

FIVE-YEAR REVIEW

TYPE I


FAIRFIELD COAL GASIFICATION PLANT SITE  
FAIRFIELD, IOWA

Prepared by:

U.S. Environmental Protection Agency

Region 7

Kansas City, Kansas

  
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Michael J. Sanderson  
Superfund Division Director

10/3/97  
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Date

MORRISON  
EFLR

*BA. Morrison*  
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BUCHHOLZ  
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*K Buchholz*  
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RICHARDS  
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*7/20/97*

SANDERSON  
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## 1.0 INTRODUCTION

This report documents the Statutory five-year review conducted by the U.S. Environmental Protection Agency (EPA) at the Fairfield Coal Gasification Plant (FCGP) Site, in Fairfield, Iowa, to determine if the remedial response actions at that site remain protective of human health, welfare, and the environment. Section 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, and Section 300.430(f)(4)(ii) of the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) require that periodic (at least once every five years) reviews be conducted for sites where hazardous substances, pollutants, or contaminants remain at the site above levels that allow for unlimited use or unrestricted exposure following the completion of all remedial actions for the site. The purpose of these reviews is to determine the continued adequacy of the implemented remedial actions in providing protection of human health, welfare, and the environment.

The five-year review is to be conducted by the lead agency, which is the EPA at the FCGP Site. In general, five-year reviews are to be started within four to five years of the initiation of site cleanup.

The EPA has established three levels of review. Level III requires the most in-depth review and would be appropriate for sites where there is the greatest likelihood that the remedial actions implemented for the site are no longer protective. Level II is a less intensive review, and Level I is appropriate for sites where it is least likely that the remedial actions are no longer protective. This review of the FCGP Site is a Level I review because the response actions implemented at the site remain protective of human health, welfare, and the environment. The remedial actions required by the ROD appear to be serving the protective purpose intended.

## 2.0 SITE BACKGROUND

### 2.1 Site Location and History

This report describes the completion of the remedial action for source material and contaminated soils operable unit at the Fairfield Coal Gasification Plant (FCGP) Superfund site located

in Fairfield, Iowa. Source material remediation constitutes only part of the remedial action at the FCGP site. A second operable unit, groundwater, and a bioremediation pilot study are additional operable units at this site that were also addressed under the same Record of Decision (ROD).

The Fairfield site is located in Fairfield, Iowa, a town of approximately 10,000 people, in central Jefferson County. The address of the site is 107 South Seventh Street. The legal description of the site location is: the southwest 1/4 of the southeast 1/4, Section 26, Township 72 North, Range 10 West of Jefferson County, Iowa as shown in Figure 1.

The 1.3 acre site is bordered by commercial and residential areas. The site is nearly level with surface runoff discharging to the south-southeast.

The main features associated with the FCGP site are three gas holders, the operations building, the 1927 tar separator and purifier pit, the 1937 tar separator, the former railroad right-of-way, and the former ditch area south of the site (Figure 1-2)

Coal gasification operations began at the FCGP site in 1878. The plant utilized a blue gas process until 1937 when the production was changed to a carburetted water gas process. Blue gas (sometimes called coal gas) was produced by reacting coal or coke with steam to yield a gas rich in hydrogen and carbon monoxide. The heating value of blue gas is enriched by adding petroleum oils. The blue gas is then thermally cracked to gaseous constituents known as the carburation process. The resulting product was known as carburetted water gas or simply "water gas." Coal tar sludge, iron oxide wastes, and associated coal gasification wastes were generated at the plant during operations.

While in operation, most of the coal tar sludge was sold as a by-product for use as wood preservative, road treatment, and for coal tar refining. An undetermined amount of coal tar sludge was disposed in the gas holder pit, the 1927 tar separator and purifier pit, and the relief gas holder (see figure 1-2). Compounds commonly found in coal tar include polyaromatic hydrocarbons (PAHs), benzene, ethylbenzene, toluene, and xylenes (BETXs).

In 1950, the gas production system in Fairfield was converted to natural gas. Operations at the manufactured gas plant were terminated, and the interior of the building was modified for use as an operations facility for Iowa Electric Power and Light Company (IE), now known as IES Utilities. IE discontinued using the location as a base for natural gas and electrical distribution systems maintenance operations in 1988.

