3.2 Site file

RECORD OF DECISION

REMEDIAL ALTERNATIVE SELECTION

SITE

Frontier Hard Chrome
Clark County
Vancouver, Washington

PURPOSE

This decision document presents the selected remedy for the soils/source control operable unit for this site. The remedy was selected in accordance with the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA),42 U.S.C. Section 9601 et seq. and to the extent practicable, the National Contingency Plan, 40 CFR Part 300.

BASIS FOR DECISION

This decision is based upon the Administrative Record for the site. The record contains, but is not limited to, the following documents. The documents describe the site, the actions taken at the site by the United States and the State of Washington, the evaluation of remedial alternatives for the site and the concerns of the affected community:

Remedial Investigation Report for Frontier Hard Chrome, Volumes 1 and 2, August,1987
Feasibility Study Report for Frontier Hard Chrome, Volumes 1 and 2, October, 1987

Summary of Remedial Alternative Selection

Community Relations Responsiveness Summary

Staff summaries and briefing documents

A complete list of documents contained in the Administrative Record is included in this Record of Decision.

DESCRIPTION OF THE SELECTED REMEDY

This Record of Decision addresses an operable unit of the Frontier Hard Chrome site. The operable unit is the control of chromium contaminated soils and structures at the site. This

operable unit does not address the remediation of contaminated groundwater. This will be addressed by a separate decision document.

The remedy selected consists of the chemical stabilization of chromium contaminated soils at the Frontier Hard Chrome site. This treatment alternative will reduce the mobility and toxicity of the contamination at the site and will prevent further contamination of the groundwater. This alternative will protect public health by preventing the direct contact between the public and the contamination found at the site.

Specific aspects of the remedy include: the excavation of chromium contaminated soils; on site treatment of the excavated materials by chemical stabilization; and replacement of the treated materials. Implementation of the action will require demolition of the building on the site. A final cover will be placed over the site to further prevent leaching of chromium from the soils and to control surface water run-off from precipitation.

DECLARATION

The selected remedy is protective of human health and the environment, attains federal and state requirements that are applicable or relevant and appropriate and is cost effective. This remedy satisfies the preference for treatment that reduces toxicity and mobility as a principal element. It is determined that this remedy utilizes permanent solutions and alternative treatment technologies to the extent possible.

The State of Washington was consulted and has concurred in the selected remedy.

12-30-87
Date

Robie G. Russell
Regional Administrator
Environmental Protection Agency
Region 10

SUMMARY OF REMEDIAL ALTERNATIVES

Site Description

The Frontier Hard Chrome (FHC) site is located in the southwestern part of the State of Washington, in the City of Vancouver, Washington. FHC is in an industrial area of the city directly across the Columbia River from the City of Portland, Oregon. (See Figure 1)

The site is approximately one half mile from the Columbia River and covers about one half acre. The area is within the floodplain and has been extensively filled. The groundwater table is within twenty feet of the ground surface and is affected by the stage height of the river. The groundwater is used as the drinking water supply for the City of Vancouver which has two well fields within one mile of the site. (See Figure 2,3)

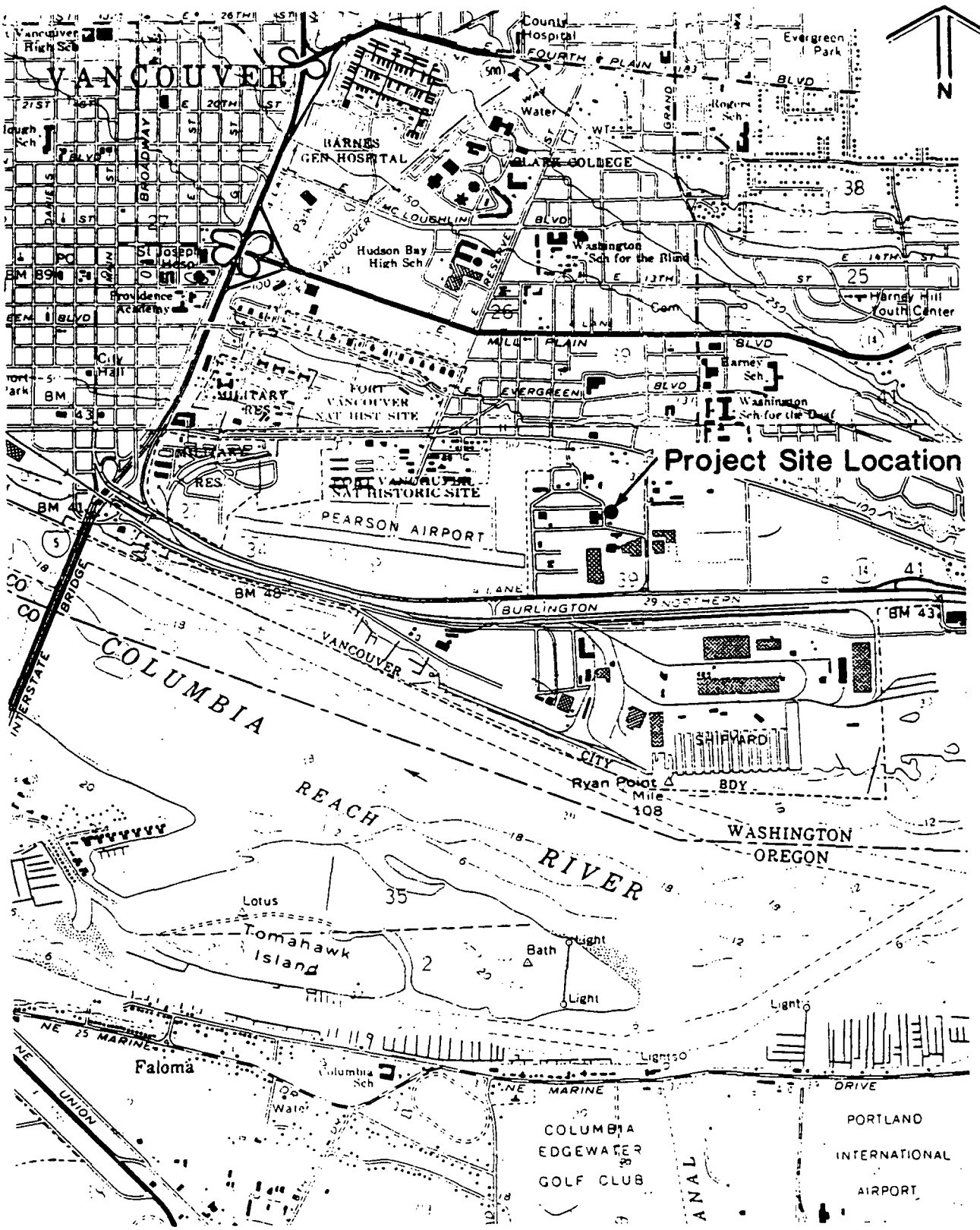
Site History

In approximately 1955, the site was filled with hydraulic dredge material and construction rubble. The site has been primarily occupied by two businesses, both engaged in the chrome plating business. Pioneer Plating operated at the site from 1958 to 1970. The site was then occupied by FHC until 1983. The property has been leased to various other businesses since 1983.

During the operation of Pioneer and the initial operation of FHC, chromium plating wastes were discharged to the sanitary sewer system. In 1975, the City of Vancouver determined that the chromium in the wastewater from FHC was upsetting the operation of its new secondary treatment system. FHC was directed by the City and the Washington Department of Ecology (Ecology) to cease discharge to the sewer system until a treatment system was installed to remove chromium from their waste. At that time, FHC began discharge of their untreated plating wastes to a drywell behind the facility.

