Region 3 Copy
356011

Department of Environmental Conservation

Division of Hazardous Waste Remediation

Ferroxcube Site

Site Number 3-56-011
Ulster County, New York

New York State Superfund

Record of Decision

March 1993

New York State Department of Environmental Conservation
MARIO M. CUOMO, *Governor* THOMAS C. JORLING, *Commissioner*

DECLARATION FOR THE RECORD OF DECISION

Site Name and Location

Ferroxcube
1033 Kings Highway
Town of Saugerties, NY 12477
Ulster County
Site Code: 356011
Funding Source: North American Philips Corporation

Statement of Purpose

This document describes the remedial alternatives for the hazardous waste disposal site at Ferroxcube, and identifies the New York State Department of Environmental Conservation's (NYSDEC) selected remedy. The remedy conforms to the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA).

Assessment of the Site

Past releases of hazardous waste at the site continue to pose a significant threat to the public health and the environment, and need to be remedied.

Statement of Basis

The Record of Decision (ROD) is based upon the Administrative Record for the site, information in the NYSDEC file, and the comments from the public. Appendix D-1 identifies the documents that form the Administrative Record for the site. A copy of the Administrative Record is available for public review and/or copying at the following locations:

NYSDEC
Division of Hazardous Waste Remediation
50 Wolf Road
Albany, NY 12233-7010

NYSDEC, Region 3
21 South Putt Corners Road
New Paltz, NY 12561

Town Hall
Town of Saugerties
Main Street
Saugerties, NY 12477

Description of Remedy:

The remedy consists of the following:

Air sparging of the saturated zone to release contaminants adsorbed on soil particles and dissolved in the groundwater.

Vapor extraction of contaminants released by air sparging, and that adsorbed on the soil particles in the unsaturated zone.

Pumping contaminated groundwater and passing it through the facility's cooling tower to strip off the volatile contaminants.

In conjunction with the remedy, methods to increase the rate of contaminated groundwater extraction will be studied. The design of the remedy will incorporate any relevant findings of the study. The ROD requires Ferroxcube to submit periodic analytical data for an annual review by the NYSDEC. Modification to the remedy will be required if it is determined that the goal of cleaning up the affected homeowners' wells in five years will not be met.

Declaration

The selected remedy is protective of human health and the environment, and complies with Federal and New York State Standards, Criteria and Guidance (SCGs) which include both those of the State and the United States to the extent that they are more stringent than those of the State (Also referred to as ARARs).

March 26, 1993
Date

Ann Hill DeBarbieri
Deputy Commissioner
Office of Environmental Remediation

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APPENDICES

RECORD OF DECISION

Ferroxcube, Saugerties, Ulster County - Site ID No. 356011

I. SITE LOCATION AND DESCRIPTION

Ferroxcube (now called The Philips Components, Discrete Products Division of North American Philips Corporation) is at 1033 Kings Highway in the Town of Saugerties, New York. The 41.5 acre site lies within a valley, and is bounded by the railroad property to the east and the New York State Thruway to the west (Fig. A-1). The site has three main buildings numbered 1 to 3, with Building 2 having annexes A and B. The focus of the remedial action is to the east of Building 2.

II. SITE HISTORY

The facility has been manufacturing electronic components since its inception, and used halogenated solvents for degreasing operations until December 1991. The company has since switched to a citrus based degreaser. Building 1 began operation in 1962, while Building 2 was constructed in 1964 for office space and manufacturing. In 1966, a solvent storage shed was constructed adjacent to the northeast corner of Building 2. Building 2A was constructed in 1975 and Building 2B was constructed in 1977.

The facility has three systems to treat wastewaters. The industrial waste treatment system (IWT) located next to Building 1 removes heavy metals and other particulates. Approximately 9,000 gallons per day (gpd) of treated wastewater is discharged through a State Pollution Discharge Elimination System (SPDES) permitted outfall. Sanitary waste is treated in two septic tank/sand filtration systems east of Building 2. Treated effluent from these systems combine with the IWT effluent before discharge. A licensed hauler removes waste solvents to a permitted treatment facility.

In 1982 the Ulster County Health Department (UCHD) sampled local wells as a part of its regional groundwater quality assessment. Analysis of the water detected the presence of volatile organic compounds (VOC) in four homeowners wells (Cunningham, Cole, Knicely, and Andreassen). The locations of these wells are shown in Fig. A-2. Ferroxcube bought the Knicely property, which had the highest level of contamination, and has abandoned its use. The Miles house was built in 1984. Since 1985 its well has consistently recorded concentrations higher than that from the Cunningham, Cole, or Andreassen well. Ferroxcube has installed carbon filters and an ultraviolet system in each of the four affected homeowners' wells. UCHD is monitoring the performance of these systems. In February 1983, Ferroxcube installed five groundwater monitoring wells. Groundwater analysis detected the presence of VOC in these monitoring wells.

Since 1983, Ferroxcube has conducted a series of investigations to determine the extent of the contamination and identify the source. In 1986 the pumping and treatment of two of the most contaminated monitoring wells (OW3 and OW10) was begun to reduce the off-site migration of contamination. Groundwater Technology's July 1992 RI Report highlights the probable source of contamination——the solvent storage shed. The final investigation in December 1992 was done to determine the migration pathway from this source, and select the most effective remedy.

III. SUMMARY OF FINDINGS:

The principal contaminants are halogenated solvents including 1,1,1-Trichloroethane (TCA), Trichloroethylene (TCE), 1,1-Dichloroethane (DCE), Tetrachloroethane (PCE), and 1,1,2 Trichloro-1,2,2 Trifluoroethane (Freon 113). The maximum total VOC concentration in groundwater was detected in monitoring well OW3 (Fig. A-2) at 134,000 parts per billion (ppb) in 1986. Recently the concentration has fallen to about 45,000 ppb. The maximum concentration in the homeowners' wells was about 2000 ppb of total VOC in 1988. The fluctuations in the contamination levels of these wells have been considerable. During 1992 the Miles well contamination reached a high of 1500 ppb in February and a low of 14 ppb in November (Fig. A-3). The capacity of the existing treatment system, ranging from .001 to .03 gpm, is not large. The observed concentration decreases in private wells may be due to several factors such as distance of the sampling points from the present source, water usage by residents, precipitation, and time of sampling.

A soil gas survey conducted in May 1992 suggests that the original source of the contamination may have been the old storage shed. The bulk of the contamination has, however, migrated deeper into the aquifer and to the north of the shed. The maximum concentration in the soil is 7 parts per million (ppm) under the former storage shed.

IV. CURRENT SITE STATUS

The drinking water treatment systems at the affected private wells (Fig A-2.) address the immediate health concerns. UCHD inspects the operation, arranges for the monthly sampling, and reviews the analytical results.

