The electronic version of this file/report should have the file name:

Type of document.Spill Number.Year-Month.File *Year-Year* or Report name.pdf

letter.______________._______-_____.File spillfile ___.pdf

report.hw907016 . 1993 -03-31. REMEDIAL INVESTIGATION / FEASIBILITY STUDY.pdf

Project Site numbers will be proceeded by the following:

Municipal Brownfields - b
Superfund - hw
Spills - sp
ERP - e
VCP - v
BCP - c

non-releasable - put .nf.pdf
Example: letter.sp9875693.1998-01.Filespillfile.nf.pdf

907016 Entered

REMEDIAL INVESTIGATION/FEASIBILITY STUDY

PRELIMINARY EVALUATION OF REMEDIAL TECHNOLOGIES AND NEED FOR TREATABILITY STUDIES

TECHNICAL MEMORANDUM NO. 2

VacAir Alloys Division

Frewsburg, New York

PRINTED ON

MAR 3 1 1993

REMEDIAL INVESTIGATION/FEASIBILITY STUDY

PRELIMINARY EVALUATION OF REMEDIAL TECHNOLOGIES AND NEED FOR TREATABILITY STUDIES

TECHNICAL MEMORANDUM NO. 2

VacAir Alloys Division

Frewsburg, New York

MARCH 1993

REFERENCE NO. 2326 (18)

CONESTOGA-ROVERS & ASSOCIATES

This report has been printed on recycled paper.

LIST OF TABLES
(Following Report)

TABLE 4.1	IDENTIFICATION OF RESPONSE ACTIONS, TECHNOLOGIES AND PROCESS OPTIONS
TABLE 4.2	INITIAL SCREENING OF POTENTIAL GROUNDWATER REMEDIATION TECHNOLOGIES
TABLE 4.3	INITIAL SCREENING OF POTENTIAL SOIL REMEDIATION TECHNOLOGIES
TABLE 4.4	INITIAL SCREENING OF POTENTIAL SURFACE WATER REMEDIATION TECHNOLOGIES
TABLE 4.5	INITIAL SCREENING OF POTENTIAL SEDIMENT REMEDIATION TECHNOLOGIES
TABLE 4.6	INITIAL SCREENING OF POTENTIAL AMBIENT AIR REMEDIATION TECHNOLOGIES
TABLE 4.7	RESULTS OF INITIAL SCREENING GROUNDWATER REMEDIATION TECHNOLOGIES
TABLE 4.8	RESULTS OF INITIAL SCREENING SOIL REMEDIATION TECHNOLOGIES
TABLE 4.9	RESULTS OF INITIAL SCREENING SURFACE WATER REMEDIATION TECHNOLOGIES
TABLE 4.10	RESULTS OF INITIAL SCREENING SEDIMENT REMEDIATION TECHNOLOGIES
TABLE 4.11	RESULTS OF INITIAL SCREENING AMBIENT AIR REMEDIATION TECHNOLOGIES

LIST OF FIGURES
(Following Report)

FIGURE 1.1 SITE LOCATION

FIGURE 1.2 VACAIR PROPERTY BOUNDARY

TABLE OF CONTENTS

			Page
1.0	INTRODUCTION		1
2.0	SITE CONDITIONS AND MEDIA OF CONCERN		3
	2.1	GENERAL	3
	2.2	HAZARDOUS CONSTITUENTS AND MEDIA OF CONCERN	3
	2.2.1	Soils	4
	2.2.2	Groundwater	4
	2.2.3	Surface Water/Sediments	5
3.0	GENERAL RESPONSE ACTIONS		6
	3.1	GENERAL	6
	3.2	NO FURTHER ACTION	6
	3.3	LIMITED FURTHER ACTION	7
	3.4	CONTAINMENT	7
	3.5	COLLECTION	8
	3.6	TREATMENT	9
	3.7	DISPOSAL	10
4.0	IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS		11
	4.1	IDENTIFICATION OF REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS	11
	4.2	SCREENING OF REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS	11
	4.3	SUMMARY	13
5.0	EVALUATION OF NEED FOR TREATABILITY STUDIES		15
	5.1	GENERAL	15
	5.2	GROUNDWATER AND SURFACE WATER	16
	5.3	SOILS AND SEDIMENT	16
	5.4	SUMMARY	17

1.0 INTRODUCTION

The VacAir Alloys Division of the Keywell Corporation (VacAir) owns and operates a high grade scrap metal processing plant site (Site) located on the outskirts of Frewsburg, New York (see Figures 1.1 and 1.2). The Site occupies approximately 15 of the 93 acres forming the VacAir property. The Site is located adjacent to the Conewango Creek and the former Frewsburg Municipal Water Supply Wells. The remaining 78 acres consist of undeveloped lowlying and wooded areas.

In the fall of 1992, Keywell began implementation of a Remedial Investigation/Feasibility Study (RI/FS) program at the Site in accordance with the New York State Department of Environmental Conservation (NYSDEC) approved RI/FS Work Plan dated August 24, 1992 and associated documents.

The approved RI/FS Work Plan included a preliminary evaluation of the need, if any, for treatability studies to evaluate potential remedial technologies and process options as RI Task 10. This evaluation was conducted in concurrence with the initial identification and preliminary screening of remedial technologies and process options (FS Task 2). The screening of remedial technologies and process options was based on the existing Site conditions and preliminary remedial action objectives (RAOs).

The following report presents the identification of potentially applicable remedial technologies and process options, the preliminary screening of the remedial technologies and process options and the evaluation of the need for treatability studies to support the detailed analysis of the remedial technologies under the FS.

2.0 SITE CONDITIONS AND MEDIA OF CONCERN

2.1 GENERAL

The principal investigative activities conducted at the Site consisted of the Site Investigation (SI) program implemented in 1990-1991, the groundwater Interim Remedial Action (IRA) program, and the Remedial Investigation (RI) program currently underway. The results of these investigations were previously presented in the SI report (CRA, 1991), the IRA report (CRA, 1992) and summarized in the report entitled, "RI/FS Preliminary Remedial Action Objectives, Technical Memorandum No. 1", dated February 1993.

For ease of reference, the hazardous constituents and media of concern at the Site are presented.

2.2 HAZARDOUS CONSTITUENTS AND MEDIA OF CONCERN

The investigative work conducted to date has shown that soil, groundwater, surface water and sediment contamination attributable to the Site has occurred. The following sections present a summary of the hazardous constituents detected in the affected media.

2.2.1 Soils

Soils at the Site contain elevated levels of volatile organic compounds (VOCs), metals and total petroleum hydrocarbon (TPH). The primary VOCs of concern are trichloroethene (TCE) and its degradation product 1,2-dichloroethene (1,2-DCE).

Elevated levels of metals in the soils are attributable to the presence of metallic chips, turnings and debris found in the fill beneath the Site. Metals detected above background include cadmium, chromium, cobalt, copper, iron, lead, nickel, vanadium, and manganese.

TPH was detected at elevated levels in soils. Low levels of polychlorinated biphenyls (PCBs) were also detected.

2.2.2 Groundwater

Two aquifers occur beneath the Site, the Water Table Aquifer and the Frewsburg Aquifer. Groundwater in the Water Table Aquifer beneath the Site is contaminated primarily with TCE, 1,2-DCE, vinyl chloride, and isolated elevated levels of 1,1-dichloroethene (1,1-DCE). Several metals, including lead, iron, manganese, and magnesium also exceed New York State Groundwater Standards in the Water Table Aquifer. However, only lead is considered a hazardous constituent.

The Frewsburg Aquifer was sampled and analyzed during the SI and IRA and also by the New York State Department of Health (NYSDOH). TCE was detected above the drinking water standard of 5 μg/L in both Frewsburg District Production Wells #1 and #2A in September 1991. Use of these wells was subsequently discontinued.

2.2.3 Surface Water/Sediments

Surface water and sediments at the Site and immediately north of the Site contain elevated levels of VOCs including TCE, 1,1-DCE, 1,2-DCE, and vinyl chloride. The highest concentrations of these contaminants are located in groundwater seeps, sediments, and surface waters on the embankment between the Site perimeter fenceline and the swampy area north of the Site.

Several metals including cadmium, chromium, lead, and mercury are also constituents of the Site surface waters and sediments.

3.0 GENERAL RESPONSE ACTIONS

3.1 GENERAL

General response actions are medium-specific remedial approaches which encompass those actions that will satisfy the preliminary RAOs. General response actions may include treatment, containment, excavation, extraction, disposal, institutional actions, or a combination of these, if required, to address varied Site environmental problems and to be effective in meeting all of the preliminary RAOs. The general response actions evaluated are described in the following sections.

