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February 1995

EPA Superfund Record of Decision:

Quality Plating Site, Sikeston, MO 1/24/1995

RECORD OF DECISION

QUALITY PLATING SITE
SIKESTON, MISSOURI

PREPARED BY:

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY

REGION VII

KANSAS CITY, KANSAS

JANUARY 1995

DECLARATION FOR THE RECORD OF DECISION

SITE NAME AND LOCATION

Quality Plating Site
Sikeston, Missouri

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedial action for the Quality Plating site north of Sikeston, Missouri chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA) and the National Contingency Plan, 40 C.F.R. Part 300. This decision is based on the Administrative Record file for the site.

The State of Missouri concurs on the selected remedy. A letter from the State of Missouri stating it's concurrence is included in this Record of Decision (ROD) package.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from the Quality Plating Site, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

The selected remedy is extraction of contaminated groundwater through two extraction wells, treatment of the contaminated groundwater by reduction/precipitation, and discharge of the treated groundwater to Ditch Number 4 approximately 4,000 feet east of the site. The discharge will be under the authority of a state operating permit. Discussion with Scott County Road personnel have indicated the routing of the discharge pipe along Scott County Road 448 will be acceptable.

Two primary treatment processes could be used to reduce the hexavalent chromium to a less toxic form, trivalent chromium; chemical reduction or electrochemical reduction. During the remedial design tests will be completed to determine which process is more appropriate for this specific site.

If the chemical reduction system is chosen, the extracted groundwater will be pumped from the extraction wells system to the influent holding tank for flow equalization. Groundwater will then be discharged to the chemical reduction tank where sulfuric acid will be added to reduce the pH alkalinity of the groundwater. With the addition of a chemical, such as ferrous sulfate, the treatment system will then reduce the hexavalent chromium to the less toxic trivalent chromium. Trivalent chromium will be precipitated out of solution as chromium hydroxide and pumped to a sludge holding tank where the sludge will be dewatered using a filter press, characterized for hazardous levels of metal contamination, and then sent off-site for proper disposal. The MDNR's Water Pollution Control Program has indicated the treated groundwater discharge to Ditch Number 4 will be limited to 0.28 mg/l total chromium. It is anticipated that chemical reduction will remove approximately 90% of the total chromium from the groundwater being treated. This process will be expected to provide a treated discharge significantly lower than the 0.28 mg/l total chromium effluent limit.

The extraction wells will be constructed of 6-inch PVC pipe to a total depth of 35 feet below ground surface (bgs) and be screened for a 20 foot interval. A pumping rate of 75 gallons per minute (gpm) for each well or a total flow rate of 150 gpm will be used to contain the plume.

Institutional controls (a groundwater monitoring program) will be implemented to monitor the plume and remediation process. A groundwater monitoring plan will be necessary.

STATUTORY DETERMINATIONS

The selected remedy for the Quality Plating Site is protective of human health and the environment, complies with Federal and State requirements that are legally applicable or relevant and appropriate to the action for the Site, and is cost-effective. This action constitutes the final remedy for the site, and the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element, is met by this remedy.

This remedy will not result in hazardous substances remaining on the site above health-based levels. A review will be conducted to ensure that the interim action for Quality Plating Site continues to provide adequate protection of human health and the environment within five years after commencement of the interim action.

Dennis Grams   1-24-95

Dennis Grams, P.E.   Date
Regional Administrator
U.S. EPA, Region VII

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DECISION SUMMARY

1.0 SITE NAME, LOCATION, AND DESCRIPTION

1.1 SITE NAME AND LOCATION

The Quality Plating site is on Scott County Highway 448, north of Sikeston, Missouri, in Scott County. The site occupies portions of the NW 1/4, NW 1/4, Section 28, and portions of the NE 1/4, NE 1/4, Section 29, Township 27 North, Range 14 East. This site is approximately 5 acres and previously consisted of the manufacturing plant, a one-acre lagoon, and a sludge pit. The foundation of the manufacturing plant remains on-site with the wastewater lagoon, however the sludge pit has been removed and the excavation backfilled with native soil. The location of the site is found on Figures 1 and 2.

1.2 TOPOGRAPHY

The topography of the area is characterized by a slightly rolling landscape to the north and west and relatively flat terrain in the southeasterly direction. The site is on the northern portion of the Sikeston Ridge, a relatively flat terrace averaging about 20 feet higher in elevation that the adjacent lowlands to the north, east, and west. The elevation in the immediate area is approximately 325 feet above sea level with local relief being approximately 20 feet. Surface drainage from the site is to the east to a tributary of St. John's Ditch.

The Quality Plating site is located in the Mississippi Embayment of the Gulf Costal Plain physiographic province. Geologically, the Mississippi Embayment is a syncline which plunges to the south and whose axis generally parallels the Mississippi River. Locally, the terrace on which the site is located is an alluvial landform produced by alternate aggradation and degradation of the Ohio and Mississippi Rivers. The sandy surface of the terrace is covered by a closely spaced network of braided stream channels. The interbraids are peppered with hollowed mounds of sand which are referred to as blowouts. One of these blowout features is located on the site and was used as the wastewater lagoon. The soil survey from Scott County, Missouri identifies the soil at the site as belonging to the Scotco series. This series consists of deep, excessively drained, rapidly permeable soils.

The site is underlain by approximately 200 feet of alluvium consisting of sand and gravel. Area well logs show only minor clay or silt present in the upper five feet of alluvium. The alluvium is recharged by precipitation and to lesser degree by streams, drainage ditches, and rivers during high stages. Discharge from the alluvium is by natural drainage into a few streams in the Sikeston Ridge area, the Mississippi River, manmade drainage ditches, evapo-transpiration, and groundwater usage. Underlying the alluvium is the Porters Creek Formation which consists of about 35 feet of uniform, dark clay.

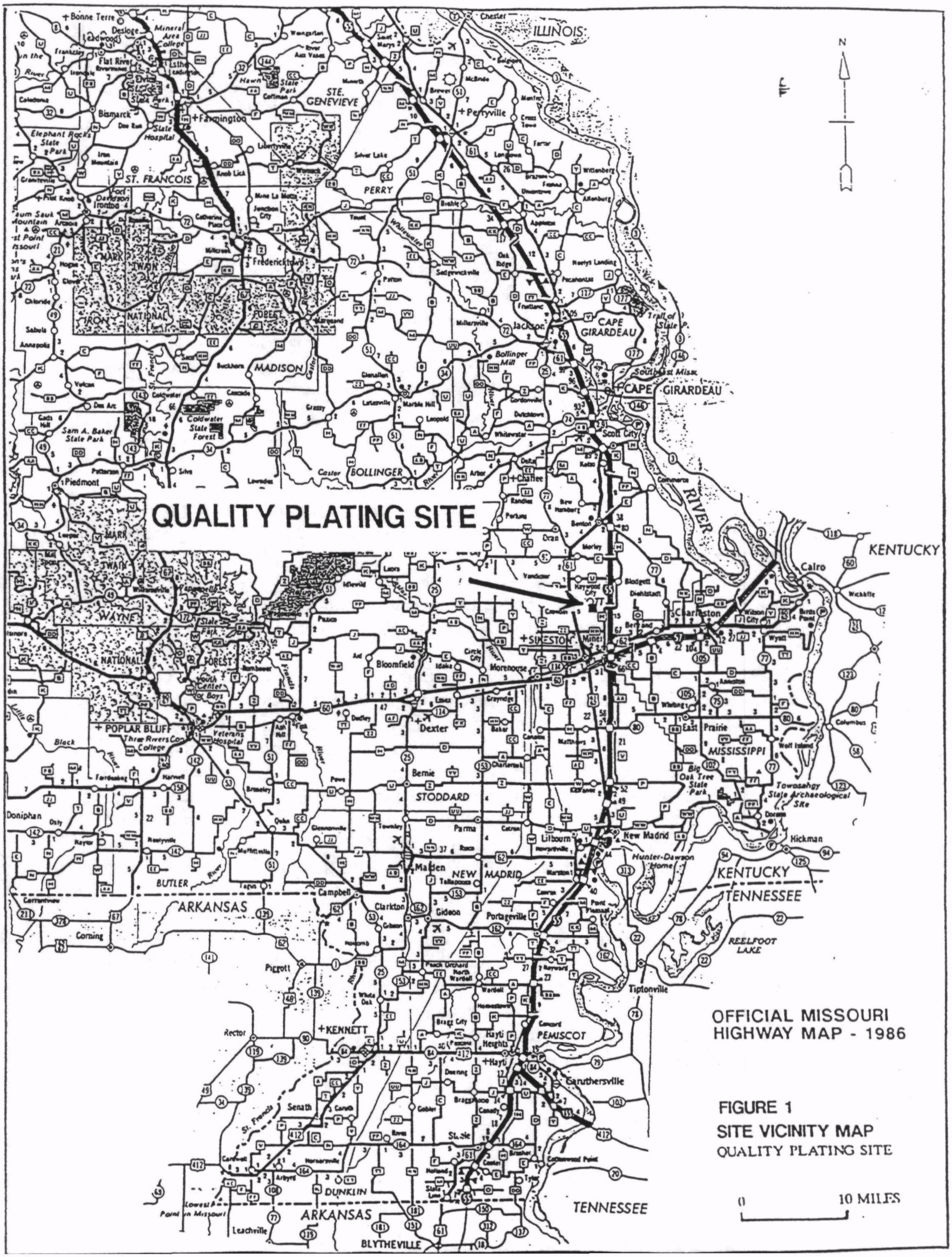
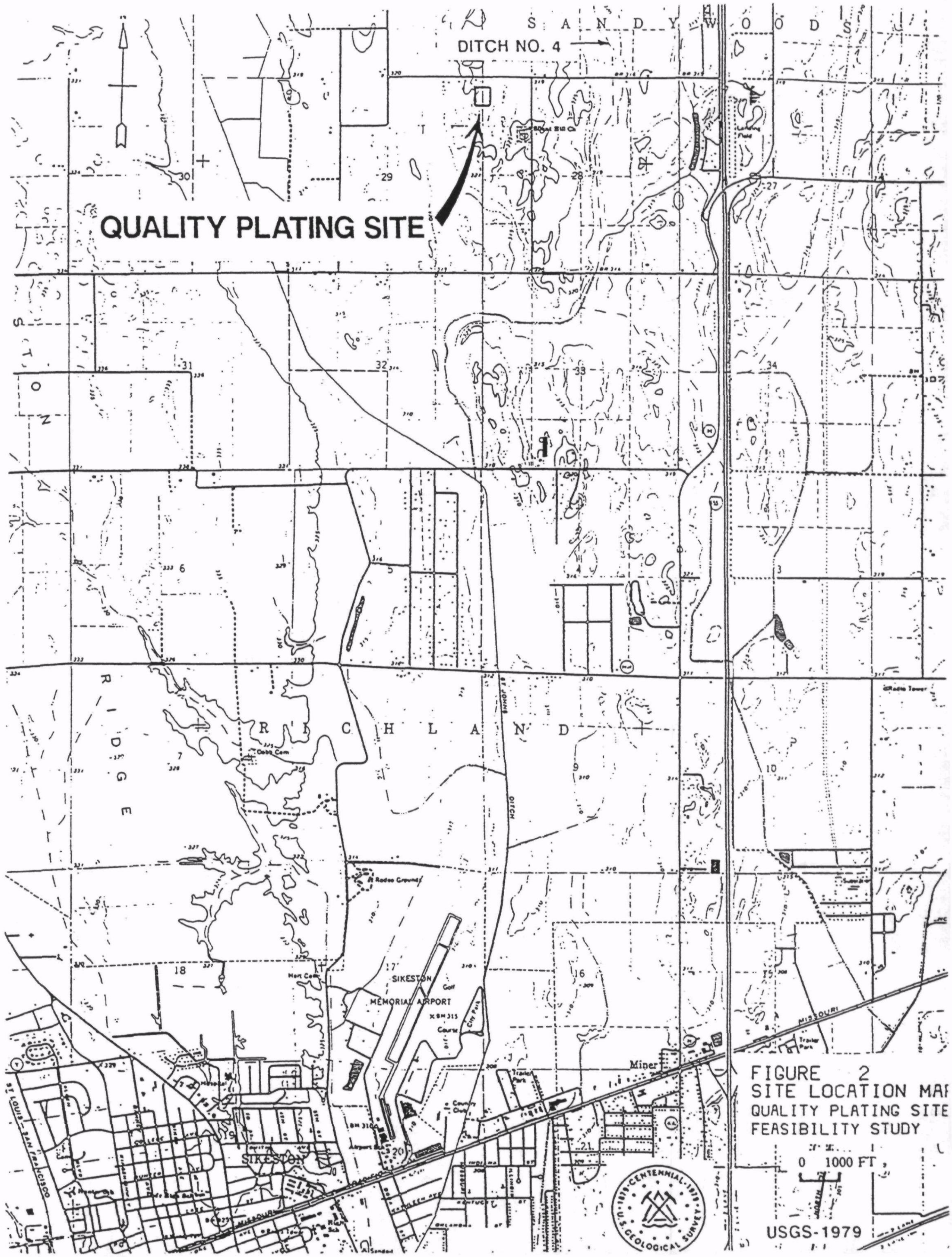


FIGURE 1
SITE VICINITY MAP
QUALITY PLATING SITE


S A N D Y W O O D S
DITCH NO. 4
QUALITY PLATING SITE
R I C H L A N D
RIDGE
SIKESTON
MEMORIAL AIRPORT
Rodeo Grounds
Radio Tower
Miner
SIKESTON
MISSOURI
FIGURE 2
SITE LOCATION MAP
QUALITY PLATING SITE
FEASIBILITY STUDY
0 1000 FT
USGS-1979

1.3 ADJACENT LAND USES

There are six residences located within 1/4 mile from the site and all have private wells for a drinking water source. The surrounding land is used primarily for agricultural purposes (row crops). From time to time, the existing landowner raises calves on the site, and an adjacent landowner raises horses.

2.0 SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.1 SITE HISTORY

Quality Plating was engaged in contract plating of common and precious metals, which included cadmium, chromium (hexavalent form), copper, nickel, and zinc from 1978 until the facility was destroyed by fire on February 12, 1983. Untreated wastewater originating from the rinse tanks and metal plating batch solutions was continuously discharged into an on-site unlined lagoon at a rate of approximately 10,000 gpd. Wastewater discharged to the lagoon then rapidly percolated through the sandy soil and infiltrated into the groundwater ("subsurface water of the state"). Sludge, generated during plant operations, was buried in the sludge pit in the southwestern portion of the site.

A Phase I Remedial Investigation (RI) was conducted at the Quality Plating site between December 1991 and February 1992. Results of the RI identified significantly elevated levels of heavy metals in the soils and sludge pit area and on-site levels of total chromium, iron, and manganese, which exceeded the water quality standards current at the time, in the shallow groundwater. These levels were confirmed by the Environmental Protection Agency (EPA) in a Removal Assessment conducted in February 1992.

EPA recommended a time-critical removal action be implemented at the site, to address the immediate health threats posed by the contents of the sludge pit and that the site be included as part of a Superfund Accelerated Cleanup Model (SACM) pilot program currently being implemented in EPA Region VII. An Action Memorandum was prepared and a soil removal action at the site was implemented by EPA.

