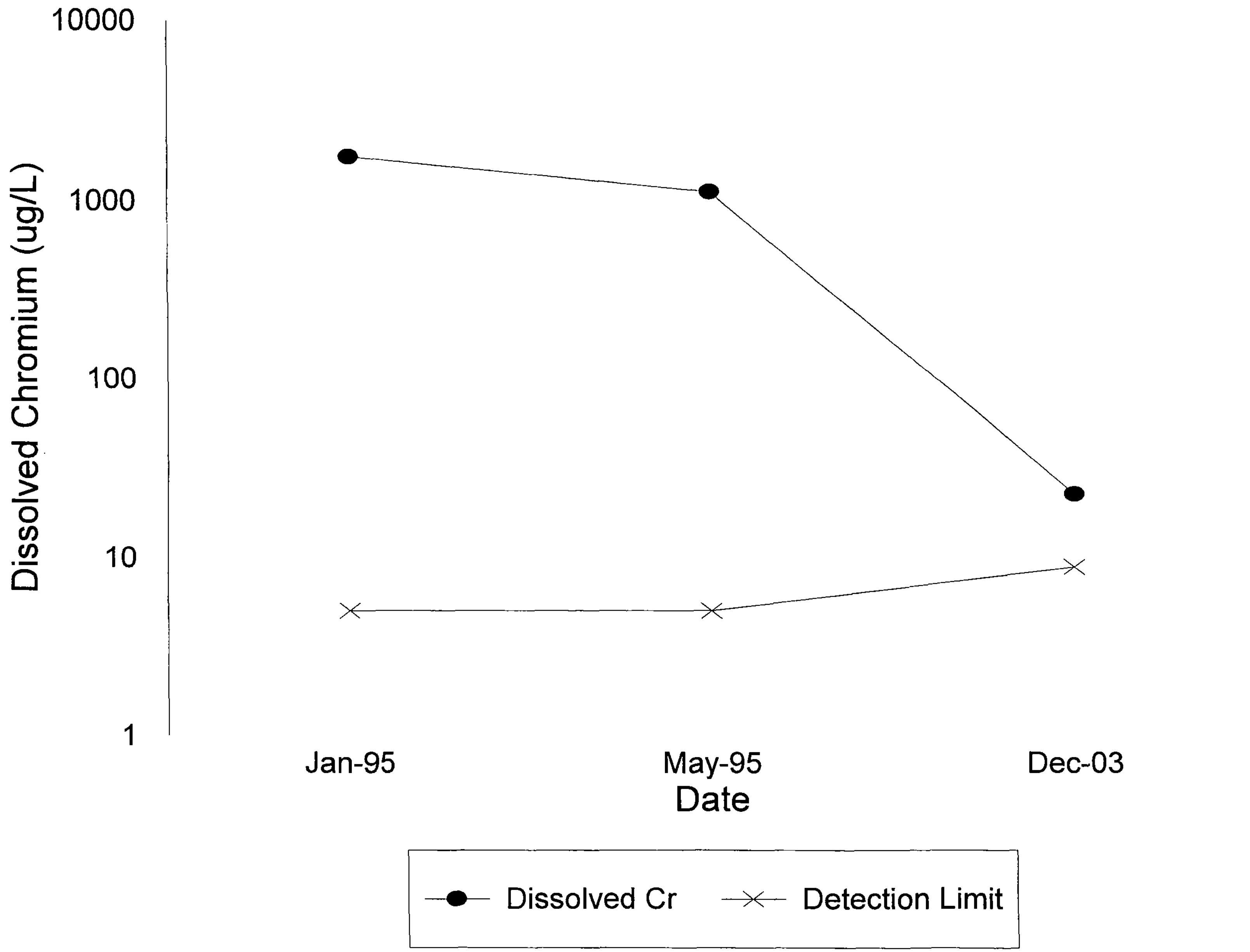


Figure 10d. RMIS-2 Dissolved Chromium

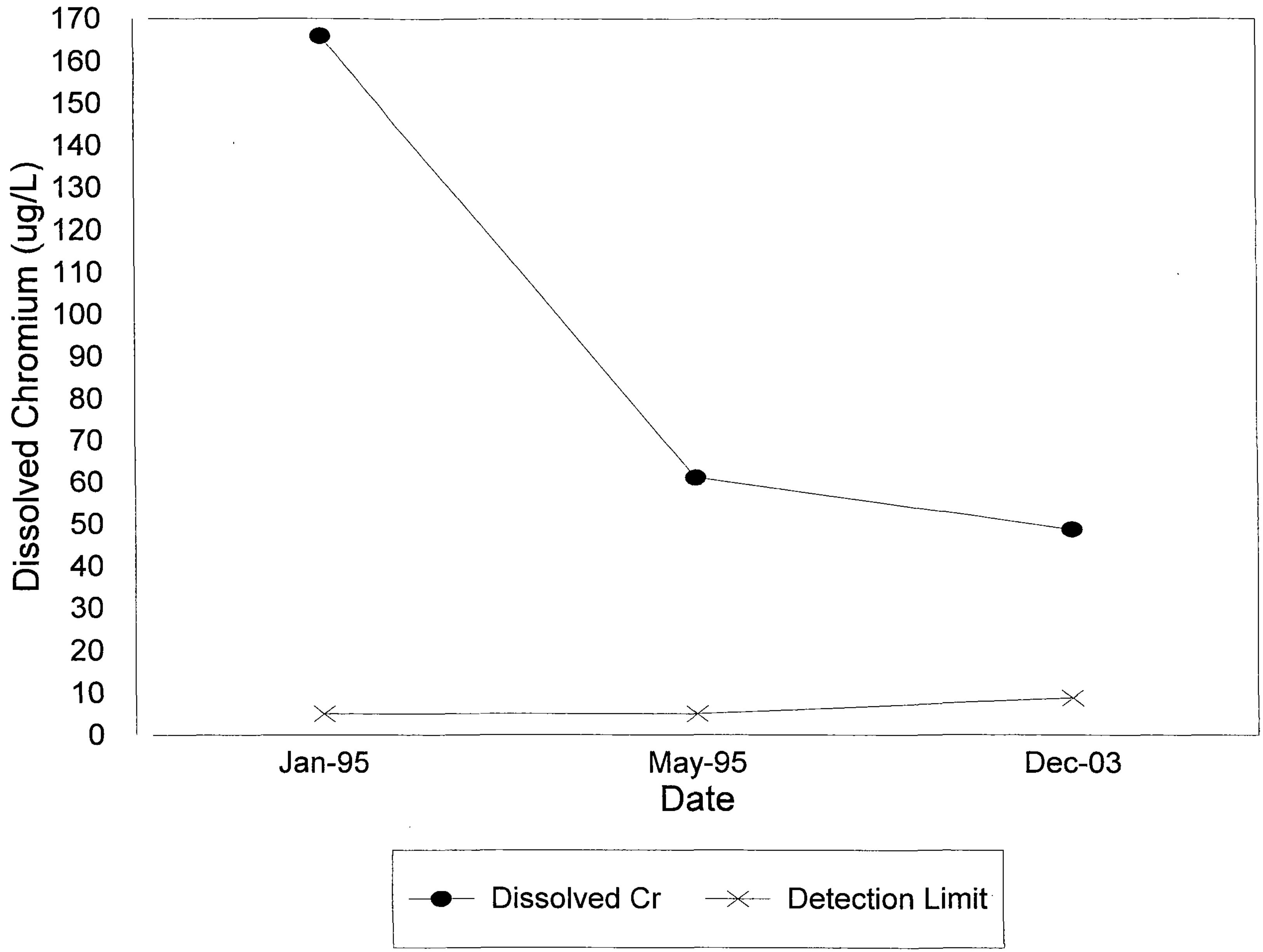


Figure 10e. RMIS-3 Dissovled Chromium

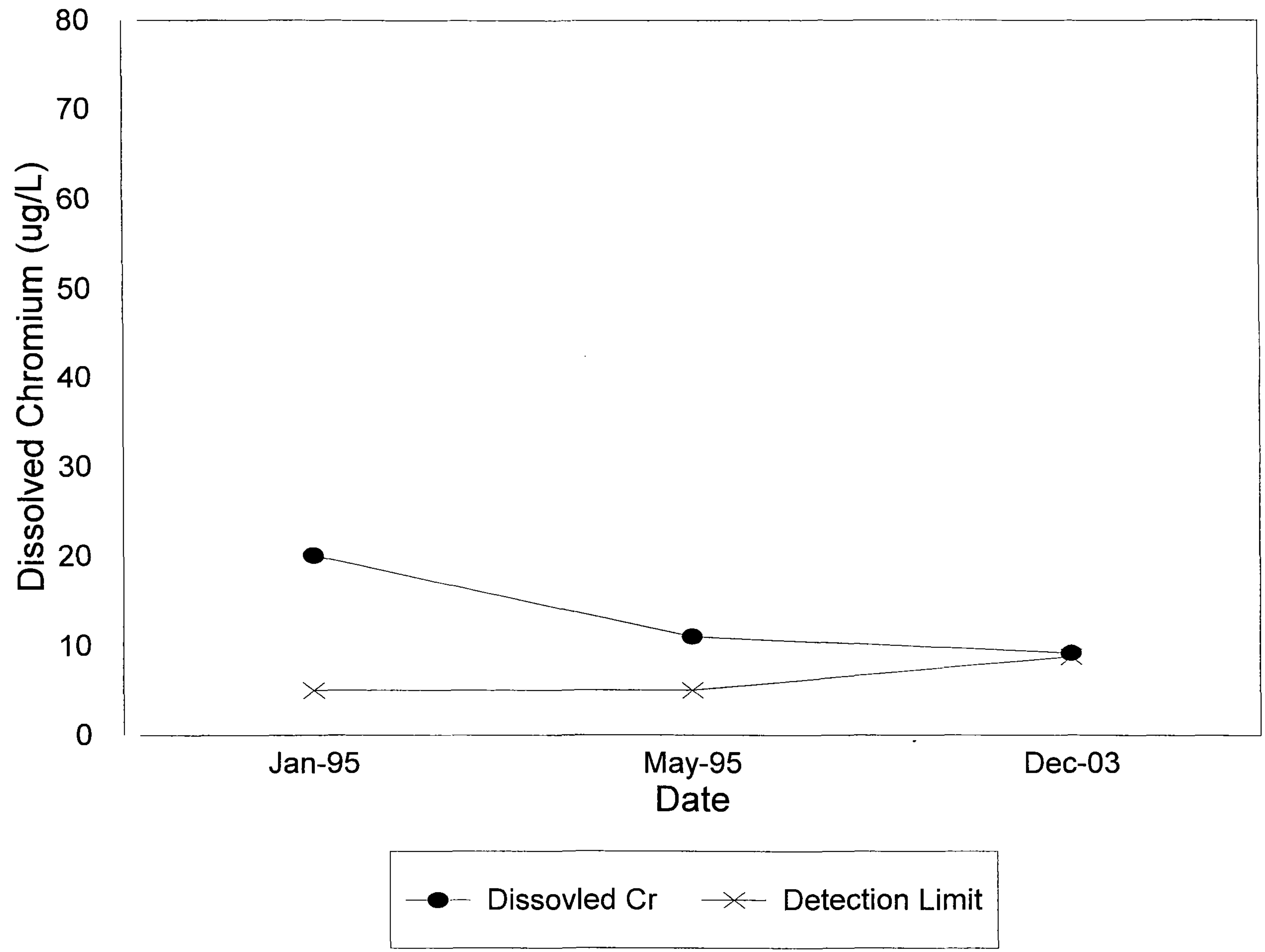


Figure 10f. RMIS-5 Dissolved Chromium

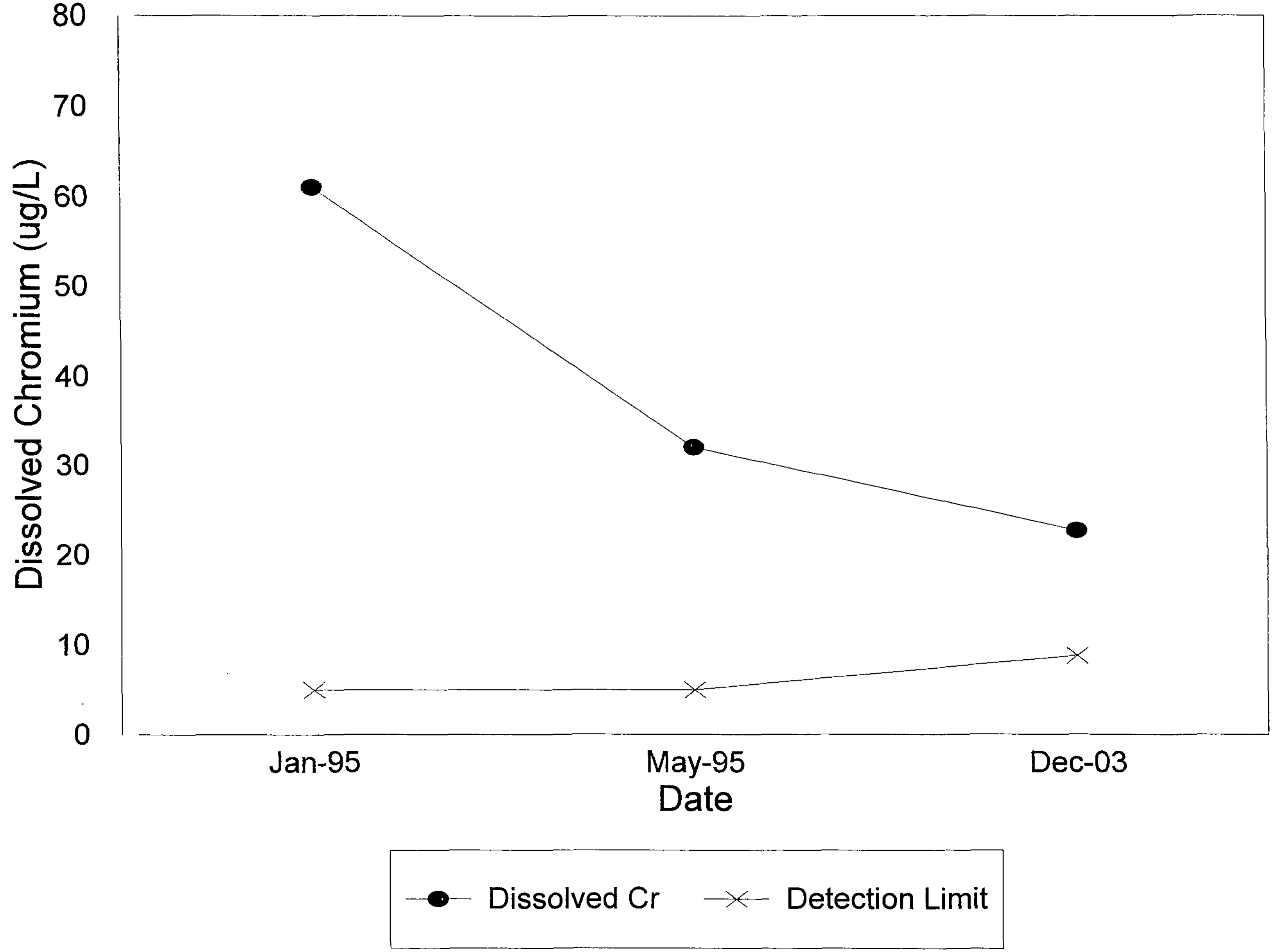


Figure 10g. RMIS-10 Dissolved Chromium

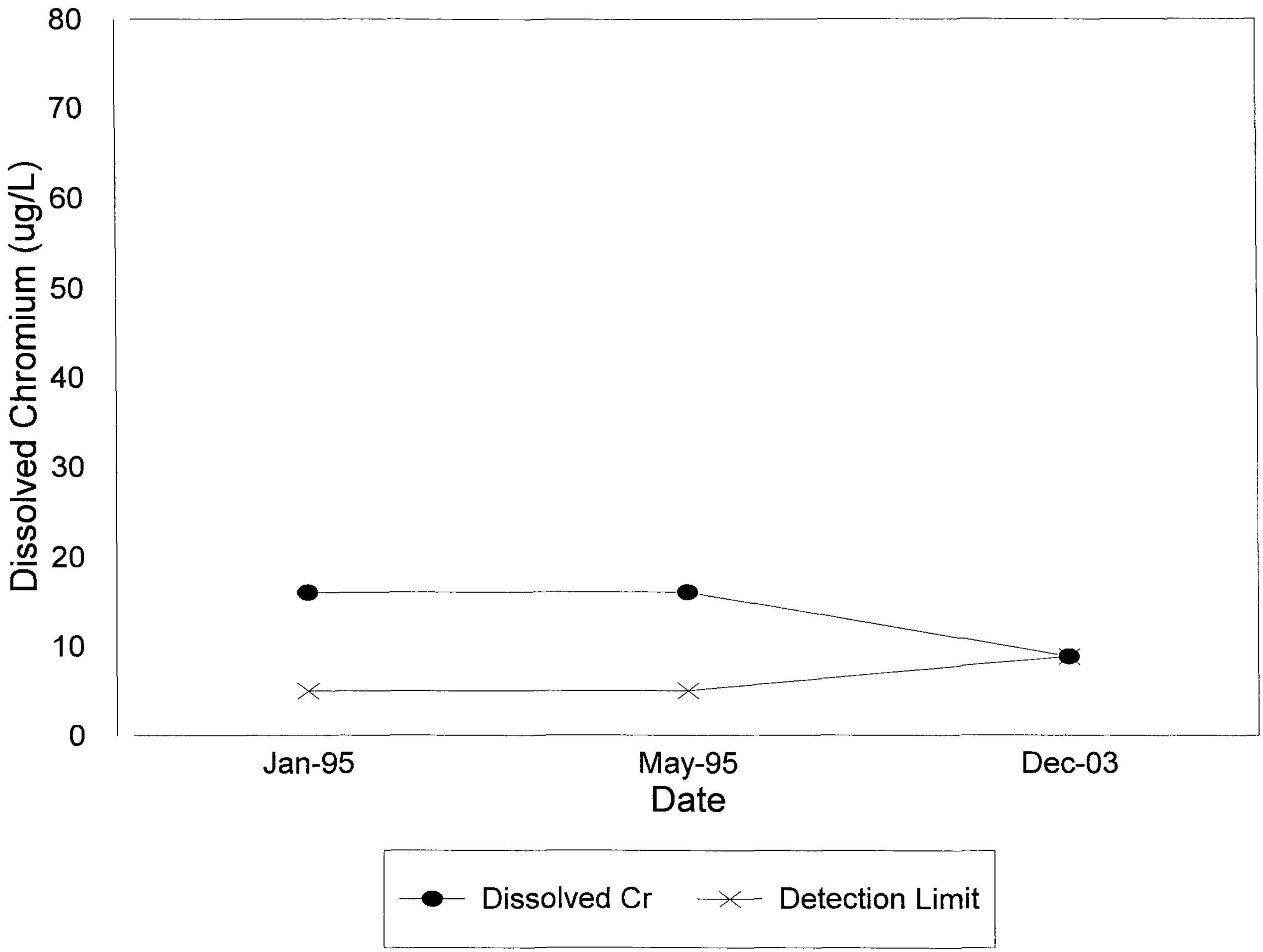


Figure 10h. W-9 Dissolved Chromium

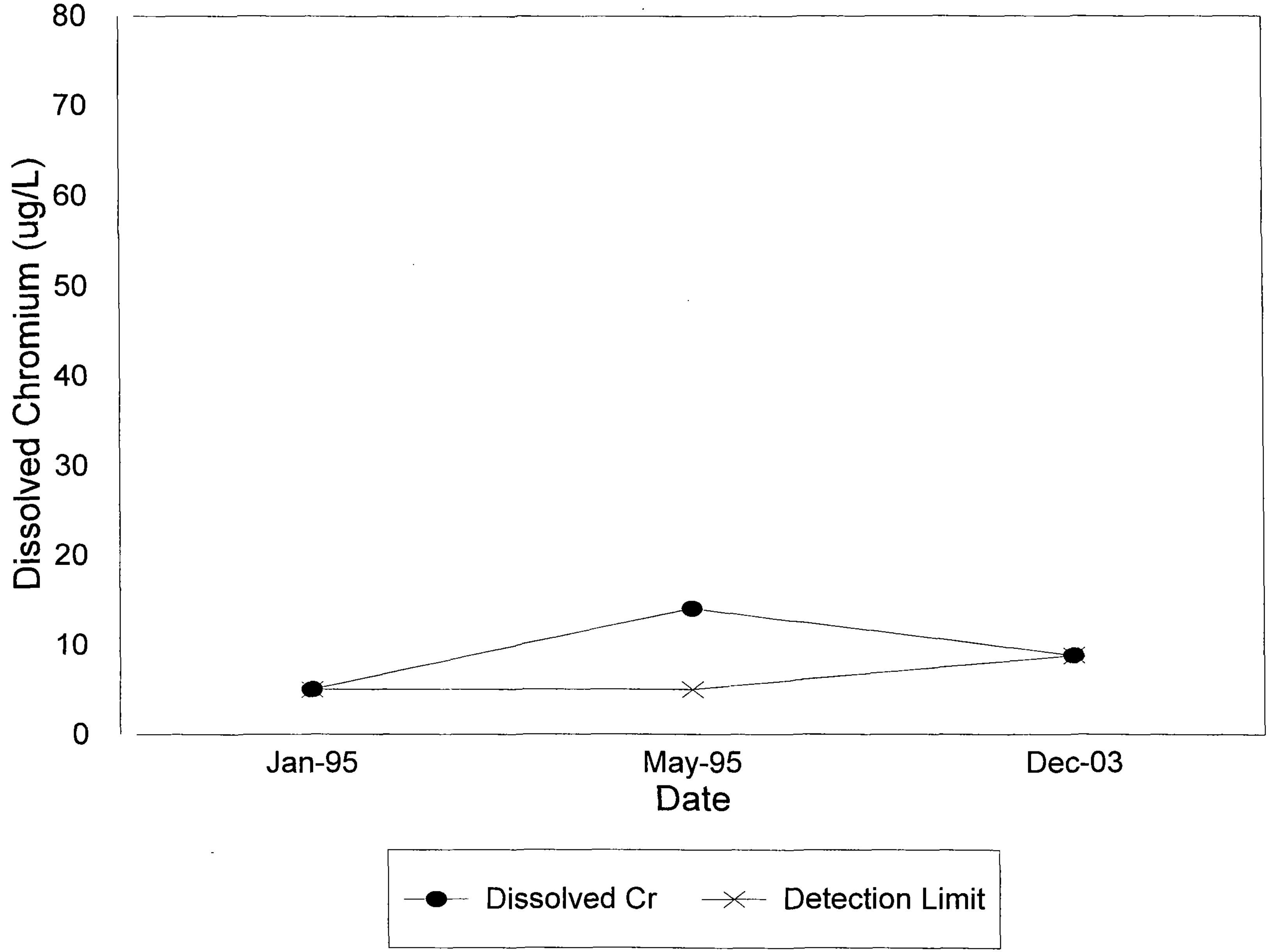


Figure 10i. W-11 Dissovled Chromium

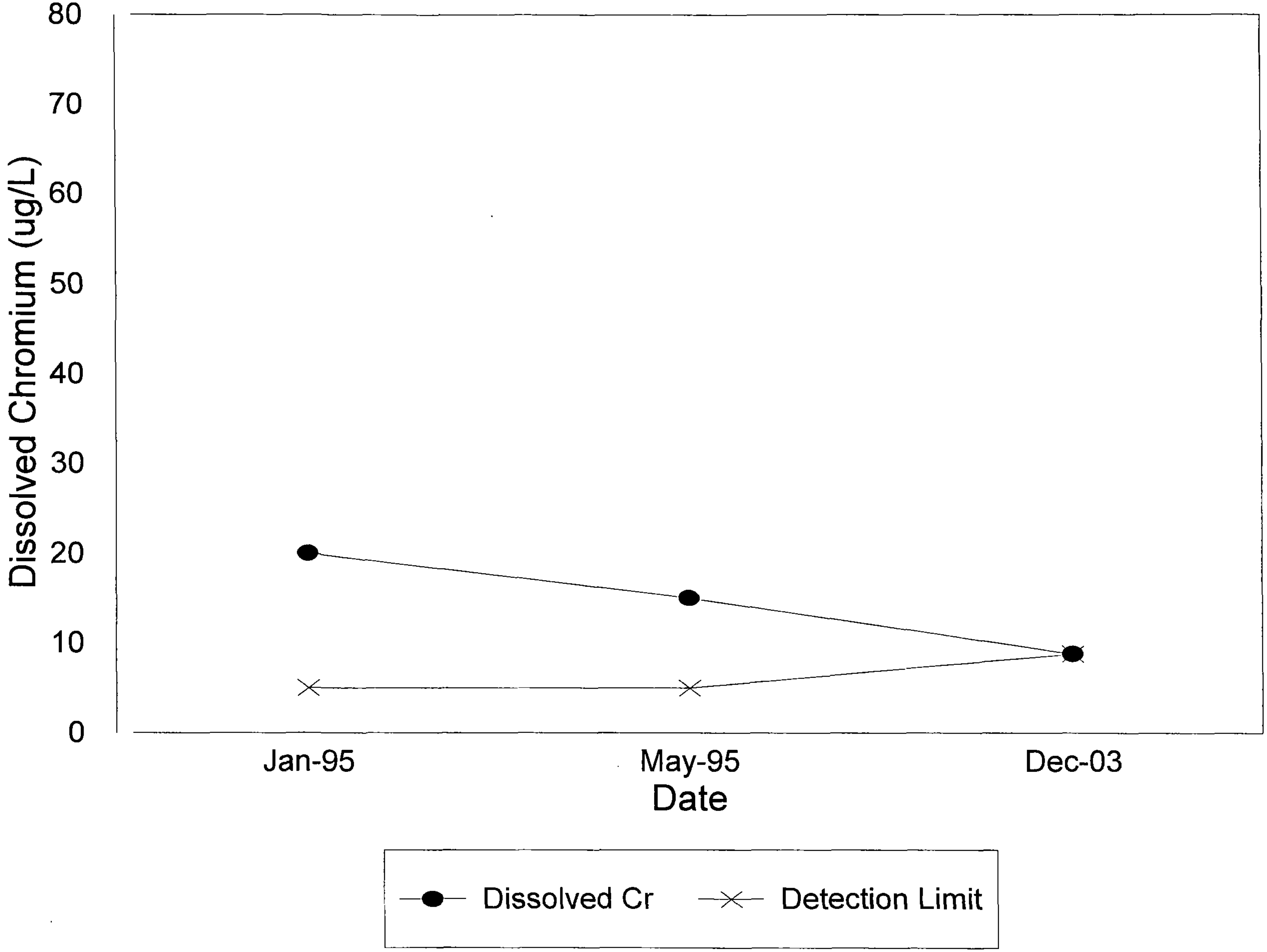
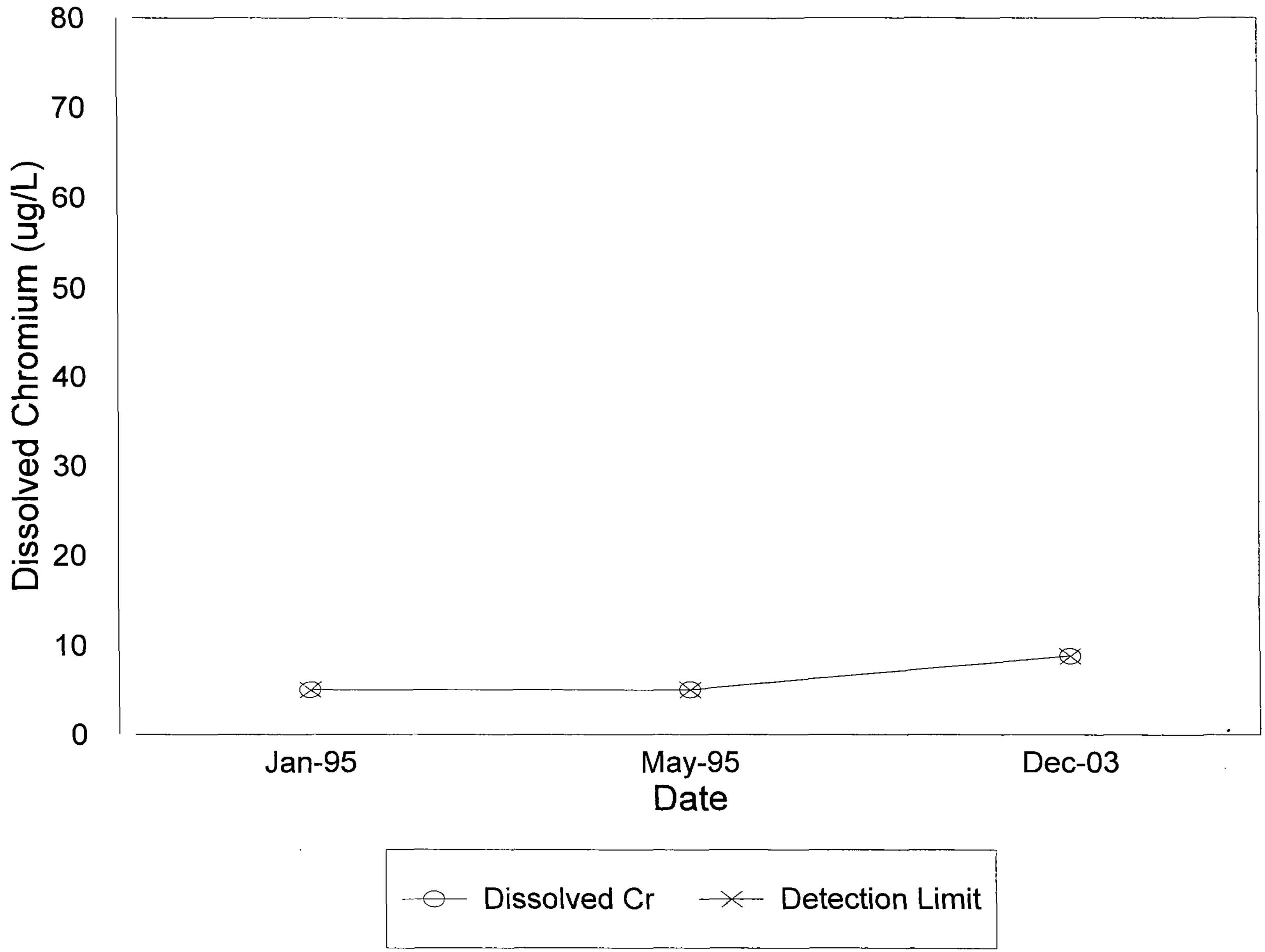


Figure 10j. W-13 Dissolved Chromium



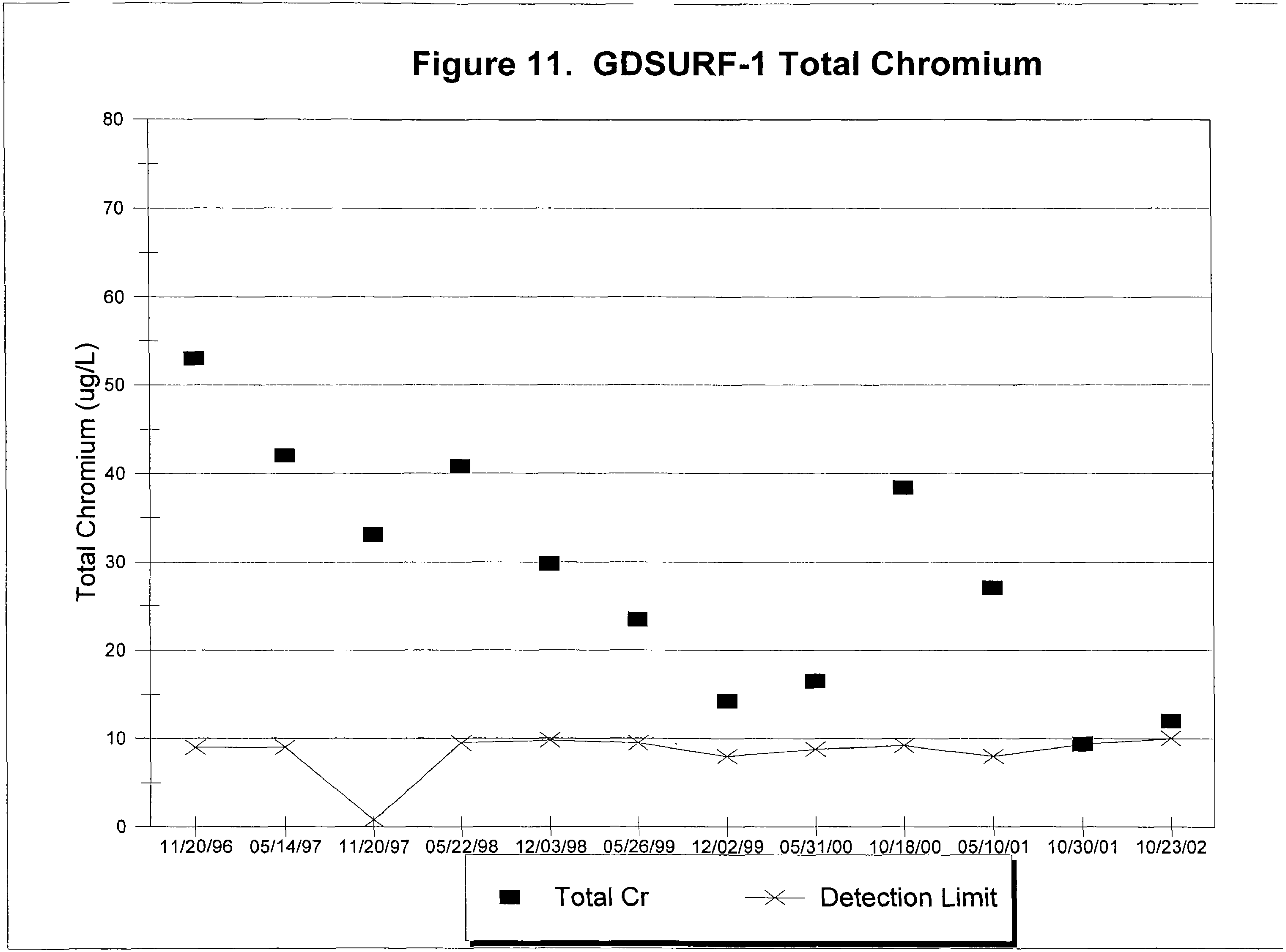


Figure 11. GDSURF-1 Total Chromium
Total Chromium (ug/L)
80
70
60
50
40
30
20
10
0
11/20/96
05/14/97
11/20/97
05/22/98
12/03/98
05/26/99
12/02/99
05/31/00
10/18/00
05/10/01
10/30/01
10/23/02
Total Cr
Detection Limit

Figure 12. GDSURF-1 Dissolved Chromium

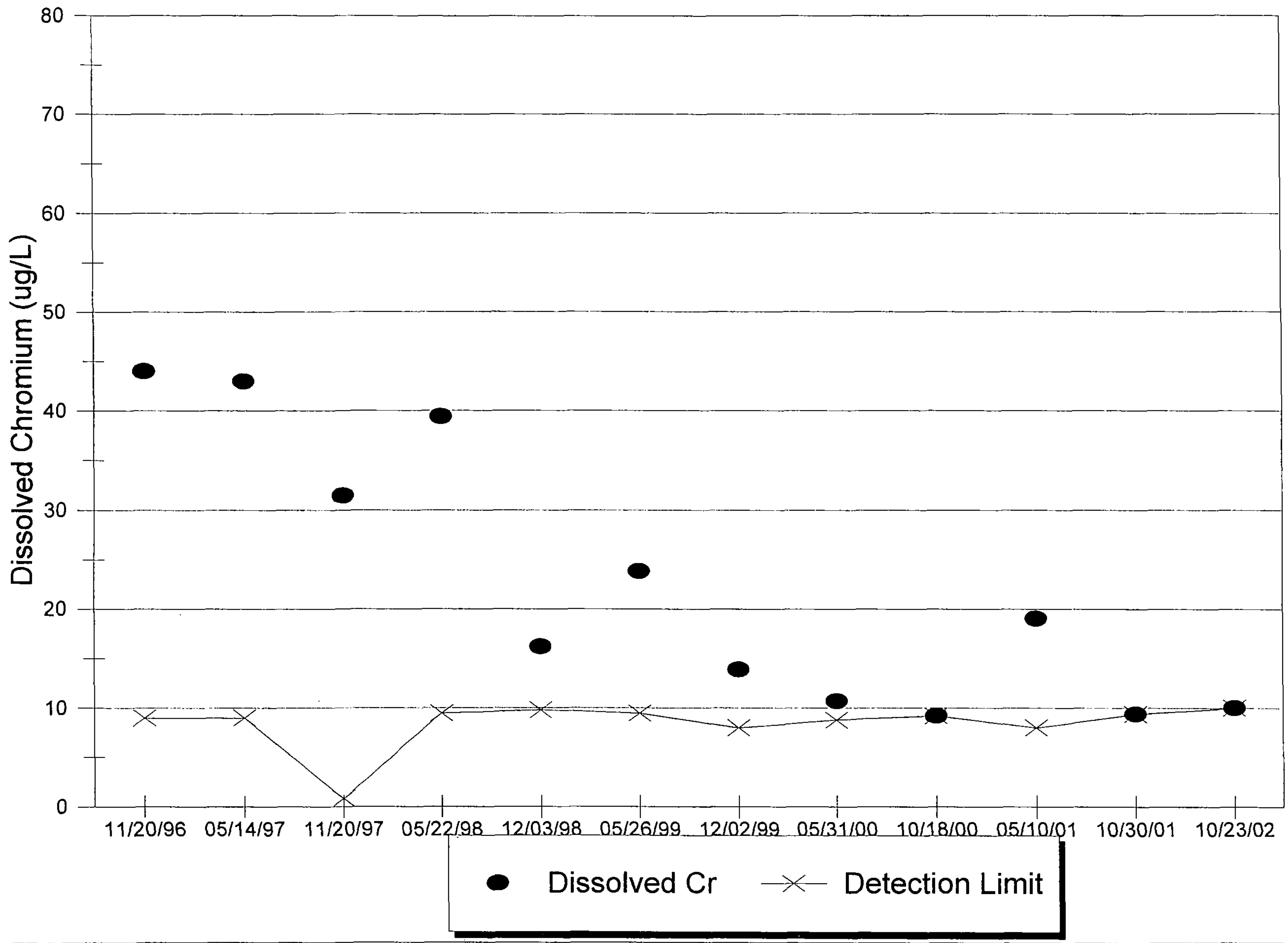
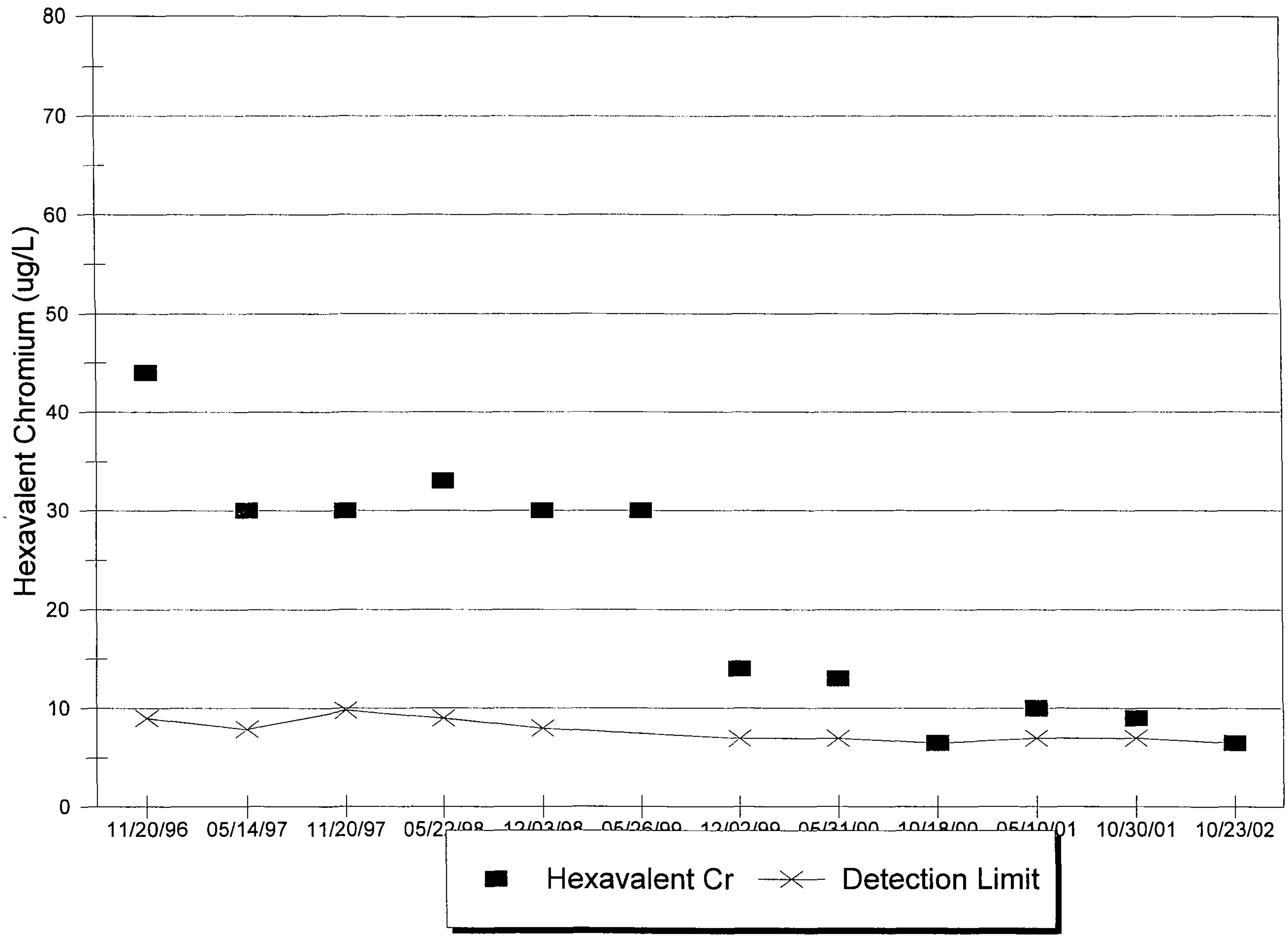


Figure 13. GDSURF-1 Chromium VI



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19-Aug-04

APPENDIX A

EPA June 1996 Enforcement/Action Memorandum

UNITED STA' 3 ENVIRONMENTAL PROTEC' ON AGENCY

REGION VIII, MONTANA OFFICE
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HELENA, MONTANA 59626-0096

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Ref: 8MO

7-12-96

ENFORCEMENT/ACTION MEMORANDUM

DATE: JUN 21 1996

SUBJECT: Request for Non-Time-Critical Removal Action Approval at Mouat Industries Site, Columbus, Stillwater County, Montana

FROM: Ron Bertram, Remedial Project Manager
Region VIII Montana Office, 8MO

TO: Max H. Dodson, Assistant Regional Administrator
Office of Ecosystems Protection and Remediation, 8EPR

THROUGH: John F. Wardell, Director
Region VIII Montana Office, 8MO

Site ID # 65

I. Purpose

The purpose of this Action Memorandum is to request approval for a non-time-critical removal action at the Mouat Industries site (Site) in Columbus, Montana. The removal action is intended to mitigate potential threats to human health and the environment from chromium contamination in groundwater. This memorandum also provides supplemental documentation of previous removal actions at the Site. This removal action is expected to be the final response action for the Site. FMC Corporation, Monte Vista Company (MVC), Mouat Industries, Inc., Timberweld Manufacturing Co. (Timberweld), Atlantic Richfield Company (ARCO), and the Town of Columbus (Town) have been identified as the potentially responsible parties (PRPs). The proposed removal action relies on natural attenuation processes to remediate the groundwater contamination, and continued groundwater monitoring and institutional controls. Through previous studies it has been documented that there is only limited, if any, threat to human health or the environment from exposure to media other than groundwater.

This Action Memorandum also is a public document that provides the public with information on the response action to be taken at the Site. The proposed removal action is described and compared

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with alternative actions in an Engineering Evaluation/Cost Analysis (EE/CA) prepared in the Spring of 1996. The proposed action is consistent with criteria set forth within the National Contingency Plan (NCP). The NCP presents the following factors for consideration in evaluating the appropriateness of initiating a removal action:

- Actual or potential exposure to nearby human populations, animals, or food chains from hazardous substances or pollutants or contaminants.
- Actual or potential contamination of drinking water supplies or sensitive ecosystems.
- Hazardous substances or pollutants or contaminants in drums, barrels, tanks, or other bulk storage containers that may pose a threat of release.
- High levels of hazardous substances or pollutants or contaminants in soils largely at or near the surface, that may migrate.
- Weather conditions that may cause hazardous substances or pollutants or contaminants to migrate or be released.
- Threat of fire or explosion.
- The availability of other appropriate federal or state response mechanisms to respond to the release.
- Other situations or factors that may pose threats to public health or welfare or the environment.

The first two factors presented above are relevant to the situation at the Site because of the potential threat to users who might rely on groundwater for part or all of their water supply. Human populations that rely on groundwater for industrial, domestic, and irrigation needs may be at greater risk as a result of elevated chromium in groundwater. There are no nationally significant or precedent-setting issues for this site.

Authority for this non-time-critical removal action is based on the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended, and regulations found at 40 CFR § 300.415. Those regulations pertain to removal actions for the abatement, prevention, minimization, stabilization, mitigation, or elimination of the release or threat of release, or the threat resulting from the release of hazardous substances. Such measures can apply to the actual or potential exposure to hazardous substances or pollutants or contaminants by nearby populations, animals, or food chains, and to drinking water supplies or sensitive ecosystems, or other conditions, situations, or factors.

Regulations at 40 CFR § 300.415(b)(3) state that removal actions such as the Mouat groundwater removal action shall begin as soon as possible to abate, prevent, minimize, stabilize, mitigate, or eliminate the threats to public health or welfare or the environment, after evaluation, public comment, and selection of an appropriate response action. The Mouat groundwater removal action will be implemented through appropriate enforcement action upon approval of the Recommended Action.

II. Site Conditions and Background

The Site (CERCLIS No. MTD021997689) is located in the Town of Columbus, Stillwater County, Montana, north of the town airport and the town golf course. Adjacent land use is primarily industrial. As a result of past chromium ore processing operations, releases of chromium (in the hexavalent oxidation state) into the environment have occurred. Remediation of chromium-containing soils has been successfully completed; however, groundwater that contains hexavalent chromium above state standards is still present below and downgradient of the site. This Action Memorandum describes the non-time-critical removal action intended to remediate the contaminated groundwater.

A. Site Description

1. Removal site evaluation

The Town of Columbus has owned the property where the Site is located since 1933. Under a leasing agreement with the town, Mouat Industries constructed and then operated a chromium processing plant on the site from 1957 until about 1963. The operation processed chromite ore mined from the Stillwater Complex in south-central Montana into high-grade sodium dichromate that was purchased by General Electric for use as a corrosion inhibitor at the Hanford Project in Richland, Washington. Process wastes included sodium sulfate solutions which contained sodium chromate and sodium dichromate. Both of these chromium compounds are characterized by a hexavalent (Cr VI) oxidation state. Cr VI leached from the sodium sulfate waste piles into the underlying soils and into groundwater. Sodium dichromate spills also occurred during normal operation of the facility, which added to the Cr VI contamination.

Between September 1961 and April 1962, FMC Corporation provided operational support to Mouat Industries for pilot-scale chromium processing at the site. In May 1963, the Monte Vista Company (MVC) purchased the chrome processing plant and acquired the leasehold interest in a portion of the site from William Mouat and Mouat Industries. MVC held the lease until it expired in 1973. MVC did not conduct ore processing operations at the facility during this period. In 1974, MVC removed the chrome chemical plant machinery, buildings, and equipment from the site.

Activities were conducted at the site by Anaconda Minerals Company in 1969 and 1973 to 1974. In 1969, some waste materials were collected from the site and placed inside a building that had been used for sodium dichromate production. In 1973, in response to concerns raised by the town, Anaconda agreed to remove approximately 100 tons of material from the site and to treat some contaminated soils in place. Anaconda removed the material stored inside the building (approximately 468 tons) to Butte, Montana, and attempted to treat soil in place by spreading acid and ferrous sulfate over a portion of the site to chemically change the Cr VI to its more stable trivalent state (Cr III). Anaconda's presence at the site ended in 1974.

In 1975, Timberweld Manufacturing Company (Timberweld), a laminated wood products facility, leased a portion of the site. During the same year, Timberweld covered the area occupied by the chromium processing plant and sodium sulfate waste piles with approximately two feet of gravel. In 1976, yellow mineral deposits, characteristic of sodium chromate, were evident at the gravel surface. In 1990, the U.S. Environmental Protection Agency (EPA) installed a fence around the area used by Timberweld to restrict public access to the chromium-containing soils. Timberweld continues to conduct business operations and activities on a portion of the site.

In 1973, Anaconda Minerals performed sampling activities at the site. The presence of chromium in soils, surface water, and groundwater was identified. In 1977, HKM Associates, under a grant funded by EPA for the Mid-Yellowstone Areawide Planning Organization, conducted groundwater sampling. Sampling results confirmed the presence of Cr VI in groundwater.

A Preliminary Assessment/Site Inspection was conducted by EPA in 1979 and 1980. Various other entities also conducted multimedia sampling during the late 1970s and 1980s. As a result of elevated chromium analytical results, the site was proposed for inclusion on the National Priorities List (NPL) by the EPA in October 1984. In June 1986 the site was placed on the NPL.

The primary problem at the site is hexavalent chromium contamination of groundwater. The problem of chromium contaminated soils has successfully been addressed by a previous removal action (discussed later). Also, surface waters on the golf course exceed water quality standards for hexavalent chromium and trivalent chromium has been found in ditch bottom sediments on the golf course.

2. Physical location

The Site is located in an industrial area of Columbus, Montana, in Stillwater County (Figures 1 and 2, Attachment 1). It is located approximately six-tenths of a mile north of the Yellowstone River and is within the river's historic floodplain. Residential areas are located within a 1/2-mile radius of the site. The land surface at and near the site slopes gently southeastward toward the Yellowstone River. Hydrogeologic investigations indicate the local groundwater flow direction is also southeast.

The Site and adjacent areas are zoned as commercial/industrial. A residential area is located to the southwest of the site but it is outside the portion of the chromium plume which exceeds the MCL of 0.1 mg/l total chromium. The residential area is included within the Superfund Overlay District which provides groundwater use restrictions (discussed later). The Town of Columbus Master Plan indicates that the area will continue to function as a commercial/industrial zone.

Current land use consists of the following:

- Timberweld occupies land along the west edge of the Site. Timberweld uses part of the area for storage and employee parking and the remainder for normal business activities.
- Immediately south of the Site is the Town of Columbus' municipal airport runway. The large open area in which the runway is located consists of mowed "prairie hay" (grasses typical of the area).
- The Town of Columbus' municipal golf course adjoins the airport to the south.
- A chromite stockpile owned by the American Metallurgy Corporation is located to the east of the site.
- Several commercial businesses are located to the west of the Site.
- Private residences are located to the north and west, upgradient of the Site.

Terrestrial ecosystems in the vicinity include upland forests, successional fields, agricultural land, commercial/industrial areas, a municipal airport, and a municipal golf course. Aquatic ecosystems include the Yellowstone River and a moderate-size pond, with associated drainage ditches, located on the golf course. Immediately to the east of the golf course are a series of wastewater treatment lagoons.

3. Site characteristics

The Site is owned by the Town of Columbus, a local government. Timberweld also owns a small western portion of the site and leases a portion of the property owned by the Town. Timberweld operates a laminated wood products business on the property they own and lease from the Town.

The geologic strata at the Site consist of 0.5 to 3 feet of imported gravel overlying 3 to 11 feet of fine-grained sand and clay (upper Quaternary alluvium), 10 to 25 feet of poorly sorted gravel, sand, and cobbles (lower Quaternary alluvium), and bedrock. The bedrock is a nearly flat-lying shale (either the Judith River Formation or, in the western portion of the site, the Bearpaw Shale), which is relatively impermeable and acts as a barrier to downward migration of groundwater and contaminants (e.g., chromium).

Groundwater is present at a depth of 3 to 11 feet below the land surface; thus, the primary saturated aquifer at the Site is the lower Quaternary alluvial aquifer. This aquifer is generally unconfined, but may be confined in places by the overlying clay and silt layers of the upper Quaternary alluvium. The saturated thickness of the aquifer ranges from 13 to 27 feet at the Site but thins to 7.5 to 16 feet downgradient of the site, near the Yellowstone River.

The groundwater gradient is to the southeast at approximately 0.003 feet per feet (ft/ft), which is consistent with the observed direction of contaminant migration. The gradient and direction of groundwater flow do not exhibit significant temporal variability.

Based on grain size analysis and a pumping test (both of which were considered to provide only a qualitative estimate of the hydraulic conductivity of the aquifer) conducted at the Town of Columbus municipal well, the hydraulic conductivity of the lower gravel aquifer was estimated at 0.11 to 0.62 feet per minute (ft/min). Aquifer hydraulic conductivities estimated from slug tests performed at each RMIS-series well ranged from 0.017 to 0.36 ft/min, with a median of 0.075 ft/min. The estimated groundwater velocity is 470 feet per year (ft/yr), which was calculated by using a gradient of 0.003, the median hydraulic conductivity, and an estimated effective porosity of 0.25 (typical for alluvium). It may, however, be as low as 90 or as high as 2,800 ft/yr, given the potential range in hydraulic conductivity and porosity.

Two previous removal actions have been completed at this NPL site (discussed in detail in the section on previous actions).

4. Release or threatened release into the environment of a hazardous substance, or pollutant or contaminant

Chromium is the identified chemical of potential concern (COPC) at the Site. Hexavalent chromium is a hazardous substance as defined by Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Sec. 101(14), and designated as such under 40 CFR 117 and 40 CFR 302. Through a series of sampling and analysis efforts, the following COPCs were identified and documented:

- Cr VI in groundwater and surface water;
- Cr III in surface and subsurface soils, both onsite and offsite; and
- Cr III in sediments and surface water.

A baseline risk assessment performed by EPA in the autumn of 1995 identified Cr III and Cr VI in surface water and sediments of the golf course pond and ditches as COPCs and chemicals of potential ecological concern (COPECs).

Contaminant release mechanisms present at the Site include physical entrainment and infiltration/percolation.

The primary receiving medium for contaminants released from the site was subsurface soil. Contaminants would then infiltrate downward to the water table and contaminate groundwater, the secondary receiving medium. Soils contaminated with chromium were the subject of a removal action completed in 1994. Soils were either treated, fixated and disposed of onsite in the form of blocks or transported off site for disposal in appropriate land disposal units (discussed in detail in the section on previous actions). The soil removal action rendered the chromium in soils non-toxic and immobile and eliminated the source of chromium contamination of groundwater. Currently, the only potential threat is from chromium in the groundwater medium. Institutional controls which are part of a Superfund Overlay District have been implemented to limit human consumption of groundwater. At the golf course pond and associated ditches, contaminated groundwater discharges to the surface. Hexavalent chromium in the groundwater is apparently reduced to trivalent chromium within the pond and ditch sediments, resulting in entrainment of chromium within the sediments. The trivalent chromium in sediments was a concern as a possible threat to ecological receptors. All affected media have been characterized through numerous sampling and analysis events.

The following documents/reports present noteworthy analytical data collected to date:

Historical Data Assessment and Evaluation Report, Mouat Industries Site, prepared for Mouat Industries Site PRP Group by Baker Environmental, Coraopolis, PA, April 1995.

Report of Sampling Activities, Mouat Industries Site, Prepared by Ecology and Environment, Inc., November 1992.

Report of Sampling Activities, Quarter 2, Mouat Industries, prepared by Ecology and Environment, Inc., March 1993.

Report of Sampling Activities, Mouat Industries, prepared by Ecology and Environment, Inc., April 1993.

Report of Sampling Activities, Fourth Quarter, Mouat Industries Site, prepared by Ecology and Environment, Inc., June 1993.

Groundwater Monitoring Program Completion Report for Work Tasks 1, 2, and 3, U.S. Bureau of Reclamation, February 1992.

Alternatives for Remediating Chromium Contaminated Groundwater in the Vicinity of the Mouat Industries Site, U.S. Bureau of Reclamation, March 1993.

Quarterly Groundwater Monitoring Investigation at the Mouat Industries Site, U.S. Bureau of Reclamation, November 1994.

Analytical Results for Additional Sampling in Support of a Risk Assessment, Baker Environmental, Coraopolis, PA. August, 1995.

These and other reports and data are included in the Administrative Record for the Site.

There are no site features or characteristics, weather conditions, human events, or other conditions that would either cause, spread, or accelerate the release of chromium at the Site.

Chromium in the groundwater medium at the Site exists in the dissolved state (Cr VI). It has been demonstrated that Cr VI would not, under naturally occurring conditions, be reduced to Cr III because of the highly oxidized groundwater existing at the Site. Factors that can impact the geochemistry of chromium (e.g., iron and total organic carbon content) have been found to be low; therefore, it can be concluded that chromium would not be precipitated. An evaluation of sorption phenomena also indicate that these would not permanently retain chromium in groundwater. They would, however, delay or retard the movement of dissolved chromium with respect to the groundwater flow rate, suggesting that chromium may be present in the groundwater for some time to come in the future. However, chromium concentrations in the groundwater will also decline by natural dispersion and dilution mechanisms. Chromium concentrations in groundwater have been declining in recent years, and the area within which elevated concentrations are found has been decreasing. Figure 3 (Attachment 1) illustrates the most recent configurations of the plume of dissolved chromium in groundwater.

5. NPL status

The Mouat Industries site was proposed for inclusion on the NPL in October 1984 by the EPA. The site received a Hazard Ranking System score of 31.66. In June 1986, the site was placed on the NPL. The proposed removal action will address any threats to human health or the environment that remain after the two previous response actions completed at the site. The removal action is scheduled to begin during the autumn of 1996. This removal action is expected to be the final response action for the Site.

6. Maps, pictures, and other graphic representations

The following Figures and Tables are included as Attachment 1 to this Action Memorandum:

Figure 1	Site Location Map
Figure 2	Interpretative Map of Area with Total Chromium in Groundwater $\geq$ 0.1 mg/l, January 1995 - Mouat Industries NPL Site
Figure 3	Iso-Concentration Lines for Total Chromium at 0.5 mg/L in Groundwater
Figure 4	Site Contours at Soil Removal Action Completion
Figure 5	Site Cross Sections A-A and B-B
Figure 6	Superfund Overlay District Map
Figure 7	Proposed Long-Term Monitoring Sampling Locations
Table 1	Summary of Analytical Results for Treated Material Samples
Table 2	Summary of Analytical Results for Confirmatory Grid Samples
Table 3	Comparative Analysis of Response Action Alternatives

Table 4 Summary of Comparisons of the Response Action Alternatives to the Nine Evaluation Criteria in the NCP

B. Other Actions to Date

1. Previous actions

Anaconda Minerals performed limited cleanup activities in 1969 and again in 1973 to 1974. In 1969, some waste materials were stockpiled inside the building used for sodium dichromate production, and portions of the site were graded. Between 1973 and 1974, Anaconda Minerals removed the materials stored inside the building to Butte, and attempted to treat a portion of the contaminated soil. The treatment consisted of reacting the Cr VI contaminated soil with acid and ferrous sulfate solution to reduce the chromium to the trivalent oxidation state.

In 1990, after evidence of chromium contamination appeared at the surface of a gravel-covered area at the Timberweld facility, the EPA installed about 1,400 feet of security fence around the Site to restrict public access to chromium-containing soils. Notices of Potential Liability Pursuant to CERCLA Section 107 were sent to the PRPs on March 19, 1990. The PRP responses indicated no interest in fencing the site; therefore, EPA completed the job using federal funds. During the same year, the Town of Columbus modified the drainage in the area to control the flow of stormwater onto the Site.

In 1991, after collecting additional soil and groundwater samples that indicated elevated levels of chromium in these media, EPA determined that chromium had been released into the environment at the Site, and that further releases were likely. EPA also determined that the Site posed a threat to public health or welfare or the environment, and that a removal action was necessary to abate the release and threat of release of hazardous substances at and from the Site. After efforts to negotiate an Administrative Order on Consent with the PRPs failed, EPA issued a Unilateral Administrative Order (UAO) on November 12, 1991 to FMC Corporation, MVC, Mouat Industries, Timberweld, and the Town of Columbus to conduct a removal action at the Site. The UAO required that approximately 20,000 cubic yards of chromium-contaminated soil be excavated and treated.

Work on a response action under the UAO was commenced in December 1991 by FMC Corporation. On March 31, 1992, a report was submitted to the EPA containing a sampling and analysis plan for site characterization. On April 10 1992, EPA approved a sampling and analysis plan for site characterization to delineate the vertical and areal extent of chromium-contaminated soil. Drilling and sampling activities were initiated on April 13, 1992 and completed on July 6, 1992. Results from those sampling activities are contained in a report which was submitted to the EPA in August 1992.

In conjunction with the site characterization study submitted in 1992, work was initiated on treatment process development, treatment facility design, equipment and material procurement, site preparation, and Response Action Work Plan development. Design, construction, and testing of the soil treatment facility were completed in November 1992. Full-scale treatment testing was conducted on site soils between November 1992 and February 1993. Between March 1993 and June 1993, the treatment facility was modified to incorporate a second treatment train and a pretreatment screening station.

Full-scale treatment commenced on June 28, 1993. The soil treatment process included soil screening, chemical addition for chromium reduction, and portland cement addition for soil fixation. The treated soils were formed into blocks for curing, testing, and placement. Operations were conducted 24 hours per day, seven days per week until October 31, 1993. During that period approximately 14,000 cubic yards of chromium-containing soil were treated, creating approximately 7,000 blocks. The treatment process rendered the contaminants non-toxic and immobile.

Each block of treated soil was sampled and analyzed for compliance with the treatment standard of less than 0.5 mg/l total chromium in the Toxicity Characteristic Leaching Procedure (TCLP) extract. Analytical results (Table 1) show that all blocks met the standard of less than 0.5 mg/l total chromium in the TCLP extract. The maximum chromium concentration in TCLP extract was 0.47 mg/l, and most values were less than 0.1 mg/l. EPA's oversight contractor, the U.S. Bureau of Reclamation, also reported that

> "...all EPA split samples for 28-day cure treated soils ... met performance criteria ... for TCLP extractable total chromium, total chromium in [the more aggressive] multiple extraction testing, and unconfined compressive strength. Moreover, the close correspondence between EPA and FMC split samples indicates that the FMC data base was appropriate for guiding remedial site operations ..."

Furthermore, all of the data for leaching the treated soil blocks fit very well within the thermodynamic framework of the geochemistry of the Site. The groundwater within the alluvial aquifer is supplied by infiltration of precipitation and thus is of an oxidizing nature. The pH of the groundwater is also neutral to slightly basic. The neutral to basic pH and oxidizing state of the groundwater combine to create a geochemical environment that is conducive for the formation of chromium oxide, Cr_2O_3, which is a stable, solid form of trivalent chromium that has a very low solubility. Consequently, there is no reason to believe that chromium will be released to the aquifer from the treated blocks under the range of natural conditions expected for this site. Corrosion of the treated soil blocks may release some silica, alumina, calcium, and, possibly, iron, but not chromium.

In response to the Town of Columbus' concerns about final site configuration and future land use considerations, an Addendum to the Response Action Work Plan was submitted on June 17, 1994. Offsite disposal of the remaining affected soils began on July 7, 1994. Removal operations were conducted 10 hours per day, seven days per week until October 1, 1994. In 1994 approximately 19,400 cubic yards of chromium-containing soils were transported and disposed of at RCRA permitted hazardous and non-hazardous offsite disposal areas depending on the concentration of chromium.

During both actions conducted in 1993 and 1994, chromium-containing soils were excavated to an elevation of 3,564 feet above sea level or to the clay-gravel interface, whichever was lower (except in those areas of the site where soil sample analytical results indicated that the cleanup criteria were met at a lesser excavation depth). After the excavation of soils containing chromium above the cleanup concentration, the excavation was backfilled with the treated soil blocks or excavated soils for which sample analyses indicated the chromium to be below the cleanup criteria. Additional excavations were made in otherwise unaffected areas of the site east of the primary excavation areas for placement of treated soil blocks that would not fit into the primary excavation.

After block and soil placement were completed, the site was graded to modest slopes to promote precipitation runoff. The western portion of the site was surfaced with a gravel cover to allow vehicular and storage use of the area. The eastern portion was covered with soil and seeded to establish a vegetative cover. Work was completed on the site as of December 31, 1994, with the exception of seeding operations conducted in 1995. Figures 4 and 5 (Attachment 1) illustrate the site configuration following the soil removal actions. Confirmatory soil sampling (Table 2, Attachment 1) indicates that the 1993 and 1994 actions were effective in removal of chromium-containing soils.

Based on the results of the confirmatory soil sampling following excavation of contaminated site soils, along with the results of the leaching analyses of treated soil blocks and the associated geochemical assessment noted previously, further leaching of chromium into groundwater is not expected to occur. The soil removal action has effectively eliminated chromium contamination in soils at the site, and eliminated the source of chromium contamination into underlying groundwater. Only the residual hexavalent chromium contamination in groundwater downgradient of the site, and associated contamination at surface water bodies that receive groundwater discharge, remains. This residual contamination will be addressed by the proposed removal action.

The cost of the 1990 removal action to fence the area that displayed evidence of chromium at the surface was about $22,000. The subsequent soil removal action in 1993 and 1994 was performed by FMC under a UAO, and its cost is not known.

In addition to the previous removal actions conducted at the Site as noted previously, a series of public announcements and meetings have taken place to keep the public informed on the status of site restoration. Fact sheets, press releases, and other public announcements were released in April and July 1986, March and June 1987, May 1989, March and July 1990, July and September 1992, December 1993, and May 1996. Public meetings were held in September and November 1992, January 1993, January 1994, November 1995, and June 1996. Following review of the EE/CA by EPA and the Montana Department of Environmental Quality (MDEQ), the document was revised and a final EE/CA was issued for public review in May 1996. The final EE/CA, and an accompanying EE/CA fact sheet, specified the alternative that will be implemented to address groundwater contamination at the Site. A 30-day comment period began following the issuance of the final EE/CA. A public meeting was held in Columbus, Montana, on June 5, 1996 to discuss the EE/CA and the preferred removal action and to solicit public comment.