3.2 NO FURTHER ACTION

The no further action response is primarily used as a basis for comparison with other alternatives. Under the no action response, no measures are taken to improve environmental conditions at the Site, however, monitoring does continue to be conducted, as appropriate. This response does not reduce the volume, mobility or toxicity of the hazardous constituents of the Site media. No action measures may include implementation of a Site emergency response program and/or implementation of monitoring programs intended to inform the public and Site personnel and provide a database for evaluation of changes in Site conditions.

3.3 LIMITED FURTHER ACTION

Limited further action responses are not intended to reduce the toxicity, mobility or volume of hazardous site constituents but to reduce the potential of human and wildlife exposure to those constituents. Limited further action options may include implementation of a long-term monitoring program to track contaminant migration and transport, and initiation of institutional controls to restrict or limit the use of the Site or the contaminated media.

3.4 CONTAINMENT

The containment response does not reduce the volume or toxicity of the contaminants in the Site media. The purpose of this response is to reduce contaminant mobility, and in doing so, limit exposure and reduce potential hazards at the Site. Periodic monitoring is necessary following implementation of the containment response to determine its effectiveness and evaluate the need for further action.

Groundwater containment technologies include construction of subsurface vertical barriers to control groundwater migration and impermeable or low permeability surface barriers to control surface water infiltration.

Soil containment technologies include surface barriers also, which are intended to retard contaminant migration upward to the ground surface. Process options identified as applicable to the Site include permeable surface barriers and low permeability surface barriers.

3.5 COLLECTION

The collection response is not intended to reduce the volume of the collected contaminated media. Use of the collection technologies, however, reduce the mobility and toxicity of Site contaminants by removal and storage at a secure location. These technologies provide no treatment of contaminated media but may be used in conjunction with a disposal and/or treatment option to meet the Site goals and objectives.

Soil collection technologies identified as potentially applicable to the Site include the technologies commonly used in the excavation of soils. These technologies are necessary for implementation of disposal and several treatment alternatives.

Groundwater collection technologies identified as potentially applicable to the Site include horizontal subsurface collection drains and extraction wells. Collection drains are generally most effective at shallow depths and in highly permeable soils, and when a low permeability confining lower layer of soil exists. Under these conditions, a collection drain would be installed at the surface of the confining layer where the most effective hydraulic influence could be created.

Extraction wells are sometimes used for shallow groundwater removal, however, they are typically used in deeper overburden and bedrock installations when collection drain installations are considered unfeasible and unimplementable.

3.6 TREATMENT

The purpose of a treatment technology, when used alone or in conjunction with a collection technology, is to reduce the volume, toxicity and/or mobility of Site contaminants. Remedial treatment technologies include biological, physical, chemical, and thermal processes or some combination of those processes (e.g., physical/thermal treatment).

The soil treatment options designed to remove, destroy or concentrate contaminants include biodegradation, vacuum extraction, soil flushing, passive adsorption, aeration, soil washing, thermal desorption, and incineration.

The groundwater treatment technologies are also intended to remove, destroy or concentrate contaminates and include activated carbon treatment, air stripping, oxidation, biodegradation, air sparging, and passive adsorption. These technologies are further described on Table 1 and evaluated based on their applicability to the various contaminated media at Site.

3.7 DISPOSAL

Disposal technologies involve off-Site or on-Site disposal of contaminated media or products of treatment processes. Disposal technologies do not usually involve reduction of contaminant volume or toxicity, but are primarily intended to reduce contaminant mobility. Off-site disposal options include disposal at a permitted treatment, storage, and disposal facility (TSDF). Off-Site disposal options normally involve transportation of the waste to the TSDF, which, depending on the proximity of the TSDF, may result in very high capital costs.

On-Site soil and solids disposal options include construction and maintenance of a disposal cell for the placement of the soil/solids. On-Site treated water disposal options include surface water discharge, sewer discharge, and reinjection.

4.0 IDENTIFICATION AND SCREENING OF REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS

4.1 IDENTIFICATION OF REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS

Remedial technologies and process options are the detailed components of general response actions and may be grouped together as remedial alternatives. Potentially applicable remedial technologies and process options for each of the general response actions identified in Section 3.0 are presented on Table 4.1. Table 4.1 also contains a brief description of each process option. This master list identifies remedial technologies and response actions that reasonably may be expected to attain the potential SCGs identified in Technical Memorandum No. 1.

The process options and remedial technologies identified are subject to preliminary screening in the following sections.

4.2 SCREENING OF REMEDIAL TECHNOLOGIES AND PROCESS OPTIONS

This section presents the screening process designed to evaluate the remedial technologies and process options to determine their applicability to the Site. The screening process is detailed on Tables 4.2 through 4.6. The technologies were screened based on their relative effectiveness, implementability and cost as specified in the Work Plan and in a manner that is consistent with the National Oil and Hazardous Substance Pollution

Contingency Plan (NCP) and appropriate United States Environmental Protection Agency (USEPA) Guidance Documents.

The screening criteria are described as follows:

Effectiveness

Each process option identified was evaluated based on their effectiveness relative to other processes within the same remedial technology type. The effectiveness evaluation focuses on the following:

i) potential effectiveness of process options in handling the estimated volumes of media and meeting the preliminary RAOs for the Site;

ii) potential impacts on human health and the environment during construction and operation;

iii) how proven and reliable the process is with respect to the contaminants and conditions at the Site; and

iv) the ability of the process to cause a reduction in volume, toxicity, and mobility of Site contaminants.

Implementability

The implementability evaluation is used to assess each technology based on its overall ability to be workable and effective at the Site. Considerations such as available space for construction at the Site, ability to obtain necessary permits, the availability, capacity and proximity of TSDF services, and the availability of skilled workers and equipment were taken into account to evaluate implementability.

Cost

The relative cost for each technology and process option was developed based on engineering judgment and are evaluated as to whether costs are high, moderate, or low relative to other processes within the same technology type. In a case involving several different options within a technology group having similar degrees of effectiveness and implementability, the relative costs of the options were compared.

A summary of the results of the initial screening process is presented on Tables 4.7 through 4.11 for each media. The purpose of these tables is to indicate which particular process options satisfy the screening criteria, and may be used in developing the remedial alternatives. The results of this screening process are preliminary and may be subject to change pending evaluation of the results of the RI.

4.3 SUMMARY

A listing of technologies and process options retained for further elevation is presented in the following.

Media	*General Response Action*	*Technology Type*	*Process Option*
Groundwater	No Further Action	No Action	None
	Limited Further Action		Access Restrictions
			Long-Term Monitoring
	Physical Containment	Barrier Walls	Slurry Walls
	Hydraulic Containment/ Source Removal	Groundwater Extraction	Extraction Wells
			Collection Trenches
	Groundwater Treatment	Physical Treatment	Activated Carbon
		Chemical Treatment	Oxidation
	In-Situ Groundwater Treatment	Physical Treatment	Air Sparging
Soil	No Further Action	No Action	None
	Limited Further Action		Access Restrictions
	Physical Containment	Capping	Impermeable Cover
	In-Situ Treatment	Physical Treatment	Vacuum Extraction
		Chemical Treatment	Soil Flushing
	Removal and on-Site Treatment/Disposal	Thermal Treatment	Low Temperature Thermal Desorption
Surface Waters	No Further Action	No Action	None
	Limited Further Action		Access Restrictions
	Physical Containment and Collection		Drop inlets, Catchbasin
	On-Site Treatment	Physical Treatment	Activated Carbon
			Air Stripping
			Aeration
		Chemical Treatment	Oxidation
	Runoff Diversion/ Isolation		Swale and Culvert Reconstruction
Sediment	No Further Action	No Action	None
	Limited Further Action		Access Restrictions
	Removal and Treatment/ Disposal	Thermal Treatment	Low Temperature Thermal Desorption

5.0 EVALUATION OF NEED FOR TREATABILITY STUDIES

5.1 GENERAL

During the FS process, several remedial alternatives may be developed which involve process options of questionable effectiveness and implementability. In many cases, the effectiveness and implementability of a certain process option will differ from site to site due to varying contaminants of concern, layouts and geological conditions. Therefore, it may be desirable to conduct treatability studies to better predict actual performance of a remedial technology at a particular site.

Treatability studies usually consist of the construction and operation of bench or pilot scale models of the process options to be evaluated. The models are intended to estimate the performance of the full scale process so that further evaluations may be conducted in the FS.

The purpose of the treatability studies in the RI/FS is to provide sufficient data to allow treatment alternatives to be fully developed and evaluated during the detailed analysis and to reduce cost and performance uncertainties associated with these alternatives to acceptable levels (e.g., ±30 percent).