Approximately 900 cubic yards of contaminated sludge pit waste were excavated and transported off-site to a Resource Conversation and Recovery Act (RCRA) approved facility for final treatment and disposal. Confirmation sampling and analysis was conducted and verified that soil cleanup levels had been achieved. The following soil cleanup levels were identified in the Action Memorandum signed by EPA in August 1992: Total Chromium, 2,000 milligrams per Kilogram (mg/Kg); Chromium, 180 mg/Kg; Nickel, 1,100 mg/Kg; and Zinc, 5,600 mg/Kg.

A Further Investigation of Groundwater (FIG) Report was completed in October 1993. It was the recommendation of the FIG that remediation of the groundwater at the Quality Plating site is warranted and that a Feasibility Study (FS) be performed for the purposed of identifying the most cost-effective and appropriate remediation activities at the site. This recommendation was based on the existence of contaminated groundwater at the site which exceeded site-designated risk-levels and the existence of known shallow groundwater down gradient of the site. The FS was completed in June 1994.

2.2 ENFORCEMENT HISTORY

The MDNR's Southeast Regional Office wrote three Notice Of Violations (NOVs) to Quality Plating between December 8, 1981 and September 20, 1982 for discharging untreated electroplating wastewater without an NPDES permit. On December 17, 1982 an Abatement Order to cease the discharge was issued.

3.0 PUBLIC RELATIONS ACTIVITIES

An availability session was held on October 30, 1991 in which information was exchanged between area residents and MDNR personnel. Additional meetings were held on August 11 and December 8, 1992 and questions of the area residents were answered on such topics as health aspects associated with the site, private drinking water testing, and CERCLA enforcement requirements. On September 30, 1993 a public meeting was held to present the findings contained in the FIG Report.

The FS and Proposed Plan, which were included as part of the Administrative Record (AR), were made available to the public at the Sikeston Public Library and at the offices of EPA in Kansas City, Kansas and at the MDNR in Jefferson City, Missouri. The notice of availability for the AR and the announcement of a public meeting held on October 3, 1994 was published in the Sikeston Standard Democrat on September 11, September 28, and October 2, 1994. The public comment period was held from September 11, 1994 to October 11, 1994. On October 9, 1994 the public comment period was extended an additional 30 days to November 10, 1994. At this meeting, representatives from the MDNR and EPA received public comments and answered questions about problems at the site and the remedial alternatives under consideration. A response to the comments received during this period is included in the Responsiveness Summary, which is part of this Record of Decision (ROD).

This decision document presents the selected remedial action for the Quality Plating site in Sikeston, Missouri, chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability (CERCLA) Law of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, and to the extent practicable, the National Contingency Plan (NCP). This decision is based on the Administrative Record for this site.

4.0 SCOPE AND ROLE OF RESPONSE ACTION

The response action selected in this ROD will address the contamination at the site not addressed during the prior removal action. This response action involves removal and treatment of hexavalent chromium contaminated groundwater.

The remedial action selected in this ROD is intended to address the entire site with regard to the principal threats to human health and the environment posed by contamination at the site as indicated in the risk assessment for the site. The findings of the risk assessment are included in the Administrative Record and are summarized in Section 6.0 of this document.

Table 1
Summary of Groundwater Well Sample Results
Quality Plating Site
Feasibility Study

Sample ID Date Collected	Units	MCL (a)/SMCL (b)	Preliminary Remediation Goal (c)	QP-93-MW-1 03/18/93	QP-93-MW-2 03/18/93	QP-93-MW-2-MS/MSD (Duplicate, See Note d) 03/18/93	QP-93-MW-2-(2) 03/20/93
Total Alkalinity	mg/L	--	--	20.0 U	20.0 U	NA	NA
Bicarbonate Alkalinity	mg/L	--	--	20.0 U	20.0 U	NA	NA
Carbonate Alkalinity	mg/L	--	--	0.0	0.0	NA	NA
Hydroxide Alkalinity	mg/L	--	--	0.0	0.0	NA	NA
Total Dissolved Solids	mg/L	500.0 (b)	--	120.0	90.0	NA	NA
Turbidity	NTU	--	--	< 1.0	< 1.0	NA	NA
Hexavalent Chromium	ug/L	--	18.0	10.00 U	28.00	26.00	39.00
Total Chromium	ug/L	100.0 (a)	3500.0	10.0 U	38.0	39.0	NA
Iron	ug/L	300.0 (b)	--	126.0	102.0	245.0	NA
Lead	ug/L	15.0 (a)	--	3.0 U	3.0 U	3.0 U	NA
Manganese	ug/L	50.0 (b)	18.0	15.0 U	15.0 U	15.0 U	NA
Nickel	ug/L	100.0 (a)	70.0	40.0 U	40.0 U	40.0 U	NA
Zinc	ug/L	5000.0 (b)	1000.0	20.0 U	20.0 U	20.0 U	NA

NA - Not Analyzed
NTU - Nephelometric Turbidity Units
U - Undetected

Value exceeds either the MCL/SMCL or PRG.

(a) Maximum Contaminant Level. Maximum permissible level as established by the Safe Drinking Water Act (40 CFR 141) for a contaminant in water that is delivered to any user of a public water system. (Lead value is defined as an "action level" rather than an MCL.)
(b) Secondary Maximum Contaminant Levels. Regulates contaminants in drinking water that primarily affect the aesthetic qualities (40 CFR 143).
(c) Preliminary Remediation Goals as determined by MDOH.
(d) Sample QP-93-MW-2-MS/MSD was designated by BVWST as a matrix spike sample; however, the laboratory incorrectly analyzed the sample as a duplicate. No other samples were analyzed as MS/MSD samples for the groundwater wells.

Table 1 (Continued)
Summary of Groundwater Well Sample Results
Quality Plating Site
Feasibility Study

Sample ID / Date Collected	Units	MCL (a)/SMCL (b)	Preliminary Remediation Goal (c)	QP-93-MW-3 03/18/93	QP-93-MW-3-(D) 03/18/93	QP-93-MW-3-(2) 03/20/93	QP-93-MW-4 03/17/93
Total Alkalinity	mg/L	--	--	36.0	NA	NA	20.0
Bicarbonate Alkalinity	mg/L	--	--	36.0	NA	NA	20.0
Carbonate Alkalinity	mg/L	--	--	0.0	NA	NA	0.0
Hydroxide Alkalinity	mg/L	--	--	0.0	NA	NA	0.0
Total Dissolved Solids	mg/L	500.0 (b)	--	120.0	NA	NA	100.0
Turbidity	NTU	--	--	< 1.0	NA	NA	< 1.0
Hexavalent Chromium	ug/L	--	18.0	60.00	45.00	71.00	10.00
Total Chromium	ug/L	100.0 (a)	3500.0	72.0	75.0	NA	10.0
Iron	ug/L	300.0 (b)	--	100.0 U	136.0	NA	129.0
Lead	ug/L	15.0 (a)	--	3.0 U	3.0 U	NA	3.0
Manganese	ug/L	50.0 (b)	18.0	15.0 U	15.0 U	NA	24.0
Nickel	ug/L	100.0 (a)	70.0	40.0 U	40.0 U	NA	40.0
Zinc	ug/L	5000.0 (b)	1000.0	20.0 U	20.0 U	NA	20.0

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Table 1 (Continued)
Summary of Groundwater Well Sample Results
Quality Plating Site
Feasibility Study

Sample ID Date Collected	Units	MCL (a)/SMCL (b)	Preliminary Remediation Goal (c)	QP-93-WH-1 03/17/93	QP-93-IGN 03/20/93	QP-93-IGS 03/19/93	QP-93-MW-3-R 03/18/93
Total Alkalinity	mg/L	--	--	20.0 U	57.0	80.0	NA
Bicarbonate Alkalinity	mg/L	--	--	20.0 U	57.0	80.0	NA
Carbonate Alkalinity	mg/L	--	--	0.0	0.0	0.0	NA
Hydroxide Alkalinity	mg/L	--	--	0.0	0.0	0.0	NA
Total Dissolved Solids	mg/L	500.0 (b)	--	120.0	80.0	110.0	NA
Turbidity	NTU	--	--	< 1.0	< 1.0	26.0	NA
Hexavalent Chromium	ug/L	--	18.0	10.00 U	10.00 U	10.00 U	10.00 U
Total Chromium	ug/L	100.0 (a)	3500.0	10.0 U	10.0 U	10.0 U	10.0 U
Iron	ug/L	300.0 (b)	--	100.0 U	431.0	3160.0	100.0 U
Lead	ug/L	15.0 (a)	--	3.0 U	3.0 U	3.0 U	3.0 U
Manganese	ug/L	50.0 (b)	18.0	15.0 U	222.0	690.0	15.0 U
Nickel	ug/L	100.0 (a)	70.0	40.0 U	40.0 U	40.0 U	40.0 U
Zinc	ug/L	5000.0 (b)	1000.0	30.0	20.0 U	20.0 U	20.0 U

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Table 1 (Continued)
Summary of Groundwater Well Sample Results
Quality Plating Site
Feasibility Study

Sample ID Date Collected	Units	MCL (a)/SMCL (b)	Preliminary Remediation Goal (c)	QP-93-MW-3-(2)-(R) 03/20/93
Total Alkalinity	mg/L	--	--	NA
Bicarbonate Alkalinity	mg/L	--	--	NA
Carbonate Alkalinity	mg/L	--	--	NA
Hydroxide Alkalinity	mg/L	--	--	NA
Total Dissolved Solids	mg/L	500.0 (b)	--	NA
Turbidity	NTU	--	--	NA
Hexavalent Chromium	ug/L	--	18.0	10.00 U
Total Chromium	ug/L	100.0 (a)	3500.0	NA
Iron	ug/L	300.0 (b)	--	NA
Lead	ug/L	15.0 (a)	--	NA
Manganese	ug/L	50.0 (b)	18.0	NA
Nickel	ug/L	100.0 (a)	70.0	NA
Zinc	ug/L	5000.0 (b)	1000.0	NA

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(b) Secondary Maximum Contaminant Levels. Regulates contaminants in drinking water that primarily affect the aesthetic qualities (40 CFR 143).
(c) Preliminary Remediation Goals as determined by MDOH.
(d) Sample QP-93-MW-2-MS/MSD was designated by BVWST as a matrix spike sample; however, the laboratory incorrectly analyzed the sample as a duplicate. No other samples were analyzed as MS/MSD samples for the groundwater wells.

TABLE 2

Summary of Push-In Well Screen Groundwater Samples
Quality Plating
Feasibility Study

Sample ID Date Collected	Units	MCL (a)/SMCL (b)	Preliminary Remediation Goals (c)	QP-93-03-24-HP-R 03/24/93	QP-93-03-25-HP-R 03/25/93	QP-93-03-26-HP-R 03/26/93
Total Alkalinity	mg/L	--	--	20.0 U	NA	NA
Bicarbonate Alkalinity	mg/L	--	--	20.0 U	NA	NA
Carbonate Alkalinity	mg/L	--	--	0.0	NA	NA
Hydroxide Alkalinity	mg/L	--	--	0.0	NA	NA
Total Dissolved Solids	mg/L	500.0 (b)	--	1.0 U	NA	NA
Turbidity	NTU	--	--	< 1.0	NA	NA
Hexavalent Chromium	ug/L	--	18.0	10.00 U	10.00 U	10.00 U
Total Chromium	ug/L	100.0 (a)	3500.0	10.0 U	10.0 U	10.0 U
Iron	ug/L	300.0 (b)	--	100.0 U	100.0 U	100.0 U
Lead	ug/L	15.0 (a)	--	3.0 U	3.0 UJ	3.0 UJ
Manganese	ug/L	50.0 (b)	18.0	15.0 U	15.0 U	15.0 U
Nickel	ug/L	100.0 (a)	70.0	40.0 U	40.0 U	40.0 U
Zinc	ug/L	5000.0 (b)	1000.0	20.0 U	20.0 UJ	26.0 J

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Value exceeds either the MCL/SMCL or PRG.

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(b) Secondary Maximum Contaminant Levels. Regulates contaminants in drinking water that primarily affect the aesthetic qualities (40 CFR 143).
(c) Preliminary Remediation Goals as determined by MDOH.

TABLE 2 (CONTINUED)

Summary of Push-In Well Screen Groundwater Samples
Quality Plating
Feasibility Study

Sample ID Date Collected	Units	MCL (a)/SMCL (b)	Preliminary Remediation Goals (c)	QP-93-HP-2 (24-25)-2 03/23/93	QP-93-HP-3 (24-25) 03/25/93	QP-93-HP-3 (49-50) 03/25/93	QP-93-HP-4 (24-25 03/24/93
Total Alkalinity	mg/L	--	--	20.0 U	20.0 U	72.0	77.0
Bicarbonate Alkalinity	mg/L	--	--	20.0 U	20.0 U	72.0	57.0
Carbonate Alkalinity	mg/L	--	--	0.0	0.0	0.0	20.0
Hydroxide Alkalinity	mg/L	--	--	0.0	0.0	0.0	0.0
Total Dissolved Solids	mg/L	500.0 (b)	--	160.0	90.0	140.0	240.0
Turbidity	NTU	--	--	8.0	7.0	16.0	51.0
Hexavalent Chromium	ug/L	--	18.0	235.00	10.00 U	10.00 U	1201.00
Total Chromium	ug/L	100.0 (a)	3500.0	353.0	10.0 U	10.0 U	1440.0
Iron	ug/L	300.0 (b)	--	840.0	752.0	1150.0	3710.0
Lead	ug/L	15.0 (a)	--	3.0 U	3.0 UJ	3.0 UJ	3.3
Manganese	ug/L	50.0 (b)	18.0	15.0 U	15.0 U	224.0	27.7
Nickel	ug/L	100.0 (a)	70.0	40.0 U	40.0 U	40.0 U	40.0 U
Zinc	ug/L	5000.0 (b)	1000.0	20.0 U	20.0 UJ	20.0 UJ	20.0 U

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(b) Secondary Maximum Contaminant Levels. Regulates contaminants in drinking water that primarily affect the aesthetic qualities (40 CFR 143).
(c) Preliminary Remediation Goals as determined by MDOH.

TABLE 2 (CONTINUED)
Summary of Push-In Well Screen Groundwater Samples
Quality Plating
Feasibility Study

Sample ID Date Collected	Units	MCL (a)/SMCL (b)	Preliminary Remediation Goals (c)	QP-93-HP-4 (24-25)-D 03/25/93	QP-93-HP-4 (49-50) 03/25/93	QP-93-HP-5 (24-25)-2 03/22/93	QP-93-HP-5 (24-25)2D 03/22/93
Total Alkalinity	mg/L	--	--	77.0	124.0	20.0 U	20.0 U
Bicarbonate Alkalinity	mg/L	--	--	57.0	124.0	20.0 U	20.0 U
Carbonate Alkalinity	mg/L	--	--	20.0	0.0	0.0	0.0
Hydroxide Alkalinity	mg/L	--	--	0.0	0.0	0.0	0.0
Total Dissolved Solids	mg/L	500.0 (b)	--	270.0	220.0	110.0	110.0
Turbidity	NTU	--	--	51.0	9.0	< 1.0	13.0
Hexavalent Chromium	ug/L	--	18.0	1206.00	10.00 U	10.00 U	10.00 U
Total Chromium	ug/L	100.0 (a)	3500.0	1460.0	10.0 U	10.0 U	10.0 U
Iron	ug/L	300.0 (b)	--	3910.0	777.0	1320.0	1410.0
Lead	ug/L	15.0 (a)	--	3.5 J	3.0 UJ	3.0 U	3.0 U
Manganese	ug/L	50.0 (b)	18.0	40.6	453.0	21.0	21.1
Nickel	ug/L	100.0 (a)	70.0	40.0 U	40.0 U	40.0 U	40.0 U
Zinc	ug/L	5000.0 (b)	1000.0	21.0 J	20.0 UJ	20.0 U	20.0 U

NA - Not Analyzed
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Value exceeds either the MCL/SMCL or PRG.

