PRELIMINARY

Health Assessment for

FAIRFIELD COAL GASIFICATION PLANT SITE

CERCLIS NO. IAD981124167

FAIRFIELD, JEFFERSON COUNTY, IOWA

AUG 27 1990

Agency for Toxic Substances and Disease Registry
U.S. Public Health Service

THE ATSDR HEALTH ASSESSMENT: A NOTE OF EXPLANATION

Section 104(i)(7)(A) of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended, states "...the term 'health assessment' shall include preliminary assessments of potential risks to human health posed by individual sites and facilities, based on such factors as the nature and extent of contamination, the existence of potential pathways of human exposure (including ground or surface water contamination, air emissions, and food chain contamination), the size and potential susceptibility of the community within the likely pathways of exposure, the comparison of expected human exposure levels to the short-term and long-term health effects associated with identified hazardous substances and any available recommended exposure or tolerance limits for such hazardous substances, and the comparison of existing morbidity and mortality data on diseases that may be associated with the observed levels of exposure. The Administrator of ATSDR shall use appropriate data, risk assessments, risk evaluations and studies available from the Administrator of EPA."

In accordance with the CERCLA section cited, this Health Assessment has been conducted using available data. Additional Health Assessments may be conducted for this site as more information becomes available.

The conclusions and recommendations presented in this Health Assessment are the result of site specific analyses and are not to be cited or quoted for other evaluations or Health Assessments.

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Prepared by

Iowa Department of Public Health

Under Cooperative Agreement with the

Agency for Toxic Substances and Disease Registry

BACKGROUND

The Fairfield Coal Gasification Plant site is proposed to be listed by the U.S. Environmental Protection Agency (EPA) on the National Priorities List (NPL). From 1878 to 1950, Iowa Electric Light and Power Company (IE) operated the Fairfield Gasification Plant (FCGP) on approximately 0.4 acres of land in southwest Fairfield (See Appendix I, Figure I). The FCGP utilized a blue gas process until 1937 when the production process was changed to a carburated water gas process. Tar sludges from the operation are the waste material of primary concern. Most of the tar sludge, containing polycyclic aromatic hydrocarbons (PAHs), was sold as a by-product for use as wood preservative, road treatment, and in coal tar refining. An undetermined amount of tar sludge was disposed in an on-site pit (See Appendix I, Figure 2) and in a nearby drainage ditch. In 1950, production of manufactured gas ceased and the plant was modified for use as an operating facility for IE. The Chicago, Rock Island, and Pacific Railroad (CRI&P) tracks on the site and railroad bridge over U.S. Highway 34 (Burlington Street) were removed in 1984. In 1988 and 1989, the nearby drainage ditch located on Vintage Power Wagon (VPW) property south of the site was replaced with a culvert and covered with soil.

The former FCGP area, including the buried tar sludge pit and the former electric plant, are within fences which have locked gates (See Appendix I, Figure 3). The parking lot between these two fenced areas, where the CRI&P tracks were located, is not fenced; and easy public access is available from Burlington and Washington Streets. The site is in a commercial and residential area with U.S. Highway 34 (Burlington Street), the city's main thoroughfare, bordering the north side of the site. Two fast-food restaurants and three residences are within approximately 200 feet of the site.

The following documents were provided to the Iowa Department of Public Health (IDPH) and the Agency for Toxic Substances and Disease Registry (ATSDR) for review:

Expanded Site Investigation of the Fairfield Coal Gasification Plant Site, Fairfield, Iowa, May 1987. Prepared by Ecology and Environment, Inc.

Preliminary Assessment of the Iowa Electric Light and Power Company's Former Coal Gasification Plant at Fairfield, Iowa, July 1986. Prepared by Ecology and Environmental, Inc., Field Investigation Team (EPE/FIT).

Fairfield Coal Gasification Plant Site, State Abandoned or Uncontrolled Site Registry (SAUSR) Site Information Package, January 1989. Prepared by Iowa Department of Natural Resources (IDNR), Des Moines, Iowa.

These documents form the basis of this Preliminary Health Assessment (PHA).