The process options which have passed the initial screening are evaluated in the following sections to make a preliminary determination of the need for treatability studies.

5.2 GROUNDWATER AND SURFACE WATER

The results of the initial screening of process options for groundwater and surface water appear on Tables 4.7 and 4.9, respectively, and are similar for the two media. The remaining options which, depending on the Site, could potentially require treatability studies include activated carbon treatment, air stripping, chemical oxidation, and air sparging.

All of these treatment process options are known to be effective in the remediation of TCE contaminated water in full scale operations. Data collected during the SI, IRA and on the Site waters is sufficient to determine effectiveness and implementability of the options.

For the retained groundwater and surface water treatment process options, no treatability studies are required to support the detailed analyses of remedial alternatives.

5.3 SOILS AND SEDIMENT

The results of the initial screening of process options for soils and sediments appear on Tables 4.8 and 4.10, respectively. The remaining process options which could potentially require treatability studies include vacuum extraction, soil flushing and low temperature thermal desorption.

Of those processes potentially requiring treatability studies, only soil flushing is of unknown effectiveness and implementability for full scale treatment of TCE contaminated soils. Because this is only retained as a support technology, treatability studies are not required at this time. Data collected in the SI, IRA and RI on the Site soils are sufficient to determine effectiveness and implementability of the retained process options.

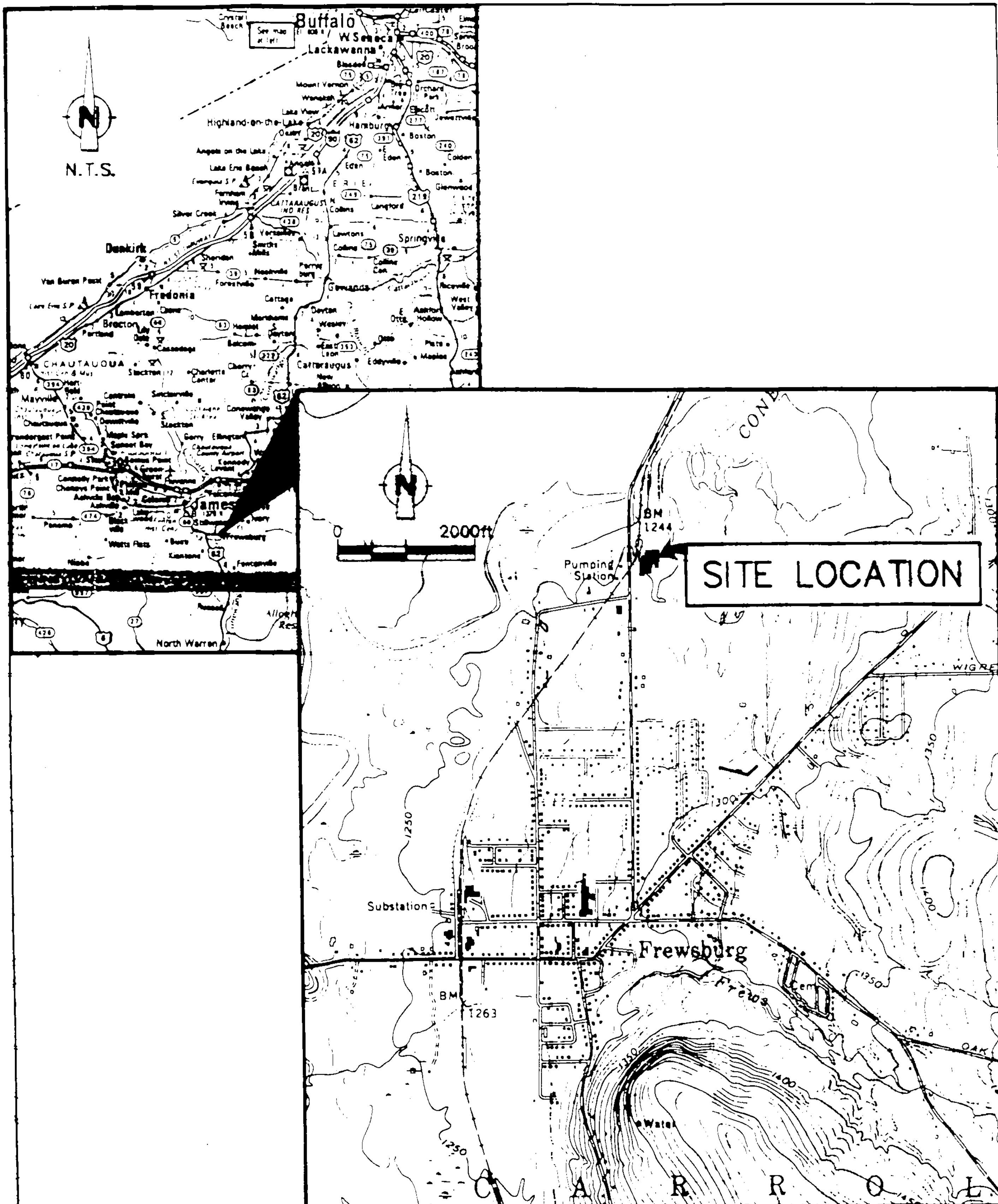
For the retained soil and sediment process options, no treatability studies are required to support the detailed analyses of remedial alternatives.

5.4 SUMMARY

The retained remedial technologies and process options for the media of concern at the Site do not require treatability studies for the purpose of completing the RI/FS. Depending on the selected remedial alternative, treatability studies may be required during the remedial design to provide detailed design parameters.

FIGURES

FIGURES



SOURCE: JAMESTOWN, N.Y.
N4200—W7907.5/7.5

figure 1.1

SITE LOCATION
FEASIBILITY STUDY
VACAIR ALLOYS DIVISION
Frewsburg, New York

CRA

2326(17)-25FEB/93-REV.0 (NF)