In a 1986 study for IE, PAH compounds were found in both the soil and ground water on the site (McDonald, April 1986). In a 1987 investigation for the EPA, elevated levels of PAHs were confirmed immediately adjacent to the old FCGP site; and concentrations of PAHs, metals, and low concentrations of cyanide, were detected in soil samples collected in the drainage ditch south of the site (EE/FIT, 1987).

Three probable sources of ground water contamination were identified at the FCGP site: the gas holder pit, the 1937 tar separator, and the relief gas holder. These units represent areas that are known or suspected to have been used for treatment or disposal of FCGP wastes and tar sludge.

The FCGP site was proposed as a candidate site for the National Priorities List (NPL) in June 1988 and became a final NPL site in August 1990. In April 1989, IE and the EPA entered into an Administrative Order on Consent to construct and operate an interim groundwater treatment system and conduct a Remedial Investigation/Feasibility Study (RI/FS) for the FCGP site. During 1990, the RI/FS was completed and a Record of Decision (ROD) was signed for the site.

Actions prescribed in the ROD included soil and groundwater treatment remedies. The major components of the selected remedy for source material (coal tar) and contaminated soil include the following:

- \* Excavation of source material and contaminated soil from in and around the gas holder pit, tar separator, and relief gas holder;
- \* Off-site incineration/thermal destruction of contaminated Source material and soil;

- \* Separation of solid waste for off-site disposal as hazardous or non-hazardous waste, as appropriate;
- \* Bioremediation pilot study and potential full scale insitu bioremediation of subsurface contaminated soil and ground water;
- \* Placement of Deed restrictions on site property;
- \* Extraction and treatment of contaminated ground water;
- \* Ground water monitoring;

## 2.2 Site Characteristics

It was determined during the RI/FS that the site stratigraphy is fill overlying glacial till consisting of interbedded silty clays and silty sands with minimal sand and gravel lenses. Bedrock was sampled at a depth of 77 feet and consisted of 2.5 feet of thin-bedded shale.

Analysis of the hydrogeologic data identified two ground water systems present in the site area: 1) a localized perched system within the fill, and 2) an unconfined system within the underlying silty clays and silty sands above the shale bedrock.

Site contamination was the result of on-site disposal of waste by-products generated from the production of coal gas. The waste by-products, referred to as "coal tar", were disposed or left in in-ground containment structures such as the gas holder pit, tar separator, and relief gas holder.

In addition to the three areas of source contamination identified in the RI, additional source areas which included purifier pits, pipe chases, a second tar separator, and a tar well were discovered during the remedial action.

The highest concentrations of contaminants identified at the site were detected in a sediment sample collected from the gas holder pit. In that sample BETXs were 13 percent and total PAHs were 24.8 percent.

### 2.3 Community Relations Activities

The RI/FS Report and the Proposed Plan for the site were released to the public for comment from July 17, 1990 to August 15, 1990. These documents were made available to the public with the administrative record, which is located at information repositories maintained at the Fairfield Public Library and the EPA Region VII office. A public meeting was held on July 26, 1990, in Fairfield, Iowa, to present the Proposed Plan and answer questions concerning the site.

Prior to starting the remediation of source material and contaminated soil, the EPA conducted a public availability session to inform citizens of the upcoming excavation activity. The session was held in May 1993, at an elementary school near the site.

The excavation and handling of the relief gas holder source material and surrounding contaminated soil in the summer of 1993 generated odiferous air emissions that resulted in citizen complaints. In response to the citizen complaints, the EPA held a series of three public meetings in Fairfield. The first two public meetings were conducted on November 16, and December 14, 1993.

During the meetings the public indicated that in addition to the odors, the lack of communication about the nature of the site and remedial action was a concern. It became apparent that due to the transient nature of some of the nearby residents (University students) and the three-year time lapse from the first public meeting, many of the concerned citizens were unfamiliar with the Fairfield site. The EPA addressed citizen concerns by providing information and presentations on the nature of the site contamination and required that IES Utilities implement additional engineering controls to mitigate the off-site odor emissions.