ENVIRONMENTAL CONTAMINATION AND PHYSICAL HAZARDS

Ground water, surface water, and soils on-site and off-site were observed to be contaminated. Sampling has been performed under two previous investigations: (1) the Site Investigation of Fairfield Coal Gasification Plant Site (SI) in January 1985 to January 1986 by D.B. McDonald Research Associates and Shive-Hattery Engineers; and (2) the Expanded Site Investigation of the Fairfield Coal Gasification Plant Site (ESI) in May 1987 by Ecology and Environment, Inc., Field Investigation Team. The quality assurance/quality control (QA/QC) data from the SI was not reviewed by IDPH, and it cannot be determined if QA/QC procedures were adequate. In the absence of information to the contrary, this PHA has been prepared under the premise that the SI data are valid.

Analytical testing of the samples from both investigations has concentrated on detection of volatile organic compounds, semi-volatile organic compounds, total metals, and cyanide. Sample locations are shown in Figure 3.

The non-carcinogenic PAHs found on-site and off-site are naphthalene, acenaphthene, acenaphthylene, phenanthrene, anthracene, fluoranthene, and pyrene. Benzo (a) anthracene, chrysene, benzo (b) fluoranthene, benzo (k) fluoranthene, and benzo (a) pyrene are the carcinogenic PAHs detected in on-site and off-site samples. Group A Human Carcinogen (benzene) and Group C possible human carcinogen (styrene) were rated by EPA and found in either on-site or off-site samples.

A. On-Site Contaminated Media and Contaminants of Concern

The 0.4 acre property is considered on-site. The IE property is the area with diagonal lines in Figure 3.

Surface Soil

The ESI surface soil sample S2 and S3 along the CRI&P track contained non-carcinogenic PAHs (1.3 mg/kg - 38.7 mg/kg) and carcinogenic PAHs (3.0 mg/kg - 35.0 mg/kg).

Subsurface Soil

SI samples from boring FI-1 at depths of 2.5 feet and 4.5 feet contained non-carcinogenic PAHs (89.5 mg/kg - 329 mg/kg) and carcinogenic PAHs (36 mg/kg - 126 mg/kg). Trace concentrations of non-carcinogenic and carcinogenic PAHs were detected in the ESI boring B-1 and B-2.

Ground water

The SI reported benzene (2400 ug/L), xylene (670 ug/L), non-carcinogenic PAHs (126 ug/L), and carcinogenic PAHs (38 ug/L) in the ground-water samples from boring FI-1. ESI ground-water samples from monitoring well FI-4 contained chromium (56 ug/L - 71 ug/L) and lead (ND - 52 ug/L).

On-site ambient air, surface water, and sediment were not sampled during the previous investigations. No consumable plants were grown on-site.

B. Off-Site Contaminated Media and Contaminants of Concern

Surface Soil

ESI surface soil sample S-4 across Washington Street from the site on the Vintage Power Wagon (VPW) property contained arsenic (94 mg/kg) and lead (3800 mg/kg). This sample was collected prior to the grading of the VPW property. ESI surface soil sample S-1, near the CRI&P tracks between two fast food restaurants is across Burlington Street from the site and contained non-carcinogenic PAHs (43 mg/kg) and carcinogenic PAHs (415 mg/kg). Dibenzofuran (0.35 mg/kg - 5.0 mg/kg) was detected in three ESI surface soil samples.

Subsurface Soil

ESI soil sample from boring B-3 at depths of 4 feet contained non-carcinogenic PAHs (603 mg/kg), carcinogenic PAHs (121 mg/kg), and dibenzofuran (13 mg/kg).

Sediments

ESI sediment samples (S-5, S-6, S-7, S-8) from the drainage ditch south of the site and from the outfall of the storm drain south of the site contained non-carcinogenic PAHs (2.3 mg/kg - 751 mg/kg), carcinogenic PAHs (2.13 mg/kg - 389 mg/kg), and dibenzofuran (.4 mg/kg - 19.0 mg/kg). These samples were collected prior to installation of the culvert and soil covering the drainage ditch.