DRAWING BASED ON A SURVEY
DONE BY GARY E. KRULL,
MARILLA, NEW YORK
DATED 24 JULY, 1991

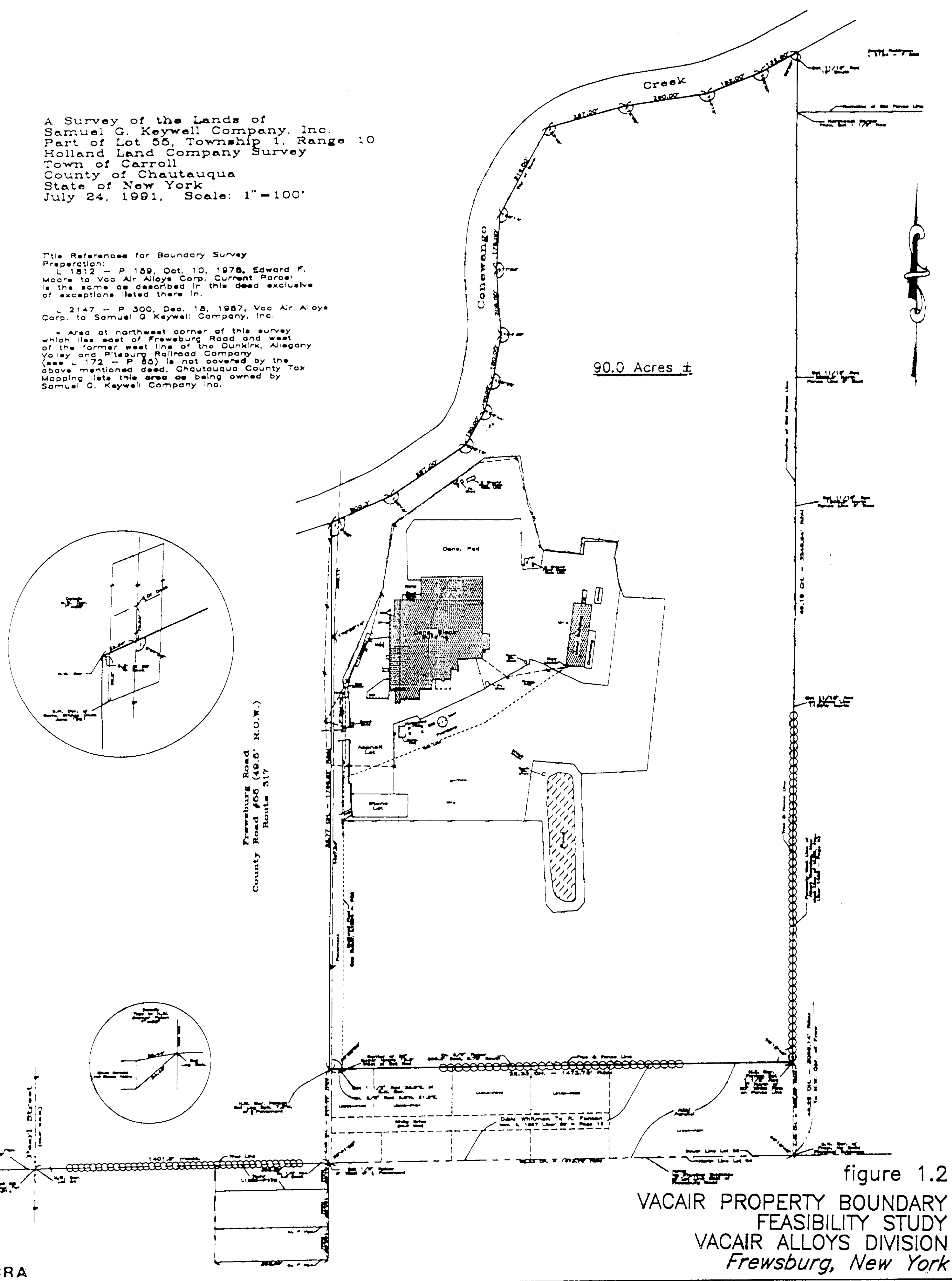


figure 1.2
VACAIR PROPERTY BOUNDARY
FEASIBILITY STUDY
VACAIR ALLOYS DIVISION
Frewsburg, New York

2326(17)–25FEB/93–REV.0 (NF)

TABLES

TABLES

TABLE 4.1

IDENTIFICATION OF RESPONSE ACTIONS, TECHNOLOGIES AND PROCESS OPTIONS
VAC AIR ALLOYS PLANT SITE
FREWSBURG, NEW YORK

Media	*General Response Action*	*Remedial Technology*	*Process Options*	*Description*
Groundwater	No Further Action	None	Not Applicable	No further action.
	Limited Further Action	Access Restrictions	Deed Restrictions	Restrict groundwater usage on Site and in the immediate vicinity of the Site in both the Watertable and Frewsburg Aquifers (possibly District Production Wells 1, 2 and 2A).
		Long-Term Groundwater Monitoring	Monitor Groundwater	Monitor the natural degradation and attenuation of Site-related contaminated groundwater through sampling and analysis.
	Physical Containment	Barrier Walls	Slurry Wall/Grout Curtain/Sheet Piling	Construction of a barrier wall downgradient or around the area of concern to restrict off-Site groundwater migration and limit upgradient groundwater flow to the Site.
	Hydraulic Containment and/or Source Removal	Groundwater Extraction	Extraction Wells	Installation and operation of groundwater extraction wells to induce an off-Site to on-Site groundwater flow direction.
			Collection Trenches	Installation of downgradient groundwater collection drains/trenches to achieve a hydraulic barrier which will restrict migration of groundwater off Site.
	Treatment of Collected Groundwater	On-Site Physical Treatment	Activated Carbon Treatment	Adsorption of contaminants onto activated carbon for off-Site disposal or treatment. Clean water would be reinjected or disposed.
		On-Site Physical Treatment	Air Stripping Treatment	Remove contaminants to vapor phase, reinject or dispose of water. Vapor treatment may be required.

TABLE 4.1

IDENTIFICATION OF RESPONSE ACTIONS,
TECHNOLOGIES AND PROCESS OPTIONS
VAC AIR ALLOYS PLANT SITE
FREWSBURG, NEW YORK

Media	*General Response Action*	*Remedial Technology*	*Process Options*	*Description*
Groundwater	Treatment of Collected Groundwater	On-Site Physical Treatment	Treatment by Oxidation	Mineralize contaminants via oxidation using ozone or UV/peroxide.
		Off-Site Treatment/ Disposal	Off-Site Disposal	Transportation of extracted groundwater to a permitted treatment, storage and disposal facility.
	In-Situ Groundwater Treatment	Biological Treatment	Aerobic/Anaerobic Biodegradation	Bacteria are added to groundwater and nutrients are injected to stimulate bacterial degradation.
		Physical Treatment	Air Sparging	Installation of an air injection system to air-strip volatiles from the groundwater. May be used in conjunction with vapor extraction.
			Passive Adsorption	Removal of contaminants by selective adsorption onto hydrophobic polymers suspended in wells or placed in trenches. Polymer must be reactivated off-Site.
		Physical/Thermal Treatment	Steam Sparging	Steam is injected into the groundwater to increase volatility of contaminants.

TABLE 4.1

IDENTIFICATION OF RESPONSE ACTIONS,
TECHNOLOGIES AND PROCESS OPTIONS
VAC AIR ALLOYS PLANT SITE
FREWSBURG, NEW YORK

Media	*General Response Action*	*Remedial Technology*	*Process Options*	*Description*
Soil	No Further Action	None	NA	No further action.
	Limited Further Action	Access Restrictions	Deed Restrictions	Limited further uses of Site grounds.
	Physical Containment	Cap	Permeable Soil Cover	Regrade, cover with compacted fill and topsoil.
			Low Permeability Cap	Regrade, cover with compacted clay and topsoil or asphalt.
	In-Situ Treatment	Biological Treatment	Aerobic/Anaerobic Biodegradation	Bacteria and nutrients are added to soils to stimulate bacterial degradation.
		Physical Treatment	Vacuum Extraction	Extraction wells or trenches are used to extract volatilized contaminants from soils with the application of a vacuum or negative pressure.
			Soil Flushing	Water or surfactant solution is circulated into the affected soil area, removed by extraction drains and treated for reinjection.
			Passive Adsorption	Adsorption cannisters are placed in wells in the vadose zone to collect and concentrate contaminants for off-Site treatment.

TABLE 4.1

IDENTIFICATION OF RESPONSE ACTIONS,
TECHNOLOGIES AND PROCESS OPTIONS
VAC AIR ALLOYS PLANT SITE
FREWSBURG, NEW YORK

Media	*General Response Action*	*Remedial Technology*	*Process Options*	*Description*
Soil	Removal and On-Site Treatment/Disposal	Physical Treatment	Aeration by Landfarming	Excavation and treatment of contaminated soil by aeration (tilling).
			Vacuum Extraction	Soil is placed in piles with vacuum applied to perforated pipes installed in the pile.
			Low Temperature Thermal Desorption	Contaminated soil is excavated and heated through a process designed to release volatiles to a vapor phase.
		Physical/Chemical Treatment	Solvent Extraction	Organic solvents are mixed with contaminated soils in a series of mixing/washing tanks and then removed from the soils extracting the contaminates.
		Thermal Treatment	Incineration	Excavation and high temperature oxidation/combustion of soils.
		On-Site Disposal	Landfill	Construction of an on-Site landfill or containment cell for placement of contaminated soils.
	Removal and Off-Site Treatment/Disposal	Thermal Treatment	Incineration	Excavation and transportation of contaminated soils to an off-Site incinerator at a permitted treatment, storage and disposal facility.
		Off-Site Disposal	Landfill	Excavation and transportation of contaminated soils to a permitted off-Site landfill facility.

TABLE 4.1

IDENTIFICATION OF RESPONSE ACTIONS,
TECHNOLOGIES AND PROCESS OPTIONS
VAC AIR ALLOYS PLANT SITE
FREWSBURG, NEW YORK

Media	*General Response Action*	*Remedial Technology*	*Process Options*	*Description*
Surface Water	No Further Action	None	Not Applicable	No further action.
	Limited Further Action	Access Restrictions	Deed Restrictions	Limited access to Site and limited further uses of Site grounds.
	Physical Containment and Collection	Surface Water Collection	Drop Inlet/Collection System	Installation of drop inlet for a sump/collection system within drainage swales and contaminated surface water streams.
	On-Site Surface Water Treatment	Chemical Treatment	Activated Carbon Treatment	Adsorption of contaminants onto activated carbon for off-Site disposal or treatment. Clean water would be reinjected or disposed.
		Physical Treatment	Air Stripping Treatment	Remove contaminants to vapor phase, reinject or dispose of water. Vapor treatment may be required.
			Treatment by Oxidation	Mineralize contaminants via oxidation using ozone or UV/peroxide.
			Passive Adsorption	Hydrophobic polymer booms are floated on the surface to collect and concentrate dissolved contaminants for off-Site treatment.
			Aeration	Mechanical aerators are installed in surface waters to strip contaminants.
	Off-Site Surface Water Treatment/Disposal	Off-Site Treatment/ Disposal	Off-Site Treatment/ Disposal	Transportation of collected surface water to a permitted treatment, storage and disposal facility.