During the winter of 1993/1994, IES prepared an engineering controls design to mitigate off-site emissions that consisted of discontinuing onsite soil screening, conducting soil excavation and handling only during the cooler months of the year, and enclosing the gas holder pit area while its remediation was implemented. The EPA approved the engineering controls and

subsequently proposed them to the Fairfield citizens in a third public meeting held on June 8, 1994. The citizens responded favorably to the engineering controls which were put in place for the remainder of source material and soil excavation at the site.

### 3.0 REMEDIAL ACTION OBJECTIVES

Based on the findings of the RI, the following are the remedial action objectives established in the 1990 FS for the Fairfield Coal Gasification Plant Site.

Remove or contain contaminated source area materials in order a) to minimize the potential for ingestion, dermal contact, and inhalation of materials containing concentrations of carcinogenic PAHs in excess of 100 ppm and b) to reduce the potential for further migration of contaminants from these units.

Prevent or minimize the potential for future inhalation, ingestion, or dermal contact with contaminants in ground water in excess of action levels.

The selected remedy in the Record of Decision consisted of the excavation and off-site incineration of the source areas and contaminated soil, used in combination with a filtration, polymer injection and settling, and carbon adsorption process to treat the contaminated ground water, with enhanced insitu bioremediation.

### 4.0 SUMMARY OF RESPONSE ACTIONS

IES completed construction of a groundwater extraction and treatment system in December 1989. The treatment system was originally designed as an interim treatment system, and was subsequently modified and approved by EPA as a permanent groundwater treatment system. Minor modifications were made to the system following construction completion and the system was temporarily shut down for two weeks and moved to a new building located on the south side of Washington Street. The groundwater extraction and treatment system is currently in full-time operation. Treatment system effluent monitoring, sewer outfall monitoring, and groundwater monitoring are conducted semi-annually.

IES signed a Consent Decree with EPA on March 29, 1991 to complete Remedial Design (RD) and Remedial Actions as prescribed in a Record of Decision. EPA approved the RD in 1992 and construction completion of the groundwater extraction and treatment system in 1993.

An insitu bioremediation treatment system designed to enhance the reduction of subsurface contamination, was started up in December 1991. Due to the innovative nature of the treatment technology, a pilot scale system was designed and constructed to allow for a 2-year trial treatment period. Subsequent evaluations of the pilot scale system concluded that the insitu biotechnology was not effective due to the nature of hydrogeologic conditions at the site. Therefore, the pilot scale, insitu bioremediation system was terminated and the decision was made to cancel any future insitu bioremediation for the site.

Remediation of coal tar source material and contaminated soil commenced in June 1993 and was completed in June 1995. Approximately 8,280 tons of contaminated soil and source material determined not to be a RCRA hazardous waste were excavated and transported off site for incineration. The material was temporarily stored at secured facilities in Marshalltown and Iowa Falls, Iowa. Subsequently, this contaminated soil was permanently disposed at the Illinois Power, Baldwin Station where it underwent thermal treatment in the utility boiler located at that facility. Approximately 580 tons of RCRA hazardous source material were excavated and disposed of at Missouri Fuel Recyclers (MFR), located in Hannibal, Missouri. This material underwent thermal treatment (incineration) while being used as a fuel supplement for the production of portland cement.

Site restoration activities were completed in July 1995. Operation and maintenance activities are conducted weekly and primarily consist of inspection of the groundwater treatment system and fence.

## 5.0 ARARS REVIEW

### 5.1 Background

The Five-Year Review includes a review of newly promulgated or modified requirements of Federal and State environmental laws. These new laws are evaluated to determine whether they are applicable or relevant and appropriate requirements (ARARs) and whether they call into question the protectiveness of the response action selected in the Record of Decision (ROD). The intent of the review is to evaluate whether the selected remedy remains protective of human health and the environment. Although ARARs are usually considered frozen as of the date of the ROD, if an evaluation in the light of the new laws concludes that the remedy is no longer protective, of human health and the environment, it would be necessary to change the remedy to meet the new ARAR standards. The NCP provides: Requirements that are promulgated or modified after ROD signature must be attained (or waived) only when determined to be applicable or relevant and appropriate and necessary to ensure that the remedy is protective of human health and the environment. NCP 40 CFR § 300.430 (f) (1) (ii) (B) (1).