Groundwater from OW3 and OW10 (Fig. A-2), two of the most contaminated on-site wells, continues to be pumped and passed through the facility's cooling tower for stripping of the VOC. The treated water is then discharged through a SPDES outfall.

V. GOALS FOR REMEDIATION

The goal of the remediation is to permanently cleanup the drinking water to meet, within five years, the requirements of the New York State Drinking Water Standards. For the compounds encountered at this site, the maximum acceptable concentration for each is 5 ppb, and that for total VOC is 100 ppb. The treatment will then continue until the groundwater meets standards, or until continued treatment no longer produces appreciable improvement in groundwater quality. The proposed remedy will increase the capacity of the existing treatment system to achieve this goal.

VI.REMEDIAL ALTERNATIVE

A. Initial Screening of Technologies

Several remedial programs can be developed that would meet the project objectives of source control, migration control and remediation in the vicinity of the solvent storage shed. However, the technologies selected and the application of each greatly impact both the efficiency with which the chlorinated organic compounds are recovered or destroyed and the cost for the clean-up. The recommendations are also based on the current understanding of the hydrogeological conditions at the site.

After reviewing all options listed on Tables B-1, B-2, and B-3 for technical effectiveness, feasibility, and relative cost, the following comparisons were reached:

- An interceptor trench system would not effectively provide source control, migration control and remediation. The difficult construction and the lengthy and costly process by which RCRA hazardous wastes are excavated and disposed of does not favor this option.

- Multiple Recovery Wells/Pumping Systems would include appropriate electric or pneumatic pumps located in a network of recovery wells. Recovery wells would be installed based on the pumping system design. This option does not require extensive excavation and enables the recovery system to capture a large portion of the groundwater flowing near the source area in comparison to the interceptor trench design.

- Soil vapor extraction systems eliminate the need for major excavation and remediate the soils in place. The proven success of the systems in remediating soils in the unsaturated zone (above groundwater table) makes this technique feasible, effective and relatively low cost.

- Air sparging systems also eliminate the need for major excavation and remediate the contaminated soil in place. The proven success of the systems in remediating soils in the saturated zone makes this remedial technique feasible, effective and relatively low cost.

- Limited excavation could be completed with a clearly defined source area. This option would only be considered further if extensive excavation could be avoided. Costs are generally moderate to high.

- On-site treatment could be completed in conjunction with limited excavation. Cost of construction of on-site treatment cells is generally moderate, while that of treatment and disposal of excavated material is high.

B. Initial Screening of Remedial Alternatives.

Technologies that were retained after the initial screening process were combined to create the following systems or remedial action alternatives:

- Soil vapor extraction system combined with groundwater recovery, air stripping with off-gas treatment with recyclable carbon units.

- Soil vapor extraction system in conjunction with air sparging, and groundwater recovery with air stripping and off-gas treatment with recyclable carbon units.

- Limited excavation of source area with on-site treatment of contaminated soils.

- Limited excavation of source area with off-site disposal of contaminated soils.

- Limited excavation of source area with a groundwater recovery system, coupled with air stripping and off-gas treatment with recyclable carbon units.

- Soil vapor extraction system with off-gas treatment with on-site recyclable carbon units.

C. Description of Retained Alternatives

Technologies that were retained after the Feasibility Study screening process were combined to produce remedial alternatives that encompass the impacted media in the target remediation area. The alternatives that were selected for detailed analysis are as follows:

Alternative 1: Excavation of source-area soils: This alternative was considered in the Feasibility Study because the potential source area appeared to be limited in extent and clearly defined.

Alternative 2: Soil Vapor Extraction and Air Sparging Treatment of Soils; Pump and Treat Groundwater from Wells; Carbon Adsorption of Off-Gas: This alternative was retained because it treated all phases of VOC occurrence: groundwater, unsaturated-zone soils, and saturated zone soils.

Alternative 3: Soil Vapor Extraction and Air Sparging Treatment of Soils; Pump and Treat Groundwater from Wells; Catalytic Incineration of Off-Gas: This alternative treated all phases of VOC occurrence and added the benefit of destructive technology.

Alternative 4: Soil Vapor Extraction and Air Sparging Treatment of Soils; Pump and Treat Groundwater from Trench: Carbon Adsorption of Off-Gas: This alternative treated all phases of VOC occurrence, and was retained because soil permeability characteristics had not been evaluated prior to pilot testing.

D. Analysis of Retained Alternatives

Each alternative was analyzed utilizing criteria outlined in the New York State Department of Environmental Conservation (NYSDEC) Technical and Administrative Guidance Memorandum (TAGM) for the Selection of Remedial Actions at Inactive Hazardous Waste Sites (May 15, 1990) and assigned a score. The criteria consist of:

- Compliance with applicable New York State Standards, Criteria and Guidelines (SGS)
- Protection of Human Health and the Environment
- Short-Term Impact and Effectiveness
- Long-Term Effectiveness and Permanence
- Reduction in Toxicity, Mobility, and Volume
- Feasibility

Compliance with SGS

Standards reviewed in the Feasibility Study included:

- EPA Toxicity Characteristic Constituents
- New York State Groundwater and Drinking Water Standards
- New York State SPDES Permit Discharge Limitations
- Air Guide 1. Ambient Guideline Concentrations (AGCs)
- Recommended Soil Clean-up Objectives prepared by NYSDEC Division of Hazardous Waste Remediation, Bureau of Program Management.

For this criterion, the following evaluation was made:

- Alternative 1 scored the lowest because soil excavation would not control or remediate impacted groundwater.
- Alternatives 2, 3 and 4 did address contaminated soil and groundwater, and achieved the same score. These alternatives did not achieve a perfect score because it is anticipated that some residual impacts to groundwater will remain inaccessible in the bedrock.

Protection of Human Health and the Environment

This criterion considered potential routes of exposure and magnitude of residual risk, and was evaluated as follows:

- Alternative 1 was ranked the lowest because it provided no mechanism to control exposures through the groundwater exposure route, and during excavation could also result in unacceptable airborne exposures.
- Alternatives 2 and 3 scored the highest because they provided a mechanism to reduce groundwater exposures, although potentially a residual risk would exist through this route.
- Alternative 4 provided a mechanism to reduce groundwater exposures, but would also increase the potential for airborne exposures during excavation of the trench.

Short-Term Impact and Effectiveness

This criterion was used to assess the effects of the alternative during implementation until the remedial objectives are met. The time required for the alternative to achieve the remedial objective was also factored:

- Alternative 1 had the potential to impact the environment and community during excavation (vapors, dust, noise, etc.) but process controls could be employed. The duration of the process was estimated to be less than of the 2 years.