FHC was given a wastewater disposal permit for discharge to the drywell in 1976 by Ecology. The permit also contained a schedule for the installation of a treatment system for their wastes. Between 1976 and 1981, several extensions of the permit and schedule were granted as the deadlines were passed without compliance.

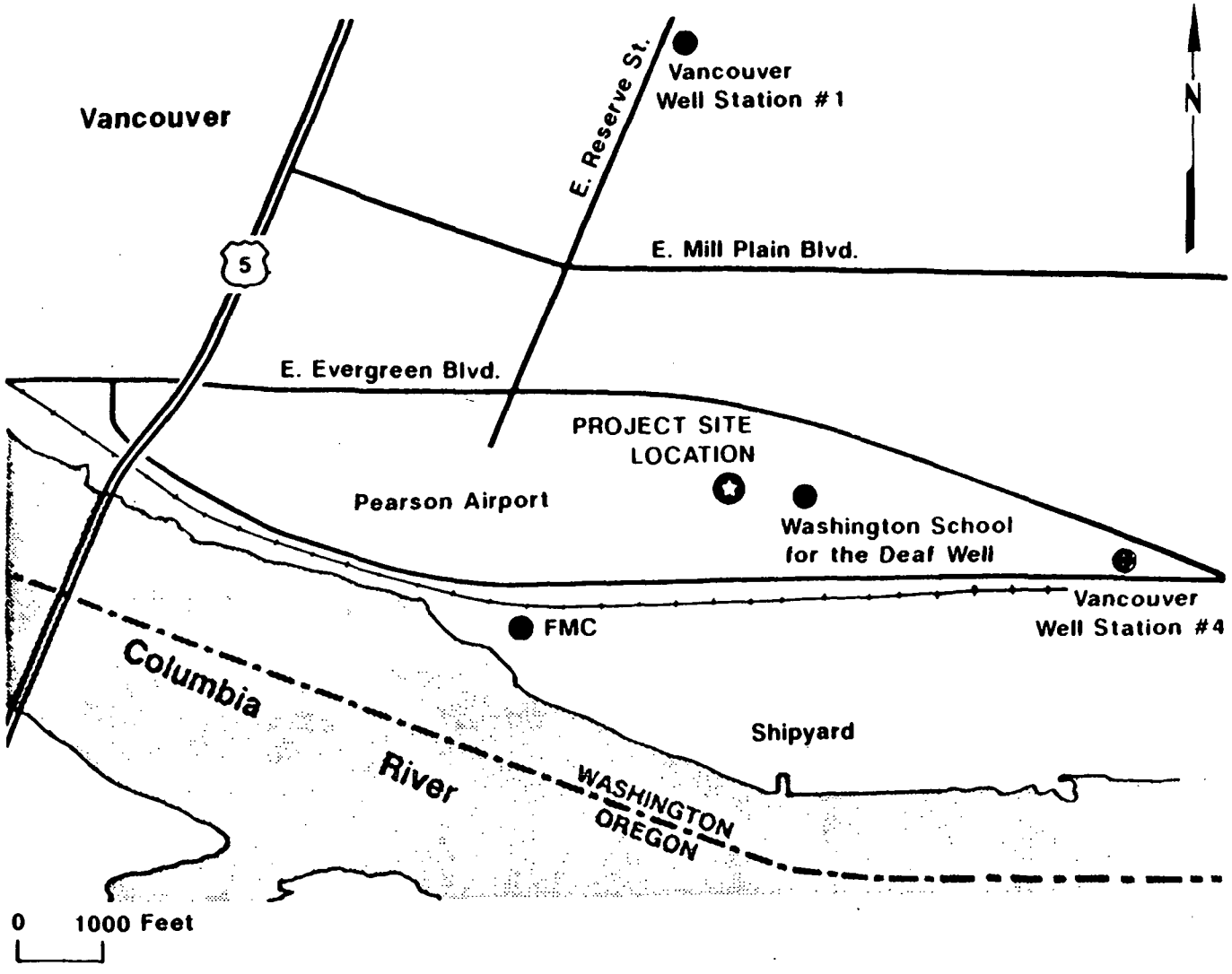
In 1982, Ecology found FHC in violation of the Dangerous Waste Act for the illegal disposal of hazardous wastes. Ecology also discovered that the groundwater in the area was contaminated with chromium at more than twice the drinking water standard. FHC's wastewater permit was again modified with a new compliance date. FHC again did not comply with the permit requirements for economic reasons and in December, 1982, the FHC site was proposed



Approx. Scale: 1" = 2000'