Federal and state soil cleanup standards for the contaminants of concern were not established at the time of the ROD. The EPA and state determined the soil cleanup standards for the contaminants of concern on a site-specific basis using carcinogenic risk factors. Currently, the EPA and state have not established soil cleanup standards for the contaminants of concern.

Federal and state groundwater cleanup standards have been established for some of the contaminants of concern at the site. EPA has established the Safe Drinking Water Act National Primary Drinking Water Standards' Maximum Contaminant Levels (MCLs) as cleanup criteria for drinking water. The Iowa Administrative Code Chapter 133, effective August 16, 1989, established cleanup levels for contaminated ground water in Iowa. The level to first be considered is the EPA negligible risk level (NRL), then the EPA lifetime health advisory level (HAL), and finally MCLs. Practical detection limits for laboratory analysis were also designated as ground water cleanup standards for some of the contaminants. Following is a Table found in the ROD that provides the cleanup standards for ground water and the basis for the standards.

CLEANUP STANDARDS

<u>Contaminant</u>	<u>Remediation Level</u> (ug/l)	<u>Standard/Detection Limit</u>
Benzene	1	NRL
Ethylbenzene	700	HAL
Toluene	2,000	HAL
Xylene	10,000	HAL
Naphthalene	20	HAL
Benzo(a)pyrene	0.2	pdl
Benzo(a)anthracene	0.1	Pdl
Benzo(b)fluoranthene	0.2	Pdl
Benzo(k)fluoranthene	0.2	Pdl
Chrysene	0.2	Pdl
Dibenz(a,h)anthracene	0.3	Pdl
Indenopyrene	0.4	Pdl

NRL - EPA Negligible Cancer Risk Level

HAL - Lifetime Health Advisory Level

Pdl - practical detection limit

5.2 Changes in Cleanup Standards Since the ROD

The only change in cleanup standards for the contaminants of concern in ground water since the signing of the ROD is for toluene. The lifetime health advisory level for toluene has changed from 2,000 µg/l to 1,000 µg/l.

## 6.0 SITE INSPECTION AND CURRENT SITE CONDITIONS

EPA conducted a final inspection for the contaminated soil operable unit on August 6, 1997. The soil excavation area has been backfilled, covered with gravel, and fenced. The groundwater extraction and treatment system remained fully operational and secured. Mr. Dan Riney, Superintendent of the Fairfield City Wastewater Treatment facility, inspects the facility on weekdays. There were no deficiencies observed at the site during the inspection. The fence around the site was in good condition and warning signs were clearly visible.

Analytical results from semi-annual groundwater monitoring of four downgradient wells and quarterly monitoring of the treatment system effluent have indicated that the groundwater extraction and treatment system remains effective in removing subsurface contaminants and preventing further migration of the contaminant plume. Monitoring data is available in the IES Utilities, Monthly Progress Reports in the EPA's site file located at the Region VII office.

## 7.0 AREAS OF NON-COMPLIANCE

Based on this review, EPA finds that the actions taken are in compliance with the remedial action objectives.