- Alternatives 2 and 3 would not produce significant short-term impacts to the community, but might exceed the 2-year criteria for implementation.

- Alternative 4 could produce significant short-term impacts during trenching (vapors, noise, dust) and could also exceed the 2-year criteria for implementation.

Long-Term Effectiveness and Permanence

This criterion includes components to evaluate the permanence of the alternative, magnitude of residual risk, and adequacy and reliability of mechanisms to control exposures to residuals.

- Alternative 1 ranked the lowest because it resulted in the highest levels of residuals (inaccessible soils and untreated groundwater).

- Alternatives 2 and 4 reduced the quantity of untreated waste and residuals but employed an off-site treatment component (carbon regeneration).

- Alternative 3 reduced the quantity of residuals, and employed on-site destructive technology to eliminate off-site treatment.

Reduction in Toxicity, Mobility, and Volume

This criterion evaluates the alternative's use of treatment technologies that permanently reduce the toxicity, mobility, or volume of hazardous wastes.

- Alternative 1 scored lowest because it would produce the lowest reduction in the volume of hazardous waste and immobilized the lowest percentage of the waste, even if off-site destructive technology (incineration) were employed.

- Alternatives 2, 3 and 4 produced equal permanent reductions in the toxicity, mobility and volume of the of the hazardous constituents of interest.

Feasibility

Each of the alternatives was evaluated for feasibility of implementing it technically, and with regard to cost.

i) Implementability

This criterion included factors to evaluate the ability to construct the alternatives, the availability and reliability of the technology, and the administrative feasibility of the process:

- Alternative 1 was anticipated to encounter difficulties due to shoring during excavation (required due to proximity to Building 2 foundation) and measures required to control vapor emissions, dust, and noise. Additionally, future remedial actions may be required due to the lower (relative) percentage of waste removed.

- Alternative 2 posed the fewest difficulties in installation and relied on proven technologies.

- Alternative 3 posed no additional logistical difficulties but employed a vapor treatment technology not yet proven for this application (catalytic incineration).

- Alternative 4 would be more difficult to implement than Alternative 2 (due to tight access and shoring required during trenching) but relied on readily available technologies.

ii) Cost

This criterion factors in the direct and indirect capital costs of the remedial alternative, operation and maintenance costs, and future land use and capital costs.

- Alternative 1 was evaluated utilizing capital costs (excavation, disposal, analytic, and oversight) monitoring costs, and including an allowance for additional remediation of the potential source area if needed. The cost of Alternative 1 was approximately 300 - 500% the cost of the alternative with the lowest present worth. The cost of future land use was considered a constant for all alternatives.

- Alternative 2 was evaluated including capital costs and operations and maintenance costs, throughout the life of the project. A lesser allowance (relative to Alternative 1) for future capital cost to expand the remedial system within the potential source area was made. Alternative 2 had the lowest present worth and was therefore assigned the highest score.

- Alternative 3 was also evaluated relative to capital cost, operations and maintenance costs, and the same future capital cost allowance as Alternative 2. Alternative 3 had a slightly higher present worth due to the extra costs anticipated for the catalytic incineration system.

- Alternative 4 was evaluated relative to capital cost, operations and maintenance, and the future capital cost allowance as in Alternative 2 and Alternative 3. Alternative 4 scored lower than Alternative 2 and Alternative 3 due to the cost penalty of trenching and soil disposal versus well drilling.

- Cost sensitivity analyses were significant relative to Alternative 2 and Alternative 3. Operations and maintenance cost for Alternative 2 may increase more than for Alternative 3 if vapor effluent levels are sustained at a higher rate than anticipated as a result of the vapor off-gas characterization. However, this determination could be made with a relatively low capital cost investment (in filter units and filtration material) and the cost penalty (in terms of unproductive capital investment) to upgrade to alternative treatment technologies, such as catalytic incineration, would be relatively minor.

E. Selection of Remedial Alternative

Pilot testing and detailed analysis of retained alternatives demonstrate that readily available technologies (soil venting, air sparging, groundwater pump and treat) would achieve the best compliance with state standards, protection of health and the environment, effectiveness, implementability, and cost relative to the other alternatives.

The pilot testing also indicated that existing plant systems (vacuum, compressed air, and water treatment) appear to offer adequate capacity to perform significant functions in the selected remedial alternative. These existing systems further enhance the implementability and cost of the recommended alternative.

A brief description of each of the technologies in the selected alternative follows:

Vapor Extraction System

The system removes VOC present in the unsaturated-zone. In addition, the soil-vapor extraction system will collect vapor generated by the air sparging system.

Pilot testing proved that soil-vapor extraction is a viable and effective technology to address adsorbed phase volatile compounds at the Philips Components facility with regard to the radial area of influence of each vent well and the levels of VOCs removed in the vapor effluent. Six vapor points are recommended for the site (Fig. A-4).

Air Sparging Remedial System

Air Sparging requires the injection of air into the saturated soil and is an effective method of removing adsorbed and dissolved volatile compounds from the saturated zone. The released vapors are collected by the vapor extraction system.

Pilot testing demonstrated air sparging to be a viable remedial technology to address adsorbed phase contaminants in the saturated zone under the former solvent storage shed. The technology exhibited satisfactory influence area. Eleven sparge points are recommended for the site (Fig. A-4).

Groundwater Recovery and Treatment System

This system pumps out contaminated water and passes it through a stripper, which exposes a greater surface area of the water to the atmosphere for releasing the volatile compounds from the water. Ferroxcube will continue to use the facility's cooling tower as the stripper. Discharge from the cooling tower will be directed to the on-site water treatment facility for the plant. The treated groundwater will then be discharged through an existing SPDES outfall into Mudderkill. The permit for this discharge will be modified to reflect the increase in flow.

The proposed system will be comprised of four existing wells, OW-3, OW-10, OW-14, and OW15 and three new recovery wells (Fig. A-4).

VII. ADDITIONAL MEASURES

The RI has revealed the heaviest contamination in groundwater to be localized within a small radius from monitoring well OW3 and at the bedrock-overburden interface. The boring log for OW3 indicates a loss of circulating water at the bottom of OW3 during drilling. This suggests a higher yielding zone near the bedrock-overburden interface. Therefore, along with the construction of the remedial alternative, Ferroxcube will study the feasibility of increasing the yield of OW3 by cleaning it, increasing its diameter, or going deeper.

Ferroxcube will submit a proposal to "mop up" the contamination in the bedrock if the operation of the overburden system does not produce an appreciable improvement in the groundwater quality. In any case, the bedrock aquifer will be actively treated when the concentration at recovery well OW3 decreases to a concentration equal to that at the Knicely or Miles well, whichever is higher.