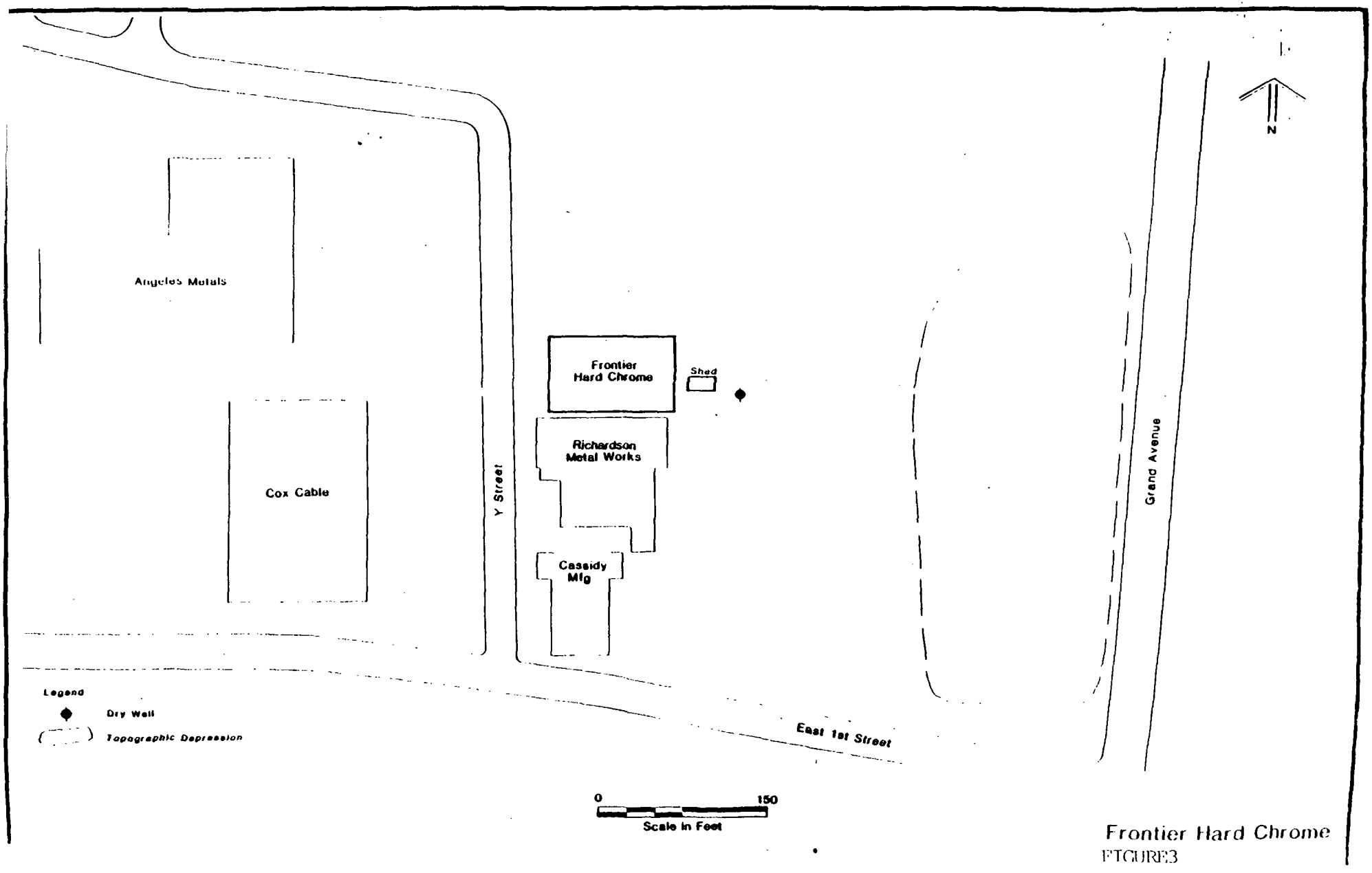
Vicinity Map

Location Map
Frontier Hard Chrome



Frontier Hard Chrome Site Location

FIGURE 2



Frontier Hard Chrome
FIGURE3

for inclusion on the National Priority List under the Comprehensive Environmental Response, Compensation and Liability Act, or Superfund. The listing was finalized in September, 1983.

In 1983, Ecology ordered FHC to stop discharge of chromium plating wastes to the drywell. FHC was also required to prepare a plan for the investigation of the groundwater. FHC closed down all operations at the site. The company has not undertaken the investigation.

In March, 1983, the EPA and Ecology signed a Cooperative Agreement which gave the Ecology the lead in investigating the FHC site under Superfund. Ecology began that investigation in Fall, 1984. The Remedial Investigation (RI) led to a Feasibility Study to determine the cost effective remedial action for the FHC site. The Feasibility Study (FS) was completed in October, 1987.

Enforcement History

The regulatory and enforcement actions at the FHC site have centered around the owners and operators of FHC, Walter Neth and Otto Neth. The Neths purchased the property in 1955 and operated a chrome plating business there. Under Superfund, they are responsible parties and liable for the cleanup of the site. Past negotiations between the responsible parties, EPA and Ecology have not been productive. Since 1976, FHC has not complied fully with any agency orders.

Pioneer Plating, another operator of the facility, is another potentially responsible party. The company went out of business in 1974. No further information is available on Pioneer Plating. Current operators of the facility may also be potentially responsible parties.

Remedial Investigation

The Remedial Investigation (RI) process was begun in the Fall of 1984. At that time Ecology selected a contractor to perform the investigation. The actual fieldwork for the investigation was started about one year later. The delay in initiating the RI resulted from difficulties in project funding, contracting, and obtaining access to the site. The RI primarily involved the installation of groundwater wells to establish the extent of contamination in the aquifer and borings on site to determine the levels of chromium in the soil.

The initial results of the RI determined that there were high concentrations of chromium in the groundwater beneath the site more than 2000 times the drinking water standard of 0.05 parts per million (ppm). The RI further determined that the chromium had spread well beyond the boundaries of the site to the

southwest. There are several drinking water wells in the vicinity of FHC, including wells used by the City of Vancouver. However, the investigation found that these city drinking water wells were not affected by the contamination from the FHC site. The RI confirmed that the wells were also not within the direction of groundwater flow and likely would not become contaminated. The surface and sub-surface soil of the site was also found to be contaminated with elevated levels of chromium.

In mid-1986, it was determined that additional work was necessary to fully characterize the site. The additional work was needed because the aquifer beneath the facility was much more complicated than anticipated. The initial investigation found that the groundwater beneath the facility existed in two zones labeled A and B, but that there was some hydraulic connection between the two.

The initial RI also found that contamination from organic solvents was present at the site but that their source could not be determined from the existing information. The source appeared to be independent of the chromium source.

Phase 2 of the investigation was begun in January 1987. The work consisted primarily of additional groundwater monitoring wells and comprehensive surface soil sampling of the FHC site.

The investigation was completed in the summer of 1987. It confirmed that the groundwater in the two zones beneath the facility was contaminated. The upper "A" zone is a sand and gravel layer about twenty feet below surface elevation. It is about ten to fifteen feet thick and sits upon a confining layer of clay. The clay is about 35 feet below ground at the site and is not continuous throughout the area. The clay layer is generally less than five feet in thickness. Hydraulic connection exists between the "A" and "B" zones but there are no distinct vertical gradients. The drywell does not penetrate deeply into the "A" aquifer or reach the clay. The "B" layer extends below the clay to a depth of about 80 to 100 feet. (See Figure 4)

The upper "A" has higher concentrations of chromium contamination than the "B" especially in the area of the drywell where the contamination was introduced into the groundwater. The level of chromium in the "A" layer groundwater exceeded 10 ppm, total chromium. Approximately 90% of the chromium in the groundwater was found to be hexavalent chromium. The contamination in the "A" had spread off site. Movement of the groundwater in the "A" is approximately 0.5 feet per day to the south-southwest. (See Figure 5)

The "B" is also made up of sands and gravel and was found to be more permeable than the upper aquifer. The groundwater velocity in this layer is approximately 2.25 feet per day to the south-southwest. The contamination of the "B" extends much further than in the "A" and has reached the Columbia River. The levels of chromium were less in the "B" aquifer. The highest