Surface Water

ESI surface water sample #1 from the drainage ditch contained lead (120 ug/L), sodium (1700 mg/L) and non-carcinogenic PAHs (3 ug/L). SI surface water sample from the drainage ditch contained non-carcinogenic PAHs (5.8 ug/L) and carcinogenic PAHs (16.3 ug/L).

Ground water (See Table)

Monitoring Well FI-3 is 37.5 feet deep and located approximately 40 feet west of the site adjacent to residential property. Monitoring well MW-3 is 40.0 feet deep and located between the site and Parson's Addition. The ground-water sample from MW-3 did not contain any volatile organics or PAHs and the concentration of metals were within a range generally considered acceptable to ATSDR. The 4 ESI and 38 SI residential ground-water samples were from private wells in Parson's Addition.

Table of Contaminants

Off-site ambient air was not sampled during the investigations. No consumable plants are known to be growing in contaminated areas near the site.

PHYSICAL HAZARDS

On March 9, 1989, a site visit was conducted by the IDPH Toxic Substance Evaluation staff with the ATSDR regional representative. Also present were representatives from IE, Fairfield, and Jefferson County. A chain link fence encloses two sections of the site. Access to the gravel parking lot (razed railroad track area) is not restricted. Plastic and iron pipes, empty wooden cable spools, and wooden pallets were stacked and scattered outside the fenced area on IE property. This is an attractive area for children to play and considered a potential physical hazard.

DEMOGRAPHICS

The population of Fairfield is approximately 9,428 (1980 census). Approximately 290 rural residents live within a 3-mile radius of the site. The Fairfield Water Works draws water from one deep well, two shallow wells, and three municipal surface supply lakes located 1.5 miles northeast of the site (See Appendix I, Figure 1). The deep well is at a depth of 2,155 feet in the Jordan Sandstone Aquifer. The shallow wells are at depths of 189 and 210 feet in the Mississippian Aquifer, and the municipal surface supply lakes are recharged by surface water. The Fairfield Water Works provides water to the city of Fairfield, Parsons Addition, Jefferson County Rural Water, and four small municipalities in Jefferson County. Many of the rural residences obtain water from the Fairfield Water Works. Some rural residences, within 3 miles of the site, use private wells (depths ranging from 25 to 45 feet) for drinking water. Most of the residents in Parson's Addition use well water for cleaning and bathing, but use alternative sources for drinking water. Within 200 feet of the site, several residences use the municipal water supply. Some of the residences in Fairfield may have old, private, shallow-sand-point wells. These wells have not been identified and sampled. In the vicinity of the site, the ground water flows southwest and southeast.

POTENTIAL ENVIRONMENTAL AND EXPOSURE PATHWAYS

The environmental pathways of public health concern are on-site and off-site surface soil, subsurface soil, and ground water and off-site surface water and sediment. Human exposure pathways of public health concern are direct ingestion of contaminated ground water, inadvertent ingestion of contaminated soil and surface water, inhalation of volatile organic compounds from secondary household use of contaminated ground water, inhalation of contaminated reentrained dust, and direct dermal exposure to contaminated ground water, surface soil, sediment, and subsurface soil.

EVALUATION AND DISCUSSION

The fairfield Coal Gasification Plant Site poses a potential concern to public health because concentrations of contaminants on-site and off-site may cause adverse health effects. The contaminants of concern are arsenic, lead, non-carcinogenic PAHs, carcinogenic PAHs, and the volatile organic compounds listed in Table 1.

Surface and Subsurface Soil

Surface soil off-site near the tracks and the ditch, and the subsurface soil on-site and off-site, have concentrations of PAHs known to be carcinogenic upon long-term exposure. Long-term inhalation, ingestion, or dermal exposure to benzo(a)pyrene, one of the carcinogenic PAHs identified in the soils, has induced mutagenic and carcinogenic effects in laboratory bioassays. Epidemiologic studies in occupational settings have shown mixtures of PAHs to cause pulmonary cancer (Hammond et al. 1976) and dermal cancer (Purde and Ethin 1980). The concentrations of arsenic and lead in the surface soil of Vintage Power and Wagon (VPW) property may also cause carcinogenic and non-carcinogenic health effects with long-term exposure. Since contaminated areas are not restricted, children with chronic exposure to the contaminated soils and remedial and construction personnel excavating the contaminated soil are considered the population at risk from exposure to contaminants in the soil via direct ingestion (pica), inadvertent ingestion, inhalation of reentrained dust, and dermal contact. Because residential surface soil data are not available at present, the potential health implications from exposure to residential soils could not be assessed.