VIII. POST CONSTRUCTION MONITORING

The effectiveness of the remedial action will be monitored by periodic analysis of the drinking and ground water. Additionally, the concentrations of contaminants in and the volume of gases and groundwater, before and after treatment, will be measured. An annual review of the data will be undertaken to determine whether groundwater quality standards will likely be met within the five years and to determine the need for any additional work. In making this assessment, two key readings from the Miles well——annual maximum concentrations of Perchloroethene and total VOC——will be compared with the theoretical concentrations as noted below.

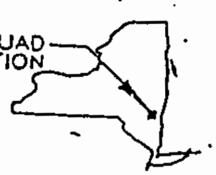
No. of Years of Remedial Operation	Theoretical Concentration of PCE (ppb)	Theoretical Concentration of Total VOC (ppb)
1	200	875
2	80	510
3	30	295
4	15	170
5	5	100

The present arrangement for treating, sampling, and analyzing the drinking water of the affected homeowners' wells will continue until the Ulster County and New York State Health Departments decide to terminate it, or until an alternate water supply is made available to the homes.

APPENDIX A

List of Figures

SOURCE: U.S.G.S. TOPOGRAPHIC QUADRANGLE
SAUGERTIES, N.Y. QUADRANGLE
7.5 MINUTE SERIES
DATE: 1963/REVISED 1978



SCALE 1:24,000

0 2,000 4,000

SCALE FEET

N

GROUNDWATER TECHNOLOGY

12 WALKER WAY
ALBANY, NY 12205
(518)456-2444

DESIGNED: RAH	PHILIPS/SAUGERTIES	
DETAILED: MET	CLIENT: PHILIPS COMPONENTS	DRAWING DATE: 6/26/92
CHECKED:	LOCATION: 5083 KINGS HIGHWAY SAUGERTIES, NEW YORK	FIGURE: 1

Fig. A-1

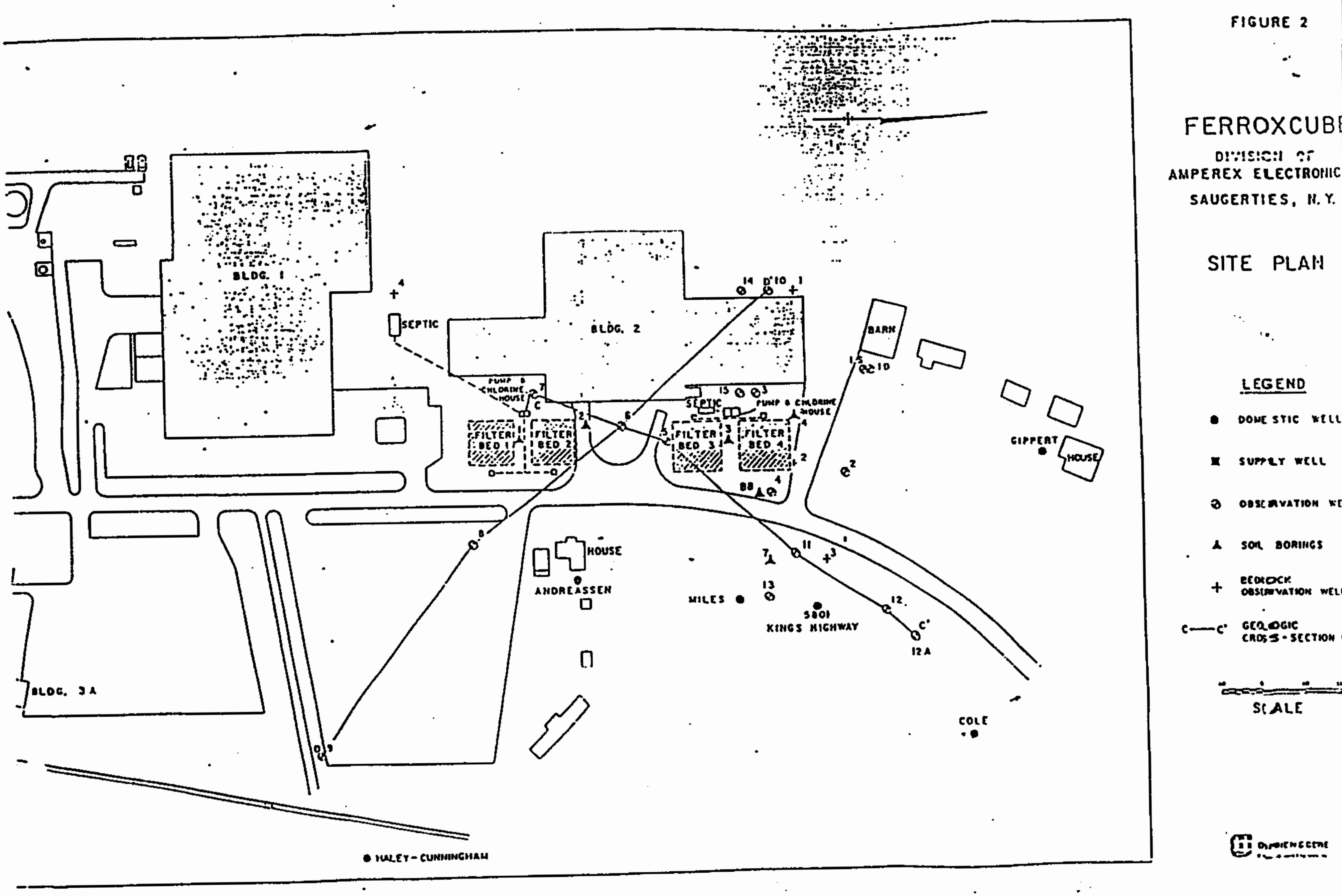


FIGURE 2
FERROXCUBE
DIVISION OF
AMPEREX ELECTRONIC
SAUGERTIES, N.Y.
SITE PLAN
LEGEND
DOMESTIC WELL
SUPPLY WELL
OBSERVATION WE
SOIL BORINGS
BEDROCK OBSERVATION WELL
C—C' GEOLOGIC CROSS-SECTION
SCALE
BLDG. 1
BLDG. 2
BLDG. 3A
SEPTIC
PUMP & CHLORINE HOUSE
FILTER BED 1
FILTER BED 2
FILTER BED 3
FILTER BED 4
BARN
GIPPERT
HOUSE
ANDREASSEN
MILES
5801 KINGS HIGHWAY
COLE
HALEY-CUNNINGHAM