TABLE 4.1

IDENTIFICATION OF RESPONSE ACTIONS,
TECHNOLOGIES AND PROCESS OPTIONS
VAC AIR ALLOYS PLANT SITE
FREWSBURG, NEW YORK

Media	*General Response Action*	*Remedial Technology*	*Process Options*	*Description*
Surface Water	Runoff Diversion/ Isolation	Drainage Swales, Culverts	Runoff Diversion Through Swale Reconstruction and Culvert Installation	Construct drainage swales to carry upstream surface water flows around and away from the potentially contaminated surface soils and groundwater seeps; install watertight culverts through areas of suspected contaminant exfiltration to swales.
			Runoff Isolation Through Swale Reconstruction and Culvert Installation	Construct drainage swale/culverts to carry known unavoidably contaminated flows toward surface water collection/ containment areas.
Sediment	No Further Action	None	Not Applicable	No further action.
	Limited Further Action	Access Restrictions	Deed Restrictions	Limited further uses of Site grounds.
	Removal and Treatment/Disposal	Off-Site Disposal	Landfill	Excavation and transportation of contaminated sediments to a permitted off-Site landfill facility.
		On-Site Disposal	Landfill	Construction of an on-Site landfill or containment cell for placement of contaminated sediments.
		Physical Treatment	Aeration by Landfarming	Tilling of contaminated sediments to be treated with contaminated soils.
		Physical/Chemical Treatment	Solvent Extraction	Organic solvents are mixed with contaminated sediments/soils, bind with the contaminants and are then removed.

TABLE 4.1

IDENTIFICATION OF RESPONSE ACTIONS,
TECHNOLOGIES AND PROCESS OPTIONS
VAC AIR ALLOYS PLANT SITE
FREWSBURG, NEW YORK

Media	*General Response Action*	*Remedial Technology*	*Process Options*	*Description*
Sediment		Physical/Thermal Treatment	Low Temperature Thermal Desorption	Sediments are heated to volatilize organics in combination with vapor treatment.
		Off-Site Thermal Treatment	Incineration	Excavation and transportation of contaminated sediments to an off-Site incinerator at a permitted treatment, storage and disposal facility.
Air	No Further Action	None	Not Applicable	No further action.
	Limited Further Action	Access Restrictions	Deed Restrictions	Restrict access to Site and usage of grounds.

TABLE 4.2

INITIAL SCREENING OF POTENTIAL
GROUNDWATER REMEDIAL TECHNOLOGIES
VAC AIR ALLOYS PLANT SITE
FREWSBURG, NEW YORK

General **Response Action**	**Description**	**Effectiveness**	**Implementability**	**Cost**
No Further Action	No measures are taken to improve Site environmental conditions with respect to the groundwater. All contaminants remain on Site. Environmental risks and potential exposure pathways are not addressed by any activities.	- Not effective in meeting SCG and RAOs. - No additional risk during implementation.	- Not applicable.	None.
Limited Further Action				
Access Restrictions	Implementation of institutional controls, such as deed restrictions, to reduce potential exposure to Site related chemicals, restrict installation of new wells, and restrict future groundwater use from the Water Table Aquifer.	- Effectiveness is dependant on future enforcement of deed restrictions. - No reduction of volume, toxicity, or mobility of Site contaminants. - Effective in reducing potential for human exposure to and ingestion of Site chemicals.	- Very implementable at any site.	Negligible cost.
Long-term Groundwater Monitoring	Implementation of a groundwater monitoring program to track the natural attenuation/degredation of Site related chemicals, and monitor the movement of the contaminant plume.	- No reduction of volume, toxicity, or mobility of Site contaminants. - Effective in identifying and tracking the contaminant plume and its natural degredation and attenuation. - Does not reduce potential for human ingestion of Site chemicals.	Very implementable, groundwater wells at the Site are sufficient in number and location.	Low capital, low O & M.
Physical Containment				
Barrier Walls	Construction of a low permeability barrier wall around the area of concern by backfilling an excavated trench to a selected depth with clay or a bentonite slurry. The barrier should be keyed into an equally low permeability layer for maximum effectiveness.	- Effectively reduces mobility of Site contaminants. - No reduction in volume or toxicity of contaminants. - Due to lower clay confining layer beneath the Site, barrier would be effective at the Site.	- Very implementable at the Site due to the clay confining layer beneath the Water Table Aquifer. - Construction at shallow depths is feasible.	Moderate capital, low O & M.

TABLE 4.2

INITIAL SCREENING OF POTENTIAL
GROUNDWATER REMEDIAL TECHNOLOGIES
VAC AIR ALLOYS PLANT SITE
FREWSBURG, NEW YORK

General ***Response Action***	***Description***	***Effectiveness***	***Implementability***	***Cost***
Hydraulic Containment and/or Source Removal				
Extraction Wells	Installation and operation of groundwater extraction wells either on Site at the source of contamination or downgradient of the source to induce an off-Site to on-Site groundwater flow direction.	Very effective for collection of groundwater and provision of hydraulic containment. - Reduces mobility of contaminants. - Site geology is favorable for groundwater collection.	Very implementable at the Site. - Construction to required depths for Water Table Aquifer is feasible. - Testing is required for well placement.	Low capital, low O & M.
Collection Trenches	Installation of downgradient groundwater collection drains/trenches to achieve a hydraulic barrier which will restrict migration of groundwater off Site. Intercepts groundwater at the Site boundary.	- Very effective and proven for collection of groundwater from shallow aquifers with a lower confining layer - as at the Site. - Reduces mobility of contaminants.	- Very implementable at the Site. Construction to required depths for collection of water from the Water Table Aquifer is feasible.	Moderate capital, low O & M.
Treatment of Collected Groundwater				
Activated Carbon Treatment	Contaminants are adsorbed onto activated carbon for off-Site disposal or treatment. Clean water would be reinjected or disposed.	- Very effective in reducing VOC concentrations in water. - Discharge will meet SPEDES regulations. - Reduces volume and mobility of contaminants.	- Implementable with low construction costs. - Construction and operation and maintenance are feasible. - Requires maintenance routinely.	Low capital, moderate O & M
Air Stripping Treatment	Contaminants (VOCs and SVOCs) are removed from the water using an air injection system. Product vapor will need treatment proir to discharge.	- Very effective in reducing VOC concentrations.	- Implementable with low construction costs. - Construction and operation and maintenance are feasible. - Requires routine maintenance. - May require vapor treatment.	Low capital, moderate O & M
Treatment by Oxidation	Involves a combination of ultra-violet light and an oxidizing agent, such as ozone or hydrogen peroxide, to chemically oxidize organic compounds in water.	- Very effective in reducing VOC concentrations. - Destroys VOCs. - Reduces toxicity of the contaminants.	Implementable with moderate construction costs. - Requires routine maintenance.	Moderate capital, moderate O & M
Off-Site Disposal	Transportation of extracted groundwater to a permitted treatment, storage and disposal facility.	- Effective for removal of organics and inorganics from the groundwater regime.	- Implementability depends on the location of a suitable treatment facility. - Less feasible for long term treatment operation.	Transportation may be high, disposal cost is moderate.

TABLE 4.2

INITIAL SCREENING OF POTENTIAL
GROUNDWATER REMEDIAL TECHNOLOGIES
VAC AIR ALLOYS PLANT SITE
FREWSBURG, NEW YORK

General Response Action	*Description*	*Effectiveness*	*Implementability*	*Cost*
In-Situ Groundwater Treatment				
Aerobic/Aanaerobic Biodegradation	Bacteria are added to groundwater through injection wells and substrate is injected to stimulate bacterial degradation. The bacterial colony will eventually break down targeted organic constituents to less toxic compounds.	- Limited effectiveness for TCE contaminated soils. - Products of bacterial degredation may not be desirable - Laboratory and pilot scale testing is required.	Technically feasible and systems are readily available. - Degredation products may require further treatment and/or disposal. - Additional substrate (methane) may be required	Low capital, low O & M
Air Sparging	Installation of an air injection system to air-strip volatiles from the groundwater. It may be used in conjunction with vapor extraction to collect and treat the vapor produced.	- Must be combined with a vapor extraction system to be effective in removal of VOCs. - May not achieve SCGs as a stand alone treatment.	- Technically feasible due to low construction and O & M costs. - Systems are readily available	Low capital, low O & M
Passive Adsorption	Removal of contaminants by selective adsorption onto hydrophobic polymers suspended in wells or placed in trenches. Polymer must be reactivated off-Site prior to reuse.	- Effectiveness is dependent on groundwater movement. - Effectiveness in trichloroethene adsorption is not established, treatability studies are required.	Very implementable due to low cost for construction and O & M. - Groundwater wells or trenches are easily installed at the necessary depth for the water table aquifer treatment	Low capital, low O & M
Steam Sparging	Steam is injected into the groundwater to increase volatility of contaminants. It may be used in conjunction with vapor extraction to collect and treat the product vapor	- Effectiveness is not well documented in the field. - Treatability studies, pilot tests may be required.	- Not any more feasible than other groundwater sparging alternatives - Higher costs for operation and maintenance due to higher energy costs.	Moderate capital, moderate O & M