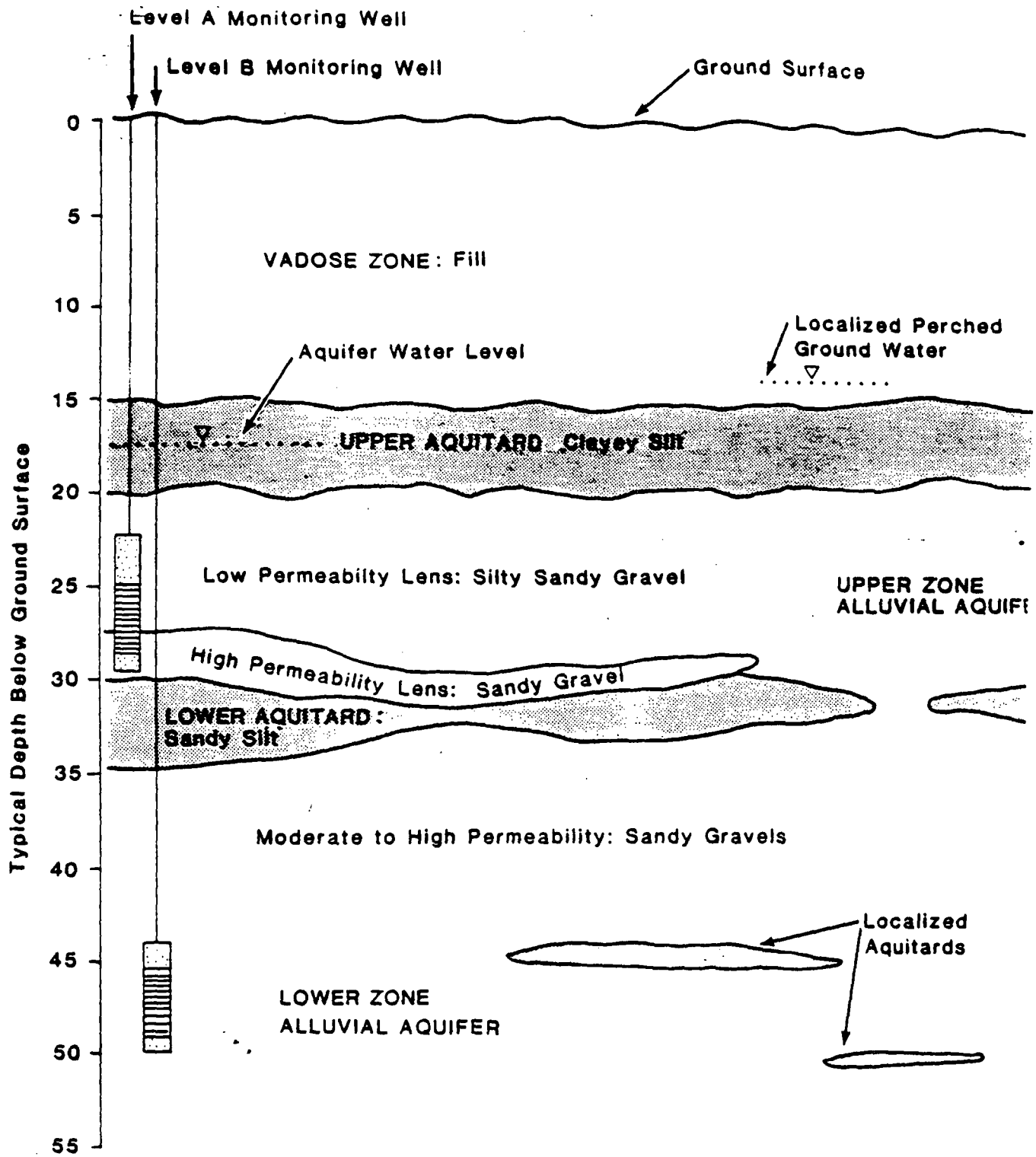


FIGURE 4
Conceptual Diagr
of Site Area Hydrostratigrap
Frontier Hard Chro

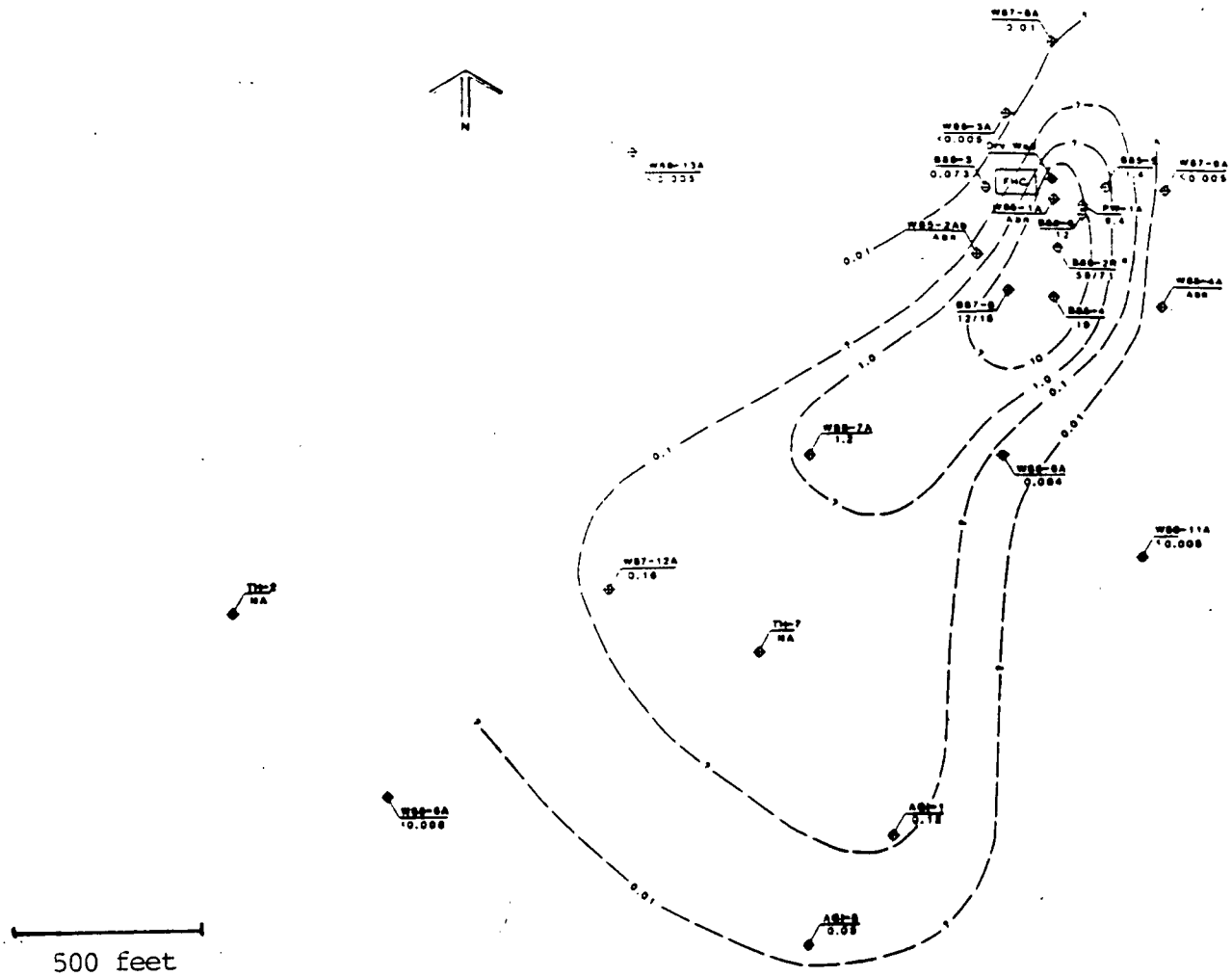


FIGURE 5
Inorganic Water Analysis
Level A Monitoring Wells
Hexavalent Chromium
Frontier Hard Chrome

concentrations of chromium were in the range of 0.3 ppm. Both of the aquifers were still above the drinking water standard of 0.05 ppm. (See Figure 6)

Organic contamination was confirmed in both layers. The contamination is highest to the north (upstream) of FHC. It is still not possible to identify the exact source of this contamination. Lower levels of the organics are found in the soils beneath the building on site and near the drywell. The organics identified include trichloroethylene and perchloroethylene. These were found in the groundwater at concentrations on the order of 40 parts per billion but also as high as 5 parts per million.

Chromium was found throughout the site in the surface and sub-surface soils. This includes adjacent properties where process cooling water had been discharged by FHC and where wastewater had migrated through the subsurface soil from the dry well. Levels of chromium in the soil range up to 17,000 ppm, total chromium. Most of the chromium was found to be trivalent. The most contaminated soils are in the area of the drywell. The depth of the most contaminated soils ranges up to 20 feet below grade. (Figure 7)

Surface water (in the form of standing puddles) on the site and on adjacent properties was sampled. The levels of chromium there are in the range of 0.01 to 0.9 ppm. The Columbia River itself was not sampled but discharge to the river was modeled. The model showed that no measurable increase of chromium would be detected in the river from the impact of the groundwater.

Air monitoring was conducted inside the FHC building during the investigation. Chromium was found in the air. The levels in the building were below the standard of 25 micrograms per cubic meter established for occupational settings. Chromium was also found on the walls and surfaces of the FHC building where the plating operation took place. The highest level found was 2300 micrograms per 50 square centimeters.

Soil/Source Control Operable Unit

During the FS, EPA and Ecology agreed that some form of soil/source control would be necessary. However, further evaluation of the necessity and extent of a groundwater remedial action was required. By agreement between the EPA and Ecology, consideration of the FHC remedial action was divided into two segments or operable units. The units consist of the soils at the FHC site and the groundwater aquifer below. Though the units are somewhat interdependent, the soil/source control unit can proceed without consideration of the final selected alternative for the groundwater.