Fig. A-2

FERROXCUBE - PRIVATE WELLS RESULTS

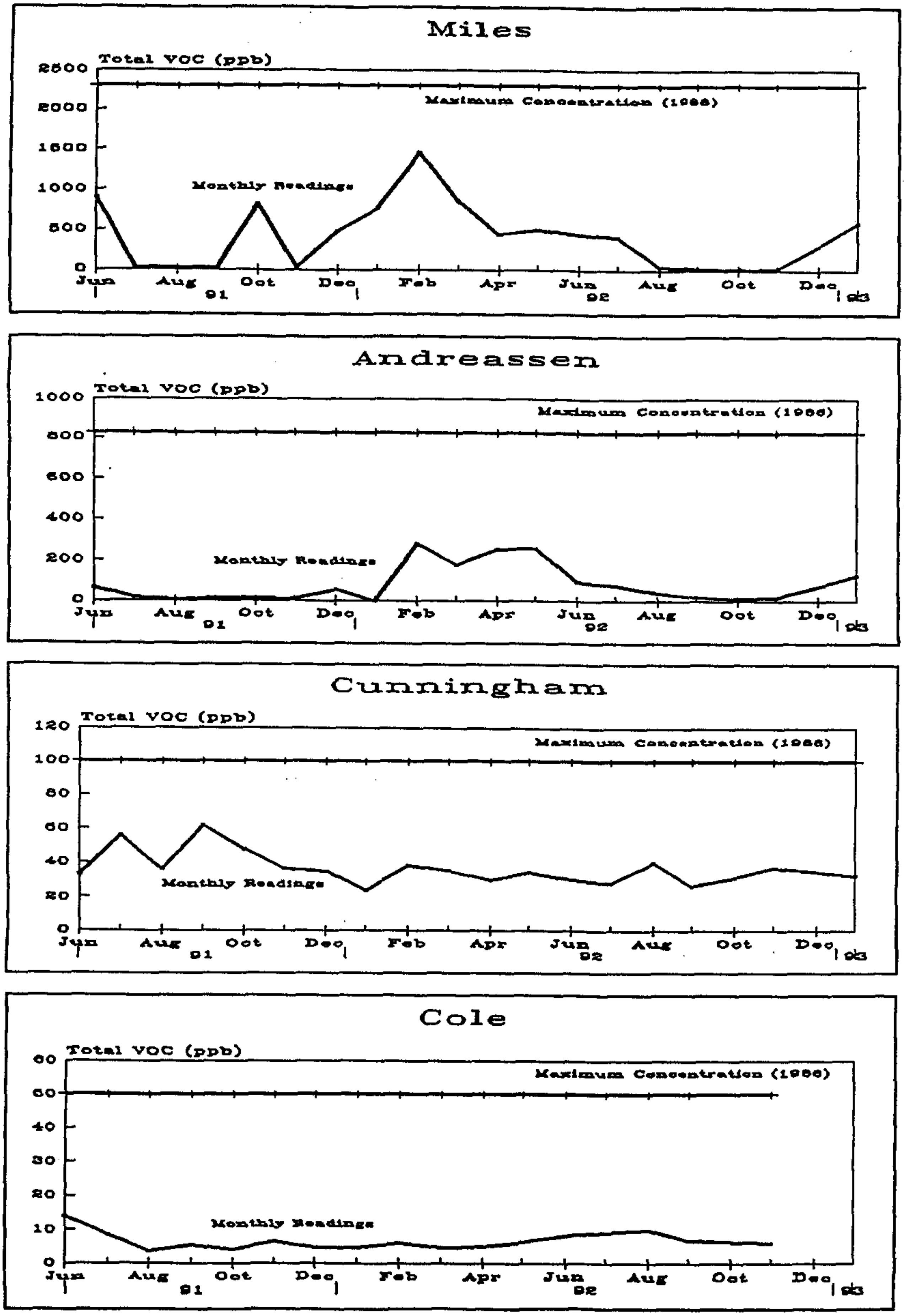


Fig. A-3

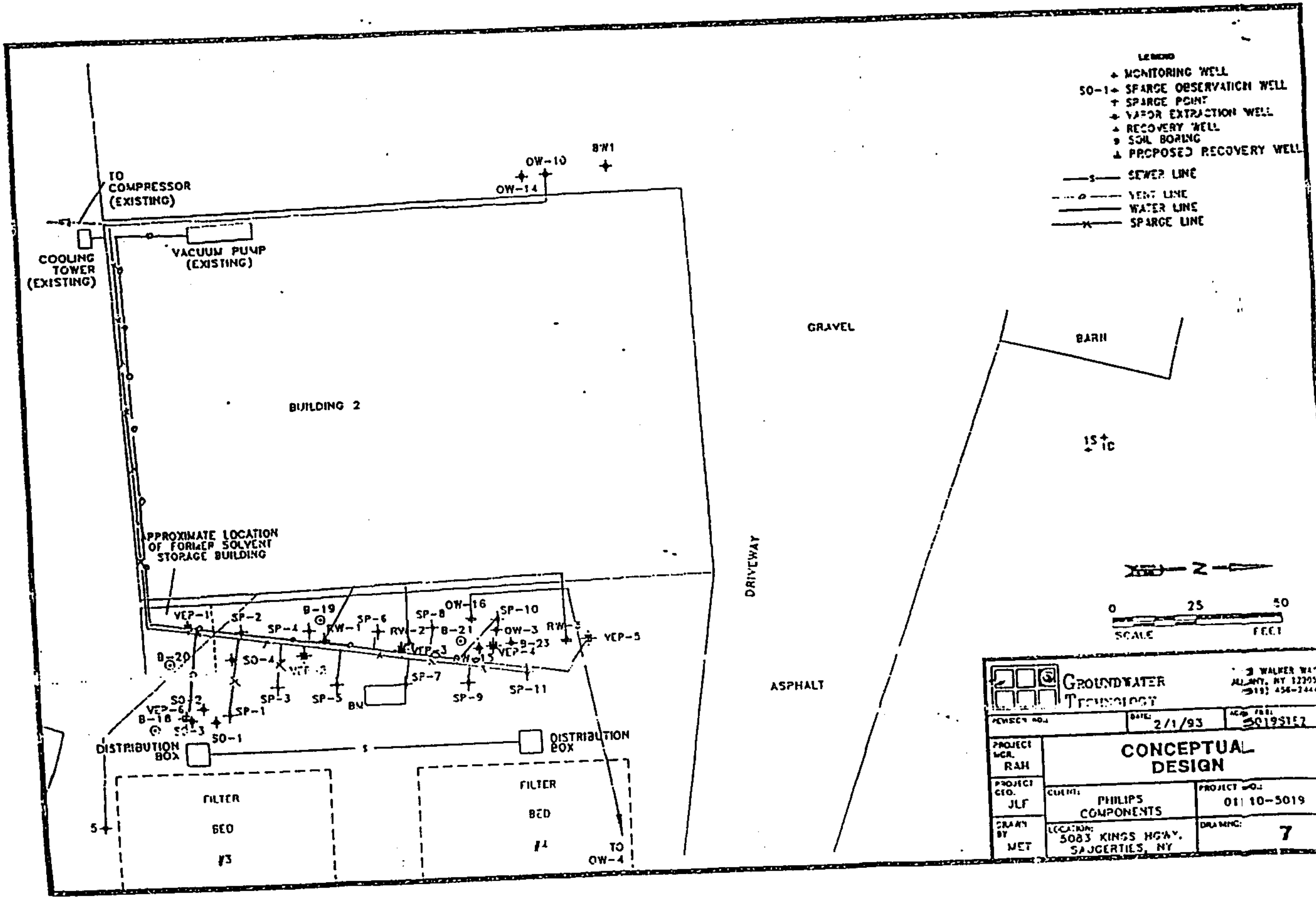

LEGEND
MONITORING WELL
SO-1 SPARGE OBSERVATION WELL
SPARGE POINT
VAPOR EXTRACTION WELL
RECOVERY WELL
SOIL BORING
PROPOSED RECOVERY WELL
SEWER LINE
VENT LINE
WATER LINE
SPARGE LINE
TO COMPRESSOR (EXISTING)
COOLING TOWER (EXISTING)
VACUUM PUMP (EXISTING)
OW-10
OW-14
BW1
BUILDING 2
GRAVEL
BARN
DRIVEWAY
ASPHALT
APPROXIMATE LOCATION OF FORMER SOLVENT STORAGE BUILDING
VEP-1
SP-2
SP-4
B-19
RW-1
SP-6
RW-2
SP-8
B-21
OW-16
SP-10
OW-3
RW-3
VEP-5
B-23
VEP-4
VEP-3
OW-15
B-20
SO-4
SP-3
SP-5
SP-7
SP-9
SP-11
SP-1
SO-2
VEP-6
B-18
SO-3
SO-1
DISTRIBUTION BOX
DISTRIBUTION BOX
FILTER BED #3
FILTER BED #4
TO OW-4
N
0
25
50
SCALE
FEET
GROUNDWATER TECHNOLOGY
2/1/93
CONCEPTUAL DESIGN
PROJECT MGR. RAH
PROJECT GEO. JLF
DRAWN BY MET
CLIENT: PHILIPS COMPONENTS
LOCATION: 5083 KINGS HGWY. SAUGERTIES, NY
PROJECT NO.: 01110-5019
DRAWING: 7

Fig. A-4

APPENDIX B

List of Tables

EVALUATION OF SOIL TREATMENT TECHNOLOGIES

ALTERNATIVE	TECHNICAL EFFECTIVENESS	FEASIBILITY	RELATIVE COST	SUMMARY
SOIL VAPOR EXTRACTION	Rapid & effective in situ method for removal of volatile hydrocarbons from the subsurface.	System may be installed rapidly and with relative ease.	Low capital costs & maintenance.	Highly effective method for volatile hydrocarbons. Has application at site for shallow zones.
SOIL FLUSHING WITH WATER OR SURFACTANT	Surfactant or water used to reduce interfacial tensions of target compounds. This leads to increased mobility and eventual recovery.	Selection of surfactant is key factor. Hydraulic control of recovery system is a key factor. Pilot studies of this technology are in progress.	Cost directly related to number of flushings required and area to be remediated.	Difficulty in establishing/maintaining hydraulic control would impact ability to control surfactant after injection at this site. Method not proven.
AIR SPARGING	Causes movement of volatile compounds towards surface, speeding extraction process.	May enhance recovery and require shallow recovery wells.	Moderate to high cost & maintenance.	Very effective method to remove volatile fraction below the water table.
SOIL EXCAVATION AND OFF-SITE DISPOSAL	Complete excavation of all soils would be required to remove source area.	Disposal subject to landfill requirements; shoring and dewatering may be required for extensive excavation.	Unit costs high	Liability of waste material is transfered off-site, unless incinerated. Potential volumes of soil to be generated could represent high cost or future off-site liability.