(a) Maximum Contaminant Level. Maximum permissible level as established by the Safe Drinking Water Act (40 CFR 141) for a contaminant in water that is delivered to any user of a public water system. (Lead value is defined as an "action level" rather than an MCL.)
(b) Secondary Maximum Contaminant Levels. Regulates contaminants in drinking water that primarily affect the aesthetic qualities (40 CFR 143).
(c) Preliminary Remediation Goals as determined by MDOH.

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TABLE 2 (CONTINUED)

Summary of Push-In Well Screen Groundwater Samples
Quality Plating
Feasibility Study

Sample ID Date Collected	Units	MCL (a)/SMCL (b)	Preliminary Remediation Goals (c)	QP-93-HP-5 (49-50) 03/22/93	QP-93-HP-6 (19-20)-2 03/24/93	QP-93-HP-6 (19-20)2F 03/24/93	QP-93-HP-7 (24-25) 03/23/93
Total Alkalinity	mg/L	--	--	62.0	NA	NA	NA
Bicarbonate Alkalinity	mg/L	--	--	62.0	NA	NA	NA
Carbonate Alkalinity	mg/L	--	--	0.0	NA	NA	NA
Hydroxide Alkalinity	mg/L	--	--	0.0	NA	NA	NA
Total Dissolved Solids	mg/L	500.0 (b)	--	110.0	NA	NA	NA
Turbidity	NTU	--	--	140.0	NA	NA	NA
Hexavalent Chromium	ug/L	--	18.0	10.00 U	10.00 U	10.00 U	10.00 U
Total Chromium	ug/L	100.0 7.0	3500.0	11.0	NA	NA	NA
Iron	ug/L	300.0 (b)	--	15200.0	NA	NA	NA
Lead	ug/L	15.0 (a)	--	3.0 U	NA	NA	NA
Manganese	ug/L	50.0 (b)	18.0	642.0	NA	NA	NA
Nickel	ug/L	100.0 (a)	70.0	40.0 U	NA	NA	NA
Zinc	ug/L	5000.0 (b)	1000.0	20.0 U	NA	NA	NA

NA - Not Analyzed
NTU - Nephelometric Turbidity Units
U - Undetected
J - Estimated

Value exceeds either the MCL/SMCL or PRG.

(a) Maximum Contaminant Level. Maximum permissible level as established by the Safe Drinking Water Act (40 CFR 141) for a contaminant in water that is delivered to any user of a public water system. (Lead value is defined as an "action level" rather than an MCL.)
(b) Secondary Maximum Contaminant Levels. Regulates contaminants in drinking water that primarily affect the aesthetic qualities (40 CFR 143).
(c) Preliminary Remediation Goals as determined by MDOH.

TABLE 2 (CONTINUED)

Summary of Push-In Well Screen Groundwater Samples
Quality Plating
Feasibility Study

Sample ID / Date Collected	Units	MCL (a)/SMCL (b)	Preliminary Remediation Goals (c)	QP-93-HP-7 (49-50) 03/23/93	QP-93-HP-8 (24-25) 03/24/93	QP-93-HP-8 (49-50) 03/24/93	QP-93-HP-9 (24-25) 03/25/93
Total Alkalinity	mg/L	--	--	NA	20.0 U	23.0	22.0
Bicarbonate Alkalinity	mg/L	--	--	NA	20.0 U	23.0	22.0
Carbonate Alkalinity	mg/L	--	--	NA	0.0	0.0	0.0
Hydroxide Alkalinity	mg/L	--	--	NA	0.0	0.0	0.0
Total Dissolved Solids	mg/L	500.0 (b)	--	NA	1.0 U	130.0	130.0
Turbidity	NTU	--	--	NA	6.0	36.0	15.0
Hexavalent Chromium	ug/L	--	18.0	10.00 U	10.00 U	10.00 U	43.00
Total Chromium	ug/L	100.0 (a)	3500.0	NA	10.0 U	20.0	65.0
Iron	ug/L	300.0 (b)	--	NA	466.0	2670.0	953.0
Lead	ug/L	15.0 (a)	--	NA	3.0 U	3.4	3.0 UJ
Manganese	ug/L	50.0 (b)	18.0	NA	15.0 U	44.1	15.0 U
Nickel	ug/L	100.0 (a)	70.0	NA	40.0 U	40.0 U	40.0 U
Zinc	ug/L	5000.0 (b)	1000.0	NA	20.0 U	20.0 U	20.0 UJ

NA - Not Analyzed
NTU - Nephelometric Turbidity Units
U - Undetected
J - Estimated

Value exceeds either the MCL/SMCL or PRG.

(a) Maximum Contaminant Level. Maximum permissible level as established by the Safe Drinking Water Act (40 CFR 141) for a contaminant in water that is delivered to any user of a public water system. (Lead value is defined as an "action level" rather than an MCL.)
(b) Secondary Maximum Contaminant Levels. Regulates contaminants in drinking water that primarily affect the aesthetic qualities (40 CFR 143).
(c) Preliminary Remediation Goals as determined by MDOH.

TABLE 2 (CONTINUED)
Summary of Push-In Well Screen Groundwater Samples
Quality Plating
Feasibility Study

Sample ID Date Collected	Units	MCL (a)/SMCL (b)	Preliminary Remediation Goals (c)	QP-93-HP-9 (49-50) 03/25/93	QP-93-HP-10 (24-25) 03/26/93	QP-93-HP-10 (49-50) 03/26/93	QP-93-HP-11 (24-25) 03/26/93
Total Alkalinity	mg/L	--	--	81.0	20.0 U	84.0	NA
Bicarbonate Alkalinity	mg/L	--	--	79.0	20.0 U	84.0	NA
Carbonate Alkalinity	mg/L	--	--	20.0 U	0.0	0.0	NA
Hydroxide Alkalinity	mg/L	--	--	0.0	0.0	0.0	NA
Total Dissolved Solids	mg/L	500.0 (b)	--	280.0	90.0	70.0	NA
Turbidity	NTU	--	--	30.0	12.0	28.0	NA
Hexavalent Chromium	ug/L	--	18.0	10.00 U	10.00 U	10.00 U	10.00 U
Total Chromium	ug/L	100.0 (a)	3500.0	11.0	10.0 U	10.0 U	NA
Iron	ug/L	300.0 (b)	--	1430.0	1870.0	2090.0	NA
Lead	ug/L	15.0 (a)	--	155.0 J	21.6 J	11.8 J	NA
Manganese	ug/L	50.0 (b)	18.0	110.0	28.1	476.0	NA
Nickel	ug/L	100.0 (a)	70.0	40.0 U	40.0 U	40.0 U	NA
Zinc	ug/L	5000.0 (b)	1000.0	20.0 UJ	20.0 UJ	81.0 UJ	NA

NA - Not Analyzed
NTU - Nephelometric Turbidity Units
U - Undetected
J - Estimated

Value exceeds either the MCL/SMCL or PRG.

(a) Maximum Contaminant Level. Maximum permissible level as established by the Safe Drinking Water Act (40 CFR 141) for a contaminant in water that is delivered to any user of a public water system. (Lead value is defined as an "action level" rather than an MCL.)
(b) Secondary Maximum Contaminant Levels. Regulates contaminants in drinking water that primarily affect the aesthetic qualities (40 CFR 143).
(c) Preliminary Remediation Goals as determined by MDOH.

TABLE 2 (CONTINUED)

Summary of Push-In Well Screen Groundwater Samples

Quality Plating

Feasibility Study

Sample ID Date Collected	Units	MCL (a)/SMCL (b)	Preliminary Remediation Goals (c)	QP-93-HP-12 (24-25) 03/26/93	QP-93-HP-13 (24-25) 03/26/93	QP-93-HP-R 03/22/93	QP-93-03-23-HP-R 03/23/93
Total Alkalinity	mg/L	--	--	NA	NA	20.0 U	NA
Bicarbonate Alkalinity	mg/L	--	--	NA	NA	20.0 U	NA
Carbonate Alkalinity	mg/L	--	--	NA	NA	0.0	NA
Hydroxide Alkalinity	mg/L	--	--	NA	NA	0.0	NA
Total Dissolved Solids	mg/L	500.0 (b)	--	NA	NA	50.0	NA
Turbidity	NTU	--	--	NA	NA	< 1.0	NA
Hexavalent Chromium	ug/L	--	18.0	421.00	10.00 U	10.00 U	10.00 U
Total Chromium	ug/L	100.0 (a)	3500.0	NA	NA	10.0 U	10.0 U
Iron	ug/L	300.0 (b)	--	NA	NA	100.0 U	100.0 U
Lead	ug/L	15.0 (a)	--	NA	NA	3.0 U	3.0 U
Manganese	ug/L	50.0 (b)	18.0	NA	NA	15.0 U	15.0 U
Nickel	ug/L	100.0 (a)	70.0	NA	NA	40.0 U	40.0 U
Zinc	ug/L	5000.0 (b)	1000.0	NA	NA	20.0 U	20.0 U

NA - Not Analyzed

NTU - Nephelometric Turbidity Units

U - Undetected

J - Estimated

Value exceeds either the MCL/SMCL or PRG.

(a) Maximum Contaminant Level. Maximum permissible level as established by the Safe Drinking Water Act (40 CFR 141) for a contaminant in water that is delivered to any user of a public water system. (Lead value is defined as an "action level" rather than an MCL.)

(b) Secondary Maximum Contaminant Levels. Regulates contaminants in drinking water that primarily affect the aesthetic qualities (40 CFR 143).

(c) Preliminary Remediation Goals as determined by MDOH.

5.0 SUMMARY OF SITE CHARACTERISTICS

5.1 INVESTIGATION OBJECTIVES

The objectives of the FIG were to more fully characterize the aquifer at the site and provide a more in depth evaluation of metals contamination in the groundwater. This section of the ROD presents the results, summary, and recommendations of the FIG.

5.2 NATURE OF CONTAMINATION

To accomplish the FIG objectives, the groundwater samples collected were analyzed primarily for metals and geochemical parameters. Parameters for analysis included hexavalent chromium, total chromium, nickel, iron, lead, zinc, manganese, alkalinity, turbidity, and total dissolved solids. Of these parameters, hexavalent chromium was considered the primary contaminant of concern at the site because of its toxicity, solubility, and highly mobile nature. Other metals at the site, particularly trivalent chromium (a reduced form of chromium), are less soluble and mobil within the present site conditions. Turbidity was measured to evaluate the representativeness of the samples. A turbidity level of 50 nephelometric turbidity units was used in the field as a maximum acceptable level with laboratory measurements of turbidity being conducted to confirm the field measurements.

5.3 GROUNDWATER WELL SAMPLING

Groundwater monitoring wells (MW-1, MW-2, MW-3, and MW-4), the on-site production well (WH-1), and off-site north and south irrigation wells (IGN and IGS) were sampled and analyzed. Results of the analyses are presented in Table 1. For evaluation purposes, the maximum contaminant levels (MCLs) as established by the Safe Drinking Water Act, the secondary maximum contaminant levels (SMCLs), and the Missouri Water Quality Standards (MWQSs) are also included.

As indicated in Table 1, hexavalent chromium contamination was detected in on-site monitoring wells MW-2 and MW-3. The presence of hexavalent chromium in the wells was verified during resampling. Concentrations of other metals in these wells which were included in the analyses were below the current standards presented in Table 1. Hexavalent chromium was not detected in the upgradient wells (MW-1 and the on-site production well) which indicates activities at the site are the probable source of the hexavalent chromium contamination.

5.4 PUSH-IN WELL SCREEN SAMPLING WITH THE BAILER

Seven push-in screen samples were collected with a bailer, however, the samples were extremely turbid and are not representative samples. Turbidity in the groundwater samples will cause false positives or elevated concentrations of low-solubility metals in samples which do not represent actual groundwater quality conditions. The presence of turbidity also appears to affect the analysis for hexavalent chromium, a highly soluble metal. Because turbid samples are not representative, the analytical results of these samples are not considered valid indications of groundwater quality at the site and are presented in Table 2 for reporting purposes only.

5.5 PUSH-IN WELL SCREEN SAMPLING WITH THE PERISTALTIC PUMP

Twenty push-in well screen samples were collected using a peristaltic pump enabling non-turbid, representative samples to be collected. Results of these samples are presented in Table 2. Samples were collected from 12 locations and at depths of 25 and 50 feet. Analytical results of the groundwater samples indicate the on- site and downgradient off-site presence of iron, manganese, and hexavalent chromium at levels above current water quality standards.

Upgradient groundwater conditions on-site indicate the presence of iron at concentrations above the current water quality standards. Concentrations of other parameters were below current water quality standards at the upgradient location. The presence of iron at an upgradient location suggests iron sampled represents background concentrations.

Manganese was detected at levels above the current water quality standard at on-site and off-site locations. The presence of manganese at the site appears to be random (higher concentrations were identified in 50-foot deep samples) with no horizontally spatial pattern and are not above concentrations commonly found in alluvium soils in southeast Missouri. Therefore, manganese is considered to be a background contaminant.