2. Current actions

Comments received on the final EE/CA are addressed in the Responsiveness Summary, included as Attachment 4 to this Action Memorandum.

An Administrative Record has been established and is available for public review pursuant to the requirements set forth in the NCP. Information repositories have been established at the EPA Montana Office in Helena and at the Stillwater County Library in Columbus.

C. State and Local Authorities' Role

1. State and local actions to date

CERCLA requires EPA to provide state and local officials timely opportunities to review and comment on response actions. The State submitted comments on the draft groundwater EE/CA and subsequent draft Action Memorandum. The State has also provided State Applicable or Relevant and Appropriate Requirements (ARARs) for consideration during development of the response actions.

Institutional controls over land use and groundwater use have been established by the Town. A zoning ordinance was approved in March 1995 which created a Superfund Overlay District (Figure 6, Attachment 1). The ordinance became enforceable in April 1995. Requirements of the Superfund Overlay District are enforced by the zoning authority of the Town. The Superfund Overlay District covers the entire site and area above the chromium plume with a reasonable buffer area.

The land use restrictions apply only to the block placement areas and surrounding protective buffer areas (Figure 6, Attachment 1). The land use restrictions encompass the following:

- prohibit excavation into the blocks of treated soil;
- limit vehicle loads on the graveled portions of the block placement area;
- prohibit any use of the soil-covered block placement area unless those areas are paved or covered with gravel;
- require the property owner to maintain the site cover, drainage facilities, and fences; and
- establish specifications for construction on the block placement area.

The Town of Columbus has also modified the drainage in the block placement area to reduce the amount of stormwater entering the site.

The groundwater use restrictions apply to the entire Superfund Overlay District. Those restrictions prohibit new wells or other groundwater extraction systems, prohibit groundwater use from existing wells or other groundwater extraction systems, except for lawn irrigation use, use of the existing golf course pond, and groundwater monitoring. Excavation below the groundwater table (static groundwater level) for any purpose is prohibited except for temporary excavation work necessary for construction purposes including placement of footings and utilities. Such temporary excavation work requires a permit from the Town of Columbus. The restrictions on groundwater use can be lifted by the Town of Columbus after response action objectives are met (the MCL for chromium in groundwater and the WQB-7 standards for chromium in groundwater have not been exceeded for a period of three consecutive years).

2. Potential for continued state/local response

The State has reviewed and commented on the proposed response action and is expected to continue to be involved in the remainder of the superfund activities at the Site. Of particular concern to the State is the possibility that the fixated blocks of chromium-containing soils are buried near or below the groundwater surface contrary to state solid waste requirements and that chromium could leach from the blocks in the long term future.

It is anticipated that the Town of Columbus will continue to enforce the Superfund Overlay District until groundwater concentrations meet the objectives of the removal action.

III. Threats to Public Health or Welfare or the Environment, and Statutory and Regulatory Authorities

The NCP presents factors for consideration in evaluating the appropriateness of initiating a removal action. Conditions at the Site meet two of these requirements for a removal action:

- o Actual or potential exposure to nearby human populations, animals, or food chains from hazardous substances or pollutants or contaminants.

- o Actual or potential contamination of drinking water supplies or sensitive ecosystems.

A. Threats to Public Health or Welfare

The Agency for Toxic Substances and Disease Registry (ATSDR) conducted a preliminary Health Assessment in 1989 at the Site and determined that a public health concern existed. In April 1991, ATSDR reviewed the updated analytical results and the current conditions at the Site. ATSDR recommendations read in part:

> "Although the restriction of access to the contaminated soils should reduce the likelihood of Timberweld employees contacting the contaminated soils, there is still a potential for exposure while surface contamination is present. This is of concern since sodium chromate is an irritant and is caustic to the skin and mucous membranes."

> "Also, there are private wells, for irrigation purposes, located downgradient of the facility and on-site monitoring wells indicate elevated concentrations of chromium. ATSDR feels there is adequate justification for the proposed [soil] removal at Mouat Industries in Columbus, Montana."

Under current exposure scenarios coupled with the prohibition on groundwater use imposed by the Superfund Overlay District, there are currently no threats to public health or welfare. However, in the unlikely event that the groundwater use restrictions of the Superfund Overlay District were lifted before groundwater cleanup and domestic use of the groundwater resource were to occur, an increased risk would probably be realized. This potential risk has not been quantified to date because this scenario is very unlikely. Chromium concentrations in groundwater beneath and downgradient of the site do exceed the state standard for drinking water quality, although the concentrations have been declining with time. Chromium is classified as a hazardous substance under CERCLA Sec. 101(14).

B. Threats to the Environment

It is believed that some contaminated groundwater beneath the municipal golf course discharges into the golf course pond and some of the associated ditches. Because groundwater is in hydraulic communication with the golf course pond and some of the associated ditches, media within these features have been affected by chromium contamination. Ecological receptors within the affected surface waters and sediments of the municipal golf course are therefore potentially at risk because of contaminated groundwater flowing beneath this area.

The results of the baseline risk assessment are as follows:

- Ecological receptors in the surface water or sediments of the Yellowstone River are not at risk.
- Within the golf course pond, Cr III and Cr VI in the surface water did not present a risk; however, Cr III concentrations in the pond sediments exceeded two of three benchmark values.

These data suggest a potential risk to bottom-feeding fish and bottom-dwelling invertebrates. In the golf course ditches, both sediment and water quality criteria are exceeded, suggesting potential hazard to ecological receptors. However, the manmade ditches were engineered to provide golf course drainage and are not likely to provide a habitat of sufficient quality to support aquatic receptors evaluated in the Baseline Risk Assessment.

IV. Endangerment Determination

Actual or threatened releases of chromium-contaminated groundwater from this site, if not addressed by implementing the removal action selected in this Action Memorandum, may present an imminent and substantial endangerment to public health, or welfare, or the environment.

V. Proposed Actions and Estimated Costs

Three removal action alternatives were evaluated in the EE/CA: (1) no action, (2) natural attenuation with institutional controls and groundwater monitoring, and (3) groundwater pump and treat. Through the alternative evaluation process, natural attenuation with institutional controls and groundwater monitoring was chosen for the Mouat site as the most appropriate removal action. This alternative is expected to remedy the groundwater below and downgradient of the site in a similar time frame as the groundwater pump and treat alternative, but with significantly lower overall costs. Specific evaluation criteria for each of the alternatives are described in the following sections. The threat to groundwater receptors (primarily ecological receptors under current exposure scenarios) is expected to be reduced through natural attenuation in a matter of years. Alternatives other than natural attenuation were determined to be less desirable for several reasons as noted below.

A. Proposed Actions

1. Proposed action description

The proposed alternative, natural attenuation with groundwater monitoring and institutional controls, includes semiannual groundwater monitoring and continued prohibitions on land and groundwater use within the Superfund Overlay District until groundwater standards are met.

The natural attenuation alternative was chosen as the most appropriate removal action at the Mouat site based on an evaluation of (1) criteria provided for in the EE/CA guidance document, namely effectiveness, implementability, and cost, and (2) criteria provided for in the NCP. Table 3 (Attachment 1) presents a summary of the comparative analysis for each of the three alternatives with respect to the EE/CA criteria, and Table 4 (Attachment 1) presents the same with respect to the NCP criteria. Review of these two tables clearly demonstrates that the selected alternative best meets the above two sets of criteria. Detailed analysis of the natural attenuation and other alternatives is presented in the EE/CA, included as Attachment 3 to this Action Memorandum.

Natural attenuation includes a variety of natural processes that can singularly or through cumulative effects, decrease the overall concentrations of contaminants with time. With respect to the Site, the primary natural attenuation processes in groundwater include adsorption and precipitation, dispersion and dilution, and chemical alteration. Each of these processes is described in the EE/CA (Attachment 3). Based on physical and chemical conditions encountered at the Site, dispersion appears to be the predominant process affecting chromium transport, with lesser effects attributable to the retardation of chromium due to adsorption. Thus, the expected effects of dispersion and adsorption on the chromium plume would be the slow release of dissolved chromium into downgradient portions of the aquifer at low concentrations.

The primary difference between the no-action alternative and the natural attenuation with institutional controls alternative is that the latter includes groundwater monitoring. Groundwater monitoring will be performed semiannually for the duration of the removal action at selected wells. These selected wells are referred to as the Monitoring Plan Well Network. The proposed wells include one upgradient well, five wells within the plume, three wells laterally adjacent to the plume, and three wells near the leading edge of the plume (as defined by the groundwater standard of 0.1 mg/l). Three of the wells within the plume are immediately downgradient of the block placement area, and will serve to verify that chromium is not leaching from the buried blocks into the groundwater. A surface water sample will also be collected to evaluate changes in surface water within the golf course ditches. The total number of semiannual sampling locations is 13. Figure 7 (Attachment 1) shows the Monitoring Plan Well Network for long-term monitoring sampling. As outlined in the EE/CA, all samples will be analyzed for total chromium. Proposed sampling procedures and related quality assurance/quality control procedures are outlined in Appendix G of the EE/CA. A complete groundwater monitoring and sampling and analysis plan, based on Appendix G of the EE/CA, will be developed as an attachment to the Administrative Order that implements the proposed removal action. The Monitoring Plan Well Network monitoring is anticipated to be performed by the PRPs under an appropriate Administrative Order.

Groundwater monitoring and hence operation of the removal action will be conducted for at least five years and then terminated once groundwater standards are met. The EE/CA stipulates that the following conditions must be met for the termination of the action:

- All groundwater monitoring wells within the Monitoring Plan Well Network must exhibit total chromium concentrations equal to or less than 0.1 mg/L for two consecutive sampling events.

- All remaining wells not included in the Monitoring Plan Well Network would then be sampled to verify that total chromium in these wells is equal to or below 0.1 mg/L.

The EE/CA states that only if the above conditions are met would groundwater monitoring and groundwater use restrictions be terminated, and then only with the written permission of EPA and the Montana Department of Environmental Quality (MDEQ). EPA has decided to modify the groundwater monitoring plan outlined in the EE/CA to make it more consistent with EPA guidance. Region VIII guidance states that monitoring continue until "...ground-water protection standards have not been exceeded for a period of three consecutive years." The groundwater monitoring plan developed for attachment to the Administrative Order will incorporate this

Region VIII recommendation, and thus, supersede the monitoring plan outlined in the EE/CA.

The groundwater monitoring will be conducted as follows:

A. The Monitoring Plan Well Network will remain as outlined above; 12 wells as shown in Figure 7 (Attachment 1) and one surface water sample from golf course ditches. The well samples will be analyzed for total chromium and the surface water sample will be analyzed for hexavalent and trivalent chromium.

B. The Monitoring Plan Well Network will be sampled semiannually for a minimum of 5 years.

C. The Monitoring Plan Well Network will continue to be monitored semiannually until both of the following conditions are met:

1). It has been demonstrated that the MCL for chromium in groundwater and the WQB-7 standards for chromium in groundwater have not been exceeded for a period of three consecutive years.

2). It has been demonstrated that all remaining wells not included in the Monitoring Plan Well Network but within the Superfund Overly District do not exceed the MCL for chromium in groundwater and the WQB-7 standards for chromium in groundwater as determined by a single sample taken after Item 1 above is satisfied.

D. Following completion of the Monitoring Plan Well Network monitoring outlined above, EPA will monitor the four wells nearest to the block placement area (RMIS-1, RMIS-4, MIS-15, and MIS-16) on an annual basis for a period of 30 years including the period of monitoring required for the Monitoring Plan Well Network. The samples will be analyzed for total chromium. This monitoring effort is not considered a part of the response action, but is intended to fullfil the post-closure monitoring of the treated block placement area.

Chromium concentrations in surface water in the golf course pond and ditches exceed WQB-7 standards for chromium. The exceedances are the result of chromium contaminated groundwater which discharges into the pond and ditches. The chromium levels do not pose a human health risk as has been stated elsewhere in this document, however, the surface water exceedances preclude compliance with all ARARs identified for the Site. As the level of chromium in groundwater attenuates, the levels of chromium in the surface water will decrease. When response action objectives are met for groundwater (the MCL for chromium in groundwater and the WQB-7 standards for chromium in groundwater have not been exceeded for a period of three consecutive years), EPA will review chromium levels in surface water to determine if further action is warranted. If chromium levels in surface water achieve WQB-7 standards as expected, no further response action would be warranted and the Site could be considered for "site completion".

The proposed action also contemplates continued Town of Columbus enforcement of institutional controls currently in place as part of the Superfund Overlay District. These controls include both land use and groundwater use restrictions as previously described. The restrictions on groundwater use can be lifted by the Town of Columbus after response action objectives are met (the MCL for chromium in groundwater and the WQB-7 standards for chromium in groundwater have not been exceeded for a period of three consecutive years).

This particular removal action alternative would not generate waste byproducts requiring offsite disposal, would not impact ecological receptors, and would not interfere with current land use activities.

2. Contribution to remedial performance

It is anticipated that the proposed removal action will be the final response action for this site. This removal action, along with past removal actions, is expected to mitigate all potential threats to human health and the environment from chromium contaminants at the site. Since no further remedial action is expected at this site, site completion will be achieved without a Record of Decision (ROD).

3. Description of alternative technologies

As mentioned earlier, two other alternatives were evaluated in addition to the natural attenuation with institutional controls alternative. These alternatives were no action and groundwater pump and treat. A comparative analysis of each of these alternatives is included in Tables 3 and 4 (Attachment 1). Table 3 (Attachment 1) presents a summary of the comparative analysis for each of the three alternatives with respect to the EE/CA criteria, and Table 4 (Attachment 1) presents the same with respect to the NCP criteria.

4. EE/CA

The identification, screening, and evaluation of removal alternatives was previously performed in the EE/CA. Attachment 3 includes the EE/CA in its entirety. *The EE/CA Approval Memorandum*, documenting the need for an EE/CA, is included in Attachment 2. Additionally, written and oral comments received by EPA on the EE/CA are included in the Responsiveness Summary (Attachment 4). These and other documents relevant to the Site are available for review in the administrative record file at locations previously noted.

5. ARARs

Attachment 5 includes a complete discussion of federal and state ARARs relevant to the proposed action. The ARARs of greatest significance are the following:

- o Federal drinking water Maximum Contaminant Levels (MCLs);
- o state water quality standards; and
- o Class II landfill construction and monitoring requirements.

Action specific ARARs address the disposal of treated soil blocks at the Site. The treated soil blocks are considered to constitute a Class II landfill under Montana solid waste regulations. Consequently, ARARs include requirements to maintain a minimum separation between landfill wastes and state waters, to demonstrate that landfill leachate will not adversely affect state waters or to provide for a landfill liner and leachate collection system, to provide for an adequate cover to minimize infiltration as part of landfill closure, and related requirements. The treated soil blocks have been partially emplaced below the local groundwater table, with no liner, and cover consists of gravel or revegetated soil and probably does not meet minimum permeability requirements. Consequently, an ARAR waiver is necessary.

EPA has determined, based on leachate data from the treated soil blocks and on confirmatory soil analyses, along with appropriate geochemical considerations regarding the environment of the treated soil blocks, and when monitored and maintained by a program of appropriate institutional controls, monitoring, and maintenance to be established and/or continued as part of this removal action, that the subsurface emplacement of treated soil blocks at the Site is equivalent to that required by the Montana solid waste regulations through use of another method or approach. Accordingly, EPA invokes the ARAR waiver provision provided by CERCLA Sec. 121(d)(4)(D) and C.F.R. 300.430(f)(1)(ii)(C)(4). In determining that this ARAR waiver may properly be invoked in this limited context, EPA has considered that the purpose behind this solid waste regulation is to ensure that the leaching of chromium from the treated soil blocks does not further contaminate underlying groundwater or surface water bodies receiving groundwater discharge so that human health or the environment are adversely affected. The institutional controls and long-term monitoring to be instituted and/or continued under this removal action can attain these specific goals at an equivalent level of performance.

6. Project schedule

The projected time needed to perform the removal action is approximately 5 years. This includes a moderate duration of time that accounts for possible decreases in the rate at which chromium concentrations in groundwater are attenuated. This also includes at least five years of groundwater monitoring to verify that chromium is not leaching from the treated blocks into the groundwater.

The schedule for groundwater monitoring will be set in the Administrative Order (AO) to implement the selected removal action. Although the schedule for groundwater monitoring will not begin until an AO is in place, the actual process of natural attenuation of chromium concentrations in groundwater is ongoing.

B. Estimated Costs

The estimated costs for the natural attenuation with institutional controls alternative is $96,000 over the initial five year duration of the removal action. Yearly costs would be about $19,200. Tables 3 and 4 (Attachment 1) provide cost estimates for the other two alternatives. These comparative cost estimates only address the initial five years of groundwater monitoring to demonstrate that MCLs and state water quality standards have been met. Since it is anticipated that the removal action will be completed by the PRPs under an Administrative Order, these costs will not be borne by EPA or the Fund.

VI. Expected Change in the Situation Should Action Be Delayed or Not Taken

Because the removal action relies on natural attenuation processes to decrease the concentrations of chromium in groundwater, delaying or not taking further action should not be detrimental. However, delaying or not taking further action would result in an overall lack of groundwater characterization. However, without groundwater monitoring it is possible that concentrations of chromium above state standards could migrate without detection toward unacceptable locations such as the Yellowstone River. Delaying or not taking action would also be inconsistent with the ARAR that requires 30 years of monitoring of the treated block placement area.

VII. Outstanding Policy Issues

None.

VIII. Enforcement

Efforts to negotiate an Administrative Order on Consent (AOC) with the PRP group for the previous removal actions at the site were unsuccessful. EPA issued a UAO (CERCLA-VIII-92-05) to FMC Corporation, Monte Vista Company, Mouat Industries, Inc., Timberweld Manufacturing Co., and the Town of Columbus following failure to negotiate an AOC for the soil removal. Only FMC Corporation complied with the terms of the UAO. EPA does not believe efforts to negotiate an AOC to implement this action would be fruitful. Therefore, EPA expects to issue a UAO to implement the proposed removal action. The enforcement strategy is not part of this Action Memorandum for purposes of NCP consistency.

IX. Recommendation

This decision document represents the selected removal action for the Mouat Industries site, in Columbus, Stillwater County, Montana, developed in accordance with CERCLA as amended, and not inconsistent with the NCP. This decision is based on the administrative record for the site.

Conditions at the site meet NCP Section 300.415(b)(2) criteria for a removal and I recommend your approval of the proposed removal action.

The undersigned approves the Action Memorandum, which substantiates the need for removal action based on criteria specified in the NCP.

Approve: ______________________ Date: 6/21/96
Max E. Dodson, Assistant Regional Administrator
Office of Ecosystems Protection and Remediation, 8EPR
USEPA Region VIII

Disapprove: ______________________ Date: ______________
Max E. Dodson, Assistant Regional Administrator
Office of Ecosystems Protection and Remediation, 8EPR
USEPA Region VIII

ATTACHMENT 1

FIGURES AND TABLES

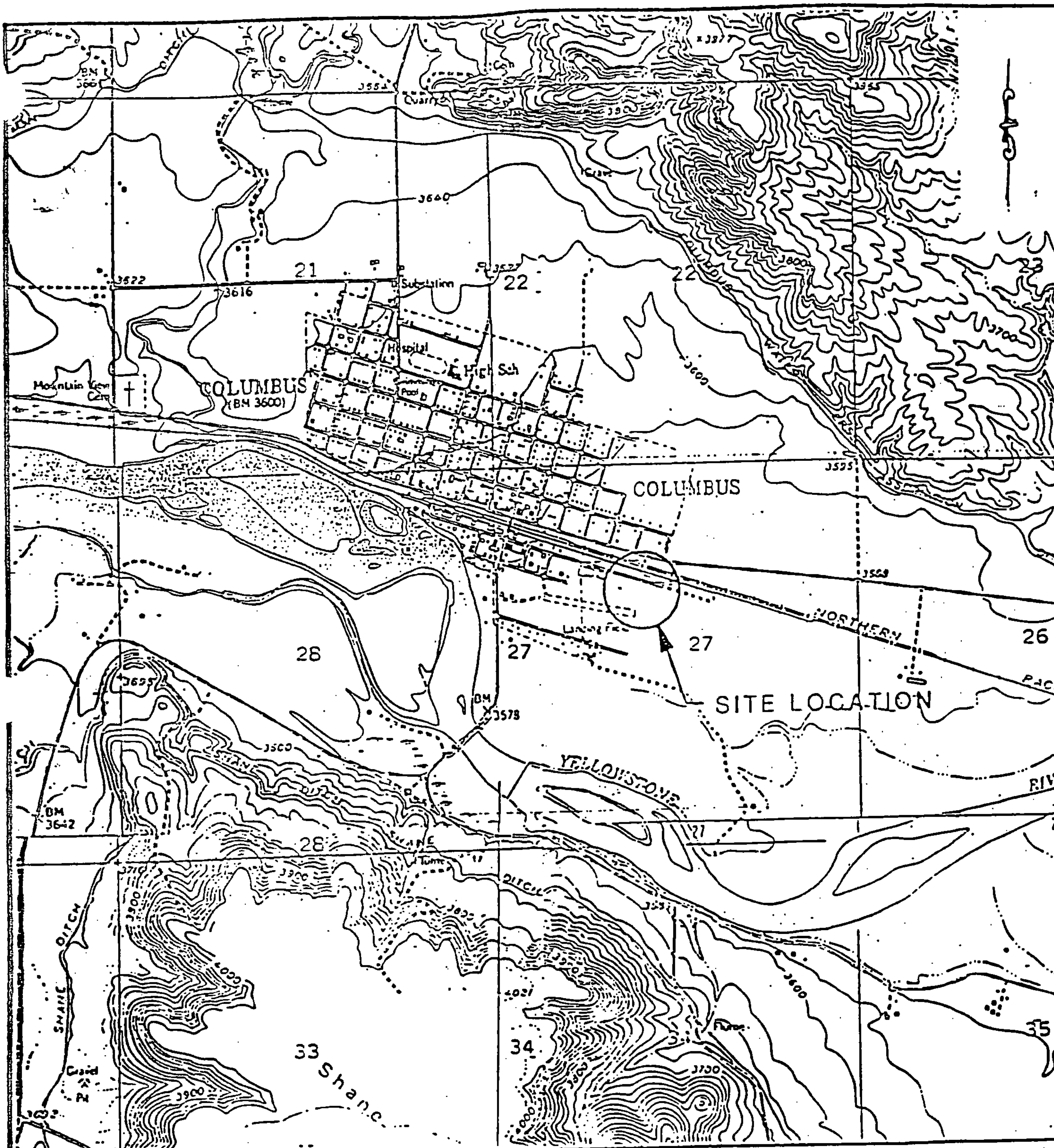

FIGURE 1
MOUAT INDUSTRIES - SITE LOCATION MAP
COLUMBUS, MONTANA

SCALE:	1" = 2000'	DATE:	3/30/95
S.O. NO.:	18978	FILE:	18978F22
DSN/DWN:	EHR/CEB	CHK:	

Baker
Baker Environmental, Inc.

BAKER ENVIRONMENTAL, INC.
CORAOPOLIS, PENNSYLVANIA

REFERENCE:
USGS 7.5 MINUTE MINUTE QUADRANGLES,
COLUMBUS WEST, COLUMBUS EAST, SHANE
RIDGE AND [illegible]

2000 0 1000 2000 4000

1 inch = 2000 ft.

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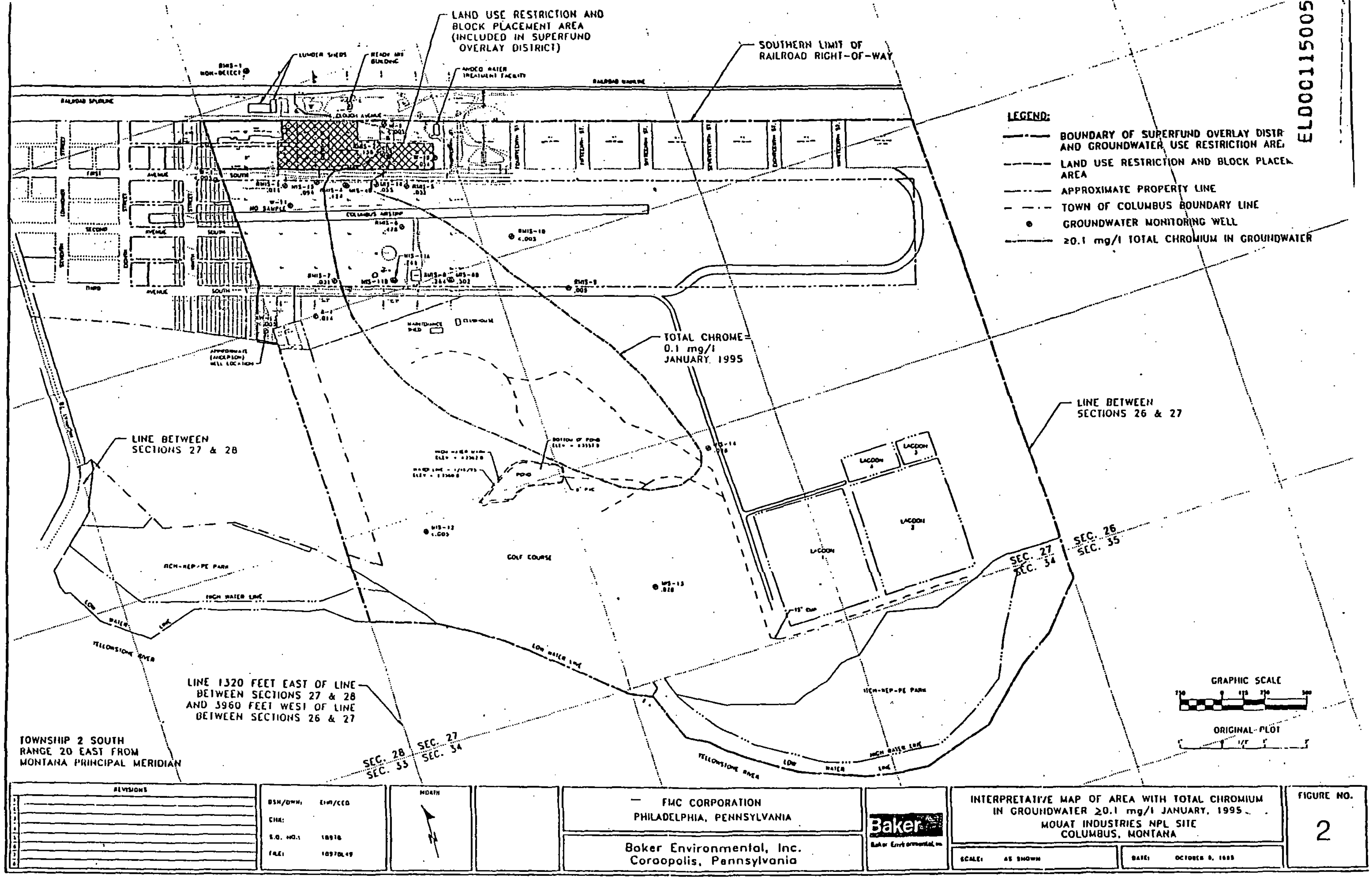
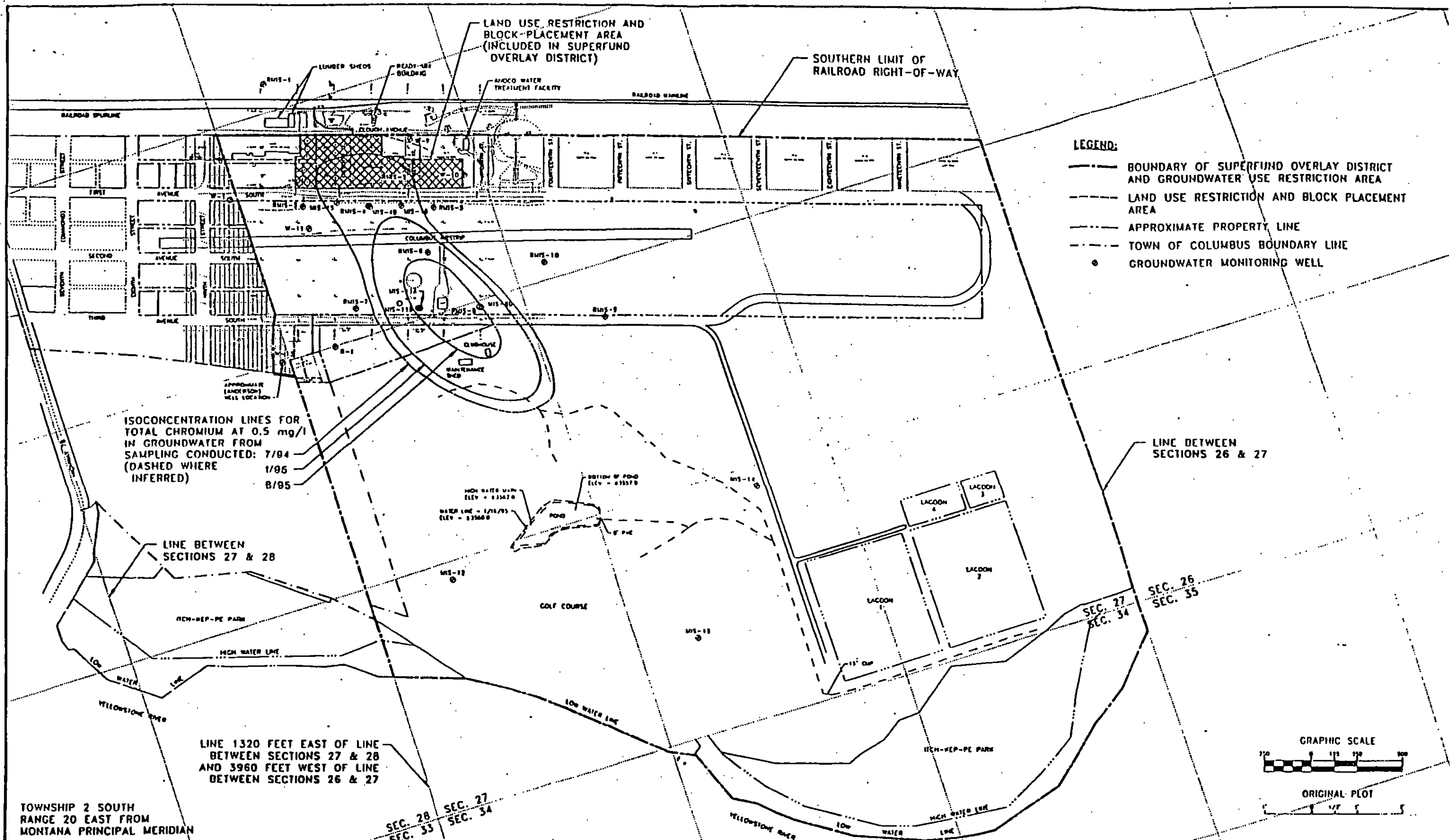
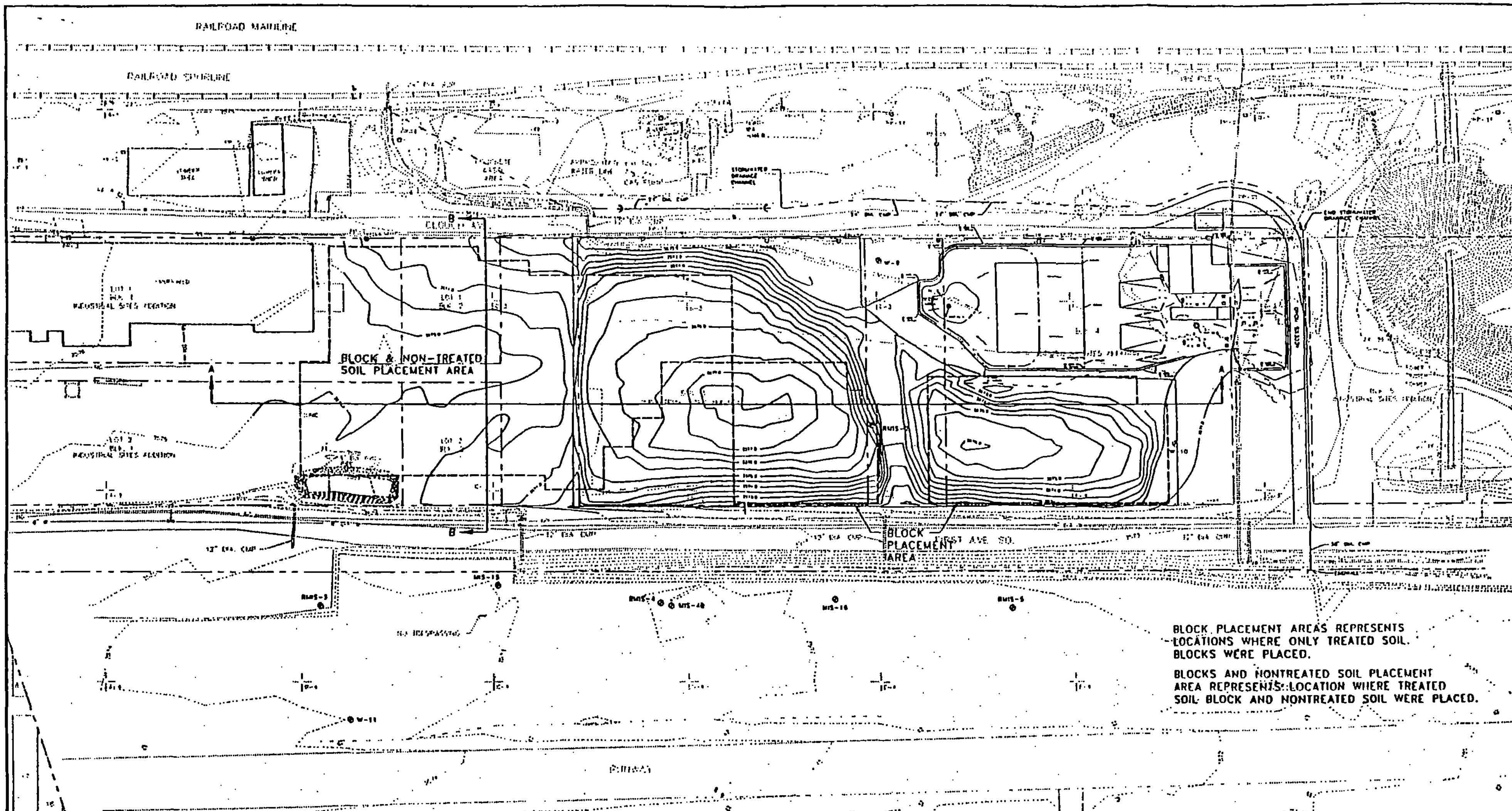
ELD0C1150053





REVISIONS	DSN/DWN: EHR/CEB CHK: S.O. NO.: 18978 FILE: 18978.15	NORTH	FMC CORPORATION PHILADELPHIA, PENNSYLVANIA Baker Environmental, Inc. Coraopolis, Pennsylvania	Baker Baker Environmental, Inc.	ISO-CONCENTRATION LINES FOR TOTAL CHROMIUM AT 0.5 mg/l IN GROUNDWATER IN JULY 994, JAN. & AUG. 1995 MOUAT INDUSTRIES NPL SITE COLUMBUS, MONTANA SCALE: AS SHOWN DATE: OCTOBER 9, 1995	FIGURE NO. 3

ELDOC1150054



GRAPHIC SCALE

REVISIONS

NORTH

FMC CORPORATION
PHILADELPHIA, PENNSYLVANIA

Baker

SITE CONTOURS AT SOIL REMOVAL ACTION COMPLETION
MOUAT INDUSTRIES NPL SITE
COLUMBUS, MONTANA

FIGURE NO.
4

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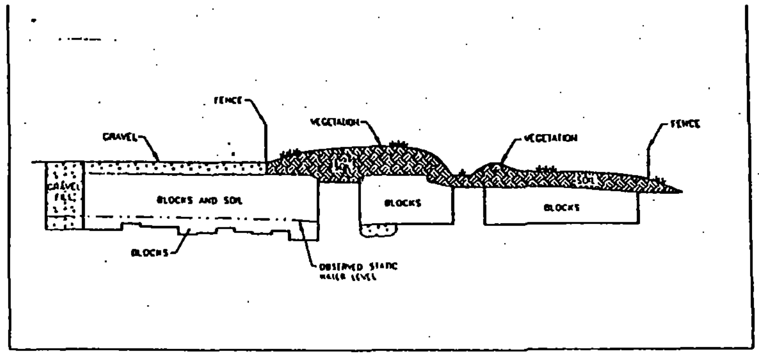
HORIZONTAL GRAPHIC SCALE
(SITE CROSS SECTIONS ONLY)
(IN FEET)

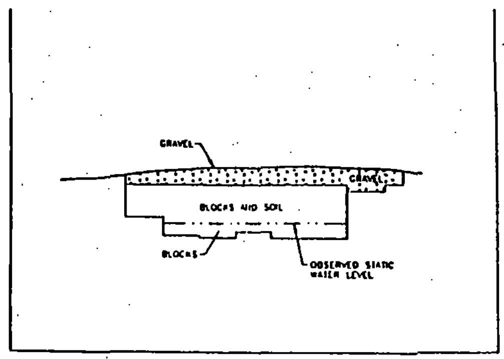
VERTICAL GRAPHIC SCALE
(SITE CROSS SECTIONS ONLY)
(IN FEET)



SECTION A-A (FACING NORTH)

HORIZONTAL GRAPHIC SCALE
(SITE CROSS SECTIONS ONLY)
(IN FEET)

VERTICAL GRAPHIC SCALE
(SITE CROSS SECTIONS ONLY)
(IN FEET)



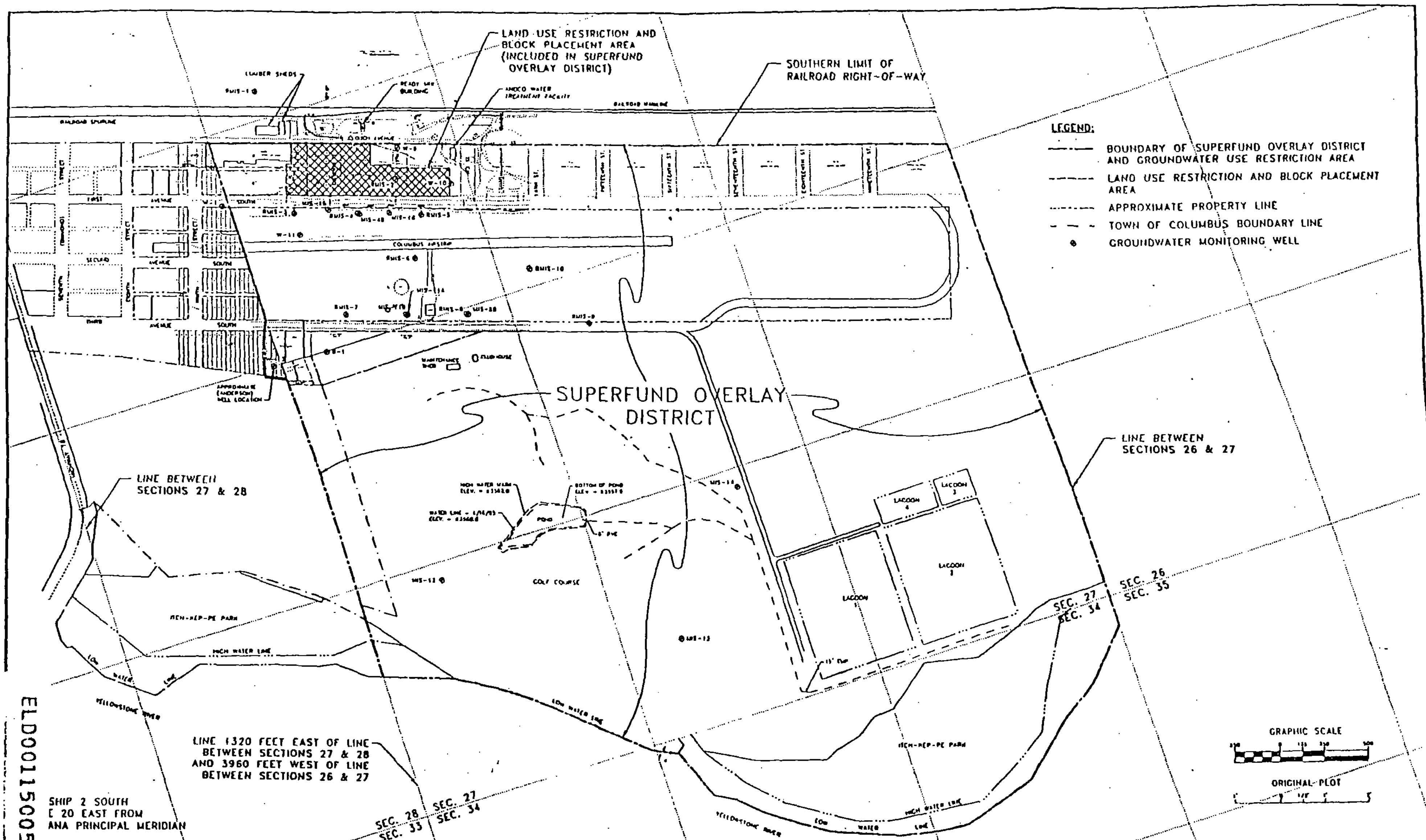
SECTION B-B (FACING WEST)

NOTES:

1. A MAXIMUM OF ONE LAYER OF BLOCKS ARE PLACED BELOW THE WATER TABLE.
2. ALL EXCAVATED, UNTREATED SOIL WITH TCLP CHROMIUM RESULTS BETWEEN 0.1 mg/L AND 0.5mg/L WAS PLACED ABOVE THE OBSERVED STATIC WATER TABLE.
3. THE GRAVEL SURFACE AREA IS NOT FENCED. THE VEGETATED AREA IS ENCLOSED WITHIN A SECURITY FENCE
4. SEE FIGURE 2-2 FOR LOCATION OF SECTIONS

ON ORIGINAL

REVISIONS	DSN/DWN: CIM/CLB CHK: S.O. NO.: 18978 FILE: 18978X05	NORTH		FMC CORPORATION PHILADELPHIA, PENNSYLVANIA Baker Environmental, Inc. Coraopolis, Pennsylvania	Baker Baker Environmental, Inc.	SITE CROSS SECTIONS A-A AND B-B MOUAT INDUSTRIES NPL SITE COLUMBUS, MONTANA SCALE: AS SHOWN DATE: MARCH 5, 1998	FIGURE NO. 5



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REVISIONS		NORTH	FMC CORPORATION PHILADELPHIA, PENNSYLVANIA	Baker	SUPERFUND OVERLAY DISTRICT MOUAT INDUSTRIES NPL SITE COLUMBUS, MONTANA	FIGURE NO. 6
	S.O. NO.: 18978		Baker ...mental, Inc.	Baker Environmental, Inc.	SCALE: AS SHOWN DATE: MARCH 30, 1995	

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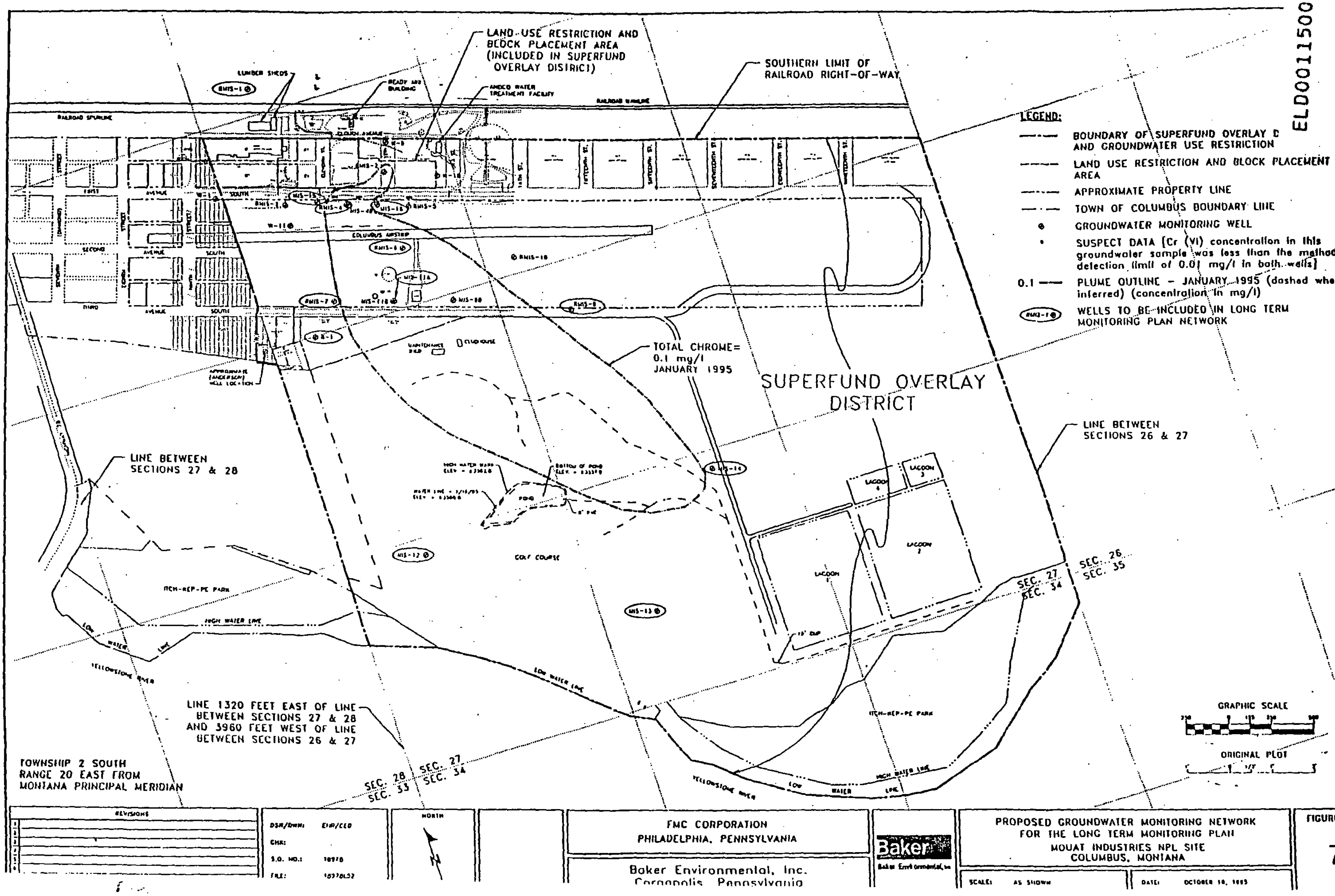

TABLE 1
Summary of Analytical Results for Treated Material Samples
Mouat Industries Site

Sample Identification	Sample Date	Sampler	TCLP Chromium (mg/l)	Estimated Hex Cr (mg/kg)	Comments
MS-TS-06/28/93-28	07/25/93	Stoddard, Peg, Walter	0.02	1.34	28 day com. bat. 1001-1004
MS-TS-121-CN1	07/27/93	Bruggman	0.09	2.57	
MS-TS-127-BN1	07/27/93	Bruggman	0.04	1.7	
MS-TS-101-CE3	07/27/93	Bruggman	0.12	3.1	
MS-TS-102-CN3	07/27/93	Bruggman	0.05	1.87	
MS-TS-112-CE1	07/27/93	Brost, Whitmer, Walt	0.1	2.75	
MS-TS-167-BEI	07/27/93	Brost, Whitmer, Wal	0.01	1.17	
MS-TS-144-CE3	07/27/93	Bruggman	< 0.01	< 0.99	
MS-TS-140-CE3	07/27/93	Brost, Whitmer, Wal	0.06	2.05	
MS-TS-143-CE3	07/27/93	Bruggman	0.02	1.34	
MS-TS-100-CE1	07/27/93	Bruggman	0.06	2.05	
MS-TS-150-BE1	07/27/93	Bruggman	0.01	1.17	
MS-TS-84-BE3	07/27/93	Bruggman	0.04	1.7	
MS-TS-06/29/93-28	07/27/93	Brost, Whitmer, Wal, Br	0.02	1.34	28 day composite 1005-1206, 1008-1013
MS-TS-160-CE1	07/27/93	Bruggman	0.18	4.16	
MS-TS-67-CN3	07/27/93	Bruggman	0.03	1.52	
MS-TS-99-CN1	07/27/93	Bruggman	0.06	2.05	
MS-TS-166	07/28/93	Stoddard, McDonald	0.34	6.97	
MS-TS-51	07/28/93	McDon, Sjong, Stoddard	< 0.01	0.99	
MS-TS-47	07/28/93	McDon, Sjong, Stoddard	0.07	2.22	
MS-TS-57	07/28/93	McDon, Sjong, Stoddard	< 0.01	0.99	
MS-TS-63	07/28/93	Stoddard, Sjong, MCDon	0.17	3.98	
MS-TS-53	07/28/93	McDon, Sjong, Stoddard	< 0.01	0.99	
MS-TS-45	07/28/93	Stoddard, Sjong, MCDon	0.11	2.93	
MS-TS-55	07/28/93	Stoddard, McDon, Sjong	< 0.01	0.99	
MS-TS-75	07/28/93	Stoddard, McDonald	0.02	1.34	
MS-TS-111	07/28/93	Stoddard, McDonald	< 0.01	0.99	
MS-TS-133	07/28/93	Stoddard, McDonald	0.01	1.17	
MS-TS-151	07/28/93	Stoddard, McDonald	0.17	3.98	
MS-TS-155	07/28/93	Stoddard, McDonald	0.1	2.75	
MS-TS-138	07/28/93	Stoddard, McDonald	< 0.01	0.99	
MS-TS-201	07/28/93	McDon, Sjong, Stoddard	0.42	8.37	
MS-TS-191	07/28/93	Stoddard, McDonald	0.26	5.56	
MS-TS-81	07/28/93	Stoddard, McDonald	0.11	2.93	
MS-TS-145	07/28/93	McDon, Sjong, Stoddard	0.21	4.68	
MS-TS-06/30/93-28	07/28/93	MCDonald	0.01	1.17	Split sample given to Bernl gold
MS-TS-07/01/93-28	07/29/93	McDonald, Sjong	0.01	1.17	
MS-TS-61	07/30/93	MCDon, Kump, Sjong	< 0.01	0.99	
MS-TS-162	07/30/93	MCDon, Kump, Sjong	0.15	3.63	
MS-TS-153	07/30/93	MCDon, Kump, Sjong	0.13	3.28	
MS-TS-171	07/30/93	McDon, Kump, Sjong	0.33	6.79	
MS-TS-132	07/30/93	MCDon, Kump, Sjong	0.01	1.17	
MS-TS-163	07/30/93	MCDon, Kump, Sjong	0.24	5.21	
MS-TS-107	07/30/93	McDon, Kump, Sjong.	< 0.01	0.99	
MS-TS-173	07/30/93	McDon, Kump, Sjong	0.35	7.14	
MS-TS-195	07/30/93	MCDon, Kump, Sjong	0.05	1.87	
MS-TS-117	07/30/93	MCDon, Kump, Sjong	0.01	1.17	
MS-TS-85	07/30/93	MCDon, Kump, Sjong	< 0.01	0.99	
MS-TS-52	07/30/93	MCDon, Kump, Sjong	0.25	5.39	
MS-TS-07/02/93-28	07/30/93	MCDon, Kump, Sjong	0.01	1.17	
MS-TS-95	07/30/93	MCDon, Kump, Sjong	0.04	1.7	
MS-TS-07/06/93-28	08/04/93	Stoddard, Bruggman	0.02	1.34	
MS-TS-07/07/93-28	08/04/93	Stoddard, Brugman	0.04	1.7	28 day composite 1051-1065, 2003-2006
MS-TS-07/08/93-28	08/05/93	Stodd, Sjong, Walt, McD	0.04	1.7	28 day composite 01044-01050
MS-TS-44	08/06/93	Sjong, MCDonald	0.02	1.34	
MS-TS-42-A	08/06/93	Sjong, MCDonald	0.3	6.27	
MS-TS-54	08/06/93	Sjong, MCDonald	0.22	4.86	
MS-TS-07/09/93-28	08/06/93	Sjong, Mcdonald	0.06	2.05	
MS-TS-70	08/06/93	Sjong, MCDonald	0.08	2.4	
MS-TS-42-B	08/06/93	Sjong, MCDonald	0.34	6.97	
MS-TS-07/10/93-28	08/07/93	MCDonald, Sjong	0.08	2.4	
MS-TS-07/11/93-28	08/08/93	McDonald, Sjong	0.08	2.4	
MS-TS-07/12/93-28	08/09/93	Bruggman	0.03	1.52	28 day com; 1151-1173, 2047-2056, 2058-2068
MS-TS-07/13/93-28	08/10/93	Stoddard, Herrick, Wal	0.04	1.7	28 day composite
MS-TS-07/14/93-28	08/11/93	Stoddard	0.05	1.87	28 day composite
MS-TS-40	08/12/93	Bruggman, Walter	< 0.01	0.99	Total Unfiltered HNO3 to pH <2.0
MS-TS-105	08/12/93	Bruggman, Walter	0.24	5.21	
MS-TS-07/15/93-28	08/12/93	Stoddard	0.05	1.87	28 day composite

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[1]Hexavalent Chromium was calculated using: Hex Cr = 0.99223 + (17.576 x TCLP)

TABLE 1 (continued)
Summary of Analytical Results for Treated Material Samples
Mouat Industries Site

Sample Identification	Sample Date	Sampler	TCLP Chromium (mg/l)	Estimated Hex Cr (mg/kg)	Comments
MS-TS-07/16/93-28	08/13/93	Kump,MCDon,Sjong	0.06	2.05	
MS-TS-07/17/93-28	08/14/93	Kump,MCDon,Sjong	0.06	2.05	
MS-TS-07/18/93-28	08/15/93	Sjong,MCDonald	0.06	2.05	
MS-TS-07/19/93-28	08/16/93	Gaustad,MCDonald	0.06	2.05	
MS-TS-01831	08/16/93	Walter	< 0.01	0.99	
MS-TS-07/20/93-28	08/17/93	Walter	0.04	1.7	28 day composition
MS-TS-07/21/93-28	08/18/93	Stoddard,Walter,Brug	0.05	1.87	EPA
Block 4308	08/18/93	Stoddard,Walter,Brug	0.04	1.7	
MS-TS-07/22/93-28	08/19/93	Stodd,Brugg,Walter	0.05	1.87	
MS-TS-07/23/93-28	08/20/93	Stoddard,Walker	0.06	2.05	
MS-TS-07/24/93-28	08/21/93	McDon,Sjong,Rubis	0.06	2.05	
MS-TS-07/25/93-28	08/22/93	McDononald, Sjong	0.03	1.52	
MS-TS-07/26/93-28	08/23/93	Sjong,McDon, Kump,	0.06	2.05	
MS-TS-07/27/93-28	08/24/93	Sjong	0.06	2.05	
MS-TS-07/28/93-28	08/25/93	Bruggman,Walter	0.07	2.22	28 day composite
MS-TS-07/29/93-28	08/26/93	Stodd,Bruggman,Walt	0.08	2.4	28 day composite
MS-TS-07/30/93-28	08/27/93	Stoddard,Walter,Brug	0.07	2.22	28 day composite
MS-TS-07/31/93-28	08/28/93	Stod,Brug,Wal,Her	0.06	2.05	28 day composite
MS-TS-08/01/93-28	08/29/93	Stod,Brug,Wal,Her	0.02	1.34	
MS-TS-08/02/93-28	08/30/93	Sjong,MCDonald	0.04	1.7	
MS-TS-08/03/93-28	08/31/93	Sjong,McDonald	0.06	2.05	
MS-TS-08/04/93-28	09/01/93	Bubis,McDon,Sjong	0.07	2.22	
MS-TS-08/05/93-28	09/02/93	McDonald	0.09	2.57	
MS-TS-08/06/93-28	09/03/93	Stoddard,Walter,Brug	0.04	1.7	28 day composite
MS-TS-08/07/93-28	09/04/93	Stoddard,Walter,Brug	0.08	2.4	28 day composite
MS-TS-08/08/93-28	09/05/93	Stoddard,Walter,Brug	0.06	2.05	28 day composite
MS-TS-08/09/93-28	09/06/93	Stoddard,Walter,Brug	0.05	1.87	
MS-TS-08/10/93-28	09/07/93	Sjong,MCDonald	0.04	1.7	
MS-TS-08/11/93-28	09/08/93	Sjong,McDonald,Eman	0.04	1.7	
MS-TS-08/12/93-28	09/09/93	Sjong,McDon,Bubis	0.04	1.7	
MS-TS-08/13/93-28	09/10/93	Bruggman,Walters	0.06	2.05	28 day composite, Billings lab
MS-TS-08/14/93-28	09/11/93	Walter	0.03	1.52	28 day composite
MS-TS-08/15/93-28	09/12/93	Stoddard,Walter,Brug	0.06	2.05	28 day composite
MS-TS-08/16/93-28	09/13/93	Stoddard,Walter,Brug	0.03	1.52	28 day composite
MS-TS-08/17/93-28	09/14/93	McDonald,Stodard	0.03	1.52	
MS-TS-08/18/93-28	09/15/93	MCDonald	0.05	1.87	Split of 28 day composite for EPA
MS-TS-08/19/93-28	09/16/93	Sjong,MCDonald,Kump	0.06	2.05	
MS-TS-08/20/93-28	09/17/93	McDonald,Sjong	0.06	2.05	
MS-TS-08/21/93-28	09/18/93	Walter,Duff,Sjong	0.07	2.22	28 day composite
MS-TS-08/22/93-28	09/19/93	Kostelecky,Walter,Sj	0.08	2.4	28 day composite
MS-TS-08/23/93-28	09/20/93	Walter,Whitmer,Brugg	0.07	2.22	28 day composite
MS-TS-08/24/93-28	09/21/93	Kostelecky,Walter	0.06	2.05	
MS-TS-08/25/93-28	09/22/93	Kostelecky,McDonald	0.07	2.22	
MS-TS-08/26/93-28	09/23/93	MCDonald,Kump,Brugg	0.08	2.4	
MS-TS-08/27/93-28-E	09/24/93	Walter,Bruggman	0.06	2.05	
MS-TS-08/28/93-28	09/25/93		0.06	2.05	
MS-TS-08/29/93-28	09/26/93		0.05	1.87	
MS-TS-08/30/93-28	09/27/93		0.05	1.87	
MS-TS-08/31/93-28	09/28/93		0.09	2.57	
MS-TS-09/01/93-28	09/29/93	Kostalecky, Bruggman	0.09	2.57	28 day composite
MS-TS-09/02/93-28	09/30/93	Kostelecky,Sjong	0.08	2.4	
MS-TS-09/03/93-28	10/01/93	McDonald,Sjong	0.07	2.22	
MS-TS-09/04/93-28	10/02/93	McDonald,Sjong	0.07	2.22	
MS-TS-09/05/93-28	10/03/93	McDonald,Sjong	0.11	2.93	
MS-TS-03750	10/04/93	Bruggman	0.22	4.86	Missing pink copy, frank will send
MS-TS-09/06/93-28	10/04/93	Bruggman,Walter	0.08	2.4	28 day composite
MS-TS-09/07/93-28	10/05/93	Bruggman,Walter	0.1	2.75	28 day composite
MS-TS-09/08/93-28	10/06/93	Kostelecky,Walter	0.11	2.93	
MS-TS-09/09/93-28	10/07/93	Kostelecky,Bruggman	0.41	8.2	28 day composite
MS-TS-FeB/PC29-28	10/07/93	Kostelecky,Bruggman	0.23	5.04	28 day composite
MS-TS-06599	10/07/93		0.05	1.87	Done directly by Energy
MS-TS-09/10/93-28	10/08/93	Kostelecky,Bruggman	0.34	6.97	
MS-TS-09/11/93-28	10/09/93	McDonald	0.1	2.75	
MS-TS-09/12/93-28	10/10/93	McDonald,Bubis	0.08	2.4	
MS-TS-09/13/93-28	10/11/93	MCDonald,Sjong	0.09	2.57	
MS-TS-09/14/93-28	10/12/93	Bruggman,Walter	0.08	2.4	28 day composite
MS-TS-09/15/93-28	10/13/93	Kostelecky,Walter	0.1	2.75	28 day composit
MS-TS-07295	10/13/93	Energy	0.06	2.05	sample done by energy labs directly

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TABLE 1 (concluded)
mary of Analytical Results for Treated Material Sa
Mouat Industries Site

Sample Identification	Sample Date	Sampler	TCLP Chromium (mg/l)	Estimated Hex Cr (mg/kg)	Comments
MS-TS-09/16/93-28	10/14/93	Kostelecky,Bruggman	0.12	3.1	28 day composite
MS-TS-09/17/93-28	10/15/93	Kostelecky,Brost	0.12	3.1	28 day composite
MS-TS-09/18/93-28	10/16/93	Kostelecky,Brost	0.11	2.93	
MS-TS-09/19/93-28	10/17/93	Sjong,McDonald	0.12	3.1	
MS-TS-09/20/93-28	10/18/93	Sjong,MCDonald	0.13	3.28	
MS-TS-09/21/93-28	10/19/93	MCDonald,Robertson	0.27	5.74	
MS-TS-09/22/93-28	10/20/93	Walter,Bruggman	0.35	7.14	28 day composite for Energy Labs
MS-TS-09/23/93-28	10/21/93	Walter,Bruggman	0.18	4.16	Re-analyzed, first analysis was .55
MS-TS-09/24/93-28	10/22/93	Walter,Bruggman	0.18	4.16	
MS-TS-09/25/93-28	10/23/93	Walter,Bruggman	0.24	5.21	
MS-TS-09/26/93-28	10/24/93	McDonald,Risher	0.1	2.75	
MS-TS-09/27/93-28	10/25/93	McDonald,Robertson,	0.09	2.57	
MS-TS-09/28/93-28	10/26/93	MCDonald,Risher	0.14	3.45	
MS-TS-09/29/93-28	10/27/93	Sjong,Walter	0.08	2.4	
MS-TS-09/30/93-28	10/28/93	Sjong	0.06	2.05	28 day composite for EPA
MS-TS-10/01/93-28	10/29/93	Bruggman,McDonald	0.04	1.7	28 day composit
MS-TS-Fe9/PC31-28	10/29/93	Bruggman,McDonald	0.04	1.7	
MS-TS-10/02/93-28-A	10/30/93	Whitmer, McDonald	0.07	2.22	Treated soil to be analyzed by Energy
MS-TS-10/03/93-28	10/31/93	Walter,Whitmer	0.04	1.7	28 day composite
MS-TS-10/04/93-28	11/01/93	Walter	0.04	1.7	
MS-TS-10/05/93-28	11/02/93	Walter	0.07	2.22	
MS-TS-10/06/93-28	11/03/93	Walter	0.09	2.57	Split with Burnll Gold
MS-TS-10/07/93-28	11/05/93	Walter	0.05	1.87	
MS-TS-10/09/93-28	11/06/93	Herrick, Whitmer	0.06	2.05	
MS-TS-10/10/93-28	11/07/93	Walter	0.12	3.1	28 day composite
MS-TS-10/11/93-28	11/08/93	Walter	0.05	1.87	
MS-TS-10/12/93-28	11/09/93	Walter	0.06	2.05	
MS-TS-10/13/93-28	11/10/93	Walter	0.07	2.22	
MS-TS-10/14/93-28	11/11/93	Kump	0.18	4.16	
MS-TS-10/14/93-28	11/11/93	Kump	0.47	9.25	
MS-TS-10/15/93-28	11/12/93	Newton	0.14	3.45	28 day composite for Energy Labs
MS-TS-10/16/93-28	11/13/93	Newton	0.1	2.75	28 day composite for Energy Labs
MS-TS-10/17/93-28	11/14/93	Walter	0.06	2.05	
MS-TS-10/18/93-28	11/15/93	Jim Walter	0.04	1.7	28 day composite for Energy
MS-TS-10/19/93-28	11/16/93	Kump	0.12	3.1	
MS-TS-10/20/93-28	11/17/93	Walter	0.02	1.34	
MS-TS-10/21/93-28	11/18/93	Herrick	0.003	1.04	
MS-TS-10/22/93-28	11/19/93	Herrick	0.02	1.34	
MS-TS-10/23/93-28	11/20/93	Herrick	0.03	1.52	28 day composite
MS-TS-10/24/93-28	11/21/93	Walter	0.08	2.4	28 day composite
MS-TS-10/28/9328test	11/22/93	Whitmer	0.02	1.34	28 day composite, need to crush, extracted ll/26
MS-TS-10/28/93-28	11/22/93	Whitmer	0.03	1.52	28 day composite, need to crush, extracted ll/26
MS-TS-10/30/93-28	11/22/93	Whitmer	0.03	1.52	28 day composite, need to crush, extracted ll/26
MS-TS-10/29/93-28	11/22/93	Whitmer	0.03	1.52	28 day composite, need to crush, extracted ll/26
MS-TS-10/25/93-28	11/22/93	Kump	0.06	2.05	28 day composite
MS-TS-10/26/93-28	11/22/93	Whitmer	0.07	2.22	28 day composite, need to crush
MS-TS-10/27/93-28	11/22/93	Whitmer	0.04	1.7	28 day composite, need to crush, extracted ll/26
MS-TS-3493	05/20/94	Walter	0.02	1.34	

1) TCLP - Toxcity Characteristic Leaching Procedure
2) mg/l - milligram per liter
3) mg/kg - milligram per kilogram
4) Calc Hex Cr - Calculated Hexavalent Chromium

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Hexavalent Chromium was calculated using: Hex Cr = 0.99223 + (17.578 x TCLP)

TABLE 2
Summary of Analytical Results for Confirmatory Grid Samples
Mouat Industries Site