TABLE 4.3

INITIAL SCREENING OF POTENTIAL
SOIL REMEDIAL TECHNOLOGIES
VAC AIR ALLOYS PLANT SITE
FREWSBURG, NEW YORK

General Response Action	*Description*	*Effectiveness*	*Implementability*	*Cost*
No Further Action	No measures are taken to improve Site environmental conditions with respect to the soils. All contaminants remain on Site. Environmental risks and potential exposure pathways are not addressed by any activities.	- No reduction of volume, toxicity, or mobility of Site contaminants.	- Not applicable	None
Limited Further Action				
Access Restrictions	Implementation of institutional controls, such as deed restrictions, to reduce potential exposure to Site related chemicals, limit future uses of the Site grounds, and generally restrict visitor access to the Site.	- Effectiveness is dependant on future enforcement of deed restrictions. - No reduction of volume, toxicity, or mobility of Site contaminants. - Effective in reducing potential for human exposure to and ingestion of Site chemicals.	Very implementable at any site	Negligible cost
Physical Containment				
Permeable Soil Cover	All portions of the Site where soil contaminant concentrations exceed potential soil cleanup goals are carefully regraded to ensure natural surface drainage and covered with compacted fill and topsoil.	- Effective in reducing the potential for human exposure to Site chemicals in the soils. - Does not reduce volume, toxicity, or mobility of Site contaminants.	- Easily implemented. - Requires routine inspections and maintenance. - Technically feasible.	Low capital, low maintenance
Impermeable Soil Cover	All portions of the Site where soil contaminant concentrations exceed potential soil cleanup goals are carefully regraded to ensure natural surface drainage and covered with compacted clay and topsoil, or asphalt.	- Effective in reducing the potential for human exposure to and mobility of Site chemicals in the soils. - Does not reduce the volume or toxicity of the Site contaminants. - Reduces volume of contaminated groundwater which may need treatment.	Easily implemented. Requires routine inspections and maintenance. - Technically feasible and more protective than permeable soil cover.	Low capital, low maintenance

TABLE 4.3

INITIAL SCREENING OF POTENTIAL
SOIL REMEDIAL TECHNOLOGIES
VAC AIR ALLOYS PLANT SITE
FREWSBURG, NEW YORK

General Response Action	*Description*	*Effectiveness*	*Implementability*	*Cost*
In-Situ Treatment				
Aerobic/Anaerobic Biodegradation	Bacteria are added to soil through injection wells and/or surface application to stimulate bacterial degradation. The bacterial colony will eventually break down targeted organic constituents to less toxic compounds. The bacterial colonies will be reduced as the targeted contaminants are reduced.	- Limited effectiveness for TCE contaminated soils. - Products of bacterial degredation may not be desirable. - Laboratory and pilot scale testing is required.	- Technically feasible and systems are readily available. - May be difficult to implement due to the variable nature of the fill at the Site. - Additional substrate (methane) may be required.	Low capital, low O & M.
Vacuum Extraction	Extraction wells or trenches are used to extract volatilized contaminants from soil vadose zone using a vacuum or negative pressure. Wells/trenches can be installed at the source area(s) or in a network surrounding the source.	- Effective in the removal of VOCs from the soil. - Possible long term operation for cleanup to SCGs.	- Very implementable and technically feasible. - Total cleanup costs are dependent on cleanup timeframe. - Off-gas treatment is nessecary for completeness.	Low capital, moderate O & M.
Soil Flushing	Water or surfactant solution is circulated through the affected soil area, removed by extraction wells or collection drains, and treated for reinjection. Contaminants will normally adsorb to the surfactant and will be rinsed from the affected area.	- Treatability studies are necessary to determine the effectiveness. - Requires collection of flushing medium. - Difficult to ensure all soil interacts with solvent.	- Implementability and feasibility depend on treatability studies, necessary flushing medium, and volume of flushing medium. - Sometimes implementation is difficult.	Moderate capital, moderate O & M.
Passive Adsorption	Adsorption cannisters are placed in wells in the vadose zone to collect and concentrate contaminants for off-Site treatment. Under normal conditions the contaminants will migrate toward the wells and will adsorb to the canisters. The canisters, when spent, are removed and disposed of or reactivated for reuse.	- Limited effectiveness dependent on air movement through the soil.	- Very implementable, wells are easily installed into the soil vadose zone. - Adsorption canisters require disposal/treatment.	Low capital, low O & M.

TABLE 4.3

INITIAL SCREENING OF POTENTIAL
SOIL REMEDIAL TECHNOLOGIES
VAC AIR ALLOYS PLANT SITE
FREWSBURG, NEW YORK

General Response Action	*Description*	*Effectiveness*	*Implementability*	*Cost*
Removal and On-Site Treatment/Disposal				
Aeration by landfarming	Treatment of contaminated soil by aeration involves the excavation of affected soils and stockpiling of them on pre-constructed containment pads. On the pads, the soils are tilled continuously to release VOCs to the air. Due to the fact that the VOCs are not destroyed, use of an air purifying system may be necessary.	- Effective in releasing VOCs from soil. - May present a problem with air emissions.	- Implementable. - Introduces risk of worker exposure to airborne contaminants. VOCs should be removed from air. - Requires excavation of soil. - Precipitation and runoff may be problems.	Moderate capital
Vacuum Extraction	The affected soil is excavated and placed in stockpiles. As with the other vapor extraction processes, soil vapors are removed from the soil using a negative pressure induced through perforated pipes inserted into each stockpile.	- Effective in the removal of VOCs from the soil. - Possible long term operation for cleanup to SCGs. - Increased effectiveness over in-situ due to the controls applied to ex-situ.	- Very implementable and technically feasible. - Total cleanup costs are dependent on cleanup timeframe. - Off-gas treatment is nessecary for completeness. - Excavation of material presents risks of exposure to workers.	Moderate capital
Soil Washing	The affected soil is excavated and placed into a series of mixing/washing tanks. Organic solvents are added to and mixed with the soil which causes contaminant disassociation from the soil. The solvents are then removed and treated or disposed of.	- Effectiveness is questionable as various washing media may be needed to wash all contaminants. - Washing media will need treatment.	- Implementability is questionable due to nature of fill at the Site. - Soil will have to be tested prior to backfill. - Requires excavation of soil.	High capital
Low Temperature Thermal Desorption	Soils are removed and heated through a process designed to cause volatilization of VOCs from the soils. A mobile thermal desorption unit can typically be implemented at most sites.	- Very effective in removing VOCs from soils. - Reduces volume of contaminants.	- Requires soil excavation. - May require solids processing. - Products will require disposal, possibly as a hazardous substance. - Air emission control may be required.	High capital
Incineration	Incineration employs high temperature oxidation to degrade substances into non-hazardous products. Incineration could be implemented by the construction of a Site dedicated thermal destruction unit or by utilizing a mobile incineration unit.	- Can be used for both liquid and solid wastes. - Reliability and effectiveness are well demonstrated. - Reduces the volume, mobility, and toxicity of contaminants in the soils. - Test runs may be necessary to determine optimum operating conditions and actual effectiveness.	- Requires excavation of the soil. - May utilize an on Site constructed unit or a mobile unit. - Limited mobile units available.	Very high capital

TABLE 4.3

INITIAL SCREENING OF POTENTIAL
SOIL REMEDIAL TECHNOLOGIES
VAC AIR ALLOYS PLANT SITE
FREWSBURG, NEW YORK

General Response Action	*Description*	*Effectiveness*	*Implementability*	*Cost*
Removal and On-Site Treatment/Disposal (cont'd)				
On Site Landfill	The affected soil is excavated and transferred to a preconstructed cell. The cell is usually constructed using a geosynthetic liner and layers of clay.	- Effectively reduces the mobility of contaminants - No reduction in volume or toxicity of contaminants.	- "Land-ban" may affect disposal onsite if waste is not pre-treated. - Potential long-term liability for waste remaining onsite.	Moderate capital, possible very high maintenance.
Removal and Off-Site Treatment/Disposal				
Incineration	Off Site incineration involves excavation and transportation of contaminated soils to an off Site incinerator at a permitted treatment, storage, and disposal facility.	- Same effectiveness as on Site incineration.	- Requires excavation and transportation of soil to facility. - May require solids processing. - Depends on proximity of incinerator to Site.	Very high capital, possible high transportation.
Landfill	Off Site disposal involves excavation and transportation of contaminated soils to a permitted off-Site landfill facility.	- Effectively reduces the mobility of contaminants - No reduction in volume or toxicity of contaminants. - Off Site transport and disposal without volume or toxicity reduction is not a favored option.	- Potential long-term liability for waste placed in landfill. - Difficult to implement without pre-treatment due to "land-ban".	High capital, possible high transportation.