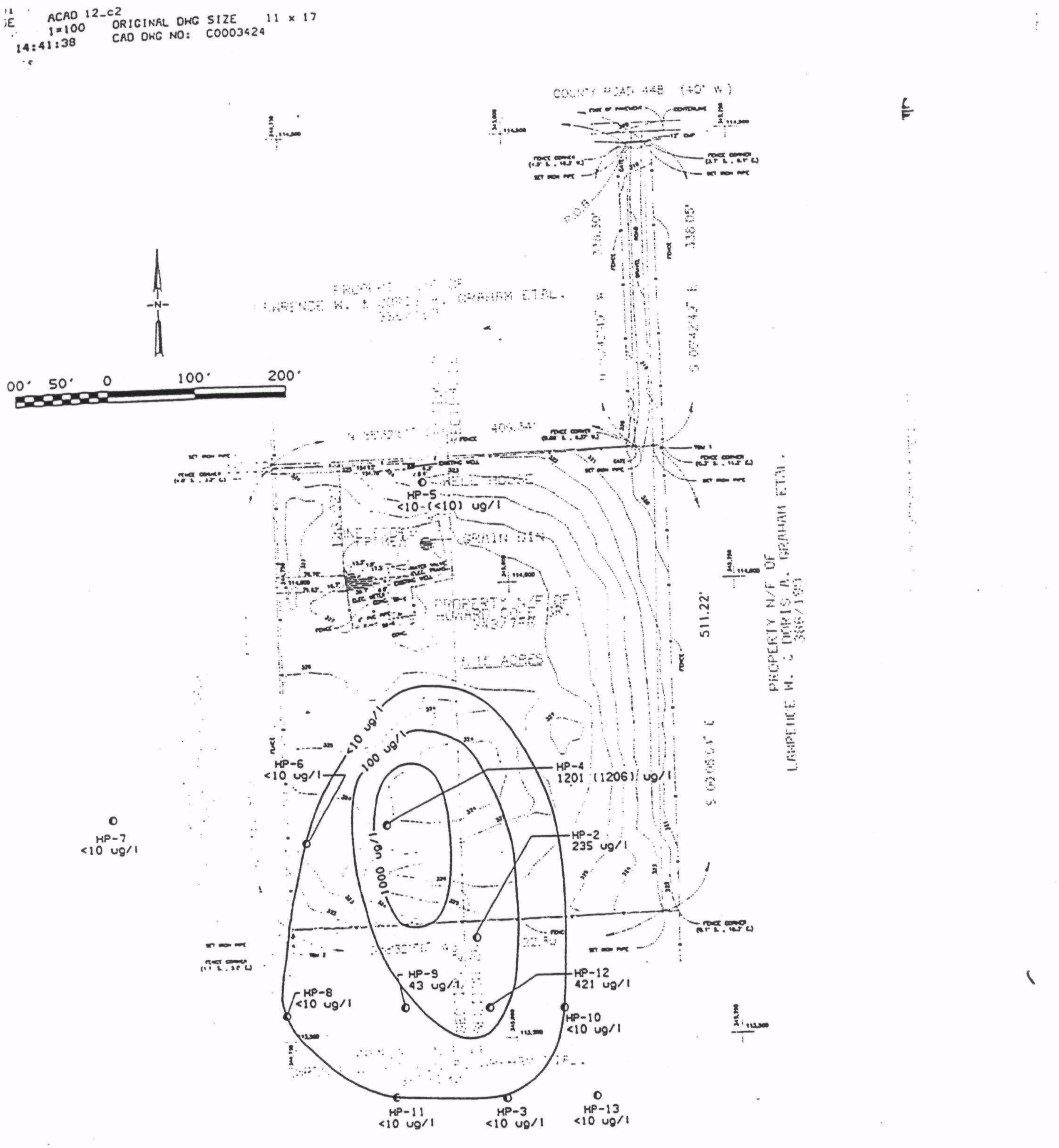
Lead was analyzed in twenty samples. Levels of lead were detected in two downgradient samples above the current water quality standard (15ppb), however, the laboratory quality control measures invalidated one sample and it could not be considered a valid result. The second sample appeared to be an isolated natural background concentration since other valid concentrations of lead above the current water quality standard were not detected.

The presence of hexavalent chromium was identified in several samples collected from on-site and downgradient off-site locations. The concentrations have been plotted and contoured on Figures 3 and 4. Figure 3 shows the horizontal extent of hexavalent chromium in the aquifer. The highest concentration (1,206 ppb) of hexavalent chromium was identified in a sample collected in the area adjacent to the downgradient side of the sludge pit/wastewater lagoon area. The extent of detectable hexavalent chromium extends approximately 200 feet downgradient (south) of the southern property boundary of the site.

Hexavalent chromium was not detected in any of the samples collected from the 50-foot bgs zone of the aquifer. Figure 4 illustrates a generalized cross section of the hexavalent chromium plume identified in the FIG sampling efforts. The cross section location is also illustrated on Figure 4.

5.6 SUMMARY AND RECOMMENDATIONS FROM THE FIG

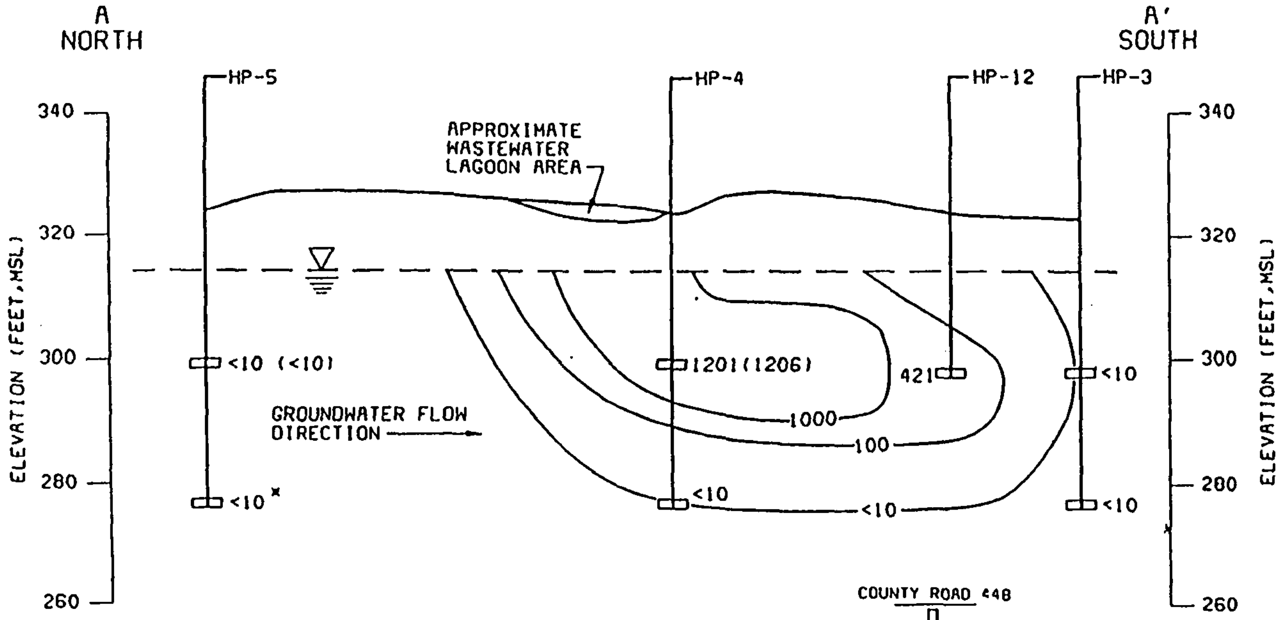
Risk-levels for hexavalent chromium and total chromium in groundwater were established in the Risk Assessment by the Missouri Department of Health (MDOH) for the Quality Plating site. While detected levels of total chromium were below the risk-level of 3,500 ppb, the risk-level of 18 ppb for hexavalent chromium was exceeded. Analytical results indicate the presence of hexavalent chromium up to concentrations of 1,206 ppb. The volume of the plume which is above the risk level is represented in Figures 3 and 4. To develop and evaluate the groundwater extraction options, a three dimensional groundwater flow (MODFLOW)/solute transport (MT3D) model was used. Modeling results demonstrate that the edge of this plume would migrate an additional 250 feet downgradient over the next 30 years.

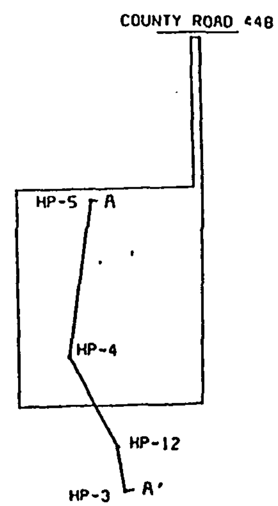


LEGEND

HP-4 1 (1206) ug/l	PUSH-IN WELL SCREEN SAMPLING LOCATION WITH NUMBER AND HEXAVALENT CHROMIUM CONCENTRATION (DUPLICATE RESULTS IN PARENTHESES)
<10 UG/L	CONCENTRATION CONTOUR FOR HEXAVALENT CHROMIUM (SAMPLE DATES 3-22-93 TO 3-26-93)

FIGURE 3
REPRESENTATIVE PUSH-IN WELL SCREEN SAMPLING LOCATIONS INCLUDING 25 FOOT BGS HEXAVALENT CHROMIUM SAMPLING RESULTS
QUALITY PLATING SITE





CROSS-SECTION LOCATION A-A'

LEGEND

1201(1206) SAMPLE INTERVAL AND HEXAVALENT CHROMIUM CONCETRATION IN ug/L (DUPLICATE RESULTS IN PARENTHESIS)

* TURBID SAMPLE, MAY NOT BE REPRESENTATIVE.

— <10 — APPROXIMATE CONCENTRATION CONTOUR FOR HEXAVALENT CHROMIUM (IN ug/L) (SAMPLE DATES 3-22-93 THRU 3-26-93).

FIGURE 4
GENERALIZED HEXAV[illegible]
CHROMIUM CONCENTR[illegible]
CROSS SECTION A-A'
QUALITY PLATING SITE
FEASIBILITY STUDY

ORIGINAL DWG SIZE 17 x 11
CAD DWG NO: C0003425
OUTLINE 1=1
03/14/94 14:45:23

Considering that contaminated groundwater which exceeds site-designated risk-levels exists at the site, and that there are known shallow groundwater users downgradient of the site, remediation of the groundwater at the Quality Plating site was determined to be warranted.

6.0 SUMMARY OF SITE RISKS

This section explains the risk assessment process. The risks to human health and the environment at the Quality Plating site are described in the site-specific Risk Assessment for Exposure to Contaminated Groundwater, which was prepared by the MDOH for MDNR using EPA guidance. The Risk Assessment followed the following four step process: 1) identification of contaminants which are of significant concern at the site, 2) an exposure assessment which identified exposure pathways and calculated contaminant intake, 3) a toxicity assessment for chemicals of potential concern at the site, and 4) a risk characterization, which integrated the three earlier steps to summarize the potential and current risks posed by hazardous substances at the site.

6.1 CONTAMINANT OF CONCERN

Hexavalent Chromium is the contaminant of concern and two assumptions were made regarding the chemical. First, it was assumed that all chromium was either trivalent or hexavalent because these are the two most common forms. For purposes of calculating chemical intake, the concentration of hexavalent measured in groundwater was used as the exposure point concentration for hexavalent chromium. The exposure point concentration for trivalent chromium was equal to the measured total chromium concentration minus the measured hexavalent chromium concentration. Second, chemical concentrations were assumed to remain constant over time, therefore, future chemical concentrations were assumed to be the same as those present.

Exposure to contaminated groundwater is generally through ingestion or bathing in water from a single well since each residence normally has only a single well. It is the policy of EPA Region VII to use contaminant concentrations in the most contaminated well for exposure point concentrations. Concentrations in HP4 were highest and used as exposure point concentration in the risk assessment.

Nickel was not detected in any groundwater sample collected during the FIG and was excluded from the risk assessment. Lead was detected above detection limits (3 ppb) in six groundwater samples. In two of the six samples, lead was detected at downgradient locations above the current water quality standard (15 ppb). The laboratory quality control measures invalidated one of the results, therefore, it could not be considered a valid result. The second sample above the water quality standard (21.6 ppb) is an isolated concentration since other valid concentrations of lead above the current water quality standard were not detected. Lead is believed to represent natural background concentrations, therefore, it was excluded from the risk assessment. The remaining four metals: chromium (total and hexavalent), iron, manganese, and zinc were retained as contaminants of concern in the risk assessment.

6.2 EXPOSURE ASSESSMENT

The objective of the exposure assessment is to estimate the type and magnitude of exposures from the site. This includes identifying exposure routes (ingestion, inhalation, and direct contact), land use scenarios, potentially exposed populations, estimating exposure point concentrations, and describing assumptions about exposure frequency and duration.

A conceptual model illustrating potential exposure pathways at the Quality Plating site is shown in Figure 5. Two potential media of concern (soil and groundwater) are shown in Figure 5. Contaminated soil was removed from the site during a removal action in August and September 1992, therefore, soil was not considered as a media of concern in the risk assessment.

Groundwater samples have been collected on-site and off-site. On-site samples collected during the FIG showed elevated metal concentrations, therefore, on-site groundwater was retained as a media of concern for the risk assessment. Off-site groundwater samples from nearby private wells have been collected annually by the MDOH since 1988. Elevated metal concentrations have not been found in any of these samples, indicating that groundwater contamination has not reached the residential wells. Off-site groundwater was excluded from further consideration in the risk assessment. Because land use surrounding the Quality Plating site is mixed agricultural and residential, residential exposure scenarios were used to estimate risks from exposure to the site. A residential scenario is generally the most conservative scenario and will result in the highest risk estimates. Industrial use at the site is not expected, thus occupational exposure scenarios were not conducted. It is possible that trespassers could cross the site, however, it is unlikely that trespassers would be exposed to groundwater. A trespasser scenario was not evaluated.

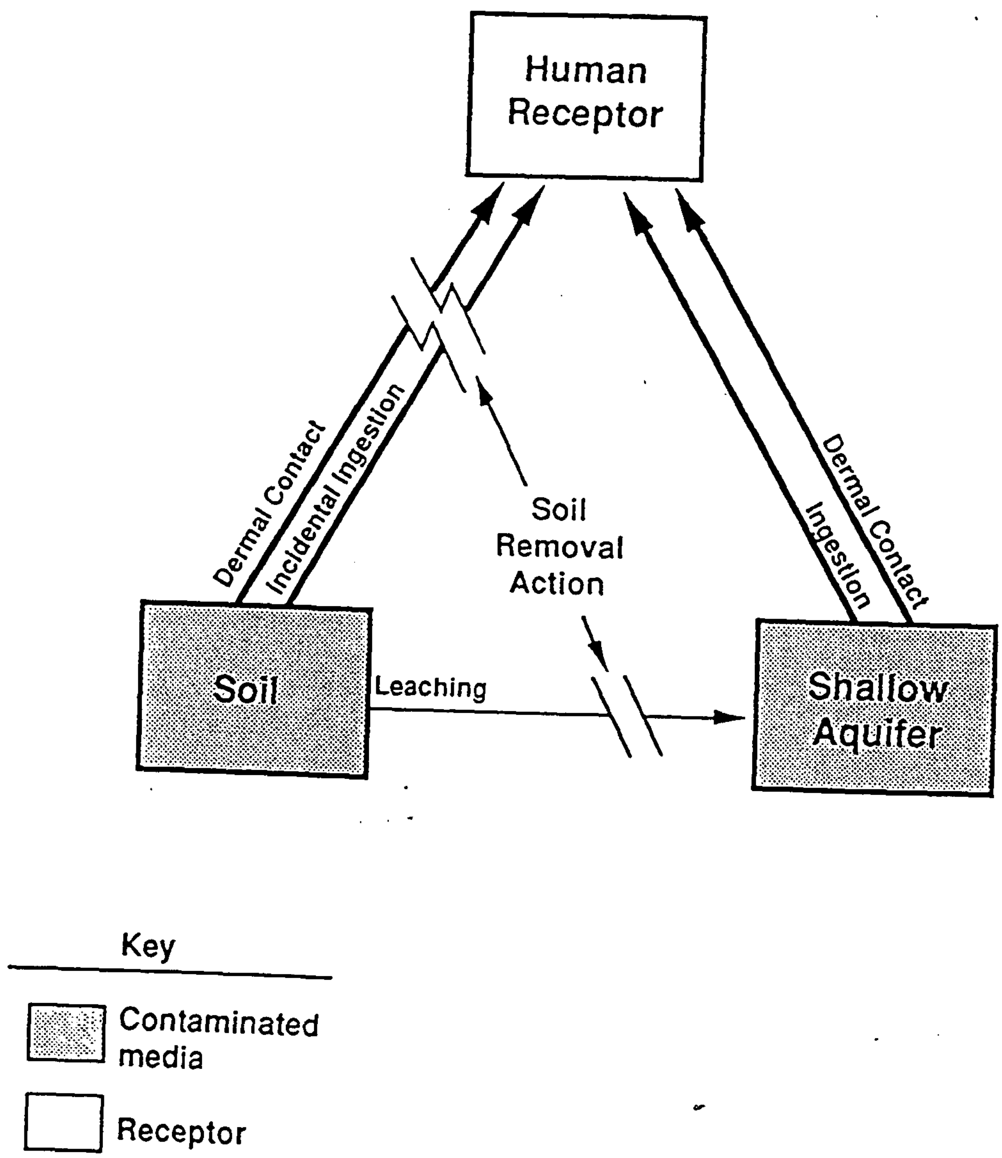
The site is currently used for agriculture purposes and it is unlikely that there is human exposure to the groundwater on-site. The surrounding area is a mixture of residential and agriculture. While area residents obtain their drinking water from individual shallow wells, no contamination has been detected in the MDOH sampling. If no action is taken, residential wells in the path of the migrating contaminated plume are at risk. Because there does not appear to be any exposure to contaminated groundwater at the Quality Plating site, no current exposure scenarios were evaluated in the risk assessment.