Sample Identification	Sample Date	Sampler	TCLP Chromium (mg/l)	Estimated Hex Cr (mg/kg)	Data Qualifier	COMMENTS (Sample Location, Sample Depth, etc.)
MS-S-B.6-V-N-3	09/04/94	Wilks	< 0.01	< 0.99		
MS-S-B.6-V-W-2	09/04/94	Wilks	< 0.01	< 0.99		
MS-S-B.7-V-N-2	09/02/94	Davison, Kump	< 0.01	< 0.99		
MS-S-B.8-V-E-1	09/02/94	Davison, Kump	0.1	2.75		
MS-S-B.8-V-N-2	09/04/94	Wilks, Herrick	< 0.01	< 0.99		
MS-S-B.8-V-S-1	09/02/94	Davison, Kump	0.05	1.87		
MS-S-C.6-1	08/31/94	Bruggman, Kump	0.01	1.17		(10')
MS-S-C.6-V-W-1	08/31/94	Bruggman, Kump	0.01	1.17		
MS-S-C.7-1	08/31/94	Bruggman, Kump	0.02	1.34		4'
MS-S-C.8-1	09/07/94	Walter, Bruggman	0.02	1.34		4'
MS-S-C.8-V-E-1	09/15/94	Bruggman, Walter	0.04	1.7		
MS-S-D.10-V-N-1	09/17/94	Wilks,Wieringa,Kump	0.05	1.87		
MS-S-D.11-V-N-1	09/17/94	Wilks,Wieringa,Kump	0.01	1.17		
MS-S-D.12-1	09/15/94	Bruggman, Walter	0.04	1.7		2'
MS-S-D.13-1	09/15/94	Bruggman, Walter	0.07	2.22		2'
MS-S-D.14-1	09/16/94	Wilks,Herman,Kump	0.07	2.22		2'
MS-S-D.15-1	09/16/94	Wilks,Herman,Kump	0.14	3.45		2'
MS-S-D.16-1	09/17/94	Wilks,Wieringa,Kump	0.06	2.05		2'
MS-S-D.17-1	09/17/94	Wilks,Wieringa,Kump	0.1	2.75		2'
MS-S-D.18-1	09/18/94	Wilks,Wieringa,Kump	0.02	1.34		2'
MS-S-D.19-1	09/18/94	Wilks,Wieringa,Kump	0.04	1.7		2'
MS-S-D.20-1	09/20/94	Bruggman	0.05	1.87		2'
MS-S-D.5-2	07/29/94	Wilks, Herman	0.06	2.05		10'
MS-S-D.5-V-N-2	07/22/94	Herman, Wilks	0.01	1.17		C.5
MS-S-D.5-V-W-3	07/25/94	Davison, Bruggman	0.01	1.17		
MS-S-D.9-V-N-1	09/08/94	Bruggman	< 0.01	< 0.99		
MS-S-E.11-V-E-2	09/12/94	Bruggman	0.02	1.34		
MS-S-E.12-2	09/14/94	Bruggman, Walter	0.15	3.63		6'
MS-S-E.12-V-N-1	09/11/94	Kump, Herman	0.41	8.2		
MS-S-E.13-V-N-1	09/13/94	Bruggman, Walter	0.29	6.09		
MS-S-E.14-3	09/17/94	Wilks,Wieringa,Kump	0.2	4.51		8'
MS-S-E.14-V-N-1	09/13/94	Bruggman, Walter	0.38	7.67		
MS-S-E.15-3	09/17/94	Wilks,Wieringa,Kump	0.22	4.86		8'
MS-S-E.15-V-N-2	09/19/94	Bruggman	0.38	7.67		Should be MS-S-E.15-V-N-3
MS-S-E.16-1	09/17/94	Wilks,Wieringa,Kump	0.13	3.28		2'
MS-S-E.16-V-N-4	09/19/94	Bruggman	0.15	3.63		
MS-S-E.17-1	09/17/94	Wilks,Wieringa,Kump	0.38	7.67		2'
MS-S-E.18-1	09/18/94	Wilks,Wieringa,Kump	< 0.01	< 0.99		2'
MS-S-E.19-1	09/18/94	Wilks,Wieringa,Kump	0.02	1.34		2'
MS-S-E.20-1	09/20/94	Bruggman	0.1	2.75		2'
MS-S-E.5-2	07/29/94	Wilks, Herman	0.08	2.4		10'
MS-S-E.5-V-W-2	07/25/94	Davison, Bruggman	0.02	1.34		
MS-S-E.7-1	07/27/94	Davison, Bruggman	0.01	1.17	U	7'
MS-S-F.10-3 (H)	08/30/94	Bruggman	0.26	5.56		8'
MS-S-F.14-1	09/01/94	Bruggman, Kump	< 0.01	< 0.99		F.16; 7'
MS-S-F.15-1	09/02/94	Davison, Kump	0.01	1.17		F.17; 6'
MS-S-F.16-1	09/02/94	Davison, Kump	0.14	3.45	U	F.18; 6'
MS-S-F.21-1	07/30/93	Kump, Risher	< 0.01	< 0.99		G.20; 10-13'
MS-S-F.21-V-3	07/20/93	McDonald	0.06	2.05		North wall of G.20
MS-S-F.22-1	07/29/93	McDonald, Kump	0.05	1.87		G.21; 10-13'
MS-S-F.22-V-2	07/29/93	McDonald, Kump	0.04	1.7		East wall of G.21, Reported as F.22-V-1
MS-S-F.22-V-N-1	07/30/93	Kump, McDonald	0.07	2.22		North wall of G.21
MS-S-F.5-V-W-4	08/09/94	Bruggman	< 0.01	< 0.99		
MS-S-G.10-1	08/23/94	Bruggman, Davison	0.01	1.17		6'
MS-S-G.19-V-2	07/25/93	Stoddard, Walter, Br	0.33	6.79		West Wall of H.18
MS-S-G.20-2	07/20/93	McDonald	0.02	1.34		G.19; 7'
MS-S-G.20-2 Dup	07/20/93	McDonald	0.02	1.34		G.19; 7'
MS-S-G.20-V-2	07/20/93	McDonald	0.04	1.7		North Wall of G.19
MS-S-G.21-3	07/30/93	Kump, McDonald	0.01	1.17		H.20; 10-13'

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TABLE 2 (continued)
Summary of Analytical Results for Confirmatory Grid Samples
Mouat Industries Site

Sample Identification	Sample Date	Sampler	TCLP Chromium (mg/l)	Estimated Hex Cr (mg/kg)	Data Qualifier	COMMENTS (Sample Location, Sample Depth, etc.)
MS-S-G.21-V-2	07/20/93	McDonald	0.09	2.57		East Wall of H.20
MS-S-G.22-3	07/31/93	MCDonald, Rober, Ris	0.07	2.22		H.21; 10-13'
MS-S-G.22-V-E-2	07/28/93	Kump	0.02	1.34		North Wall of H.21
MS-S-G.22-V-S-1	07/30/93	Kump, McDonald	0.04	1.7		South Wall of H.21
MS-S-G.3-V-N-2	08/09/94	Bruggman	< 0.01	< 0.99		
MS-S-G.3-V-W-1	08/09/94	Bruggman	< 0.01	< 0.99		
MS-S-G.4-V-NW-1	08/10/94	Bruggman, Davison	< 0.01	< 0.99		
MS-S-G.6	08/19/94	Herman	0.09	2.57		8'
MS-S-G.7	08/19/94	Herman	0.05	1.87		8'
MS-S-G.F-22-5	07/30/93	Kump, McDonald	0.03	1.52		G,H.21; 5'
MS-S-H.16-2	08/04/93	Stodd,Sjong,Walt,MCD	0.13	3.28		I.15; 8'
MS-S-H.17-V-S-1	08/10/93	Stoddard,Herrick,Wal	0.17	3.98		I.16 South Wall
MS-S-H.19-V-W-2	09/28/94	Bruggman, Walter	< 0.01	< 0.99		
MS-S-H.2-1	07/20/94	Brost,Herrick,David	0.01	1.17		7'
MS-S-H.2-V-N-3	08/03/94	Davison, Bruggman	< 0.01	< 0.99	U	
MS-S-H.2-V-W-1	07/19/94	Brost,Herrick,David	< 0.01	< 0.99		
MS-S-H.20-2	07/20/93	McDonald	0.02	1.34		H.19; 7'
MS-S-H.21-1	07/30/93	Kump, McDonald	0.01	1.17		I.20; 8'
MS-S-H.21-V-2	07/20/93	McDonald	0.05	1.87		I.20 Southeast Wall
MS-S-H.22-V-1	07/22/93	MCDonald	0.06	2.05		I.21 East Wall
MS-S-I.13-V-S-1	10/22/93	Walter,Bruggman	0.45	8.9		
MS-S-I.14-2	07/19/93	Walter,Whitmer	0.21	4.68		J.13; 4'
MS-S-I.14-V-S-1	10/22/93	Walter,Bruggman	0.15	3.63		
MS-S-I.15-2	07/19/93	Stoddard,Walter,Bros	0.17	3.98		J.14; 4'
MS-S-I.16-1	07/19/93	Kump,McDon,Sjong	0.12	3.1		J.15; 4'
MS-S-I.16-2	10/06/93	Walter,Whitmer	0.09	2.57		7-9'; (dug to 3562')
MS-S-I.16-V-1	07/19/93	Kump,Mcdon,Sjong	0.41	8.2		J.15 South Wall
MS-S-I.16-V-2	07/19/93	Kump, McDon, Sjong	0.21	4.68		J.15 East Wall
MS-S-I.16-V-E-1	10/06/93	Walter,Whitmer	0.14	3.45		
MS-S-I.19-V-W-2	09/25/94	Emanuel, Kump	0.03	1.52		
MS-S-I.19-V-W-3	10/03/94	Emanuel	0.48	9.43		
MS-S-I.2-V-W-2	07/19/94	Brost,Herrick,David	< 0.01	< 0.99		
MS-S-I.20-V-2	07/20/93	McDonald	0.02	1.34		I.19 East Wall
MS-S-J.1-1	07/21/94	Wilks,Herman,Brost	< 0.01	< 0.99		7'; (3566')
MS-S-J.1-V-N-1	07/21/94	Wilks,Herman,Brost	< 0.01	< 0.99		
MS-S-J.1-V-SW-1	07/21/94	Wilks,Herman,Brost	0.03	1.52		
MS-S-J.12-2	08/12/93	Walter	0.08	2.4	U	K.11; 3'
MS-S-J.12-3	08/17/93	Crowell Herrick	< 0.01	< 0.99		K.11; 7.5', Depth Sample
MS-S-J.12-V-S-1	08/12/93	Walter	0.05	1.87		K.11 South Wall
MS-S-J.13-2	08/13/93	Stoddard,Evans,Walte	0.02	1.34		K.12, 3'
MS-S-J.13-3	08/17/93	Crowell Herrick	0.04	1.7		K.12; 8'; Depth Samples
MS-S-J.13-V-S-1	08/12/93	Walter	0.02	1.34		K.12 South Wall
MS-S-J.14-2	07/29/93	McDonald, Kump	0.09	2.57		K.13; 4'
MS-S-J.14-V-S	07/29/93	McDonald, Kump	0.04	1.7		K.13 South Wall
MS-S-J.15-2	07/29/93	McDonald, Kump	0.29	6.09		K.14; 4'
MS-S-J.15-V-2	07/30/93	Kump, McDonald	0.39	7.85		K.14 South Wall
MS-S-J.19-V-W-2	10/02/94	Emanuel	0.16	3.8		
MS-S-K.10-V-S-1	08/20/93	Stoddard	0.01	1.17		K.9, K.10; South Wall
MS-S-K.11-V-S-1	08/28/93	Walter	0.2	4.51		K.10, K.11; South Wall
MS-S-K.2-1	07/16/94	Herman, Wilks	0.08	2.4		6'
MS-S-K.2-V-SW-1	07/16/94	Herman, Wilks	0.01	1.17		
MS-S-K.2-V-SW-2	08/03/94	Davison, Bruggman	0.04	1.7	U	
MS-S-K.3-V-S-1	07/16/94	Herman, Wilks	0.02	1.34		
MS-S-K.5-V-S-1	09/27/93	Kostelecky,Walter	0.02	1.34	U	
MS-S-K.6-V-S-1	09/27/93	Kostelecky,Walter	0.11	2.93		
MS-S-K.9-V-E-1	08/26/93	Walter	0.03	1.52		2nd (0.02), 3rd (0.07), (L.8 SE wall)
MS-S-L.10-1	07/05/94	Herrick, Brost	0.03	1.52		3'
MS-S-L.10-V-S-1	07/05/94	Herrick, Brost	0.02	1.34		
MS-S-L.11-1	07/08/94	Herman,Wilks,Brost	0.18	4.16		3'

TABLE 2 (concluded)
Su. ary of Analytical Results for Confirmatory Grid Sa.
Mouat Industries Site

Sample Identification	Sample Date	Sampler	TCLP Chromium (mg/l)	Estimated Hex Cr (mg/kg)	Data Qualifier	COMMENTS (Sample Location, Sample Depth, etc.)
/IS-S-L.11-V-S-1	07/08/94	Herman,Wilks,Brost	0.11	2.93		
MS-S-L.12-1	07/08/94	Herman,Wilks,Brost	0.09	2.57		3'
MS-S-L.12-V-S-1	07/08/94	Herman,Wilks,Brost	0.09	2.57		
MS-S-L.8-V-S-1	07/01/94	Wilks, Herrick	0.13	3.28		
MS-S-L.9-V-S-1	07/01/94	Wilks, Herrick	0.01	1.17		
MS-S-MT-1	09/18/94	Wilks,Wieringa,Kump	0.03	1.52		Under Mud Tank; Grade

1) TCLP Cr - TCLP extractable chromium
2) mg/l - milligrams per liter
3) Hex Cr - hexavalent chromium
4) mg/kg - milligram per kilogram

TABLE 3

COMPARATIVE ANALYSIS OF
RESPONSE ACTION ALTERNATIVES
MOUAT INDUSTRIES SITE
COLUMBUS, MONTANA

	Response Action Alternatives		
Evaluation Criteria	1. No Action	2. Natural Attenuation with Monitoring and Groundwater and Land Use Controls	3. Groundwater Pumping and Treatment
<u>Effectiveness</u>			
• Protectiveness	Good	Good	Good
• Compliance with ARARs	Good	Good	Good
• Achievement of removal objectives	Good	Good	Good
<u>Implementability</u>			
• Technical feasibility	Good	Good	Fair
• Availability of needed resources	Good	Good	Fair
• Administrative feasibility	Poor	Good	Fair
<u>Costs</u>	-0-	$96,000	$1,080,000

Source: Guidance on Conducting Non-Time-Critical Removal Actions Under CERCLA, EPA 540-F-93-057, August 1993, Exhibit 7, page 36.

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TABLE 4

SUMMARY OF COMPARISONS OF THE RESPONSE ACTION ALTERNATIVES TO THE NINE EVALUATION CRITERIA IN THE NATIONAL OIL AND HAZARDOUS SUBSTANCES POLLUTION CONTINGENCY PLAN

Evaluation Criteria	Response Action Alternatives		
	1. No Action	2. Natural Attenuation and Monitoring with Groundwater and Land Use Controls	3. Groundwater Pumping and Treatment
<u>Threshold Criteria</u>			
A. Overall protection of human health and the environment	Good	Good	Good
B. Compliance with ARARs	Good	Good	Good
<u>Primary Balancing Criteria</u>			
C. Long-term effectiveness and permanence	Good	Good	Good
D. Reduction in toxicity, mobility, or volume through treatment	Good [1]	Good [1]	Good
E. Short-term effectiveness	Good [1]	Good [1]	Good
F. Implementability	Good	Good	Fair
G. Cost	$0	$90,000	$1,008,000
H. State acceptance	Poor [2]	Good [2]	Good [2]
I. Community acceptance	Good	Good	Fair

[1] Treatment is natural attenuation

[2] Assessments of state and community acceptance are presumptive and will be finalized after the Proposed Plan has been made available for public review and comment.

Source: National Oil and Hazardous Substances Contingency Plan at 40 CFR 300.430(e)(9)(iii)

ATTACHMENT 2

APPROVAL MEMORANDUM

UNITED STA .S ENVIRONMENTAL PROTE(ON AGENCY

REGION VIII, MONTANA OFFICE
FEDERAL BUILDING, 301 S. PARK, DRAWER 10096
HELENA, MONTANA 59626-0096

DEC 14 1995

Ref: 8MO

November 16, 1995

APPROVAL MEMORANDUM

SUBJECT: Request for an Engineering Evaluation/Cost Analysis for the Mouat Industries Site, Columbus, Montana

Category of Removal: Expedited, Nontime-Critical Response Action

FROM: Robert L. Fox, Chief
Superfund Unit, 8MO

Thru: Max H. Dodson, Director
Ecosystems Protection & Remediation Division, EPR

TO: William P. Yellowtail
Regional Administrator, 8A

OBJECTIVE

The objective of this memorandum is to seek approval for the completion of an engineering evaluation/cost analysis (EE/CA) for the Mouat Industries site at Columbus, Montana. The EE/CA will be used to determine any remaining response actions necessary to alleviate potential health or ecological threats of contaminated groundwater, sediments, and surface water associated with chromium releases form the Mouat Industries site. (Chromium is considered a hazardous substance under CERCLA.) The Potentially Responsible Party (PRP) group has agreed to perform the EE/CA.

INTRODUCTION

A successful soils removal action was completed at the site in 1994. An evaluation of (1) the existing data; (2) the remaining groundwater, sediment, and surface water contamination, and (3) the potential risks to human and ecological receptors indicated that a typical Remedial Investigation/Feasibility Study (RI/FS) process was unnecessary and too complicated for the site conditions. Therefore, an expedited, nontime-critical response action and preparation of an EE/CA is recommended.

11/14/95

11/16/95

12/14/95

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BACKGROUND

The site is located in a light industrial area of Columbus, Montana, in Stillwater County. It is located approximately six-tenths of a mile north of the Yellowstone River and is within the river's floodplain. Residential areas are located within a one-mile radius of the site. The Town of Columbus has owned the Mouat Industries property since 1933. In 1957, under a leasing agreement, Mouat Industries constructed and operated a chromium processing facility, which converted chromium ore to high-grade sodium dichromate. Processing waste products containing sodium dichromate, sodium sulfate, and hexavalent chromium (Cr VI) were generated and stored at the site. Currently, no residences are located on the site. Terrestrial ecosystems in the vicinity include upland forests, successional fields, and agricultural land. Commercial/industrial areas, a municipal airport, and a municipal golf course are located in the vicinity. Aquatic ecosystems in the vicinity include the Yellowstone River in addition to a small pond and associated drainage ditches on the golf course.

In June 1986, the site was placed on the National Priorities List.

In December 1991, under the direction of an EPA Unilateral Administrative Order (UAO), work began on a response action for the site by the PRPs. The UAO required excavation and treating soil that contained chromium above the specified action level and placing the treated soil back into the site excavations. After approximately 45 percent of the contaminated soil had been removed and treated, the remedy was changed to excavation and off-site disposal for the remainder of the contaminated soil. The site was capped with a 24 inch thick soil or gravel cover. The portion of the site which was capped with soil was planted with grasses. Work was completed on the site on December 31, 1994. Institutional controls for land use and groundwater use have been established. A zoning restriction was established to identify a special Superfund Overlay District implemented by the City of Columbus. The land use restrictions apply only to the capped area and surrounding protective buffer areas. The land use restrictions prohibit excavation into the 24 inch soil or gravel cover, limit vehicle loads on the graveled portions of the block placement area, and prohibit any use of the vegetated soil cover area unless those areas are covered with gravel or paved. The land use restrictions also require the property owner to maintain the site cover, drainage facilities, and fences, and establish specifications for construction on the block placement area. The groundwater use restrictions apply to the entire Superfund Overlay District. These restrictions prohibit new wells or other groundwater extraction systems, prohibit groundwater use from existing wells or other groundwater extraction systems, except for golf course irrigation, and control excavation to or below the water table within the Superfund Overlay District.

THREAT TO PUBLIC HEALTH, WELFARE, OR THE ENVIRONMENT

Contamination of groundwater, sediment, and surface water from chromium originating from the former chromium processing operations at the site could pose a potential threat to human health and the environment. Conceptually, the chromium, through physical entrainment, infiltration and percolation, moved into the soil and through infiltration and percolation, moved into the groundwater. Chromium, which was transported by the groundwater, has contaminated surface water and surface water sediments in the golf course pond and ditches. Although the original source of contamination has been contained as a result of the soil removal action, a chromium groundwater plume (chromium levels have exceeded Maximum Contaminant Levels by as much as 50 times) exists beneath and downgradient of the site. Institutional controls implemented in a special Superfund Overlay District ordinance by the Town of Columbus prohibits the use of groundwater from the contaminated plume. These institutional controls eliminate the potential pathway for direct human exposure to the groundwater contamination. The EE/CA will address the effectiveness of the institutional controls in preventing unrestricted use of the groundwater. Recreational users, golfers, and trespassing children are considered the most likely human receptors for potential exposure to surface water and sediment contamination. Both aquatic and terrestrial organisms will also be exposed to surface water and sediment contamination.

A preliminary human health risk assessment indicates that no adverse hazards to public health exist (below one in a million for carcinogenic risks and less than a hazard index of 1 for noncarcinogenic risks). These risks are based on existing land use and would change with changes in land use. A preliminary ecological risk assessment indicates that an insignificant hazard may exist to terrestrial ecological receptors. However, a potentially significant risk may exist to bottom-feeding fish and bottom-dwelling invertebrates in the golf course pond and ditches. The EE/CA will use the risk assessment in assessing response action alternatives.

PROJECTED COST

Because the PRP group will be voluntarily performing the EE/CA, associated costs are expected to be minimal. Oversight costs will be much less than those projected for overseeing an RI/FS. One of the purposes of proceeding with the EE/CA is to expedite and simplify the response process based on remaining site conditions.

REGIONAL RECOMMENDATION

Because of the need to provide a decision basis for determining what, if and, additional actions are needed at the Mouat Industries site and to ensure human health and the environment are protected from the release of chromium, a CERCLA hazardous substance, from the chromium processing activities to the soil, groundwater, surface water and sediments around the site, I recommend that you approve this Engineering Evaluation/Cost Analysis request. The existing site conditions and actions meet the criteria in Section 104 of CERCLA, the NCP (40 CFR. §300.415).

Approve: ______________________ Date: ______________

Disapprove: ______________________ Date: ______________

ATTACHMENT 3

ENGINEERING EVALUATION/COST ANALYSIS

The EE/CA is included in the Administrative Record for the Site. Because of its length, it is not included with the Action Memorandum.

ATTACHMENT 4

RESPONSIVENESS SUMMARY

This Responsiveness Summary provides EPA's responses to public comments received on the Mouat Industries Site EE/CA during the Public Comment period between May 11 and June 13, 1996, and at the Public Meeting held on June 5, 1996, in Columbus, Montana. In each case, the comment is first stated, and then EPA's response is provided.

The following comment was presented orally at the Public Meeting on June 5, and was also provided to EPA in writing:

COMMENT by Mary Westwood on behalf of Monte Vista Company:

June 5, 1996

TESTIMONY OF THE MONTE VISTA COMPANY FOR PRESENTATION AT MOUAT INDUSTRIES SITE RESPONSE ACTION PUBLIC HEARING TO BE HELD IN COLUMBUS, MONTANA, AT 7 P.M. ON JUNE 5, 1996

Ladies and Gentlemen:

My name is Mary Westwood and I am the Director of Governmental Relations for the Monte Vista Company. I am appearing today on behalf of Monte Vista Company to voice our support for Alternative 2, the Response Action recommended in the Engineering and Cost Analysis Report that would allow for Natural Attenuation with Groundwater Monitoring and Continuation of Institutional Controls. We believe that this alternative will provide the assurances which the people of Columbus deserve while minimizing the cost to those parties responsible for elevated levels of chromium in the groundwater.

In that regard, Monte Vista protests the dissemination of erroneous information contained in the EE/CA Report concerning Monte Vista's activities on the site and asks that EPA publicly retract its statements regarding Monte Vista. From the beginning, Monte Vista has provided the U.S. Environmental Protection Agency with complete and accurate information regarding its role and the role of others on this site. At no time during its occupancy of the Mouat

Industries Site did Monte Vista process chrome ore or produce chrome chemicals at the site. All processing of chrome ore and production of chrome chemicals on the Columbus site took place while the property was under the control of the Mouat family, Mouat Industries, and FMC. Monte Vista urges EPA to publicly set the record straight in this matter.

As further testimony on this point, I have attached relevant excerpts from Monte Vista's February 8, 1994, Supplemental Response to Requests for Information Pursuant to Section 104 of CERCLA -- Mouat Industries Site at Columbus, Montana, which was prepared for Monte Vista by its attorneys. The full text of that Supplemental Response and documentary support for that text has been made a part of the administrative record in this case.

Thank you for your attention.

RESPONSE

EPA appreciates the support of Monte Vista for its recommended groundwater removal action at the Mouat Industries Site in Columbus, Montana.

EPA acknowledges that mistakes were made in the Engineering Evaluation/Cost Analysis, May 1996 Community Relations Plan and May 1996 Fact Sheet for the Mouat Industries Site. The publications state or imply that the Monte Vista Company conducted ore processing operations at the Mouat Industries Site. After obtaining further information on the history of activities at the site and review of information in the administrative record, EPA acknowledges that Monte Vista Company never conducted ore processing operations at the Mouat Industries Site. This does not release Monte Vista Company from liability at the site as an owner/operator under CERCLA.

The following comment was presented orally at the Public Meeting on June 5:

COMMENT by Doug Howard on behalf of the Town of Columbus, Montana:

I would like to make a comment on behalf of the Town. I guess this comment would be in regard to the monitoring that's going to be required to complete the remedy. There is apparently some question as to who is going to assume responsibility for completing the monitoring and also for who is going to pay the cost. The Town of Columbus has worked, has tried to work closely with FMC Corporation throughout the time that this has been going on. As we've worked, tried to work with FMC, we've worked with the understanding that the Town would be collecting the samples and that FMC would be paying the costs of getting the samples analyzed and submitting the reports and whatever other paperwork is required to the EPA. We hope that that's still the understanding that FMC has and that they will work with us on that. Because we feel that as between the Town and FMC, at least, that that's FMC's responsibility.

RESPONSE

EPA thanks the Town for its comment. No response is necessary.

The following comment was provided in writing to EPA during the public comment period:

COMMENT **by Pamela S. Sbar on behalf of Atlantic Richfield Company:**

The following comments are submitted on behalf of Atlantic Richfield Company ("ARCO") on EPA's Engineering Evaluation/Cost Analysis Fact Sheet for the Mouat Industries Site, Columbus, May 1996 (the "Mouat Fact Sheet").

ARCO supports EPA's recommended response action set forth in the Mouat Fact Sheet of natural attenuation and monitoring with institutional controls. ARCO agrees with EPA that no significant threat to human health currently exists from exposure to contaminants in surface water or sediments in the vicinity of the Mouat site. Institutional controls currently in place at the site are effective, enforceable and reliable. Natural attenuation is occurring at the site, and will continue to lower chromium concentrations. EPA's recommended response action : 1) is protective of human health and the environment; 2) is the most technically feasible and cost effective of the proposed alternatives; 3) reduces the concentration of total chromium in groundwater to below state standards; and 4) complies with ARARs.

As we have discussed with EPA, ARCO continues to contest any assertion that ARCO is potentially responsible party ("PRP") under Section 107 of CERCLA with respect to the Mouat site. Any cleanup activities conducted by Anaconda at the site improved site conditions, and did not exacerbate existing contamination. By submitting these comments, ARCO does not admit and expressly denies any liability it may have for the Mouat site. ARCO reserves its rights to contest any allegations of fact or law or conclusions in the EE/CA, action memoranda, or any previous Administrative Orders or deliverables submitted thereunder in the event that such allegations or conclusions purport to or are used in any way to provide a basis for ARCO's liability. ARCO incorporates by reference its previous correspondence to EPA setting forth the bases for ARCO's position that it is not a PRP and does not have liability for the Mouat site.

ARCO respectfully requests that EPA consider these comments and include these comments in the administrative record.

RESPONSE

EPA appreciates the support of ARCO for its recommended groundwater removal action at the Mouat Industries Site in Columbus, Montana.

No response is necessary to the remainder of the comment.

ATTACHMENT 5

IDENTIFICATION OF ARARS

IDENTIFICATION OF APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS FOR THE MOUAT INDUSTRIES NPL SITE

INTRODUCTION

40 C.F.R. § 300.415(i) and guidance and policy issued by the Environmental Protection Agency ("EPA") require that removal actions under CERCLA comply with substantive provisions of applicable or relevant and appropriate standards, requirements, criteria, or limitations ("ARARs") of state and federal environmental laws and state facility siting laws "to the extent practicable considering the exigencies of the situation." Because this removal action need not be completed any more quickly than a remedial action, EPA believes this removal action should achieve ARARs to the same extent as a remedial action. 40 C.F.R. § 300.430(e)(9)(iii)(B).

This document identifies ARARs that are expected to apply to the activities to be conducted under the Mouat Industries NPL Site removal action. The following ARARs or groups of related ARARs are each identified by a statutory or regulatory citation, followed by a brief explanation of the ARAR and a brief discussion as to how and to what extent the ARAR is expected to apply to the activities to be conducted under this removal action.

Substantive provisions of the requirements listed below are identified as ARARs pursuant to 40 CFR § 300.400. ARARs that are within the scope of this removal action must be attained during and at the completion of the removal action.[1] No permits are anticipated for the removal action for the Mouat site in accordance with Section 121(e) of CERCLA.

TYPES OF ARARs

ARARs are either "applicable" or "relevant and appropriate." Both types of requirements are mandatory for remedial actions under Superfund guidance.[2] Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria or limitations promulgated under federal environmental or state environmental facility siting laws that specifically address a hazardous substance, pollutant, contaminant, removal action, location, or other circumstance found at a CERCLA site. Only those state standards that are identified by a state in a timely manner and that are more stringent than federal

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[1] 40 CFR Section 300.435(b)(2); Preamble to the National Oil and Hazardous Substances Pollution Contingency Plan, 55 Fed. Reg. 8755-8757 (March 8, 1990).

[2] CERCLA § 121(d)(2)(A), 42 U.S.C. § 6921(d)(2)(a). See also, 40 C.F.R. § 300.430(f)(1)(i)(A).

Such requirements do not themselves determine the cleanup alternative, but define how chosen cleanup methods should be performed.

Many requirements listed as ARARs are promulgated as identical or near identical requirements in both federal and state law, usually pursuant to delegated environmental programs administered by EPA and the state. The Preamble to the NCP provides that such a situation results in citation to the state provision and treatment of the provision as a federal requirement.

Also contained in this list are policies, guidance or other sources of information which are "to be considered" in the selection of the remedy and implementation of the response action. Although not enforceable requirements, these documents are important sources of information which EPA and the State of Montana Department of Environmental Quality (MDEQ) may consider during selection of the remedy, especially in regard to the evaluation of public health and environmental risks; or which will be referred to, as appropriate, in selecting and developing cleanup actions.[6]

This list constitutes MDEQ's and EPA's detailed description of ARARs for use at the Mouat Industries NPL Site in making removal action decisions. This list will be used in evaluating the compliance of the various removal alternatives with ARARs. However, the final determination of ARARs that will ultimately apply to the site and the final determination of compliance with ARARs or applicability of ARAR waivers will be presented in the Action Memorandum.

I. CONTAMINANT SPECIFIC ARARs

A. Federal and State Groundwater ARARs.

Compliance points for groundwater ARARs are throughout the Mouat Industries NPL Site.

1. State of Montana requirements.

a. ARM § 16.20.1002 and -1003 (applicable).

ARM § 16.20.1002 provides that groundwater is classified I through IV based on its present and future most beneficial uses, and states that groundwater is to be classified according to actual quality or use, whichever places the groundwater in a higher class. Class I is the highest quality class; class IV the lowest. Based upon its specific conductance, groundwater throughout the entire Mouat site is considered Class I groundwater.

ARM § 16.20.1003 sets the standards for the different classes of groundwater. Concentrations of dissolved substances in Class I or

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[6] 40 CFR Section 300.400(g)(3); 40 CFR Section 300.415(i); Preamble to the NCP, 55 Fed. Reg. 8744-8746 (March 8, 1990).

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#9283.1-2, December 1988.

In addition, maximum contaminant level goals (MCLGs) may also be relevant and appropriate in certain site-specific situations. See 55 Fed. Reg. 8750-8752. MCLGs are health-based goals which are established at levels at which no known or anticipated adverse effects on the health of persons occur and which allow an adequate margin of safety. According to the NCP, MCLGs that are set at levels above zero must be attained by remedial actions for ground or surface waters that are current or potential sources of drinking water, where the MCLGs are relevant and appropriate under the circumstances of the release. Where the MCLG for a contaminant has been set at a level of zero, the MCL promulgated for that contaminant must be attained.

The MCLGs and MCLs for chromium:

contaminant	MCL (mg/l)	MCLG (mg/l)
chromium	0.1	0.1

Resource Conservation and Recovery Act (RCRA) standards for groundwater found at 40 CFR Part 264, Subpart F, incorporated by reference pursuant to ARM § 17.54.702, may be relevant and appropriate if hazardous waste or something similar is placed or maintained in a solid waste management unit as a result of this response action. If so, they would be identified at a later date. The RCRA standards would be no more stringent than the MCLs or MCLGs identified above.

B. Federal and State of Montana Surface Water ARARs.

1. State of Montana Surface Water Quality Requirements, Montana Water Quality Act, MCA § 75-5-101 et seq., and implementing regulations. General. The Clean Water Act, 33 U.S.C. § 1251, et seq., provides the authority for each state to adopt water quality standards (40 CFR Part 131) designed to protect beneficial uses of each water body and requires each state to designate uses for each water body. Pursuant to this authority and the criteria established by Montana surface water quality regulations, ARM § 16.20.601, et seq., Montana has established the Water-Use Classification system. Under ARM § 16.20.608(1), waters of Yellowstone River drainage to the Laurel water supply intake have been classified "B-1." Ditches and certain other bodies of surface water must also meet these requirements.[7] Certain of the B-1 standards, codified at ARM § 16.20.618, as well as Montana's nondegradation requirements, are presented below.

7 As provided under ARM § 16.20.603(25), "'surface waters' means any waters on the earth's surface, including but not limited to, streams, lakes, ponds, and reservoirs; and irrigation and drainage systems discharging directly into a stream, lake, pond, reservoir or other surface water. Water bodies used solely for treating, transporting or impounding pollutants shall not be considered surface water."

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animal, plant or aquatic life; (e) create conditions which produce undesirable aquatic life.

ARM § 16.20.633 also states that no waste may be discharged and no activities conducted which, either along or in combination with other waste activities, will cause violation of surface water quality standards; provided a short term exemption from a surface water quality standard may be authorized by the department under certain conditions.

c. ARM § 16.20.708 (applicable). Existing and anticipated uses of surface water and water quality to support those uses must be maintained.

2. Federal Surface Water Quality Requirements, Clean Water Act, 33 U.S.C. §§ 1251 et seq. (applicable). As provided under Section 303 of the Clean Water Act, 33 U.S.C. § 1313, the State of Montana has promulgated water quality standards. See the discussion above under State surface water quality requirements.

C. Federal and State Air Quality Requirements.

1. National Ambient Air Quality Standards, 40 CFR § 50.6 (PM-10) (applicable). This provision establishes standards for PM-10 particulates (the corresponding state standard is found at ARM § 16.8.821).

2. Montana Ambient Air Quality Regulations, ARM §§ 16.8.807, -.815, -.818, and -.821 (applicable).

a. ARM § 16.8.807. This provision establishes sampling, data collection and analytical requirements to ensure compliance with ambient air quality standards.

b. ARM § 16.8.809. Establishes sampling, data collection, recording, and analysis to ensure compliance with ambient air quality standards.

c. ARM § 16.8.821. PM-10 concentrations in ambient air shall not exceed a 24 hour average of 150 micrograms per cubic meter of air and an annual average of 50 micrograms per cubic meter of air.

II. LOCATION SPECIFIC REQUIREMENTS

The statutes and regulations set forth below relate to the preservation of certain natural resources which may be adversely affected by the Mouat site removal action. They require that steps be taken to minimize the impact of the removal action upon any such resources.

A. Floodplain Management, 40 CFR § 6.302(b), and Executive (applicable). This requirement establishes a federal responsibility for protection of bald and golden eagles, and requires continued consultation with the USFWS during remedial design and remedial construction to ensure that any cleanup of the site does not unnecessarily adversely affect the bald and golden eagles. Specific mitigative measures may be identified for compliance with this requirement.

G. Resource Conservation and Recovery Act and regulations, 40 CFR § 264.18 (a) and (b) (relevant and appropriate). Any discrete waste units created by site cleanup actions must comply with the siting restrictions and conditions found in these sections. These sections require management units to be designed, constructed, operated and maintained to avoid washout, if they are within or near the 100 year flood plain.

H. Solid Waste Management Act and regulations, MCA 75-1-201, et seq., ARM § 16.14.505(1). Sets forth requirements applying to the location of any solid waste management facility. Among other things, the location must have sufficient acreage, must not be within a 100-year floodplain, must be located so as to prevent pollution of ground, surface, and private and public water supply systems, and must allow for reclamation of the land.

III. ACTION SPECIFIC REQUIREMENTS

A. State and Federal Water Requirements.

1. Clean Water Act Point Source Discharges requirements, 33 U.S.C. § 1342. Section 402 of the Clean Water Act, 33 U.S.C. § 1342, et seq., authorizes the issuance of permits for the "discharge" of any "pollutant." This includes storm water discharges associated with "industrial activity." See, 40 CFR § 122.1(b)(2)(iv). "Industrial activity includes inactive mining operations that discharge storm water contaminated by contact with or that has come into contact with any overburden, raw material, intermediate products, finished products, byproducts or waste products located on the site of such operations, see, 40 CFR § 122.26(b)(14)(iii); landfills, land application sites, and open dumps that receive or have received any industrial wastes including those subject to regulation under RCRA subtitle D, see, 40 CFR § 122.26(b)(14)(v); and construction activity including clearing, grading, and excavation activities, see, 40 CFR § 122.26(b)(14)(x). Because the State of Montana has been delegated the authority to implement the Clean Water Act, these requirements are enforced in Montana through the Montana Pollutant Discharge Elimination System (MPDES). The MPDES requirements are set forth below.

a. Substantive MPDES Permit Requirements, ARM §§ 16.20.1318-1320 (applicable). These set forth the substantive requirements applicable to all MPDES and NPDES permits. The substantive requirements, including the requirement to properly operate and maintain all facilities and systems of treatment and (b). ARM § 16.20.1011. This provides that any groundwater whose existing quality is higher than the standard for its classification must be maintained at that high quality unless degradation may be allowed under the principles established in § 75-5-303, MCA, and the nondegradation rules at ARM § 16.20.706 et seq.

iv. Stormwater Runoff.

(a). ARM § 26.4.633. All surface drainage from a disturbed area must be treated by the best technology currently available.

(b). General Permits. Under ARM § 16.20.601, et seq., and ARM § 16.20.1301, et seq., including ARM § 16.20.1314, the Water Quality Division has issued general stormwater permits for certain activities. The substantive requirements of the following permits are applicable for the following activities: (1) for construction activities: General Discharge Permit for Storm Water Associated with Construction Activity, Permit No. MTR100000 (November 17, 1992); (2) for mining activities: General Discharge Permit for Storm Water Associated with Mining and with Oil and Gas Activities, Permit No. MTR300000 (May 18, 1993).[9] (3) for industrial activities: General Discharge Permit for Storm Water Associated with Industrial Activity, Permit No. MTR000000 (October 26, 1994).[10]

Generally, the permits require the permittee to implement Best Management Practices (BMP) and to take all reasonable steps to minimize or prevent any discharge which has a reasonable likelihood of adversely affecting human health or the environment. However, if there is evidence indicating potential or realized impacts on water quality due to any storm water discharge associated with the activity, an individual MPDES permit or alternative general permit may be required.

v. Surface Water, ARM § 16.20.633. Prohibits discharges containing substances that will: (a) settle to form objectionable sludge deposits or emulsions beneath the surface of the water or upon adjoining shorelines; (b) create floating debris, scum, a visible oil film (or be present in concentrations at or in excess of 10 milligrams per liter) or globules of grease or other floating materials; (c) produce odors, colors or other conditions which create a nuisance or render undesirable tastes to fish flesh or make fish inedible; (d) create concentrations or combinations of materials which are toxic or harmful to human, animal, plant or

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9 This permit covers point source discharges of storm water from mining and milling activities (including active, inactive, and abandoned mine and mill sites) including activities with Standard Industrial Code 14 (metal mining).

10 Industrial activities are defined as all industries defined in 40 CFR 122, 123, and 124, excluding construction, mining, oil & gas extraction activities and stormwater discharges subject to effluent limitations guidelines. This includes wood treatment operations, as well as the production of slag.

the integrity of the management facility.

c. 40 C.F.R. § 264.310. This specifies requirements for caps, maintenance, and monitoring after closure.

3. 40 C.F.R. § 264.301. Prescribes design and operating requirements for landfills.

a. 40 C.F.R. § 264.301(a). This provides for a single liner and leachate collection and removal system.

b. 40 C.F.R. § 264.301(f). This requires a run-on control system.

c. 40 C.F.R. § 264.301(g). This requires a run-off management system.

d. 40 C.F.R. § 264.301(h). This requires prudent management of facilities for collection and holding of run-on and run-off.

e. 40 C.F.R. § 264.301(i). This requires that wind dispersal of particulate matter be controlled.

C. Federal and State RCRA Subtitle D Requirements (relevant and appropriate).

40 CFR Part 257 establishes criteria under Subtitle D of the Resource Conservation and Recovery Act for use in determining which solid waste disposal facilities and practices pose a reasonable probability of adverse effects on health or the environment. See 40 CFR § 257.1(a). This part comes into play whenever there is a "disposal" of any solid or hazardous waste from a "facility." "Disposal" is defined as "the discharge, deposit, injection, dumping, spilling, leaking, or placing of any solid waste or hazardous waste into or on any land or water so that such solid waste or hazardous waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including ground waters." See 40 CFR § 257.2. "Facility" means "any land and appurtenances thereto used for the disposal of solid wastes." Solid waste requirements are listed herein because there may be disposal of solid wastes as a result of this removal action.

1. 40 CFR § 264.257 (incorporated by reference in Montana under ARM § 17.54.702). Criteria for Classification of Solid Waste Disposal Facilities and Practices. The activities to be performed for the Mouat site removal action are expected to comply with the following requirements.

a. 40 CFR § 257.3-1. Washout of solid waste in facilities in a floodplain posing a hazard to human life, wildlife,

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relevant and appropriate are run-on and run-off control systems requirements, requirements that sites be fenced to prevent unauthorized access, and prohibitions of point source and nonpoint source discharges which would violate Clean Water Act requirements. ARM § 16.14.506 specifies design requirements for landfills. All landfills must contain a composite liner and leachate collection system which comply with specified criteria. Landfills must either be designed to ensure that MCLs are not exceeded or comply with further composite liner and leachate collection system criteria.

d. ARM § 17.50.523. Specifies that solid waste must be transported in such a manner as to prevent its discharge, dumping, spilling or leaking from the transport vehicle.

e. ARM § 17.50.530. Sets forth the closure requirements for landfills. Class II landfills must meet the following criteria: (1) install a final cover that is designed to minimize infiltration and erosion; (2) design and construct the final cover system to minimize infiltration through the closed unit by the use of an infiltration layer that contains a minimum 18 inches of earthen material and has a permeability less than or equal to the permeability of any bottom liner, barrier layer, or natural subsoils or a permeability no greater than 1 X 10-5 cm/sec, whichever is less; (3) minimize erosion of the final cover by the use of a seed bed layer that contains a minimum of six inches of earthen material that is capable of sustaining native plant growth and protecting the infiltration layer from frost effects and rooting damage; (4) revegetate the final cover with native plant growth within one year of placement of the final cover.

f. ARM § 17.50.531. Sets forth post closure care requirements for Class II landfills. Post closure care must be conducted for a period sufficient to protect human health and the environment. Post closure care requires maintenance of the integrity of the integrity and effectiveness of any final cover, including making repairs to the cover as necessary to correct the effects of settlement, subsidence, erosion, or other events, and preventing run-on and run-off from eroding or otherwise damaging the cover and comply with the groundwater monitoring requirements found at ARM Title 16, chapter 14, subchapter 7.

D. Air Requirements (all applicable).

1. ARM § 16.8.1401(2), (3), and (4). Airborne particulate matter. There shall be no production, handling, transportation, or storage of any material, use of any street, road, or parking lot, or operation of a construction site or demolition project unless reasonable precautions are taken to control emissions of airborne particles. Emissions shall not exhibit an opacity exceeding 20% or greater averaged over 6 consecutive minutes.

2. ARM § 16.8.1404(2). Visible Air Contaminants.

conducted at the reservoir sediments operable unit. They do not purport to be an exhaustive list of such legal requirements, but are included because they set out related concerns that must be addressed and, in some cases, may require some advance planning. They are not included as ARARs because they are not "environmental or facility siting laws." As applicable laws other than ARARs, they are not subject to ARAR waiver provisions.

Section 121(e) of CERCLA exempts removal or remedial actions conducted entirely on-site from federal, state, or local permits. This exemption is not limited to environmental or facility siting laws, but applies to other permit requirements as well.

A. Other Federal Laws

1. Occupational Safety and Health Regulations. The federal Occupational Safety and Health Act regulations found at 29 CFR § 1910 are applicable to worker protection during conduct of response activities.

B. Other Montana Laws

1. Groundwater Act. Section 85-2-505, MCA, precludes the wasting of groundwater. Any well producing waters that contaminate other waters must be plugged or capped, and wells must be constructed and maintained so as to prevent waste, contamination, or pollution of groundwater.

2. Public Water Supply Regulations. If response action at the site requires any reconstruction or modification of any public water supply line or sewer line, the construction standards specified in ARM § 16.20.401(3) must be observed.

3. Groundwater Act. Section 85-2-516, MCA, states that within 60 days after any well is completed a well log report must be filed by the driller with the DNRC and the appropriate county clerk and recorder.

4. Water Rights. Section 85-2-101, MCA, declares that all waters within the state are the state's property, and may be appropriated for beneficial uses. The wise use of water resources is encouraged for the maximum benefit to the people and with minimum degradation of natural aquatic ecosystems.

Parts 3 and 4 of Title 85, MCA, set out requirements for obtaining water rights and appropriating and utilizing water. All requirements of these parts are laws which must be complied with in any action using or affecting waters of the state. Some of the specific requirements are set forth below.

Section 85-2-301, MCA, of Montana law provides that a person may only appropriate water for a beneficial use.

6. <u>Montana Safety Act</u>. Sections 50-71-201, 202 and 203, MCA, state that every employer must provide and maintain a safe place of employment, provide and require use of safety devices and safeguards, and ensure that operations and processes are reasonably adequate to render the place of employment safe. The employer must also do every other thing reasonably necessary to protect the life and safety of its employees. Employees are prohibited from refusing to use or interfering with the use of safety devices.

7. <u>Employee and Community Hazardous Chemical Information Act</u>. Sections 50-78-201, 202, and 204, MCA, state that each employer must post notice of employee rights, maintain at the work place a list of chemical names of each chemical in the work place, and indicate the work area where the chemical is stored or used. Employees must be informed of the chemicals at the work place and trained in the proper handling of the chemicals.

APPENDIX B

Unilateral Administrative Order for Conduct of a Non-Time Critical Removal Action at the Mouat Industries NPL Site

RESPONDENTS
IN THE MATTER OF:
THE MOUAT INDUSTRIES NPL SITE, COLUMBUS, MONTANA

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EPA REGION VIII
HEARING CLERK

UNITED STATES
ENVIRONMENTAL PROTECTION AGENCY
REGION VIII

IN THE MATTER OF:
THE MOUAT INDUSTRIES NPL SITE
COLUMBUS, STILLWATER COUNTY, MONTANA
SITE NO. 65

ATLANTIC RICHFIELD COMPANY
FMC CORPORATION,
MONTE VISTA COMPANY,
MOUAT INDUSTRIES, INC.,
TIMBERWELD MANUFACTURING CO., and
TOWN OF COLUMBUS, MONTANA,
Respondents.

PROCEEDING UNDER SECTION 106(a)
OF THE COMPREHENSIVE ENVIRONMENTAL
RESPONSE, COMPENSATION, AND
LIABILITY ACT, AS AMENDED (42 U.S.C.
§ 9606(a)).

EPA Docket No.
CERCLA-VIII-96-22

UNILATERAL ADMINISTRATIVE ORDER FOR CONDUCT OF A NON-TIME-CRITICAL REMOVAL ACTION

TABLE OF CONTENTS

I. JURISDICTION AND GENERAL PROVISIONS

1. This Order is issued pursuant to the authority vested in the President of the United States by section 106(a) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. § 9606(a), as amended ("CERCLA"), and delegated to the Administrator of the United States Environmental Protection Agency ("EPA") by Executive Order No. 12580, January 23, 1987, 52 Federal Register 2923, and further delegated to the Regional Administrators by EPA Delegation Nos. 14-14-A and 14-14-B. This authority has been further delegated to the Assistant Regional Administrator for Ecosystems Protection and Remediation, EPA Region VIII.

2. This Order pertains to property located north of the Columbus Airport, Columbus, Stillwater County, Montana, in the SW 1/4 of the NW 1/4 of Section 27, T2S, R20E, of the Columbus East Quadrangle, known as the Mouat Industries NPL Site or the "Site." This Order requires the Respondents to conduct a removal action described herein to abate an imminent and substantial endangerment to the public health, welfare or the environment that may be presented by the actual or threatened release of hazardous substances at or from the Site.

3. EPA has notified the State of Montana of this action pursuant to section 106(a) of CERCLA, 42 U.S.C. § 9606(a).

II. PARTIES BOUND

4. This Order applies to and is binding upon Respondents and Respondents' heirs, directors, officers, employees, agents, receivers, trustees, successors and assigns. Any change in ownership or corporate status of Respondents including, but not limited to, any transfer of assets or real or personal property shall in no way alter Respondents' responsibilities under this Order. Respondents are jointly and severally liable for carrying out all activities required by this Order. Compliance or noncompliance by one or more Respondents with any provision of this Order shall not excuse or justify noncompliance by any other Respondents.

5. Respondents shall ensure that their contractors, subcontractors, and representatives receive a copy of this Order and comply with this Order. Respondents shall be responsible for any noncompliance with this Order.

III. DEFINITIONS

6. Unless otherwise expressly provided herein, terms used in this Order which are defined in CERCLA or in regulations promulgated under CERCLA shall have the meaning assigned to them in CERCLA or such regulations. Whenever terms listed below are

used in this Order or in the documents attached to this Order or incorporated by reference into this Order, the following definitions shall apply:

"**Contractor**" means any person, including the contractors, subcontractors, consultants, or agents retained or hired by Respondents to undertake any work under this Order.

"**Day**" means calendar day. In computing any period of time under this Order, where the last day would fall on a Saturday, Sunday, or federal holiday, the period shall run until the end of the next working day. Time will be computed in accordance with Rule 6 of the Federal Rules of Civil Procedure, unless otherwise specified.

"**Deliverable**" means any written product, including but not limited to, plans, reports, memoranda, data, and other documents that Respondents must submit to EPA under this Order.

"**Montana Department of Environmental Quality**" or "**MDEQ**" means the Montana Department of Environmental Quality, by and through the Environmental Remediation Division, Superfund Program, and any successor departments, divisions or programs.

"**NCP**" means the National Oil and Hazardous Substances Pollution Contingency Plan promulgated under Section 105 of CERCLA, 42 U.S.C. § 9605, and codified at 40 C.F.R. Part 300, including any amendments thereto.

"**Order**" means this Order, the Exhibit A attached to this Order, and all documents incorporated into this Order by reference or according to the procedures set forth herein.

"**Respondents**" means the Atlantic Richfield Company, FMC Corporation, Monte Vista Company, Mouat Industries, Inc., Timberweld Manufacturing Company, and the Town of Columbus.

"**State**" means the State of Montana, by and through the Montana Department of Environmental Quality.

"**Site**" means the Mouat Industries site, as described in the Action Memorandum, and any additional areas in close proximity to the Site that are necessary for implementation of the Work.

"**Work**" means all activities Respondents are required to perform under this Order.

IV. FINDINGS OF FACT

Site Description and History

7. The Site is located just north of the Columbus Airport, Columbus, Montana, in Stillwater County, in the SW 1/4 of the NW 1/4 of Section 27, T2S, R20E, of the Columbus East Quadrangle. The Town of Columbus (Town) and Timberweld Manufacturing Co. (Timberweld) are the current owners of the Site. The Town has owned the eastern portion of the Site since 1933. In 1960, the Town became the owner of the western portion of the Site which they subsequently sold to Timberweld. Under a leasing agreement with the Town, William G. Mouat and Mouat Industries, Inc. (Mouat) constructed and then operated a chromium processing plant on the Site from 1957 until about 1963. The operation processed chromite ore mined from the Stillwater Complex in south-central Montana into high-grade sodium dichromate. The operation generated sodium sulfate process wastes containing sodium chromate and sodium dichromate. The chromium compounds contained hexavalent chromium (Cr VI). Cr VI leached from the sodium sulfate waste piles into the underlying soils and into groundwater. Sodium dichromate spills also occurred during normal operation of the facility, which added to the Cr VI contamination.

8. Between September 1961 and April 1962, FMC Corporation and Mouat jointly operated the chromium processing plant at the Site.

9. In May 1963, the Monte Vista Company (MVC) purchased the chrome processing plant and acquired the leasehold interest in a portion of the Site from Mouat. In 1968, Mouat assigned its interest in the agreements it had with MVC to The Anaconda Company ("Anaconda"). Activities were conducted at the Site by Anaconda Minerals Company in 1969 and 1973 to 1974. In 1969, some waste materials were collected from the Site and placed inside a building that had been used for sodium dichromate production. In 1973, in response to concerns raised by the town, Anaconda agreed to remove approximately 100 tons of material from the Site and to treat some contaminated soils in place. Anaconda removed the material stored inside the building (approximately 468 tons) to Butte, Montana, and attempted to treat soil in place by spreading acid and ferrous sulfate over a portion of the Site to chemically change the Cr VI to its more stable trivalent state (Cr III). Anaconda's presence at the Site ended in 1974. MVC held the lease until it expired in 1973. In 1974, MVC removed the chrome processing plant machinery, buildings, and equipment from the Site. In 1981, Anaconda merged into the Atlantic Richfield Company (ARCO).

10. In 1960, Timberweld purchased a portion of the Site from the Town and in 1975 leased additional property from the

Town. During the same year, Timberweld covered the area occupied by the chromium processing plant and sodium sulfate waste piles with approximately two feet of gravel. In 1976, yellow mineral deposits, characteristic of sodium chromate, were evident at the gravel surface. Timberweld continues to conduct business operations and activities on a portion of the Site.

11. Investigations were conducted at the Site in 1977, 1980, 1983, and 1984 leading to the Site being proposed for the National Priorities List of the NCP in 1984. The Site was placed on the NPL in 1986. Further studies were done at the Site and in 1990 EPA undertook a removal action to secure the Site and to control run-on and run-off of surface water. In 1991 EPA issued a unilateral administrative order to several potentially responsible parties directing that a removal action of contaminated soil be conducted. FMC responded to the order and commenced full scale soil excavation and treatment at the Site in June, 1993. FMC's execution of the soil removal action was completed in 1995.

12. Pursuant to section 105 of CERCLA, 42 U.S.C. § 9605, EPA placed the Site on the National Priorities List set forth at 40 C.F.R. Part 300, Appendix B, by publication in the Federal Register on June 10, 1986 (51 Fed. Reg. 111).

Release or Threatened Release

13. In 1977, HKM Associates conducted groundwater sampling at the Site for both the Montana Water Quality Bureau and the EPA. Results of the investigation revealed a hexavalent chromium plume migrating southeast from the Site toward the Yellowstone River. Investigations by EPA in 1980, 1983, 1984, 1985, 1989 and 1992 established that elevated levels of chromium were present in the soil, surface water and groundwater within and adjacent to the Site. These data confirmed continued plume movement southeastward toward the Yellowstone River.

14. A threat to public health or welfare or the environment is posed by the Site and adjacent areas to which chromium contamination has migrated. Chromium contamination from the chrome ore processing conducted by Mouat and other Respondents at the Site and thereafter exacerbated by activities of other Respondents has found its way into the surface water and groundwater where it has been detected in elevated levels. Currently, the primary threat is from chromium in the groundwater medium. At the golf course pond and associated ditches, contaminated groundwater discharges to the surface. Hexavalent chromium in the groundwater is reduced to trivalent chromium within the pond and ditch sediments, resulting in entrainment of chromium within the sediments. Some of the pathways through which humans could be exposed to chromium are from contaminated

surface water and groundwater through the direct contact and ingestion pathways.

Endangerment

15. The Site is located immediately southeast of Columbus in the flood plain of the Yellowstone River, less than 0.6 miles north of the present river channel. Approximately 1,500 people live in the Town with residences, schools, and businesses located within a mile of the Site. The land surface slopes gently to the southeast and the Town's surface storm drainage passes through the Site toward the Yellowstone River. The groundwater table ranges from 3-11 feet below the surface of the Site, and flows southeasterly toward the Yellowstone River. Concentrations of chromium in groundwater at the Site exceed the MCL for chromium in drinking water and the state WQB-7 standards for chromium in groundwater. The contaminated groundwater poses a clear threat to potential human consumers. Concentrations of chromium in surface water at the Site also exceeds WQB-7 standards for chromium in surface water.

16. Hexavalent chromium is a hazardous substance as defined by Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Sec. 101(14), and designated as such under 40 CFR 117 and 40 CFR 302. Ingestion of high levels of Cr(VI) can cause severe circulatory collapse and toxic nephritis; it can be fatal. Cr(VI) irritates skin and can cause ulcers. Prolonged contact with Cr(VI) can cause broken skin to develop "chrome sores," leaving the area vulnerable to infection.

Respondents

17. The Town is one of the current owners of the Site and has owned all or part of the Site since 1933. Timberweld also owns a small western portion of the Site.

18. In 1957, the Town leased the Site to Mouat. Mouat built and operated a chrome processing plant at the Site which processed and converted chromium ore into a high-grade sodium dichromate and produced sodium sulfate wastes containing hexavalent chromium or Cr(VI). Cr(VI) leached from the sodium sulfate waste piles into the surrounding soils, surface water and groundwater. Dichromate spills occurred during normal operation of the facility and added to the Cr(VI) contamination. Mouat operated the plant during the period from 1958-1961.

19. At the Site, FMC operated the chromium processing plant in conjunction with Mouat from approximately September, 1961 until approximately April, 1962. The chromium processing plant processed and converted chromium ore into a high-grade sodium dichromate and produced sodium sulfate wastes containing hexavalent chromium or Cr(VI). Cr(VI) leached from the sodium

sulfate waste piles into the surrounding soils, surface water and groundwater. Dichromate spills occurred during normal operation of the chrome processing plant and added to the Cr(VI) contamination.

20. In 1963, MVC purchased the chromium processing plant and equipment located at the Site, and acquired the leasehold interest in a portion of the Site from Mouat by assignment from Mouat to MVC.

21. In 1968, Mouat assigned its interest in the agreements it had with MVC to Anaconda. In 1969, Anaconda received a complaint from the Town of Columbus concerning several piles of chrome chemicals (approximately 200 tons) stored at the Site. After receiving the complaint, Anaconda placed a portion of the piles in steel drums and stacked the steel drums near the chromium processing plant building. The remainder of the piles was laid down on the concrete floor inside the building. Subsequent to this effort, Anaconda observed that: (1) some of the chrome chemicals that had penetrated the ground where the piles had been located had again leached through to the surface; and (2) the chemicals stored on the plant floor would become a problem in the future since the building was located in a depression and had in the past, during periods of spring thaw or heavy storms, accumulated up to eight inches of water on the floor.

22. In 1973, Anaconda, in response to concerns raised by the Town of Columbus, removed approximately 450 tons of waste material from the Site and conducted an in-situ soil treatment action. Initially, an investigation of the contamination on the ground surface at the Site was carried out to determine technical and economic feasibility of various alternate treatment methods. After a treatment method was selected, approximately six tons of ferrous sulfate was spread over the soil at the Site and then turned under with a disc and harrow. Thereafter, approximately 500 gallons of concentrated sulfuric acid was spread over the Site and the area was watered down and disced and harrowed. Additional ferrous sulfate was added to 'hot spots' and the entire area was re-watered.

23. MVC's lease at the Site expired at the end of 1973 and was not renewed. In 1974, MVC removed the chrome processing plant machinery, buildings, and equipment from the Site.

24. In October, 1980, Anaconda, as lessor, served upon MVC its notice of termination of the lease agreements that had been assigned to Anaconda by Mouat. This action precipitated a lawsuit by MVC which was finally resolved against MVC by the Montana Supreme Court in 1988. In 1981, Anaconda merged into ARCO.

25. In 1975, Timberweld leased a portion of the western side of the Site for use in its laminated wood products business. During the same year, Timberweld covered the area where the chromium processing plant and chromate waste piles had been located with a two foot layer of gravel and used the area for a storage yard for its finished products. Timberweld continues to conduct business operations on a portion of the Site owned by Timberweld and continues to lease a portion of the Site from the Town.

Response Actions

26. In March, 1990, EPA Region VIII's Emergency Response Branch initiated a removal action to secure the Site and to mitigate the threat of direct contact to hazardous substances. Approximately 1,400 feet of 6-foot industrial chain link fencing with two 20-foot wide gates with locks were installed around the Site. This action was completed in April, 1990. During this same time period, the Town, at the request of EPA's On-scene Coordinator, re-routed the drainage ditch which had channeled storm runoff water directly onto the contaminated soils at the Site.

27. On September 20, 1991, the Assistant Administrator for EPA's Office of Solid Waste and Emergency Response granted a consistency exemption under Section 104(c)(1)(C) of CERCLA, 42 U.S.C. § 9604(c)(1)(C), for continued response action at the Site in order to carry out a removal action to mitigate the source of groundwater contamination and off-site migration and to eliminate threats associated with surface contamination. After negotiations with potentially responsible parties for the Site to carry out this removal action failed, on November 12, 1991 EPA issued Administrative Order for Removal Action, Docket No. CERCLA-VIII-92-05 to FMC, MVC, Mouat, Timberweld and the Town. FMC responded to the order and commenced full scale soil excavation and treatment at the Site in June, 1993. FMC's execution of the soil removal action was completed in 1995.

V. CONCLUSIONS OF LAW AND DETERMINATIONS

28. Based on the Findings of Fact set forth above, and the Administrative Record supporting this removal action, EPA has determined that:

a. The Mouat Industries NPL Site is a "facility" as defined by section 101(9) of CERCLA, 42 U.S.C. § 9601(9).

b. The contaminants found at the Site, as identified in the Findings of Fact above, include "hazardous substances" as defined by section 101(14) of CERCLA, 42 U.S.C. § 9601(14).

c. Each Respondent is a "person" as defined by section 101(21) of CERCLA, 42 U.S.C. § 9601(21).

d. Each Respondent is liable under section 107(a) of CERCLA, 42 U.S.C. § 9607(a).

e. The conditions described in the Findings of Fact above constitute an actual or threatened "release" of a hazardous substance from the facility as defined by sections 101(22) of CERCLA, 42 U.S.C. § 9601(22).

f. The conditions present at the Site constitute an imminent and substantial endangerment to public health, welfare, or the environment.

g. The actual or threatened release of hazardous substances from the Site may present an imminent and substantial endangerment to the public health, welfare, or the environment within the meaning of section 106(a) of CERCLA, 42 U.S.C. § 9606(a).

h. The removal actions required by this Order are necessary to protect the public health, welfare, or the environment, and are not inconsistent with the NCP and CERCLA.

VI. ORDER

29. Based upon the foregoing Findings of Fact, Conclusions of Law, Determinations, and the Administrative Record for this Site, EPA hereby orders that Respondents comply with the following provisions, including but not limited to all attachments to this Order, all documents incorporated by reference into this Order, and all schedules and deadlines in this Order, attached to this Order, or incorporated by reference into this Order, and perform the following actions:

a. Notice of Intent to Comply. Each Respondent shall notify EPA in writing within 5 days after the effective date of this Order of its irrevocable intent to comply with this Order. Failure of any Respondent to provide such notification within this time period shall be a violation of this Order by such Respondent.

b. Designation of Contractor, Project Coordinator, and On-Scene Coordinator. (1). Respondents shall perform the removal action themselves or retain a contractor or contractors to perform the removal action. Respondents shall notify EPA of Respondents' qualifications or the names and qualifications of such contractors within 20 days of the effective date of this Order. Respondents shall also notify EPA of the name(s) and qualification(s) of any other contractor(s) or subcontractor(s) retained to perform the removal action under this Order at least 7 days prior to commencement of such removal action. EPA retains the right to disapprove of any, or all, of the contractors and/or subcontractors retained by the Respondents, or of Respondents' choice of themselves to do the removal action. If EPA disapproves of a selected contractor or Respondent(s), Respondents shall retain a different contractor or notify EPA that they will perform the removal action themselves within 10 days following EPA's disapproval and shall notify EPA of that contractor's name or Respondents' names and qualifications within 10 days of EPA's disapproval.

(2). Within 10 days after the effective date of this Order, the Respondents shall designate a Project Coordinator who shall be responsible for administration of all the Respondents' actions required by the Order. Respondents shall submit the designated coordinator's name, address, telephone number, and qualifications to EPA. EPA retains the right to disapprove of any Project Coordinator named by the Respondents. If EPA disapproves of a selected Project Coordinator, Respondents shall retain a different Project Coordinator and shall notify EPA of that person's name and qualifications within 10 days following EPA's disapproval. Receipt by Respondents' Project Coordinator of any notice or communication from EPA relating to this Order shall constitute receipt by all Respondents.