TABLE 4.4

INITIAL SCREENING OF POTENTIAL
SURFACE WATER REMEDIAL TECHNOLOGIES
VAC AIR ALLOYS PLANT SITE
FREWSBURG, NEW YORK

General Response Action	*Description*	*Effectiveness*	*Implementability*	*Cost*
No Further Action	No further measures will be taken to improve the environmental conditions with respect to the surface water at the Site. All risks associated with the contaminated surface water will remain unaddressed.	- Risks due to implementation of no action alternative at the Site are identified in the Public Health Evaluation.	- Not applicable	None.
Limited Further Action	Implementation of institutional controls to reduce the potential for human exposure to Site related chemicals. Deed restrictions will be implemented to limit further uses of and general access to the Site.	- Effectiveness is dependant on future enforcement of deed restrictions. - No reduction of volume, toxicity, or mobility of Site contaminants. - Effective in reducing potential for human exposure to and ingestion of Site chemicals.	- Very implementable at any site.	Negligible cost.
Physical Containment and Collection	Surface water is contained and collected using drainage collection structures (drop inlets). Drop inlets would be installed within each surface water swale downstream of the suspected contaminated area.	- Very effective in the collection of surface water.	- Implementable at the Site, a water treatment option must be included for completeness. - Much of costs are associated with water treatment.	Low capital, very low maintenance
On-Site Surface Water Treatment				
Activated Carbon	Contaminants are adsorbed onto activated carbon for off Site disposal or treatment. Clean water would be recirculated or disposed of.	- Very effective in reducing VOC concentrations in water. - Discharge will meet SPEDES regulations - Reduces volume and mobility of contaminants.	- Implementable with low construction costs. - Construction, operation and maintenance are feasible. - Requires maintenance routinely.	Low capital, moderate O & M.
Air Stripping	Contaminants are removed from the liquid phase and are converted to the vapor phase using an air injection system. The vapor product normally requires treatment.	- Very effective in reducing VOC concentrations.	- Implementable with low construction costs. - Construction and operation and maintenance are feasible. - Requires routine maintenance. - May require vapor treatment.	Low capital, moderate O & M.
Oxidation	Contaminants are mineralized using a combination of UV light and ozone or peroxide (oxidizing agent).	- Very effective in destroying VOCs. - Reduces toxicity of the contaminants	- Implementable with moderate construction costs. - Requires routine maintenance	Moderate capital, moderate O & M.
Passive Adsorption	Dissolved contaminants are collected and concentrated using hydrophobic polymer booms floating on the water surface. Once spent, the booms can be disposed of or reactivated for reuse.	- Effectiveness is dependent on surface water movement. - Effectiveness in trichloroethene adsorption is not established, treatability studies are required.	- Very implementable due to low cost for construction and O & M. - Adsorption booms require treatment of disposal.	Low capital, low O & M.

TABLE 4.4

INITIAL SCREENING OF POTENTIAL
SURFACE WATER REMEDIAL TECHNOLOGIES
VAC AIR ALLOYS PLANT SITE
FREWSBURG, NEW YORK

General Response Action	*Description*	*Effectiveness*	*Implementability*	*Cost*
On-Site Surface Water Treatment (cont'd)				
Aeration	Mechanical aerators are installed in standing surface waters to strip contaminants. A flow of air is passed through the aerators into the water and volatiles are driven off into the vapor phase. A vapor collection system may be necessary depending on the contaminant concentration.	- Effective in releasing VOCs from the water to vapor phase. - Does not address source of contaminants.	- Implementable due to low construction, O & M costs. - Air emissions require treatment	Low capital, low O & M.
Off-Site Surface Water Treatment/Disposal				
Off Site Treatment/ Disposal	Surface water is collected and transported to a permitted treatment, storage and disposal facility.	- Effective for removal of organics and inorganics from the surface waters.	- Implementability depends on the location of a suitable treatment facility. - Less feasible for long term treatment operation.	Transportation may be high, disposal cost is moderate.
Runoff Diversion/ Isolation				
Runoff Diversion	Drainage swales are reconstructed to carry upstream surface water flows around and away from the potentially contaminated surface soils and groundwater seeps; install watertight culverts through areas of suspected contaminated groundwater exfiltration to culverts.	- Very effective in reducing volume of additional contaminated surface water.	- Very implementable. - Low construction costs.	Low capital, low maintenance.
Runoff Isolation	Drainage swales/culverts are reconstructed to carry known unavoidably contaminated flows toward central surface water collection/containment areas.	- Very effective in isolating contaminated flows, flows must be collected and treated. - Equally if not less effective than diversion.	- Implementable. - Costs are low for construction, however total cost is to include treatment/disposal.	Low capital, low maintenance.

TABLE 4.5

INITIAL SCREENING OF POTENTIAL
SEDIMENT REMEDIAL TECHNOLOGIES
VAC AIR ALLOYS PLANT SITE
FREWSBURG, NEW YORK

General Response Action	Description	Effectiveness	Implementability	Cost
No Further Action	No measures are taken to improve Site environmental conditions with respect to the sediments. All contaminants remain on Site. Environmental risks and potential exposure pathways are not addressed by any activities.	- Risks due to implementation of no action alternative at the site are identified in the Public Health Evaluation.	- Not applicable	None.
Limited Further Action	Implementation of institutional controls, such as deed restrictions, to reduce potential exposure to Site related chemicals, limit future uses of the Site grounds, and generally restrict visitor access to the Site.	- Effectiveness is dependant on future enforcement of deed restrictions. - No reduction of volume, toxicity, or mobility of Site contaminants. - Effective in reducing potential for human exposure to and ingestion of Site chemicals.	- Very implementable at any site.	Negligible cost.
Removal and Treatment/Disposal				
Off Site Landfill	Affected sediments are removed, solidified, and transported to a permitted off-Site landfill facility.	- Effectively reduces the mobility of contaminants - No reduction in volume or toxicity of contaminants. - Off Site transport and disposal without volume or toxicity reduction is not a favored option.	- Potential long-term liability for waste placed in landfill. - Difficult to implement without pre-treatment due to "land-ban".	Low capital, possible high transportation.
On Site Landfill	Affected sediments are removed, solidified and transferred to a preconstructed on Site disposal cell.	- Effectively reduces the mobility of contaminants - No reduction in volume or toxicity of contaminants.	- "Land-ban" may affect disposal onsite if waste is not pre-treated. - Potential long-term liability for waste remaining onsite	Moderate capital, possible very high maintenance.
Aeration By Landfarming	Affected sediments are removed, dried and aerated using a tilling process.	- Effective in releasing VOCs from sediments. - May present a problem with air emissions.	- Implementable - Introduces risk of worker exposure to airborne contaminants, VOCs should be removed from air. - Requires excavation/removal.	Low capital
Soil Washing	Organic solvents are mixed with contaminated sediments/soils. Contaminants are disassociated from the sediment particles and are removed with the solvent.	- Effectiveness is questionable as various washing media may be needed to wash all contaminants. - Washing media will need treatment.	- Implementability is questionable due to nature of fill at the Site. - Soil will have to be tested prior to backfill. - Requires excavation of soil.	High capital

TABLE 4.5

INITIAL SCREENING OF POTENTIAL
SEDIMENT REMEDIAL TECHNOLOGIES
VAC AIR ALLOYS PLANT SITE
FREWSBURG, NEW YORK

General Response Action	Description	Effectiveness	Implementability	Cost
Removal and Treatment/Disposal (cont'd)				
Low Temperature Thermal Desorption	Sediments are removed and heated through a process designed to cause volatilization of VOCs from the sediments.	- Very effective in removing VOCs from sediments. - Reduces volume of contaminants - Test runs may be necessary to determine optimum operating conditions and actual effectiveness.	- Requires excavation of the sediments. - May utilize an on Site unit or a mobile unit. - Limited mobile units available.	High capital
Off Site Incineration	Contaminated sediments are excavated and transported to an off-Site incinerator at a permitted treatment, storage and disposal facility.	- Can be used for both liquid and solid wastes. - Reliability and effectiveness are well demonstrated. - Reduces the volume, mobility, and toxicity of	- Requires excavation and transportation of sediments to facility. - May require solids processing. - Depends on proximity of incinerator to Site	Very high capital, transportation may be high.