On-Site Ground water

Benzene, xylene, chromium, lead, non-carcinogenic PAHs, and carcinogenic PAHs in the on-site ground water are at concentrations that would cause severe adverse health effects upon chronic exposure via ingestion, inhalation, and dermal contact. Human exposure to on-site ground water is highly unlikely. At this time, only monitoring wells are located on-site, and there are no known human receptors of on-site ground water. There is a public health concern in the future use of the on-site ground water.

Off-Site Ground water

Ground water from FI-3 contained cadmium, sodium, non-carcinogenic PAHs, carcinogenic PAHs, benzene, ethylbenzene, 2-methylphenol, 4-methylphenol, styrene, toluene, and xylene at concentrations above EPA drinking water standards and recommendationsin public water supplies (i.e., MCL, MCLG, PMCLG, AWQC) and could lead to adverse health effects including cancer in long-term exposure through direct ingestion, inhalation secondary to household use, and dermal contact.

One SI sample of residential ground water from Parson's Addition contained 200 ug/L of only one carcinogenic PAH, chrysene. The residential ground water was retested and no PAHs were detected in the ground water. Sodium in the residential ground water is above the American Heart Association recommendation of 20 mg/L sodium in drinking water for adults requiring a low sodium diet.

Table 1. Off-Site Ground Water Samples from the Site Investigation (SI) and Expanded Site Investigation (ESI)

Contaminant	FI-3 (ESI) ug/L	F-3 (SI) ug/L	Residential (ESI) ug/L	Residential (SI) ug/L	Comparative Standard ug/L
Barium	930	680	25M-180M	NR	1,000 (MCL)
Cadmium	ND	30	ND	NR	10 (MCL)
Sodium	130,000	NR	21,000-45,000	NR	20 mg/L (AHA
noncarcinogenic PAH	1,960M	9,621-360,000	ND	0.1	
carcinogenic PAH	ND	696-130,000	ND	0.1-200	0.0028 (AWQC
Benzene	38,000	20,000-108,000	ND	NR	5 (MCL)
Ethylbenzene	260M	700	ND	NR	680 (PMCLG)
2-Methylphenol	19,000J	<1	ND	NR	
4-Methylphenol	36,000J	<1	ND	NR	
Styrene	2,100	2,700	ND	NR	140 (PMCLG)
Toluene	14,000	15,000-41,000	ND	ND-20	2,000 (PMCLG
Xylene	1,200	4,200-10,600	ND	<1	440 (PMCLG)

mg/L - milligrams per liter
ug/L - microgram per liter
ND - not detected
NR - not reported
M - qualitatively identified; quantitative value is less than contract required detection limit; or less than limit of quantitation
J - qualitatively identified; failed to meet all QA criteria; estimated value
MCL - Maximum Contaminant Level
PMCLG - Proposed Maximum Contaminant Level Goal
AWQC - EPA Ambient Water Quality Criteria for a lifetime cancer risk of 10^{-6}
AHA - American Heart Association recommended Na concentration in water for adults requiring low sodium diet

Since the Fairfield Water Works draws water from the Mississippian Aquifer which is hydrogeologically connected to the contaminated surficial aquifer, the population with a potential risk of exposure to contaminants in the off-site ground water is the residences obtaining water from the Fairfield Water Works and any residence using a private well in close proximity to the site. At present there are no known human receptors of ground water with these contaminants at concentrations found in FI-3.