(3). The EPA has designated Ron Bertram of the EPA Region VIII Montana Office, as its On-Scene Coordinator (OSC). Respondents shall direct all submissions required by this Order to the OSC at EPA Region VIII, Montana Office, Federal Building, 301 South Park, Drawer 10096, Helena, Montana 59626-0096.

c. Work to Be Performed. Respondents shall perform, at a minimum, all removal activities outlined in the Response Action Work Plan (RAWP) attached hereto as Exhibit A. The work to be performed is briefly summarized below:

(1). Groundwater and Surface Water Monitoring

Groundwater monitoring will be performed semiannually for the duration of the removal action at selected wells. These selected wells are referred to as the Monitoring Plan Well Network and are located and identified in the RAWP attached hereto as Exhibit A. The well network includes one upgradient well, five wells within the plume, three wells laterally adjacent to the plume, and three wells near the leading edge of the plume (as defined by the groundwater standard of 0.1 mg/l). Three of the wells within the plume are immediately downgradient of the block placement area, and will serve to verify that chromium is not leaching from the buried blocks into the groundwater. A surface water sample will also be collected to evaluate changes in surface water within the golf course ditches. The total number of semiannual sampling locations is 13. Quality assurance/quality control procedures are outlined in the attached RAWP. A complete groundwater monitoring and sampling and analysis plan is included in the attached RAWP.

The groundwater monitoring will be conducted as follows:

A. The Monitoring Plan Well Network will consist of 12 wells and one surface water sample from golf course ditches as identified in the attached RAWP. The well samples will be analyzed for total chromium and the surface water sample will be analyzed for hexavalent and trivalent chromium.

B. The Monitoring Plan Well Network will be sampled semiannually for a minimum of 5 years.

C. The Monitoring Plan Well Network will continue to be monitored semiannually until both of the following conditions are met:

1). It has been demonstrated that the MCL for chromium in groundwater and the WQB-7 standards for chromium in groundwater have not been exceeded for a period of three consecutive years.

2). It has been demonstrated that all remaining wells not included in the Monitoring Plan Well Network but within the Superfund Overly District do not exceed the MCL for chromium in groundwater and the WQB-7 standards for chromium in groundwater as determined by a single sample taken after Item 1 above is satisfied.

(2). Institutional Controls

Institutional controls over land use and groundwater use that have been established by the Town must be enforced. The institutional controls are provided for by zoning ordinance which created a Superfund Overlay District. The institutional controls are presented in the attached RAWP. The land use restrictions apply only to the block placement areas and surrounding protective buffer areas. The land use restrictions encompass the following:

- prohibit excavation into the blocks of treated soil;
- limit vehicle loads on the graveled portions of the block placement area;
- prohibit any use of the soil-covered block placement area unless those areas are paved or covered with gravel;

- require the property owner to maintain the site cover, drainage facilities, and fences; and

- establish specifications for construction on the block placement area.

The groundwater use restrictions apply to the entire Superfund Overlay District. Those restrictions prohibit new wells or other groundwater extraction systems and groundwater use from existing wells or other groundwater extraction systems, except for lawn irrigation use, use of the existing golf course pond, and groundwater monitoring. Excavation below the groundwater table (static groundwater level) for any purpose is prohibited except for temporary excavation work necessary for construction purposes including placement of footings and utilities. Such temporary excavation work requires a permit from the Town of Columbus. The restrictions on groundwater use can be lifted by the Town of Columbus after response action objectives are met (the MCL for chromium in groundwater and the WQB-7 standards for chromium in groundwater have not been exceeded for a period of three consecutive years). Lifting of the SOD groundwater restrictions will *not* apply to the Block Placement Area where groundwater wells, or other extraction/recovery systems, will continue to be prohibited in order to protect the integrity of the Block Placement Area.

(3). Work Plan and Implementation. Respondents shall implement the RAWP attached hereto as Exhibit A in accordance with the schedule set forth therein. The RAWP, the schedule, and any subsequent modifications are fully enforceable under this Order. Respondents shall notify EPA at least 48 hours prior to performing any on-site work pursuant to the RAWP. Respondents shall not commence or undertake any removal actions at the Site without prior EPA approval.

(4). Health and Safety Plan. Within 14 days after the effective date of this Order, the Respondents shall submit for EPA review and comment a plan that ensures the protection of the public health and safety during performance of on-site work under this Order. This plan shall be prepared in accordance with EPA's Standard Operating Safety Guide, (November 1984, updated July 1988). In addition, the plan shall comply with all current applicable Occupational Safety and Health Administration (OSHA) regulations; Hazardous Waste Operations and Emergency Response; found at 29 CFR Part 1910. Respondents shall incorporate all changes to the plan recommended by EPA, and implement the plan during the pendency of the removal action.

(5). Quality Assurance and Sampling. All sampling and analyses performed pursuant to this Order shall conform to EPA direction, approval, and guidance regarding sampling, quality assurance/quality control (QA/QC), data validation, and chain of custody procedures. The Respondents shall follow the Quality Assurance/Quality Control requirements contained in the attached RAWP (Exhibit A). Respondents shall use only laboratories which have a documented Quality Assurance Program that complies with current EPA guidance. The Respondents shall ensure that any laboratory used performs analyses according to a method or methods deemed satisfactory by EPA and submits all protocols to be used for analyses to EPA at least 30 days before beginning analysis. Upon request by EPA, Respondents shall have the laboratory analyze samples submitted by EPA for quality-assurance monitoring. Upon request by EPA, Respondents shall allow EPA or its authorized representatives to take split and/or duplicate samples of any samples collected by Respondents while performing actions under this Order. Respondents shall notify EPA not less than 10 days in advance of any sample collection activity. EPA shall have the right to take any additional samples that it deems necessary.

(6) Reporting. (a). Respondents shall comply with the reporting requirements contained in the attached RAWP (Exhibit A). (b). Any Respondent and Successor in title shall, at least 30 days prior to the conveyance of any interest in real property at the Site, give written notice of this Order to the transferee and written notice to EPA of the proposed conveyance, including the name and address of the transferee. The party conveying such an interest shall require that the transferee comply with Section VI, paragraph 29, item d, of this Order - Access to Property and Information.

(7). Final Report. Within 30 days after completion of all removal actions required under this Order, the Respondents shall submit for EPA review and approval a final report summarizing the actions taken to comply with this Order. The final report shall conform, at a minimum, with the requirements set forth in Section 300.165 of the NCP entitled "OSC Reports". The final report shall include a good faith estimate of total costs or statement of actual costs incurred in complying with the Order, a presentation of the analytical results of all sampling and analyses performed, and accompanying appendices containing all relevant documentation generated during the removal action (e.g., manifests, invoices, bills, contracts, and permits). The final report shall also include the following certification signed by a person who supervised or directed the preparation of that report:

> Under penalty of law, I certify that to the best of my knowledge, after appropriate inquiries of all relevant persons involved in the preparation of the report, the information submitted is true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations.

d. Access to Property and Information. (1). Respondents shall provide and/or obtain access to the Site and off-site areas to which access is necessary to implement this order, and provide access to all records and documentation related to the conditions at the Site and the action conducted pursuant to this Order. Such access shall be provided to EPA employees, contractors, agents, consultants, designees, representatives, and State of Montana representatives. These individuals shall be permitted to move freely at the Site and appropriate off-site areas in order to conduct actions which EPA determines to be necessary. Respondents shall submit to EPA, upon receipt, the results of all sampling or tests and all other data generated by Respondents or their contractor(s), or on the Respondents' behalf during implementation of this Order. (2). Where action under this Order is to be performed in areas owned by or in possession of someone other than Respondents, Respondents shall use their best efforts to obtain all necessary access agreements within 30 days after the effective date of this Order, or as otherwise specified in writing by the OSC. Respondents shall immediately notify EPA if after using their best efforts they are unable to obtain such agreements. Respondents shall describe in writing their efforts to obtain access. EPA may then assist Respondents in gaining access, to the extent necessary to effectuate the removal actions described herein, using such means as EPA deems appropriate. EPA reserves the right to seek reimbursement from Respondents for all costs and attorney's fees incurred by the United States in obtaining access for Respondents.

e. Record Retention, Documentation, Availability of Information. (1). Respondents shall preserve all documents and information relating to work performed under this Order, or relating to the hazardous substances found on or released from the Site, for ten years following completion of the removal actions required by this Order. At the end of this ten year period and 30 days before any document or information is destroyed, Respondents shall notify EPA that such documents and information are available to EPA for inspection, and upon request, shall provide the originals or copies of such documents and information to EPA. In addition, Respondents shall provide documents and information retained under this Section at any time before expiration of the ten year period at the written request of EPA. (2). Respondents may assert a business confidentiality claim pursuant to 40 C.F.R. § 2.203(b) with respect to part or all of any information submitted to EPA pursuant to this Order, provided such claim is allowed by section 104(e)(7) of CERCLA, 42 U.S.C. § 9604(e)(7). If no such claim accompanies the information when it is received by EPA, EPA may make it available to the public without further notice to Respondent(s).

f. Off-Site Shipments. All hazardous substances, pollutants or contaminants removed off-site pursuant to this Order for treatment, storage, or disposal shall be treated, stored, or disposed of at a facility in compliance, as determined by EPA, with 42 U.S.C.§ 9621(d)(3) and the EPA "Revised Procedures for Implementing Off-Site Response Actions," OSWER Directive Number 9834.11, November 13, 1987. Regional Offices will provide information on the acceptability of a facility under section 121(d)(3) of CERCLA and the above directive.

g. Compliance With Other Laws. Respondents shall perform all actions required pursuant to this Order in accordance with all applicable local, state, and federal laws and regulations except as provided in CERCLA section 121(e) and 40 C.F.R. section 300.415(i). In accordance with 40 C.F.R. § 300.415(i), all on-site actions required pursuant to this Order shall, to the extent practicable, as determined by EPA, considering the exigencies of the situation, attain applicable or relevant and appropriate requirements (ARARs) under federal environmental, state environmental, or facility siting laws. (see "The Superfund Removal Procedures for Consideration of ARARs During Removal Actions," OSWER Directive No. 9360.3-02, August 1991).

h. Emergency Response and Notification of Releases. (1). If any incident, or change in site conditions, during the actions conducted pursuant to this Order causes or threatens to cause an additional release of hazardous substances from the Site or an endangerment to the public health, welfare, or the environment, the Respondents shall immediately take all appropriate action. The Respondents shall take these actions in accordance with all applicable provisions of this Order, including, but not limited to the Health and Safety Plan, in order to prevent, abate or minimize such release or endangerment caused or threatened by the release. Respondents shall also immediately notify the OSC, Ron Bertram at (406) 441-1150, or in the event of his unavailability, shall notify the Regional Duty Officer, Prevention Assessment and Emergency Removal Program, EPA Region VIII, (303) 293-1788, of the incident or site conditions. If Respondents fail to take action, then EPA may respond to the release or endangerment and reserve the right to pursue cost recovery. (2). In addition, in the event of any release of a hazardous substance, Respondents shall immediately notify EPA's Regional Duty Officer, (303) 293-1788, and the National Response Center at telephone number (800) 424-8802. Respondents shall submit a written report to EPA within seven (7) days after each release, setting forth the events that occurred and the measures taken or to be taken to mitigate any release or endangerment caused or threatened by the release and to prevent the reoccurrence of such a release. This reporting requirement is in addition to, not in lieu of, reporting under CERCLA section 103(c) and section 304 of the Emergency Planning and Community Right-To-Know Act of 1986, 42 U.S.C. Sections 11001 et seq.

VII. AUTHORITY OF THE EPA ON-SCENE COORDINATOR

30. The OSC shall be responsible for overseeing the proper and complete implementation of this Order. The OSC shall have the authority vested in an OSC by the NCP, 40 CFR 300.120, including the authority to halt, conduct, or direct any action required by this Order, or to direct any other removal action undertaken by EPA or Respondents at the Site. Absence of the OSC from the Site shall not be cause for stoppage of work unless specifically directed by the OSC.

31. EPA and Respondents shall have the right to change their designated OSC or Project Coordinator. EPA shall notify the Respondents, and Respondent(s) shall notify EPA within five (5) days before such a change is made. Notification may initially be made orally, but shall be followed promptly by written notice.

VIII. ENFORCEMENT: PENALTIES FOR NONCOMPLIANCE

32. Violation of any provision of this Order may subject Respondents to civil penalties of up to twenty-five thousand dollars ($25,000) per violation per day, as provided in section 106(b)(1) of CERCLA, 42 U.S.C. § 9606(b)(1). Respondents may also be subject to punitive damages in an amount up to three times the amount of any cost incurred by the United States as a result of such violation, as provided in section 107(c)(3) of CERCLA, 42 U.S.C. § 9607(c)(3). Should Respondents violate this Order or any portion hereof, EPA may carry out the required actions unilaterally, pursuant to section 104 of CERCLA, 42 U.S.C. § 9604, and/or may seek judicial enforcement of this Order pursuant to section 106 of CERCLA, 42 U.S.C. § 9606.

IX. RESERVATION OF RIGHTS

33. Except as specifically provided in this Order, nothing herein shall limit the power and authority of EPA or the United States to take, direct, or order all actions necessary to protect public health, welfare, or the environment or to prevent, abate, or minimize an actual or threatened release of hazardous substances, pollutants or contaminants, or hazardous or solid waste on, at, or from the Site. Further, nothing herein shall prevent EPA from seeking legal or equitable relief to enforce the terms of this Order, from taking other legal or equitable action as it deems appropriate and necessary, or from requiring the Respondent(s) in the future to perform additional activities pursuant to CERCLA or any other applicable law. EPA reserves the right to bring an action against Respondents under section 107 of CERCLA, 42 U.S.C. section 9607, for recovery of any response costs incurred by the United States related to this Order or the Site and not reimbursed by Respondents.

X. OTHER CLAIMS

34. By issuance of this Order, the United States and EPA assume no liability for injuries or damages to persons or property resulting from any acts or omissions of Respondents. The United States or EPA shall not be deemed a party to any contract entered into by the Respondents or their directors, officers, employees, agents, successors, representatives, assigns, contractors, or consultants in carrying out actions pursuant to this Order.

35. This Order does not constitute a pre-authorization of funds under section 111(a)(2) of CERCLA, 42 U.S.C. § 9611(a)(2).

36. Nothing in this Order shall constitute a satisfaction of or release from any claim or cause of action against the Respondents or any person not a party to this Order, for any liability such person may have under CERCLA, other statutes, or the common law, including but not limited to any claims of the United States for costs, damages and interest under section 106(a) and 107(a) of CERCLA, 42 U.S.C. § 9606(a) and 9607(a).

XI. MODIFICATIONS

37. Modifications to any plan or schedule may be made in writing by the OSC or at the OSC's oral direction. If the OSC makes an oral modification, it will be memorialized in writing within 5 days; provided, however, that the effective date of the modification shall be the date of the OSC's oral direction. The rest of the Order, or any other portion of the Order may only be modified in writing by signature of the Assistant Regional Administrator for Ecosystems Protection and Remediation, EPA Region VIII.

38. If Respondents seeks permission to deviate from any approved plan or schedule, Respondents' Project Coordinator shall submit a written request to EPA for approval outlining the proposed modification and its basis.

39. No informal advice, guidance, suggestion, or comment by EPA regarding reports, plans, specifications, schedules, or any other writing submitted by the Respondents shall relieve the Respondents of their obligation to obtain such formal approval as may be required by this Order, and to comply with all requirements of this Order unless it is formally modified.

XII. NOTICE OF COMPLETION

40. When EPA determines, after EPA's review of the Final Report, that all removal actions have been fully performed in accordance with this Order, with the exception of any continuing obligations required by this Order, including continued

enforcement of institutional controls, EPA will provide notice to the Respondents. If EPA determines that any removal actions have not been completed in accordance with this Order, EPA will notify the Respondents, provide a list of the deficiencies, and require that Respondents complete the removal actions outlined in the RAWP. The Respondents shall implement the remaining work outlined in the RAWP and shall submit a modified Final Report in accordance with the EPA notice. Failure by Respondents to complete the work in the RAWP shall be a violation of this Order.

XIII. ACCESS TO ADMINISTRATIVE RECORD

41. The Administrative Record supporting this removal action is available for review at the following address during normal business hours:

United States Environmental Protection Agency
Region VIII, Montana Office
301 South Park
Helena, MT 59626-0096 (406) 441-1150

XIV. OPPORTUNITY TO CONFER

42. Within 7 days after issuance of this Order, Respondents may request a conference with EPA. Any such conference shall be held within 7 days prior to the effective date unless extended by agreement of the parties. At any conference held pursuant to the request, Respondents may appear in person or be represented by an attorney or other representative.

43. If a conference is held, Respondents may present any information, arguments or comments regarding this Order. Regardless of whether a conference is held, Respondents may submit any information, arguments or comments in writing to EPA within 7 days following the conference , or within 7 days following issuance of the Order if no conference is requested. This conference is not an evidentiary hearing, does not constitute a proceeding to challenge this Order, and does not give Respondents a right to seek review of this Order. Requests for a conference, or any written submittal under this paragraph, shall be directed to Andrew J. Lensink, Enforcement Attorney, Legal Enforcement Program, EPA Region VIII, 999 18th Street, Suite 500, Denver, Colorado, 80202, telephone (303) 312-6908.

XV. SEVERABILITY

44. If a court issues an order that invalidates any provision of this Order or finds that Respondents have sufficient cause not to comply with one or more provisions of this Order, Respondents shall remain bound to comply with all provisions of this Order not invalidated or determined to be subject to a sufficient cause defense by the court's order.

XVI. EFFECTIVE DATE

45. This Order shall be effective 20 days after the Order is signed by the Assistant Regional Administrator.

IT IS SO ORDERED

BY: Max H Dodson DATE: 7/22/96

Max H. Dodson
Assistant Regional Administrator
Office of Ecosystems Protection and Remediation
U.S. Environmental Protection Agency, Region VIII

EFFECTIVE DATE: 8/11/96

EXHIBIT A

Mouat Industries Superfund Site
Columbus, Montana
Groundwater Removal Action
Response Action Work Plan

July 1996

Prepared by Jacobs Engineering Group Inc.
For U.S. Environmental Protection Agency
Region VIII, Montana Office
Federal Building
301 South Park, Drawer 10096
Helena, Montana 59626-0096

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MOUAT INDUSTRIES SUPERFUND SITE
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RESPONSE ACTION WORK PLAN

1.0 INTRODUCTION

This Response Action Work Plan (RAWP) is presented as Exhibit A to the Unilateral Administrative Order (UAO) for Conduct of a Non-Time-Critical Removal Action at the Mouat Industries National Priorities List (NPL) Site (U.S. Environmental Protection Agency [EPA] 1996a), which has been directed to Atlantic Richfield Company (ARCO), FMC Corporation, Monte Vista Company, Mouat Industries, Inc., Timberweld Manufacturing Co., and the Town of Columbus, Montana, as the identified potentially responsible parties (PRPs) for the Mouat Industries NPL Site (the Site). This RAWP describes the work to be performed by the Respondents under the UAO, and associated requirements that must be met during the performance of that work.

1.1 PURPOSE AND SCOPE

The purpose of this RAWP is to describe the work to be performed by the Respondents for the Site under the UAO. In general, the work to be performed includes continuance of the existing Town of Columbus zoning restrictions for the Superfund Overlay District (SOD) (Town of Columbus 1995), and a program of groundwater and surface water monitoring to verify that natural attenuation is continuing to be effective in reducing total chromium concentrations in groundwater and surface water at and adjacent to the Site (within the SOD). This RAWP also describes the requirements for sampling and analysis to be conducted as part of the monitoring plan, quality assurance and quality control (QA/QC) procedures to be followed, criteria that must be met before the response action can be completed, and reporting requirements. The work to be performed is intended to implement the Action Memorandum for the Site (EPA 1996b), which was approved on June 21, 1996. The combination of relevant specifications in the UAO, the RAWP, and Standard Operating Procedures (SOPs) to be prepared by the Respondents is intended to meet the QA/QC requirements for the planned non-time-critical removal to be performed by Respondents. Because of the limited work required under the UAO, the requirements stated in the UAO and RAWP, and the information required in SOPs, a separate Quality Assurance Project Plan and Field Sampling Plan will not be required.

1.2 BACKGROUND INFORMATION

The Site is located in the Town of Columbus, Stillwater County, Montana. A municipal golf course is located southeast of the Site. Past activities at the Site included the processing of chromite ore into high-grade sodium dichromate that was sold for use as a corrosion inhibitor at the Hanford Project in Richland, Washington. Process wastes included sodium sulfate solutions that contained sodium chromate and sodium dichromate. Both of these chromium compounds are characterized by the hexavalent oxidation state (Cr VI). Cr VI leached from the sodium sulfate waste piles into the underlying soils and into groundwater. Sodium dichromate spills also occurred during normal operation of the facility, which added to the Cr VI contamination.

As a result of the past chromium ore processing operations at the Site, releases of chromium (in the hexavalent oxidation state) into the environment have occurred. Remediation of chromium-containing soils has been successfully completed; however, groundwater that contains hexavalent chromium in excess of state standards is still present below and downgradient of the site. At the golf course southeast (downgradient) of the Site, contaminated groundwater discharges to the surface at a pond and associated drainage ditches. Hexavalent chromium in the groundwater is apparently reduced to trivalent chromium within the pond and ditch sediments, resulting in entrainment of chromium within the sediments. Chromium concentrations in surface water within the drainage ditches also exceed state standards.

2.0 WORK TO BE PERFORMED

The work to be performed by the Respondents at the Site (the Work) will implement the Groundwater Removal Action documented in the Action Memorandum (EPA 1996b). The Work includes continuance of the existing Town of Columbus zoning restrictions within the SOD, and a program of groundwater and surface water monitoring.

2.1 INSTITUTIONAL CONTROLS

Institutional controls over land use and groundwater use have been established by the Town. A zoning ordinance was approved in March 1995, which created the SOD (Town of Columbus 1995). The ordinance became enforceable in April 1995. Requirements of the SOD are enforced by the zoning authority of the Town. The SOD zoning ordinance includes both land use and groundwater use restrictions. The SOD requirements are summarized below. The entire Ordinance is attached to this RAWP as Attachment A.

The land-use restrictions apply only to the block placement areas and surrounding protective buffer areas (Figure 1). The land-use restrictions are as follows:

- prohibit excavation into blocks of treated soil buried at the Site;
- limit vehicle loads on the graveled portions of the block placement area;
- prohibit any use of the soil-covered block placement area unless those areas are paved or covered with gravel;
- require the property owner to maintain the site cover, drainage facilities, and fences; and
- establish specifications for construction on the block placement area.

The groundwater use restrictions apply to the entire SOD (Figure 1). Those restrictions prohibit new wells or other groundwater extraction systems and prohibit groundwater use from existing wells or other groundwater extraction systems (except for lawn irrigation use, use of the existing golf course pond, and groundwater monitoring). Excavation below the groundwater table within the SOD is also controlled.

As part of the work to be performed, the Town of Columbus will continue to enforce the SOD zoning restrictions until the criteria of Section 5.0 of this RAWP have been achieved and EPA has given written approval to the Town that the SOD groundwater restrictions can be lifted. Lifting of the SOD groundwater restrictions will not apply to the Block Placement Area where groundwater wells, or other extraction/recovery systems, will continue to be prohibited in order to protect the integrity of the Block Placement Area. The SOD ordinance cannot be amended, suspended, or otherwise rendered ineffective without the prior written approval of EPA. Once the criteria of Section 5.0 of this RAWP have been achieved, any written approval by EPA to lift or otherwise modify the SOD groundwater restrictions will **not require** that the SOD groundwater restrictions be lifted or otherwise modified. The Town can continue to enforce the SOD groundwater restrictions, solely on its own authority, even after EPA has granted approval to lift the restrictions.

2.2 GROUNDWATER MONITORING

Groundwater monitoring will be performed semiannually for the duration of the removal action at selected wells. These selected wells are referred to as the Monitoring Plan Well Network. The proposed wells include one upgradient well (RMIS-1), five wells within the plume (RMIS-4, RMIS-6, MIS-11A, MIS-15, and MIS-16), three wells laterally adjacent to the plume (R-1, RMIS-7, and RMIS-9), and three wells near the leading edge of the plume as defined by the groundwater standard of 0.1 milligram per liter (mg/L) (MIS-12, MIS-13, and MIS-14). Figure 2 illustrates the proposed long-term monitoring locations of the Monitoring Plan Well Network. All groundwater samples will be analyzed for total chromium in filtered and unfiltered samples. Proposed sampling procedures and related QA/QC procedures are outlined in Sections 3.0 and 4.0 of this RAWP. The Monitoring Plan Well Network will be sampled semiannually for a minimum of five years.

2.3 SURFACE WATER MONITORING

A surface water sample will also be collected semiannually to evaluate changes in surface water within the golf course ditches. The surface water sample will be collected at the approximate location GDSURF-1 indicated in Figure 3. The surface water sample will be analyzed for both total chromium and Cr VI in filtered and unfiltered samples.

3.0 SAMPLING AND ANALYSIS PLAN

These procedures are intended to provide general guidance for field sampling personnel to prepare for and execute the groundwater and surface water monitoring program at the Site. The objectives of this work are to provide groundwater and surface data of sufficient quality to demonstrate that natural attenuation is continuing to be effective in reducing total chromium concentrations in groundwater and surface water at and adjacent to the Site (within the SOD). The principal data quality objective (DQO) is to provide data suitable for comparison with the criteria for completion of the response action (Section 5.0 of this RAWP). Thus, an appropriate monitoring network, specific analytical methods and reporting limits, sampling procedures, and appropriate quality control and documentation requirements are selected to meet the DQO.

Section 3.0 discusses preparing for and conducting field activities and sampling procedures. Section 4.0 discusses associated QA/QC requirements and procedures. Section 6.0 discusses data management requirements. The various forms, check lists, sample labels, and similar information included in the attached figures and tables were excerpted from Appendix G of the Engineering Evaluation/Cost Analysis (EE/CA) Report (Baker 1996). These or similar forms, check lists, and labels may be used to document monitoring activities. Any alternates to these forms, check lists, or labels that are used should provide essentially the same information as those included with this RAWP.

For the sake of generality, the procedures outlined in Sections 3.0 and 4.0 of this RAWP anticipate that Respondents may contract with an offsite firm to conduct the sampling activities, while also designating local personnel (e.g., Town employees) to coordinate, assist, or perform the sampling activities. In Sections 3.0 and 4.0, the terms "Project Manager," "Field Team Leader," "QA Officer," and "Equipment Manager" refer to personnel of such an offsite firm, while the term "Site Contact" refers to such local personnel. If the sampling activities are to be performed by local personnel (such as Town employees), it is presumed that such personnel have the requisite training and experience to fulfill the requirements of this RAWP. Within 10 days of written request from EPA, Respondents shall provide EPA with acceptable documentation that any or all personnel assigned to the Work have had adequate training in sampling, sample preservation and packaging, sample shipment and delivery, health and safety procedures, QA/QC procedures, and any other activities required by the Work. In addition, within 10 days of a written request from EPA, Respondents shall provide EPA with acceptable documentation regarding the roles, responsibilities, and authorities of the team members (e.g., "Field Team Leader") mentioned in this section, or their functional equivalents. In particular, the "QA Officer" should be independent of the "Field Team Leader" (e.g., by reporting directly to the "Project Manager" or the Project Coordinator defined in the UAO).

Within 20 days of the effective date of the Order to which this RAWP is attached, Respondents will submit for EPA review and comment copies of Standard Operating Procedures (SOPs) for implementing the Work outlined in this RAWP. Such SOPs will be in substantial conformance with the requirements of Sections 3.0 and 4.0 of this RAWP. Respondents shall incorporate all changes to the SOPs recommended by EPA.

3.1 PREPARATION FOR FIELD ACTIVITIES

Preparation for sampling must involve three elements. First, sampling activities must be closely coordinated (both techniques and schedule) with analytical laboratory personnel so that the project activities proceed without uncertainty and delay that can contribute to the loss of sample integrity. Secondly, all necessary equipment and forms must be gathered. Thirdly, all sampling personnel should be thoroughly trained in the operation of all sampling equipment, precautions to avoid sample and bottle contamination, operation of field water-quality testing equipment, record keeping procedures, and other procedures unique to the facility.

The following procedure is to be initiated approximately two weeks before the scheduled sampling trip to Columbus. It is the responsibility of the appointed Field Team Leader to certify that each task has been completed. To ensure that no items have been omitted, a "punch list" of office activities will be used as a basis for directing preparatory activities needed before field activities can occur (Table 1). It will be up to the Field Team Leader, unless otherwise specified, to initial each completed task on the punch list to ensure that no steps are overlooked. The following paragraphs detail the required sampling preparation activities.

3.1.1 Schedule

The Project Manager or Field Team Leader should notify the appropriate Site Contact approximately 14 days before the scheduled sampling trip, provide the Site Contact with the names of the personnel to be involved, and the estimated arrival time of the sampling crew. The Field Team Leader should confirm arrangements and request weather and site conditions information approximately two working days before arriving.

3.1.2 Schedule with Laboratory

The Project Manager or Field Team Leader should notify the laboratory about the scheduled sampling trip approximately 14 days before departure to arrange for the pick-up (or delivery) of the appropriate type and number of sample containers and shipping coolers and to brief laboratory personnel on the anticipated date and time that samples will be delivered. Table 2 is a list of anticipated parameters, volume of sample required, container type, preservative, holding times, analytical methods, and detection levels. The Project Manager or Field Team Leader will specify the anticipated number of sampling sites (13), parameters to be measured at each site and the number of extra bottles needed for QA testing to the laboratory manager so that the proper number of bottle sample preservations and shipping containers are prepared. Additionally, the Project Manager or Field Team Leader must specify the quantity of laboratory-supplied distilled and deionized water (needed for preparing field blank samples) to the laboratory manager. After sample bottles and shipping containers are received, it is the Field Team Leader's responsibility to check that the proper type and number of containers have been supplied.

3.1.3 Assemble Equipment

The Project Manager or Field Team Leader then must assemble all necessary equipment. Table 3 is a checklist that can be used to help in assembling equipment for sampling at the site. The equipment checklist must be completed by the Field Team Leader in preparation for each sampling round. This checklist should be updated as appropriate.

3.1.4 Prepare Meter Calibration

Field meters to be used during sampling, specifically the field thermometer, pH, specific conductance and turbidity meters, must be checked against laboratory meters to ensure proper calibration and precision response. The Equipment Manager (or designated alternate) will perform this activity. In addition, pH buffer solutions, specific conductance standard solutions, and turbidity standard solutions to be used to field calibrate the field meters must be laboratory tested to ensure their accuracy. The preparation date of standard solutions must be clearly marked on each of the containers to be taken into the field. Appropriate new batteries must be purchased and kept with the meters to facilitate immediate replacement when necessary in the field. Other spare equipment needs are listed in Table 3.

3.1.5 Test Equipment Operation

Each piece of equipment to be used during the field sampling must be examined to certify that it is in operating condition. This includes checking the manufacturers' operating manuals to ensure that all maintenance items are being observed. Field notes from previous sampling trips should be reviewed so that any prior equipment problem notations are not overlooked and so all necessary repairs to equipment have been carried out.

3.1.6 Assemble Forms and Log Book

The Project Manager or Field Team Leader must assemble all necessary forms including the field log book (or field log form), field activities trip report form (Table 4), chain-of-custody records (Figure 4), and sample analyses request forms (Figure 5). The field log book is a bound, consecutively paginated notebook used to record field data measurements and observations. Along with the chain-of-custody and sample analyses request, it serves as the permanent record of data collected during the sampling trip. Field forms may be used in lieu of a field log book. Use of a master field log book that cross-references the other individual forms used in the field is preferred. In this way, the master field log book would describe the information (e.g., field meter calibration data) that is detailed on the other forms, without duplicating the information on the cross-referenced forms. The field log book and other forms should be filled out as completely as possible before mobilization to the field. Entries into the field log book or field forms must be made in waterproof ink.

3.1.7 Label Bottles

To minimize delays in the field and serve as a check on the completeness of the sample containers that were provided by the laboratory, bottles should be prelabeled in the office to the extent possible. Before the sampling trip, sample bottle labeling will be accomplished using preprinted sticky-back labels. The information that will be given on the label will include the site name, a sample number, analyses requested, preservative, date and time of sample collection, company affiliation(s) and telephone number(s) of sampler(s), and the sampler's initials. The specific well will not be identified. After the labels have been marked, they will be taped over with clear tape to prevent the label from peeling off due to contact with water and ice in coolers. The field log book or field form will contain the cross-reference of sample number versus monitoring well number.

Sample bottles shall contain the appropriate preservative(s) before departing the laboratory. The Laboratory Manager shall coordinate this so that sample containers are sealed and also labeled as containing the proper preservative. Alternatively, the laboratory may provide preservatives in premeasured vials, so that a proper quantity of preservative can be added to the sample while onsite.

3.1.8 Review Sampling Procedures

Within one week before the scheduled sampling trip, the Field Team Leader or Project Manager will assemble the field sampling crew and review the requirements of this manual and sampling procedures to be used. Before this meeting, the Project Manager and Field Team Leader shall review and discuss previous sampling trips to the facility and identify areas of concern or techniques to be used at the site.

3.1.9 Prepare Activities Punch List

The final step in the preparatory activities procedure will be for the Project Manager and Field Team Leader to review the Pre-Field/Office Punch List (Table 1) and the Field Team Leader to sign and date this form. The punch list will then be placed in the project files.

3.2 GROUNDWATER AND SURFACE WATER SAMPLING

The sampling procedure and sequence to be followed at the Site are summarized below. Note that all field measurements and observations must be entered into the field log book or field log form in waterproof ink while at each well. Plastic sheeting will be placed on the ground at the well head before initiating sampling activities.

3.2.1 Data Records

Information recorded at each sampling site will vary, but shall, at a minimum, contain the following details:

- sampling date and time;
- sampling location and identification number;
- legibly printed names of field crew present at the site, including company affiliation(s) and telephone number(s);
- brief description of weather conditions;
- measured well depth (for groundwater samples);
- measured groundwater levels (for groundwater samples);
- well evacuation and pumping details (for groundwater samples);
- estimate of stream depth and flow rate (for surface water samples);
- the following field water-quality measurements:
  - pH;
  - specific conductance;
  - turbidity; and
  - water temperature;
- sampling remarks and observations, such as color and odor of sample;
- documentation of QA/QC sample collection (e.g., field blank and duplicate samples);
- field meter calibration records;
- deviations from approved procedures, reasons for deviation, and corrective actions to avoid further deviations (if needed);
- sample preservatives;
- required parameters, detection levels, and analytical methods;
- sample shipping and custody details; and
- other pertinent information.

These data will be recorded in the field log book, field log form, or on the various forms provided herein (i.e., Table 4 and Figures 4, 5, and 6).

3.2.2 Calibration and Use of Field Meters

All field meters should be calibrated in accordance with the appropriate instructions in the operation manuals. Copies of the operation manuals shall be provided for EPA review and approval along with the SOPs noted in Section 3.0 of this RAWP. The following briefly describes typical requirements for calibration of pH, specific conductance, temperature, and turbidity meters. Calibrations must be performed and recorded **before** making any sample measurements. Specifications for the range and accuracy of field meters are guidelines only. Meters with alternate ranges and accuracies may be approved by EPA.

The pH meter should have a range of zero to 14 standard units (SU) and an accuracy of 0.1 SU. The pH meter standardization must be conducted at least once each day using three different pH buffer solutions (e.g., 4.0, 7.0, 10.0 buffers). In addition to the daily standardization with three buffers, the meter also needs to be rechecked throughout the day against a single buffer (typically the 7.0 buffer) near the expected pH of the samples. This will help monitor drift of the meter. This check against a single buffer should be performed before using the meters at each sampling location (monitoring well or surface water location). The probe must be rinsed thoroughly between buffer measurements with distilled water and again after the check is completed. The source and pH of the buffer solutions that were used must be recorded in the field log book or on field forms. The pH meter standardization will be checked before use on a water sample by selecting a pH buffer solution in the expected pH range of the well water samples and taking a measurement. If the reading deviates from the known value of the buffer by more than 0.1 SU, the instrument will be restandardized as described above. If unacceptable deviations still occur, the operating manual will be consulted for the remedial course of action.

The specific conductance meter shall have a range of zero to 5,000 micromhos per centimeter (μmhos/cm) and an accuracy of 0.5 percent of the maximum reading. The specific conductance meter is less likely to exhibit random fluctuations and will only require a daily check against a standardized solution. Note that the specific conductance is temperature-dependent; therefore, meter readings must be corrected to 25 degrees Celsius (° C) unless the meter used provides internal temperature compensation. Correction factors are included as Table 5, Specific Conductance Conversion Table, and can be applied to YSI S-C-T type meters or their equivalent. The probe must be thoroughly rinsed with distilled water after each reading. In addition to daily checks of the conductivity readings, the temperature readings must also be checked daily. This is accomplished by taking a temperature reading of the standard solution with both the conductivity probe and a mercury thermometer. The temperature thermistor shall have a range of -2 to +50° C and an accuracy of 0.1° C.

The turbidity meter shall have a range of zero to 500 nephelometric turbidity units (NTU) and an accuracy of 1 NTU. The turbidity meter may require primary and secondary calibration steps. The primary calibration should be done before entering the field using "primary standards." The Equipment Manager or designated alternate should perform these activities in accordance with the manufacturer's instructions. Secondary calibration steps will be conducted in the field in accordance with manufacturers' instructions. Secondary calibration should be performed before using the meters at each sampling location. The meter should not be used if temperatures are at the freezing point of water. The field standards must not be allowed to freeze. If required by the manufacturer's instructions, secondary calibration will require that the same standards be used that were used during the primary calibration. Some meters may require a zero calibration with distilled or deionized water and a span calibration with a prepared standard. These calibrations should be performed as both primary and secondary calibrations as described above.

Before using the meters at each sampling location, double-check the "range" settings on the meters before recording each reading, and record the temperature of the sample for adjustment of specific conductance to 25° C. Record pH values to the nearest one-tenth of an SU, temperature to the nearest one-tenth of a degree Celsius, turbidity to the nearest two significant digits NTU, and specific conductance in µmhos/cm to two significant digits (after conversion to 25 °C). Convert the specific conductance readings to 25° C using Table 5 unless the meter used provides internal temperature compensation. Samples should be warmed to a temperature above 10° C (if necessary) before making any specific conductance readings.

3.2.3 Water Level and Well Depth Measurements

The following procedures describe the data needed to estimate purge volumes before the well is sampled and to provide guidelines for QA/QC:

1. Before mobilization, batteries should be checked for charge in all meters and meters should be checked for defects and any possible need for repair.
2. Rinse the probe and electric "tape" (or wire) of the water level meter with distilled water (this should be performed before the first well and after each measurement).
3. While holding the electric water level meter reel atop the well casing, lower the probe gradually into the well until the indicator shows contact with the water surface (*depending on the unit, this could be a light, alarm, or both*).
4. When the alarm sounds, note the reading where the tape meets the top of the surveyed casing (TOC) to the nearest hundredth of a foot (0.01 feet).
5. Draw the probe a few feet up the well casing and repeat steps 3 and 4 until a reliable reading is obtained and record this reading in the field log book or form.
6. To locate the well bottom for volumetric purge calculations, lower the water level probe or weighted tape measure slowly down the middle of the well casing.
7. When the probe is felt to hit the well bottom, or the tape slacks noticeably, draw the tape up slowly until it is taut again.
8. Note the reading on the tape (to the nearest 0.1 feet) at TOC when the tape is taut at the well bottom. If a water level probe is used for the depth measurement, determine the distance from the bottom of the probe to the measuring point on the probe. Add this distance to the total depth.
9. Record this value in the field log book or form and rinse the weighted tape and/or probe with distilled water after removing it from the well.
10. Subtract and record the difference in feet between total well depth (including stickup) and depth to groundwater (including stickup) to determine "saturated column thickness" in the well.

3.2.4 Field Data Measurements and Well Purging

Remove stagnant water contained in the well casing. Purging and sampling should generally be conducted using dedicated discharge tubing and a peristaltic or other appropriate pump, or as otherwise appropriate (e.g., residential well pumps and piping). Turbidity, pH, specific conductivity, and temperature measurements will be taken throughout the purging period. Purging will continue until: (1) successive pH values vary no more than 0.1 SU, (2) specific conductivity and turbidity vary less than 10 percent, (3) temperature varies less than 1 °C, and (4) at least three well volumes have been purged. Stabilization of purge parameters will be demonstrated over the end points of successive saturated borehole volumes with readings recorded after approximately each borehole volume is evacuated. When the purging criteria are satisfied, sampling will proceed. If field parameters have not stabilized after three borehole volumes have been purged, two additional borehole volumes will be purged before sampling proceeds. Readings of field parameters will continue to be recorded after approximately each borehole volume is evacuated.

At a minimum, three well volumes will be evacuated before sampling with the pump, using the following formula:

$$V=X\,(D - M)$$

Where:

V = Volume in gallons (3 well volumes)

D = Total well depth (in feet) below the top of the casing

M = Depth (in feet) to water below the top of the casing

X = Multiplication factor

= $[(3)(7.48)\pi/144][r_c^2 + n(r_w^2 - r_c^2)]$, where r_c is the well screen radius in inches, r_w is the borehole radius in inches, and n is the porosity of the well filter pack.

In the case of very slow recharge wells, the wells will be completely evacuated one time before sampling. Sampling will proceed when the well recovers sufficiently. Purge water will be containerized and properly disposed of as described in Section 3.5 of this RAWP. Take field measurements for each purge sample of turbidity, pH, specific conductance and temperature, following manufacturers' instructions. Use wide-mouth containers (rinsed thoroughly with well water) or alternate sample container. Record values in the log book or on a form such as the groundwater monitoring data sheet (Figure 6).

3.2.5 Groundwater Sample Collection

Sampling will be accomplished immediately after purging directly from the pump discharge or bailer. Samples collected with the pump will be collected directly from the discharge hosing and placed into the prelabeled/preserved bottles. Samples collected with the pump that require filtering (for dissolved metals only) will be filtered through new in-line 0.45 micron filters, and the filtered water will be placed directly in the appropriate bottles (except that the first portion of filtered water will be discarded to rinse the filter). If in-line filters are not used, the filtration will be accomplished as discussed below.

For wells that are sampled with a bailer, samples will be placed directly into the prelabeled/preserved bottles by pouring the water directly from the bailer or by using a bottom-emptying device for the bailer. Also, an appropriate number of decontaminated, large glass or plastic bottles will be filled and used for temporary holding so that filtering (for dissolved metals) may be accomplished as soon as possible in the field. These temporary field bottles will be thoroughly decontaminated before use, using steps described in Section 3.2.7. Lastly, these temporary bottles will be rinsed with the well water before filling. Waste decontamination and rinse water will be disposed of as described in Section 3.5 of this RAWP.

After sample collection, the contents of the temporary containers (collected from slow recharging wells) must be filtered. It will be essential that access to an electrical outlet or an electric generator be available so that the sample filtration process can be conducted using a peristaltic pump and in-line filter. Water that was temporarily placed in the bottles will be pumped out of the bottles through a new in-line 0.45-micron membrane filter and placed in the appropriate preserved sample containers (except that the initial filtered water will be discarded). The peristaltic pump hosing (for those wells not having dedicated hosing) or bailer will be decontaminated between samples using methods described in Section 3.2.7 of this RAWP. Alternate methods of filtering samples may be proposed in the SOPs, as long as samples are filtered through a 0.45 micron filter.

Only samples submitted for dissolved chromium analyses will be filtered. All other analyses (total chromium) will be performed on unfiltered samples.

3.2.6 Surface Water Sample Collection

A grab sample will be collected by immersing a pond dipper, weighted sampler, or glass or nalgene beaker directly into the water of the ditch, near midstream. Care shall be taken to minimize sediment disturbance while collecting surface water samples. Sample bottles or beakers that do not contain preservatives shall be rinsed at least once with the water to be sampled before collecting the sample. Measurements for temperature, pH, turbidity, and specific conductance shall be collected immediately after collecting the sample for laboratory analyses.

3.2.7 Sample Storage

All sample containers, except preserved metals bottles, must be immediately put on ice after filling and kept at approximately 4° C until analyzed. Samples should be stored in accordance with custody procedures (Section 4.2).

3.2.8 Decontamination

Decontamination will be required for all nondedicated sampling equipment that comes in contact with the samples, using the following steps:

1. Wash with a solution of distilled water and a nonphosphate detergent such as Alconox, Liquinox, or equivalent.
2. Rinse with distilled water.
3. Rinse with dilute nitric acid.
4. Rinse at least three times with distilled water.

Waste decontamination water will be disposed with the purge as described in Section 3.5 of this RAWP.

3.3 POST-SAMPLING ACTIVITIES

The post-sampling activities center around delivering samples to the laboratory for analysis, and placing the necessary documentation of the sampling trip in the project files. In addition, sampling equipment and field meters must be properly stored and any required maintenance and/or repairs performed.

3.3.1 Delivery of Samples to the Laboratory

After the samples have been collected, it is the responsibility of the Field Team Leader to arrange their delivery to the laboratory and ensure that the proper chain-of-custody is documented.

Samples should be properly packed in coolers or other shipping containers to prevent breakage during transport handling. Additionally, ice used to cool samples should be placed in garbage bags before the samples are placed in the coolers to limit the amount of moisture in contact with the bottle labels. Because samples will be invalidated if custody seals are not intact, it is a good precaution to put the samples into a heavy-duty plastic bag (e.g., clean garbage bag) liner in the shipping container and also seal this bag with a signed and dated custody seal. Then, if the seals on the outside of the shipping container are inadvertently damaged during shipment, an intact liner bag and custody seal would still provide evidence of sample custody. Shipping containers must either be locked or sealed securely with fiber tape, duct tape, or other appropriate means to prevent tampering and avoid accidental opening during transit. Additionally, signed and dated custody seals should be placed over the shipping containers if they are not in the custody of the sampling crew or the laboratory (e.g., if the samples are shipped via overnight express air freight).

The samples will be transported by one of two methods. They may be shipped via overnight express air freight or by land transport, in sealed coolers containing ice. The original copy of the chain-of-custody form and sample analyses request will be placed within one of the coolers in a waterproof bag if shipped in this manner. Alternately, the samples will be transported directly to the laboratory by the sampling or laboratory personnel. On delivery, date and time of custody transfer will be recorded along with the temperature of the cooler contents. The original copy of the custody form and analyses request sheet will remain with the samples until completion of analyses. The mode of sample transport selected for surface water samples shall ensure that the 24-hour holding time limitation for hexavalent chromium analyses can be met.

The Field Team Leader must contact the Laboratory Manager and provide him (or her) with the way bill number and expected date and time of the arrival of shipped samples. The Field Team Leader must also inform the Laboratory Manager as to the expected time of delivery for samples transported to the laboratory directly by the sampling team.

3.3.2 Record Keeping

Upon returning to the office, the Field Team Leader must take the following actions:

- Check the accuracy of all field calculations (e.g., groundwater elevation and specific conductance).
- Provide copies of the field log book pages or forms for the project file and Project Manager. The field log book must be stored in a secure area for safekeeping.
- Photocopy the Field Activities Trip Report and provide copies to the Project Manager. The original copy must be placed in the project files.
- Copies of the chain-of-custody record and sample analyses request plus the way bill or other transfer documents must be placed in the project files. Copies will also be provided to the Project Manager. The original chain-of-custody form and sample analyses request must also be placed in the project files, when received from the laboratory.

3.3.3 Equipment Maintenance

After transport from the site, sampling gear and any other equipment used must be checked to ascertain its condition. All necessary repairs and maintenance items as specified by the equipment operating manual must be pursued as soon as possible after return to the office. The Field Team Leader must prepare a list of items to be addressed before the sampling equipment is ready to be taken into the field again with the recommended course of action necessary to prepare the equipment for the next trip. Particular attention must be taken to replenishing expendable supplies and replacing spare parts used during the trip. The Field Team Leader and/or Equipment Manager will be responsible for overseeing equipment repair and replacement activities.

3.3.4 Field Activities Trip Report

The Field Activities Trip Report is to be used to record new developments at the Site, note observations and sampling problems, and serve as an agenda for discussions between the Site Contact (or other appropriate personnel) and the Field Team Leader. The report also should be reviewed by the Field Team Leader and Project Manager in preparation for the next sampling trip (see Section 3.1.8). Table 4 is the Field Activities Trip Report form.

If the Project Manager and Field Team Leader determine that significant changes (i.e., changes that may affect the quality/usability/interpretation of the data) to the SOPs are required, the proposed changes must be submitted to EPA for approval no less than 30 days before the sampling round in which changes are proposed to be implemented.

3.4 ANALYTICAL REQUIREMENTS

Groundwater samples will be analyzed for total chromium by Method SW7191. Surface water samples will be analyzed for total chromium by Method SW7191 and for hexavalent chromium by Method SW7196. For surface water samples, trivalent chromium will be estimated as the difference between total and hexavalent chromium. Requirements for sample volume, containers, preservation, detection limits, and holding times are summarized in Table 2. Respondents will contract with an appropriate analytical laboratory capable of performing the required analyses, achieving the detection limits, and meeting the holding-time requirements, subject to the conditions of Section VI, Paragraph 29(b)(1) of the UAO..

3.5 WASTE MANAGEMENT

During the field activities to be conducted under this RAWP, two types of waste materials will be generated: (1) purge water during sampling from monitoring wells and (2) liquid wastes from decontamination of equipment. These waste materials must be properly stored in an appropriate container with appropriate labeling (e.g., dated) until receipt of analytical data from the monitoring program. Based on the analytical and QA data, the containerized wastes will be classified as either hazardous or nonhazardous according to Resource Conservation and Recovery Act (RCRA) Subtitle C. Waste storage and handling must be performed in compliance with all applicable local and federal regulations in accordance with Section VI, Paragraphs 29(f) and 29(g) of the UAO. For example, regulations regarding maximum storage time must be observed.

4.0 QA/QC REQUIREMENTS

QA/QC requirements for the Work shall be consistent with those specified for Definitive Data according to *Data Quality Objectives Process for Superfund* (EPA 1993). This data category is generally consistent with the older data use objective QA3 in *Quality Assurance/Quality Control Guidance for Removal Activities* (EPA 1990) and EPA Contract Laboratory Program (CLP) Level IV data (EPA 1994). The QA/QC requirements specified and referred to in this RAWP are generally consistent with requirements for all three data categories, although they are intended to ensure consistency with the Definitive Data category. Additional site-specific requirements for the Work are described below.

4.1 QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

Only one equipment rinsate blank will be taken during each sampling event, because most wells will have dedicated sampling equipment. This sample will be taken to ensure proper decontamination techniques were used to clean nondedicated sampling equipment between monitoring well sites. The analytical laboratory will provide an adequate supply of distilled and deionized water to prepare the equipment rinsate samples. After decontamination of the sampling equipment, the distilled and deionized water will be taken through all sampling steps (i.e., contact with the appropriate sampling equipment, filtering, preservation, and analysis).

A duplicate sample (one for every 10 groundwater or surface water samples) will also be collected (as appropriate) at one or more of the sampling locations and will be used as a check on the variability of the laboratory analyses. Because 12 groundwater samples and one surface water sample will be collected each sampling round, three duplicate samples (two groundwater and one surface water) will be required for each sampling round for filtered samples and three duplicate samples (two groundwater and one surface water) will be required for unfiltered samples. The laboratory will be unaware which samples are the duplicate samples, because samples are only identified with an arbitrary sample number and not a well number. Any duplicate sample must be prepared using equivalent proportions of water as found in the original sample, and should be taken from as near the same general subsample of water that was used for the original sample, as practical.

The analytical laboratory will require additional sample volumes for internal QC requirements, such as matrix spike analysis, as specified by the analytical methods being implemented. The field team will need to coordinate with the laboratory to define the volumes, labeling, and frequency of collection of samples for such internal QC. For example, it may be appropriate to merely ensure that enough volume of each sample is collected for sufficient volume to remain after sample analyses for QC purposes. On the other hand, the laboratory may require that separate samples be collected. The collection of such samples for QC analyses should be described in the SOPs required by Section 3.0 of this RAWP, or described in the changes to SOPs required by Section 3.3.4 of this RAWP.

4.2 CHAIN-OF-CUSTODY RECORDS

Chain-of-custody records must be completed at the time of sampling (see Figure 4). The following chain-of-custody procedure must be implemented by the Field Team Leader to ensure sample integrity. The chain-of-custody form and sample analyses request form document specific details concerning numbers and types of bottles obtained for each sample; sample preservation details; scheduling and personnel involved; custody details; and analyses requested. Figures 4 and 5 are examples of a custody form and analysis request form, respectively. Additionally, signed and dated custody seals should be placed over the shipping containers if they are not in the custody of the sampling crew or laboratory (e.g., if the samples are shipped via overnight express air freight).

4.2.1 Custody Definition

The samples are under custody of the Field Team Leader when one of the following conditions exists:

- They are in his (or her) possession.
- They are in view after being in possession.
- They are locked up or sealed securely to prevent tampering.
- They are in a designated secure area.

4.2.2 Custody Transfer

When samples are transferred in possession, the individuals relinquishing and receiving will sign, date, and note the time on the form. Also, individuals receiving the sample shipping containers should note whether the custody seals on the shipping containers and any interior liners have been broken. If the seals are broken, it should be determined who was responsible for the breakage and why the seal was broken. If the seals are broken, the samples will be invalidated and resampling will be required.

If samples are shipped, the Field Team Leader will note the method of shipment and courier name in the custody transfer section of the form. The Field Team Leader will keep a copy of the way bill and attach it to his (or her) copy of the custody form, to be placed in project files on return of the sampling crew to the office.

4.2.3 Chain-of-Custody Form Copies

The original of the chain-of-custody form and analysis request form must accompany the samples at all times after collection. A QA review of the documentation will be conducted in the field by the Field Team Leader or designate. Any mistake will be corrected by the sampler by making a line through the mistake and printing the correct information next to it. The sampler will also initial and date the correction. A black waterproof pen will be used on all sample documentation. If the sample documentation is acceptable, the samples will be shipped to the laboratory or will be kept by the samplers for field tests. The Field Team Leader must keep a copy of the forms and place them in the project file immediately after the crew returns to the office along with the field log book duplicate pages or copies of the field log form and the Field Activities Trip Report. A copy of the documents must also be provided to the Project Manager for review. After completion of the analyses, the original is to be returned by the laboratory (along with the analytical results) to the Project Manager for inclusion into the project files.

4.3 QUALITY ASSURANCE OBJECTIVES FOR MEASUREMENT DATA

The overall QA objective for this monitoring program is to ensure that the decisions based on laboratory analytical data are technically sound, statistically valid, and properly documented. To meet the project objectives specified in Section 3.0 of this RAWP, specific QA/QC protocols will be executed and are described for all activities related to the collection of groundwater and surface water samples, the analyses of these samples, and the handling of data generated during the program.

As required by Section VI, Paragraph 29(c)(5) of the UAO, the laboratory analyses will be performed by a laboratory that participates in a QA/QC program that complies with the appropriate guidance, in particular the QC and reporting requirements of EPA's CLP Inorganic Statement of Work (EPA 1992). The use of actual CLP forms will not be required, as long as essentially the same information is reported. Analytical data will be generated using EPA, ASTM, or other standard methods. A copy of the laboratory QA plan will be provided for EPA review and approval along with the SOPs required in Section 3.0 of this RAWP.

The statistical acceptance criteria for the specific analyses used will be expressed in terms of precision, accuracy, representativeness, comparability, and completeness. These terms are defined below.

Accuracy and precision control limits will be established by the laboratory and will be unique to the laboratory performing the analysis. The laboratory-established control limits will be evaluated at regular intervals, and scheduled control measurements will be taken to detect trends and out-of-control values. The laboratory will maintain records of these activities. EPA CLP or method-specified control limits are unacceptable substitutes for laboratory-generated control limits, except when the laboratory limits are outside the method-specified limits. However, the laboratory must be in the process of performing corrective actions to bring their limits within those of the published method.

4.3.1 Precision

Precision is defined as the degree of agreement between repeated measurements of the same parameter under prescribed, similar conditions. Precision, therefore, represents the repeatability of the measurement. The precision of a series of measurements can be expressed in terms of relative percent difference (RPD). Precision between duplicate values is determined by calculating the RPD between the duplicates.

The RPD will be calculated as follows:

$$RPD = (D1 - D2)/([D1 + D2]/2) \times 100$$

where:

RPD = relative percent difference;
D1 = first duplicate value; and
D2 = second duplicate value.

Precision will be assessed by analyzing laboratory duplicates and field duplicates; determining the RPD; and comparing the RPD with the acceptance criteria presented in the QC requirements for the analytical method. The RPD for field duplicates should be less than or equal to 25 percent.

4.3.2 Accuracy

Accuracy is the measure of the degree of agreement between an analyzed value and the true or accepted value, where it is known. For the purpose of this RAWP, accuracy will be statistically represented by calculating percent recovery (% R) of a known standard added to the sample of interest.

Percent recovery will be calculated as follows:

$$\% R = (Q_d/Q_a) \times 100$$

where:

$\% R$ = percent recovery;
Q_d = quantity determined by analysis; and
Q_a = true or accepted reference quantity or value.

Laboratory accuracy will also be assessed through analyzing laboratory QC data such as instrument calibration verification standards, laboratory control samples, matrix spiked samples, surrogate spiked samples, and performance evaluation QC check samples. The degree of accuracy depends on the sample matrix, method of analysis, sample preparation method, and the analyte being determined. The analytical laboratory will perform all analyses within the prescribed limits of accuracy specified in the analytical method. True values for field tests such as pH, specific conductance, turbidity, and temperature are not known for the particular matrices and specific sampling locations for the program. Therefore, the accuracy of the data produced by field instruments will be maintained and documented by performing proper instrument calibration in accordance with manufacturers' instructions.

4.3.3 Representativeness

Samples collected during monitoring activities will represent the population from which they were collected. Representativeness is defined as the degree with which the data collected accurately and precisely characterize a population, a parameter of interest, variations at a sampling point, or a process or an environmental condition.

Sampling protocols are developed to ensure that samples collected represent the media. Sample handling protocols (e.g., storage and transportation) are selected to protect the representativeness of the collected sample. Measurements will be made so that results are as representative of the media (groundwater and surface water) and conditions being measured, as possible. Proper documentation will establish that protocols have been followed and sample identification and integrity are ensured.

4.3.4 Comparability

Comparability, as used within this RAWP, is the confidence with which one data set can be compared with another. Each value reported for a given measurement should be similar to other values within the same data set and within other related data sets.

To help ensure data set comparability, the following steps and similar actions have been outlined in this RAWP:

- Instruments will be operated within their calibrated range, and appropriate analytical methodologies will be used. Analyses will be performed using EPA and ASTM methods.
- Techniques used to collect samples in previous studies will be implemented when possible.
- Data will be reported in conventional and standard units (mg/L).

4.3.5 Completeness

Completeness, as it pertains to the laboratory and for the purposes of this RAWP, is defined as the ratio of the number of valid sample results to the total number of samples run with a specific analysis and/or on a specific matrix. In terms of sampling protocols, completeness is the ratio of the number of valid samples collected to the total number of samples required to be representative.

Completeness is expressed as a percent of the overall data that were generated and is calculated as follows:

$$C = (V/T) \times 100$$

where:

C = percent completeness;
V = number of measurements judged valid; and
T = total number of measurements.

Laboratory completeness will be based on the total number of samples that are analyzed under controlled conditions that met the EPA CLP or laboratory-established precision and accuracy objectives, as applicable. Data produced by the laboratory should achieve completeness of greater than or equal to 80 percent.

Section 3.0 of this RAWP describes specific field procedures to ensure the completeness of field-collected samples. Field QC samples, including trip blanks and decontamination rinsate blanks, will be collected to verify that sampling and decontamination procedures are not introducing trace constituents of concern.

4.4 QA/QC DATA REVIEW AND DATA VALIDATION

The laboratory will be responsible for performing adequate internal QA/QC sample analyses, according to analytical method requirements and the laboratory QA plan, in conjunction with completing analyses of actual site samples. The Field Team Leader or Project Manager always will carefully review the field duplicate results to confirm that original and duplicate sample results are similar (as should be expected) and to detect extraneous contamination (if any) in the field blanks that may impact the data. Some analytical data and supporting documentation will also be submitted to an independent third party for formal data validation. Data validation will be consistent with that specified in the National Functional Guidelines for Inorganic Data Review (EPA 1994).

Formal data validation by a third party will be required for the first two rounds of sampling, and the second round of sampling in the fifth year of monitoring. For all other sampling rounds, the supporting data necessary to perform validation will be archived and the data archival will be addressed in the Respondents' SOPs. Additional data validation, using the archived information, will be performed as directed by EPA.

Any suspected problems will be immediately discussed with the laboratory and all possible corrective measures and checks taken. Additionally, the Field Team Leader or Project Manager will check the results of the data validation report.

4.5 PERFORMANCE AND SYSTEM AUDITS

Performance and system audits for sampling and analysis may be conducted. Audits may include a review of field and laboratory QA systems and onsite review of equipment for sampling, calibration and measurement. Audits may evaluate the capability and performance of project personnel, items, activities, and documentation. The audits will ensure and document that QC measures are being used to provide data of acceptable quality, and that subsequent calculations, interpretation, and other project outputs are checked and validated. The QA Officer or designee will conduct system and performance audits. The QA Officer or designee will audit fieldwork and review the project documentation.

QA audits will be conducted at the request of the Respondents or EPA. A written report of a QA project audit will include the following:

- an assessment of project team status in each major project area;
- clear statements of areas requiring improvement or problems to be corrected;
- recommendations and assistance regarding proposed corrective actions or system improvements; and
- a timetable for any corrective action required.

The QA Officer will be responsible for the coordination of audits and the disposition of audit records. Respondents will provide an SOP for conducting audits that describes the type of work oversight activities that will be performed for the data collection activities; the persons or functional positions who will perform the oversight activities and the standards they will review against (e.g., the RAWP and SOPs); the authority of the overseeing person or position for corrective action; and the degree of independence of the overseeing person or position. Most oversight activities will involve checking for compliance of activities as implemented with approved plans (the RAWP and associated SOPs).

During a systems audit, if requested, the entire QA process will be evaluated. The project or field team organization will be reviewed for compliance with the proposed organization and clarity of assigned responsibility. Qualifications of personnel assigned to the project will be reviewed to ensure that assigned responsibility, skill, and training are properly matched. A systems audit may be conducted on all components of measurement systems to determine proper selection and use. The systems audit includes evaluation of both field and laboratory procedures.

During a performance audit, if requested, proper execution of procedures is evaluated. The audit will address whether field equipment and analytical instruments are selected and used to meet requirements specified by the project objectives. Equipment and facilities provided for personnel health and safety may also be evaluated. Calibration procedures for field instruments will also be covered.

A performance audit for oversight of field activities should be performed during one of the first two sampling rounds and any corrections to field procedures should be described in the changes to SOPs required by Section 3.3.4 of this RAWP and implemented during subsequent sampling rounds.

5.0 CRITERIA FOR COMPLETION OF RESPONSE ACTION

The Monitoring Plan Well Network will be monitored semiannually for a minimum of five years, and will continue to be monitored semiannually until both of the following conditions are met:

1. It has been demonstrated that the maximum contaminant level (MCL) for chromium in groundwater (0.1 mg/L total chromium in unfiltered samples) and the Montana numeric water quality standards set forth in Montana Department of Environmental Quality (MDEQ) circular WQB-7 (WQB-7 standards, MDEQ 1995) for chromium in groundwater (0.1 mg/L hexavalent chromium and 0.1 mg/L trivalent chromium in filtered samples) have not been exceeded for a period of three consecutive years. Because neither the hexavalent nor the trivalent chromium concentration can be greater than the total chromium concentration, and because the MCL and WQB-7 standards all have the same numerical values, compliance with the WQB-7 standards can be demonstrated with total chromium data for filtered samples.

2. It has been demonstrated that all remaining wells not included in the Monitoring Plan Well Network but within the SOD do not exceed the MCL for chromium in groundwater and the WQB-7 standards for chromium in groundwater as determined by samples from a single sampling round after the conditions of Item 1 above are met.

If the conditions of Items 1 and 2 above have been met after the initial five years of monitoring, the response action objectives for groundwater will have been achieved.

Chromium concentrations in surface water in the golf course pond and ditches exceed WQB-7 standards (0.011 mg/L hexavalent chromium and 0.1 mg/L trivalent chromium) as a result of chromium-contaminated groundwater that discharges into the pond and ditches. When response action objectives are met for groundwater (the MCL for chromium in groundwater and the WQB-7 standards for chromium in groundwater have not been exceeded for a period of three consecutive years), EPA will review chromium levels in surface water to determine whether further action is warranted. If chromium levels in surface water achieve WQB-7 standards as expected, no further response action would be required.

6.0 DATA MANAGEMENT PLAN

Data reduction, validation, and reporting procedures will involve evaluating the laboratory analytical data package. The overall QA goals for the program can only be met if the data generated in the field and by the analytical laboratory can be demonstrated to be valid.

Data validity will be function of both the magnitude of data qualification and overall data quality. That is, nonqualified and estimated (J) data will be considered to be valid, usable data. Data that are rejected (R) because of failure to meet established QC limits or have systematic problems will not be used for any purpose. Those data found to be suspect and outside any acceptable bias will not be used.

6.1 DATA MANAGEMENT

Analytical data will be presented in both hard copy and computer-readable formats. Computer-readable data will be presented with at least the following information for each record:

- sample number;
- sample location;
- date sampled;
- filtration code (yes/no);
- total chromium (mg/L);
- hexavalent chromium (mg/L);
- laboratory data qualifiers; and
- validation data qualifiers.

Hard copies of the data will also be provided with at least the same information as the computer-readable data.

The field team will collect the samples described in Section 3.0 of this RAWP. After the team collects the samples, the sample documentation (field log books, chain-of-custody records, etc.) will be completed as described in Section 3.0. A QA review of the sample documentation will be conducted in the field. Any mistake will be corrected by the sampler by making a line through the mistake and printing the correct information next to it. The sampler will also initial and date the correction. A black waterproof pen will be used on all sample documentation. If the sample documentation is acceptable, the samples will be shipped to the laboratory or will be kept by the samplers for field tests.

6.2 DATA REDUCTION

Data reduction is the process of converting measurement system outputs into an expression of parameters and information from which conclusions about the monitoring program can be made. These processes must be performed accurately, with accepted statistical techniques. All calculations and data entries will be checked in a QA review to maintain the accuracy of this process.