This Record of Decision (ROD) discusses the soil/ source

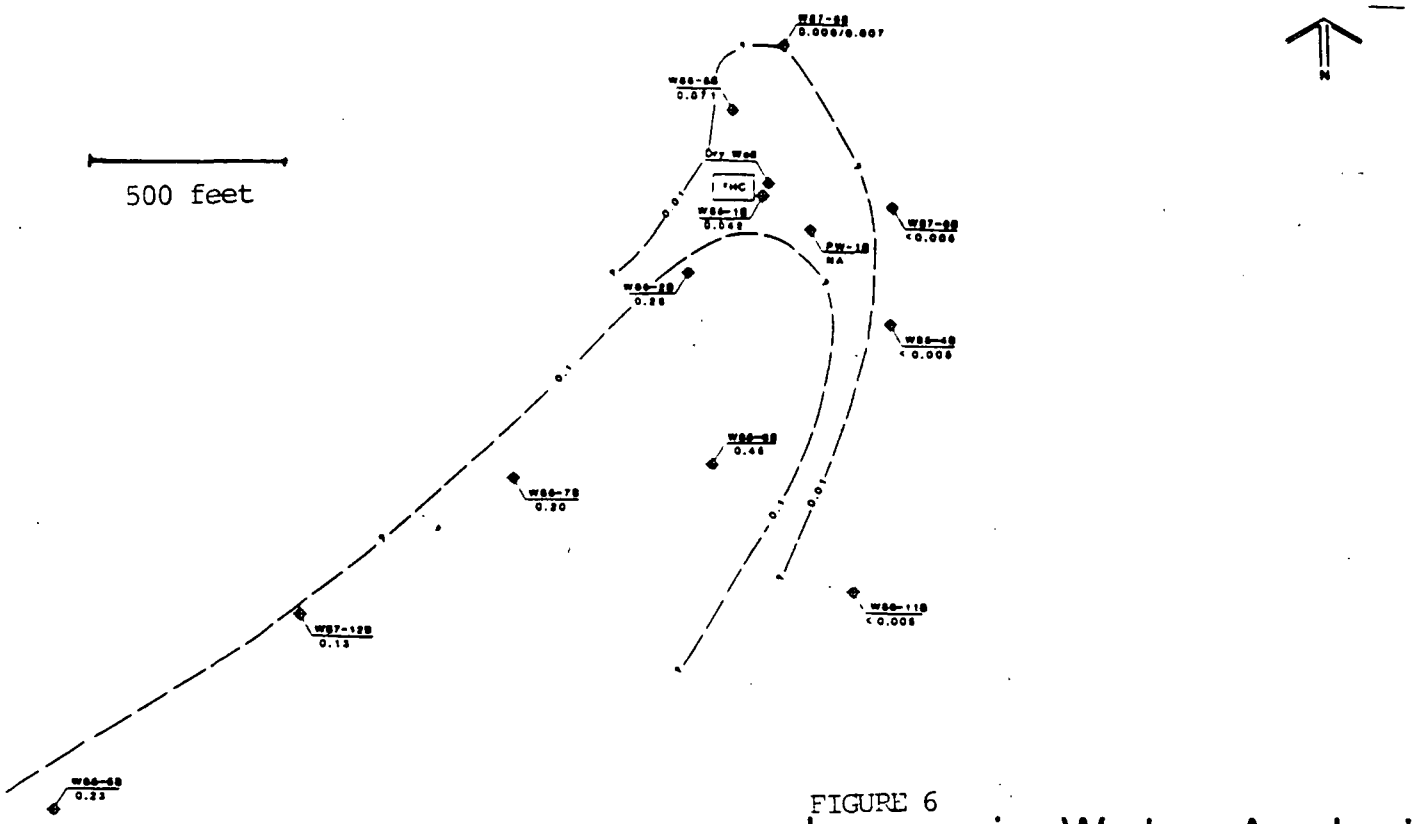
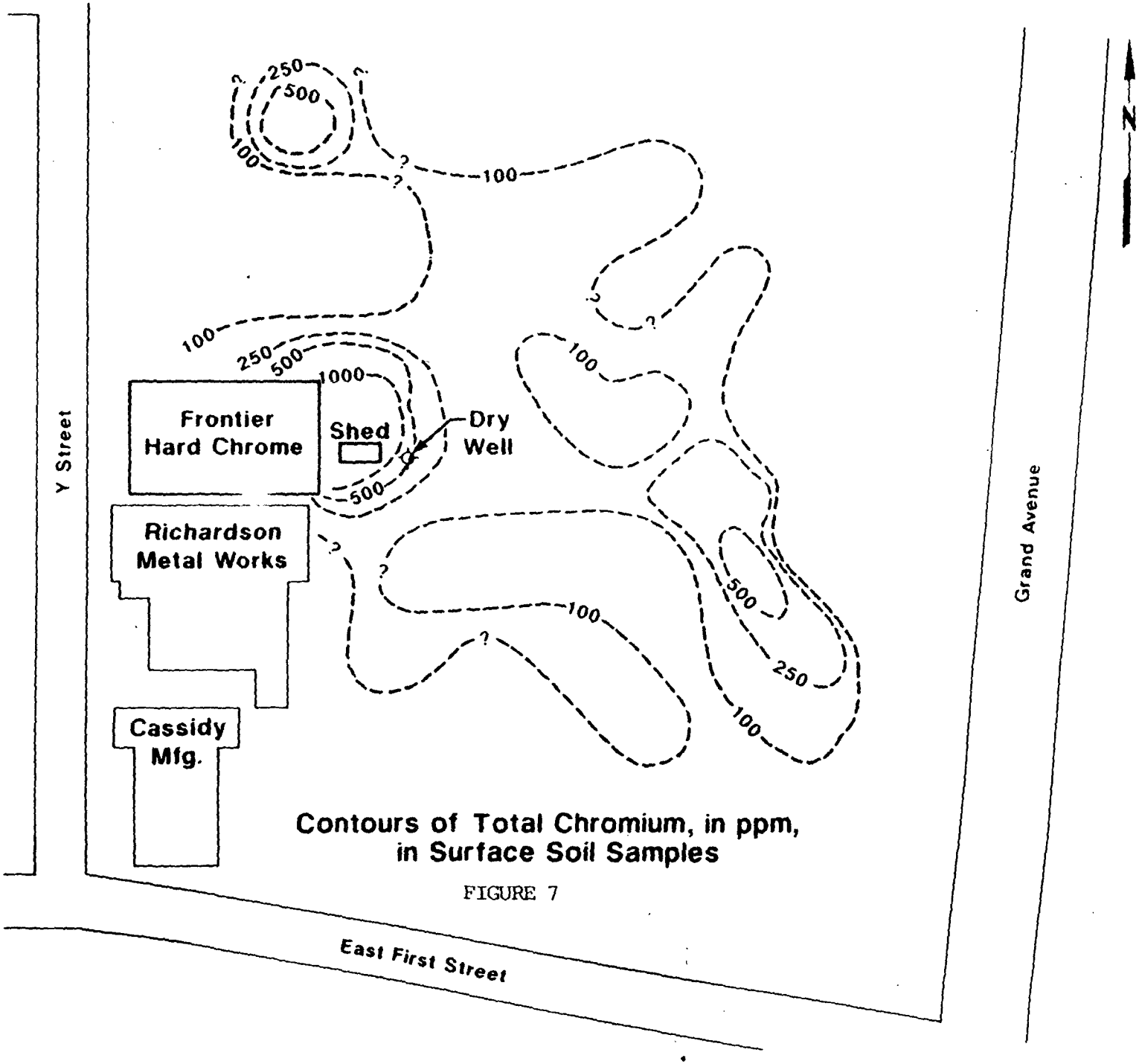


FIGURE 6

Inorganic Water Analysis
Level B Monitoring Wells Hexavalent Chromium
Frontier Hard Chrome



Contours of Total Chromium, in ppm, in Surface Soil Samples

FIGURE 7

control operable unit only. A groundwater ROD will be signed when the EPA and Ecology have more thoroughly considered the options.