Off-Site Surface Water

The drainage ditch has been replaced with a culvert covered with soil. The culvert enters a city storm drain that discharges into a unnamed stream about 700 feet south of the site. The unnamed stream is fed by water runoff from the city and discharges into Cedar Creek 2.9 miles from the site. The unnamed stream is not used as a source of drinking or domestic water but is a potentially attractive place for children to play. Prior to the installation of the culvert, surface water samples from the drainage ditch contained concentrations of lead and carcinogenic PAHs that are of public health concern.

No contaminants were detected at concentrations of public health concern in the surface water sample from the outfall of the unnamed stream. The samples were collected prior to the installation of the culvert covered with soil. However, the present potential health effects from exposure to surface water cannot be accurately assessed because conditions on-site and off-site have changed since the surface water samples were collected.

Off-Site Sediment

The sediment samples from the drainage ditch south of the site contained concentrations of carcinogenic PAHs that are of public health concern. However, the ditch is covered over with a culvert and soil. Human exposure to the contaminated sediments is unlikely without excavation of the soil.

The concentrations of contaminants detected in the sediment sample from the outfall in the stream are not of public health concern.

Food Chain

No consumable plants are grown on-site or the VPW property. Adverse health effects resulting from consumable plants grown on residential property cannot be determined due to lack of residential soil data and data on vegetables grown on potentially contaminated residential soil. Also, the adverse health effects resulting from the consumption of fish obtained from Cedar Creek cannot be determined because of the lack of current fish sampling, surface water data, and sediment data.

Air

Adverse health effects from the inhalation of volatile organic compounds cannot be determined because of the lack of ambient air data.

CONCLUSIONS AND RECOMMENDATIONS

Based on the available information, this site is considered to be of potential public health concern because of the risk to human health caused by the possible exposure to hazardous substances via direct ingestion, inhalation from secondary household use, and dermal contact of ground water; via direct ingestion (pica), inadvertent ingestion and dermal contact with surface soil and subsurface soil; via inhalation of reentrained dust; and via ingestion and dermal contact with surface water.

Further environmental characterization and sampling of the site and impacted off-site areas during the Remedial Investigation and Feasibility Study should be designed to address the environmental and human exposure pathways discussed above. In particular, the following specific recommendations are:

1. Analyze surface soil from residential property adjacent to the site, VPW property where the drainage ditch soil was excavated to install a culvert, and CRIP property across Burlington Street from the site for site contaminants.

2. Determine the vertical and horizontal extent of ground-water contamination.

3. Conduct a private well and monitor well inventory within the potentially contaminated ground water.

4. Analyze surface water and sediment from the culvert.

5. When indicated by public health needs, and as resources permit, the evaluation of additional relevant health outcome data and community health concerns, if available, is recommended.

In accordance with CERCLA as amended, the Fairfield Coal Gasification Plant Site, Fairfield, Iowa, has been evaluated for appropriate follow-up with respect to health effects studies. Although there are indications that human exposure to on-site/off-site contaminants may be currently occurring and may have occurred in the past, this site is not being considered for follow-up health studies at this time because there is no documented exposure pathway. However, if data become available suggesting that human exposure to significant levels of hazardous substances is currently occurring or has occurred in the past, ATSDR and the Iowa Department of Public Health will reevaluate this site for any indicated follow-up.

When additional information and data become available, e.g., the completed RI/FS, such material will form the basis for further assessment by ATSDR at a later date.

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CERTIFICATION

This health assessment was prepared by the Iowa Department of Public Health under a cooperative agreement with the Agency for Toxic Substances and Disease Registry (ATSDR). It is in accordance with approved methodology and procedures existing at the time the health assessment was initiated.

Technical Project Officer, SPS, RPB, DHAC

The Division of Health Assessment and Consultation, ATSDR, has reviewed this health assessment and concurs with its findings.

Director, DHAC, ATSDR

REFERENCES

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APPENDIX

Figure 1 Fairfield Coal Gasification Plant Site Location

Figure 2 Coal Gasification Facilities

Figure 3 Fairfield Coal Gasification Plant Site and Vicinity

Figure 2. THE COAL GASIFICATION FACILITIES AT THE FAIRFIELD COAL GASIFICATION PLANT SITE.

Source: D. B. McDonald Research Associates, 1986.