Statistical techniques will be applied to laboratory QC samples to assess the accuracy and precision of the data. The formulas for calculating the precision or RPD, and accuracy or percent recovery, are presented in Section 4.3.1. Accuracy and precision data will be used to determine errors in the analytical data introduced through analytical procedures. This information may be used to determine the probability that the concentration of each analyte in the sample will exceed the action levels.

In addition, the QC field samples (such as equipment rinsate blanks and duplicate samples) will be evaluated to determine any systematic or random errors introduced by field procedures. Respondents must not correct the data based on QC sample results (e.g., matrix spike results), but should only report the corresponding QC sample results along with the field sample results.

6.3 DATA QUALITY ASSESSMENT AND DATA VALIDATION

Data quality assessment and data validation involve reviewing the field records, maintaining proper laboratory record keeping, and assessing the laboratory data. These steps are discussed in the following sections.

6.3.1 Review of Field Records

At a minimum, field records will be evaluated for the following:

- completeness of field records;
- identification of valid samples;
- identification of anomalous field test data; and
- assessment of the accuracy and precision of the field test data and measurements.

The check of field record completeness will ensure that (1) all requirements for field activities have been fulfilled, (2) complete records exist for each field activity, and (3) the procedures specified in program planning documents have been implemented. The results of the completeness check will be documented, and data affected by incomplete records will be identified in technical reports.

Valid samples are identified by interpreting and evaluating the field records to detect problems affecting the representativeness of the samples. Field audit reports are another source of data for review. Judgments of sample validity will be documented in the technical report, and data associated with poor or incorrect fieldwork will be identified.

Anomalous field data will be identified and explained to the extent possible. The assessment of the quality of field measurements will be based on instrument calibration records and a review of any corrective action reports. The accuracy and precision of field measurements will be addressed.

6.3.2 Laboratory Record Keeping

Record keeping requirements for the laboratory are as follows:

- The laboratory will maintain records sufficient to recreate each analytical event conducted. At a minimum, the records will contain the following:
  - chain-of-custody records;

- initial and continuous calibration records including standards preparation traceable to the original material and lot number;
- instrument tuning records, if applicable;
- method blank analyses;
- internal standard results;
- surrogate spiking and results (if required);
- spike and spike duplicate records and results;
- laboratory duplicate records and results (if done);
- raw data including instrument printouts, laboratory bench work sheets and/or chromatograms with compound identification and quantitation reports; and
- other QC samples and results (e.g., ICP interference check standards results, results of matrix quantitation limit studies, and results of blank spiking).

- The laboratory will have written procedures for each analytical method and QA/QC function.
- Analytical results will be reported in mg/l.

An analytical report will be prepared by the laboratory for each sampling round. The analytical report will include a narrative and results (summary and raw data) from analyses of monitoring samples and analyses of QC samples such as calibration standards, method blank, matrix spike, laboratory control spike, laboratory control spike duplicate, and QC check samples.

6.3.3 Assessment of Laboratory Data

As noted in Section 4.4 of this RAWP, formal data validation by a third party will be required for the first two rounds of sampling, and the second round of sampling in the fifth year of monitoring. For all other sampling rounds, the supporting data necessary to perform validation will be archived according to an SOP to be presented according to Section 3.0 of this RAWP. Such supporting data will be consistent with the National Functional Guidelines (EPA 1994).

7.0 REPORTING REQUIREMENTS

The Respondents will report on the Work to be conducted according to this RAWP to EPA and MDEQ on a routine basis. Reporting requirements will include an Annual Report, a Five-Year Report at the end of each five-year period of monitoring, and a Final Report after the criteria of Section 5.0 of this RAWP have been met. The following sections describe the contents of each of these categories of reports.

7.1 ANNUAL REPORT

An Annual Report will be submitted to EPA and MDEQ within 60 days of the completion of the second semiannual sampling event of each year. The annual report will include, at a minimum, the following information:

- tables of all analytical data from samples collected during the year, including both monitoring samples and QA/QC samples;
- electronic data deliverables in accordance with the Data Management Plan (Section 6.0 of this RAWP);
- text describing the results and significance of QA/QC samples, in particular, any out-of-control results, in accordance with the requirements of Section 4.0 of this RAWP;
- contour maps of total chromium concentrations in groundwater for each of the semiannual sampling events;
- cumulative time-trend plots of chromium concentrations in individual monitoring wells, and at the surface-water monitoring location (the time-trend plots will be cumulative from the beginning of the monitoring program instituted under this RAWP); and
- associated narrative describing the data collected during the year, any problems encountered and their solutions, interpretation of QA/QC data, and the rate of approach toward the criteria for completing the response action.

A statement confirming continuation of the SOD will be included, and any administrative activities related to applying or maintaining the SOD will be summarized.

7.2 FIVE-YEAR REPORT

Every fifth annual report will support EPA's five-year review of the response action. Each Five-Year Report will be submitted to EPA and MDEQ within 90 days of the completion of the second semiannual sampling event of the year. The first report will summarize the first five years of data, and provide greater detail on contour maps of chromium concentrations in groundwater, time-trend plots of chromium concentrations in individual monitoring wells and the surface-water monitoring location, and narrative describing the rate of approach to criteria for completing the response action. Each subsequent five-year report (if any are needed) will summarize all data collected from the initiation of the Work until the time of the report. Copies of all monitoring and QA/QC data will be attached as appendices. Cumulative computer-readable data will also be provided.

7.3 FINAL REPORT

After the criteria described in Section 5.0 of this RAWP for completion of the response action have been achieved, a Final Report will be prepared. If the timing of the Final Report does not coincide with a Five-Year Report, the Final Report will follow the format of and provide the same information as a Five-Year Report. However, the Final Report will have separate sections summarizing the action taken to comply with the Order to which this RAWP is attached and demonstrating that all of the criteria of Section 5.0 of this RAWP have been met. In addition, the Final Report will include the cost estimate, certification, and other requirements of Section VI, Paragraph 29(c)(7) of the Order.

8.0 SCHEDULE

Semiannual groundwater and surface water sampling in accordance with this RAWP should be conducted in the late summer-early autumn and the late winter-early spring. The first sampling event should be conducted in September or October 1996, with subsequent sampling events scheduled for approximately every six months thereafter. The Annual Report should be submitted to EPA and MDEQ within 60 days of performance of the spring sampling event each year. Monitoring according to this RAWP will take place for at least five years, from autumn 1996 through spring 2001. The Five-Year Report will be submitted to EPA and MDEQ within 90 days following performance of the spring sampling event in 2001. If the conditions stated in Section 5.0 of this RAWP have been met at that time, the Five-Year Report can be submitted as the Final Report described in Section 7.3 of this RAWP.

9.0 REFERENCES

Baker Environmental. 1996 (May). *Engineering Evaluation and Cost Analysis Report*. Prepared for FMC Corporation.

Montana Department of Environmental Quality (MDEQ). 1995 (December). *Montana Numeric Water Quality Standards*. MDEQ Circular WQB-7.

Town of Columbus. 1995 (March). Town of Columbus, Montana, Zoning Ordinance Section 11.02.190.

U.S. Environmental Protection Agency. 1996a. *Unilateral Administrative Order for Conduct of a Non-Time-Critical Removal Action, In the Matter of: The Mouat Industries NPL Site, Columbus, Stillwater County, Montana, Site No. 65*. EPA Docket No. CERCLA-VIII-96- 22 .

U.S. Environmental Protection Agency. 1996b (June 21). *Enforcement/Action Memorandum: Request for Non-Time-Critical Removal Action at Mouat Industries Site, Columbus, Stillwater County, Montana*. EPA Region VIII.

U.S. Environmental Protection Agency. 1994 (February). *U.S. EPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review*. Office of Solid Waste and Emergency Response. Washington, DC: Publication 9240.1-05-01. EPA/540/R-94/013. PB94-963502.

U.S. Environmental Protection Agency. 1993 (September). *Data Quality Objectives Process for Superfund*. Office of Solid Waste and Emergency Response. Washington, DC: Publication 9355.9-01. EPA540-R-93-071. PB94-963203.

U.S. Environmental Protection Agency. 1992. *USEPA Contract Laboratory Program - Statement of Work for Inorganic Analysis - Multi-Media, Multi-Concentration*. Document ILM02.0 - ILM03.0.

U.S. Environmental Protection Agency. 1990 (April). *Quality Assurance/Quality Control Guidance for Removal Activities*. Washington, DC: Office of Solid Waste and Emergency Response. OSWER Directive 9360.4-01.

TABLE 1

MOUAT INDUSTRIES SITE
COLUMBUS, MONTANA

PRE-FIELD/OFFICE PUNCH LIST
GROUNDWATER SAMPLING

	Task	Initials	Date
1.	Notify Site Representative	______	______
2.	Notify Laboratory	______	______
3.	Assemble Sampling Equipment and Completed Equipment Checklist	______	______
4.	Perform Laboratory Calibrations and Precision Checks of Field Meters	______	______
	a. pH Meter	______	
	b. Conductivity Meter	______	______
	c. Turbidity Meter	______	______
	d. Field Calibration Solutions	______	______
5.	Check Operating Condition and Maintenance Records of Field Equipment	______	______
6.	Assemble Necessary Forms	______	______
	a. Field Log Book or Field Forms	______	______
	b. Field Activities Trip Report	______	______
	c. Chain of Custody	______	______
	d. Analyses Request Sheet	______	______
	e. Preprinted Sample Bottle Labels	______	______
7.	Receive Sample Containers from Laboratory	______	______
8.	Pre-Label Sample Containers	______	______
9.	Review Site Specific Field Sampling Manual	______	______
10.	Review Sampling Procedures with Project Team	______	______
11.	Identify and Confirm with the Project Manager what Samples and Locations are to be used for Quality Assurance	______	______

____

Field Team Leader Date

TABLE 2

MOUAT INDUSTRIES GROUNDWATER AND SURFACE WATER MONITORING PROGRAM ANALYTICAL METHODS AND SAMPLING CONSIDERATIONS

Parameter	Analytical Method	Description	Detection Limit[1]	Container	Preservative	Reference[2]	Recommended Sample Volume[3]	Recommended Maximum Holding Time[2c,4]
Chromium (total and dissolved)	Method SW7191	ICP* or Atomic Absorption Furnace Method (AAFM)	0.005 mg/l	Plastic or glass	HNO_3 to pH < 2	(a) or (b)	200 ml	6 months
Hexavalent Chromium	Method SW7196	Colorimetric	0.01 mg/l	Plastic or glass	Cool to 4°C	(a)	250 ml	24 hours
Specific Conductance**	Method 9050 or 120.1	Wheatstone-bridge conductivity meter	20 μmhos/cm	Plastic or glass	--	(a) or (b)	100 ml	Analyze Immediately
pH**	Method 9040 or 150.1	Glass electrode in combination with reference potential or combination electrode	Nearest 0.1 unit	Plastic or glass	--	(a) or (b)	25 ml	Analyze Immediately
Turbidity**	EPA 180.1	Nephelometric	2 NTU	Plastic or glass	--	(b)	100 ml	Analyze Immediately

* ICP = Inductively Coupled Plasma Atomic Emission Spectroscopy

** Field Analysis

TABLE 2 (Continued)

MOUAT INDUSTRIES GROUNDWATER AND SURFACE WATER MONITORING PROGRAM
ANALYTICAL METHODS AND SAMPLING CONSIDERATIONS

1. Detection limits based on current lab practices, which must allow for quantitative reporting of total chromium at 0.1 mg/l and hexavalent chromium at 0.011 mg/l.

2. References:
   (a) Test Methods for Evaluating Solid Waste -- Physical/Chemical Methods, U.S. EPA, SW-846, Third Edition, Revised November 1986, including Updates I and II.

   (b) Methods for Chemical Analysis of Water and Wastes, U.S. EPA, Environmental Monitoring and Support Laboratory, EPA-600/4-079-020, Revised March 1983.

   (c) RCRA Groundwater Monitoring Technical Enforcement Guidance Document, U.S. EPA, OSWER 9950.1, September 1986.

3. Recommended required sample volume is listed as a general guideline only; the analytical laboratory should be contacted for specific requirements. One liter (1,000 ml) is commonly required. The tabulated value was derived from EPA-600/4-79-020, OSWER 9950.01, or current laboratory practice.

4. EPA-600/4-79-020 specifies that samples should be analyzed as soon as possible after collection. Times listed are the maximum times that samples may be held before analysis and still be considered valid. Samples may be held for longer periods only if the Respondents, or the analytical laboratory, have data on file to show that the specific types of samples under study are stable for the longer time, and have received a variance from the Regional Administrator. Some samples may not be stable for the maximum time period given in the table. Respondents, or the analytical laboratory, are obligated to hold the sample for a shorter time if knowledge exists to show this is necessary to maintain sample stability.

TABLE 3

MOUAT INDUSTRIES SITE
COLUMBUS, MONTANA

SAMPLING EQUIPMENT CHECKLIST

Sampling and Testing Equipment

_ Water Level Meter with Spare Batteries (1)

_ pH Meter (2) with Spare Batteries and Spare Electrode, Buffers

_ Conductivity Meter (1) with Spare Batteries, Standard Solution

_ Conductivity Conversion

_ Turbidity Meter, Standard Solutions, Cuvette and Glass Cleaning Supplies

_ Field Thermometers (2)

_ Six-foot Folding Rule (2)

_ Depth of Well Tape

_ Squeeze Bottles (3)

_ Plastic Bucket, Calibrated (2)

_ In-line 0.45 Micron Filters (at least one per well)

_ Labeled sample bottle sets in coolers along with two extra empty coolers

_ Generator and Gasoline Can

_ Tool Box

_ Peristaltic Pump

_ Wire Coat Hanger (to retrieve the dedicated tubing from the wells)

_ 40-foot Tygon Tubing (for residential wells)

_ Containers (wide mouth) for pH, Specific Conductance (4)

_ Temporary Storage Bottles, Cleaned with Dilute Nitric Acid and Distilled Water (1 per well, if needed)

_ Containers to store/transport purgewater and decon water

Decontamination Equipment and Supplies

_ Dilute Nitric Acid (5%) (one jug)

_ Distilled Water

_ Laboratory-Supplied Distilled/Deionized Water for equipment rinsate and trip blanks (5 gallons)

_ Sprayer (distilled)

TABLE 3

MOUAT INDUSTRIES SITE
COLUMBUS, MONTANA

SAMPLING EQUIPMENT CHECKLIST
(Continued)

Sampling and Testing Equipment

Decontamination Equipment and Supplies (cont.)

_ Styrofoam Containers for Acid Transport

_ Scrubb brush

Stationery Supplies

_ Clipboard (1), Pencils, Markers and Pens

_ Field Log Book or Field Log Form, with Basic Information Included

_ Field Activities Trip Report Form

_ Chain-of-Custody Forms

_ Sample Analyses Request Forms (with detection levels indicated)

_ Shipping Labels (if needed)

_ Writing Paper

_ Carbon Paper

_ Paper Clips

_ Stapler

_ Scissors

Health and Safety Equipment

_ Coveralls

_ Nitrile Gloves or equivalent (12 pair)

_ PVC (surgical) Gloves (1 box)

_ Hard Hats

_ Steel Toed Boots

_ Safety Glasses

_ Rain Gear

_ 1/2 Face Respirator with HEPA/OV/AG combination filter cartridges

_ Tyvek or cotton coveralls

_ Nitrile outer boots or boot covers

TABLE 3

MOUAT INDUSTRIES SITE
COLUMBUS, MONTANA

SAMPLING EQUIPMENT CHECKLIST
(Continued)

<u>Sampling and Testing Equipment</u>

__ Hearing protection (ear plugs or ear muffs)

<u>Miscellaneous</u>

__ Groundwater Monitoring, Field Sampling, and Analytical Procedures Manual

__ Filament Tape (2 rolls), Teflon Tape (1 roll), Electrical Tape (1 roll)

__ Site Map

__ Road Maps

__ Sample Sack

__ Calculator

__ Tools/Rock Hammer

__ Flashlight (1)

__ Watch (1)

__ Ice

__ Well Keys

__ Ground Plastic

__ Paper Towels

__ Rope (if needed)

__ Garbage Bags

__ WD-40 or other lubricant spray for the well locks

__ Paint for Wells (if applicable)

____
Team Leader Date

TABLE 4

MOUAT INDUSTRIES SITE
COLUMBUS, MONTANA

FIELD ACTIVITIES TRIP REPORT
Groundwater Sampling

____ 1. Pre-Sampling Safety Meeting with Site Contacts :

____ 2. Site Weather Conditions

a. Day 1
b. Day 2
c. Day 3
d. Day 4
e. Day 5

____ 3. Changes in Operation Since Last Visit

____ 4. Site Conditions During Sampling

____ 5. Problems Encountered During Sampling

____ 6. Any Observations or Remarks Concerning Site Visit

____

Field Team Leader Date

TABLE 5

MOUAT INDUSTRIES SITE - COLUMBUS, MONTANA
SPECIFIC CONDUCTANCE CONVERSION TABLE

Temperature Degrees C	Calculated Multiplier	Temperature Degrees C	Calculated Multiplier	Temperature Degrees C	Calculated Multiplier
10	1.402	13	1.297	16	1.208
10.1	1.398	13.1	1.294	16.1	1.205
10.2	1.394	13.2	1.291	16.2	1.202
10.3	1.390	13.3	1.288	16.3	1.199
10.4	1.387	13.4	1.285	16.4	1.197
10.5	1.383	13.5	1.281	16.5	1.194
10.6	1.379	13.6	1.278	16.6	1.191
10.7	1.376	13.7	1.275	16.7	1.188
10.8	1.372	13.8	1.272	16.8	1.186
10.9	1.369	13.9	1.269	16.9	1.183
11	1.365	14	1.266	17	1.180
11.1	1.361	14.1	1.263	17.1	1.178
11.2	1.358	14.2	1.260	17.2	1.175
11.3	1.354	14.3	1.257	17.3	1.172
11.4	1.351	14.4	1.254	17.4	1.170
11.5	1.347	14.5	1.251	17.5	1.167
11.6	1.344	14.6	1.248	17.6	1.165
11.7	1.341	14.7	1.245	17.7	1.162
11.8	1.337	14.8	1.242	17.8	1.159
11.9	1.334	14.9	1.239	17.9	1.157
12	1.330	15	1.236	18	1.154
12.1	1.327	15.1	1.233	18.1	1.152
12.2	1.324	15.2	1.230	18.2	1.149
12.3	1.320	15.3	1.227	18.3	1.147
12.4	1.317	15.4	1.225	18.4	1.144
12.5	1.314	15.5	1.222	18.5	1.142
12.6	1.310	15.6	1.219	18.6	1.139
12.7	1.307	15.7	1.216	18.7	1.137
12.8	1.304	15.8	1.213	18.8	1.134
12.9	1.301	15.9	1.210	18.9	1.132
19	1.129	22	1.061	25	1.000
19.1	1.127	22.1	1.059	25.1	0.998
19.2	1.125	22.2	1.057	25.2	0.996
19.3	1.122	22.3	1.054	25.3	0.994
19.4	1.120	22.4	1.052	25.4	0.992

TABLE 5

MOUAT INDUSTRIES SITE - COLUMBUS, MONTANA
SPECIFIC CONDUCTANCE CONVERSION TABLE (Continued)

Temperature Degrees C	Calculated Multiplier	Temperature Degrees C	Calculated Multiplier	Temperature Degrees C	Calculated Multiplier
19.5	1.117	22.5	1.050	25.5	0.991
19.6	1.115	22.6	1.048	25.6	0.989
19.7	1.113	22.7	1.046	25.7	0.987
19.8	1.110	22.8	1.044	25.8	0.985
19.9	1.108	22.9	1.042	25.9	0.983
20	1.106	23	1.04	26	0.981
20.1	1.103	23.1	1.038	26.1	0.979
20.2	1.101	23.2	1.036	26.2	0.978
20.3	1.099	23.3	1.034	26.3	0.976
20.4	1.096	23.4	1.032	26.4	0.974
20.5	1.094	23.5	1.029	26.5	0.972
20.6	1.092	23.6	1.027	26.6	0.970
20.7	1.089	23.7	1.025	26.7	0.969
20.8	1.087	23.8	1.023	26.8	0.967
20.9	1.085	23.9	1.021	26.9	0.965
21	1.083	24	1.019	27	0.963
21.1	1.080	24.1	1.017	27.1	0.961
21.2	1.078	24.2	1.016	27.2	0.960
21.3	1.076	24.3	1.014	27.3	0.958
21.4	1.074	24.4	1.012	27.4	0.956
21.5	1.072	24.5	1.010	27.5	0.954
21.6	1.069	24.6	1.008	27.6	0.953
21.7	1.067	24.7	1.006	27.7	0.951
21.8	1.065	24.8	1.004	27.8	0.949
21.9	1.063	24.9	1.002	27.9	0.948
28	0.946	30	0.913	32	0.882
28.1	0.944	30.1	0.911	32.1	0.881
28.2	0.942	30.2	0.910	32.2	0.879
28.3	0.941	30.3	0.908	32.3	0.878
28.4	0.939	30.4	0.907	32.4	0.876
28.5	0.937	30.5	0.905	32.5	0.875
28.6	0.936	30.6	0.903	32.6	0.873
28.7	0.934	30.7	0.902	32.7	0.872
28.8	0.932	30.8	0.900	32.8	0.870
28.9	0.931	30.9	0.899	32.9	0.869

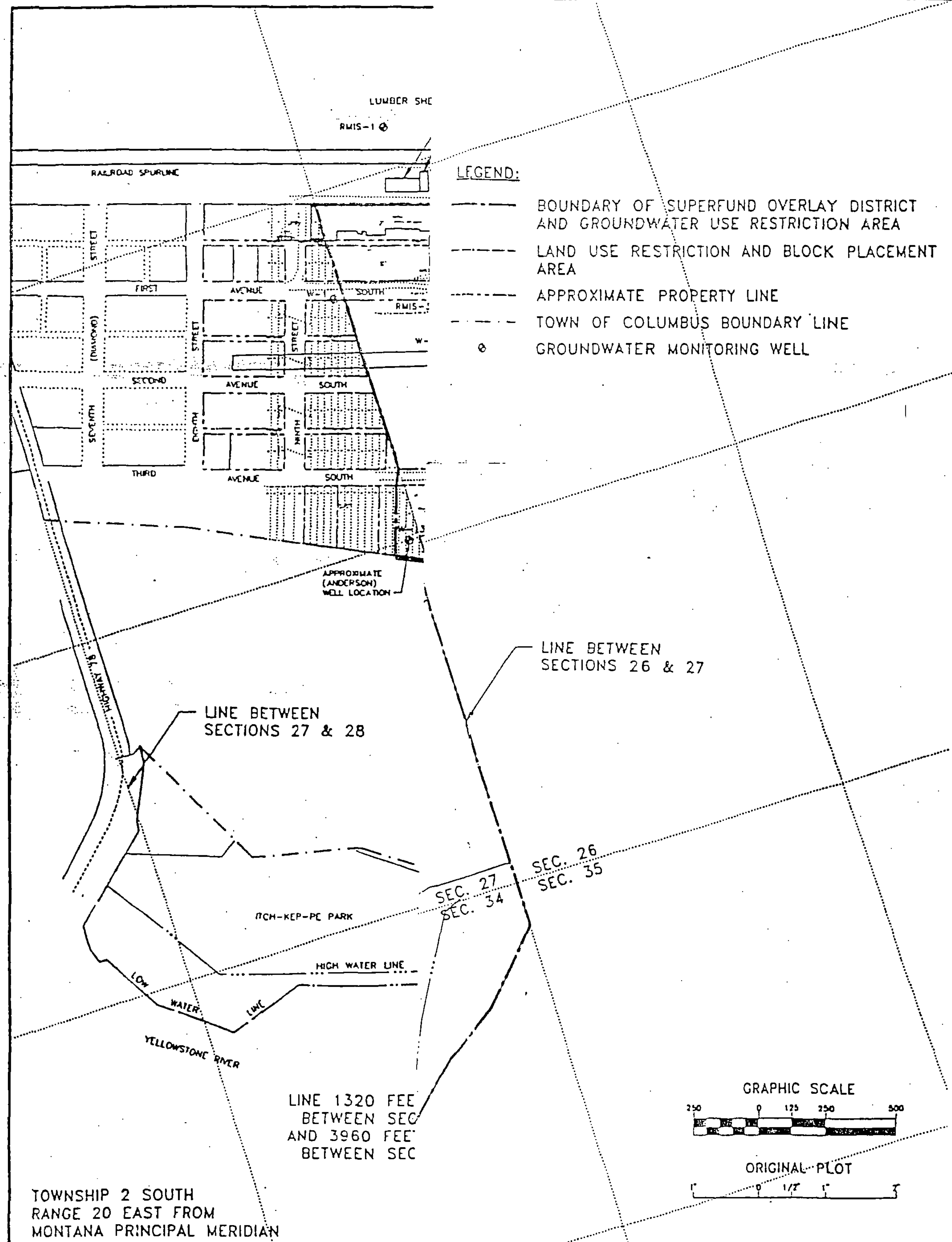
TABLE 5

MOUAT INDUSTRIES SITE - COLUMBUS, MONTANA
SPECIFIC CONDUCTANCE CONVERSION TABLE (Continued)

Temperature Degrees C	Calculated Multiplier	Temperature Degrees C	Calculated Multiplier	Temperature Degrees C	Calculated Multiplier
29	0.929	31	0.897	33	0.867
29.1	0.927	31.1	0.896	33.1	0.866
29.2	0.926	31.2	0.894	33.2	0.865
29.3	0.924	31.3	0.893	33.3	0.863
29.4	0.922	31.4	0.891	33.4	0.862
29.5	0.921	31.5	0.890	33.5	0.860
29.6	0.919	31.6	0.888	33.6	0.859
29.7	0.918	31.7	0.887	33.7	0.858
29.8	0.916	31.8	0.885	33.8	0.856
29.9	0.914	31.9	0.884	33.9	0.855

Notes:

- Do not make specific conductance measurements at temperatures below 10° C.
- Measure temperature to the nearest 0.1° C.
- Report all conductivities at 25° C. to two significant digits.
- This conversion table is based on a temperature coefficient of 0.0191 (as per SW-846) and a cell constant of 1, where the ratio of conductivity at 25° C to the conductivity at temperature °C equals 1/(1 + 0.0191[t - 25]).



REVISIONS
1
2
3
4
5
6
7
8

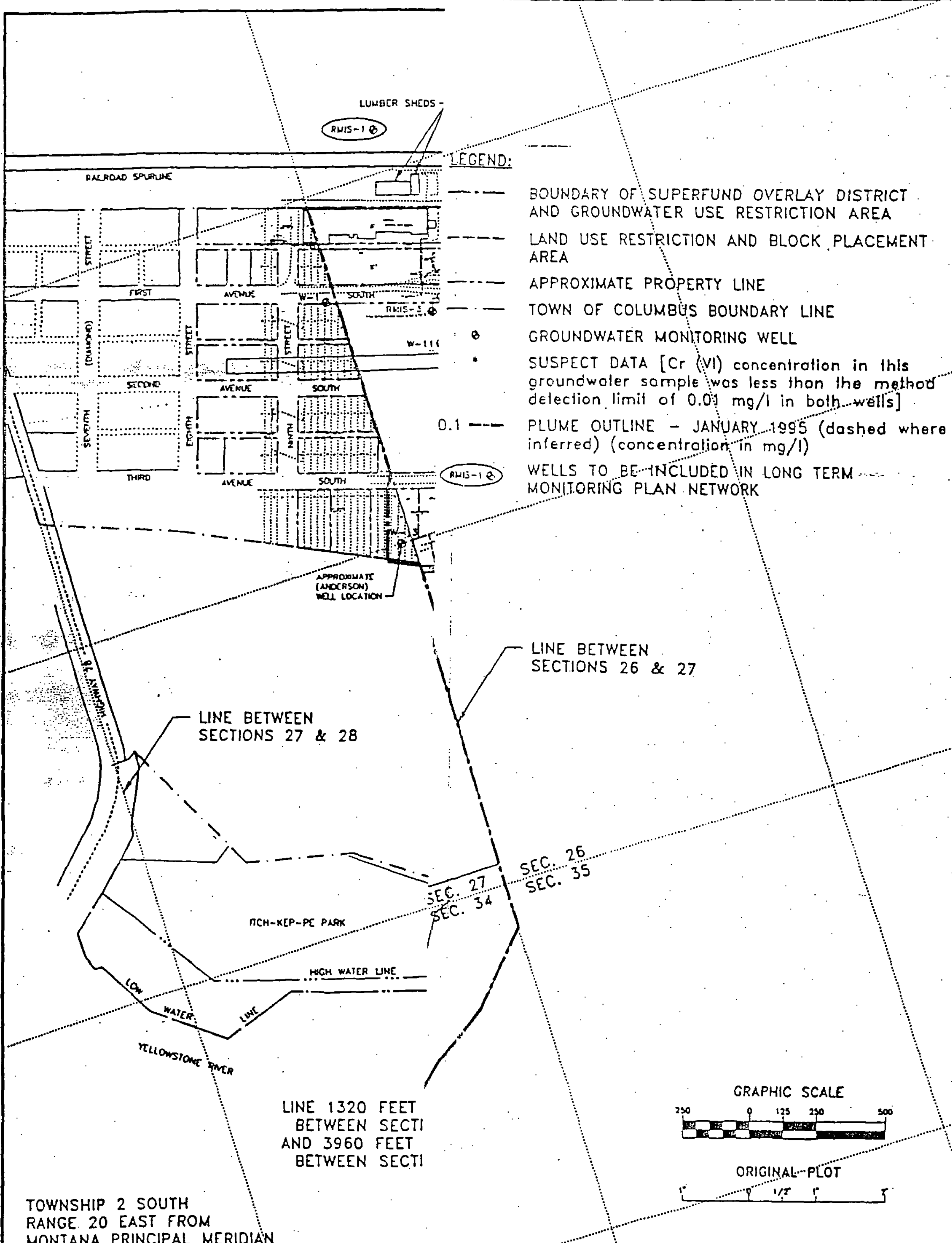
SUPERFUND OVERLAY DISTRICT

MOUAT INDUSTRIES NPL SITE
COLUMBUS, MONTANA

FIGURE 1

AS SHOWN

DATE: MARCH 30, 1995



REVISIONS
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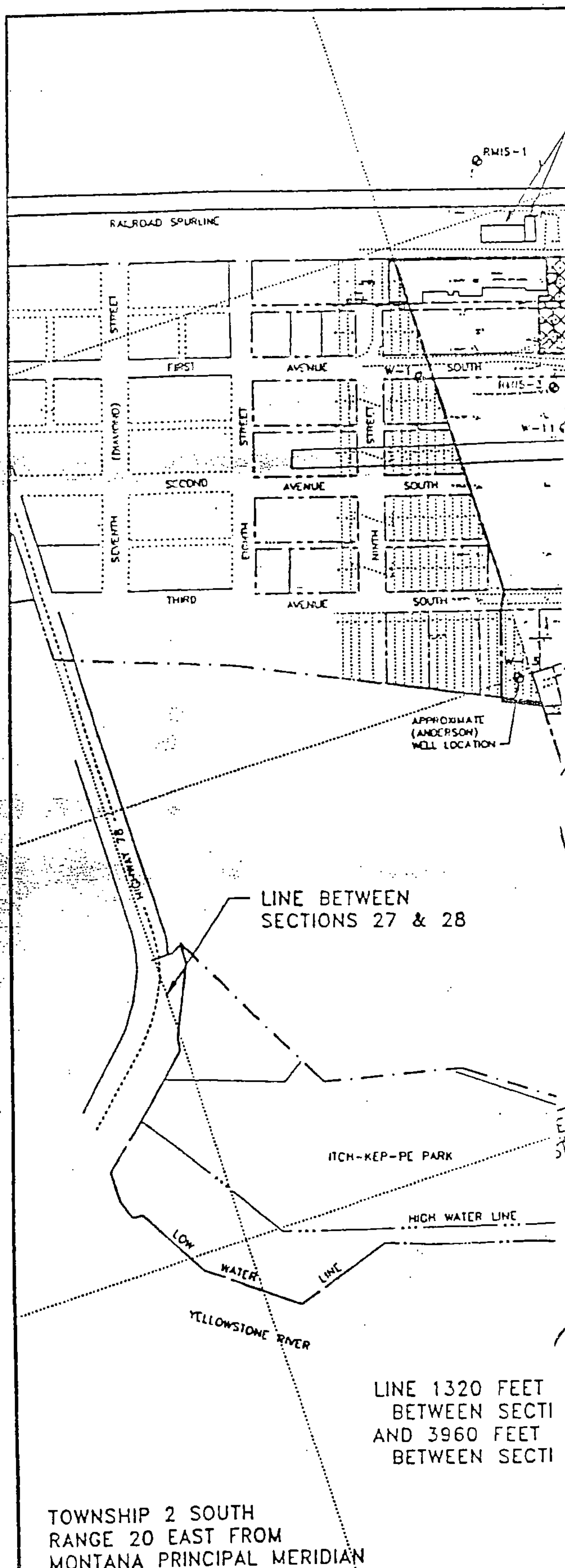
OSED GROUNDWATER MONITORING NETWORK
OR THE LONG TERM MONITORING PLAN
MOUAT INDUSTRIES NPL SITE
COLUMBUS, MONTANA

DSI
CH
S.C
FIL SHOWN

DATE: OCTOBER 18, 1995

FIGURE NO

2



LEGEND:

- BOUNDARY OF PROPOSED SUPERFUND OVERLAY DISTRICT AND GROUNDWATER USE RESTRICTION AREA
- LAND USE RESTRICTION AND BLOCK PLACEMENT AREA
- APPROXIMATE PROPERTY LINE
- TOWN OF COLUMBUS BOUNDARY LINE
- GROUNDWATER MONITORING WELL
- PLUME OUTLINE – AUGUST 1995 (dashed where inferred) (concentration in mg/l)

ADDITIONAL SAMPLE LOCATIONS:

- SEDIMENT AND SURFACE WATER SAMPLE
- SEDIMENT SAMPLE
- SURFACE WATER SAMPLE

	ANALYSIS
SAMPLE ID	TOTAL CHROMIUM
GDSURF-1	0.329
GDSURF-2	0.408
GDSURF-3	0.075
GDSURF-4	0.121
GDSURF-5	<0.005
GPSURF-1	<0.005
GPSURF-2	<0.005
GPSURF-3	0.038
GPSURF-4	0.053
GDSED-1	95
GDSED-3	550
GDSED-5	700
GDSED-7	270
GDSED-9	230
GPSED-1	130
GPSED-3	190
GPSED-5	180

NOTES:

1. UNITS FOR SURFACE WATER SAMPLES ARE mg/l or ppm.
2. UNITS FOR SEDIMENT SAMPLES ARE mg/k, OR ppm.

GRAPHIC SCALE

250 0 125 250 500

ORIGINAL PLOT

1" 0 1/2" 1" 2"

REVISIONS
1
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8

DIMENT AND SURFACE WATER SAMPLE COLLECTION LOCATIONS
MOUAT INDUSTRIES NPL SITE
COLUMBUS, MONTANA

DS
CH
S.
FILOWN
DATE: OCTOBER 18, 1995

FIGURE NO.
3

Figure 4

CHAIN-OF-CUSTODY RECORD

Baker Environmental, Inc.
Airport Office Park, Bldg. 3
420 Rouser Road
Coraopolis, PA 15108
412-269-6000

Pg. __ of __

Service Order No.: ____________________
Project Name: ____________________
Project Manager: ____________________
Field Team: ____________________

Sample Number	Date	Time	Sample Location	Matrix Type (1) GB (2)	Matrix Type (1) COM. (2)	Analysis Requested / Preservative Required; Type of Container(s) (3); Number of Container(s)												Remarks

Relinquished By: ____________________ Date: ________ Time: ________
Received By: ____________________ Date: ________ Time: ________
Shipped by (check one): Hand ☐ Overnight ☐ Other ☐ ____________

Relinquished By: ____________________ Date: ________ Time: ________
Received By: ____________________ Date: ________ Time: ________
Shipped by (check one): Hand ☐ Overnight ☐ Other ☐ ____________

Relinquished By: ____________________ Date: ________ Time: ________
Received By: ____________________ Date: ________ Time: ________
Shipped by (check one): Hand ☐ Overnight ☐ Other ☐ ____________

Sample Stored at 4°C: Yes ☐ No ☐
Chain-of-custody seal on cooler: Yes ☐ No ☐
Analysis turnaround: Priority ☐ ______ hrs. Regular ☐
See Work Order ☐
See Analysis Request Form ☐
Sample Disposal: Return to Baker ☐ Lab Disposal ☐
Archive until: ____________ (date)

NOTES:
(1) A - Air; GW - Groundwater; S - Spring; SO - Soil; SW - Surface water; W - Waste; WP - Wipe; WW - Wastewater
(2) GB - Grab; COM - Composite
(3) P - Plastic

SEND ANALYTICAL RESULTS AND CHAIN OF CUSTODY TO PROJECT MANAGER.

.AKER ENVIRONMENTAL, INC.
.IRPORT OFFICE PARK - BLDG. 3
20 ROUSER ROAD
:ORAOPOLIS, PA 15108
412) 269-6000

SAMPLE ANALYSES REQUEST

Figure 5

Date: ____________

Requested By: ____________

BAKER SAMPLE ID NUMBER	POLLU. INDICA-TORS				GENERAL QUALITY						DRINKING WATER SUITABILITY																				ADDITIONAL																SAMPLE SPECIFIC COMMENTS
	pH	TOC	TOX	Specific Conductance	Chloride	Sulfate	Iron	Manganese	Sodium	Phenolics	Arsenic	Barium	Cadmium	Chromium	Lead	Mercury	Selenium	Silver	Fluoride	Nitrate (as N)	Endrin	Lindane	Methoxychlor	Toxaphene	2, 4-D	2, 4, 5-TP Silvex	Radium	Gross Alpha	Gross Beta	Total Coliforms	Alkalinity	Total Dissolved Solids	Ammonia Nitrogen	Chemical Oxygen Demand	Nickel	Copper	Zinc	Cyanides	Prior.Poll. Volatiles	Prior.Poll. B/N Ext.	Prior.Poll. Acid Ext.	Chromium, hexavalent					
DESIRED ETECTION LEVELS																																															

GENERAL COMMENTS

FIGURE 6

Groundwater Monitoring Data Sheet

Date:_____________

Well Identification	
Depth of Well (W)	
Depth to Water(H)	
Column (W-H)	
*Multiplier	
*3	

Trial	Time	Temp.	pH	Cond.	Turbidity
1					
2					
3					
4					
5					

Notes:

Sampler:_________________ Signature:_____________________

ATTACHMENT A

SUPERFUND OVERLAY DISTRICT

ZONING ORDINANCE

ORDINANCE NO. 267

AN ORDINANCE REPEALING CHAPTER 11.02, ZONING REGULATIONS, OF THE EXISTING ORDINANCES AND ADOPTING "TOWN OF COLUMBUS ZONING REGULATIONS, AMENDED 1995", WHICH SHALL BE CODIFIED AS CHAPTER 11.02.

WHEREAS, the Town Council deems a complete revision of the Town's existing zoning ordinances to be in the public interest, and

WHEREAS, the Town Council deems it appropriate to adopt airport zoning, and

WHEREAS, the City-County Planning Board was appointed to serve as the Columbus Zoning Commission to undertake a thorough review of the Town's current zoning ordinances and map and to make recommendations to update the ordinances, and

WHEREAS, the Columbus Zoning Commission has spent considerable time reviewing the Town's existing zoning ordinances and drafting proposed revisions, and

WHEREAS, the Columbus Zoning Commission held a public hearing in the matter on November 22, 1994, after publishing legal notice of the hearing in the November 2, 1994, issue of the ***Stillwater County News***, and

WHEREAS, all public comments were considered by the Columbus Zoning Commission before it made its final recommendation that the Town Council adopt the Town of Columbus Zoning Regulations, Amended 1995, and

WHEREAS, the Town Council deems it in the public interest to adopt Town of Columbus Zoning Regulations, Amended 1995;

NOW, THEREFORE, pursuant to the authority granted under Sections 7-5-4202, 67-6-201, and 76-2-301, MCA, (1993), be it ordained by the Town Council of the Town of Columbus, Montana:

Section 1: That the Town of Columbus Zoning Regulations, Amended 1995, are hereby adopted and shall be codified as Chapter 11.02 of the Official Code of the Town of Columbus, Montana.

Section 2: That all ordinances or parts of ordinances in conflict herewith shall be repealed upon the effective date of this Ordinance.

Section 3: That this Ordinance shall become effective thirty (30) days after its passage and approval.

PASSED by the Town Council and approved by the Mayor this 6th day of March, 1995.

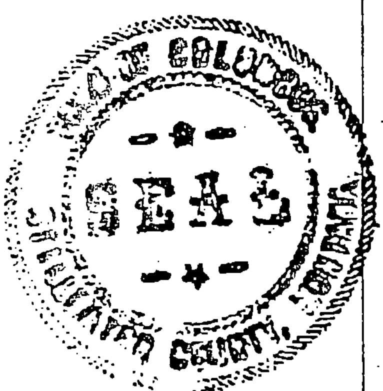
Jack Kenyon

Jack Kenyon - Mayor

ATTEST:

Ronald D Barndt

Ronald D. Barndt - Town Clerk



SECTION 11.02.190

SOD - SUPERFUND OVERLAY DISTRICT

Subsections:

11.02.191 Intent. The intent of the Superfund Overlay District (SOD) is to protect public health, safety and welfare while allowing appropriate use of lands within the district. This intent will be accomplished by:

1. assuring that land use in the Superfund Overlay District is compatible with protecting, and providing for permanent preservation and maintenance of remedial actions implemented pursuant to the Superfund law, including soil caps, treated concrete blocks, and other remedial structures;

2. requiring that any development in the block placement area of the SOD be preceded by submittal of detailed site and construction plans, prepared by an Architect or Engineer, for review and approval by the Town as an institutional control in the context of the federal Superfund law;

3. requiring submittal of as built plans with certification from an Architect or Engineer that site development and construction was completed in compliance with this Zoning Ordinance and federal Superfund law;

4. limiting well use and prohibiting drilling of wells within the SOD; and

5. placing a notice to purchasers on any deed, contract for sale, or other instrument of conveyance before any lot or parcel, or any interest in any lot or parcel, in the Superfund overlay district is conveyed.

11.02.192 Additional Application Requirements. All applications for uses and development in the Superfund Overlay Area shall include the following information:

1. As with other permit applications, an application form, an accurate site plan, and review fees; and

2. a detailed grading and drainage plan prepared by an Engineer showing the location, dimensions and depth of all excavations, volumes of material to be moved, and other drainage features;

3. detailed plans prepared by an Architect or Engineer showing how remedial structures such as soil caps, treated concrete blocks, and other structures will be protected and maintained in relation to the proposed site development;

4. test results that confirm that any fill material proposed to be imported to the site has less than 0.1 mg/l total chromium in toxicity characteristic leaching procedure (TCLP) extracts or written certification that no fill material will be imported; and

5. bearing capacities, design loads, and wheel loads resulting from uses proposed for the site.

11.02.193 Performance Standards for Block Placement Area.
The following standards apply to the block placement area within the Superfund Overlay District.

1. No excavation will be permitted through the 24 inch thick soil or gravel cover except for building or utility construction as described in item 6. (Excavation is permitted at the existing sanitary sewer only for purposes of sewer maintenance and improvement).

2. Areas with gravel cover and block placement can be used for vehicle parking, material storage and related traffic. This includes: trucks up to the maximum gross vehicle weight and axel loads permitted under the Montana Department of Highways adopted "Federal Bridge Formula"; forklifts up to 50,000 pounds gross weight with up to 37,000 pounds on a single axel with four tires; and construction equipment with up to 7,200 pounds per square foot under the actual tire or track contact area.

3. Areas with a vegetated soil cover cannot be used for any purpose unless a gravel cover or a gravel and asphalt overlay is placed over the 24-inch thick soil cover or a gravel cover that meets the following criteria:

- The gravel will be select road stone from a local source. Gravel already on the site will be used to the extent possible; off-site gravel sources will be used only if on-site quantities of suitable gravel are not sufficient. This gravel will be well sorted with a range of particle sizes to facilitate close compaction and to minimize voids and permeability in the cover after placement and compaction.

- The gravel will be separated from the underlying blocks and soils by a woven geotextile designed to reduce migration of gravel particles downward into the block-south layer and of block pieces upward into the gravel layer.

- The gravel layer will be approximately 2 feet (24 inches) thick.

- The gravel will be placed in 6 to 12 inch lifts to facilitate grading and compaction. Each lift will be compacted with a motorized road construction type roller.

- The finished surface of gravel will be graded to promote precipitation runoff to perimeter diversion ditches. The center elevation of the gravel surface will be approximately one foot above the perimeter elevations, and the average surface slope will be one percent.

- The gravel surface will be designed and installed to accommodate vehicular traffic and open storage of materials. Operation of vehicles such as trucks and forklifts will promote compaction of the surface gravel and further reduce infiltration.

- Maintenance of the gravel cover will be by the landowner or lessee.

4. The soil and gravel covers constructed pursuant to (3) above must be maintained by the property owner to prevent degradation. Damage due to erosion, wind, burrowing animals, vehicles, or other causes must be repaired promptly by the property owner.

5. The perimeter drainage channels and culverts must be maintained by the City of Columbus Public Works Department in an open, free-flowing condition.

6. If any building or structure (including related utilities) is to be constructed on the block placement areas, sufficient soil must be placed over initial cover so that any excavation required for this construction does not penetrate the placed blocks. Any building or structure, including the related utilities, must meet all applicable requirements of the Montana State Building Code and the City of Columbus Zoning Code. Load limits for buildings or structures will not exceed 6,000 pounds per square foot.

7. Asphalt paving can be substituted for the uppermost 6 inches of the gravel cover. In this case, the asphalt will be placed in two courses—a 4 inch base course and a 2 inch surface wearing course.

8. The fences around the soil cover areas must be maintained by the property owner and the gates must be kept locked. To protect the soil cover, wheeled vehicles must be excluded from soil cover areas except for soil cover and vegetation maintenance.

11.02.194 Limitations on Groundwater Use.

The following limitations apply to groundwater use and related activities within the Superfund Overlay District.

1. Installation or operation of new ground water wells, groundwater fed ponds or channels, and other groundwater extraction or recovery systems will not be permitted.

2. Use of groundwater from existing wells, ponds, springs, seeps or any other groundwater recovery or extraction system will not be permitted, except for lawn irrigation use, use of the existing golf course pond, and groundwater monitoring of wells.

3. Excavation below the groundwater table (static groundwater level) for any purpose will not be allowed except for temporary excavation work necessary for construction purposes including placement of footings and utilities. Such temporary excavation work shall require a permit from the Town of Columbus.

APPENDIX C

Ground Water Quality Data

2/24/2005

NOTICE

This item(s) is not suitable for microfilming, but is available for review at the Environmental Protection Agency, Region VIII Superfund Records Center, Helena, Montana

TITLE: "FINAL CLOSURE REPORT MOUAT INDUSTRIES SUPERFUND SITE COLUMBUS, MONTANA"

DATE: NOV. 2004

ITEM DESCRIPTION: CD ROM - APPENDIX C, GROUNDWATER DATA

FILE: 8801401 DOCNO: **453277**

Mouat Industries NPL Site - Columbus, MT
Water Quality Field Parameters and Chromium Concentrations

Sample ID	Date	Q	Hexavalent Cr (mg/L)	Q	Total Cr (mg/L)	Q	Dissolved Cr (mg/L)	Temp (°C)	pH (SU)	SC mmhos/cm	Turbidity (NTU)	SWL Ft
GDSURF-1	11/20/96		0.044		0.053		0.044		7.36	2.68	2.50	
GDSURF-1	11/20/96		0.049		0.057		0.056					
GDSURF-1	05/14/97		0.030		0.042		0.043	10.57	7.33	2.55	3.60	
GDSURF-1	05/14/97		0.030		0.041		0.041					
GDSURF-1	11/20/97		0.030		0.033		0.031	8.49	7.32	2.23		
GDSURF-1	11/20/97		0.030		0.035		0.032	8.49	7.32	2.23		
GDSURF-1	05/22/98		0.033		0.041		0.039	10.62	7.13	2.47		
GDSURF-1	05/22/98		0.036		0.035		0.030	10.62	7.13	2.47		
GDSURF-1	12/03/98		0.030		0.030		0.016	8.92	7.13	2.56		
GDSURF-1	12/03/98		0.023		0.028		0.023	8.92	7.13	2.56		
GDSURF-1	05/26/99		0.030		0.023		0.024	12.74	7.56	2.53	4	
GDSURF-1	05/26/99		0.030		0.024		0.023	12.74	7.56	2.53	4	
GDSURF-1	12/02/99		0.014		0.014		0.014	8.33	7.46	2.49	6.92	
GDSURF-1	12/02/99		0.017					8.33	7.46	2.49	6.92	
GDSURF-1	05/31/00		0.013		0.017		0.011	10.93	7.60	2.52	2.20	
GDSURF-1	05/31/00	<	0.007		0.026		0.011	10.93	7.60	2.52	2.20	
GDSURF-1	10/18/00	<	0.007		0.038	<	0.009	11.59	7.45	2.63	33.00	
GDSURF-1	10/18/00	<	0.007		0.036	<	0.009	11.59	7.45	2.63	33.00	
GDSURF-1	05/10/01		0.010		0.027		0.019	8.57	7.38	2.58	27.00	
GDSURF-1	05/10/01	<	0.007		0.026		0.027	8.57	7.38	2.58	27.00	
GDSURF-1	10/30/01		0.009	<	0.009	<	0.009	9.97	7.45	2.55	34.00	
GDSURF-1	10/30/01		0.010	<	0.009	<	0.009	9.97	7.45	2.55	34.00	
GDSURF-1	10/23/02	<	0.007		0.012	<	0.010	7.10	7.48	2.42	8.90	
GDSURF-1	10/23/02	<	0.007	<	0.010		0.013	7.10	7.48	2.42	8.90	
MIS-11A	Feb-94		2.780		2.790							
MIS-11A	Apr-94		2.530		2.090							
MIS-11A	Jul-94		2.720		2.990							
MIS-11A	Oct-94		2.850		2.750							
MIS-11A	Jan-95		1.780		1.440							
MIS-11A	11/19/96				0.177		0.149	12.07	7.39	2.75	1.10	9.14
MIS-11A	05/13/97				0.128		0.124	9.27	7.31	2.63	0.80	8.8
MIS-11A	11/20/97				0.102		0.098	12.29	7.33	2.26	1.70	8.80
MIS-11A	05/21/98				0.106		0.094	9.80	7.30	2.56	1.80	9.20
MIS-11A	05/25/99				0.059		0.062	9.3	7.32	2.74	3	9.27
MIS-11A	12/02/99				0.075		0.068	12.79	7.51	2.7	2	9.27
MIS-11A	05/30/00				0.044		0.039	9.67	7.60	2.60	1.00	9.30
MIS-11A	10/18/00				0.059		0.044	14.20	7.41	2.84	1.10	9.40

Mouat Industries NPL Site - Columbus, MT
Water Quality Field Parameters and Chromium Concentrations

Sample ID	Date	Q	Hexavalent Cr (mg/L)	Q	Total Cr (mg/L)	Q	Dissolved Cr (mg/L)	Temp (°C)	pH (SU)	SC mmhos/cm	Turbidity (NTU)	SWL Ft
MIS-11A	05/09/01				0.030		0.036	9.44	7.38	2.68	0.98	9.81
MIS-11A	10/29/01				0.058		0.046	14.11	7.40	2.80	0.88	9.60
MIS-11A	10/23/02				0.044		0.040	13.24	7.38	2.78	0.90	9.39
MIS-11B	Feb-94		2.510		2.470							
MIS-11B	Apr-94		2.210		1.820							
MIS-11B	Jul-94		2.290		2.540							
MIS-11B	Oct-94		2.280		2.290							
MIS-11B	Jan-95				1.710		1.730					
MIS-11B	May-95				1.160		1.110					
MIS-11B	Dec-03				0.022		0.023	12.64	7.38	2.66	0.31	9.78
MIS-12	Feb-94	<	0.010	<	0.005							
MIS-12	Apr-94	<	0.010	<	0.005							
MIS-12	Jul-94		0.020	<	0.005							
MIS-12	Oct-94	<	0.010		0.007							
MIS-12	Jan-95	<	0.010	<	0.005							
MIS-12	11/18/96				0.009	<	0.009	11.85	7.22	2.68	1.09	3.98
MIS-12	05/12/97			<	0.009	<	0.009	7.63	7.14	2.5	2.20	3.2
MIS-12	05/12/97			<	0.009	<	0.009					
MIS-12	05/20/98			<	0.010	<	0.010	8.26	6.99	3.03	1.43	3.55
MIS-12	05/20/98			<	0.010	<	0.010	8.26	6.99	3.03	1.43	3.55
MIS-12	12/01/98			<	0.010	<	0.010	12.31	7.16	2.99	1.6	4.04
MIS-12	05/24/99			<	0.010	<	0.010	8.86	7.07	2.96	2.2	3.54
MIS-12	12/01/99			<	0.008	<	0.008	12.01	7.36	2.8	1.1	4.2
MIS-12	05/31/00			<	0.009	<	0.009	8.62	7.43	2.68	0.90	3.18
MIS-12	10/17/00			<	0.009	<	0.009	13.37	7.15	2.87	0.89	4.10
MIS-12	05/09/01			<	0.008	<	0.008	7.46	7.21	2.76	0.92	3.71
MIS-12	10/30/01			<	0.009	<	0.009	13.35	7.14	2.84	0.91	4.07
MIS-12	10/22/02			<	0.010	<	0.010	11.47	7.11	2.81	1.10	4.06
MIS-13	Feb-94		0.020		0.030							
MIS-13	Apr-94		0.020		0.014							
MIS-13	Jul-94		0.030		0.022							
MIS-13	Oct-94		0.030		0.037							
MIS-13	Jan-95		0.030		0.028							
MIS-13	11/18/96				0.016		0.023	11.2	7.27	2.28	1.20	7.04
MIS-13	05/12/97				0.017		0.020	7.95	7.18	2.15	0.50	5.71
MIS-13	11/19/97				0.016		0.016	11.36	7.09	2.05	1.40	6.78
MIS-13	11/19/97				0.017		0.016	11.36	7.09	2.05	1.40	6.78

Mouat Industries NPL Site - Columbus, MT
Water Quality Field Parameters and Chromium Concentrations

Sample ID	Date	Q	Hexavalent Cr (mg/L)	Q	Total Cr (mg/L)	Q	Dissolved Cr (mg/L)	Temp (°C)	pH (SU)	SC mmhos/cm	Turbidity (NTU)	SWL Ft
MIS-13	12/01/98				0.026		0.014	11.57	7.15	2.44	1.3	7.04
MIS-13	05/24/99				0.023		0.014	8.91	7.11	2.4	2	7.33
MIS-13	12/01/99				0.017		0.019	11.54	7.38	2.01	1	8.48
MIS-13	05/31/00				0.012	<	0.009	9.40	7.48	1.90	1.10	6.45
MIS-13	10/17/00				0.024		0.022	12.63	7.25	2.30	1.06	8.53
MIS-13	05/10/01				0.008		0.013	8.45	7.27	1.75	0.98	8.14
MIS-13	10/30/01				0.037		0.033	12.68	7.24	2.34	1.10	8.98
MIS-13	10/22/02				0.028		0.030	11.74	7.23	2.37	1.20	8.61
MIS-13	05/20/98				0.014	<	0.010	8.64	7.01	2.63	1.80	5.84
MIS-14	Feb-94		0.060		0.070							
MIS-14	Apr-94		0.070		0.065							
MIS-14	Jul-94		0.150		0.160							
MIS-14	Oct-94		0.070		0.073							
MIS-14	Jan-95		0.070		0.069							
MIS-14	11/18/96				0.019		0.021	11.86	7.14	2.88	0.14	9.84
MIS-14	05/12/97				0.016		0.016	8.95	7.06	2.76	0.08	9.22
MIS-14	11/19/97				0.015		0.015	11.90	7.00	2.38	0.04	9.42
MIS-14	05/20/98				0.011		0.010	9.26	6.97	2.64	0.29	9.58
MIS-14	12/01/98				0.012		0.013	12.35	7.14	2.65	0.12	9.18
MIS-14	12/01/98				0.021	<	0.010	12.35	7.14	2.65	0.12	9.18
MIS-14	05/24/99				0.011		0.015	9.4	7.06	2.79	0.2	10.24
MIS-14	12/01/99				0.015		0.015	12.81	7.31	2.56	1	10.64
MIS-14	05/30/00				0.034		0.023	9.75	7.35	2.53	0.13	10.40
MIS-14	10/17/00				0.012		0.015	13.75	7.09	2.66	0.11	10.52
MIS-14	10/17/00				0.026		0.013	13.75	7.09	2.66	0.11	10.52
MIS-14	05/10/01				0.027		0.027	9.44	7.11	2.55	0.21	10.40
MIS-14	10/29/01				0.023		0.015	13.80	7.12	2.57	0.22	10.55
MIS-14	10/22/02				0.014		0.017	12.94	7.16	2.63	0.31	10.45
MIS-15	Oct-94		0.420		0.400							
MIS-15	Jan-95		0.180		0.163							
MIS-15	11/19/96				0.032		0.031	12.97	7.29	2.74	1.80	6.43
MIS-15	05/13/97				0.038		0.036	10.43	7.27	2.71	1.90	6.1
MIS-15	11/20/97				0.026		0.024	12.99	7.22	2.32	1.67	5.92
MIS-15	05/21/98				0.027		0.027	10.62	7.23	2.54	0.85	6.46
MIS-15	12/02/98				0.019		0.016	13.09	7.31	2.72	0.42	6.23
MIS-15	05/25/99				0.025		0.023	11.05	7.32	2.77	5	6.44
MIS-15	12/02/99				0.020		0.016	13.16	7.53	2.74	1	6.56

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Sample ID	Date	Q	Hexavalent Cr (mg/L)	Q	Total Cr (mg/L)	Q	Dissolved Cr (mg/L)	Temp (°C)	pH (SU)	SC mmhos/cm	Turbidity (NTU)	SWL Ft
MIS-15	05/30/00				0.023		0.019	11.10	7.60	2.70	1.20	6.66
MIS-15	10/18/00				0.027		0.023	14.43	7.41	2.86	1.12	6.76
MIS-15	05/10/01				0.017		0.011	10.29	7.38	2.66	0.98	7.29
MIS-15	10/29/01				0.016		0.016	14.40	7.38	2.84	0.89	7.02
MIS-15	10/22/02				0.013		0.016	12.68	7.36	2.79	0.90	6.75
MIS-16	Oct-94		0.170		0.157							
MIS-16	Jan-95		0.130		0.108							
MIS-16	11/19/96				0.019		0.016	11.16	7.34	2.74	1.20	6.55
MIS-16	05/13/97				0.018		0.016	10.12	7.32	2.58	3.30	6.3
MIS-16	11/20/97				0.010		0.009	11.49	7.25	2.22	2.05	6.13
MIS-16	05/21/98				0.012	<	0.010	10.26	7.30	2.29	1.90	6.62
MIS-16	12/02/98				0.015	<	0.010	11.44	7.34	2.52	2.1	6.48
MIS-16	05/25/99				0.012	<	0.010	10.63	7.31	2.62	2	6.72
MIS-16	12/02/99				0.013		0.015	11.58	7.5	2.53	5	6.8
MIS-16	12/02/99				0.013		0.015	11.58	7.5	2.53	5	6.8
MIS-16	05/30/00			<	0.009	<	0.009	10.69	7.60	2.45	0.80	6.84
MIS-16	10/18/00			<	0.009	<	0.009	12.35	7.39	2.60	0.60	6.89
MIS-16	05/09/01			<	0.008	<	0.008	9.98	7.33	2.64	0.80	7.41
MIS-16	05/09/01			<	0.008	<	0.008	9.98	7.33	2.64	0.80	7.41
MIS-16	10/29/01			<	0.009	<	0.009	12.41	7.41	2.46	0.8	7.1
MIS-16	10/22/02				0.017		0.011	12.12	7.38	2.49	1.00	6.88
MIS-4B	Oct-94		0.330		0.312							
MIS-4B	Jan-95		0.100		0.113		0.096					
MIS-4B	May-95				0.079		0.070					
MIS-4B	Dec-03			<	0.009	<	0.009	12.6	7.44	2.52	4.54	7.07
MIS-8B	Feb-94		2.170		2.280							
MIS-8B	Apr-94		2.080		1.770							
MIS-8B	Jul-94		1.500		1.710							
MIS-8B	Oct-94		1.100		1.060							
MIS-8B	Jan-95		1.510		1.220		1.240					
MIS-8B	May-95				1.180		1.220					
MIS-8B	Dec-03				0.031		0.030	12.81	7.4	2.69	0.31	8.35
R-1	Dec-92		0.380		0.380							
R-1	Mar-93		0.040		0.040							
R-1	Jun-93	<	0.010		0.013							
R-1	Aug-93		0.030		0.019							
R-1	Sep-93		0.060		0.110							

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Sample ID	Date	Q	Hexavalent Cr (mg/L)	Q	Total Cr (mg/L)	Q	Dissolved Cr (mg/L)	Temp (°C)	pH (SU)	SC mmhos/cm	Turbidity (NTU)	SWL Ft
R-1	Sep-93		0.100		0.130							
R-1	Oct-93		0.120		0.160							
R-1	Oct-93		0.140		0.143							
R-1	Nov-93		0.150		0.150							
R-1	Dec-93		0.130		0.130							
R-1	Dec-93		0.130		0.130							
R-1	Jan-94		0.110		0.100							
R-1	Apr-94		0.110		0.096							
R-1	Jul-94		0.070		0.090							
R-1	Oct-94		0.490		0.449							
R-1	Jan-95		0.130		0.109							
R-1	11/19/96				0.054		0.021	11.85	7.15	2.63	2.80	12.19
R-1	11/19/96				0.040	<	0.009					
R-1	05/13/97				0.017	<	0.009	9.46	7.15	2.52	1.25	11.77
R-1	11/19/97				0.009		0.007	11.96	7.06	2.25	0.15	11.80
R-1	05/21/98				0.015		0.012	9.51	7.05	2.38	2.65	12.22
R-1	12/01/98				0.012	<	0.010	12.61	7.17	2.47	0.42	12.04
R-1	05/24/99				0.027	<	0.010	9.89	7.11	2.52	3	12.2
R-1	12/02/99				0.011		0.010	12.84	7.4	2.47	6	12.3
R-1	05/30/00			<	0.009	<	0.009	10.02	7.49	2.44	2.40	12.27
R-1	05/30/00			<	0.009	<	0.009	10.02	7.49	2.44	2.40	12.27
R-1	10/17/00			<	0.009	<	0.009	12.98	7.16	2.65	2.00	12.46
R-1	05/10/01			<	0.008	<	0.008	9.84	7.21	2.59	2.20	12.75
R-1	10/29/01				0.032	<	0.009	13.30	7.25	2.49	2.18	12.61
RMIS-1	Jun-92	<	0.010	<	0.005							
RMIS-1	Sep-92	<	0.010	<	0.005							
RMIS-1	Dec-92	<	0.010	<	0.005							
RMIS-1	Mar-93	<	0.010	<	0.005							
RMIS-1	Jun-93	<	0.010	<	0.005							
RMIS-1	Aug-93	<	0.010	<	0.005							
RMIS-1	Sep-93	<	0.010	<	0.005							
RMIS-1	Sep-93	<	0.010	<	0.005							
RMIS-1	Oct-93	<	0.005	<	0.010							
RMIS-1	Oct-93	<	0.005	<	0.010							
RMIS-1	Nov-93	<	0.005	<	0.010							
RMIS-1	Dec-93	<	0.005	<	0.010							
RMIS-1	Dec-93	<	0.005	<	0.010							

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Sample ID	Date	Q	Hexavalent Cr (mg/L)	Q	Total Cr (mg/L)	Q	Dissolved Cr (mg/L)	Temp (°C)	pH (SU)	SC mmhos/cm	Turbidity (NTU)	SWL Ft
RMIS-1	Jan-94	<	0.005	<	0.010							
RMIS-1	Apr-94	<	0.010	<	0.005							
RMIS-1	Jul-94	<	0.010	<	0.005							
RMIS-1	Oct-94	<	0.010	<	0.005							
RMIS-1	Jan-95	<	0.010	<	0.005							
RMIS-1	11/18/96			<	0.009		0.012	12.17	7.43	0.95	3.44	9.71
RMIS-1	05/12/97			<	0.009	<	0.009	9.33	7.33	2.59	3.50	9.56
RMIS-1	11/19/97				0.001	<	0.001	12.71	7.29	2.25	1.15	9.08
RMIS-1	05/20/98			<	0.010	<	0.010	9.84	7.22	2.43	2.64	9.82
RMIS-1	12/01/98			<	0.010		0.010	13.28	7.39	2.5	2.18	9.44
RMIS-1	05/24/99			<	0.010	<	0.010	10.76	7.23	2.59	1.8	9.79
RMIS-1	12/01/99			<	0.008	<	0.008	13.11	7.52	2.41	3	9.98
RMIS-1	05/30/00			<	0.009	<	0.009	10.39	7.65	2.47	3.21	10.09
RMIS-1	10/17/00			<	0.009	<	0.009	14.05	7.41	2.54	2.80	10.05
RMIS-1	05/10/01			<	0.008	<	0.008	9.35	7.41	2.57	1.14	10.92
RMIS-1	10/29/01			<	0.009	<	0.009	14.11	7.45	2.3	1.1	10.42
RMIS-1	10/22/02			<	0.010	<	0.010	13.88	7.46	2.28	1.40	10.11
RMIS-1	10/22/02				0.015	<	0.010	13.88	7.46	2.28	1.40	10.11
RMIS-10	Jun-92	<	0.010		0.018							
RMIS-10	Sep-92	<	0.010		0.005							
RMIS-10	Dec-92	<	0.010		0.006							
RMIS-10	Mar-93		0.060		0.050							
RMIS-10	Jun-93		0.010		0.020							
RMIS-10	Aug-93	<	0.010	<	0.005							
RMIS-10	Sep-93	<	0.010	<	0.005							
RMIS-10	Sep-93	<	0.010	<	0.005							
RMIS-10	Oct-93	<	0.010		0.009							
RMIS-10	Oct-93	<	0.010	<	0.005							
RMIS-10	Nov-93	<	0.010	<	0.005							
RMIS-10	Dec-93	<	0.010	<	0.005							
RMIS-10	Dec-93	<	0.010	<	0.005							
RMIS-10	Jan-94	<	0.010		0.005							
RMIS-10	Apr-94		0.020		0.016							
RMIS-10	Jul-94		0.010		0.009							
RMIS-10	Oct-94	<	0.010		0.008							
RMIS-10	Jan-95	<	0.020		0.018		0.016					
RMIS-10	May-95				0.011		0.016					