## 8.0 STATEMENT OF PROTECTIVENESS

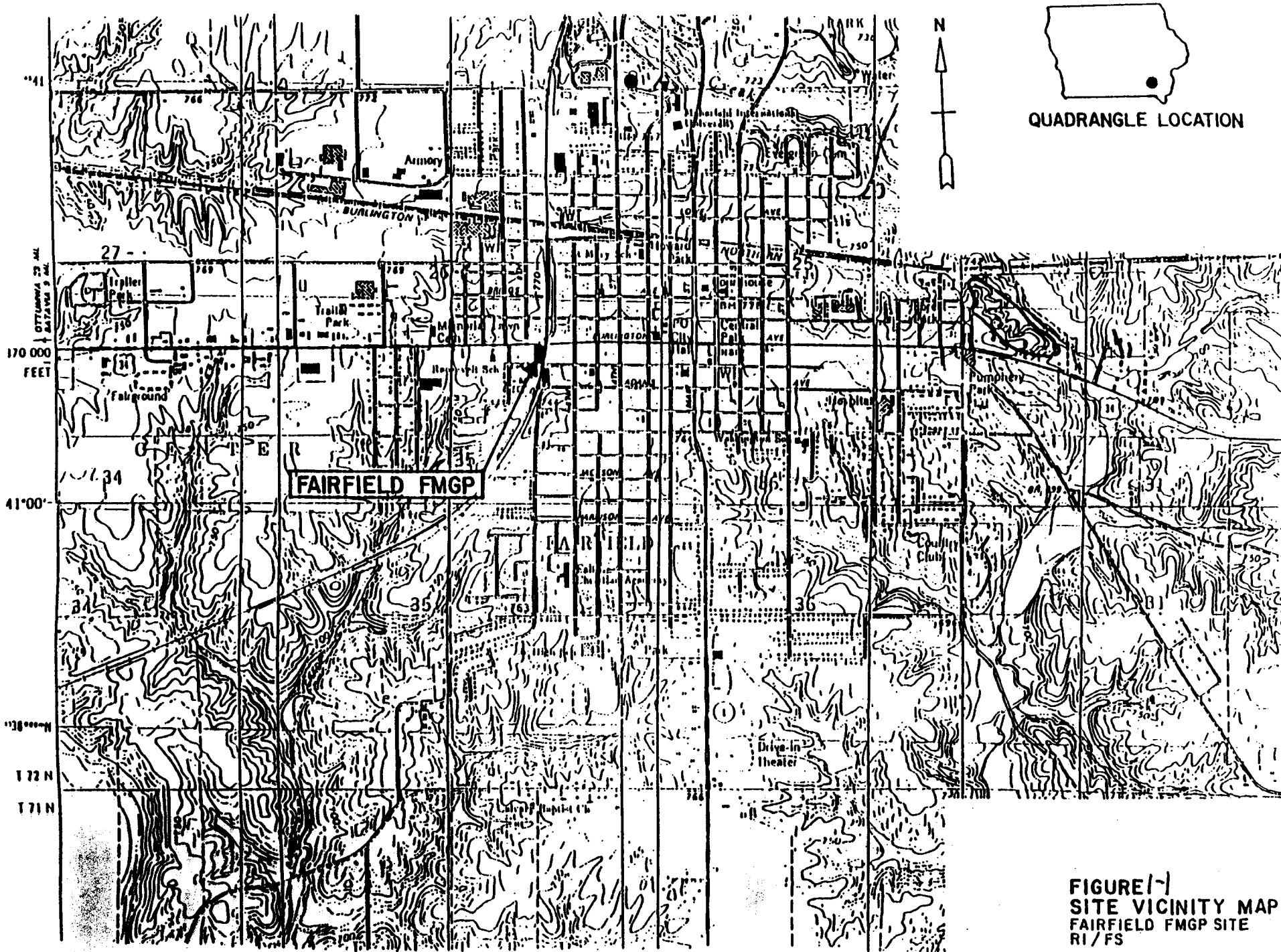
EPA's evaluation of the FCGP Site monitoring data has indicated that the existing groundwater monitoring system continues to be effective in detecting further migration of subsurface contamination. In addition, the residual concentrations of soil contaminants in conjunction with the property access restrictions continue to be protective of human health, welfare, and the environment.

## 9.0 RECOMMENDATIONS

Based on the Five-Year Review of the Fairfield Coal Gasification Plant Site, it is recommended that the semi-annual groundwater monitoring, treatment system operation and monitoring, and property access restrictions continue to be implemented at the site.

## 10.0 NEXT REVIEW

Since hazardous substances, pollutants or contaminants remain at the site at levels above the cleanup standards established for this remedial action and which will not allow for unlimited use or unrestricted exposure, the EPA will conduct additional Five-Year Reviews. According to guidance from EPA headquarters, this statutory Five-Year Review should have been completed by July 20, 1997. Therefore, EPA Region VII will complete the next Five-Year Review for this site by July 20, 2002.



**FIGURE 1-1**  
**SITE VICINITY MAP**  
**FAIRFIELD FMGP SITE**  
**RI / FS**