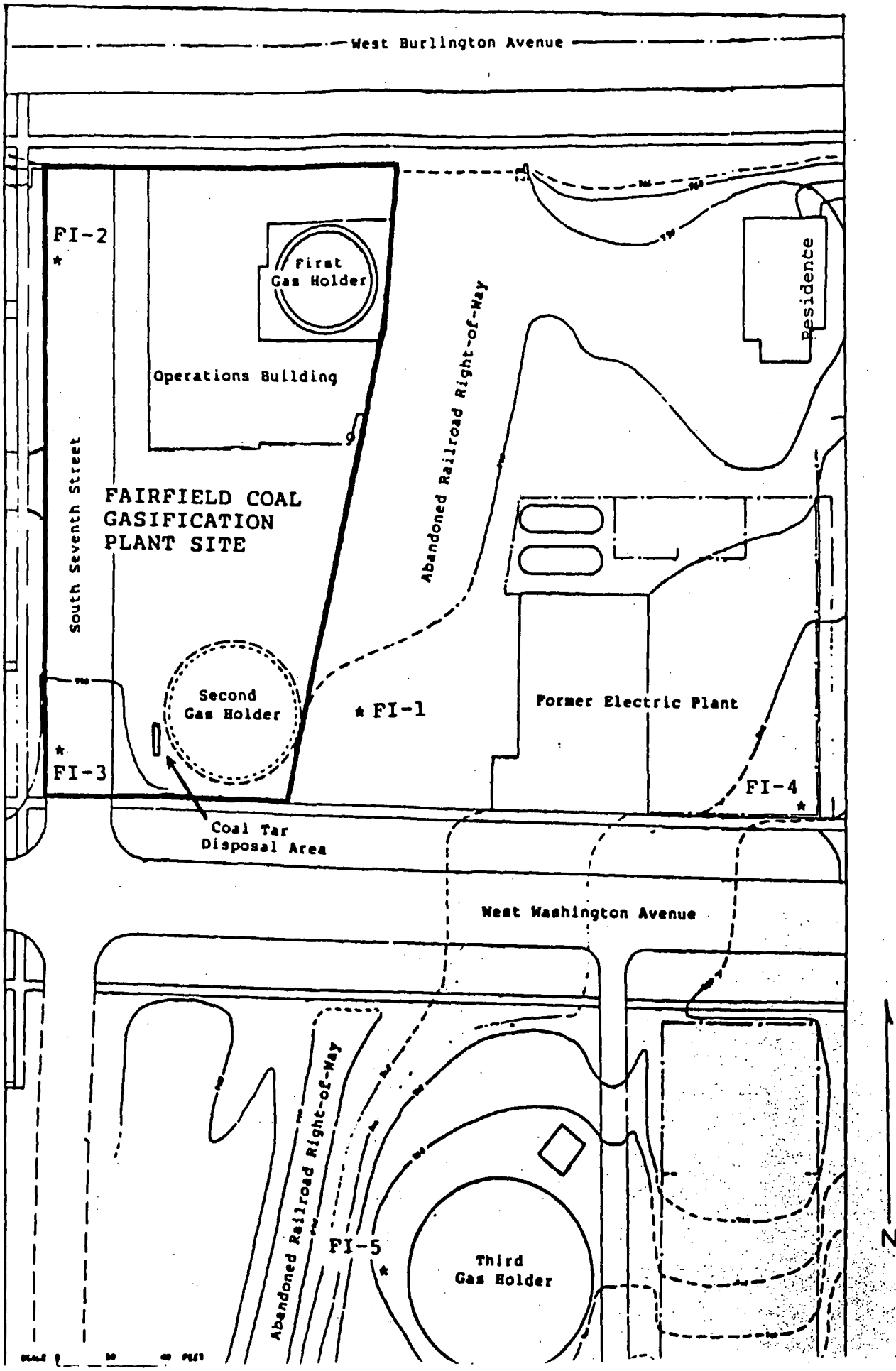

Figure 3.

FAIRFIELD COAL GASIFICATION PLANT SITE AND VICINITY