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Sample ID	Date	Q	Hexavalent Cr (mg/L)	Q	Total Cr (mg/L)	Q	Dissolved Cr (mg/L)	Temp (°C)	pH (SU)	SC mmhos/cm	Turbidity (NTU)	SWL Ft
RMIS-10	Dec-03				0.015	<	0.009	12.6	7.36	2.56	2.37	7.6
RMIS-2	Jun-92		0.300		0.260							
RMIS-2	Sep-92		0.200		0.220							
RMIS-2	Dec-92		0.170		0.190							
RMIS-2	Mar-93		0.100		0.090							
RMIS-2	Jun-93		0.100		0.090							
RMIS-2	Aug-93		0.140		0.140							
RMIS-2	Sep-93		0.180		0.200							
RMIS-2	Sep-93		0.120		0.191							
RMIS-2	Oct-93		0.100		0.110							
RMIS-2	Oct-93		0.140		0.136							
RMIS-2	Nov-93		0.140		0.151							
RMIS-2	Dec-93		0.190		0.190							
RMIS-2	Dec-93		0.180		0.204							
RMIS-2	Jan-94		0.220		0.230							
RMIS-2	Apr-94		0.110		0.091							
RMIS-2	Jul-94		0.440		0.540							
RMIS-2	Oct-94		0.280		0.236							
RMIS-2	Jan-95		0.160		0.135		0.166					
RMIS-2	May-95				0.062		0.061					
RMIS-2	Dec-03				0.044		0.049	12.68	7.41	2.41	4	11.24
RMIS-3	Jun-92		0.020		0.023							
RMIS-3	Sep-92		1.160		1.310							
RMIS-3	Dec-92		0.340		0.380							
RMIS-3	Mar-93		0.030		0.020							
RMIS-3	Jun-93		0.020		0.020							
RMIS-3	Aug-93		0.010		0.013							
RMIS-3	Sep-93	<	0.010		0.030							
RMIS-3	Sep-93		0.010		0.012							
RMIS-3	Oct-93		0.010		0.010							
RMIS-3	Oct-93		0.010		0.013							
RMIS-3	Nov-93		0.030		0.034							
RMIS-3	Dec-93		0.060		0.060							
RMIS-3	Dec-93		0.080		0.087							
RMIS-3	Jan-94		0.080		0.070							
RMIS-3	Apr-94	<	0.010		0.013							
RMIS-3	Jul-94		0.010		0.015							

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Sample ID	Date	Q	Hexavalent Cr (mg/L)	Q	Total Cr (mg/L)	Q	Dissolved Cr (mg/L)	Temp (°C)	pH (SU)	SC mmhos/cm	Turbidity (NTU)	SWL Ft
RMIS-3	Oct-94		0.170		0.156							
RMIS-3	Jan-95		0.020		0.021		0.020					
RMIS-3	May-95				0.011		0.011					
RMIS-3	Dec-03			<	0.009		0.009	12.97	7.21	2.31	2.73	8.63
RMIS-4	Jun-92		5.280		5.500							
RMIS-4	Sep-92		2.420		2.610							
RMIS-4	Dec-92		3.160		3.240							
RMIS-4	Mar-93		2.920		2.920							
RMIS-4	Jun-93		3.600		3.260							
RMIS-4	Aug-93		2.680		2.340							
RMIS-4	Sep-93		2.600		2.210							
RMIS-4	Sep-93		2.110		1.850							
RMIS-4	Oct-93		1.420		1.370							
RMIS-4	Oct-93		1.480		1.410							
RMIS-4	Nov-93		1.670		1.650							
RMIS-4	Dec-93		2.040		1.900							
RMIS-4	Dec-93		2.110		1.930							
RMIS-4	Jan-94		2.130		2.040							
RMIS-4	Apr-94		1.850		1.580							
RMIS-4	Jul-94		1.260		1.470							
RMIS-4	Oct-94		0.380		0.313							
RMIS-4	Jan-95		0.190		0.163							
RMIS-4	11/19/96				0.091		0.095	12.26	7.3	2.89	4.70	6.79
RMIS-4	05/13/97				0.041		0.042	9.92	7.32	2.8	2.20	6.53
RMIS-4	05/13/97				0.045		0.043					
RMIS-4	11/20/97				0.073		0.035	12.10	7.22	2.45	2.40	6.35
RMIS-4	05/21/98				0.047		0.030	10.12	7.29	2.61	4.85	6.85
RMIS-4	12/02/98				0.057		0.039	11.92	7.31	2.8	3.5	6.66
RMIS-4	05/24/99				0.051		0.016	10.61	7.32	2.76	22	6.85
RMIS-4	12/02/99				0.098		0.040	12.3	7.52	2.78	10	6.93
RMIS-4	05/30/00				0.025		0.025	11.16	7.60	2.73	1.80	7.04
RMIS-4	10/18/00				0.020	<	0.009	13.96	7.38	2.89	1.60	7.09
RMIS-4	05/09/01				0.017		0.015	9.72	7.35	2.73	1.60	7.57
RMIS-4	10/29/01				0.076		0.023	13.41	7.38	2.74	1.40	7.30
RMIS-4	10/22/02				0.035		0.020	12.22	7.28	2.70	1.30	7.08
RMIS-5	Jun-92		0.030		0.030							
RMIS-5	Sep-92		0.030		0.030							

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Sample ID	Date	Q	Hexavalent Cr (mg/L)	Q	Total Cr (mg/L)	Q	Dissolved Cr (mg/L)	Temp (°C)	pH (SU)	SC mmhos/cm	Turbidity (NTU)	SWL Ft
RMIS-5	Dec-92		0.030		0.030							
RMIS-5	Mar-93		0.030		0.030							
RMIS-5	Jun-93		0.030		0.030							
RMIS-5	Aug-93		0.030		0.028							
RMIS-5	Sep-93		0.030		0.030							
RMIS-5	Sep-93		0.020		0.026							
RMIS-5	Oct-93		0.030		0.025							
RMIS-5	Oct-93		0.020		0.024							
RMIS-5	Nov-93		0.020		0.023							
RMIS-5	Dec-93		0.030		0.028							
RMIS-5	Dec-93		0.030		0.037							
RMIS-5	Jan-94		0.040		0.040							
RMIS-5	Apr-94		0.030		0.030							
RMIS-5	Jul-94		0.150		0.160							
RMIS-5	Oct-94		0.120		0.093							
RMIS-5	Jan-95		0.070		0.068		0.061					
RMIS-5	May-95				0.035		0.032					
RMIS-5	Dec-03				0.018		0.023	11.81	7.39	2.54	3.3	7.15
RMIS-6	Jun-92		3.000		3.200							
RMIS-6	Sep-92		4.410		4.370							
RMIS-6	Dec-92		4.860		5.160							
RMIS-6	Mar-93		4.190		4.750							
RMIS-6	Jun-93		3.900		4.090							
RMIS-6	Aug-93		4.480		3.920							
RMIS-6	Sep-93		4.300		3.680							
RMIS-6	Sep-93		4.100		3.500							
RMIS-6	Oct-93		3.860		3.580							
RMIS-6	Oct-93		4.070		3.840							
RMIS-6	Nov-93		3.730		3.500							
RMIS-6	Dec-93		3.510		3.140							
RMIS-6	Dec-93		3.290		2.710							
RMIS-6	Jan-94		2.970		2.840							
RMIS-6	Apr-94		2.550		1.890							
RMIS-6	Jul-94		2.100		2.280							
RMIS-6	Oct-94		1.720		1.620							
RMIS-6	Jan-95		1.220		0.990							
RMIS-6	11/19/96				0.206		0.200	13.24	7.36	2.86	0.40	8.16

Mouat Industries NPL Site - Columbus, MT
Water Quality Field Parameters and Chromium Concentrations

Sample ID	Date	Q	Hexavalent Cr (mg/L)	Q	Total Cr (mg/L)	Q	Dissolved Cr (mg/L)	Temp (°C)	pH (SU)	SC mmhos/cm	Turbidity (NTU)	SWL Ft
RMIS-6	05/13/97				0.140		0.133	8.94	7.37	2.77	0.50	7.82
RMIS-6	11/20/97				0.113		0.108	13.12	7.27	2.38	0.18	7.76
RMIS-6	11/20/97				0.117		0.107	13.12	7.27	2.38	0.18	7.76
RMIS-6	05/21/98				0.152		0.141	9.07	7.32	2.59	1.90	8.22
RMIS-6	06/03/99				0.115		0.109	9.17	7.38	2.75	4	8.21
RMIS-6	12/02/99				0.090		0.091	13.29	7.54	2.71	3	8.36
RMIS-6	05/30/00				0.087		0.065	9.08	7.65	2.67	0.30	8.46
RMIS-6	10/18/00				0.078		0.071	14.06	7.47	2.86	0.22	8.57
RMIS-6	05/09/01				0.068		0.060	8.81	7.40	2.76	0.26	9.01
RMIS-6	10/29/01				0.050		0.058	14.66	7.50	2.69	0.33	8.76
RMIS-6	10/23/02				0.047		0.044	13.22	7.44	2.57	0.51	8.56
RMIS-7	Jun-92		0.140		0.160							
RMIS-7	Sep-92		0.450		0.460							
RMIS-7	Dec-92		0.560		0.630							
RMIS-7	Mar-93		0.250		0.250							
RMIS-7	Jun-93		0.090		0.080							
RMIS-7	Aug-93		0.110		0.100							
RMIS-7	Sep-93		0.150		0.154							
RMIS-7	Sep-93		0.200		0.180							
RMIS-7	Oct-93		0.230		0.170							
RMIS-7	Oct-93		0.250		0.250							
RMIS-7	Nov-93		0.270		0.257							
RMIS-7	Dec-93		0.230		0.260							
RMIS-7	Dec-93		0.230		0.268							
RMIS-7	Jan-94		0.260		0.250							
RMIS-7	Apr-94		0.470		0.413							
RMIS-7	Jul-94		0.310		0.380							
RMIS-7	Oct-94		0.640		0.675							
RMIS-7	Jan-95		0.230		0.205							
RMIS-7	11/19/96				0.021		0.018	11.77	7.22	2.56	0.90	9.57
RMIS-7	11/19/96				0.037		0.029					
RMIS-7	05/13/97				0.017		0.016	9.44	7.2	2.4	1.30	9.16
RMIS-7	11/20/97				0.015		0.014	11.97	7.06	2.00	2.32	9.24
RMIS-7	05/21/98				0.017		0.013	9.34	7.11	2.29	1.25	9.60
RMIS-7	12/02/98			<	0.010		0.011	12.46	7.13	2.4	0.66	9.43
RMIS-7	05/24/99				0.013		0.011	9.88	7.13	2.45	3.4	9.6
RMIS-7	05/24/99				0.016		0.013	9.88	7.13	2.45	3.4	9.6

Mouat Industries NPL Site - Columbus, MT
Water Quality Field Parameters and Chromium Concentrations

Sample ID	Date	Q	Hexavalent Cr (mg/L)	Q	Total Cr (mg/L)	Q	Dissolved Cr (mg/L)	Temp (°C)	pH (SU)	SC mmhos/cm	Turbidity (NTU)	SWL Ft
RMIS-7	12/02/99				0.014		0.010	12.51	7.34	2.41	3	9.74
RMIS-7	05/30/00			<	0.009	<	0.009	10.10	7.47	2.38	1.00	9.68
RMIS-7	10/18/00				0.022		0.018	13.47	7.24	2.60	0.90	9.84
RMIS-7	05/09/01			<	0.008	<	0.008	9.84	7.20	2.56	0.82	10.14
RMIS-7	10/29/01				0.016		0.016	13.46	7.23	2.59	0.88	10.00
RMIS-7	10/23/02				0.020		0.017	12.28	7.26	2.54	0.90	9.87
RMIS-8	Jun-92		0.860		0.760							
RMIS-8	Sep-92		0.320		0.350							
RMIS-8	Dec-92		0.620		0.670							
RMIS-8	Mar-93		2.020		2.150							
RMIS-8	Jun-93		1.200		1.100							
RMIS-8	Aug-93		1.180		1.450							
RMIS-8	Sep-93		0.600		0.860							
RMIS-8	Sep-93		0.720		0.750							
RMIS-8	Oct-93		0.810		0.800							
RMIS-8	Oct-93		0.680		0.780							
RMIS-8	Nov-93		0.730		0.680							
RMIS-8	Dec-93		0.740		0.680							
RMIS-8	Dec-93		0.850		0.710							
RMIS-8	Jan-94		0.910		0.880							
RMIS-8	Apr-94		0.780		0.772							
RMIS-8	Jul-94		0.880		0.910							
RMIS-8	Oct-94		0.590		0.588							
RMIS-8	Jan-95		0.610		0.514							
RMIS-9	Jun-92		0.010		0.017							
RMIS-9	Sep-92	<	0.010		0.010							
RMIS-9	Dec-92	<	0.010		0.007							
RMIS-9	Mar-93		0.020		0.020							
RMIS-9	Jun-93		0.020		0.030							
RMIS-9	Aug-93		0.020		0.016							
RMIS-9	Sep-93		0.020		0.016							
RMIS-9	Sep-93		0.010		0.011							
RMIS-9	Oct-93	<	0.010		0.007							
RMIS-9	Oct-93	<	0.010		0.006							
RMIS-9	Nov-93	<	0.010		0.007							
RMIS-9	Dec-93	<	0.010		0.007							
RMIS-9	Dec-93	<	0.010		0.007							

Mouat Industries NPL Site - Columbus, MT
Water Quality Field Parameters and Chromium Concentrations

Sample ID	Date	Q	Hexavalent Cr (mg/L)	Q	Total Cr (mg/L)	Q	Dissolved Cr (mg/L)	Temp (°C)	pH (SU)	SC mmhos/cm	Turbidity (NTU)	SWL Ft
RMIS-9	Jan-94	<	0.010		0.008							
RMIS-9	Apr-94	<	0.010		0.006							
RMIS-9	Jul-94	<	0.010		0.014							
RMIS-9	Oct-94		0.010		0.012							
RMIS-9	Jan-95	<	0.010		0.009							
RMIS-9	11/19/96			<	0.009	<	0.009	11.74	7.41	2.87	0.70	7.74
RMIS-9	05/13/97				0.010	<	0.009	8.78	7.38	2.73	0.88	7.35
RMIS-9	11/20/97				0.005		0.005	11.75	7.27	2.40	0.32	7.38
RMIS-9	05/21/98			<	0.010	<	0.010	9.04	7.31	2.56	0.77	7.76
RMIS-9	12/02/98			<	0.010	<	0.010	12.02	7.31	2.76	0.4	7.41
RMIS-9	05/25/99			<	0.010		0.011	9.26	7.32	2.73	1	7.68
RMIS-9	12/01/99			<	0.008	<	0.008	12.33	7.57	2.64	0.4	7.8
RMIS-9	05/30/00			<	0.009	<	0.009	9.95	7.67	2.55	0.70	7.75
RMIS-9	10/17/00			<	0.009	<	0.009	13.97	7.43	2.69	0.55	7.78
RMIS-9	05/10/01			<	0.008	<	0.008	9.03	7.41	2.53	0.62	8.32
RMIS-9	10/29/01			<	0.009	<	0.009	14.23	7.45	2.60	0.63	8.05
RMIS-9	10/29/01				0.012	<	0.009	14.23	7.45	2.60	0.63	8.05
RMIS-9	10/22/02				0.011	<	0.010	12.23	7.36	2.62	0.80	7.81
W-1	Jun-92	<	0.010	<	0.005							
W-1	Sep-92	<	0.010	<	0.005							
W-1	Dec-92	<	0.010	<	0.005							
W-1	Mar-93		0.010	<	0.010							
W-1	Jun-93	<	0.010	<	0.005							
W-1	Aug-93	<	0.010	<	0.005							
W-1	Sep-93	<	0.010	<	0.005							
W-1	Sep-93		0.020		0.006							
W-1	Oct-93	<	0.010	<	0.005							
W-1	Oct-93	<	0.010	<	0.005							
W-1	Nov-93	<	0.010	<	0.005							
W-1	Dec-93	<	0.010	<	0.005							
W-1	Dec-93	<	0.010	<	0.005							
W-1	Jan-94	<	0.010	<	0.005							
W-1	Apr-94	<	0.010	<	0.005							
W-1	Jul-94	<	0.010	<	0.005							
W-1	Oct-94	<	0.010	<	0.005							
W-1	Jan-95	<	0.010		0.064							
W-10	Oct-93	<	0.010		0.006							

Mouat Industries NPL Site - Columbus, MT
Water Quality Field Parameters and Chromium Concentrations

Sample ID	Date	Q	Hexavalent Cr (mg/L)	Q	Total Cr (mg/L)	Q	Dissolved Cr (mg/L)	Temp (°C)	pH (SU)	SC mmhos/cm	Turbidity (NTU)	SWL Ft
W-10	Oct-93	<	0.010		0.006							
W-10	Nov-93	<	0.010		0.058							
W-10	Dec-93	<	0.010		0.006							
W-10	Dec-93	<	0.010		0.006							
W-10	Jan-94	<	0.010		0.014							
W-10	Apr-94	<	0.010		0.016							
W-10	Jul-94		0.030		0.042							
W-10	Oct-94	<	0.010		0.015							
W-10	Jan-95	<	0.010		0.128							
W-11	Jun-92	<	0.010		0.012							
W-11	Sep-92		0.040		0.040							
W-11	Dec-92		0.050		0.060							
W-11	Mar-93		0.010	<	0.010							
W-11	Jun-93	<	0.010		0.009							
W-11	Aug-93	<	0.010		0.007							
W-11	Sep-93		0.010		0.008							
W-11	Sep-93		0.010		0.010							
W-11	Oct-93	<	0.010		0.009							
W-11	Oct-93	<	0.010		0.009							
W-11	Nov-93		0.010		0.010							
W-11	Dec-93		0.010		0.012							
W-11	Dec-93		0.010		0.015							
W-11	Jan-94		0.020		0.020							
W-11	Apr-94		0.010		0.014							
W-11	Jul-94		0.010		0.013							
W-11	Oct-94		0.030		0.025							
W-11	Jan-95		0.010		0.025		0.020					
W-11	May-95				0.018		0.015					
W-11	Dec-03				0.014	<	0.009	12.38	7.34	2.39	0.63	8.87
W-13	Jun-92	<	0.010	<	0.005							
W-13	Sep-92	<	0.010	<	0.005							
W-13	Dec-92	<	0.010	<	0.005							
W-13	Mar-93	<	0.010	<	0.010							
W-13	Jun-93	<	0.010	<	0.005							
W-13	Aug-93	<	0.010	<	0.005							
W-13	Sep-93	<	0.010	<	0.005							
W-13	Sep-93	<	0.010	<	0.005							

Mouat Industries NPL Site - Columbus, MT
Water Quality Field Parameters and Chromium Concentrations

Sample ID	Date	Q	Hexavalent Cr (mg/L)	Q	Total Cr (mg/L)	Q	Dissolved Cr (mg/L)	Temp (°C)	pH (SU)	SC mmhos/cm	Turbidity (NTU)	SWL Ft
W-13	Oct-93	<	0.005	<	0.010							
W-13	Oct-93	<	0.005	<	0.010							
W-13	Nov-93	<	0.005	<	0.010							
W-13	Dec-93	<	0.005	<	0.010							
W-13	Dec-93	<	0.005	<	0.010							
W-13	Jan-94	<	0.005	<	0.010							
W-13	Apr-94	<	0.010	<	0.005							
W-13	Jul-94	<	0.010	<	0.005							
W-13	Oct-94	<	0.010	<	0.005							
W-13	Jan-95	<	0.010	<	0.005	<	0.005					
W-13	May-95			<	0.005	<	0.005					
W-13	Dec-03			<	0.009	<	0.009	11.87	7.34	2.52	2.27	5.03
W-9	Jun-92		0.010		0.010							
W-9	Sep-92	<	0.010	<	0.005							
W-9	Dec-92	<	0.010	<	0.005							
W-9	Mar-93		0.010	<	0.010							
W-9	Jun-93	<	0.010		0.008							
W-9	Aug-93	<	0.010	<	0.005							
W-9	Sep-93	<	0.010		0.064							
W-9	Sep-93	<	0.010		0.011							
W-9	Oct-93		0.010		0.008							
W-9	Oct-93	<	0.010		0.011							
W-9	Nov-93	<	0.010		0.006							
W-9	Dec-93	<	0.010	<	0.005							
W-9	Dec-93	<	0.010	<	0.005							
W-9	Jan-94	<	0.010	<	0.005							
W-9	Apr-94	<	0.010		0.008							
W-9	Jul-94		0.140		0.140							
W-9	Oct-94	<	0.010		0.062							
W-9	Jan-95	<	0.010		0.073	<	0.005					
W-9	May-95				0.013		0.014					
W-9	Dec-03			<	0.009	<	0.009	10.34	7.42	2.32	0.7	6.65

SWL = Static water level measured from measuring point on well casing
< = less than instrument detection limit

Sample Identification	Sample Date	Document ID #	Sampler (Organization)	Total Chromium (mg/l)	Hexavalent Chromium (mg/l)	Comments
GW-1	1977	GW8603	Weston TAT	**	< 0.05	
	1980	GW8603	Weston TAT	**	< 0.01	
	1983	GW8603	Weston TAT	**	< 0.05	
	1984*	GW8603	Weston TAT	**	< 0.01	MI-GW-1
	1985*	GW8603	Weston TAT	**	< 0.02	MI-GW-1
GW-2	1977	GW8603	Weston TAT	**	< 0.05	
	1980	GW8603	Weston TAT	**	< 0.01	
	1983	GW8603	Weston TAT	**	< 0.05	
	1984*	GW8603	Weston TAT	**	< 0.01	MI-GW-2
	1985*	GW8603	Weston TAT	**	< 0.02	MI-GW-2
GW-3	1977	GW8603	Weston TAT	**	< 0.05	
	1980	GW8603	Weston TAT	**	< 0.01	
	1983	GW8603	Weston TAT	**	0.06	
	1984*	GW8603	Weston TAT	**	< 0.01	MI-GW-3
GW-4	1977	GW8603	Weston TAT	**	6.2	
	1980	GW8603	Weston TAT	**	4.6	
	1983	GW8603	Weston TAT	**	3.9	
	1984*	GW8603	Weston TAT	**	3.8	MI-GW-4
	1985*	GW8603	Weston TAT	**	3.8	MI-GW-4
GW-5	1977	GW8603	Weston TAT	**	13.2	
	1980	GW8603	Weston TAT	**	6.1	
	1983	GW8603	Weston TAT	**	4.5	
GW-6	1977	GW8603	Weston TAT	**	< 0.05	
GW-7	1977	GW8603	Weston TAT	**	0.35	
	1980	GW8603	Weston TAT	**	0.38	
	1983	GW8603	Weston TAT	**	0.53	
	1984*	GW8603	Weston TAT	**	< 0.01	MI-GW-7
MI-GW-8	1984	GW8603	Weston TAT	**	< 0.01	
GW-9	1977	GW8603	Weston TAT	**	< 0.05	
	1980	GW8603	Weston TAT	**	< 0.01	
	1983	GW8603	Weston TAT	**	< 0.05	
GW-10	1977	GW8603	Weston TAT	**	< 0.05	
	1980	GW8603	Weston TAT	**	< 0.01	
	1983	GW8603	Weston TAT	**	< 0.05	
GW-11	1977	GW8603	Weston TAT	**	< 0.05	
	1983	GW8603	Weston TAT	**	< 0.05	
GW-12	1977	GW8603	Weston TAT	**	< 0.05	
	1983	GW8603	Weston TAT	**	< 0.05	
GW-13	1980	GW8603	Weston TAT	**	< 0.01	
	1983	GW8603	Weston TAT	**	< 0.05	
GW-14	1977	GW8603	Weston TAT	**	1.3	
GW-15	1977	GW8603	Weston TAT	**	8.1	
	1980	GW8603	Weston TAT	**	6.2	
	1983	GW8603	Weston TAT	**	3.8	
	1984*	GW8603	Weston TAT	**	< 0.01	MI-GW-15
GW-16	1977	GW8603	Weston TAT	**	0.48	

Sample Identification	Sample Date	Document ID #	Sampler (Organization)	Total Chromium (mg/l)	Hexavalent Chromium (mg/l)	Comments
	1980	GW8603	Weston TAT	**	0.3	
	1983	GW8603	Weston TAT	**	0.42	
	1984*	GW8603	Weston TAT	**	0.6	MI-GW-16
	1985*	GW8603	Weston TAT	**	1.2	MI-GW-16
GW-17	1977	GW8603	Weston TAT	**	< 0.05	
	1980	GW8603	Weston TAT	**	< 0.01	
GW-18	1977	GW8603	Weston TAT	**	< 0.05	
	1980	GW8603	Weston TAT	**	< 0.01	
GW-19	1977	GW8603	Weston TAT	**	63.5	
River (u)	1977	GW8603	Weston TAT	**	< 0.01	Upstream Yellowstone River
River (d)	1977	GW8603	Weston TAT	**	< 0.01	Downstream Yellowstone River
SW-1	1984	SW8603	Weston TAT	**	< 0.01	Slough at Dump
	1985	SW8603	Weston TAT	**	< 0.02	
SW-2	1984	SW8603	Weston TAT	**	0.23	Golf Course Slough
SW-3	1984	SW8603	Weston TAT	**	< 0.01	Junkyard Slough
SW-4	1984	SW8603	Weston TAT	**	< 0.01	Wegner Ranch
	1985	SW8603	Weston TAT	**	< 0.02	
SW-5	1985	SW8603	Weston TAT	**	0.54	Slough NW of Mouat
SW-6	1985	SW8603	Weston TAT	**	0.14	Slough W of Landfill
SW-7	1980	SW8603	Weston TAT	**	0.59	Golf Course Pond
	1983	SW8603	Weston TAT	**	0.5	
	1984	SW8603	Weston TAT	**	0.08	
W-1	1977	GW7701	MYAPO	0.04	< 0.05	
	1980	GWUN02	EPA	< 0.005	< 0.01	
W-2	1977	GW7701	MYAPO	0.04	< 0.05	
	1980	GWUN02	EPA	< 0.005	< 0.01	
W-3	1977	GW7701	MYAPO	0.09	< 0.05	
	1980	GWUN02	EPA	< 0.005	< 0.01	
W-4	1977	GW7701	MYAPO	17.4	6.2	
	1980	GWUN02	EPA	4.1	4.64	
W-5	1977	GW7701	MYAPO	25	13.2	
	1980	GWUN02	EPA	5.9	6.1	
W-6	1977	GW7701	MYAPO	0.08	< 0.05	
W-7	1977	GW7701	MYAPO	0.42	0.35	
	1980	GWUN02	EPA	0.34	0.38	
W-9	1977	GW7701	MYAPO	0.04	< 0.05	
	1980	GWUN02	EPA	< 0.005	< 0.01	
W-10	1977	GW7701	MYAPO	0.26	< 0.05	
	1980	GWUN02	EPA	< 0.005	< 0.01	
W-11	1977	GW7701	MYAPO	0.08	< 0.05	
W-12	1977	GW7701	MYAPO	0.06	< 0.05	
W-13	1980	GWUN02	EPA	< 0.005	< 0.01	
W-14	1977	GW7701	MYAPO	2.74	1.32	
W-15	1977	GW7701	MYAPO	7.19	8.1	
	1980	GWUN02	EPA	5.8	6.24	
W-16	1977	GW7701	MYAPO	2.45	0.48	

Sample Identification	Sample Date	Document ID #	Sampler (Organization)	Total Chromium (mg/l)	Hexavalent Chromium (mg/l)	Comments
	1980	GWUN02	EPA	0.257	0.3	
W-17	1977	GW7701	MYAPO	0.07	< 0.05	
	1980	GWUN02	EPA	< 0.005	< 0.01	
W-18	1977	GW7701	MYAPO	0.11	< 0.05	
	1980	GWUN02	EPA	< 0.005	< 0.01	
W-19	1977	GW7701	MYAPO	76	63.5	
Golf Course Sp	1980	GWUN02	EPA	0.515	0.59	
River Upsh	1977	GW7701	MYAPO	< 0.02	< 0.01	
	1980	GWUN02	EPA	< 0.005	**	
River Downsh	1977	GW7701	MYAPO	< 0.02	< 0.01	
	1980	GWUN02	EPA	< 0.005	**	
RB-3	6/89	GW8905	ERT/REAC	< 0.01	< 0.01	
W-1	6/89	GW8905	ERT/REAC	< 0.01	< 0.01	
W-2	6/89	GW8905	ERT/REAC	< 0.01	< 0.01	
W-3	6/89	GW8905	ERT/REAC	0.63	0.58	
W-4	6/89	GW8905	ERT/REAC	2.3	2.3	
W-4 (DUP)	6/89	GW8905	ERT/REAC	2.3	2.3	
W-5	6/89	GW8905	ERT/REAC	7.2	7	
W-5 (DUP)	6/89	GW8905	ERT/REAC	7.3	7.2	
W-7	6/89	GW8905	ERT/REAC	0.19	0.17	
W-7	6/89	GW8905	ERT/REAC	0.18	0.17	
W-9	6/89	GW8905	ERT/REAC	< 0.01	< 0.01	
W-9	6/89	GW8905	ERT/REAC	0.01	< 0.01	
W-16	6/89	GW8905	ERT/REAC	0.53	0.38	
W-16	6/89	GW8905	ERT/REAC	0.53	0.51	
W1-10	6/89	GW8905	ERT/REAC	0.01	< 0.01	
W1-10	6/89	GW8905	ERT/REAC	< 0.01	< 0.01	
Ballfield Well	6/89	GW8905	ERT/REAC	0.02	0.02	
Landfill Well	6/89	GW8905	ERT/REAC	0.02	< 0.01	
Griffel Farm	6/89	GW8905	ERT/REAC	< 0.01	< 0.01	
Griffel Residence	6/89	GW8905	ERT/REAC	< 0.01	< 0.01	
Rix	6/89	GW8905	ERT/REAC	< 0.01	< 0.01	
R - 1(Anderson)	6/89	GW8905	ERT/REAC	< 0.01	< 0.01	
R-2(Ziegler)	6/89	GW8905	ERT/REAC	< 0.01	< 0.01	
RMIS-1	6/9/92	GE9409	USBR	ND	ND	Total Cation, Total Anion, Unfiltered Hex Cr
	9/21/92	GE9409	USBR	ND	ND	Total Cation, Total Anion, Unfiltered Hex Cr
	12/7/92	GE9409	USBR	ND	ND	Total Cation, Total Anion, Unfiltered Hex Cr
	3/29/93	GE9409	USBR	ND	ND	Total Cation, Total Anion, Unfiltered Hex Cr
RMIS-2	6/9/92	GE9409	USBR	0.352	0.3	Total Cation, Total Anion, Unfiltered Hex Cr
	9/21/92	GE9409	USBR	0.154	0.17	Total Cation, Total Anion, Unfiltered Hex Cr
	12/7/92	GE9409	USBR	0.17	0.16	Total Cation, Total Anion, Unfiltered Hex Cr
	3/29/93	GE9409	USBR	0.096	0.1	Total Cation, Total Anion, Unfiltered Hex Cr
RMIS-3	6/9/92	GE9409	USBR	0.024	0.02	Total Cation, Total Anion, Unfiltered Hex Cr
	9/21/92	GE9409	USBR	1.07	1.28	Total Cation, Total Anion, Unfiltered Hex Cr
	12/7/92	GE9409	USBR	0.307	0.33	Total Cation, Total Anion, Unfiltered Hex Cr
	3/29/93	GE9409	USBR	0.016	0.03	Total Cation, Total Anion, Unfiltered Hex Cr

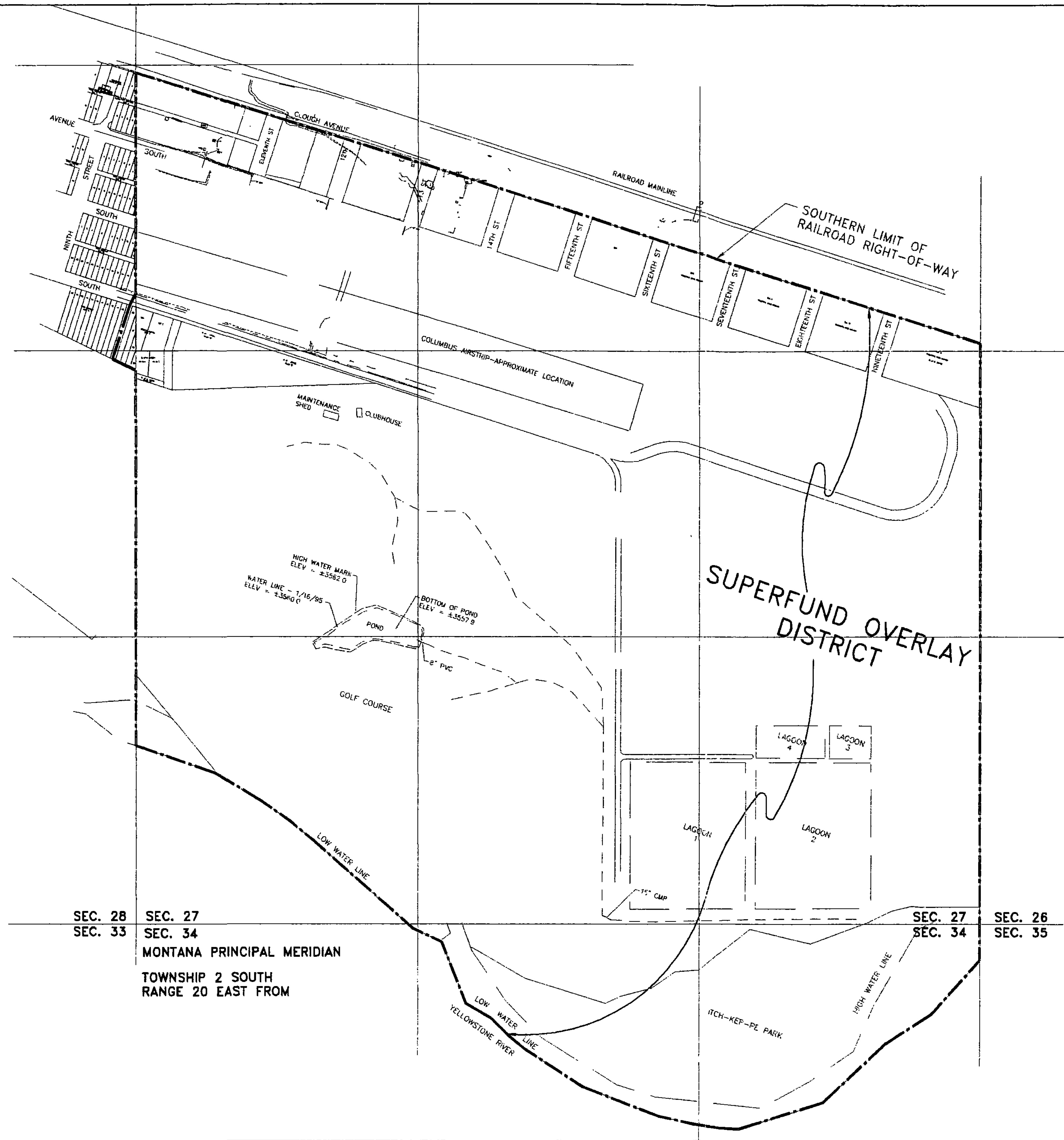
Sample Identification	Sample Date	Document ID #	Sampler (Organization)	Total Chromium (mg/l)	Hexavalent Chromium (mg/l)	Comments
RMIS-4	6/9/92	GE9409	USBR	5.11	5.43	Total Cation, Total Anion, Unfiltered Hex Cr
	9/21/92	GE9409	USBR	2.27	2.61	Total Cation, Total Anion, Unfiltered Hex Cr
	12/7/92	GE9409	USBR	2.6	3.05	Total Cation, Total Anion, Unfiltered Hex Cr
	3/29/93	GE9409	USBR	2.67	2.97	Total Cation, Total Anion, Unfiltered Hex Cr
RMIS-5	6/9/92	GE9409	USBR	0.044	0.02	Total Cation, Total Anion, Unfiltered Hex Cr
	9/21/92	GE9409	USBR	0.028	0.03	Total Cation, Total Anion, Unfiltered Hex Cr
	12/7/92	GE9409	USBR	0.03	0.03	Total Cation, Total Anion, Unfiltered Hex Cr
	3/29/93	GE9409	USBR	0.028	0.03	Total Cation, Total Anion, Unfiltered Hex Cr
RMIS-6	6/9/92	GE9409	USBR	3.15	3.31	Total Cation, Total Anion, Unfiltered Hex Cr
	9/21/92	GE9409	USBR	4.11	5.08	Total Cation, Total Anion, Unfiltered Hex Cr
	12/7/92	GE9409	USBR	4.33	5.07	Total Cation, Total Anion, Unfiltered Hex Cr
	3/29/93	GE9409	USBR	3.89	4.23	Total Cation, Total Anion, Unfiltered Hex Cr
RMIS-7	6/9/92	GE9409	USBR	0.14	ND	Total Cation, Total Anion, Unfiltered Hex Cr
	9/21/92	GE9409	USBR	0.422	0.47	Total Cation, Total Anion, Unfiltered Hex Cr
	12/7/92	GE9409	USBR	0.576	0.63	Total Cation, Total Anion, Unfiltered Hex Cr
	3/29/93	GE9409	USBR	0.246	0.25	Total Cation, Total Anion, Unfiltered Hex Cr
RMIS-8	6/9/92	GE9409	USBR	0.655	0.71	Total Cation, Total Anion, Unfiltered Hex Cr
	9/21/92	GE9409	USBR	0.255	0.36	Total Cation, Total Anion, Unfiltered Hex Cr
	12/7/92	GE9409	USBR	0.616	0.66	Total Cation, Total Anion, Unfiltered Hex Cr
	3/29/93	GE9409	USBR	1.84	1.98	Total Cation, Total Anion, Unfiltered Hex Cr
RMIS-9	6/9/92	GE9409	USBR	0.013	0.01	Total Cation, Total Anion, Unfiltered Hex Cr
	9/21/92	GE9409	USBR	0.01	ND	Total Cation, Total Anion, Unfiltered Hex Cr
	12/7/92	GE9409	USBR	0.012	ND	Total Cation, Total Anion, Unfiltered Hex Cr
	3/29/93	GE9409	USBR	0.015	0.02	Total Cation, Total Anion, Unfiltered Hex Cr
RMIS-10	6/9/92	GE9409	USBR	0.02	ND	Total Cation, Total Anion, Unfiltered Hex Cr
	9/21/92	GE9409	USBR	0.006	ND	Total Cation, Total Anion, Unfiltered Hex Cr
	12/7/92	GE9409	USBR	0.006	ND	Total Cation, Total Anion, Unfiltered Hex Cr
	3/29/93	GE9409	USBR	0.045	0.06	Total Cation, Total Anion, Unfiltered Hex Cr
W-1	6/9/92	GE9409	USBR	0.008	ND	Total Cation, Total Anion, Unfiltered Hex Cr
	9/21/92	GE9409	USBR	0.003	ND	Total Cation, Total Anion, Unfiltered Hex Cr
	12/7/92	GE9409	USBR	0.007	ND	Total Cation, Total Anion, Unfiltered Hex Cr
	3/29/93	GE9409	USBR	ND	0.01	Total Cation, Total Anion, Unfiltered Hex Cr
W-9	6/9/92	GE9409	USBR	0.014	ND	Total Cation, Total Anion, Unfiltered Hex Cr
	9/21/92	GE9409	USBR	ND	ND	Total Cation, Total Anion, Unfiltered Hex Cr
	12/7/92	GE9409	USBR	ND	ND	Total Cation, Total Anion, Unfiltered Hex Cr
	3/29/93	GE9409	USBR	ND	ND	Total Cation, Total Anion, Unfiltered Hex Cr
W-10	6/9/92	GE9409	USBR	0.035	ND	Total Cation, Total Anion, Unfiltered Hex Cr
	9/21/92	GE9409	USBR	0.008	ND	Total Cation, Total Anion, Unfiltered Hex Cr
W-11	6/9/92	GE9409	USBR	0.012	ND	Total Cation, Total Anion, Unfiltered Hex Cr
	9/21/92	GE9409	USBR	0.037	0.04	Total Cation, Total Anion, Unfiltered Hex Cr
	12/7/92	GE9409	USBR	0.045	0.05	Total Cation, Total Anion, Unfiltered Hex Cr
	3/29/93	GE9409	USBR	ND	0.01	Total Cation, Total Anion, Unfiltered Hex Cr
W-13	6/9/92	GE9409	USBR	ND	ND	Total Cation, Total Anion, Unfiltered Hex Cr
	9/21/92	GE9409	USBR	ND	ND	Total Cation, Total Anion, Unfiltered Hex Cr
	12/7/92	GE9409	USBR	0.005	ND	Total Cation, Total Anion, Unfiltered Hex Cr
	3/29/93	GE9409	USBR	ND	ND	Total Cation, Total Anion, Unfiltered Hex Cr

Sample Identification	Sample Date	Document ID #	Sampler (Organization)	Total Chromium (mg/l)	Hexavalent Chromium (mg/l)	Comments
R-1	12/7/92	GE9409	USBR	0.375	0.36	Total Cation, Total Anion, Unfiltered Hex Cr
	3/29/93	GE9409	USBR	0.038	0.04	Total Cation, Total Anion, Unfiltered Hex Cr

1) mg/l - milligram per liter
2) ND - analytical result below the method detection limit for the Analytical Method

APPENDIX D

Town of Columbus Superfund Overlay District Zoning Ordinance and Institutional Controls



LEGEND:

—·— BOUNDARY OF SUPERFUND OVERLAY DISTRICT (SOD) AND GROUND WATER USE RESTRICTION AREA

Atlantic Richfield Company

SUPERFUND OVERLAY DISTRICT

GRAPHIC SCALE

500 0 125 250 500

F:\02116 Mount Monitoring\Acad Dwgs\TREC\2003-Final Report\APPDSOD.dwg

Date: 13 October 2004

Chapter 17.76

SOD SUPERFUND OVERLAY DISTRICT

Sections:

17.76.010 Intent.

The intent of the superfund overlay district (SOD) is to protect public health, safety and welfare while allowing appropriate use of lands within the district. This intent will be accomplished by:

A. Assuring that land use in the superfund overlay district is compatible with protecting, and providing for permanent preservation and maintenance of remedial actions implemented pursuant to the superfund law, including soil caps, treated concrete blocks, and other remedial structures;

B. Requiring that any development in the block placement area of the SOD be preceded by submittal of detailed site and construction plans, prepared by an architect or engineer, for review and approval by the town as an institutional control in the context of the federal superfund law;

C. Requiring submittal of as built plans with certification from an architect or engineer that site development and construction was completed in compliance with this zoning title and federal superfund law;

D. Limiting well use and prohibiting drilling of wells within the SOD; and

E. Placing a notice to purchasers on any deed, contract for sale, or other instrument of conveyance before any lot or parcel, or any interest in any lot or parcel, in the superfund overlay district is conveyed. (Ord. 298 § 1 (part) (11.02.191), 1997)

17.76.020 Additional application requirements.

All applications for uses and development in the superfund overlay area shall include the following information:

A. As with other permit applications, an application form, an accurate site plan and review fees; and

B. A detailed grading and drainage plan prepared by an engineer showing the location, dimensions and dep[illegible] of all excavations, volumes of material [illegible] and other drainage features; [illegible]

C. Detailed plans prepared by an architect or engineer showing how remedial structures such as soil caps, treated concrete blocks, and other structures will be protected and maintained in relation to the proposed site development; and

D. Test results that confirm that any fill material proposed to be imported to the site has less than 0.1 mg/l total chromium in toxicity characteristic leaching procedure (TCLP) extracts or written certification that no fill material will be imported; and

E. Bearing capacities, design loads and wheel loads resulting from uses proposed for the site. (Ord. 298 § 1 (part) (11.02.192), 1997)

17.76.030 Performance standards for block placement area.

The following standards apply to the block placement area within the superfund overlay district:

A. No excavation will be permitted through the twenty-four (24) inch thick soil or gravel cover except for building or utility construction as described in subsection F of this section. (Excavation is permitted at the existing sanitary sewer only for purposes of sewer maintenance and improvement.)

B. Areas with gravel cover and block placement can be used for vehicle parking, material storage and related traffic. This includes trucks up to the maximum gross vehicle weight and axle loads permitted under the Montana Department of Highways adopted "Federal Bridge Formula," forklifts up to fifty thousand (50,000) pounds gross weight with up to thirty-seven thousand (37,000) pounds on a single axle with four tires, and construction equipment with up to seven thousand two hundred (7,200) pounds per square foot under the actual tire or track contact area.

C. Areas with a vegetated soil cover cannot be used for any purpose unless a gravel cover or a gravel and asphalt overlay is placed over the twenty-four (24) inch thick soil cover or a gravel cover that meets the following criteria:

1. The gravel will be select road stone from a local source. Gravel already on the site will be used to the extent possible; off-site gravel sources will be used only if on-site quantities of suitable gravel are not sufficient. This gravel will be well sorted with a range of particle sizes to facilitate close compaction and to minimize voids and permeability in the cover after placement and compaction.

2. The gravel will be separated from the underlying blocks and soils by a woven geotextile designed to reduce migration of gravel particles downward into the block-south layer and of block pieces upward into the gravel layer.

3. The gravel layer will be approximately two feet (twenty-four (24) inches) thick.

4. The gravel will be placed in six to twelve (12) inch lifts to facilitate grading and compaction. Each lift will be compacted with a motorized road construction type roller.

5. The finished surface of gravel will be graded to promote precipitation runoff to perimeter diversion ditches. The center elevation of the gravel surface will be approximately one foot above the perimeter elevations, and the average surface slope will be one percent.

6. The gravel surface will be designed and installed to accommodate vehicular traffic and open storage of materials. Operation of vehicles such as trucks and forklifts will promote compaction of the surface gravel and further reduce infiltration.

7. Maintenance of the gravel cover will be by the landowner or lessee.

D. The soil and gravel covers constructed pursuant to subsection C of this section above must be maintained by the property owner to prevent degradation. Damage due to erosion, wind, burrowing animals, vehicles, or other causes must be repaired promptly by the property owner.

E. The perimeter drainage channels and culverts must be maintained by the city of Columbus public works department in an open, free-flowing condition.

F. If any building or structure (including related utilities) is to be constructed on the block placement areas, sufficient soil must be placed over initial cover so that any excavation required for this construction does not penetrate the placed blocks. Any building or structure, including the related utilities, must meet all applicable requirements of the Montana State Building Code and the city of Columbus zoning code. Load limits for buildings or structures will not exceed six thousand (6,000) pounds per square foot.

G. Asphalt paving can be substituted for the uppermost six inches of the gravel cover. In this case, the asphalt will be placed in two courses—a four inch base course and a two inch surface wearing course.

H. The fences around the soil cover areas must be maintained by the property owner and the gates must be kept locked. To protect the soil cover, wheeled vehicles must be excluded from soil cover areas except for soil cover and vegetation maintenance. (Ord. 298 § 1 (part) (11.02.193), 1997)

17.76.040 Limitations on groundwater use.

The following limitations apply to groundwater use and related activities within the superfund overlay district:

A. Installation or operation of new groundwater wells, groundwater fed ponds or channels, and other groundwater extraction or recovery systems will not be permitted.

B. Use of groundwater from existing wells, ponds, springs, seeps or any other groundwater recovery or extraction system will not be permitted, except for lawn irrigation use, use of the existing golf course pond, and groundwater monitoring of wells.

C. Excavation below the groundwater table (static groundwater level) for any purpose will not be allowed except for temporary excavation work necessary for construction purposes including placement of footings and utilities. Such temporary excavation work shall require a permit from the town of Columbus. (Ord. 298 § 1 (part) (11.02.194), 1997)

ORDINANCE NO. 267

AN ORDINANCE REPEALING CHAPTER 11.02, ZONING REGULATIONS, OF THE EXISTING ORDINANCES AND ADOPTING "TOWN OF COLUMBUS ZONING REGULATIONS, AMENDED 1995", WHICH SHALL BE CODIFIED AS CHAPTER 11.02.

WHEREAS, the Town Council deems a complete revision of the Town's existing zoning ordinances to be in the public interest, and

WHEREAS, the Town Council deems it appropriate to adopt airport zoning, and

WHEREAS, the City-County Planning Board was appointed to serve as the Columbus Zoning Commission to undertake a thorough review of the Town's current zoning ordinances and map and to make recommendations to update the ordinances, and

WHEREAS, the Columbus Zoning Commission has spent considerable time reviewing the Town's existing zoning ordinances and drafting proposed revisions, and

WHEREAS, the Columbus Zoning Commission held a public hearing in the matter on November 22, 1994, after publishing legal notice of the hearing in the November 2, 1994, issue of the *Stillwater County News*, and

WHEREAS, all public comments were considered by the Columbus Zoning Commission before it made its final recommendation that the Town Council adopt the Town of Columbus Zoning Regulations, Amended 1995, and

WHEREAS, the Town Council deems it in the public interest to adopt Town of Columbus Zoning Regulations, Amended 1995;

NOW, THEREFORE, pursuant to the authority granted under Sections 7-5-4202, 67-6-201, and 76-2-301, MCA, (1993), be it ordained by the Town Council of the Town of Columbus, Montana:

Section 1: That the Town of Columbus Zoning Regulations, Amended 1995, are hereby adopted and shall be codified as Chapter 11.02 of the Official Code of the Town of Columbus, Montana.

Section 2: That all ordinances or parts of ordinances in conflict herewith shall be repealed upon the effective date of this Ordinance.

Section 3: That this Ordinance shall become effective thirty (30) days after its passage and approval.

PASSED by the Town Council and approved by the Mayor this 6th day of March, 1995.

Jack Kenyon - Mayor

ATTEST:

Ronald D. Barndt - Town Clerk

SEAL

SECTION 11.02.190

SOD - SUPERFUND OVERLAY DISTRICT

Subsections:

11.02.191 Intent
11.02.192 Additional Application Requirements
11.02.193 Performance Standards for Block Placement Area
11.02.194 Limitations for Groundwater Use

11.02.191 Intent. The intent of the Superfund Overlay District (SOD) is to protect public health, safety and welfare while allowing appropriate use of lands within the district. This intent will be accomplished by:

1. assuring that land use in the Superfund Overlay District is compatible with protecting, and providing for permanent preservation and maintenance of remedial actions implemented pursuant to the Superfund law, including soil caps, treated concrete blocks, and other remedial structures;

2. requiring that any development in the block placement area of the SOD be preceded by submittal of detailed site and construction plans, prepared by an Architect or Engineer, for review and approval by the Town as an institutional control in the context of the federal Superfund law;

3. requiring submittal of as built plans with certification from an Architect or Engineer that site development and construction was completed in compliance with this Zoning Ordinance and federal Superfund law;

4. limiting well use and prohibiting drilling of wells within the SOD; and

5. placing a notice to purchasers on any deed, contract for sale, or other instrument of conveyance before any lot or parcel, or any interest in any lot or parcel, in the Superfund overlay district is conveyed.

11.02.192 Additional Application Requirements. All applications for uses and development in the Superfund Overlay Area shall include the following information:

1. As with other permit applications, an application form, an accurate site plan, and review fees; and

2. a detailed grading and drainage plan prepared by an Engineer showing the location, dimensions and depth of all excavations, volumes of material to be moved, and other drainage features;

3. detailed plans prepared by an Architect or Engineer showing how remedial structures such as soil caps, treated concrete blocks, and other structures will be protected and maintained in relation to the proposed site development;

4. test results that confirm that any fill material proposed to be imported to the site has less than 0.1 mg/l total chromium in toxicity characteristic leaching procedure (TCLP) extracts or written certification that no fill material will be imported; and

5. bearing capacities, design loads, and wheel loads resulting from uses proposed for the site.

11.02.193 Performance Standards for Block Placement Area.
The following standards apply to the block placement area within the Superfund Overlay District.

1. No excavation will be permitted through the 24 inch thick soil or gravel cover except for building or utility construction as described in item 6. (Excavation is permitted at the existing sanitary sewer only for purposes of sewer maintenance and improvement).

2. Areas with gravel cover and block placement can be used for vehicle parking, material storage and related traffic. This includes: trucks up to the maximum gross vehicle weight and axel loads permitted under the Montana Department of Highways adopted "Federal Bridge Formula"; forklifts up to 50,000 pounds gross weight with up to 37,000 pounds on a single axel with four tires; and construction equipment with up to 7,200 pounds per square foot under the actual tire or track contact area.

3. Areas with a vegetated soil cover cannot be used for any purpose unless a gravel cover or a gravel and asphalt overlay is placed over the 24-inch thick soil cover or a gravel cover that meets the following criteria:

   - The gravel will be select road stone from a local source. Gravel already on the site will be used to the extent possible; off-site gravel sources will be used only if on-site quantities of suitable gravel are not sufficient. This gravel will be well sorted with a range of particle sizes to facilitate close compaction and to minimize voids and permeability in the cover after placement and compaction.

   - The gravel will be separated from the underlying blocks and soils by a woven geotextile designed to reduce migration of gravel particles downward into the block-south layer and of block pieces upward into the gravel layer.

   - The gravel layer will be approximately 2 feet (24 inches) thick.

- The gravel will be placed in 6 to 12 inch lifts to facilitate grading and compaction. Each lift will be compacted with a motorized road construction type roller.

- The finished surface of gravel will be graded to promote precipitation runoff to perimeter diversion ditches. The center elevation of the gravel surface will be approximately one foot above the perimeter elevations, and the average surface slope will be one percent.

- The gravel surface will be designed and installed to accommodate vehicular traffic and open storage of materials. Operation of vehicles such as trucks and forklifts will promote compaction of the surface gravel and further reduce infiltration.

- Maintenance of the gravel cover will be by the landowner or lessee.

4. The soil and gravel covers constructed pursuant to (3) above must be maintained by the property owner to prevent degradation. Damage due to erosion, wind, burrowing animals, vehicles, or other causes must be repaired promptly by the property owner.

5. The perimeter drainage channels and culverts must be maintained by the City of Columbus Public Works Department in an open, free-flowing condition.

6. If any building or structure (including related utilities) is to be constructed on the block placement areas, sufficient soil must be placed over initial cover so that any excavation required for this construction does not penetrate the placed blocks. Any building or structure, including the related utilities, must meet all applicable requirements of the Montana State Building Code and the City of Columbus Zoning Code. Load limits for buildings or structures will not exceed 6,000 pounds per square foot.

7. Asphalt paving can be substituted for the uppermost 6 inches of the gravel cover. In this case, the asphalt will be placed in two courses–a 4 inch base course and a 2 inch surface wearing course.

8. The fences around the soil cover areas must be maintained by the property owner and the gates must be kept locked. To protect the soil cover, wheeled vehicles must be excluded from soil cover areas except for soil cover and vegetation maintenance.

11.02.194 Limitations on Groundwater Use.
The following limitations apply to groundwater use and related activities within the Superfund Overlay District.

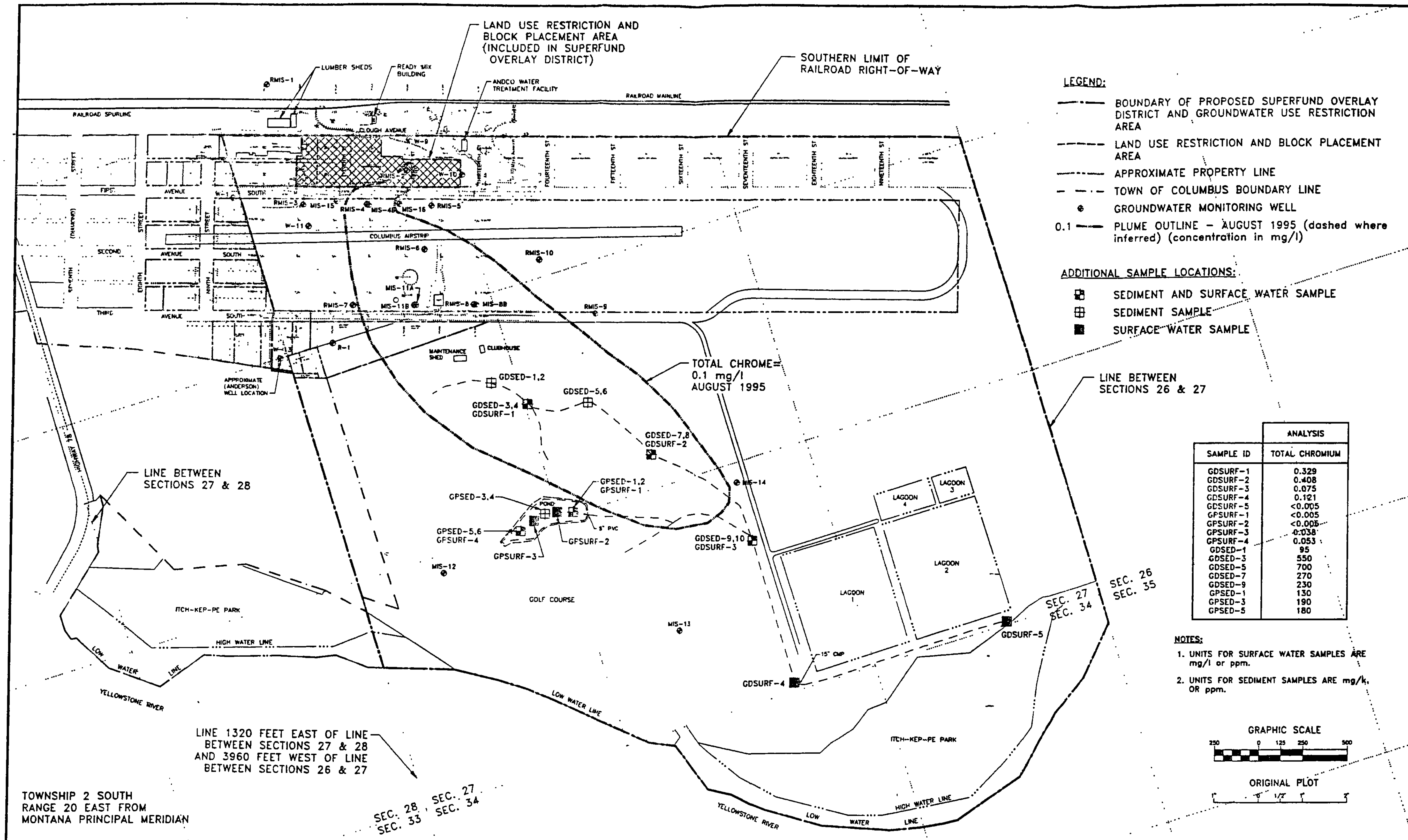
1. Installation or operation of new ground water wells, groundwater fed ponds or channels, and other groundwater extraction or recovery systems will not be permitted.

2. Use of groundwater from existing wells, ponds, springs, seeps or any other groundwater recovery or extraction system will not be permitted, except for lawn irrigation use, use of the existing golf course pond, and groundwater monitoring of wells.

3. Excavation below the groundwater table (static groundwater level) for any purpose will not be allowed except for temporary excavation work necessary for construction purposes including placement of footings and utilities. Such temporary excavation work shall require a permit from the Town of Columbus.

APPENDIX E

Surface Water Data



	ANALYSIS
SAMPLE ID	TOTAL CHROMIUM
GDSURF-1	0.329
GDSURF-2	0.408
GDSURF-3	0.075
GDSURF-4	0.121
GDSURF-5	<0.005
GPSURF-1	<0.005
GPSURF-2	<0.005
GPSURF-3	0.038
GPSURF-4	0.053
GDSED-1	95
GDSED-3	550
GDSED-5	700
GDSED-7	270
GDSED-9	230
GPSED-1	130
GPSED-3	190
GPSED-5	180

NOTES:

1. UNITS FOR SURFACE WATER SAMPLES ARE mg/l or ppm.
2. UNITS FOR SEDIMENT SAMPLES ARE mg/kg OR ppm.

REVISIONS
1
2
3
4
5
6
7
8

DSN/DWN. EHR/CEB
CHK.
S.O NO.. 18978
FILE. 18978L53

NORTH

FMC CORPORATION
PHILADELPHIA, PENNSYLVANIA

Baker Environmental, Inc.
Coraopolis, Pennsylvania

Baker
Baker Environmental Inc

SEDIMENT AND SURFACE WATER SAMPLE COLLECTION LOCATIONS
MOUAT INDUSTRIES NPL SITE
COLUMBUS, MONTANA

SCALE: AS SHOWN
DATE: OCTOBER 18, 1995

FIGURE NO.
2-6

Table 2-4

SUMMARY OF ANALYTICAL RESULTS FOR SURFACE WATER SAMPLES OBTAINED FROM THE YELLOWSTONE RIVER

Mouat Industries Site

Sample Identification	Sample Date	Sampler (Organization)	Total Chromium (mg/l)	Hexavalent Chromium (mg/l)	Comments
1W1	11/11/93	ES	< 0.01	< 0.01	Far Bank, Up River
1W2	11/11/93	ES	< 0.01	< 0.01	Center Channel, Up River
1W3	11/11/93	ES	< 0.01	0.013	Near Bank, Up River
2W1	11/11/93	ES	< 0.01	< 0.01	Far Bank, Immediately Downgradient
2W2	11/11/93	ES	< 0.01	< 0.01	Center Channel, Immediately Downgradient
2W3	11/11/93	ES	< 0.01	< 0.01	Near Bank, Immediately Downgradient
3W1	11/11/93	ES	< 0.01	< 0.01	Far Bank, Down River (approx. 0.5 mile)
3W2	11/11/93	ES	< 0.01	0.012	Center Channel, Down River (approx. 0.5 mile)
3W3	11/11/93	ES	< 0.01	< 0.01	Near Bank, Down River (approx. 0.5 mile)
4W1	11/11/93	ES	< 0.01	< 0.01	Center Channel, Immediately Downgradient
6W1	11/11/93	ES	< 0.01	0.012	Far Bank, Down River (approx. 1 mile)
6W2	11/11/93	ES	< 0.01	< 0.01	Center Channel, Down River (approx. 1 mile)
6W3	11/11/93	ES	< 0.01	< 0.01	Near Bank, Down River (approx. 1 mile)

1) mg/l - milligram per liter
2) < 0.01 - analytical result below the method detection limit for the Analytical Method
3) ES - Environmental Sciences, Inc.

ATTACHMENT 1

Mouat Industries NPL Site
2003 Non-Network Well Data Summary Report

2003 Non-Network Well Data Summary Report

Mouat Industries Superfund Site
Columbus, Montana

Prepared for:
United States Environmental Protection Agency
Region VIII, Montana Office
Helena, Montana

Prepared by:
Atlantic Richfield Company
317 Anaconda Road
Butte, MT 59701

October 2004

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APPENDICES

1.0 INTRODUCTION

This 2003 Data Summary Report was prepared in order to comply with the monitoring portion of the Unilateral Administration Order (UAO) for Conduct of a Non-Time Critical Removal Action at the Mouat Industries NPL Site in Columbus, Montana (EPA, 1996). This report presents the ground water sampling results, sampling procedures and deviations from the Response Action Work Plan (RAWP) (Jacobs Engineering, 1996), Memorandum of Sampling and Analysis Protocol (SAP) and Health and Safety Plan for the Mouat Industries NPL Site (ESE, 1996). The SAP was written to address all the monitoring requirements specified in the RAWP.

From 1957 to approximately 1973, a chromium processing plant was operated by various owners and co-owners. This site is located immediately southeast of Columbus, Montana, within the Yellowstone River floodplain. Currently, the local area consists of a variety of sites including an active air-strip, a municipal golf course, and mining and lumber processing facilities. The chromium operation processed chromate ore into high-grade sodium dichromate, which produced sodium sulfate process wastes containing sodium chromate and sodium dichromate. These chromium compounds also contained hexavalent chromium. Previous investigations performed in 1977, 1980, 1983, 1984, 1985, 1989 and 1992 revealed elevated chromium levels in the soil, surface water and ground water within and adjacent to the site. Elevated concentrations of chromium in the ground water were detected moving southeast of the site toward the Yellowstone River (EPA, 1996). In June of 1993, a full scale excavation and treatment of the soil was implemented. The program was completed in 1995.

Semi-annual ground water and surface water monitoring began in November 1996 and continued until October 2002. Monitoring was scheduled to continue for 5 years, to verify that natural attenuation continued to be effective in reducing chromium concentrations in ground water and surface water within restrictive zones as prescribed by the Superfund Overlay District (SOD) (EPA, 1996). In December 2003, ground water wells (non-network wells) that were not included in the regular network of monitoring wells but were within the SOD were monitored.

2.0 GROUND WATER MONITORING

The results of ground water monitoring conducted in December 2003 are presented in this section. From November 1996 through October 2002, the monitoring network consisted of twelve monitoring wells and one surface water monitoring station. The 2003 monitoring was to consist of monitoring eleven non-network wells, all of which lie within the SOD, to confirm that chromium levels at the Mouat facility have reached the cleanup goal of less than 100 ug/L. All ground water monitoring was performed in accordance with the scope of work presented in the SAP for the following:

- Field Logbook/Sampling Documentation
- Water Level and Well Depth Measurement
- Field Meter Calibration
- Ground Water Sample Collection
- Decontamination
- QA/QC Field Samples
- Chain-of-Custody Records
- Data Validation

Field observations were documented in a logbook and on field data sheets. Copies of these field notes and data sheets are provided in Appendices A and B, respectively.

Water quality field parameters were measured with a YSI® Water Quality Monitoring System, a Fischer Scientific® pH meter and a HACH® portable turbidity meter, or equivalents, which were calibrated each day in accordance to the manufacturers' instructions and the SAP.