One important aspect of calculating the risk for a site is the concept of Reasonable Maximum Exposure (RME). The RME is an estimate of the highest exposure that is reasonably expected to occur at a site. Two RME's were evaluated in the risk assessment for the Quality Plating site: a 70 kg future adult resident (RME1) and a 15 kg future child resident (RME2) living on the site. The adult ingests 2 L of contaminated groundwater a day and bathes with contaminated groundwater 15 minutes a day over a 30 year period while living on the site. The child ingests 1 L of contaminated groundwater a day and bathes with contaminated groundwater 15 minutes a day over a 6 year period while living on the site.

6.3 TOXICITY ASSESSMENT PROCESS

The first step of the toxicity assessment, hazard identification, weighs the available evidence regarding the potential for contaminants of concern to cause adverse effects in exposed individuals. The second step of the toxicity assessment, dose-response evaluation, quantitatively evaluates the toxicity information and characterizes the relationship between the dose (in mg/kg-day) and the incidence of adverse health effects in the exposed population.

Figure 5
Conceptual Model
Quality Plating Superfund Site
Scott County, MO



6.3.1 NON-CARCINOGENIC EFFECTS

Oral Reference Doses (RfD) were the toxicity values used in assessing non-carcinogenic effects from oral exposure. Contaminate-specific RfD values used in the risk assessment were derived from EPA Integrated Risk Information System (IRIS) and EPA Health Effects Assessment Summary Tables (HEAST).

To assess non-carcinogenic effects from dermal exposure, oral RfDs must be adjusted from the administered doses to absorbed doses. This is accomplished using the following formula:

Absorbed RfD = (Administered RfD)(Oral Absorption Efficiency)

Calculated absorbed RfD doses are presented in Table 3.

6.3.2 CARCINOGENIC EFFECTS

Hexavalent chromium is a known human carcinogen when inhaled as a dust. Hexavalent chromium has not been found to cause cancer when ingested in food or water. No oral Slope Factor (SF) exists for hexavalent chromium. SFs are used to assess carcinogenic effects for specific contaminants. A SF is the plausible upper-bound estimate of the probability of a response (cancer) per unit intake of a chemical expressed over a lifetime.

6.4 RISK CHARACTERIZATION

Non-cancer hazard quotients were calculated for each contaminant in each pathway by dividing the Intake or Absorbed Dose by the RfD. The non-cancer hazard quotients within an exposure pathway were summed to give the pathway hazard index. The Total Hazard Index was then calculated by summing the pathway hazard indices. Human health risks may exist when the Total Hazard Index exceeds unity (1.0).

The Total Hazard Index for the adult resident was 7.9 and is presented in Table 4. Ingestion of groundwater contributed substantially to the Total Hazard Index (7.1) with hexavalent chromium as the chemical which contributed the most risk (6.9).

The Total Hazard Index for the child resident was 5.0 and is presented in Table 5. The groundwater pathway and chromium contributed to the child's Total Hazard Index similar to those calculated in the adult resident scenario. A summary of the hazard index values for RME1 and RME2 is presented on Table 6.

6.5 UNCERTAINTIES

The estimation of risk posed at a site involves several areas of uncertainty in the determination of chemical intake and toxicity. Daily chemical intake is estimated using a variety of variables. The values used for most intake variables are 95% upper confidence limit of the mean variable value. This is done in an attempt to ensure the protection of public health, but it may overestimate the true risk posed at a site. Most of the toxicity values used to calculate risks are derived from tests carried out on animals. Interspecific, as well as intraspecific variation adds uncertainty to the toxicity values, therefore, the true risks posed may be higher or lower than those presented in the risk assessment.

TABLE 3
Summary of Calculated Absorbed Toxicity Values
Further Investigation of Groundwater
Quality Plating Site, Sikeston, MO

Chemical	Oral Absorption Efficiency	Chronic Administered Reference Dose (mg/kg/d)	Chronic Absorbed Reference Dose (mg/kg/d)	Subchronic Administered Reference Dose (mg/kg/d)	Subchronic Absorbed Reference Dose (mg/kg/d)
Chromium VI	0.021	0.005	0.00011	0.02	0.00042
Chromium III	0.004	1.0	0.004	10	0.04
Manganese	0.03	0.005	0.00015	0.005	0.00015
Zinc	0.33	0.3	Inappropriate	0.3	Inappropriate

Inappropriate - Oral to dermal route extrapolation is not appropriate for this chemical (Appendix D).

TABLE 4
Quality Plating Site, Sikeston, MO
Further Investigation of Groundwater
Hazard Index Values for RME1

Ingestion of 2 L/day of contaminated drinking water by a 70 kg adult 365 days/year over a 30 year period.						
Chemical	Concentration (mg/L)	Intake (mg/kg/d)	Intake/RfD Adjusted for Absorption	RfD (mg/kg/d)	Hazard Quotient	Pathway Hazard Index
Hexavalent Chromium	1.206	0.035	no/no	0.005	6.9	
Trivalent Chromium	0.254	0.0073	no/no	1	0.0073	
Manganese	0.0406	0.0012	no/no	0.005	0.23	
Zinc	0.021	0.0006	no/no	0.3	0.0020	7.1
Dermal contact with contaminated water by a 70 kg adult bathing 15 minutes/day over a 30 year period						
Chemical	Concentration (mg/kg)	Final Intake (mg/kg/d)	RfD/Intake Adjusted for Absorption	RfD (mg/kg/d)	Hazard Quotient	Pathway Hazard Index
Hexavalent Chromium	1.206	0.000063	yes/yes	0.000105	0.60	
Trivalent Chromium	0.254	0.000013	yes/yes	0.004	0.0033	
Manganese	0.0406	0.0000021	yes/yes	0.00015	0.014	0.61
			Total Hazard Index			7.7

TABLE 5
Quality Plating Site, Sikeston, MO
Further Investigation of Groundwater
Hazard Index Values for RME2

Ingestion of 1 L/day of contaminated drinking water by a 15 kg child 365 days/year over a 6 year period.						
Chemical	Maximum Detected Concentration (mg/L)	Intake (mg/kg/d)	Intake/RfD Adjusted for Absorption	RfD (mg/kg/d)	Hazard Quotient	Pathway Hazard Index
Hexavalent Chromium	1.206	0.08	no/no	0.02	4.0	
Trivalent Chromium	0.254	0.017	no/no	10	0.0017	
Manganese	0.0406	0.0027	no/no	0.005	0.54	
Zinc	0.021	0.0014	no/no	0.3	0.0047	4.6
Dermal contact with contaminated water by a 15 kg child bathing 15 minutes/day over a 6 year period						
Chemical	Concentration (mg/kg)	Final Intake (mg/kg/d)	RfD/Intake Adjusted for Absorption	RfD (mg/kg/d)	Hazard Quotient	Pathway Hazard Index
Hexavalent Chromium	1.206	0.00012	yes/yes	0.00042	0.28	
Trivalent Chromium	0.254	0.000024	yes/yes	0.04	0.00061	
Manganese	0.0406	0.0000039	yes/yes	0.00015	0.026	0.30
			Total Hazard Index			4.9

TABLE 6
Summary of Noncarcinogenic Risks
Further Investigation of Groundwater
Quality Plating Superfund Site
Sikeston, MO

RME1 - Residential Adult	HP 4	
	Ingestion	Dermal Contact
Pathway Hazard Index	7.1	0.61
Total Hazard Index	7.7	
RME2 - Residential Child	HP 4	
	Ingestion	Dermal Contact
Pathway Hazard Index	4.6	0.30
Total Hazard Index	4.9	

Several areas of uncertainty are specific to this site. Because chemical concentrations from only one groundwater sample were used to estimate intake, the concentrations in groundwater may have been over or underestimated. This would result in an over or underestimation of risks posed by the site. Also chemical concentrations in groundwater were assumed to remain constant over time.

6.6 CONCLUSIONS

The greatest risk at the site is due to non-carcinogenic effects from hexavalent chromium contamination in the groundwater. The contaminated groundwater, if not addressed by implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health.

7.0 REMEDIAL ACTION OBJECTIVES

Remedial Action objectives define the allowable exposures to contaminants of concern found at the Quality Plating site. The primary contaminant of concern is hexavalent chromium and the objectives addressing hexavalent chromium will also address human health risks with other site contaminants.

The National Contingency Plan [40 CFR 300.430(a)(iii)(F) states "EPA expects to return usable ground waters to their beneficial uses whenever practicable,..." At this site there are nearby residents who use shallow groundwater as their source of drinking water. The groundwater will be treated to meet site-specific goals for drinking water and the treated effluent will meet Missouri Water Quality Standards and NPDES discharge limitations established by MDNR prior to discharge.

Since the risk assessment did not identify carcinogenic risks at the Quality Plating site, the following Remedial Action Objectives were developed:

1) Prevent ingestion of water having non-carcinogenic contaminants in excess of MCLs or preliminary remediation goals (PRGs) as determined from adverse non-carcinogenic effects. MCLs and PRGs identified for this site by the MDOH are presented in Table 7. PRGs are those cleanup goals established for a specific contaminant by MDOH and is based upon the risk assessment.

2) Prevent migration of contaminants to protect wild and domesticated plant and animal life and prevent degradation of natural resources.

8.0 DESCRIPTION OF ALTERNATIVES

The remedial alternatives evaluated in detail in the FS report are described in the following subsections and are summarized in Table 8. These descriptions identify engineering components, institutional controls, implementation requirements, estimated costs, and major Applicable or Relevant and Appropriate Requirements (ARARs) associated with each alternative.
With the exception of the "No Action" alternative, all of the alternatives considered for this site have a number of common elements. These common elements include neutralization and

Table 7
Final Groundwater Preliminary Remediation Goals
Quality Plating Site

Chemical	Maximum Concentration Detected in Groundwater Onsite or On Adjacent Properties (μg/L)	Final Preliminary Remediation Goal (μg/L)	Maximum Contaminant Level (μg/L)[a]
Chromium VI	1,206	18	--
Chromium, Total	1,460	3,500	100
Iron	15,200	(b)	300[c]
Lead	21.6	(b)	15[d]
Manganese	690	18	--
Nickel	40 U	70	100
Zinc	30	1,000	--

U Undetected.

(a) Maximum Contaminant Level. Maximum permissible levels as established by the Safe Drinking Water Act (40 CFR 141) for a contaminant in water that is delivered to any user of a public water system.

(b) Toxicity data are insufficient for quantitative risk assessment.

(c) Secondary Maximum Contaminant Levels. Regulates contaminants in drinking water that primarily affect the aesthetic qualities (40 CFR 143).

(d) Lead value is defined as an "action level" based on treatment technology rather than an MCL.

TABLE 8
Groundwater Alternatives
Quality Plating Site

General Response Action Technology/Process Option	Groundwater Alternatives						
	1	2	3	4	5	6	7
No Action	●						
Institutional Controls							
Groundwater Monitoring		●	●	●	●	●	●
Groundwater Removal by Extraction Wells							
Containment (50 gpm)		●		●		●	
Active Restoration (150 gpm)			●		●		●
Extracted Groundwater Treatment							
Coagulation/Flocculation		●	●			●	●
Neutralization		●	●	●	●	●	●
Reduction		●	●	●	●	●	●
Precipitation		●	●			●	●
Ion Exchange						●	●
Treated Groundwater Disposal							
POTW				●	●		
Ditch No. 4		●	●			●	●

reduction of contaminants, extraction wells and groundwater monitoring.

Neutralization and reduction - The extracted groundwater is pumped to the influent holding tank and discharged to a chemical reduction tank. Hexavalent chromium is reduced to the trivalent form using either electrochemical or chemical reduction. When using chemical reduction sulfuric acid would be added to a reduction tank to reduce the Ph alkalinity of the groundwater. Following Ph reduction, a chemical such as ferrous sulfate would be added to react with hexavalent chromium and reduce it to trivalent chromium.

Extraction wells - Groundwater extraction wells would be installed and built similar in type and construction to domestic or municipal water supply wells. The exact size, location and pumping capacity will be determined through hydrogeological analysis during the remedial design phase.

Two well extraction scenarios are considered. A "containment" scenario extracts contaminated groundwater at a rate sufficient to contain the plume during remediation. An "active restoration" scenario extracts contaminated groundwater at a more aggressive rate.

Groundwater monitoring - Groundwater monitoring would serve to detect changes in the migration of contaminants and to indicate the effectiveness of any remedial actions, however, they would not treat or reduce the contamination. Monitoring wells would be added to the existing network of monitoring wells to provide additional definition of the contaminated plume. In addition, a sampling and chemical analysis plan would be implemented.

8.1 ALTERNATIVE 1: NO ACTION

The no action alternative is required by CERCLA to be developed and serves as a baseline for comparison with the cleanup alternatives. Under this alternative, no action would be taken to remove the groundwater contaminants, however, a 5-year review of the site would be required under CERCLA. Funds would be expended to conduct the review. Since this alternative does not change the contamination concentration or exposure, the risk remaining at the site would be equivalent to the current estimated risks based on the risk assessment results. Consequently, this alternative is not protective of human health and the environment and does not meet ARARs in that the groundwater does not currently meet the chemical-specific ARARs. Modeling results indicate that the plume would degrade to below the PRG by natural precesses in 500 years and would migrate approximately 3,000 feet to the south-southwest from the site.