Feasibility Study

Endangerment Assessment

The endangerment assessment was conducted to evaluate the risk to public health posed by the site and to assist in determining the proper level of remedial response. The endangerment assessment examines the particular hazardous substances present at the site, the amounts of the substances which are found, the routes of exposure or how people would encounter those substances, and the levels of those substances which are known to cause harm. The determination of this level of risk provides an additional basis for the selection of a remedial action.

Chromium is the hazardous substance of primary concern at the FHC site. Chromium is present in two forms, designated trivalent chromium and hexavalent chromium. Of the two, hexavalent chromium is the more hazardous. Hexavalent chromium is a potential carcinogen when inhaled. The level of allowable chromium in the air is 25 micrograms per cubic meter based upon an occupational exposure of eight hours per day. For the protection of public health, the Maximum Contaminant Level for chromium is set at 0.05 ppm in drinking water. Chromium was found on the walls of the building but there is no standard method for evaluating the risk posed by chromium on surfaces.

Nickel and lead are also found at the facility. The contaminant levels of these substances is much less than the chromium. Remedial actions designed to mitigate the hazard from the chromium would also deal with the lead and nickel.

The risk from exposure to inorganic contaminants from direct contact and inhalation of airborne dust was investigated. Exposure was measured using personal air monitoring samples obtained from on site workers. Long term exposure was modeled based on surface soil contaminant concentrations. It was determined that the levels of exposure were well below the amount allowed in standards for occupational settings. Chromium and nickel at the site presently do not exceed the 10^{-7} cancer risk for long term airborne exposures. Lead would also present minimal risk at the site in that the levels do not exceed and are not expected to exceed the National Ambient Air Quality Standards. Though the levels of exposure were not zero, the additional risk imposed by the dust was negligible. These exposure estimates do not account for potentially higher short term exposures to dust due to vehicular traffic and wind. This increased risk was not quantified.

Organic solvents on the site pose some cancer risk through the contamination of the groundwater. At the site, the excess

cancer risk associated with the ingestion of water containing solvents is approximately 10^{-2}. In areas that are not within the contamination plume, the estimated level of risk was found to be less than 10^{-7}, and zero at the City of Vancouver wells.

Surface water was examined near the site. Standing water in puddles were sampled for the presence of chromium. Chromium was found but at levels below the water quality criteria. Risk from exposure to the surface water was considered minimal. Any remedial action implemented which would address the soil contamination would reduce the contamination of the surface water on the site, further reducing any risk from this exposure. Risk due to contamination of the Columbia River was modeled and found to be negligible as the dilution of the river would not allow any measurable increase of chromium.

The greatest risk presented by the site is through the contamination of the groundwater and the drinking water supply with chromium. The aquifer is contaminated in excess of the drinking water standards. The groundwater in the area generally is used for drinking water but existing drinking water wells are not currently affected nor is it expected that they will be in the future. The risk from drinking contaminated water is based on the potential use of the water from the contaminated portion of the aquifer. This threat to the potential drinking water supply is expected to remain for over three hundred years if no actions are taken to remedy the site.

Alternatives Assessment

The alternatives evaluated in the FS are directed at the protection of public health and the environment. This ROD is specifically to address the hazards associated with the soils on the site. A ROD which addresses groundwater at the FHC site will be issued as a separate document. This Source Control/Soils ROD will deal with groundwater only in that the soils of the site present a continuing source of chromium to the groundwater and presents further threat to the groundwater. This direct threat to the environment would also be a threat to public health if the contaminated portion of the aquifer is accessed for drinking water. This ROD will not deal with the actual harm which the groundwater represents. The soils remedial action will therefore be evaluated on the ability of the alternatives to provide protection from direct or indirect exposure to the soil of the site and protection of the groundwater by eliminating the release of chromium.

The process of the FS is placed into several phases. The initial phase is the identification of potential remedial measures and technologies. These alternatives are screened for their site specific effectiveness and capabilities. The alternatives which survive the screening and would be potentially usable at this site are further evaluated with a detailed examination of their effectiveness, implementability and the

costs involved in implementation.

Under Superfund, the assessment of the alternatives must take into account the protection of public health and the environment, short term and long term effectiveness, long term maintenance costs and the uncertainty and risk associated with land disposal.

Criteria have been established in policy which are used to evaluate alternatives to insure that the process meets the intent of the law. The criteria includes a preference for alternatives which result in the permanent decrease in the persistence, mobility, toxicity and volume of the hazardous material. The long term and short term effectiveness of the remedial action must also be considered. The assessment must consider the technical implementability and community and state acceptance of the alternative. The remedy selected must be protective of public health and the environment. The remedy must meet or exceed the applicable or relevant and appropriate state and federal requirements and must be cost effective, that is, the least cost alternative meeting the remedial objectives.

The range of potential alternatives initially considered is shown in Table 1. Alternatives which did not pass the initial screening were eliminated from further consideration. Specific treatment technologies within the general alternative categories shown in Table 1 were considered and evaluated.

The specific alternatives which passed the initial screening include: soil excavation and treatment; excavation and soil stabilization; excavation and disposal at an offsite location; excavation and disposal on site; removal of surface soils and capping only (with offsite disposal); and no further action. The no-action alternative must be evaluated throughout the alternatives assessment. The alternatives and their ratings against the various criteria appear in Table 2.

Selection of Remedy

The above evaluation identified several alternatives. The alternatives meet the objective and criteria for selection to varying degrees. The specific goals of the remedial action would be the protection of public health by preventing the direct exposure to chromium contaminated soils and dusts and the protection of the groundwater by controlling the source of contamination.

The no action alternative was the least cost alternative but would not remove any of the chromium source to the groundwater and would not mitigate the risk from direct contact with the chromium. This alternative would not reduce the toxicity or mobility of the contaminants nor would it reduce any threat to public health or the environment. This alternative would include

Table 1

Potential Remedial Alternatives

Alternative	Description	Analysis
No action	Monitoring of site only	Retained for consideration due to regulatory requirements
Capping Surface soil removal	Placing an impermeable cap over the site to reduce contaminant leaching, direct exposure to contaminated soils	Retained for consideration
Stabilization/Fixation	Treatment of soils to bind contaminants to prevent leaching into groundwater and direct exposure to contaminated soils	Retained for consideration
Soil Removal/Disposal	Excavation and removal of contaminated soils with the disposal of the materials either on-site or off-site in a secure landfill	Retained for consideration
Soil Removal/Treatment	Excavation of soils, chemical treatment on-site or off-site, final disposal off-site or on-site	Retained for consideration
Biological Treatment	Use of bacteria in situ to break down contaminants	Rejected as technically infeasible for these contaminants
In-situ treatment	Chemical treatment of soils in place	Rejected as technically infeasible due to site specific conditions