Sample collection utilized a submersible Grundfos Redi-Flow pump for purging and sampling each well. With the Grundfos pump, discharge can be controlled by adjusting the revolutions per minute (RPMs) from a control panel rather than increasing the head. This allows samples to be collected without excessively agitating the sample. The ground water sampling procedures included the following basic steps:

- Measure depth to water in the wells from the surveyed reference point on the top of the well casing using an electronic depth to water tape.

- Based on the water level and total well depth, three casing volumes were calculated and purged prior to sampling.

- A minimum of three casing volumes was purged from each well, and purging continued until field parameter readings were stabilized to within 20 percent over one casing volume. Field parameters were measured using a calibrated YSI® Water Quality Monitoring System, a Fischer Scientific® pH meter and a HACH® portable turbidity meter, or equivalents. Parameters measured included temperature, pH, specific conductance and turbidity.

- Ground water samples were collected directly from the Grundfos pump discharge line. Sample bottles were filled, preserved, labeled, packaged, stored and shipped under chain-of-custody procedures in accordance with the SAP (ESE, 1996).

- All sampling equipment was decontaminated prior to sampling each well. Decontamination procedures included liberally flushing with deionized water and non-phosphate laboratory grade detergent, rinsing with deionized water, rinsing with dilute nitric acid and rinsing with deionized water.

- All purge water and liquid wastes were properly disposed of.

2.1. Non-Network Ground Water Monitoring

Eleven non-network wells were scheduled for sampling in December 2003. In general, these wells were identified as being within the SOD for the Mouat Site but not included in the network of wells monitored during the 1996 to 2002 timeframe. Included in the non-network well list was one up-gradient location of the study area (W-9), four wells within the area of concern (RMIS-2, MIS-4B, MIS-8B and MIS-11B) and six wells laterally adjacent to the area of concern (W-10, W-11, W-13, RMIS-3, RMIS-5 and RMIS-10) as defined by the ground water chromium standard of 100 ug/L. During the 2003 monitoring, it was observed that well W-13 is a hand dug domestic well which was used for irrigation in the past. According to the owner, this well has not been used to withdraw water for over two years, but is being used as a drain for the homeowner's water softening system. Appropriate purging and sampling procedures were followed for well W-13 and it is anticipated that a representative sample was obtained from this location.

Deviations from the SAP for the 2003 monitoring event are discussed in Section 4.0. Field parameters measured during the 2003 monitoring of non-network wells included temperature, pH, specific conductance, turbidity and the static water level. All field observations were documented in a logbook and on field data sheets which are provided in Appendix A and B, respectively. The December 2003 ground water sampling consisted of collecting a total of thirteen samples, which included ten ground water, 1 duplicate sample, 1 external contamination and cross contamination blank and 1 field blank. Deviations from the SAP for the 2003 monitoring event are discussed in Section 4.0. Well W-10 was not sampled due to access issues and is explained further in Section 4.0.

2.2. Non-Network Sampling Results

Field parameters and laboratory results for the December 2003 sampling event are presented in Table 1. Both pH and specific conductance values were similar throughout the site. Values of pH ranged from 7.21-7.44 standard units and specific conductance values ranged from 2.31-2.69 mmhos/cm. For the December 2003 non-network monitoring event, chromium levels in all wells were significantly below the 100 μg/L ground water standard. Total chromium concentrations ranged from less than 8.8 μg/L (W-9, MIS-4B, RMIS-3 and W-13) to a maximum of 43.9 μg/L at RMIS-2. Dissolved chromium concentrations in the non-network wells monitored during the December 2003 event ranged from less than 8.8 µg/L (W-9, RMIS-10, MIS-4B, W-11 and W-13) to a maximum of 48.8 µg/L at RMIS-2. Figure 1 presents dissolved chromium concentrations for the 2003 monitoring event, while total chromium concentrations for the 2003 monitoring event are illustrated on Figure 2.

2.3. Evaluation of Historical Trend

Time-series diagrams of total and dissolved chromium concentrations for each well are presented in Appendices C and D, respectively. When the non-network wells were last sampled in May 1995, total chromium concentrations ranged from less than 5.0 ug/L (W-13) to a maximum of 1,180 ug/L at MIS-8B. Dissolved chromium concentrations in May of 1995 ranged from less than 5.0 ug/L (W-13) to a maximum of 1,220 ug/L at MIS-8B. Chromium concentrations at W-13 have not changed from less than the instrument detection limit during the 1995 to 2003 period. However, both total and dissolved chromium concentrations have decreased by nearly two orders of magnitude at MIS-8B (31.1 ug/L total chromium and 29.5 ug/L dissolved chromium in 2003).

Generally, total chromium concentrations have been similar to dissolved chromium concentrations throughout the monitoring period. The chromium concentration has remained below the detection limit at well W-13 in the eight year period. There has been a significant decrease in four wells and there has been a slight decrease in chromium concentrations in five wells. In January 1995, four wells had dissolved chromium concentrations greater than, or near the MCL and WQB-7 standard of 100 µg/L dissolved chromium, these wells were RMIS-2, MIS-4B, MIS-8B, and MIS-11B. In December 2003 the dissolved chromium concentrations at RMIS-2 had dropped from 166 to 48.8 µg/L. At MIS-4B, the dissolved chromium concentration was less than 8.8 µg/L compared to 96 ug/L in January 1995. At MIS-8B, the dissolved chromium concentration fell from 1,240 ug/L in 1995 to 29.5 ug/L in 2003. In January 1995, the dissolved chromium concentration at MIS-11B was 1,730 ug/L compared to 22.7 µg/L in December 2003. To conclude, all of the non-network wells sampled in December 2003 were below the ground water standard of 100 µg/L, verifying that the original extent of impacts from the chromium plume has decreased substantially and that natural attenuation has been successful at the Mouat site.

3.0 QUALITY ASSURANCE/QUALITY CONTROL RESULTS

This monitoring program required that both laboratory and field quality assurance (QA) samples be prepared and analyzed. Three types of QA samples were prepared in the field: sample duplicate (D), field blanks (FB) and equipment rinsate blanks (ECB/CCB). Section III, part B of the *USEPA Functional Guidelines for Evaluating Inorganic Analyses* (EPA, 1988) specifies that no contaminants should be present in field blanks. As stated in the *RAWP*, the relative percent difference (RPD) for field duplicate samples should be less than or equal to 25 percent. Table 2, which reports the results of December 2003 field QA samples and RPD between duplicate samples, shows that FB and ECB/CCB samples met the required criteria, but duplicate samples did not. The RPD for total and dissolved chromium duplicate samples was 66% and 46%, respectively. These RPDs are outside the limits number, but do not warrant rejection of the data.

All laboratory QA values were within contract laboratory limits. Refer to Appendix E for copies of laboratory QA/QC result tables and the laboratory validation report.

4.0 DEVIATIONS FROM THE SAP

The following is a list of deviations from the SAP for December 2003 monitoring and reporting activities:

- Samples were not collected with a bailer but with the submersible Grundfos Redi-Flow pump. After purging was complete, the flow rate was cut back to less than 0.5 gallons per minute for minimal turbulence during sample collection.

- Wells were not sampled in the exact order specified by the SAP. However, sampling was performed roughly from lowest to highest concentration wells. The order in which sampling was performed, combined with decontamination procedures assure the highest quality sample results.

- Well W-10 was not sampled because it was under a large gravel stockpile, apparently utilized by and owned by the City of Columbus. Since adjacent well RMIS-5 is in relatively close proximity to W-10, the decision to not sample the well (and not requesting the gravel to be moved) was made. EPA was notified of the situation and indicated that it was acceptable for this well to be eliminated from the non-network monitoring.

5.0 REFERENCES

ESE, Inc., *Memorandum of Sampling Protocol and Health and Safety Plan for Mouat Industries NPL Site*, November 1996.

Jacobs Engineering Group Inc., *Mouat Industries Superfund Site Columbus, Montana, Groundwater Removal Action Response Action Work Plan*, July 1996.

U.S. EPA, *Unilateral Administrative Order (UOA) for conduct of a Non-Time-Critical Removal Action at the Mouat Industries NPL Site in Columbus*, Montana, July 1996.

U.S. EPA, *USEPA Functional Guidelines for Evaluating Inorganic Analyses*, 1988, Viar and Co. for the United States Environmental Protection Agency, Washington, D.C.

TABLES

Mouat Industries NPL Site - Columbus, MT
Table 1. Water Quality Field Parameters and Chromium Concentrations December 2003

Sample ID	Date		Total Chromium (ug/L)		Dissolved Chromium (ug/L)	Temp (°C)	pH (SU)	SC mmhos/cm	Turbidity (NTU)	SWL Ft
MIS-4B	Dec-03	<	8.8	<	8.8	12.6	7.44	2.52	4.54	7.07
MIS-8B	Dec-03		31.1		29.5	12.81	7.4	2.69	0.31	8.35
MIS-11B	Dec-03		22.3		22.7	12.64	7.38	2.66	0.31	9.78
RMIS-2	Dec-03		43.9		48.8	12.68	7.41	2.41	4	11.24
RMIS-3	Dec-03	<	8.8		9.2	12.97	7.21	2.31	2.73	8.63
RMIS-5	Dec-03		17.9		22.7	11.81	7.39	2.54	3.3	7.15
RMIS-10	Dec-03		14.5	<	8.8	12.6	7.36	2.56	2.37	7.6
W-9	Dec-03	<	8.8	<	8.8	10.34	7.42	2.32	0.7	6.65
W-11	Dec-03		13.9	<	8.8	12.38	7.34	2.39	0.63	8.87
W-13	Dec-03	<	8.8	<	8.8	11.87	7.34	2.52	2.27	5.03

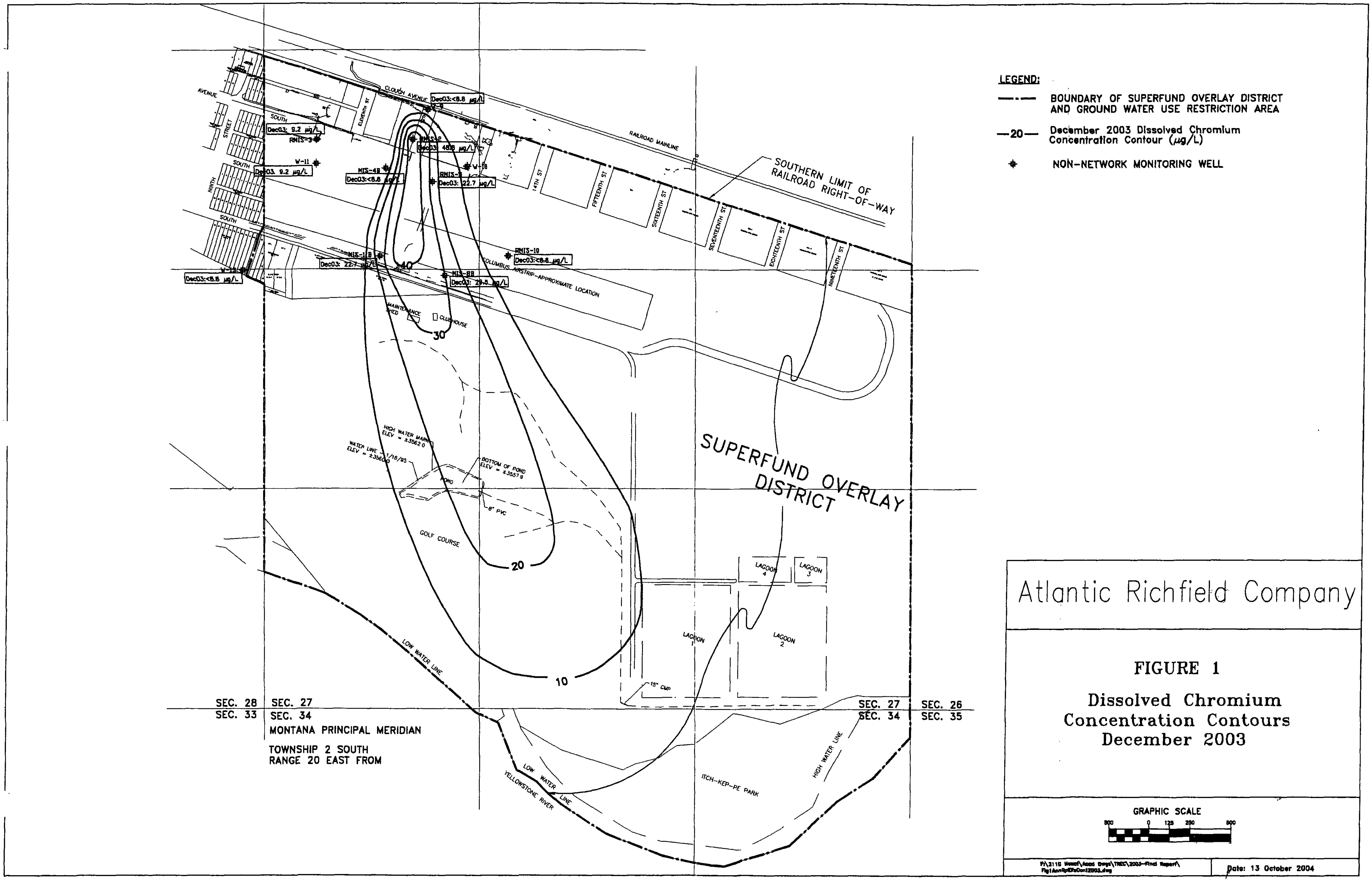
SWL = Static water level measured from measuring point on well casing
D = Duplicate Sample
ECB/CCB = External contamination blank/cross-contamination blank
FB = Field blank
< = less than instrument detection limit

Mouat Industries NPL Site - Columbus, MT
TABLE 2. December 2003 Field Water Quality Assurance Results

Sample Type	Sample ID	Date		Total Chromium (ug/L)	RPD or IDL		Dissolved Chromium (ug/L)	RPD or IDL
MIS-4B	GW282	12/17/2003	<	8.8		<	8.8	
MIS-4BD	GW283	12/17/2003		17.4	65.6%		14	45.6%
ECB/CCB	GW237	12/17/2003	<	8.8	8.8	<	8.8	8.8
FB	GW238	12/17/2003	<	8.8	8.8	<	8.8	8.8

RPD = Relative Percent Difference
D = Duplicate Sample
ECB/CCB = External contamination blank, cross-contamination blank
FB = Field Blank
< = less than laboratory detection limit

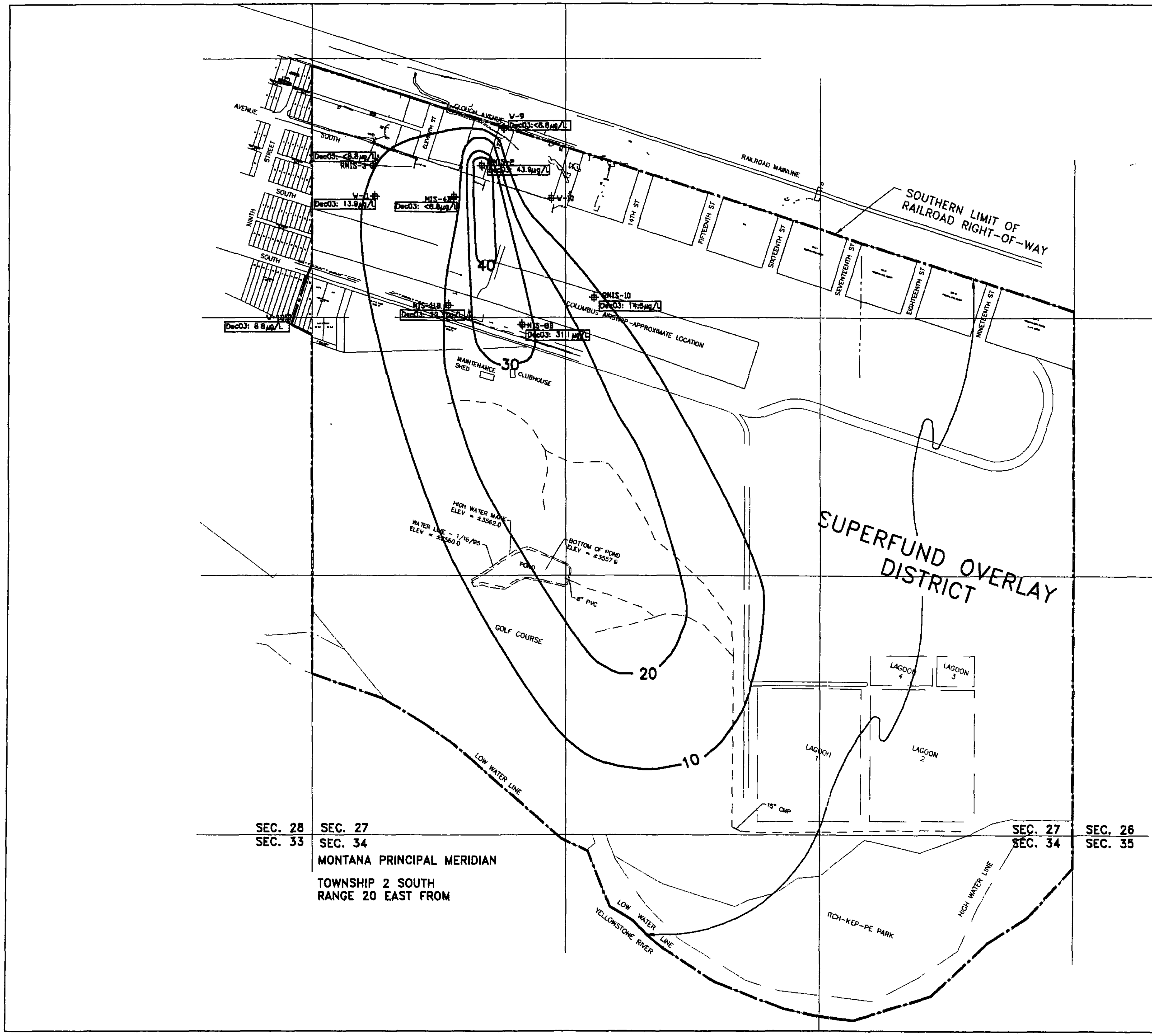
FIGURES



Atlantic Richfield Company

FIGURE 1

Dissolved Chromium Concentration Contours December 2003



LEGEND:

—·— BOUNDARY OF SUPERFUND OVERLAY DISTRICT AND GROUND WATER USE RESTRICTION AREA

—20— December 2003 Total Chromium Concentration Contour (µg/L)

⌖ NON-NETWORK MONITORING WELL

Atlantic Richfield Company

FIGURE 2

Total Chromium Concentration Contours December 2003

GRAPHIC SCALE

250 0 125 250 500

DATE: 13 October 2004

APPENDIX A

FIELD NOTES

12-16-03 Semi-Annual G.W. Sampling
TREC: G. Pierce – J. Martin.
Overcast ≤15°F
0700 Load sampling equipment.
Other items: tools, fire ext., 1st aid kit, torch, shovel, marking paint.
Fueled truck
0815 Depart Butte to Columbus
Plan is to locate + sample 11 wells not previously sampled. Will hook up with Dennis Holten w/ Columbus Public works to discuss safety issues + access agreements. Hopefully he will aid in locating wells.
NOTE: Snow packed + icy on Homestake Pass.
Icy roads through pass east of Bozeman
Livingston area very windy.
1104 Arrived in Columbus.
Checked into Motel.
Partly cloudy, lt. breeze, ≈ 30°F
trace of snow on ground.

GGP
12-16-03

12-16-03 Semi-Annual G.W. Sampling

1140 Arrived Columbus Public Works. Met with Dennis. He will be sending Steve out w/us to locate well sites. Gave access agreement to Dennis for review + signature. These guys are preparing to break for lunch, we will return @ 12:45.

Jeff + I review JSA + sign. additional items: Amber light strobe required inside airport property.

Steve will only be with us to locate wells

1250 Back @ Public Works shop. Review JSA w/Steve. Depart to locate wells.

NOTE: Well # W-10 is under large gravel stock pile & we cannot sample.

Checked in @ airport w/ Allan Rickman.

SAP 12-16-03

12-16-03 Semi-Annual GW Sampling.

WELL INFO

W-9 located under 2' manhole cover near S.W. corner of county storage yard. 4" PVC, MP @ top of pvc.
TD = 10.10' SWL = 6.65'
Stick up = -1.8'

RMS-2 located ≈ 150' South of W-9
2" PVC, MP - top of PVC
SWL = 11.24' TD = 19.2'
Stick up = +0.4'

NOTE: Anderson well W-13 is located in homeowner's basement. Entrance to basement is through dog's runway. Dog is reportedly vicious. Well was previously used for irrigation up until pump burned up ≈ 2 yrs ago and has since been used as drain for water softener. Contacted Tina to find out if we are to sample this well or not. Waiting for word.

RMS-10 located between runway + taxiway - nearest runway. 2" pvc flush mount vault. MP - Top PVC
SWL = 7.60' TD = 17.20'
Stickup = -0.45'

SAP 12-16-03

12-16-03 Semi-Annual G.W. Sampling

RMIS-5 located on airport property along North fence between RMIS-2 + W-10. 2" pvc well MP - top of pvc. Stick up = -0.43' SWL = 7.15' TD = 14.80' MP-Top PVC

MIS-4B located on airport property along North fence ≈ 10' East of RMIS-4. 2" pvc well. flush mount SWL = 7.07' TD = 25.90' Stick up = -0.30' MP-Top PVC

RMIS-3 located on airport property along North fence ≈ 250' west of taxiway end. Flushmount vault, 2" PVC well. Stickup = -0.15' SWL = 8.63' TD = 17.85' MP-Top PVC

W-11 located west of airport runway. ≈ 250' from center of taxiway + runway. Flushmount vault - 4" pvc well. MP - Top PVC SWL = 8.87' TD = 10.1 Stick up = -0.4' - on airport property.

JAP
12-16-03

12-16-03 Semi-Annual G.W. Sampling

MIS-11A located on airport property along south fence ≈ 10' West of well MIS-11B Flushmount vault, 2" pvc well. MP - Top PVC SWL = 9.78' TD = 27.4' Stick up = -0.35'

MIS-8B located on airport property along south fence ≈ 300' North of Golf Course pro shop. Flush mount vault. 2" PVC well, MP-Top pvc. SWL = 8.35' TD = 27.3' Stick up = 0.35'

NOTE: Tina called back and the word is that we are to sample the Anderson well. Will contact ~~them~~ them in the A.M. and see if they can divert the dog long enough to check this well out.

1700 Finished for today, will begin sampling tomorrow A.M.

JAP
12-16-03

12-17-03 Semi-Annual GW Sampling
TREC: Gary Pierce - Jeff Martin
P.cloudy, ≈34°F, windy. Expect high near 45°F. High wind warning in effect

0700 Calibrate HydroLab Quanta as per manuf. specs. for pH + SC.

	Std.	Initial	Final	Temp
pH	7.00	6.93	7.01	25.83°C
	10.00	9.84	10.00	26.18°C
SC.	1.000mS	0.999	0.999	25.15°C

Meter working well.
Calibrated HACH turbidity meter as per manuf. specs. using NTU standard.
Meter working OK.

0740 Tailgate safety meeting:
Review JSA
* PPE
* Generator Safety
* Sample Prep.
* airport safety

GAP
12-17-03

12-17-03 Semi-Annual G.W. Sampling
0810 At W-9
DTW = 6.65' Td = 10.10'
0818 Begin purging for WQ samples
See field data sheet #1

	Sample #	Tag #	Pres.
0840	GW278	10358	HNO_3 / filt.
"	GW278	10359	HNO_3

Field Parameters: Temp pH SC Turb.
10.34 - 7.42 - 2.32 0.7
Preserved / Stored samples
Decontaminated Equipment.

0855 At RMIS-2
DTW = 11.24' Td = 19.20'
0912 Begin purging for WQ samples
See field data sheet #2

	Sample #	Tag #	Pres.
0938	GW279	10360	HNO_3 / filt.
0938	GW279	10361	HNO_3

Field Parameters:

Temp	pH	SC	Turb.
12.68	7.41	2.41	4.0

Preserved / Stored samples
Decontaminated Equipment

GAP 12-17-03

12/17/03 Semi-Annual G.W. Sampling

0952 At RMIS-10

DTW = 7.60' Td = 17.20'

1010 Begin purging for WQ samples.

See field data sheet #3

Time	Sample #	Tag #	Pres.
1042	GW280	10362	HNO_3 / filt.
"	GW280	10363	HNO_3

Field Parameters:

Temp	pH	SC	Turb.
12.60	7.36	2.56	2.37

Preserved / Stored samples

Deconned Equipment.

1053 At RMIS-5

DTW = 7.15' Td = 14.80'

1102 Begin purging for WQ samples

See field data sheet #4

Time	Sample #	Tag #	Pres.
1130	GW281	10364	HNO_3 / filt.
"	GW281	10365	HNO_3

Field Parameters:

Temp	pH	SC	Turb.
11.81	7.39	2.54	3.30

Preserved / Stored samples

Deconned Equipment

GAP 12/17/03

12-17-03 Semi-Annual GW Sampling

NOTE: Attempted to contact Gary Anderson this morning regarding access to sample well. Left message + have not heard back from him as of yet.

1142 At RMIS-4B

DTW = 7.07' Td = 25.90'

1151 Begin purging for WQ samples

See field data sheet #5

Will collect QA/QC samples this site.

Time	Sample #	Tag #	Pres.
1233	GW282	10366	HNO_3 / filt.
"	GW282	10367	HNO_3
	Collect Duplicate samples		
1238	GW283	10368	HNO_3 / filt.
"	GW283	10369	HNO_3

Field Parameters:

Temp	pH	SC	Turb.
12.60	7.44	2.52	4.54

Deconned Equipment - purged ~3 gal. D.I. water through pump + collected

Time	Sample #	Tag #	Pres.
1258	ECB/CCB samples		
"	GW284	10370	HNO_3 / filt.
"	GW284	10371	HNO_3
	Field Blanks		
1303	GW285	10372	HNO_3 / filt.
"	GW285	10373	HNO_3

GAP 12/17/03

142

12-17-03 Semi-Annual GW Sampling

1312 At RMIS-3

DTW = 8.63' Td = 17.85'

1321 Begin purging for WQ samples

See field data sheet #6

Sample #	Tag #	Pres.
1353 GW286	10374	HNO_3/filt.
" GW286	10375	HNO_3

Field Parameters:

Temp	pH	SC	Turb.
12.97	7.21	2.31	2.73

Preserved / Stored samples

Deconned Equipment.

1404 At W-11

DTW = 8.87' Td = 10.10'

1411 Begin purging for WQ samples

See field data sheet #7

Sample #	Tag #	Pres.
1433 GW287	10376	HNO_3/filt
" GW287	10377	HNO_3

Field Parameters:

Temp	pH	SC	Turb.
12.38	7.34	2.39	0.63

Preserved / Stored samples

Deconned Equipment

SAP 12-17-03

143

12-17-03 Semi-Annual GW Sampling

1445 At MIS-11B

DTW = 9.78' Td = 27.40'

1454 Begin purging for WQ samples

See field data sheet #8

Sample #	Tag #	Pres.
1520 GW288	10378	HNO_3/filt.
" GW288	10379	HNO_3

Field Parameters:

Temp	pH	SC	Turb.
12.64	7.38	2.66	0.31

Preserved / Stored samples

Deconned Equipment

1538 At MIS-8B

DTW = 8.35' Td = 27.30'

1544 Begin purging for WQ samples

See field data sheet #9

Sample #	Tag #	Pres
1615 GW289	10380	HNO_3/filt.
" GW289	10381	HNO_3

Field Parameters:

Temp	pH	SC	Turb.
12.81	7.40	2.69	0.31

Preserved / Stored samples

Deconned Equipment

SAP 12-17-03

12-17-03 Semi-Annual G.W. Sampling

1630 Attempted to reach Gary Anderson again by phone - No luck, left another message. will stop by residence + see if anyone is home.

1640 Arrived Anderson's place (W-13) They are home + we will check out logistics on well to sample. Access agreements have both been signed + Dennis is mailing back to TREC,

Well is hand dug 2' diameter

SWL = 5.03' Td = 6.30'

Not much standing water but will try to sample.

1654 Begin purging for WQ samples

See field data sheet # 10

	Sample #	Tag #	Pres.
1715	GW290	10382	HNO_3 / filt
"	GW290	10383	HNO_3

Field Parameters:

Temp	pH	SC	Turb.
11.87	7.34	2.52	2.27

Preserved / Stored samples

Decon'd equipment

GAP 12-17-03

12-18-03 Semi-Annual G.W. Sampling

TREC - G Pierce - J. Martin

Add ice to sample coolers.

C.O.C filled out

0830 Depart Columbus to Butte.

Fueled R.V. in Bozeman

1140 Samples dropped off @ lab.

GAP 12-18-03

APPENDIX B

FIELD DATA SHEETS

FIELD SAMPLE DATA SHEET

PROJECT NAME: MOUAT NPL SITE

PROJECT NUMBER: 2110

****

WELL/STATION W-9 DATE 12-17-03 ARRIVAL TIME 0810

SAMPLING PERSONNEL JP-JM WEATHER CONDITIONS Windy, 40°F, P. cloudy

PURGE DATA:

PURGE METHOD Grunfos RediFlo 2

START PURGING 0818

PURGE RATE 1.5 GPM

RATE CHANGE 1)Time 0838 Rate < 2 gpm

2)Time ___ Rate ___

SAMPLE TIME 0840

WELL DEPTH 10.10 Ft

DEPTH TO WATER 6.65 Feet

COLUMN HEAD 3.45 Feet

CASING DIAMETER 4 Inch

3 WELL VOLUMES 6.76 Gal.

TOTAL PURGE VOLUME 30+ Gal.

SAMPLE DATA:

SAMPLE ID	SAMPLE #	TAG #	VOLUME	CHECK IF FILTERED	PRES.	ANALYSIS REQUESTED
W9-01	GW278	10358	1 Liter	✓	HNO_3	Dissolved Cr.
W-9-02	"	10359	1 Liter		HNO_3	Total Cr.

FIELD PARAMETERS:

TIME	TEMP (°C)	pH	SPECIFIC CONDUCTANCE (~~mmhos~~ mS/cm @ 25°C)	Turbidity (NTUs)
0822	10.34	7.56	2.32	>100
0826	10.43	7.47	2.34	42.4
0830	10.44	7.46	2.33	10.4
0834	10.42	7.45	2.34	1.4
0838	10.43	7.42	2.32	0.7
****************** FINAL FIELD PARAMETERS PRIOR TO SAMPLING ******************				
0838	10.43	7.42	2.32	0.7

ELD EQUIPMENT Q/A AND CALIBRATION: Recorded in field logbook

ELD

MARKS: Well has a lot of silt. Surged w/pump to clean out.

FIELD SAMPLE DATA SHEET

PROJECT NAME: MOUAT NPL SITE

PROJECT NUMBER: 2110

****

WELL/STATION RM15-2 DATE 12-17-03 ARRIVAL TIME 0855

SAMPLING PERSONNEL GP-JM WEATHER CONDITIONS Windy ≈ 45°F

PURGE DATA:

PURGE METHOD Grunfos RediFlo 2

START PURGING 0912

PURGE RATE 2.0 GPM

RATE CHANGE 1)Time 0937 Rate <2gpm

2)Time ___ Rate ___

SAMPLE TIME 0938

WELL DEPTH 19.2 Ft

DEPTH TO WATER 11.24 Feet

COLUMN HEAD 7.96 Feet

CASING DIAMETER 2 Inch

3 WELL VOLUMES 3.89 Gal.

TOTAL PURGE VOLUME 50+ Gal.

SAMPLE DATA:

SAMPLE ID	SAMPLE #	TAG #	VOLUME	CHECK IF FILTERED	PRES.	ANALYSIS REQUESTED
RM15-2-01	GW279	10360	1 Liter	✓	HNO_3	Dissolved Cr.
RM15-2-02	GW279	10361	1 Liter		HNO_3	Total Cr.

FIELD PARAMETERS:

TIME	TEMP (°C)	pH	SPECIFIC CONDUCTANCE (~~mmhos~~ mS/cm @ 25°C)	Turbidity (NTUs)
0917	12.41	7.54	2.40	>100
0922	12.63	7.42	2.41	54.2
0927	12.66	7.41	2.41	5.1
0932	12.67	7.41	2.41	4.3
0937	12.68	7.41	2.41	4.0
****************** FINAL FIELD PARAMETERS PRIOR TO SAMPLING ******************				
0937	12.68	7.41	2.41	4.0

FIELD EQUIPMENT Q/A AND CALIBRATION: Recorded in field logbook

FIELD REMARKS: Well has alot of silt. surged w/pump to clean up.

FIELD SAMPLE DATA SHEET

PROJECT NAME: MOUAT NPL SITE
PROJECT NUMBER: 2110

****

WELL/STATION RMIS-10 DATE 12-17-03 ARRIVAL TIME 0952
SAMPLING PERSONNEL GP-JM WEATHER CONDITIONS P. cloudy 45°F, very windy

PURGE DATA:

PURGE METHOD Grunfos RediFlo 2
START PURGING 1010
PURGE RATE 2.0 GPM
RATE CHANGE 1)Time 1010 Rate <2 gpm
2)Time ___ Rate ___
SAMPLE TIME 1042

WELL DEPTH 17.20 Ft
DEPTH TO WATER 7.60 Feet
COLUMN HEAD 9.60 Feet
CASING DIAMETER 2 Inch
3 WELL VOLUMES 4.69 Gal.
TOTAL PURGE VOLUME 60+ Gal.

SAMPLE DATA:

SAMPLE ID	SAMPLE #	TAG #	VOLUME	CHECK IF FILTERED	PRES.	ANALYSIS REQUESTED
RMIS-10-01	GW280	10362	1 Liter	✓	HNO_3	Dissolved Cr.
RMIS-10-02	GW280	10363	1 Liter		HNO_3	Total Cr.

FIELD PARAMETERS:

TIME	TEMP (°C)	pH	SPECIFIC CONDUCTANCE (~~mmhos~~ mS/cm @ 25°C)	Turbidity (NTUs)
1016	12.17	7.39	2.50	>1000
1022	12.57	7.36	2.58	157
1028	12.59	7.35	2.58	41.1
1034	12.58	7.36	2.56	7.1
1040	12.60	7.36	2.56	2.37
****************** FINAL FIELD PARAMETERS PRIOR TO SAMPLING ******************				
1040	12.60	7.36	2.56	2.37

FIELD EQUIPMENT Q/A AND CALIBRATION: Recorded in field logbook

FIELD REMARKS: Well H2O very dirty, surged w/pump to clean up

FIELD SAMPLE DATA SHEET

PROJECT NAME: MOUAT NPL SITE
PROJECT NUMBER: 2110

****

..LL/STATION RM1S-5 DATE 12-17-03 ARRIVAL TIME 1053
SAMPLING PERSONNEL GP-JM WEATHER CONDITIONS P. cloudy, 45°F, very winc

PURGE DATA:

PURGE METHOD	Grunfos RediFlo 2	WELL DEPTH	14.80 Ft
START PURGING	1102	DEPTH TO WATER	7.15 Feet
PURGE RATE	2.0 GPM	COLUMN HEAD	7.65 Feet
RATE CHANGE	1)Time 1127 Rate <2 gpm	CASING DIAMETER	2 Inch
	2)Time ___ Rate ___	3 WELL VOLUMES	3.74 Gal.
SAMPLE TIME	1130	TOTAL PURGE VOLUME	50 + Gal.

SAMPLE DATA:

SAMPLE ID	SAMPLE #	TAG #	VOLUME	CHECK IF FILTERED	PRES.	ANALYSIS REQUESTED
RM1S-5-01	GW281	10364	1 Liter	✓	HNO_3	Dissolved Cr.
RM1S-5-02	GW281	10365	1 Liter		HNO_3	Total Cr.

FIELD PARAMETERS:

TIME	TEMP (°C)	pH	SPECIFIC CONDUCTANCE (~~mmhos~~ mS/cm @ 25°C)	Turbidity (NTUs)
1107	11.80	7.40	2.55	>500
1112	11.80	7.39	2.60	127.2
1117	11.81	7.39	2.57	14.8
1122	11.81	7.40	2.59	4.27
1127	11.81	7.39	2.54	3.30
****************** FINAL FIELD PARAMETERS PRIOR TO SAMPLING ******************				
1127	11.81	7.39	2.54	3.30

FIELD EQUIPMENT Q/A AND CALIBRATION: Recorded in field logbook

FIELD REMARKS: Well H2O very dirty, surged w/pump to clean up.

FIELD SAMPLE DATA SHEET

PROJECT NAME: MOUAT NPL SITE

PROJECT NUMBER: 2110

****

WELL/STATION M1S-4B DATE 12-17-03 ARRIVAL TIME 1142

SAMPLING PERSONNEL GP-JM WEATHER CONDITIONS M. sunny, 45°F very windy

PURGE DATA:

PURGE METHOD Grunfos RediFlo 2
START PURGING 1151
PURGE RATE 2.0 GPM
RATE CHANGE 1)Time 1231 Rate <2gpm
2)Time ___ Rate ___
SAMPLE TIME 1233

WELL DEPTH 25.90 Ft
DEPTH TO WATER 7.07 Feet
COLUMN HEAD 18.83 Feet
CASING DIAMETER 2 Inch
3 WELL VOLUMES 9.21 Gal.
TOTAL PURGE VOLUME 80+ Gal.

SAMPLE DATA:

SAMPLE ID	SAMPLE #	TAG #	VOLUME	CHECK IF FILTERED	PRES.	ANALYSIS REQUESTED
M1S-4B-01	GW282	10366	1 Liter	✓	HNO_3	Dissolved Cr.
M1S-4B-02	GW282	10367	1 Liter		HNO_3	Total Cr.
M1S-4B-03	GW283	10368	1L	✓	HNO_3	Diss. Cr.
M1S-4B-04	GW283	10369	1L		HNO_3	Total Cr.

FIELD PARAMETERS:

TIME	TEMP (°C)	pH	SPECIFIC CONDUCTANCE (~~mmhos~~ mS/cm @ 25°C)	Turbidity (NTUs)
1159	12.49	7.72	2.54	>100
1207	12.57	7.46	2.52	47.9
1215	12.58	7.45	2.52	18.2
1223	12.59	7.44	2.51	11.0
1231	12.60	7.44	2.52	4.54
****************** FINAL FIELD PARAMETERS PRIOR TO SAMPLING ******************				
1231	12.60	7.44	2.52	4.54

FIELD EQUIPMENT Q/A AND CALIBRATION: Recorded in field logbook

FIELD REMARKS: Well H2O very dirty, surged w/ pump to clean up
QA/QC samples collected @ this site

FIELD SAMPLE DATA SHEET

PROJECT NAME: MOUAT NPL SITE
PROJECT NUMBER: 2110

****

W__L/STATION RM15-3 DATE 12-17-03 ARRIVAL TIME 1312
SAMPLING PERSONNEL GP-JM WEATHER CONDITIONS M. sunny, 45°F, windy

PURGE DATA:

PURGE METHOD Grunfos RediFlo 2
START PURGING 1321
PURGE RATE 1.50 GPM
RATE CHANGE 1)Time 1351 Rate <2gpm
2)Time ___ Rate ___
SAMPLE TIME 1353

WELL DEPTH 17.85 Ft
DEPTH TO WATER 8.63 Feet
COLUMN HEAD 9.22 Feet
CASING DIAMETER 2 Inch
3 WELL VOLUMES 4.51 Gal.
TOTAL PURGE VOLUME 45 Gal.

SAMPLE DATA:

SAMPLE ID	SAMPLE #	TAG #	VOLUME	CHECK IF FILTERED	PRES.	ANALYSIS REQUESTED
RM15-3-01	GW286	10374	1 Liter	✓	HNO_3	Dissolved Cr.
RM15-3-02	GW286	10375	1 Liter		HNO_3	Total Cr.

FIELD PARAMETERS:

TIME	TEMP (°C)	pH	SPECIFIC CONDUCTANCE (mmhos/cm @ 25°C) mS	Turbidity (NTUs)
1327	12.90	7.22	2.27	7100
1333	12.91	7.22	2.28	58.8
1339	12.96	7.21	2.29	36.0
1345	12.97	7.20	2.30	5.12
1351	12.97	7.21	2.31	2.73
****************** FINAL FIELD PARAMETERS PRIOR TO SAMPLING ******************				
1351	12.97	7.21	2.31	2.73

ELD EQUIPMENT Q/A AND CALIBRATION: Recorded in field logbook

ELD MARKS: Well H2O very dirty, surged w/ pump to clean up.

FIELD SAMPLE DATA SHEET

PROJECT NAME: MOUAT NPL SITE
PROJECT NUMBER: 2110

****

WELL/STATION W-11 DATE 12-17-03 ARRIVAL TIME 1404
SAMPLING PERSONNEL GP-JM WEATHER CONDITIONS P. cloudy, windy, 45°F

PURGE DATA:

PURGE METHOD Grunfos RediFlo 2
START PURGING 1411
PURGE RATE 0.5 GPM
RATE CHANGE 1)Time 1431 Rate <.2gpm
2)Time ___ Rate ___
SAMPLE TIME 1433

WELL DEPTH 10.10 Ft
DEPTH TO WATER 8.87 Feet
COLUMN HEAD 1.23 Feet
CASING DIAMETER 4 Inch
3 WELL VOLUMES 2.41 Gal.
TOTAL PURGE VOLUME 10+ Gal.

SAMPLE DATA:

SAMPLE ID	SAMPLE #	TAG #	VOLUME	CHECK IF FILTERED	PRES.	ANALYSIS REQUESTED
W-11-01	GW287	10376	1 Liter	✓	HNO_3	Dissolved Cr.
W-11-02	GW287	10377	1 Liter		HNO_3	Total Cr.

FIELD PARAMETERS:

TIME	TEMP (°C)	pH	SPECIFIC CONDUCTANCE (~~mmhos~~ mS/cm @ 25°C)	Turbidity (NTUs)
1415	12.22	7.36	2.40	>100
1419	12.33	7.35	2.39	22.1
1423	12.34	7.35	2.40	5.33
1427	12.36	7.35	2.40	1.41
1431	12.38	7.34	2.39	0.63
***************** FINAL FIELD PARAMETERS PRIOR TO SAMPLING *****************				
1431	12.38	7.34	2.39	0.63

ELD EQUIPMENT Q/A AND CALIBRATION: Recorded in field logbook

ELD MARKS: Water very dirty - Very small amount of standing water, unable to surge w/ pump. Yield OK @ rate listed.

FIELD SAMPLE DATA SHEET

PROJECT NAME: MOUAT NPL SITE
PROJECT NUMBER: 2110

WELL/STATION MIS-11B DATE 12-17-03 ARRIVAL TIME 1445
SAMPLING PERSONNEL GP-JM WEATHER CONDITIONS Mostly Sunny, 45°, windy

PURGE DATA:

PURGE METHOD Grunfos RediFlo 2
START PURGING 1454
PURGE RATE 2.0 GPM
RATE CHANGE 1)Time 1519 Rate <2gpm
2)Time ___ Rate ___
SAMPLE TIME 1520

WELL DEPTH 27.4 Ft
DEPTH TO WATER 9.78 Feet
COLUMN HEAD 17.62 Feet
CASING DIAMETER 2 Inch
3 WELL VOLUMES 8.62 Gal.
TOTAL PURGE VOLUME ___ Gal.

SAMPLE DATA:

SAMPLE ID	SAMPLE #	TAG #	VOLUME	CHECK IF FILTERED	PRES.	ANALYSIS REQUESTED
MIS-11B-01	GW288	10378	1 Liter	✓	HNO_3	Dissolved Cr.
MIS-11B-02	GW288	10379	1 Liter		HNO_3	Total Cr.

FIELD PARAMETERS:

TIME	TEMP (°C)	pH	SPECIFIC CONDUCTANCE (~~mmhos~~ mS/cm @ 25°C)	Turbidity (NTUs)
1459	12.63	7.38	2.64	7100
1504	12.63	7.38	2.64	247
1509	12.64	7.38	2.65	8.82
1514	12.64	7.38	2.66	1.04
1519	12.64	7.38	2.66	0.31
****************** FINAL FIELD PARAMETERS PRIOR TO SAMPLING ******************				
1519	12.64	7.38	2.66	0.31

FIELD EQUIPMENT Q/A AND CALIBRATION: Recorded in field logbook

FIELD REMARKS: Water very dirty, surged w/ pump to clean up

FIELD SAMPLE DATA SHEET

PROJECT NAME: MOUAT NPL SITE

PROJECT NUMBER: 2110

****

WELL/STATION MIS-8B DATE 12-17-03 ARRIVAL TIME 1538

SAMPLING PERSONNEL GP-JM WEATHER CONDITIONS P.cloudy, 45°F lt. wind

PURGE DATA:

PURGE METHOD Grunfos RediFlo 2

START PURGING 1544

PURGE RATE 2.0 GPM

RATE CHANGE 1)Time 1614 Rate <2gpm

2)Time ___ Rate ___

SAMPLE TIME 1615

WELL DEPTH 27.30 Ft

DEPTH TO WATER 8.35 Feet

COLUMN HEAD 18.95 Feet

CASING DIAMETER 2 Inch

3 WELL VOLUMES 9.27 Gal.

TOTAL PURGE VOLUME 60+ Gal.

SAMPLE DATA:

SAMPLE ID	SAMPLE #	TAG #	VOLUME	CHECK IF FILTERED	PRES.	ANALYSIS REQUESTED
MIS-8B-01	GW289	10380	1 Liter	✓	HNO_3	Dissolved Cr.
MIS-8B-02	GW289	10381	1 Liter		HNO_3	Total Cr.

FIELD PARAMETERS:

TIME	TEMP (°C)	pH	SPECIFIC CONDUCTANCE (~~mmhos~~ mS/cm @ 25°C)	Turbidity (NTUs)
1550	12.51	7.56	2.64	>100
1556	12.75	7.41	2.68	48.1
1602	12.78	7.41	2.69	12.1
1608	12.79	7.40	2.69	3.47
1614	12.81	7.40	2.69	0.31
****************** FINAL FIELD PARAMETERS PRIOR TO SAMPLING ******************				
1614	12.81	7.40	2.69	0.31

FIELD EQUIPMENT Q/A AND CALIBRATION: Recorded in field logbook

FIELD REMARKS: Water very turbid, surged w/ pump to clean up.

FIELD SAMPLE DATA SHEET

PROJECT NAME: MOUAT NPL SITE

PROJECT NUMBER: ________

****

ELL/STATION W-13 DATE 12-17-03 ARRIVAL TIME 1640

SAMPLING PERSONNEL GP-JM WEATHER CONDITIONS Mostly Cloudy, 40°F lt. bre

PURGE DATA:

PURGE METHOD Grunfos RediFlo 2

START PURGING 1654

PURGE RATE 8.0 GPM

RATE CHANGE 1)Time 1714 Rate < 2lpm

2)Time ___ Rate ___

SAMPLE TIME 1715

WELL DEPTH 6.30 Ft

DEPTH TO WATER 5.03 Feet

COLUMN HEAD 1.27 Feet

CASING DIAMETER 24 Inch

3 WELL VOLUMES 89.5 Gal.

TOTAL PURGE VOLUME 160 Gal.

SAMPLE DATA:

SAMPLE ID	SAMPLE #	TAG #	VOLUME	CHECK IF FILTERED	PRES.	ANALYSIS REQUESTED
W13-01	GW290	10382	1 Liter	✓	HNO_3	Dissolved Cr.
W-13-02	GW290	10383	1 Liter		HNO_3	Total Cr.

FIELD PARAMETERS:

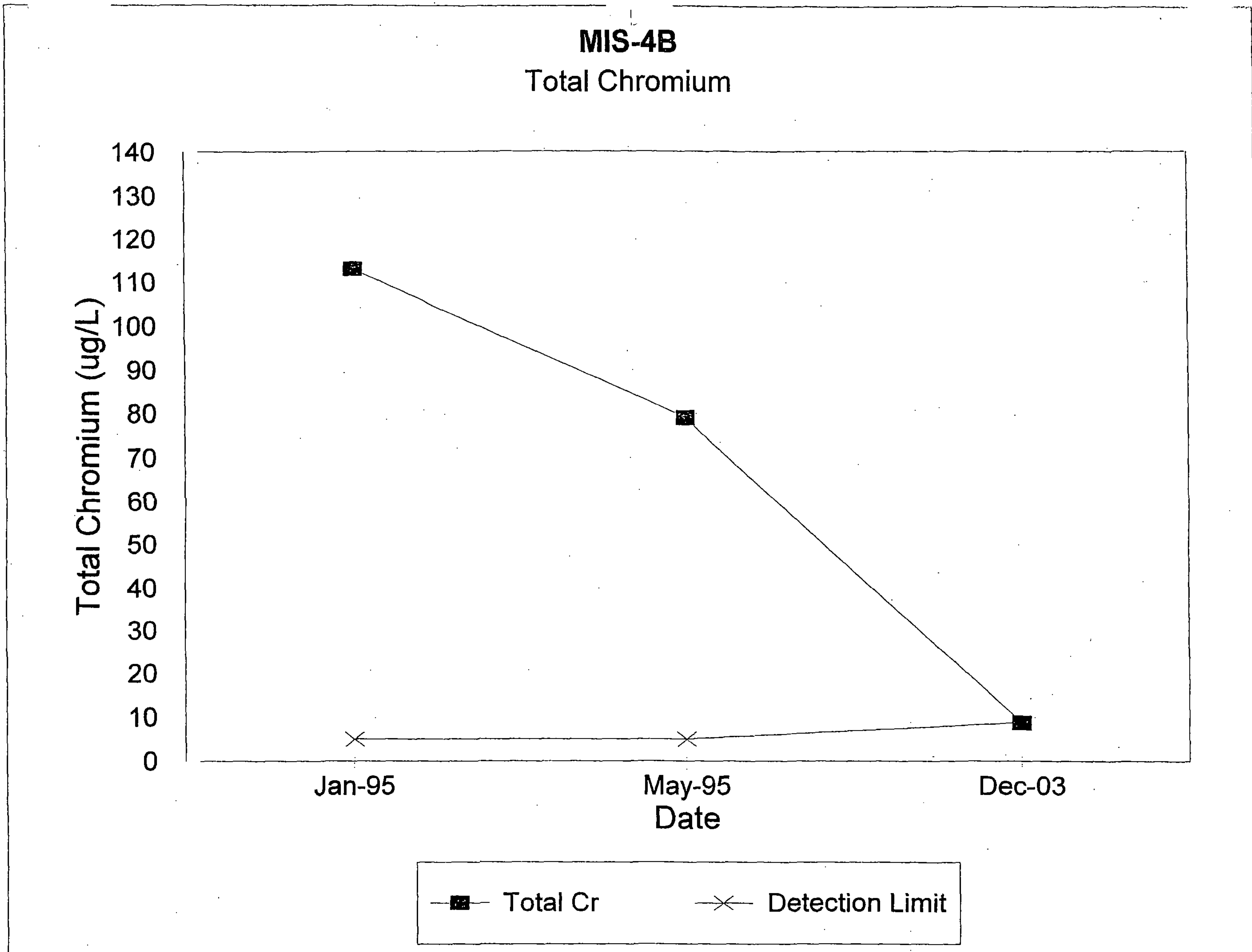
TIME	TEMP (°C)	pH	SPECIFIC CONDUCTANCE (~~mmhos~~ mS/cm @ 25°C)	Turbidity (NTUs)
1658	11.87	7.34	2.54	37.1
1702	11.87	7.34	2.53	15.4
1706	11.87	7.35	2.52	4.18
1710	11.88	7.34	2.53	3.11
1714	11.87	7.34	2.52	2.27
****************** FINAL FIELD PARAMETERS PRIOR TO SAMPLING ******************				
1714	11.87	7.34	2.52	2.27

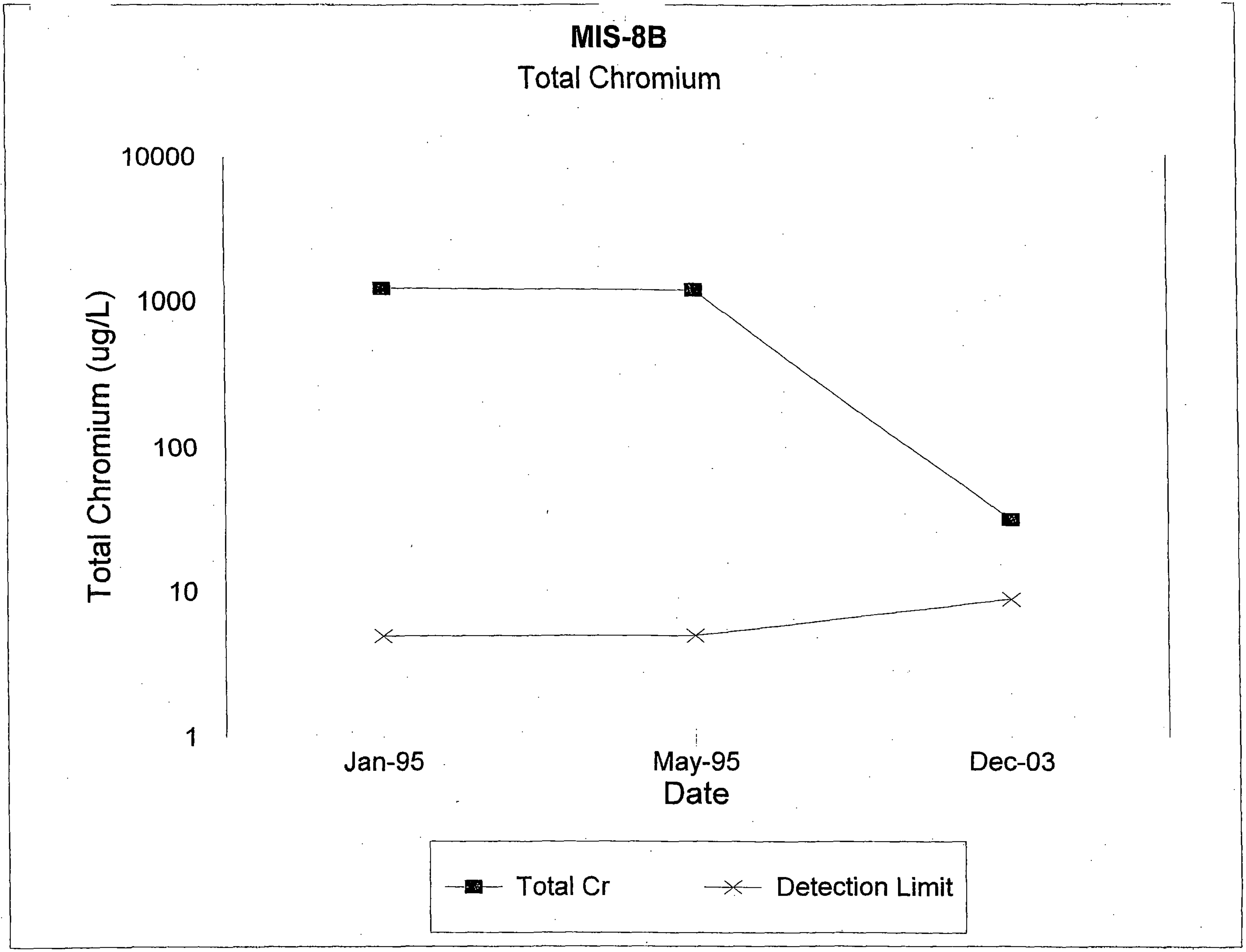
ELD EQUIPMENT Q/A AND CALIBRATION: Recorded in field logbook

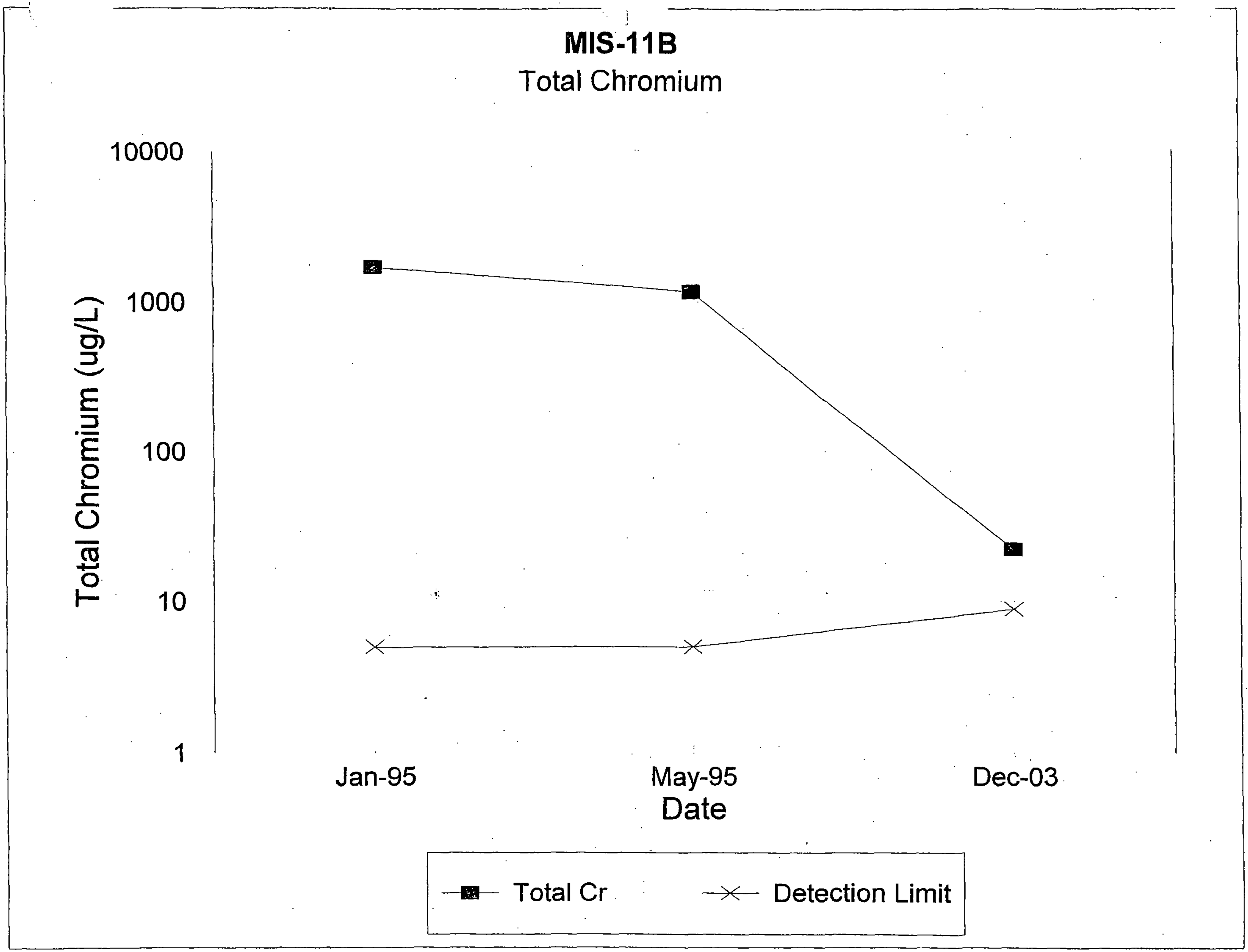
ELD MARKS: Well is old hand dug w/ very little standing water. Well yield is good @ rate listed above. Used to be jet pump installed in wel but has not been used for ≈ 2 yrs. Water softener backwash drains into well + has since pump was no longer used.