IN-SITU OR EX-SITU BIOTREATMENT TECHNOLOGIES	Beneficial usage of indigenous bacterial populations to degrade organic compounds in the surface.	Petroleum Compounds readily degradable. Chlorinated organic compounds are resistant to biodegradation. Co-metabolism with other readily degradable carbon sources has been demonstrated (petroleum, methane).	Costs usually low to moderate.	Effectiveness uncertain, dependent on VOC types and concentrations present in source-area soils.

Table B-1

EVALUATION OF GROUNDWATER TREATMENT TECHNOLOGIES

ALTERNATIVE	TECHNICAL EFFECTIVENESS	FEASIBILITY	RELATIVE COST	SUMMARY
AIR STRIPPING SYSTEMS	Rapid & effective removal of volatile organic compounds from water. Volatilization occurs through mass transfer of compounds in water to air through bed of packing material.	Air stripping technology and equipment are readily available. Off-gas treatment may be required.	Air stripping costs relatively low; Off-gas treatment can be relativley high.	Effective method for removal of volatile compounds from ground water; may be cost-effective at this site dependent upon VOC concentrations. in source area groundwater.
ACTIVATED CARBON FILTRATION SYSTEMS	Effective removal of many organic compounds from waste water streams.	Carbon units readily available in various flow rate capacities.	Relatively low capital costs; operating and maintenance costs become relatively high as organic influent loading increases.	High organic influent concentrations in ground water could potentially produce high capital costs for this technology.
RECOVERY WELLS/ PUMPING SYSTEMS	Pumping systems create cones of ground water depression, allowing the capture, extraction, and treatment of ground water.	Properly designed well/pump systems produce effective ground water containment in aquifers of sufficient permeability.	Multiple well/pump systems can become relatively expensive in terms of capital and operating costs.	Appears to offer an effective groundwater containment/capture method at this site.
INTERCEPTOR TRENCH SYSTEMS	Interceptor trenches create paths for preferential ground water migration by the excavation and removal of soils and replacement with material of greater permeability.	Construction of interceptor trenches at depth below the water table is difficult. Shoring and dewatering of the excavation may be required.	Shoring and dewatering can become expensive at great depths. Disposal of waste soil can also be costly.	Trenching is a potentially feasible alternative depending upon the depth of the groundwater table.
BIOSCAVENGER SYSTEMS	Fixed-film bioreactors employ microbial degradation to destroy organic compounds in waste water streams.	Units are currently available with several design flow rates.	Capital and maintenance costs are moderate.	Bacterial degradation for petroleum hydrocarbons is well documented. Use of bacteria to degrade chlorinated organic compounds has not been sufficiently documented to-date.