TABLE 4.6

INITIAL SCREENING OF POTENTIAL
AMBIENT AIR REMEDIAL TECHNOLOGIES
VAC AIR ALLOYS PLANT SITE
FREWSBURG, NEW YORK

General Response Action	Description	Effectiveness	Implementability	Cost
No Further Action	No measures will be taken to remediate on Site air.	- Risks due to implementation of no action alternative at the site are identified in the Public Health Evaluation.	- Not applicable	None.
Limited Further Action	Implementation of institutional controls, such as deed restrictions, to reduce potential exposure to Site related chemicals, limit future uses of the Site grounds, and generally restrict visitor access to the Site.	- Effectiveness is dependant on future enforcement of deed restrictions. - No reduction of volume, toxicity, or mobility of Site contaminants. - Effective in reducing potential for human exposure to and ingestion of Site chemicals.	- Very implementable at any site.	Negligible cost.

TABLE 4.7

RESULTS OF INITIAL SCREENING
GROUNDWATER REMEDIAL TECHNOLOGIES
VAC AIR ALLOYS PLANT SITE
FREWSBURG, NEW YORK

General Response Action	*Technology Type*	*Process Options*	*Retained for Further Evaluation*	*Comments*
No Further Action	No Action	None	Yes	Required by NYSDEC approved Work Plan
Limited Further Action		Access Restrictions	Yes	May be utilized as a support technology, will not reach remediation goals alone
		Long-term Groundwater Monitoring	Yes	May be utilized as a support technology, will not reach remediation goals alone
Physical Containment	Barrier Walls	Slurry Walls	Yes	May reduce volume of contaminated groundwater to be treated and/or migration of contaminants off Site
Hydraulic Containment and/or Source Removal	Groundwater Removal	Extraction Wells	Yes	Retained as a possible support technology, may not be as effective as collection trenches
		Collection Trenches	Yes	Retained as an effective collection technology

TABLE 4.7

RESULTS OF INITIAL SCREENING
GROUNDWATER REMEDIAL TECHNOLOGIES
VAC AIR ALLOYS PLANT SITE
FREWSBURG, NEW YORK

General Response Action	*Technology Type*	*Process Options*	*Retained for Further Evaluation*	*Comments*
Treatment of Collected Groundwater	Physical Treatment	Activated Carbon Treatment	Yes	Retained as an effective treatment technology
		Air Stripping Treatment	Yes	Retained as an effective treatment technology
	Chemical Treatment	Treatment by Oxidation	Yes	Retained as an effective treatment technology
	Off-Site Disposal	Off-Site Disposal	No	Eliminated due to high cost for long term operation
In-Situ Groundwater Treatment	Biological Treatment	Aerobic/Anaerobic Biodegradation	No	Not a proven technology in large scale applications, limited effectiveness in degrading Site contaminants (TCE), undesired degredation products are formed
	Physical Treatment	Air Sparging	Yes	May be utilized as a support technology, will not remove VOC vapors from ground alone
		Passive Adsorption	No	No demonstrated effectiveness, will not reach the remediation goals within a reasonable time
	Physical/Thermal Treatment	Steam Sparging	No	Eliminated due to high cost and limited effectiveness

TABLE 4.8

RESULTS OF INITIAL SCREENING
SOIL REMEDIAL TECHNOLOGIES
VAC AIR ALLOYS PLANT SITE
FREWSBURG, NEW YORK

General Response Action	*Technology Type*	*Process Options*	*Retained for Further Evaluation*	*Comments*
No Further Action	No Action	None	Yes	Required by NYSDEC approved Work Plan
Limited Further Action		Access Restrictions	Yes	May be utilized as a support technology, will not reach remediation goals alone
Physical Containment	Capping	Permeable Soil Cover	No	Permeable cover will not be necessary as no surface soil contamination is present
		Impermeable Cover	Yes	May be utilized as a support technology to control air flows (for vapor extraction) and infiltration
In-Situ Treatment	Biological Treatment	Aerobic/Anaerobic Biodegradation	No	Eliminated due to undemonstrated and questionable effectiveness in treating TCE
	Physical Treatment	Vacuum Extraction	Yes	Retained as an effective treatment technology
	Chemical Treatment	Soil Flushing	Yes	May be utilized as a support technology only when groundwater collection is implemented
		Passive Adsorption	No	No demonstrated effectiveness, will not reach remediation goals within a reasonable time

TABLE 4.8

RESULTS OF INITIAL SCREENING
SOIL REMEDIAL TECHNOLOGIES
VAC AIR ALLOYS PLANT SITE
FREWSBURG, NEW YORK

General Response Action	*Technology Type*	*Process Options*	*Retained for Further Evaluation*	*Comments*
Removal and On-Site Treatment/Disposal	Physical Treatment	Aeration by landfarming	No	Implementability would be a problem due to space restrictions and air emissions
		Vacuum Extraction	No	Implementability would be a problem due to space restrictions for construction of treatment area
	Chemical Treatment	Soil Washing	No	Eliminated due to high relative cost and limited effectiveness
	Thermal Treatment	Low Temperature Thermal Desorption	Yes	Retained as an effective treatment technology
		Incineration	No	Eliminated due to extremely high cost
	Disposal	On Site Landfill	No	Eliminated due to land ban restrictions and due to least favored option being landfilling without treatment
Removal and Off-Site Treatment/Disposal	Thermal Treatment	Incineration	No	Eliminated due to extremely high cost
	Disposal	Landfill	No	Eliminated due to land ban restrictions and due to least favored option being landfilling without treatment

TABLE 4.9

RESULTS OF INITIAL SCREENING
SURFACE WATER REMEDIAL TECHNOLOGIES
VAC AIR ALLOYS PLANT SITE
FREWSBURG, NEW YORK

General Response Action	*Technology Type*	*Process Options*	*Retained for Further Evaluation*	*Comments*
No Further Action	No Action	None	Yes	Required by NYSDEC approved Work Plan
Limited Further Action		Access Restrictions	Yes	May be utilized as a support technology, will not reach remediation goals alone.
Physical Containment and Collection		Drop Inlets, Catchbasins	Yes	Retained as an effective collection technology
On-Site Surface Water Treatment	Physical Treatment	Activated Carbon	Yes	Retained as an effective treatment technology
		Air Stripping	Yes	Retained as an effective treatment technology
		Aeration	Yes	May be utilized as a support technology
	Chemical Treatment	Oxidation	Yes	Retained as an effective treatment technology
		Passive Adsorption	No	Limited effectiveness, will not acheive remedial action goals within a reasonable timeframe
Off-Site Surface Water Treatment/Disposal	Off Site Treatment / Disposal	Permitted Treatment Storage, Disposal Facility	No	Eliminated due to difficult administrative implementability and high cost for long term operation
Runoff Diversion/ Isolation		Swale Reconstruction, Culvert Reconstruction	Yes	Retained as primary remedial option

TABLE 4.10

RESULTS OF INITIAL SCREENING
SEDIMENT REMEDIAL TECHNOLOGIES
VAC AIR ALLOYS PLANT SITE
FREWSBURG, NEW YORK

General Response Action	*Technology Type*	*Process Options*	*Retained for Further Evaluation*	*Comments*
No Further Action	No Action	None	Yes	Required by NYSDEC approved Work Plan
Limited Further Action		Access Restrictions	Yes	May be utilized as a support technology, will not reach remediation goals alone.
Removal and Treatment/Disposal	Disposal	Off Site Landfill	No	Eliminated due to land ban restrictions and due to least favored option being landfilling without treatment
		On Site Landfill	No	Eliminated due to land ban restrictions and due to least favored option being landfilling without treatment
	Physical Treatment	Aeration By Landfarming	No	Eliminated due to Site space restrictions for treatment area construction and to uncontrolled air emissions during treatment
	Chemical Treatment	Soil Washing	No	Eliminated due to high cost and limited effectiveness
	Thermal Treatment	Low Temperature Thermal Desorption	Yes	Retained as an effective treatment technology
		Off Site Incineration	No	Eliminated due to extremely high cost

TABLE 4.11

RESULTS OF INITIAL SCREENING
AMBIENT AIR REMEDIAL TECHNOLOGIES
VAC AIR ALLOYS PLANT SITE
FREWSBURG, NEW YORK

General Response Action	*Technology Type*	*Process Options*	*Retained for Further Evaluation*	*Comments*
No Further Action	No Action	None	Yes	Required by NYSDEC approved Work Plan
Limited Further Action		Access Restrictions	Yes	May be utilized as a support technology, will not reach remediation goals alone

RECEIVED
APR 1 1993
N.Y.S. DEPT. OF
ENVIRONMENTAL CONSERVATION
REGION 9