Table 2

Summary of Remedial Alternatives

Alternatives	No Action	Capping	Removal/Disposal	Removal/treatment	Stabilization
Description	no further action monitoring only	places impermeable cap over site, limited soil removal	excavates contaminated soil with land disposal off-site	onsite treatment of soils (soil washing)	onsite stabilization of soils
Cost ($1000) Present worth	238	405	3,500	7,500	2,000
Protection of Public Health & Environment	allows direct contact w/ contamination allows further GW contamination	prevents public contact w/ soils allows further GW contamination	Alternatives protect public health by preventing the direct contact with chromium contaminated soils. Chromium is prevented from entering the groundwater eliminating the source of contamination		
ARARs	no attempt to meet regulations	would not meet RCRA	off site disposal would comply w/ RCRA	Placement of treated soils and alternate closure would comply with RCRA as appropriate standard	
Short term effectiveness	not effective	Alternatives would reduce the risk to the public from exposure to the soils			
		would not be effective in GW source control	All alternatives would eliminate immediate source of groundwater contamination		
		action would be completed within three months	remedial action would be completed within three months	would take two years to complete remedial action	remedial action would be completed within six months

Table 2
(continued)

Alternatives	No Action	Capping	Removal/Disposal	Soil Washing	Stabilization
Long term effectiveness	does nothing to protect in the long term, GW monitoring only	does not totally eliminate GW contamination, cap efficiency would decline over time	major source of contamination to GW removed from site permanently	effectively removes contamination from site	long term effectiveness of process not well known, has proved effective in appplication
Reduction of toxicity, mobility, persistence	Alternatives do not provide for the reduction of toxicity mobility or persistence.			Treatment alternatives reduce the mobility, toxicity of the contaminants, alternatives would alter the character of the hazardous constituents	
Technical feasibility, Implementability		Actions involve known technology and are proven and easily implemented		Physical/chemical characteristics of metals are known. Site specific feasibility to be tested, Large volume of material requires extended time for action, associated treatment systems	Stabilization effective in other locations, site specific feas. to be tested
Community, State Acceptance	These alternatives proposed at public meeting by citizens as the only actions necessary. Rejected as options by local government		These alternatives not recommended by the public which sees them as excessive, costly and unnecessary		recommended by the state as most cost effective source control alternative

continued monitoring to determine the continuing extent of contamination. This alternative is not favored by state or local governmental agencies but has been proposed by citizens attending public meetings.

Capping would be the placement of an impermeable surface over the site to prevent direct contact with the contaminated soils. This alternative is closely linked to the limited removal of contaminated soils at the surface only and are considered together as the actions utilize the same approach to contamination at the site. The cap might consist of asphalt or concrete paving or could consist of a coating which would seal the surface of the site. A cap would prevent the infiltration of precipitation through the soil column which would reduce the contamination source to the groundwater. The alternative would not be as effective or reliable as other alternatives at removing the source of groundwater contamination. This is because a large source of chromium to the groundwater is in the clay soils which are located in the saturated zone. Also, the effectiveness of the cap would deteriorate over time. Capping only would not meet the statutory preference for alternatives which would reduce the mobility or toxicity of the hazardous substance. Capping the site is an easily implemented and relatively low cost option. This option is favored by citizens who have attended the public meetings but is not favored by governmental agencies. This alternative, and all subsequent alternatives, include as part of the action long term monitoring of groundwater conditions.

Removal of the chromium contaminated subsurface soil from the site with disposal off site was evaluated. This alternative would effectively meet the direct contact goal and would remove the source of groundwater contamination, however, this alternative does not meet the criteria established which state that preference should be given to alternatives that utilize treatment for the reduction of toxicity and mobility of the contaminants and do not rely upon land disposal. This would apply to on-site as well as off-site disposal. This alternative could be implemented within six months.

The soil treatment alternative would remove the chromium from the surface and subsurface soil by excavation and chemical treatment. Contaminated soils would be excavated and placed in a treatment unit. The treatment process would remove the chromium by washing it from the soil. The treated soil would then be placed back on site. The chromium removed from the soil would require further treatment to reduce the toxicity prior to disposal. The site would then be capped. This alternative would both reduce the direct contact hazard to public health and remove the source of groundwater contamination. This alternative would also be responsive to the statutory preferences for treatment alternatives which provide a permanent response action. The soil treatment would require about two years to implement following design. The alternative would also require a system for treating the contaminated solutions which would result from the soil washing. Soil treatment is a relatively high cost option but would

meet concerns for the mitigation of risk presented by the chromium.

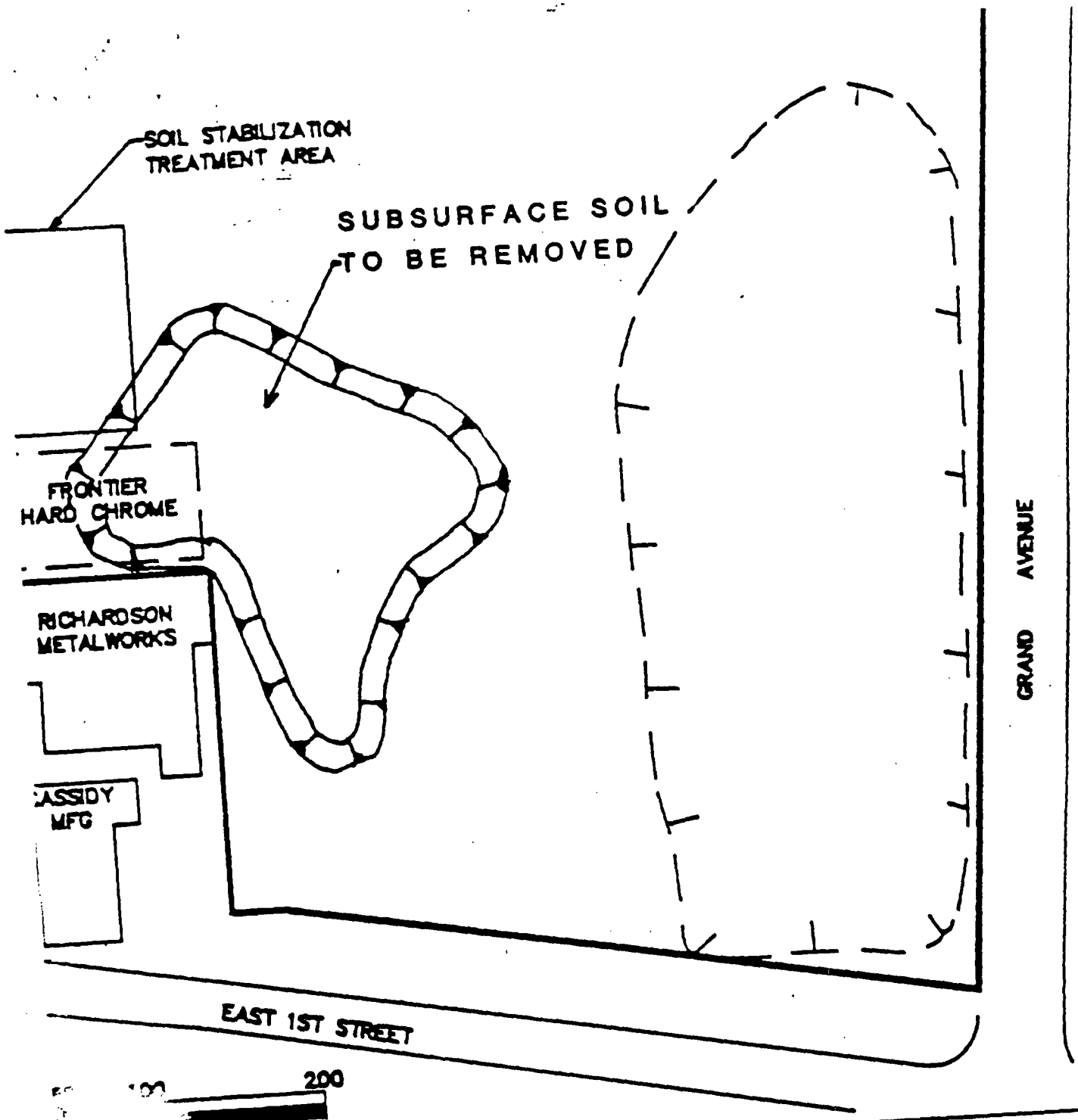
The final alternative evaluated was soil stabilization. It would utilize a chemical process which would transform the contaminated surface and sub-surface soils into a mass which would bind the chromium in the soil. As with the soil treatment alternative, the soils would be excavated and treated on site. The soil would be excavated and then mixed with chemicals to immobilize the chromium and then be placed back on the site. The site would finally be covered with an impermeable layer to assist in the control of surface run-off from precipitation. Stabilization would remove the threat to the groundwater and to direct contact with the contaminated soils. The alternative could be completed within 6 months not including testing and design. The process would require testing during the design process to insure the site specific feasibility of the process. Soil stabilization meets the preference for treatment alternatives and the permanent reduction of the toxicity and mobility of the hazardous substances.