Note - If separate-phase compounds are encountered, corrective measure technologies will be evaluated.

Table B-2

EVALUATION OF AIR TREATMENT TECHNOLOGIES

ALTERNATIVE	TECHNICAL EFFECTIVENESS	FEASIBILITY	RELATIVE COST	SUMMARY
VAPOR-PHASE CARBON FILTER UNITS (DISPOSABLE OR REGENERABLE)	Organic compounds in vapor streams can be effectively transferred to adsorbent material.	Several different systems are readily available. Steam regeneration of carbon on-site is available.	Systems are moderate to expensive in terms of capital or maintenance costs.	Regenerable carbon systems currently offer advantages in cost and effectiveness.
CATALYTIC INCINERATION	Can produce high VOC destruction rates in vapor streams.	Problems with catalyst material compatibility with chlorinated compounds have been experienced.	Systems are typically expensive in terms of capital cost; can be offset by lower maintenance costs (relative to carbon).	Reliability currently problematic; new catalysts under development have promise.

Table B-3

APPENDIX C

Responsiveness Summary

RESPONSIVENESS SUMMARY

Remedial Action Plan
Ferroxcube Inactive Hazardous Waste Disposal Site (356011)

INTRODUCTION:

This document summarizes comments and questions received by New York State Department of Environmental Conservation (DEC), during a 30 day public comment period, regarding the Proposed Remedial Action Plan (PRAP) for the Ferroxcube Inactive Hazardous Waste Site (356011). A public meeting was held by DEC and New York State Department of Health (DOH) on March 11, 1993 at the Senior Citizens Building in Saugerties, New York to present the results of the investigations performed at the site and describe the proposed remedial action. The remedial alternative selected in the PRAP (Alternative 2) includes the use of air sparging, soil venting and groundwater pump and treat systems to remove contaminants in the soil, soil vapor and groundwater.

The questions and responses given below are summarized from the transcript of the public meeting and the following written comments:

1. Letter dated March 15, 1993 from Barbara L. Budik, resident, to DEC, Region 3, regarding surface water discharges. Attached to this letter is a letter dated March 15, 1993 from Barbara L. Budik, resident, to Joseph L. Wolf, Jr., Philips Components, regarding provision of alterriate water supply to homeowners.

2. Letter dated March 17, 1993 from Joseph L. Wolf, Jr., Manager Environmental Affairs, Philips Components to Ramanand Pergadia, DEC, regarding the proposed remedy.

3. Letter dated March 19, 1993 from Laura Zeisel, Attorney and Counselor at Law to Ramanand Pergadia, DEC, regarding an extension of the public comment period and provision of an alternate water supply to the affected homeowners.

Copies of the transcript of the meeting and the written comments are available for public review at the document repositories for the site.

QUESTIONS AND RESPONSES:

The Responsiveness Summary has been organized so that similar questions and comments are grouped together.

Q1: If one of the criteria used to select a remedy is protection of human health and there are four homeowner wells contaminated with halogenated solvents, why doesn't the proposal require the provision of an alternate drinking water supply?

R: DEC's proposal does not require the provision of an alternative drinking water supply because there are measures currently in place to ensure that the homeowners are not exposed to contaminants at levels above DOH drinking water standards. Philips Components, the site owner, has installed granular activated carbon (GAC) filters on each of the affected wells. Since the filters bring the contaminants within DOH drinking water standards, the current remedy is considered to be protective of human health.

In addition, the proposed remedial action addresses the long term goal of restoring the groundwater to groundwater and drinking water quality standards. The remedial action will stem the migration of contaminants from the source at the site to the homeowners wells, over an estimated period of five years. This action will reduce the contamination in the groundwater to a level that would render the groundwater potable to the homeowners.

It should be noted that although Philips Components will not be required to provide an alternative water source at this time, Philips Components has approached Saugerties Water Sewerage Commission concerning the feasibility of extending the village water line to the affected homes.

Q2: What are the DOH drinking water standards? Are the standards set for individual substances or for total contaminants?

R: The drinking water standards for Public Water Supply are contained in the New York State Sanitary Code Part 5. The standard for most of the principle organic contaminants is 5 parts per billion (ppb) each. The standard for total contaminants is 100 ppb.

Q3: Why did DOH rule out inhalation as a possible "route of exposure?"

R: When determining routes of exposure, DOH looks at the various ways that the public could come in contact with site contaminants. The environmental data from the site suggests that the primary means of coming into contact with contaminants from Ferroxcube is from groundwater, and, therefore, the principle route of exposure is through ingestion. Inhalation while showering or bathing would be a possibility if GAC filters were not in place.

Q4: Could the water in the homeowners' basements be contaminated, and if so is there a risk of exposure by inhalation?

R: It is unlikely that the water in the basement is contaminated from the site; the water is most probably surface runoff from precipitation, rather than groundwater from the bedrock into which the contamination has migrated.

Q5: Did the groundwater studies conducted at the site define the extent of the contamination plume?

R: There were numerous studies conducted at the site since 1983. The information provided by these studies indicate that the plume in the soil above the bedrock is within the boundary of the Ferroxcube site. This has been charted by the numerous monitoring wells on the site; the wells on the boundary of the property show little or no contamination.

On the other hand, the contamination plume in the bedrock, which is affecting the homeowners wells, has not been fully defined. Since the pathways in the bedrock are through fractures, faults, or bedding planes, they are much more difficult to define than those in the soil. However, the concentrations of contaminants in the homeowners wells, that are spread out over a large area, provide a good indication of the extent of the contamination.

Q6: Has anyone looked into drilling wells, deeper than the affected homeowners wells and away from the plume, to form a small municipal system? Would there be a problem if an individual homeowner wanted to drill a private well?

R: It is inadvisable to tap into bedrock aquifer that has contamination nearby. As noted above, the migration paths in the bedrock are difficult to map, and without the surety of completely isolating a new well from any pathways, there is always the probability of drawing contaminated water into the new system.

It is also important to note that a new well will change the dynamics of the groundwater flow and affect the distribution of contamination in the groundwater.

Q7: If seasonal high water levels bring "slugs" of contamination to homeowner wells, is there any means of controlling the high groundwater?

R: It is the high groundwater at the source, i.e. the Ferroxcube site, that is the probable cause of the "slug" release. The remedial action will be an attempt to lower the groundwater table at the source, through the addition of five pump and treat wells, by increasing the extraction rate of the contaminated groundwater. With the lowering of the groundwater table, at the source, the release of the contaminant slug into the groundwater should be diminished.

Q8: What is the cone of influence of the pump and treat wells?