Capital Costs: $0
Annual O&M (Operation and Maintenance) Costs
(5-year review): $2,600
Total Present Worth (PW): $10,700
Months to Implement: Immediate

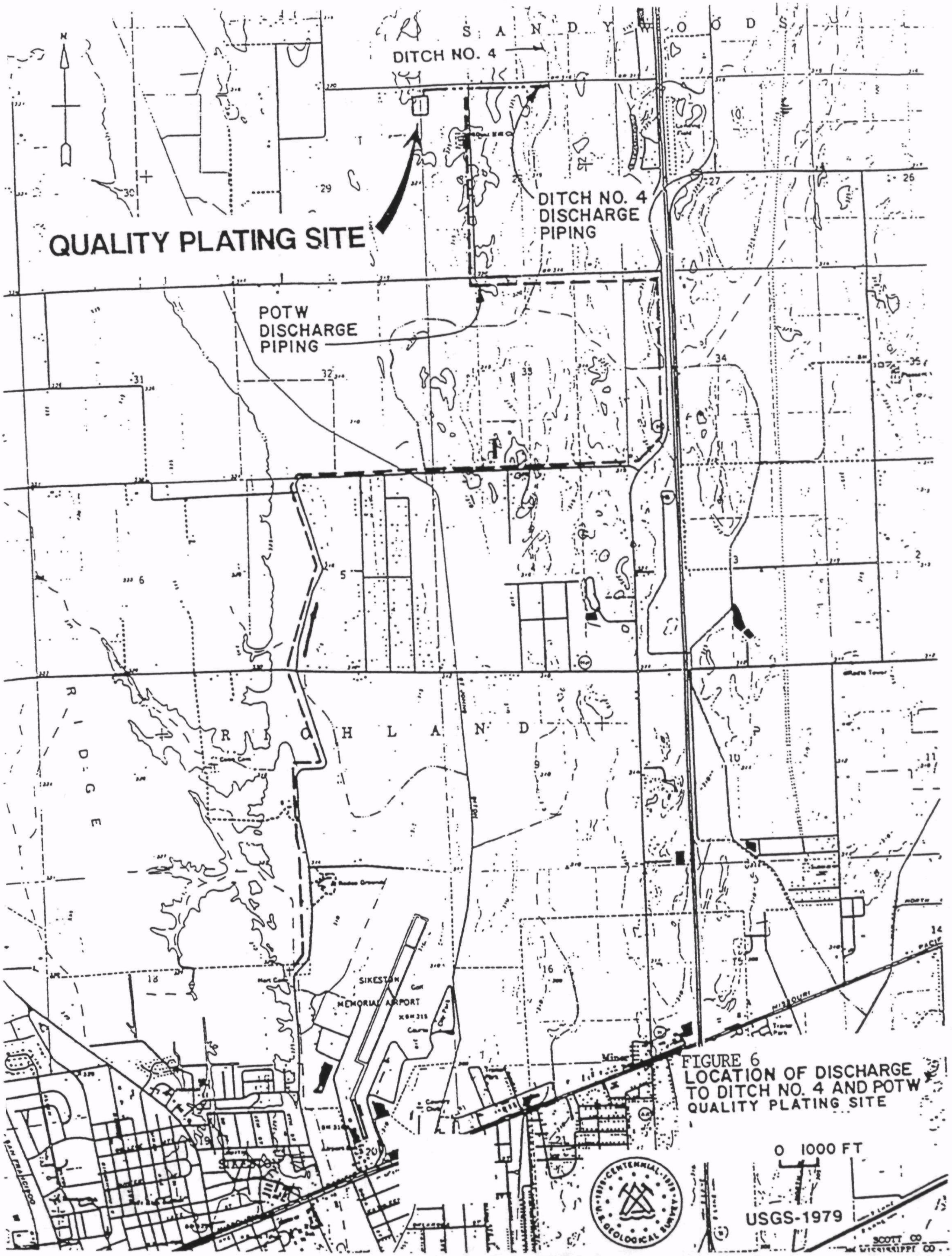


FIGURE 6
LOCATION OF DISCHARGE TO DITCH NO. 4 AND POTW
QUALITY PLATING SITE

TABLE 9
Cost Sensitivity Analysis
Quality Plating Site

Cost Sensitivity Parameters	Alternative 1		Alternative 2		Alternative 3		Alternative 4		Alternative 5		Alternative 6		Alternative 7	
	Total Present Worth	Percent Change*	Total Present Worth	Percent Change*	Total Present Worth	Percent Change*	Total Present Worth	Percent Change*	Total Present Worth	Percent Change*	Total Present Worth	Percent Change*	Total Present Worth	Percent Change
Original Present Worth (7 percent discount rate)	$10,700	--	$1,057,000	--	$1,166,000	--	$954,000	--	$993,000	--	$961,000	--	$1,475,000	--
Discount Rate														
5 Percent	$11,700	9.3%	$1,080,000	2%	$1,170,000	0.3%	$972,000	2%	$998,000	0.5%	$987,000	3%	$1,482,000	0.5%
10 Percent	$9,300	-13%	$1,027,000	-0.3%	$1,159,000	-0.6%	$930,000	-2%	$988,000	-0.5%	$927,000	-4%	$1,466,000	-0.6%
Double Remediation Time	--	--	$1,236,000	17%	$1,309,000	12%	$1,094,000	15%	$1,121,000	13%	$1,163,000	21%	$1,671,000	13%
Substitute Chemical Reduction for Electro-chemical Reduction	--	--	$1,305,000	23%	$1,438,000	23%	$1,285,000	35%	$1,315,000	32%	--	--	--	--

*Refers to the percent change in cost from the original present worth estimate.

8.2 ALTERNATIVE 2: CONTAINMENT/REDUCTION/PRECIPITATION

Alternative 2 involves extraction of contaminated groundwater through an extraction well, treatment of the contaminated groundwater by reduction/precipitation, and discharge of the treated groundwater to Ditch Number 4 approximately 4,000 feet east of the site as shown on Figure 6. The discharge would be under the authority of a state operating permit. Discussion with Scott County road personnel have indicated the routing of the discharge pipe along Scott County Road 448 would be acceptable. Two primary treatment processes, chemical reduction and electrochemical reduction, could be used to reduce the hexavalent chromium to the less toxic trivalent chromium. During the remedial design, tests will be completed to determine which process is more appropriate for this specific site. To evaluate alternatives, it is assumed that a chemical process will be utilized. A cost comparison between electrochemical and chemical treatment is shown as part of the Cost Sensitivity Analysis presented in Table 9.

In the chemical reduction system, the extracted groundwater would be pumped from the extraction well system to the influent holding tank for flow equalization. Groundwater would then be discharged to the chemical reduction tank where sulfuric acid would be added to reduce the Ph alkalinity of the groundwater. With the addition of a chemical, such as ferrous sulfate, the treatment system would then reduce the hexavalent chromium to the less toxic trivalent chromium. Trivalent chromium would be precipitated out of solution as chromium hydroxide and pumped to a sludge holding tank where the sludge would be dewatered using a filter press, characterized, and then sent off-site for proper disposal. The MDNR's Water Pollution Control Program has indicated the treated groundwater discharge to Ditch Number 4 would be limited to 0.28 mg/L total chromium. It is anticipated that chemical reduction will remove approximately 90% of the total chromium from the groundwater being treated. This process would be expected to provide a treated discharge significantly lower that the 0.28 mg/L total chromium effluent limit.

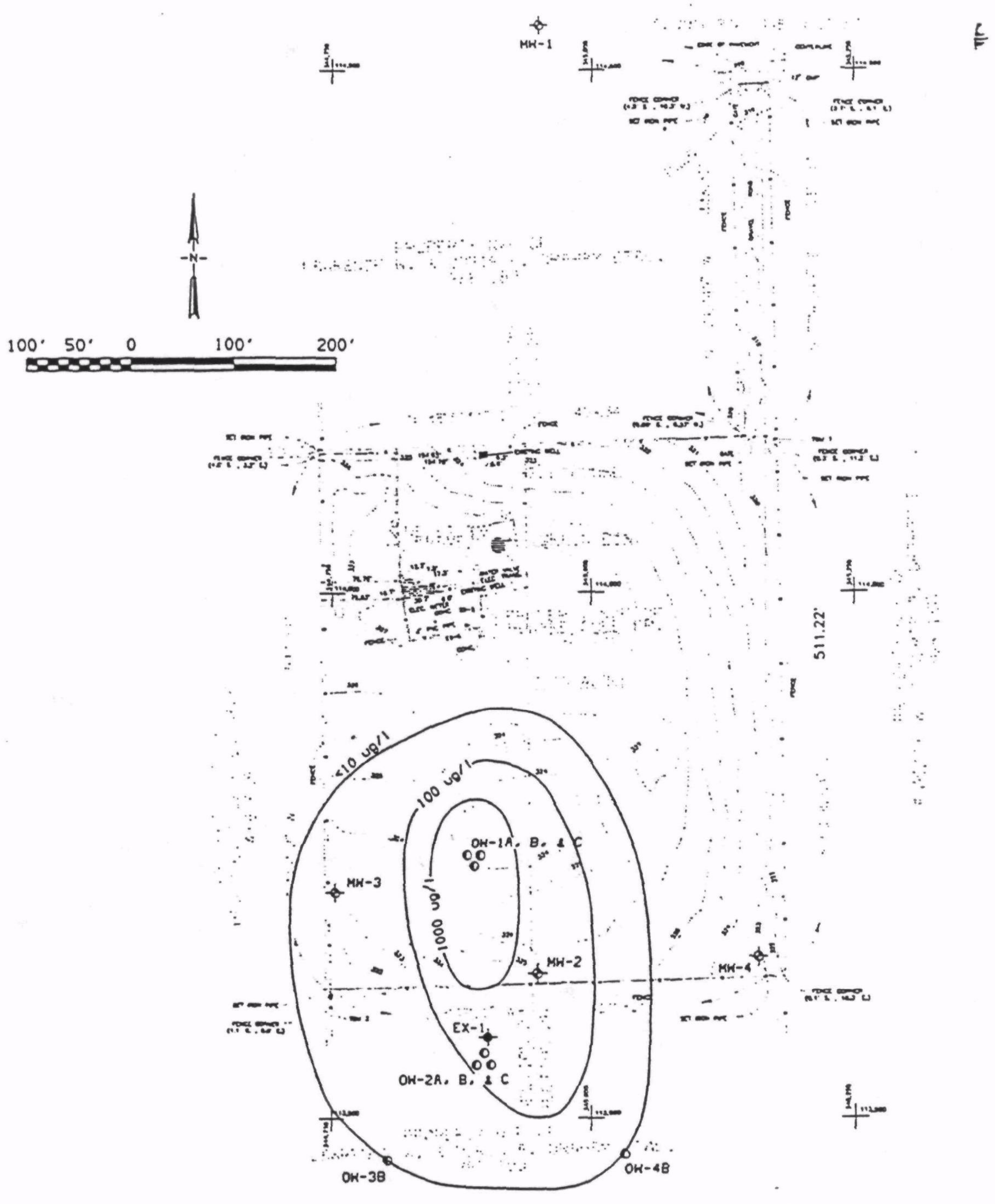
The extraction well would be constructed of 6-inch PVC pipe to a total depth of 35 feet bgs (below ground surface) and be screened for a 20 foot interval. A pumping rate of 50 gallons per minute (GPM) would be used to contain the plume. Figure 7 shows the approximate location of the extraction well (EX-1) for this alternative.

Institutional controls (a groundwater monitoring program) would be implemented to monitor the plume and remediation process. A groundwater monitoring plan would be necessary.

Capital Costs: $762,000
Annual O&M: $52,000
Total PW: $1,057,000
Months to Implement: 10 months to plant startup; treatment would take 7 to 8 years.

8.3 ALTERNATIVE 3: ACTIVE RESTORATION/REDUCTION/PRECIPITATION

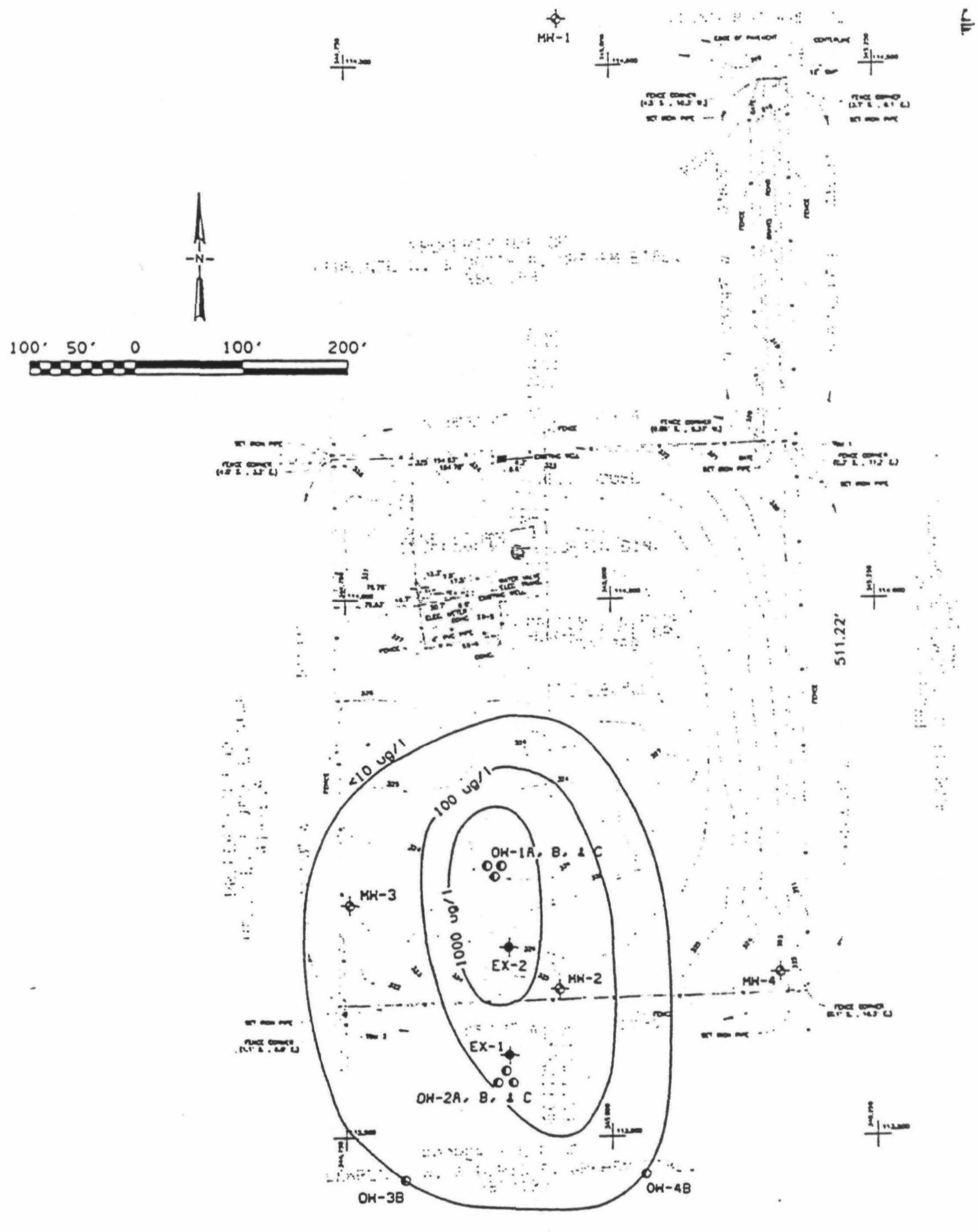
Alternative 3 entails extraction of contaminated groundwater through the use of two extraction wells, treatment of contaminated groundwater by chemical reduction/precipitation, and discharge of treated groundwater to Ditch Number 4. Each extraction well would be pumped at 75 gpm or a total flow rate of 150 gpm. The extraction wells would be constructed similarly to the extraction well in Alternative 2. Figure 8 shows the approximate location of the extraction wells (EX-1 and EX-2) used in this alternative. The groundwater treatment process for Alternative 3



LEGEND

OW-1A ◎◎ OW-1B ◎ OW-1C	PROPOSED LOCATION FOR OBSERVATION WELL/WELL NEST AND NUMBER (A = 15 FEET DEEP, B = 25 FEET DEEP, C = 50 FEET DEEP)
MW-1	EXISTING MONITORING WELL LOCATION AND NUMBER
EX-1	PROPOSED LOCATION FOR THE EXTRACTION WELL AND NUMBER
—<10 UG/L—	CONCENTRATION CONTOUR FOR HEXAVALENT CHROMIUM (SAMPLE DATES 3-22-93 TO 3-26-93)

FIGURE 7
CONTAINMENT EXTRACTION
WELL LOCATION



LEGEND

OW-1A OW-1B OW-1C	PROPOSED LOCATION FOR OBSERVATION WELL/WELL NEST AND NUMBER (A = 15 FEET DEEP, B = 25 FEET DEEP, C = 50 FEET DEEP)
MW-1	EXISTING MONITORING WELL LOCATION AND NUMBER
EX-1	PROPOSED LOCATION FOR THE EXTRACTION WELL AND NUMBER
<10 UG/L	CONCENTRATION CONTOUR FOR HEXAVALENT CHROMIUM (SAMPLE DATES 3-22-93 TO 3-26-93)

FIGURE 8
ACTIVE RESTORATION
EXTRACTION WELL LOCATION
QUALITY PLATING SITE

would be similar to the process described in Alternative 2, and it would require similar institutional controls as those being required in Alternative 2.