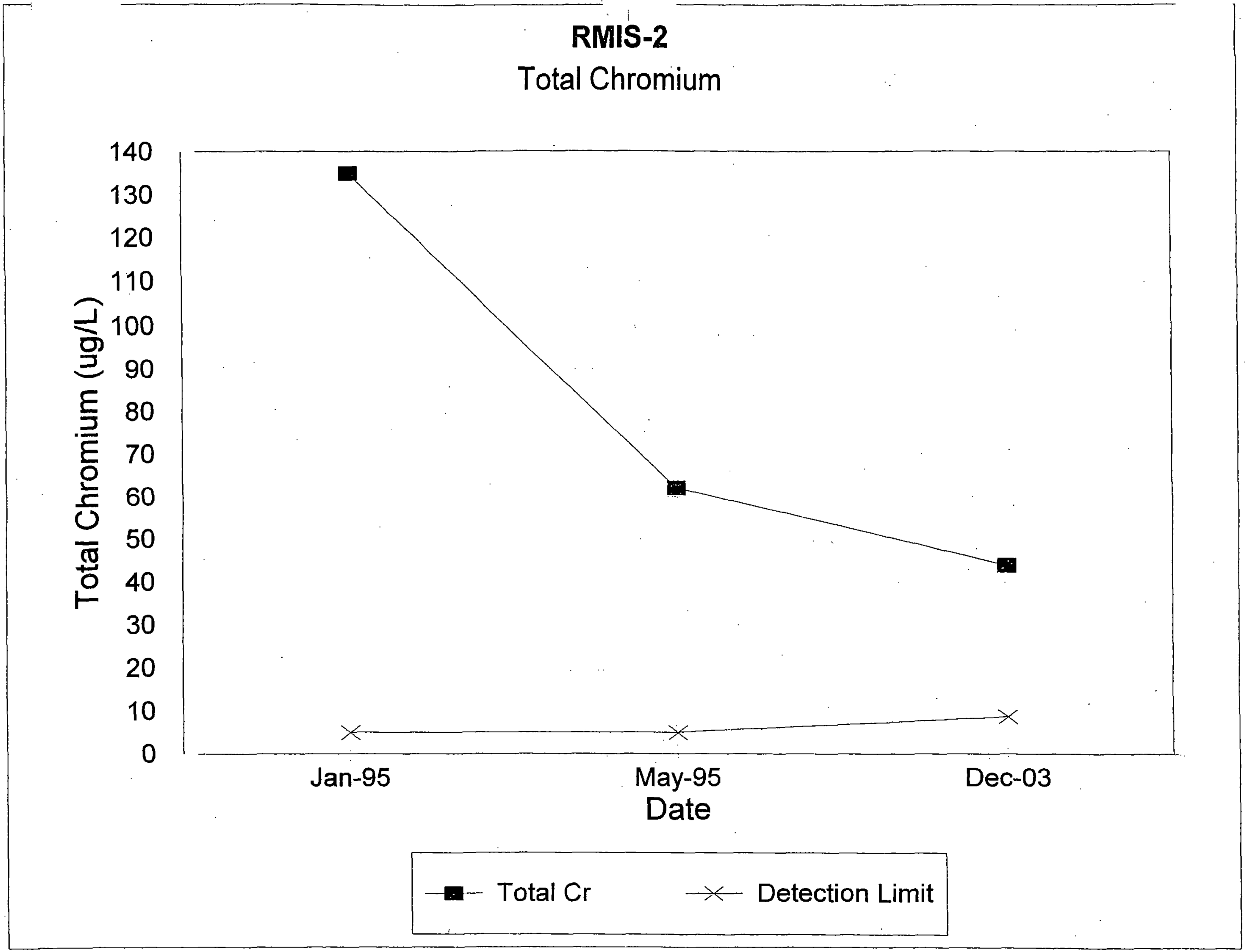
APPENDIX C

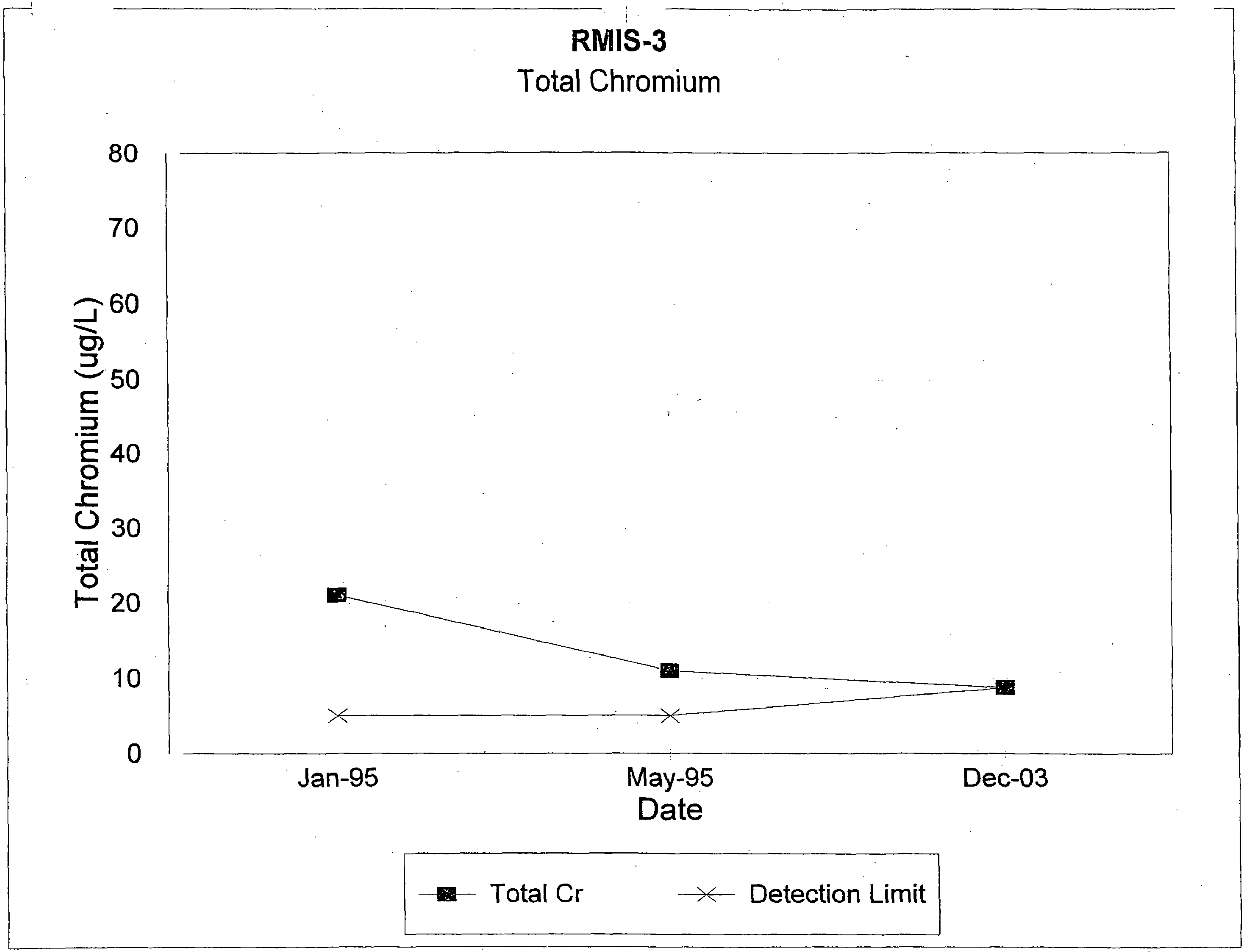
TOTAL CHROMIUM
CONCENTRATIONS VS. TIME FOR NON-NETWORK GROUNDWATER MONITORING WELLS

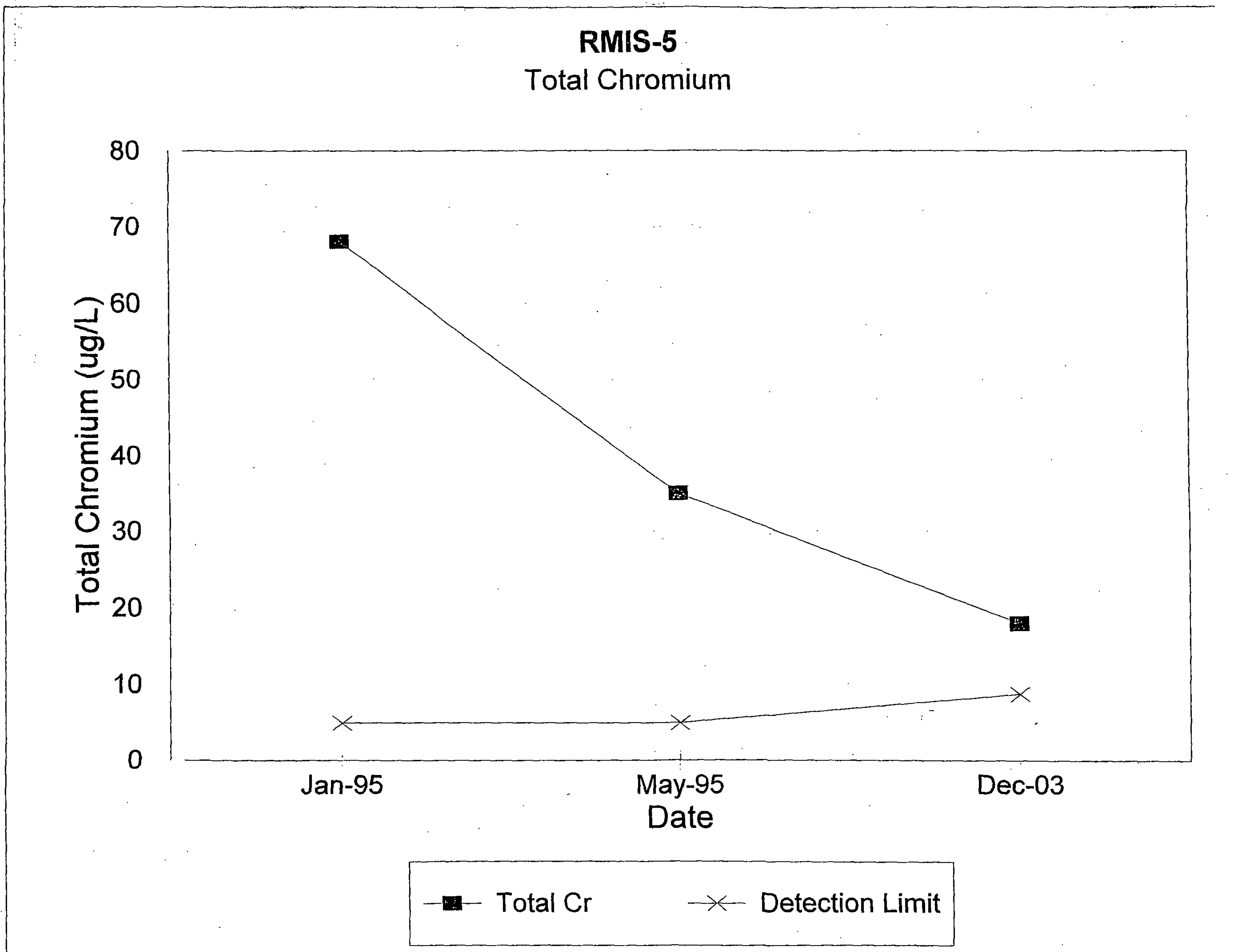

MIS-4B
Total Chromium
Total Chromium (ug/L)
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
Jan-95
May-95
Dec-03
Date
Total Cr
Detection Limit

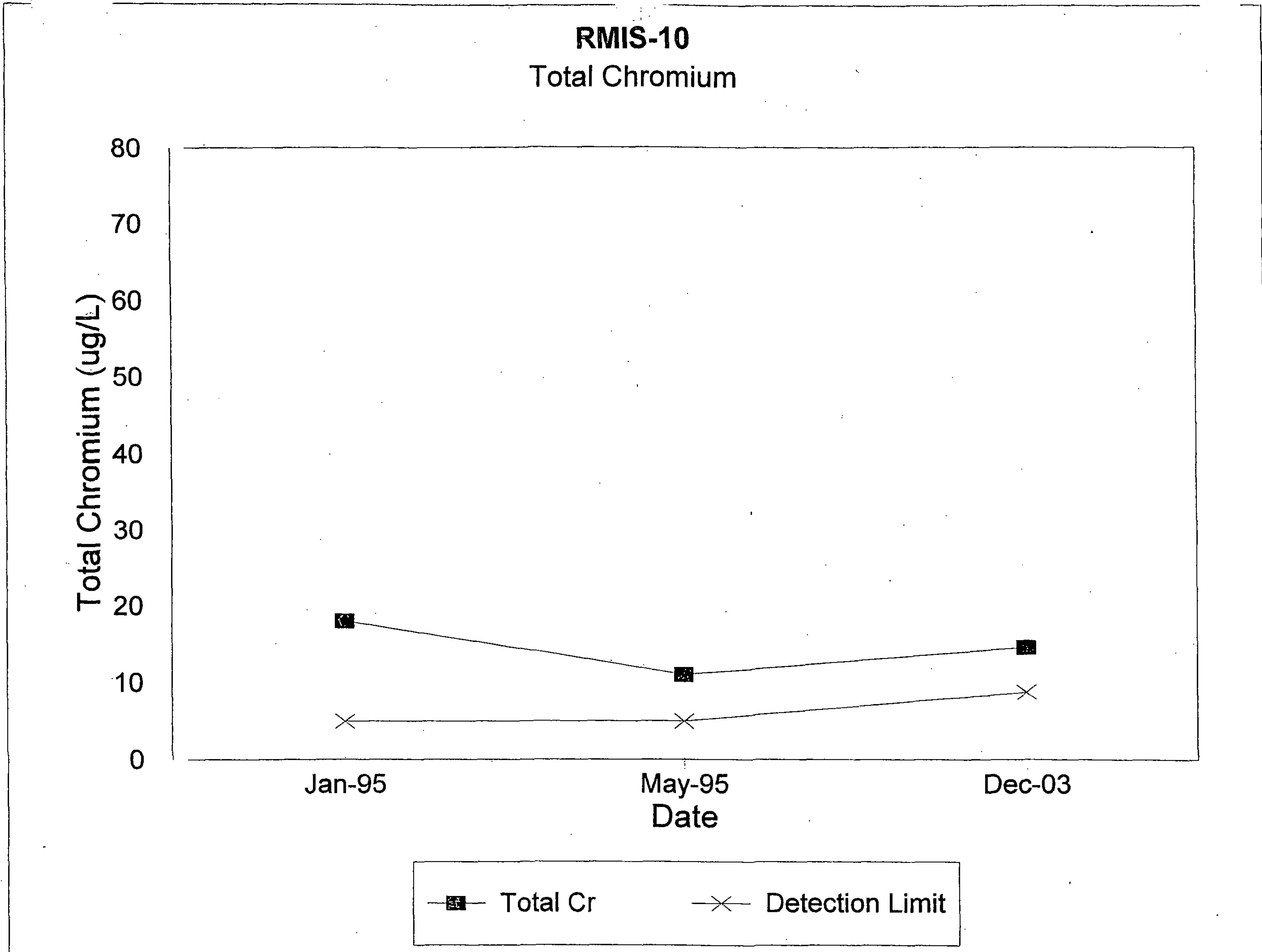

MIS-8B
Total Chromium
10000
1000
100
10
1
Total Chromium (ug/L)
Jan-95
May-95
Dec-03
Date
Total Cr
Detection Limit

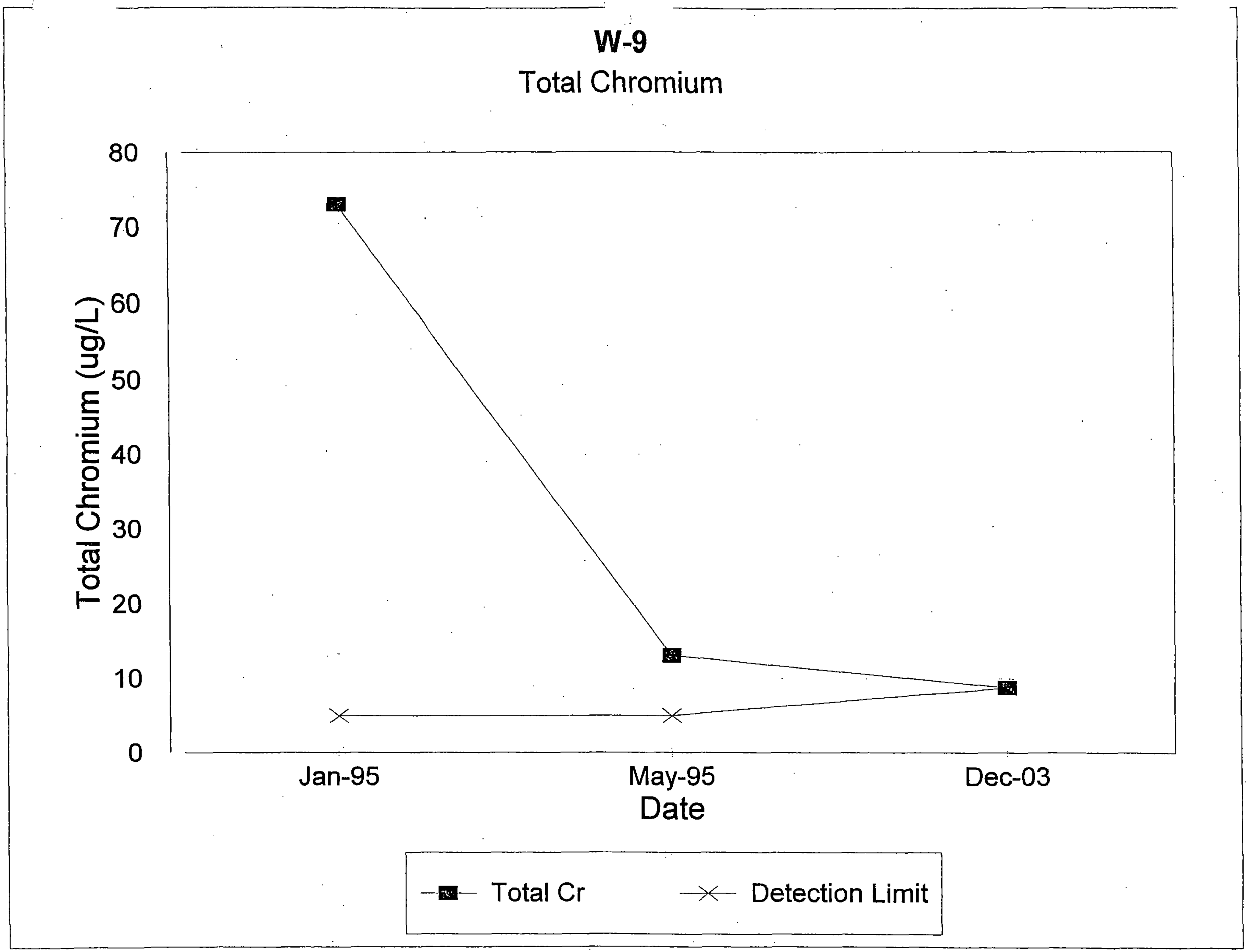

MIS-11B
Total Chromium
10000
1000
100
10
1
Total Chromium (ug/L)
Jan-95
May-95
Dec-03
Date
Total Cr
Detection Limit

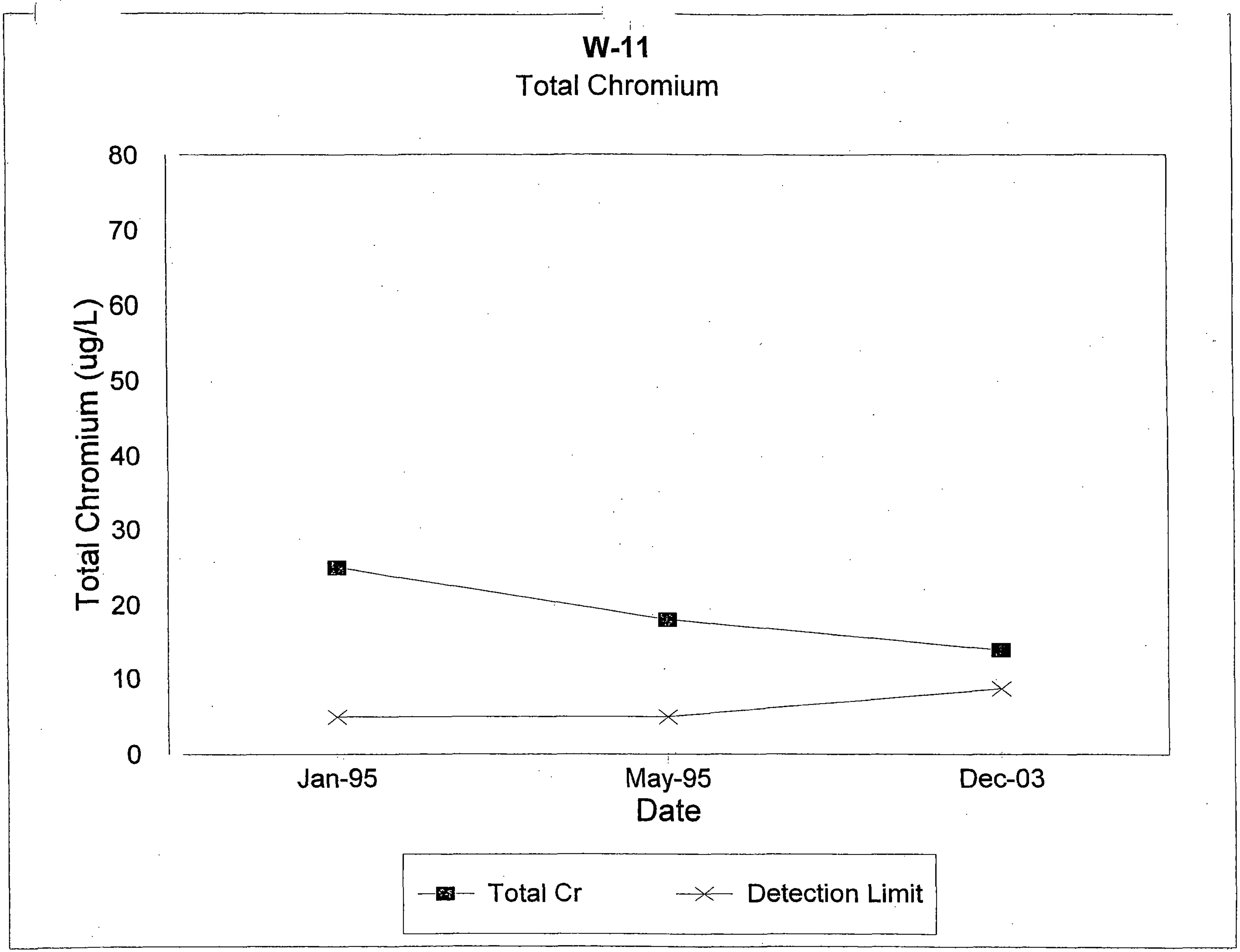

RMIS-2
Total Chromium
Total Chromium (ug/L)
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
Jan-95
May-95
Dec-03
Date
Total Cr
Detection Limit

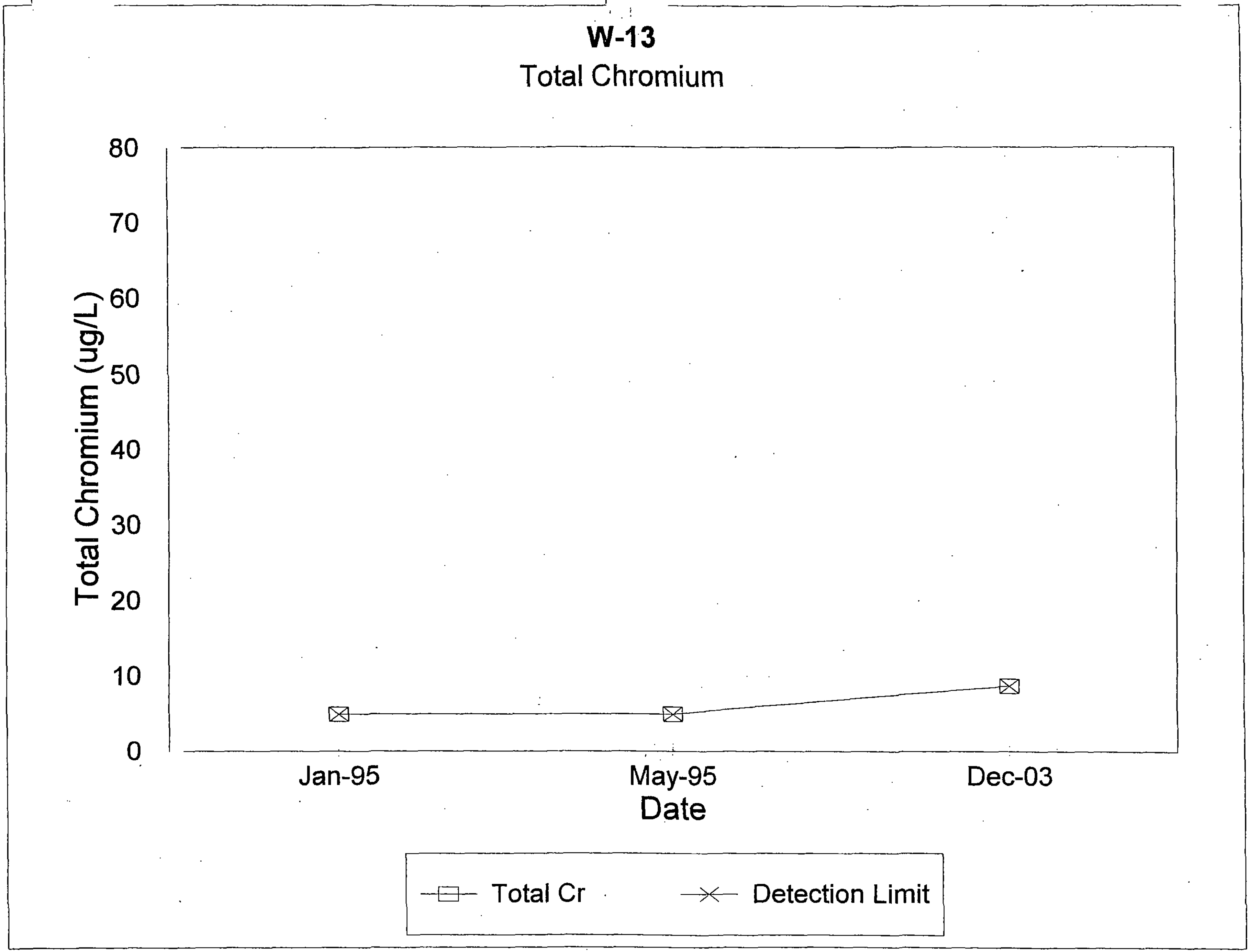

RMIS-3
Total Chromium
80
70
60
50
40
30
20
10
0
Total Chromium (ug/L)
Jan-95
May-95
Dec-03
Date
Total Cr
Detection Limit


RMIS-5
Total Chromium
Total Chromium (ug/L)
80
70
60
50
40
30
20
10
0
Jan-95
May-95
Dec-03
Date
Total Cr
Detection Limit


RMIS-10
Total Chromium
Total Chromium (ug/L)
80
70
60
50
40
30
20
10
0
Jan-95
May-95
Dec-03
Date
Total Cr
Detection Limit

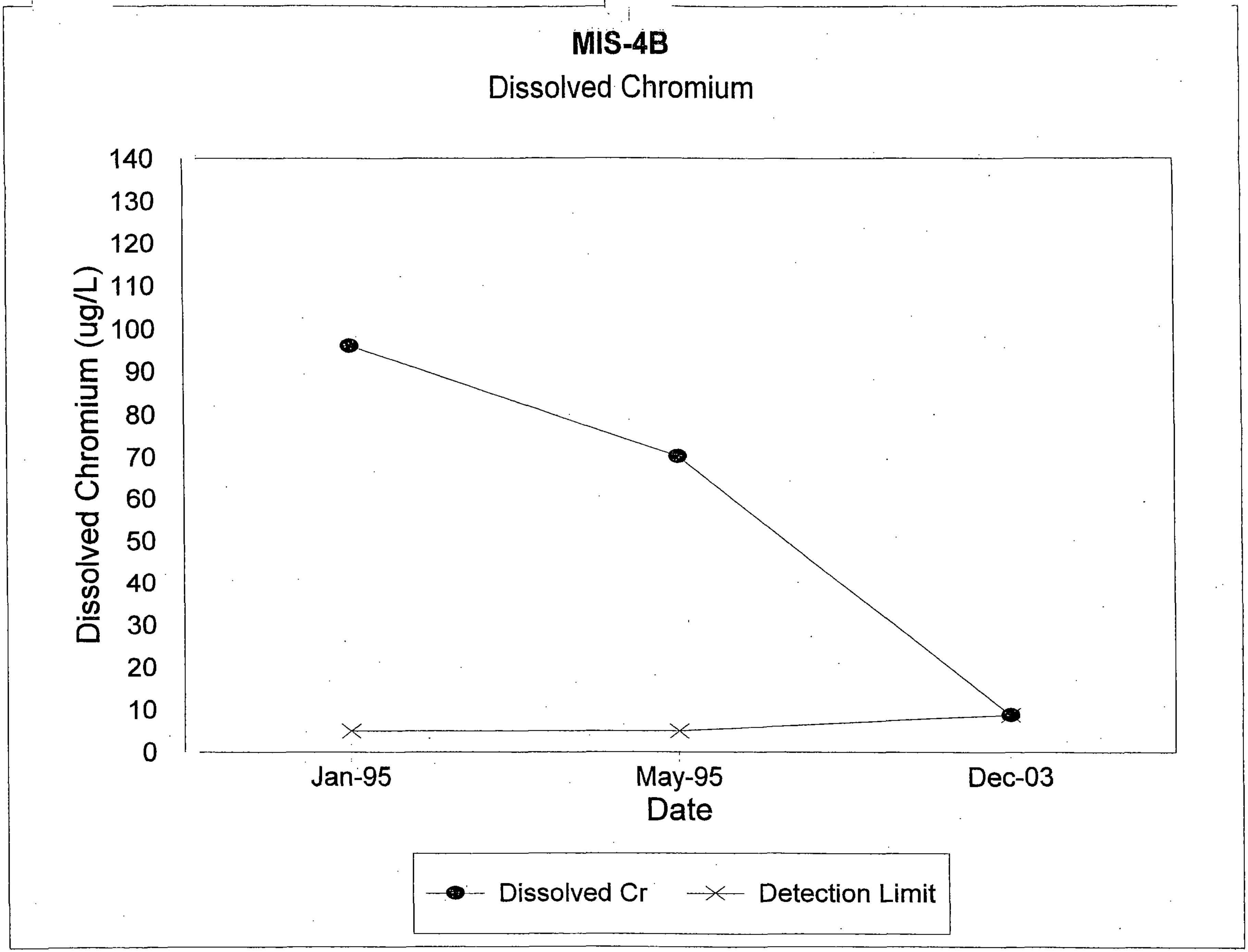

W-9
Total Chromium
Total Chromium (ug/L)
80
70
60
50
40
30
20
10
0
Jan-95
May-95
Dec-03
Date
Total Cr
Detection Limit


W-11
Total Chromium
80
70
60
50
40
30
20
10
0
Total Chromium (ug/L)
Jan-95
May-95
Dec-03
Date
Total Cr
Detection Limit

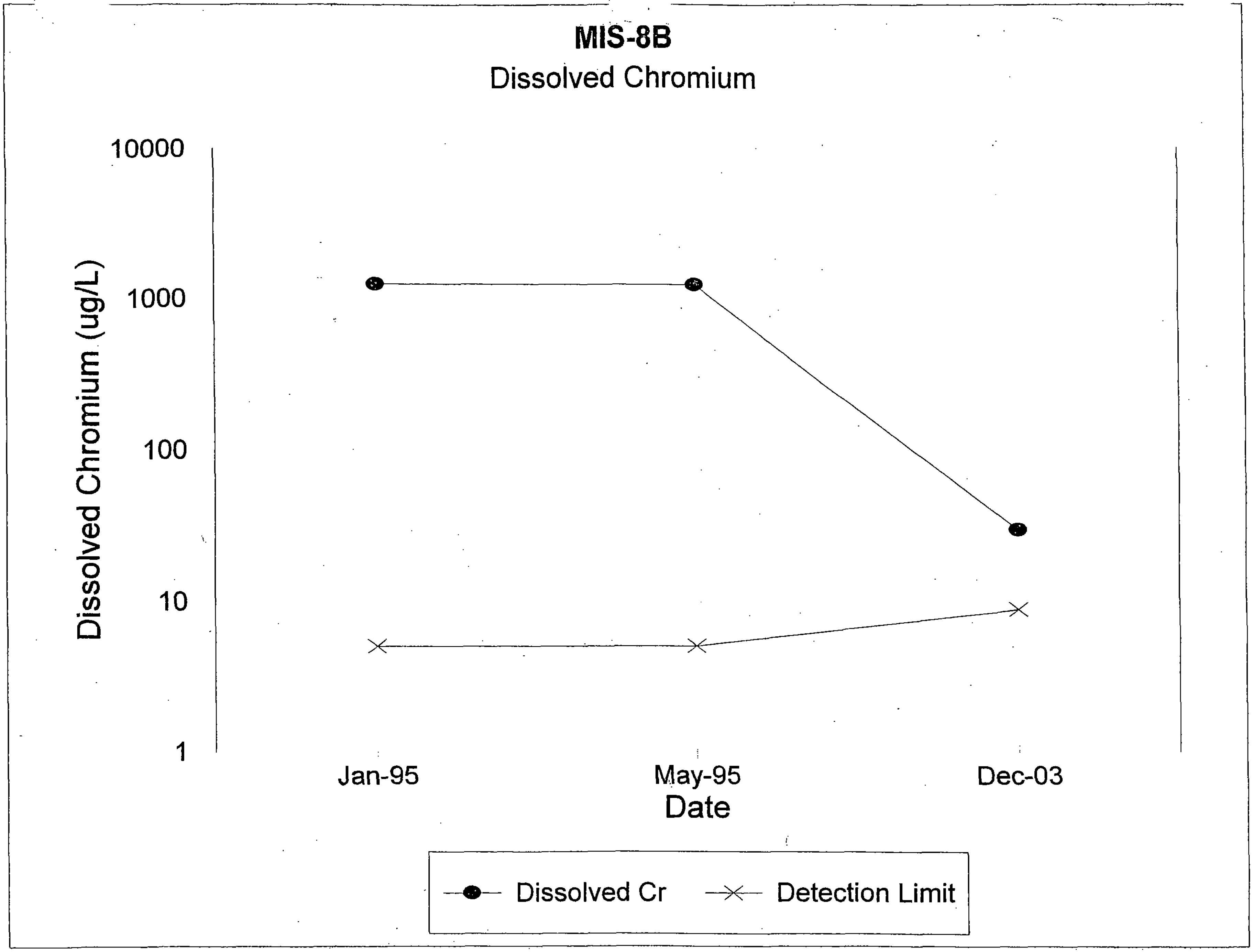

W-13
Total Chromium
Total Chromium (ug/L)
80
70
60
50
40
30
20
10
0
Jan-95
May-95
Dec-03
Date
Total Cr
Detection Limit

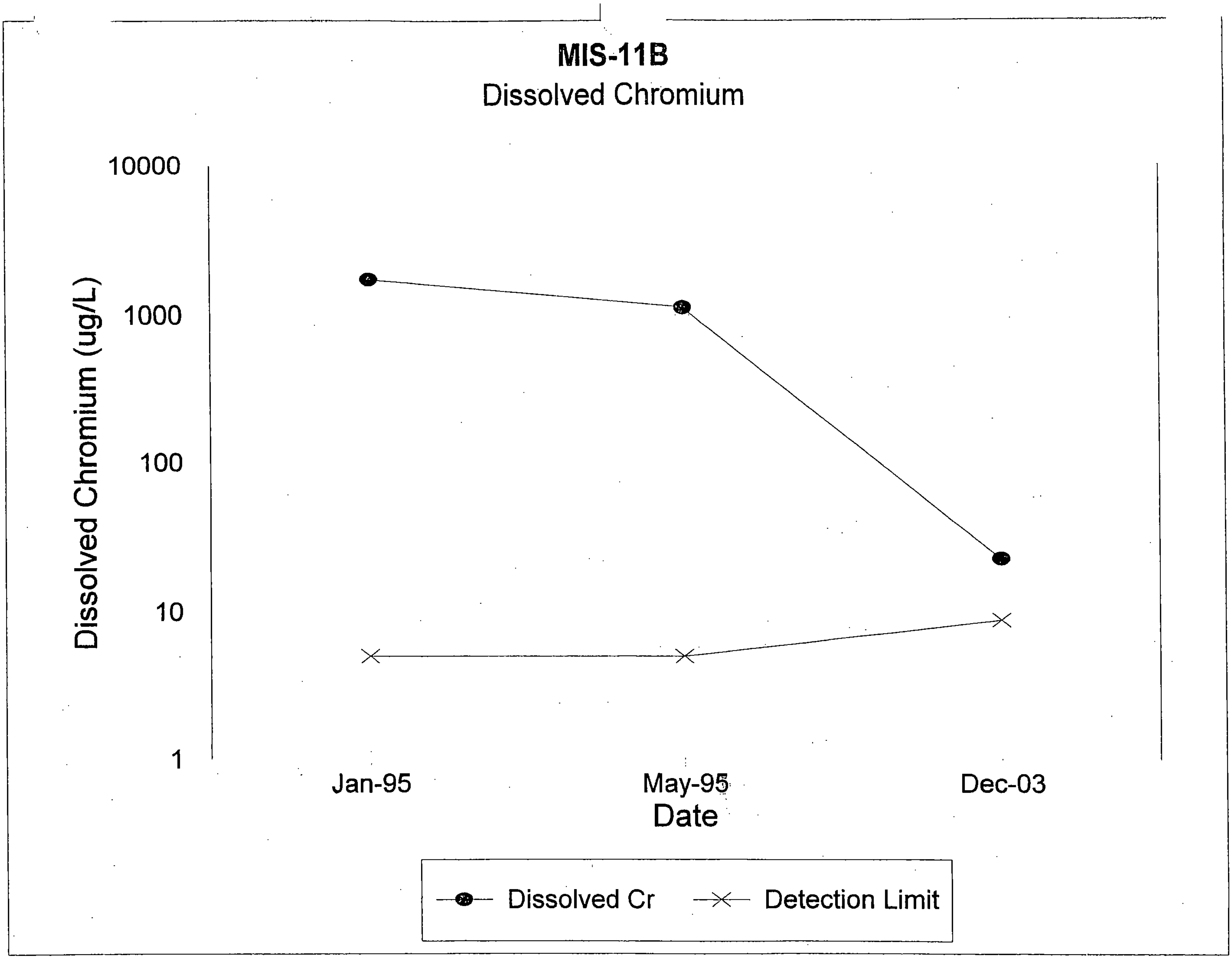
APPENDIX D

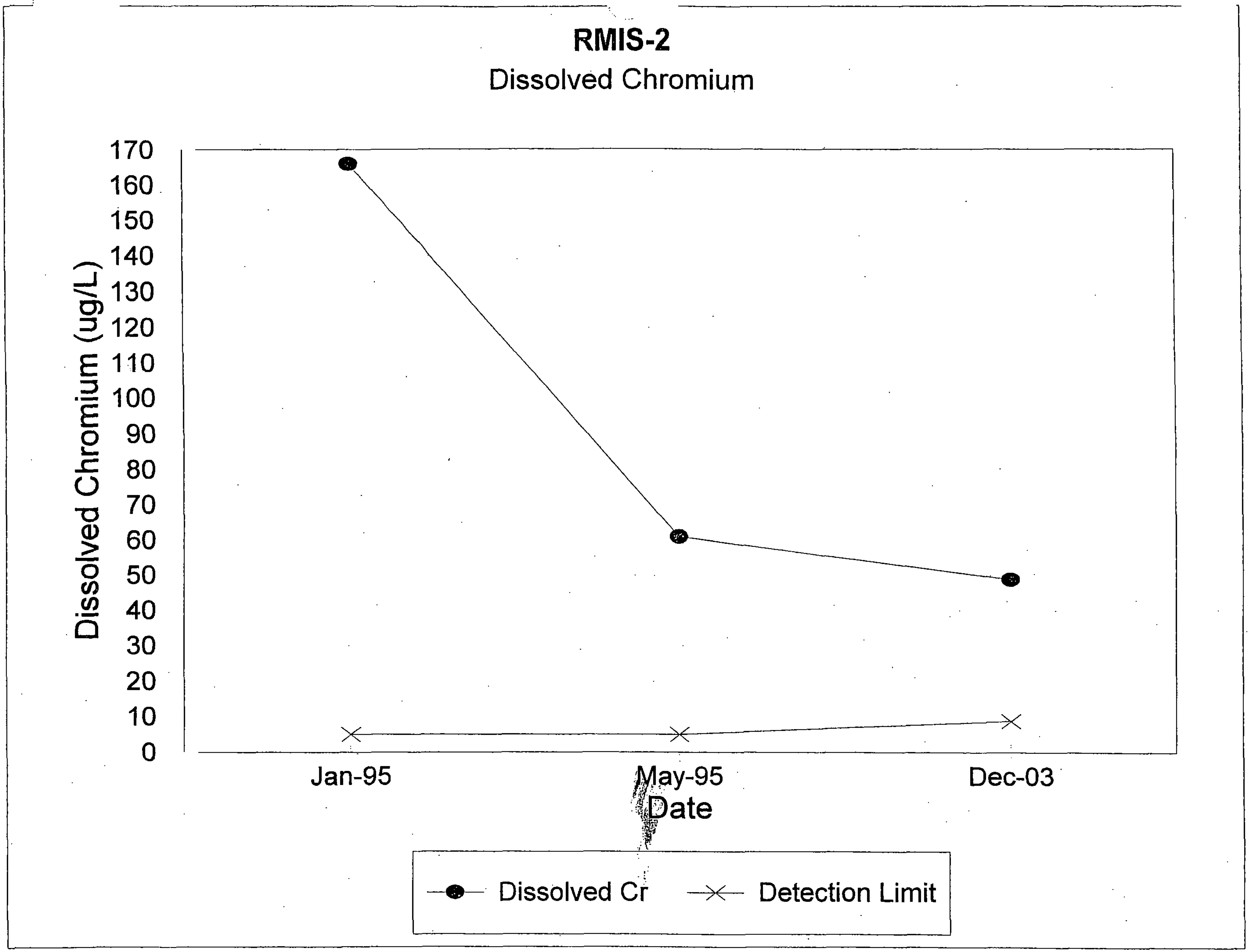
DISSOLVED CHROMIUM CONCENTRATIONS VS. TIME FOR NON-NETWORK GROUNDWATER MONITORING WELLS

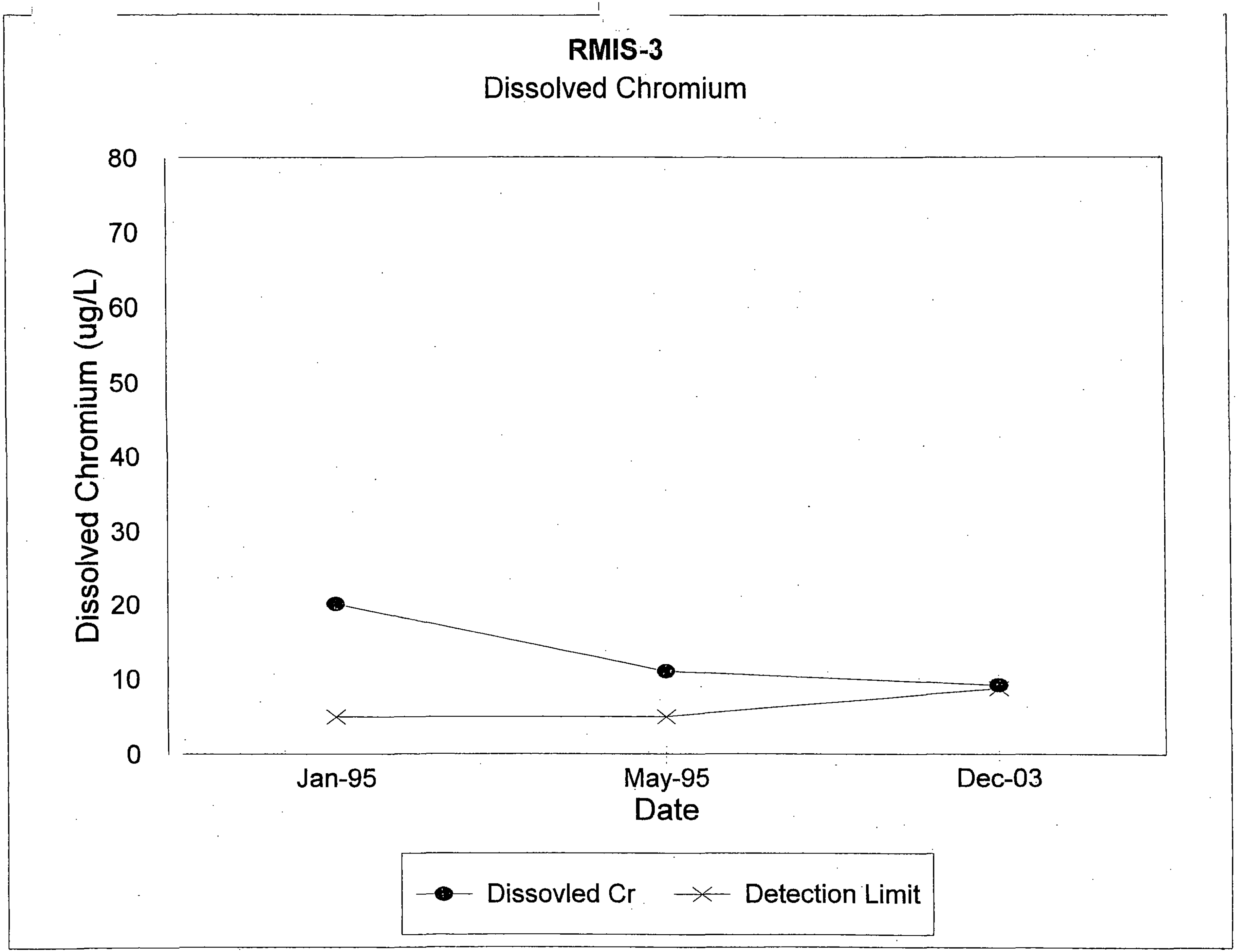


MIS-4B
Dissolved Chromium
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
Dissolved Chromium (ug/L)
Jan-95
May-95
Dec-03
Date
Dissolved Cr
Detection Limit


MIS-8B
Dissolved Chromium
10000
1000
100
10
1
Dissolved Chromium (ug/L)
Jan-95
May-95
Dec-03
Date
Dissolved Cr
Detection Limit


MIS-11B
Dissolved Chromium
Dissolved Chromium (ug/L)
10000
1000
100
10
1
Jan-95
May-95
Dec-03
Date
Dissolved Cr
Detection Limit


RMIS-2
Dissolved Chromium
Dissolved Chromium (ug/L)
170
160
150
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
Jan-95
May-95
Dec-03
Date
Dissolved Cr
Detection Limit



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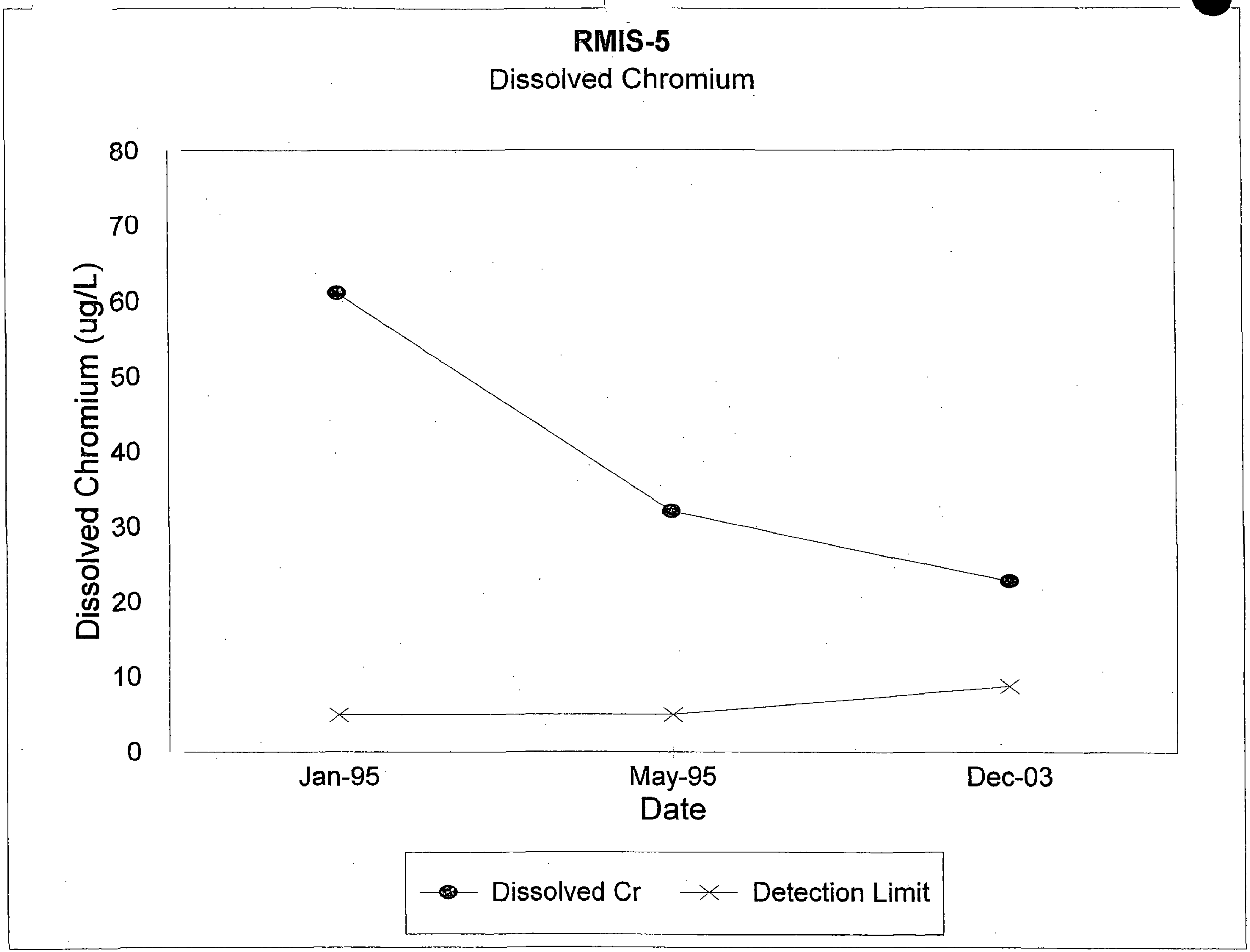
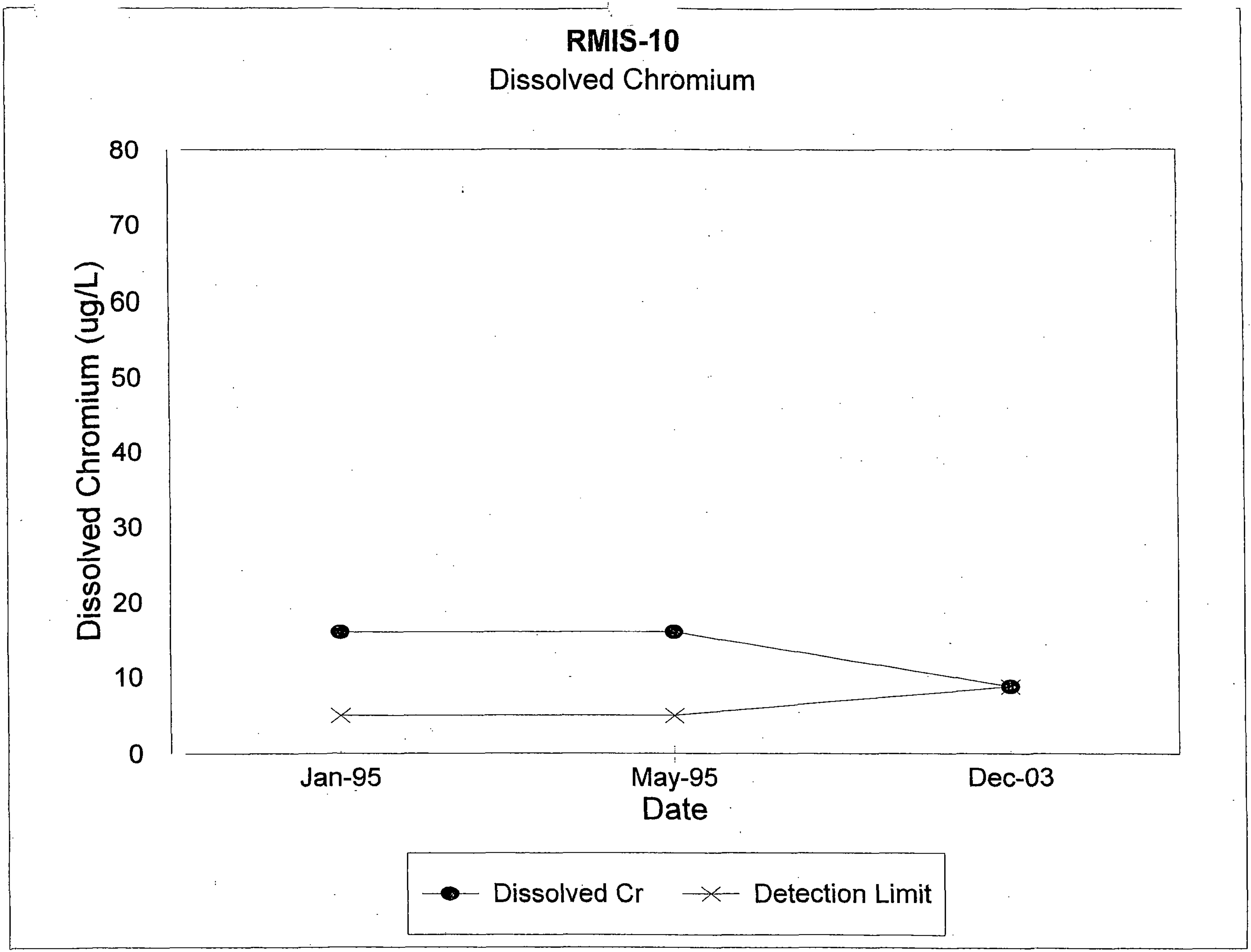
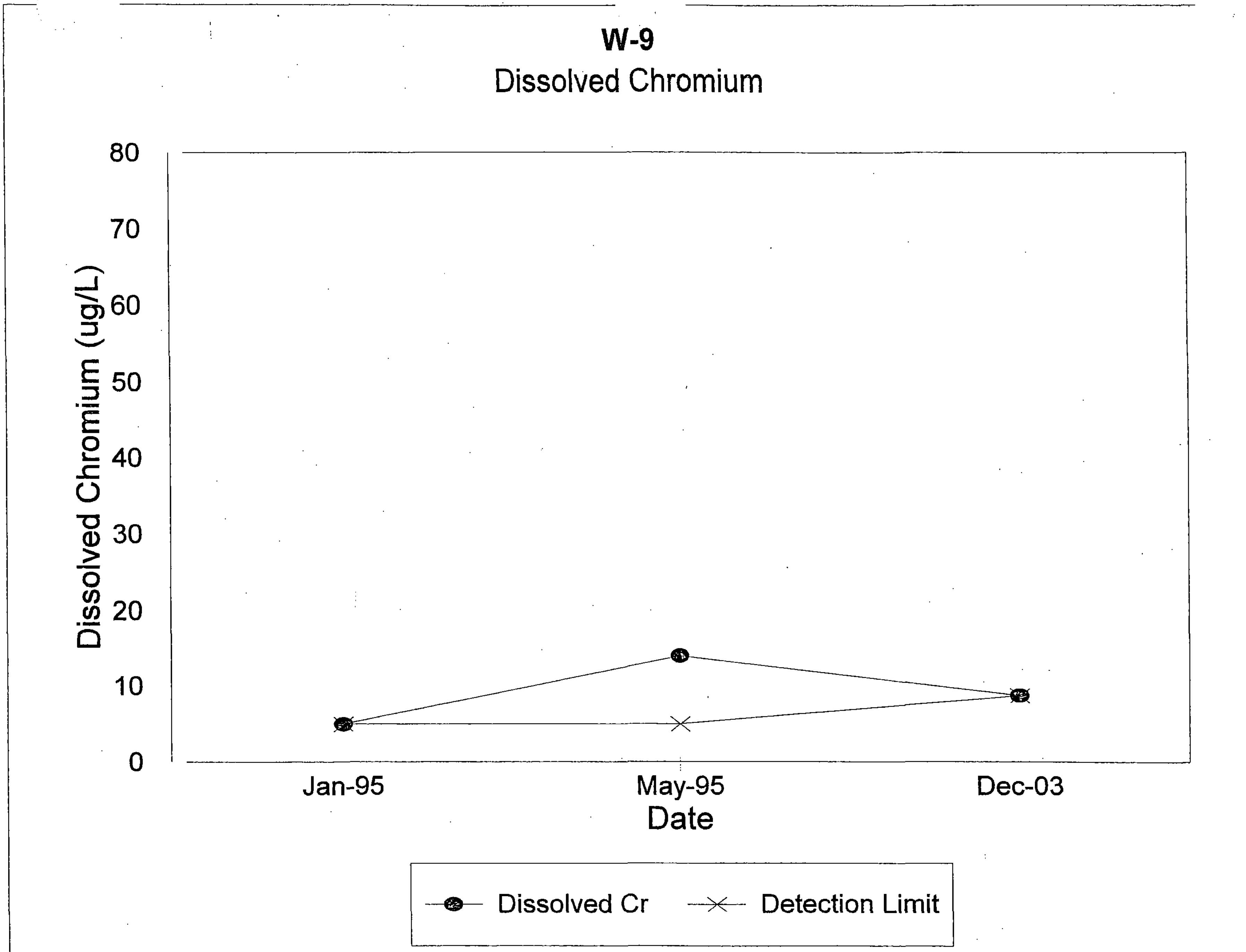
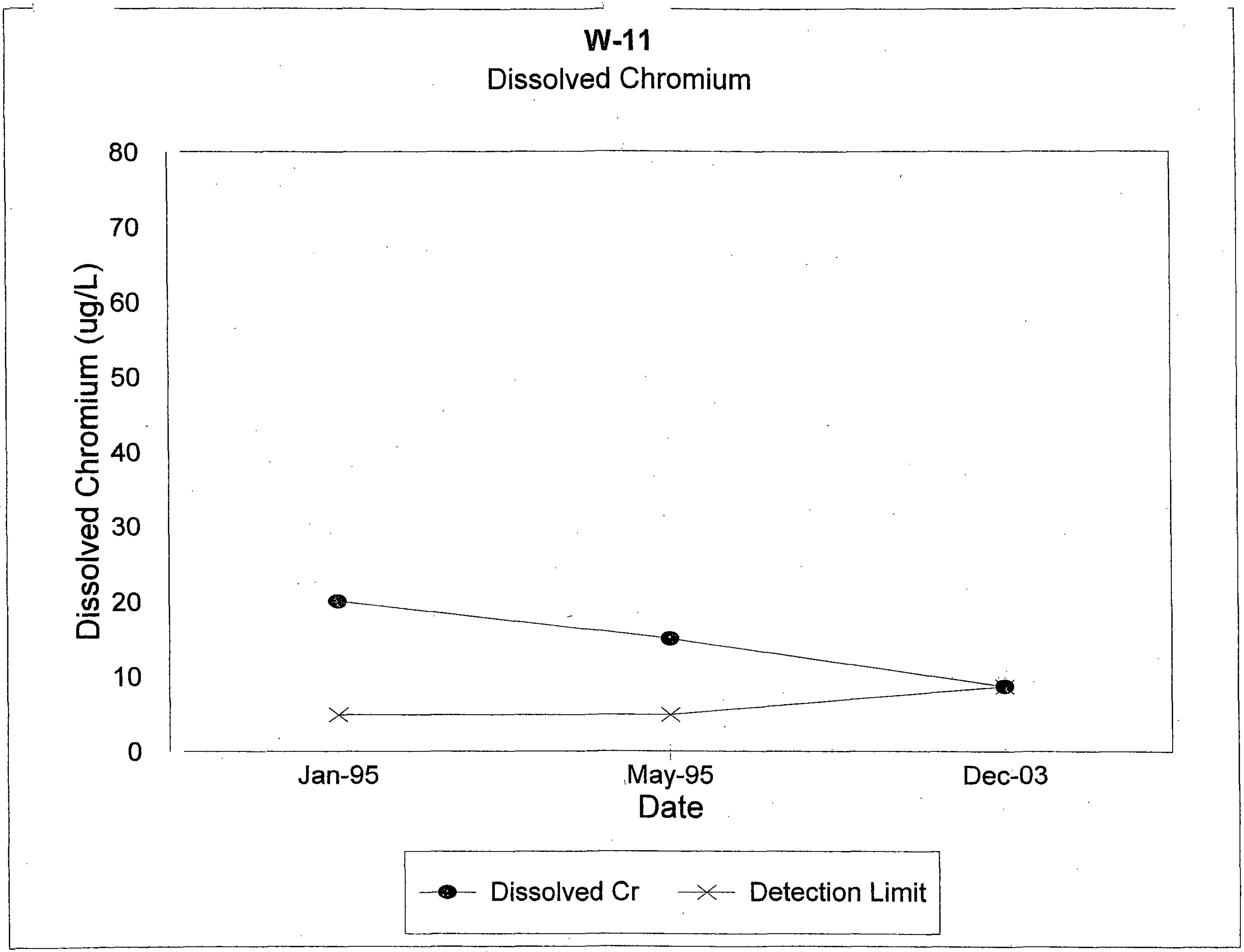

RMIS-5
Dissolved Chromium
Dissolved Chromium (ug/L)
80
70
60
50
40
30
20
10
0
Jan-95
May-95
Dec-03
Date
Dissolved Cr
Detection Limit

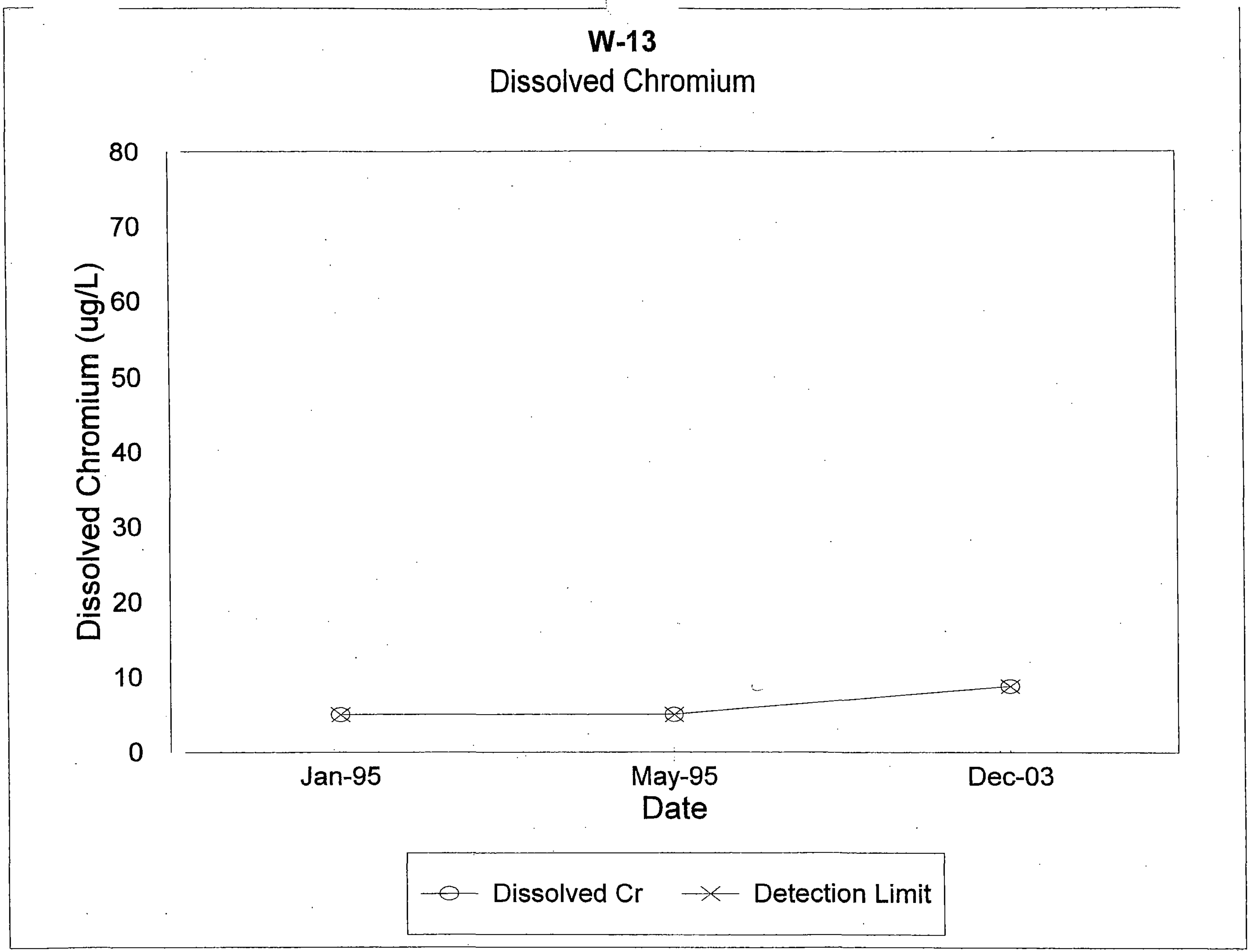


RMIS-10
Dissolved Chromium
80
70
60
50
40
30
20
10
0
Dissolved Chromium (ug/L)
Jan-95
May-95
Dec-03
Date
Dissolved Cr
Detection Limit



C:\Projects\MOUAT\CHEM\CHEM2.wb3 20-Jan-04


W-11
Dissolved Chromium
Dissolved Chromium (ug/L)
80
70
60
50
40
30
20
10
0
Jan-95
May-95
Dec-03
Date
Dissolved Cr
Detection Limit



W-13
Dissolved Chromium
80
70
60
50
40
30
20
10
0
Dissolved Chromium (ug/L)
Jan-95
May-95
Dec-03
Date
Dissolved Cr
Detection Limit

APPENDIX E

LABORATORY REPORTS

Dec 20 →

HKM ENGINEERING

TREC - Mouat
Dissolved Metals
HKM Batch No.: 6231
Results in µg/L

SAMPLE ID	FIELD ID	Cr
CRDL		10.0
IDL		8.8
031218P004	GW278-121703	8.8 U
031218P005	GW279-121703	48.8
031218P006	GW280-121703	8.8 U
031218P007	GW281-121703	22.7
031218P008	GW282-121703	8.8 U
031218P009	GW283-121703	14.0
031218P010	GW284-121703	8.8 U
031218P011	GW285-121703	8.8 U
031218P012	GW286-121703	9.2 B
031218P013	GW287-121703	8.8 U
031218P014	GW288-121703	22.7
031218P015	GW289-121703	29.5
031218P016	GW290-121703	8.8 U

HKM Laboratory

Reviewed by ________

Dec 2003

HKM ENGINEERING

TREC - Mouat
Total Metals
HKM Batch No.: C5700
Results in µg/L

SAMPLE ID	FIELD ID	Cr
CRDL		10.0
IDL		8.8
031218P004	GW278-121703	8.8 U
031218P005	GW279-121703	43.9
031218P006	GW280-121703	14.5
031218P007	GW281-121703	17.9
031218P008	GW282-121703	8.8 U
031218P009	GW283-121703	17.4
031218P010	GW284-121703	8.8 U
031218P011	GW285-121703	8.8 U
031218P012	GW286-121703	8.8 U
031218P013	GW287-121703	13.9
031218P014	GW288-121703	22.3
031218P015	GW289-121703	31.1
031218P016	GW290-121703	8.8 U

HKM Laboratory

Reviewed by

Dec. 2003

TREC - Mouat
QA/QC SUMMARY
HKM Batch No.: 6231
Results in μg/L

SAMPLE ID	FIELD ID	Cr
CRDL		10.0
IDL		8.8
LRB		8.8 U
QCS		506.53
QCS True Value		500.00
% RECOVERY		101.3
031218P004	GW278-121703	8.80 U
031218P004R	GW278-121703R	9.20 B
RPD		<IDL
031218P004	GW278-121703	8.80 U
031218P004A	GW278-121703A	1023.67
Spike True Value		1000.00
% RECOVERY		102.4

HKM Laboratory

Reviewed by

Dec. 3

HKM ENGINEERING

TREC - Mouat
QA/QC SUMMARY
HKM Batch No.: C5700
Results in µg/L

SAMPLE ID	FIELD ID	Cr
CRDL		10.0
IDL		8.8
PB		8.8 U
LCS		405.57
LCS True Value		400.00
% RECOVERY		101.4
031218P004	GW278-121703	8.80 U
031218P004D	GW278-121703D	8.80 U
RPD		<IDL
031218P004	GW278-121703	8.80 U
031218P004S	GW278-121703S	204.70
Spike True Value		200.00
% RECOVERY		102.4

HKM Laboratory

Reviewed by [signature]

HKM ENGINEERING

CHAIN OF CUSTODY

Page 1

011290

PROJECT ID: MOUAT

LABORATORY PERFORMING ANALYSIS: MSE/HKM

SAMPLERS (Signature): Gary Pierce

SAMPLE ID	LAB ID	DATE	TIME	1L, HNO3, filt. Diss. Cr.	1L, HNO3, unfilt. T. Cr.						REMARKS
10358 GW278 121703		12/17/03	0840	X							031218P004
10359		"	"		X						|
10360 GW279 121703		"	0938	X							P005
10361		"	"		X						|
10362 GW280 121703		"	1042	X							P006
10363		"	"		X						|
10364 GW281 121703		"	1130	X							P007
10365		"	"		X						|
10366 GW282 121703		"	1233	X							P008
10367		"	"		X						|
10368 GW283 121703		"	1238	X							P009
10369		"	"		X						|
10370 GW284 121703		"	1258	X							P010
10371		"	"		X						|

RELINQUISHED BY (Signature)	DATE	TIME	RECEIVED BY (Signature)	DATE	TIME
Gary Pierce	12-18-03	1140	Sean O'Connor	12/18/03	11:40
PRINTED NAME	COMPANY		PRINTED NAME: SEAN O'CONNOR	COMPANY: HKM	
RELINQUISHED BY (Signature)	DATE	TIME	RECEIVED BY (Signature)	DATE	TIME
PRINTED NAME	COMPANY		PRINTED NAME	COMPANY	
RELINQUISHED BY (Signature)	DATE	TIME	RECEIVED FOR LAB BY (Signature)	DATE	TIME
PRINTED NAME	COMPANY		PRINTED NAME	COMPANY	

COMMENTS: RECV'D @ <4°C IN COOLER IN GOOD CONDITION.

HKM Laboratory Services
P. O. Box 3588 Butte, MT 59701
PH: (406) 494-1502 / FAX: (406) 494-1673

HKM ENGINEERING

CHAIN OF CUSTODY

PROJECT ID
MOUAT

LABORATORY PERFORMING ANALYSIS
MSE / HKM

SAMPLERS (Signature)
Gary Pierce

SAMPLE ID	LAB ID	DATE	TIME	1l, HNO3 filt. Diss. Cr.	1l, HNO3, unfilt. T. Cr.						REMARKS
10372 GW285 121703		12-17-03	1303	X							031218F011
10373		"	"		X						|
10374 GW286 121703		"	1353	X							F012
10375		"	"		X						|
10376 GW287 121703		"	1433	X							F013
10377		"	"		X						|
10378 GW288 121703		"	~~1454~~ 1520	X							F014
10379		"	"		X						|
10380 GW289 121703		"	1615	X							F015
10381		"	"		X						|
10382 GW290 121703		"	1715	X							F016
10383		"	"		X						|

RELINQUISHED BY (Signature)	DATE	TIME	RECEIVED BY (Signature)	DATE	TIME	COMMENTS
Gary Pierce	12-18-03	1140	Sean O	12/18/03	11:40	RECVD @ <4°C
PRINTED NAME	COMPANY		PRINTED NAME: SEAN O'CONNOR	COMPANY: HKM		
RELINQUISHED BY (Signature)	DATE	TIME	RECEIVED BY (Signature)	DATE	TIME	
PRINTED NAME	COMPANY		PRINTED NAME	COMPANY		
RELINQUISHED BY (Signature)	DATE	TIME	RECEIVED FOR LAB BY (Signature)	DATE	TIME	
PRINTED NAME	COMPANY		PRINTED NAME	COMPANY		

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