R: The RI/FS has estimated the cone of influence in the soil due to each of the wells in the pump and treat system. However, the cone of influence in the bedrock due to this withdrawal or due to enhancements in the capacity of OW3 has not been defined. It should be noted that the concept of cone of influence does not readily apply to bedrock; this terminology is more often used in discussing the behavior of homogeneous material like soil.

Q9: Was Alternative 2 (the preferred remedy from the PRAP) the one which was originally proposed by Groundwater Technology, the consultants to Philips Component?

R: Yes, Alternative 2 is essentially the same as Groundwater Technology's recommendation in its July 24, 1992 and February 4, 1993 RI/FS reports. DEC's remedial action, however, requires additional study for increasing recovery well yield, and includes provisions for future bedrock study as needed.

Q10: Shouldn't the active treatment of the bedrock aquifer be deferred until the remedial action proves to be ineffective?

R: Active treatment of the bedrock aquifer will not begin until the need for such action is evaluated using the following criteria: 1) If the contaminants in the Miles and the Knicely wells reach standards within five years, there will be no need to treat the bedrock aquifer. As the concentration of contaminants in the overburden decreases through active remediation (as shown in well OW-3), there will be a corresponding decrease in the contaminants in the bedrock (as will be manifested in the Miles and Knicely wells). 2). If, prior to the standards being achieved in the Miles and Knicely wells, the overburden concentrations fall below the bedrock concentrations, active remediation of the bedrock would be necessary. It can be concluded at that stage that the bulk of the residual contamination is outside the influence of the remedial system for the overburden.

Q11: Since the GAC filter system provides a permanent solution for the homeowners and effectively eliminates any associated risk, DEC's statement that an indefinite use of the treatment system poses an unwarranted risk is inappropriate.

R: While GAC is proven method for treating the contaminants encountered at the site, the maintenance of the system does require close monitoring. In order to avoid any lapse in this regard, it is advisable to reduce the period for which the system is needed by expediting the groundwater cleanup.

Q12: Is monitoring well OW3 the only "hot-spot" on the Ferroxcube site?

R: Investigations have been conducted at the site for several years and the site has been fully characterized. These investigations lead to the conclusion that the contamination at the facility is presently localized near this monitoring well.

Q13: How many SPDES (State Pollution Discharge Elimination System) permits does the facility have? Are the discharges to the Mudderkill routinely monitored for volatile organic compounds (VOC)?

R: The facility has four SPDES discharge points numbered 1,3,4, and 6. Points 3 and 4 are for the discharges from the sewage treatment units, and number 6 is from the carbon filter unit for the groundwater remediation system. The three discharges combine and flow out through the SPDES outfall No. 1, principally meant for the industrial wastewater treatment (IWT) plant. Outfalls numbers 2 and 5 are no longer in use. Discharge qualities for each of the points are specified, monitored, and reported separately. These reports are submitted to the DEC for review as stipulated in the permits. VOCs are included in the list of compounds to be monitored.

Q14: What was the composition of the material that violated the facility's SPDES permit on January 9, 1993? Was this material tested for VOC's?

R: The violation related to a change in the characteristic of the wastewater passing through Philip Components' treatment facility which altered the effectiveness of treatment additives. This malfunction caused a slight discoloration in the discharge. Philips Component has settled the fine imposed for introducing visual contrast in the quality of discharge. The stripping of the volatile organic compounds (VOC) from the remedial system takes place in the facility's cooling tower. The water from the cooling tower is further "polished" by running it through a carbon filter. The effluent is then passed through the IWT to make use of a common discharge pipe and SPDES outfall. A malfunction in IWT would not significantly affect the stripping of the VOCs.

The discharge was not tested for VOC at this January 9, 1993 incident.

Q15: Has the Mudderkill been sampled downgradient of the SPDES outfall?

R: Based on requests received at a public meeting held by DEC in November, 1991, a sample of the water from Mudderkill was taken and analyzed. No site-related contaminants were detected.

Q16: The Cole property should be removed from the discussion in the PRAP/ROD because the concentrations are below standards.

R: While it is true that the concentrations are generally below standards, the well has been impacted by the release from the site. The fluctuations in the concentrations are large enough that the well needs continued monitoring.

Q17: Will DEC extend the public comment period to March 31, 1993? The commentor noted that Philips Components did not provide copies of site documents (including the PRAP) to interested parties in an on-going litigation until the public meeting and additional time is necessary to fully review the proposal.

R: The comment period was not extended. Although a personal copy of the site documents may not have been provided to the commentor in a timely fashion by Philips Components, copies of the same documents were available for public review at the local document repositories (Saugerties Town Hall and DEC's Region 3 Office) during the 30-day public comment period. All persons on the mailing list for the site were notified of the availability of the PRAP, the date and time of the public meeting, the timeframe of the comment period and the location of the document repositories. In addition, the individual requesting the extension was provided a copy of the PRAP with the public meeting notification at the beginning of the comment period.

Q18: What is the duration of the post-contstruction monitoring?

R: The duration of monitoring will extend until the drinking water meets the health standards. The program will then continue until groundwater quality standard is reached, or when the comprehensive review of data, to be conducted every five years, indicates that the termination of the monitoring program will not subject the public health or environment to adverse impact from the site contamination.

Q19: Why is it necessary to monitor the quantity of and concentrations in the gases and groundwater before and after treatment in the remediation system. Shouldn't the analytical data from the homeowners' wells be sufficient to determine the effectiveness of the remedy?

R: The data on the remedial system's performance are essential in determining the system's effectiveness and in making mid-course corrections, if needed.

Q20: Will the public be invited to participate in the annual review of the monitoring data and progress on cleanup.

R: Yes. All data will be made available to the public for information. Proposals for significant changes to the remedial action will be made available to the public for review and comments.

Q21: What is the time frame for remediation?

R: The timetable to begin the remediation will be defined in the Consent Order for the Remedial Design and Construction. Once the remedial system is in place, it is anticipated that the cleanup of drinking water would be achieved in five years.

Q22: Is the five year time frame for remediation of the homeowners wells a projection or a goal?

R: This is a goal.

APPENDIX D

List of Documents in the Administraive Record.

DOCUMENTS IN THE ADMINISTRATIVE RECORD

Date	Description
08 Apr 91	Conceptual Remedial Action Plan
29 Apr 91	Building 3 Study
20 Jun 91	Source Area Assessment and Initial Pilot Test Work Plan
05 Dec 91	Remedial Investigation/Feasibility Study (RI/FS) Work Plan (Vols I-V)
24 Jul 92	RI/FS and Treatability Study Report (Vols I & II)
04 Feb 93	RI/FS. Additional Site Characterization Report

Note: All the above reports prepared by Groundwater Technology for Ferroxcube.