Capital Costs: $1,001,000
Annual O&M: $91,000
Total PW: $1,166,000
Months to Implement: 10 months to plant startup; treatment would take 2 years.

8.4 ALTERNATIVE 4: CONTAINMENT/REDUCTION

Alternative 4 entails extraction of contaminated groundwater through the use of one extraction well, treatment of contaminated groundwater by chemical reduction, and discharge of treated groundwater to the local Public Owned Treatment Works (POTW) which is approximately 5 miles south in Sikeston, Missouri. The alignment of the effluent pipe to the POTW is shown on Figure 6. The location of the proposed well would be that as selected in Alternative 2, pumped at a rate of 50 gpm to provide plume containment, and similar in construction to the extraction well in Alternative 2.

Extracted groundwater would be pumped to an influent holding tank for flow equalization. Groundwater would then go to the chemical reduction tank where sulfuric acid would be added to reduce the Ph and reduce the groundwater's natural alkalinity. Following Ph reduction, the treatment process would reduce the hexavalent chromium to trivalent chromium by the addition of a chemical reagent, such as ferrous sulfate. Treated groundwater would then be discharged directly to the POTW under the authority of a pretreatment agreement with the city of Sikeston. The proposed routing of the discharge pipe to the POTW would be placed in the easement already obtained by Scott County for Scott County roads. Discussions with Scott County officials have indicated that routing of the discharge pipe along Scott County roads would be acceptable. In this alternative, residual waste would not be generated because chromium wouldnot be precipitated out of the groundwater. Institutional controls as identified in Alternative 2 would apply.

Capital Costs: $721,000
Annual O&M: $41,200
Total PW: $954,000
Months to Implement: 10 months to plant startup; treatment would take 7 to 8 years.

8.5 ALTERNATIVE 5: ACTIVE RESTORATION/REDUCTION

Alternative 5 removes contaminated groundwater through the use of two extraction well, treats the contaminated groundwater by chemical reduction, and discharges the treated groundwater to the Sikeston POTW. Two extraction wells would be located similarly to positions chosen for Alternative 3. Each well would be pumped at a rate of 75 gpm for a total flow rate of 150 gpm. The treatment process, discharge, and institutional controls would be the same as those in Alternative 4.

Capital Costs: $847,000
Annual O&M: $81,000
Total PW: $993,000
Months to Implement: 10 months to plant startup; treatment would take 2 years.

8.6 ALTERNATIVE 6: CONTAINMENT/ION EXCHANGE

Alternative 6 entails extraction of contaminated groundwater through the use of one extraction well, treatment of contaminated groundwater by ion exchange, and discharge of the treated groundwater to Ditch Number 4. The construction of the extraction well would be similar to that in Alternative 2. The extraction well would be pumped at approximately 50 gpm. Extracted groundwater would be pumped into the influent holding tank for flow equalization. The influent would than be sent to the anion exchanger where hexavalent chromium is removed by the ion exchange process. Following hexavalent chromium removal, trivalent chromium would be removed in the cation exchanger. The ion exchange is a process in which wastewater is passed through a bed of insoluble exchange material called resin. As wastewater is passed through the resin, chromium ions are exchanged on the surface with other negatively charged ions of less toxic elements. As a result, chromium is removed from the wastewater and bound up in the resin particles. It is anticipated that this process will remove nearly 100% of the total chromium from the groundwater being treated.

Periodically, the ion exchange resin will become saturated with chromium and require regeneration. Regeneration would be conducted on-site without removing the resin from the exchangers. To regenerate the ion exchange resin, sulfuric acid and sodium hydroxide would be passed through the anion exchanger, and only sulfuric acid would be passed through the cation exchanger. Regenerate solution exiting the exchangers would be routed to the chemical reduction/precipitation batch tank. Sulfuric acid and ferrous sulfate would be added to reduce and precipitate the chromium out of the regenerate solution as chromium hydroxide. The resulting solution would be routed to the filter press, and the sludge would be characterized and shipped off-site for disposal.

Institutional controls would be implemented at the site (monitoring wells would be installed) and a groundwater monitoring and sampling analysis plan would be necessary. As was indicated in Alternative 2 and 3, the Scott County officials have indicated that routing the discharge pipe along Scott County Road 448 would be acceptable.

Capital Costs: $629,000
Annual O&M: $59,000
Total PW: $961,000
Months to Implement: 10 months to startup; treatment would take 7 to 8 years.

8.7 ALTERNATIVE 7: ACTIVE RESTORATION/ION EXCHANGE

Alternative 7 will extract contaminated groundwater through the use of two extraction wells, treatment of the contaminated groundwater by ion exchange, and discharge to Ditch Number 4. The extraction wells would be pumped at 75 gpm each for a total flow rate of 150 gpm. Construction of the extraction wells would be similar to that described in Alternative 2. The process units and the ion exchange treatment process would be similar to that describe in Alternative 6. In addition, the common elements associated with the institutional controls as described in Alternative 2 would be applicable to Alternative 7.

Capital Costs: $1,251,000
Annual O&M: $124,000

Total PW: $1,475,000
Months to Implement: 10 months to plant startup; treatment would take 2 years.

9.0 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

Alternative remedial actions were developed to respond to the contamination at the Quality Plating site. The alternatives described in the preceding section were evaluated using criteria related to the factors set forth in Section 121 of CERCLA and the NCP (National Oil and Hazardous Substances Pollution Contingency Plan). The nine criteria are described below.

Threshold Criteria:

Overall Protection of Human Health and the Environment. This criterion addresses whether a remedy provides adequate protection to human health and the environment and describes how risks from each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

Compliance With ARARs. This criterion addresses whether a remedy will comply with chemical-specific, action-specific, and location-specific ARARs and with other criteria, advisories and guidance such as To Be Considered (TBCs), or provide grounds for a waiver. TBCs are further discussed in Section 11.2.4.

Primary Balancing Criteria:

Long-Term Effectiveness and Permanence. This criterion refers to the magnitude of residual risk, including the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been met, and the adequacy and reliability of engineering and institutional controls.

Reduction in Toxicity, Mobility, and Volume through Treatment. This criterion assesses the anticipated performance of the treatment technologies that may be employed in a remedy.

Short-Term Effectiveness. This criterion refers to the speed with which the remedial response objectives are achieved, as well as the remedy's potential to have adverse impacts on human health and the environment during the construction and implementation periods.

Implementability. This criterion assesses the technical feasibility for constructing and operating a remedy; the technical and administrative reliability of a remedy, including the availability of materials and services needed to implement the chosen remedy, and the ease of undertaking additional action, if necessary.

Cost. This criterion includes the capital, operation and maintenance (O&M), and present worth cost of a remedy.

Modifying Criteria:

State Acceptance. This criterion assesses whether, based on its review of the FIG/FS and Proposed Plan, the state agency concurs, opposes, or declines to comment on the preferred alternative.

Community Acceptance. This criterion assesses the degree of community acceptance of a remedy. The degree of community acceptance can generally be determined as a result of a review of comments received during the public comment period.

9.1 OVERALL PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

All of the alternatives, with the exception of Alternative 1, the "No Action" alternative, provide protection of human health and the environment by reducing and eliminating risks through treatment, engineering, and institutional controls. Alternatives 6 and 7 provide the greatest overall protection by removing nearly 100% of the total chromium from the groundwater.

Based upon groundwater modeling extractions results, Alternatives 2, 4, and 6 provide protection, but risks would remain for 7-8 years until groundwater cleanup goals are achieved. Alternatives 3, 5, and 7 achieve these results in 2 years.

Alternatives 4 and 5 discharge treated groundwater to the POTW after hexavalent chromium has been reduced to trivalent chromium. According to the POTW's wastewater permit, sludge from the POTW is currently being land applied, therefore, Alternatives 4 and 5 could result in the chromium extracted from Quality Plating being land applied in an uncontrolled manner. If uncontrolled and not properly monitored, this could lead to elevated levels of chromium in soil where land application occurs, however, the city of Sikeston's Sewer Use Ordinance and a properly constructed pretreatment agreement could address these concerns.

Alternatives 6 and 7 (ion exchange alternatives) would remove nearly 100% of the total chromium from the contaminated groundwater and would generate a regeneration solution concentrated with hexavalent chromium. This hexavalent chromium solution could potentially be reclaimed by recyclers, thus avoiding the disposal of chromium residuals in a landfill. Alternatives 2 and 3 remove approximately 90% of the total chromium and provide protection to human health and the environment by achieving the PRG for chromium and meeting discharge requirements for the treated groundwater. Alternative 7 provides for active restoration (2 years) and it removes nearly 100% of the total chromium prior to discharge.

9.2 COMPLIANCE WITH ARARs

All alternatives, with the exception of the "No Action" alternative, would comply with federal and state ARARs. Disposal of the sludge and solid wastes generated at the site will need to be managed in accordance with the Solid Waste Disposal Act, DOT Hazardous Materials Transportation Act, Missouri Solid and Hazardous Waste laws and Rules, and the Missouri Hazardous Substance Rules. Discharges of treated groundwater from the site will need to be managed in accordance with the Clean Water Act, Missouri Clean Water Law, Missouri Water Quality Standards, and Missouri Water Pollution Control Regulations. All activities at the site will need to comply with the Occupational Safety and Health Act.

Because Alternative 1 did not meet the criteria presented in Subsections 9.1 and 9.2, it was not compared in the analysis with the Primary Balancing Criteria.

9.3 LONG-TERM EFFECTIVENESS AND PERMANENCE

All alternatives (except Alternative 1) would essentially eliminate the long-term risks associated with the contaminated groundwater extracted and treated during remediation, however, Alternatives 6 and 7 would remove both hexavalent and trivalent chromium to a greater degree than Alternatives 2 through 5. In addition, Alternative 7 provides for better protection of long-term risk with groundwater remaining in the aquifer than does Alternative 6 because, being an active restoration alternative, it will achieve cleanup goals approximately 5.5 years sooner.

9.4 REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT

All alternatives (except Alternative 1) are capable of restoring the contaminated groundwater to the PRG, however, the different treatment processes vary in their ability to remove total chromium from the treated groundwater to be discharged. While Alternatives 2 through 5 all reduce hexavalent chromium, only Alternatives 2 and 3 remove the chromium as a precipitate. Alternatives 4 and 5 discharge the trivalent chromium to the POTW. Alternatives 6 and 7 remove hexavalent chromium and removes trivalent chromium as a precipitate.

Alternatives 2, 4, and 6 treat approximately 210 million gallons of contaminated groundwater, while Alternatives 3, 5, and 7 treat approximately 157 million gallons of contaminated groundwater. In addition, Alternatives 2 and 6 generate approximately 15,200 pounds of sludge and Alternatives 3 and 7 generate approximately 11,600 pounds of sludge. Alternatives 4 and 5 do not generate sludge.

While Alternatives 2 through 7 all meet the statutory preference for treatment as a principal element, Alternatives 6 and 7 provide the largest reduction in toxicity, mobility, and volume.

9.5 SHORT-TERM EFFECTIVENESS

Alternatives 2 through 7 would all provide similar community risks. Community risk would be low during the installation of the extraction well(s) and the treatment facility. There would be a greater risk to workers but compliance with OSHA requirements and guidelines for hazardous waste site activities would minimize these. Analysis for air emissions would not be necessary because the contaminate is a heavy metal and will not volatilize into the air pathway.

Environmental impacts resulting from the installation of the well(s) and treatment system would include noise pollution and minimal fugitive dust emissions during construction. during extraction and monitoring well construction, sedimentation and erosion controls would be implemented to minimize contact with contaminated soil removed from the contaminated aquifer.

As with community risks, risks to workers and the environment would be similar in all alternatives, however, in the active restoration alternatives (Alternatives 3, 5, and 7) workers and equipment would be removed from the site faster than under the containment scenarios. The time required for design and construction would be similar for all alternatives.

9.6 IMPLEMENTABILITY

The technical feasibility of all alternatives (except Alternative 1) would be similar because process options employed in all alternatives are proven and reliable. Alternatives 4 and 5 may prove to have less operational difficulties because they will not provide a chromium precipitate at the site. The administrative feasibilities of Alternatives 4 and 5 may be more difficult to implement than other alternatives because they would require acceptance of the wastewater discharge to the POTW and an agreement with the city of Sikeston regarding appropriate pretreatment requirements. The availability of materials and services would be the same for all alternatives.

Alternatives 2 and 3 would equally provide the best overall implementability because the chemical reduction/precipitation process is very reliable, and POTW agreements are not needed.

9.7 COST

Alternative 4 has the lowest total present worth cost ($954,000). Alternative 7 has the highest total present worth cost ($1,475,000). The total present worth cost of Alternatives 2, 3, 5, and 6 are $1,057,000, $1,166,000, $993,000, and $961,000. While electrochemical reduction offers no additional advantages, it could be substituted for chemical reduction in Alternatives 2 through 5.

If electrochemical reduction is substituted for chemical reduction, costs would be increased and the new present worth cost and the percentage of increase would be as follows: Alternative 2, $1,305,000 (23%); Alternative 3 $1,438,000 (23%); Alternative 4, $1,285,000 (35%); and Alternative 5, $1,315,000 (32%).

9.8 STATE ACCEPTANCE

MDNR wrote the Proposed Plan for this site on which this ROD is based. Furthermore, MDNR concurs with this ROD.

9.9 COMMUNITY ACCEPTANCE

Community acceptance is specifically addressed in the attached Responsiveness Summary. The Responsiveness Summary provides a through review of the significant public comments received on the FS and Proposed Plan, and responses to the comments. The community has indicted general agreement with the remedy selected in this ROD.

10.0 SELECTED REMEDY

Based upon consideration of the requirements of CERCLA and the NCP, the evaluation of the relative performance of each alternative with respect to the nine criteria, and consideration of comments received during the public comment period, EPA has determined that Alternative 3 is the selected remedy. This selected remedy includes: Two extraction wells each pumping at a rate of 75 gpm would be constructed. Treatment would be provided by chemical reduction and precipitation.

Approximately 210 million gallons of contaminated groundwater would by treated and approximately 11,600 pounds of sludge would be generated. The sludge would be characterized and properly disposed of off-site at an EPA approved facility. Nearly 90% of the total chromium would be removed and the treated effluent would be discharged to Ditch Number 4. The length of time required for remediation would be 2 years and constructed at an estimated cost of $1,001,000. Annual O&M costs are estimated at $91,000.

The selected remedy would reduce the hexavalent chromium in the groundwater to 0.018 mg/L and provide an effluent which would meet the Missouri Water Quality Standards for 0.28 mg/L for Total Chromium for the receiving stream.

Additional monitoring wells will be added to the existing field of monitoring wells. During construction these will serve to detect changes in the migration of the contaminated plume and indicate effectiveness of remedial actions. At that time, a sampling and chemical analysis plan will be implemented. Groundwater monitoring will continue for a minimum of 5 years and could be extended upon the occurrence of certain events, including but not limited to: analytical data indicating an increase in the levels of contamination in the shallow groundwater; or analytical data indicating significant fluctuations in contaminant levels between sampling events. The number and location of groundwater monitoring wells and the frequency and analysis will be established in the remedial design work plan.

11.0 STATUTORY DETERMINATION

Under its legal authority, EPA's primary responsibility at Superfund sites is to undertake remedial actions that achieve adequate protection of human health and the environment. In addition, Section 121 of CERCLA establishes several other statutory requirements and preferences. These specify that when complete, the selected remedial action for the site must comply with ARARs unless a statutory waiver is justified. The selected remedial action must also be cost-effective and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. Finally, the statute includes a preference of remedies that employ treatments that permanently and significantly reduce the volume, toxicity, or mobility of the hazardous waste as their principal element.

The following subsections discuss how the selected remedy for the Quality Plating site meets these statutory requirements of Section 121 of CERCLA, as amended by SARA, and to the maximum extent possible, the NCP.

11.1 PROTECTION OF HUMAN HEALTH AND THE ENVIRONMENT

The selected remedy protects human health and the environment by reducing hexavalent chromium to a less toxic form, trivalent chromium. Nearly 90% of the chromium will be removed as a precipitate with the sludge being characterized and properly disposed of off-site in an EPA approved facility.

Removal and treatment of the contaminated groundwater will eliminate the threat of exposure to the contaminate of concern. Implementation of the selected remedy will not pose any unacceptable short-term risks or cross-medial impacts such as airborne toxics or exposure to water to the site, the workers, or the community.

11.2 COMPLIANCE WITH ARARs

The selected remedy will comply with all applicable, relevant, and appropriate requirements. No waiver of an ARAR is being sought or invoked for the selected remedy. The ARARs of concern include but are not limited to the following:

11.2.1 LOCATION-SPECIFIC ARARs

Action-specific ARARs are technology or activity based requirements of limitations on actions affecting hazardous wastes. These requirements are triggered by the particular remedial activities selected to cleanup the site. Action-specific ARARs include the following:

- Clean Water Act
- DOT Hazardous Materials Transportation Act
- Missouri Solid Waste Law and Rules
- Missouri Hazardous Waste Management Law and Rules
- Missouri Hazardous Substance Rules
- Missouri Clean Water Law
- Missouri Water Quality Standards
- Missouri Water Pollution Control Rules
- Missouri Solid Waste Disposal Act
- Occupational Safety and Health Act

11.2.2 CHEMICAL-SPECIFIC ARARs

Chemical-specific requirements are usually health or risk based numerical values or methodologies that establish the acceptable amount or concentration of a chemical in the ambient environment. The following are the chemical-specific requirements for Quality Plating:

- Clean Water Law
- Missouri Clean Water Law
- Missouri Water Pollution Control Rules
- National Pollution Discharge Elimination System
- National Primary Drinking Water Standards
- Safe Drinking Water Act

11.2.3 LOCATION-SPECIFIC ARARs

The Illinois chorus frog, (Pseudacris streckeri illinoenis), which has a state listing as "rare", and the umbrella sedge (Cyperus grayioides) which is a state listed endangered plant species, have both been identified near the site; therefore, the Endangered Species Act is a location-specific ARAR.

11.2.4 TO BE CONSIDERED

A memorandum from the MDOH provided PRGs for the Quality Plating site. The PRGs are TBCs and will be considered as an ARAR. The PRGs are found on Table 7.

11.3 COST-EFFECTIVENESS

The selected alternative is cost-effective because it has been determined to provide overall effectiveness proportional to its cost, estimated at a present total worth of $1,166,000. While Alternative 6 has a lower cost than the selected alternative, it will require 5-6 years of additional remediation to meet the PRGs. During this time short-term risks during O&M and the possibility of exposure to area residents would be increased. The selected alternative assures a higher degree of overall protection than the least costly alternative (Alternative 4).

11.4 UTILIZATION OF PERMANENT SOLUTIONS AND ALTERNATIVE TREATMENT OR RESOURCE RECOVERY TECHNOLOGIES TO THE MAXIMUM EXTENT PRACTICABLE

The selected remedy represents the maximum extent to which permanent solutions and treatment technologies can be utilized at the Quality Plating site to meet water quality requirements. Of those alternatives that are protective of human health and the environment and comply with ARARs, EPA has determined that this selected remedy provides the best balance of tradeoffs in terms of long-term effectiveness and permanence; reduction in toxicity, mobility, or volume achieved through treatment; short-term effectiveness; implementability; and cost.

11.5 PREFERENCE FOR TREATMENT AS A PRINCIPAL ELEMENT

The selected remedy satisfies, in part, the statutory preference for treatment as a principal element. The principal threat to human health is from ingestion or dermal contact with contaminated groundwater. Hexavalent chromium will be reduced to a less toxic form, trivalent chromium through the treatment process chemical reduction. Trivalent chromium will be removed as a precipitate with the sludge being characterized and properly disposed of off-site in an EPA approved facility.

12.0 DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for the Quality Plating site, which identified Alternative 3 as the preferred remedy, was released for public comment on September 11, 1994. One written comment was received in addition to the oral comments received during the public meeting held on October 3, 1994 and is addressed in the attached Responsiveness Summary. Upon review of these comments, it was determined that no significant changes to the remedy, as it was identified in the Proposed Plan, were necessary.

QUALITY PLATING SITE

RESPONSIVENESS SUMMARY

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QUALITY PLATING SITE RESPONSIVENESS SUMMARY

Community Relations History

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) requirements for public participation include releasing the Feasibility Study (FS) and the Proposed Plan to the public and providing a public comment on the Feasibility Plan and Proposed Plan. The Department of Natural Resources (DNR) met these requirements in September 1994 by placing both documents in the Administrative Record for the site. DNR published a notice of the release of the FS and Proposed Plan in the Sikeston Standard Democrat on September 11 and 28, 1994 and October 2, 1994. Notice of the 30 day public comment period and the public meeting discussing the Plan were included in the newspaper notice. A public meeting was held on October 3, 1994 at the Ramada Inn in Miner, Missouri. The public comment period was extended an additional 30 days and ended on November 10, 1994 with one letter received from the public.

To date, the following community relations activities have been conducted by DNR at the Quality Plating site:

October 30, 1991	An availability session was held in which an information exchange between area residents and department personnel took place.
August 11, 1992	A public meeting was held with questions centering around the health aspects associated with the site, private water testing, and CERCLA enforcement actions.
December 8, 1992	A community meeting was held at the Sandywood Baptist Church to answers questions of the area residents.
September 30, 1993	A public meeting was held to present the Federal Investigation of Groundwater (FIG) to concerned citizens and to discuss future activities.

September 9, 1994	The Administrative Record containing the FS and the Proposed Plan is in place.
September 11, 1994	A public notice announces the release of the FS and Proposed Plan for public comment and announces the public comment period (the notice was also printed on September 28 and October 2, 1994).
October 3, 1994	A public meeting is held to receive public comment on the FS and Proposed Plan (approximately 22 people are in attendance, of which, about 12 people represented area citizens). The public seemed to be in general agreement of the preferred remedy.
October 9, 1994	A public notice announces that the public comment period is extended an additional 30 days.
November 10, 1994	The public comment period is closed with one letter from the public received.
November 1994	Responsiveness Summary prepared.

Overview

In the Proposed Plan released to the public, the MDNR, with concurrance from the Envirnomental Protection Agency (EPA), made a preliminary selection of the preferred remedy. The MDNR's recommended alternative addressed contaminated groundwater at the site. The preferred alternative involved a pump and treat system using reduction\precipitation. The treated effluent from the treatment process will be pumped and discharged to Ditch No. 4.

The comments received from interested citizens during the public meeting focused on potential health issues during the remedial action, the continued testing of private drinking wells in the immediate area, the receiving stream, and the schedule for implementation of the alternative. The area residents generally accepted the preferred remedy.

Comments received during the public meeting and the written comment received are summarized as follows:

Comment #1

A commentor requested a 30 day extension to the public comment period.

Response - An extension to the public period comment period was granted and the comment period was extended 30 days to November 10, 1994.

Comment #2

A commentor asked the Missouri Department of Health (MDOH) to explain from page 5 of the Proposed Plan "Consequently, non-carcinogenic health risks may be present for future adults or a child residing or living on the site".

Response - The site risk assessment was explained in which the most contaminated sample of water was used (1,206 mg/L of hexavalent chromium sampled from pushin well screen number HP-4) and based on this, if an adult drank this water or bathed in this water for 30 years or if a child drank this water or bathed in this water for 6 years there may be a non-carcinogenic health risk for those living on this site. Non-carcinogenic risks are non-cancer causing risks and include such effects as stomach pains and cramps, gastric ulcers, skin irritation, and dermatitis.

Comment #3

A commentor asked if the risk was limited to one living only on this site.

Response - Yes, the risk as explained in the risk assessment is limited to persons living only on this site.

Comment #4

A commentor asked how long the biannual water testing of private wells would continue.

Response - Biannual testing will continue through the 5 year review period. If there is a potential problem noted at that time the testing will be continued.

Comment #5

A commentor asked why Alternative 3 was selected as the preferred remedy over Alternative 7.

Response - Alternative 3 was selected because, while both will meet the Preliminary Remediation Goals (PRG) for hexavalent chromium of .018 mg/L, meet effluent requirements for chromium of .280 mg/L, and remediate the site in two years, Alternative 3 can be constructed with an approximate savings in capital costs of $215,000 and $40,000 in annual operation and maintenance costs.

Comment #6

A commentor indicated that some confusion may be coming from the discussion of ppb and ppm and ask that we go through the requirements we are seeking to achieve.

Response - The PRG for hexavalent chromium is 0.018 mg/L. This is equal to .018 ppm or 18 ppb. Our effluent limit proposed by the Water Pollution Control Program (WPCP) for chromium is .280 mg/L. This is equal to .280 ppm or 280 ppb. The most contaminated sample of groundwater taken was approximately 1.400 ppm. All indications point to a reduction with the selected treatment process of approximately 90%. If even the most contaminated water was being treated, one could expect the treatment system to produce an effluent of approximately .140 ppm (1.400 X 90%). Additional satisfaction can be arrived in knowing that the effluent limit is based on hexavalent chromium, which is very toxic, and the effluent produced by the treatment system will be the less toxic trivalent form.

Comment #7

A commentor asked if the effluent limit of .280 ppm was for total chromium.

Response - While the number provided by the WPCP is stated for Chromium it is based as if all the chromium were hexavalent chromium.

Comment #8

One commentor asked if there is a lung cancer risk from hexavalent chromium.

Response - There is a cancer risk for inhaling the dust only.

Comment #9

One commentor asked what the radius was of the contaminated water at the site.

Response - The plume is approximately 500 feet by 300 feet and extends about 200 feet to the south of the property.

Comment #10

One commentor asked what did she need to be concerned with living next to the site.

Response - Again, it was reiterated that the risks would be a result of actually drinking the contaminated water or bathing in it. Area private wells are to be tested biannually and previous test results indicated the private wells are free of contamination.

Comment #11

One commentor responded that it appeared then that there would be very little public input.

Response - There will be given substantial consideration given to all public input received, not only to the public input received during the meeting, but to any written comments received during the remaining public comment period.

Comment #12

One commentor asked if they were under any legal requirement to disclose that they lived near this site if they chose to sell their property.

Response - The state's registry system for abandoned and uncontrolled hazardous waste sites was explained and that owners of properties on the registry must notify potential buyers that the site is on the registry; however, it was stated that the Quality Plating site is not on the registry and property owners are not required to notify buyers.

Comment #13

One commentor asked if the risk assessment was based on old samples.

Response - After a removal action was conducted to eliminate risk from soils, a second risk assessment was prepared to address potential risks resulting from the remaining contaminated groundwater. This second risk assessment was based on the more recent samples taken after the removal action.

Comment #14

A commentor asked what responsibility does the Quality Plating company have for paying for the cleanup.

Response - They are responsible but they have gone bankrupt and do not have any assets.

Comment #15

A commentor asked if the present landowner, even if he did not do the dumping himself, could be made to clean up the property.

Response - The law clearly states that the property owner is liable. That is not to say that EPA will go back and recover the cleanup costs from the landowner but the law allows for that.

Comment #16

A commentor indicated that Ditch No. 4 (the proposed receiving stream for the treated effluent) was privately owned.

Response - Ditch No. 4 is a classified stream and as such is recognized as waters of the State of Missouri.

Comment #17

One commentor asked if there was any possibility of contaminating the Mini Farms during spring floods with the discharge.

Response - There is no possibility of contaminating the Mini Farms property with effluent from this treatment process. Water being discharged will meet the effluent limits for this receiving stream. This limit is based on the beneficial uses of the stream and the chromium limit is 280 ppb. This limit is based as if all the chromium will be of the toxic hexavalent form; however, not only will the effluent meet the discharge requirements, any chromium in the treated effluent will be of a much less toxic trivalent form.

Comment #18

One commentor indicated he understood that the treated discharge would be drinking water quality.

Response - While the treated effluent will meet all requirements it has never been claimed to be drinking water quality. While it is the PRG (18 ppb for hexavalent chromium) to treat the contaminated plume to drinking water quality, the discharge requirement for the effluent is 280 ppb.

Comment #19

One commentor asked what will happen to animals and fish that drink water in the receiving stream and will it be safe for them.

Response - The Missouri Water Quality Standards which establish the effluent limits for the receiving stream are based on the beneficial uses of the stream. Livestock and wildlife watering and warm-water fisheries are recognized as beneficial uses of Ditch No. 4 and, as such, the effluent limit is protective for these uses.

Comment #20

One commentor asked how they could get comments recognized after the meeting closed.

Response - It was repeated that the public comment period would be extended and the name and address as to where written comments could be sent was provided.

Comment #21

One commentor asked that of the seven alternatives, who would decide on which alternative eventually gets selected.

Response - The MDNR will consider all the public comments received on the Proposed Plan during the public comments period, both written and oral, and with consultation with the EPA will select the remedy and write the Record Of Decision (ROD). The ROD will be reviewed and approved by the department's Hazardous Waste Program

(HWP), the Division of Environmental Quality (DEQ), and the Director of DNR. After receiving these approvals the ROD will be sent to EPA where it will be further reviewed and finally signed by Mr. Dennis Grams, the Regional Director. A notice would be published in the newspaper when the ROD was available.

Comment #22

One commentor asked that after getting the final signature on the ROD, how long before the actual cleanup operation is started.

Response - It is planned that design services can be procured by the first of March and the facility can be under operation by March, 1996.

Comment #23

One commentor asked if there was enough opposition to "running the waste down the St. John's Ditch", would that have any input into your decision on how you are going to clean it up.

Response - If there were opposition, attention would first be given to what objections were being made and why. We would also look at what other alternatives were available and what compromises, if any, could be made. While the first priority is to protect human health and the environment, considerable effort will be given to achieving community agreement with the selected alternative.

Written comments received

A single written comment was received. The commentor indicated agreement with Alternative 3 (the preferred remedy) and stated the commentor was convinced this is the safest and best alternative. An appreciation was also expressed for extending the public comment period.