The soil stabilization alternative was selected as the remedial action best meeting all of the criteria. The stabilization was favored over the soil treatment alternative for reasons including lower cost. The stabilization could also be implemented in a much shorter time and would minimize the amount of support activity required for remedial action, including treatment of contaminated water resulting from the treatment process. The site specific reliability of the stabilization is somewhat less than the soil treatment in that the stabilization is a more recently developed technique. The process of stabilization though has proven effective at similar sites.

Summary of the Remedial Action

The treatment system would use a chemical binding agent such as lime, polymers, fly ash or other, possibly proprietary mixtures, to chemically bind the chromium to the soil. The treatment would take place on the site. Surface and sub-surface soil exceeding a concentration of 550 ppm chromium would be excavated and put through the process. The stabilized soil would then be placed back in the excavation. The total volume of soil to be treated is estimated at 7400 cubic yards. The volume of soil is expected to increase by approximately 20% due to the treatment process. Implementation of the remedial action will require the demolition of the building on the site. (Figure 8)

Only those soils in excess of 550 ppm are to be treated. There is presently no standard which states a specific criteria for allowable chromium in the soil. The level of 550 ppm at this site was selected on the basis of tests performed at FHC. It was determined that soils with a concentration of less than 550 ppm would not release chromium to the groundwater at levels above the



REMOVE AND STABILIZE THE SURFACE AND SUBSURFACE SOILS (SS)

FRONTIER HARD CHROME FEASIBILITY STUDY

FIGURE 8

drinking water standard of 0.05 ppm. Therefore the untreated soils would not act as a source of contamination to the groundwater. Additional testing will be conducted in the Remedial Design process to refine the threshold level of chromium which would be treated.

Additionally, the site would be covered with a impermeable cap which would minimize the amount of precipitation entering the soil. This would further limit the amount of any leaching of chromium which would occur. Also, risk from exposure to soils and dust could be further lowered by reducing the levels of chromium in the soils.

The selected alternative of soil stabilization complies with requirements that the remedial action be protective of public health and the environment, reduce the mobility and toxicity of the hazardous substances and not rely on land disposal of hazardous substances. Stabilization is also a permanent remedy which does not require future actions other than monitoring of the site and maintenance of the cover.

The alternative meets the preference for on-site treatment. The action would be solely confined to the site.

Soil stabilization is the cost effective alternative meeting the criteria and objectives for the site.

Compliance with Regulations

Superfund requires that all Applicable or Relevant and Appropriate requirements (ARARs) be achieved at the site. Among the potential ARARs for this site would be the drinking water standards for contaminated groundwater beneath the site. However, the soil stabilization remedy does not directly address cleanup of the groundwater (though it does remove the source of contamination.) Therefore, drinking water requirements are not ARARs for the purposes of this ROD. As discussed, the stabilization of the soils is an operable unit of the total remedial action. Therefore, this Record of Decision for the soils still complies with the law. The ROD which addresses the groundwater remedial action will address the drinking water standards as ARARs directly.

The implementation of this remedial action would comply with all ARARS. There are no standards which would dictate a criteria for chromium in the soil. The site specific determination made at the FHC site was to treat soils in excess of 550 ppm chromium. This determination was made relative to the drinking water standard which would be applicable in the cleanup of groundwater beneath the site. This level would also minimize direct contact or exposure to chromium contamination at levels which could possibly cause harm.

Washington State has regulations dealing with the disposal of solid and dangerous wastes. The stabilized soil would not be classified as a dangerous waste as defined in those regulations and would not be subject to those regulations. The requirements for the disposal of dangerous wastes under these regulations, however would be appropriate standards. The disposal of the stabilized soils as a solid waste would be applicable. All of these requirements would be met by the selected alternative.

The Resource Conservation and Recovery Act, as amended by the Hazardous and Solid Waste Amendments, (RCRA) is not specifically applicable to the FHC site or the remedial action (though it is relevant and appropriate.) The contaminated soils of the site are not subject to regulation under 40 CFR Section 261 of RCRA. The stabilized soils would also not be a characteristic waste (EP toxic) or listed waste under the definitions in RCRA. Further, because of the nature of the material as indicated, placement of the treated soils back on the site would not create a new disposal unit under RCRA.

Placement of the stabilized soils on the site would not be subject to the land disposal ban under RCRA. The rules do not presently regulate materials which would be involved in this operable unit of the remedial action. As regulations are developed which would address directly the disposal of chromium contaminated waste and debris, those regulations would be relevant and appropriate to this remedial action.

RCRA is relevant and appropriate as a standard in the requirements for the closure and long term care of the facility. This operable unit of the remedial action at the FHC site would meet the substantive requirements for an "alternate closure" under proposed rules governing closure found in 40 CFR Section 264.310 of RCRA.

Community Relations

There have been two public meetings for the purposes of informing the local population about the activities at the site. The initial meeting was held in 1984 at the commencement of the RI. The second meeting was held on November 4, 1987 to discuss the FS and the proposed alternatives.

Contamination from this site has resulted in the contamination of the drinking water aquifer utilized in this community. The present drinking water supply is not affected though the potential industrial and commercial development of the area may be. The public interest at this site has been limited.

The attendance at the meetings has been sparse. The meetings were attended by the responsible parties and by people directly associated with the operation of FHC. Adjacent property owners were also in attendance at the meetings. A transcript of the November public meeting was made and a responsiveness summary

prepared. The responsiveness summary is attached.

Media interest in the site has been limited. The local media was in attendance at the November meeting. Much of the media interest centered around the cost of the work which has been conducted to date and the future costs.

FRONTIER HARD CHROME SITE
RESPONSIVENESS SUMMARY

This appendix summarizes the major issues raised by the public and provides agency responses to those issues. It is included as a part of this decision document in accordance with the requirements of the National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR Part 300, Section 67.

The responsiveness summary is divided into the following sections:

Section 1.0 Overview. This section discusses the preferred soil/source control alternative for corrective action, and general public reaction to this alternative.

Section 2.0 Background on Community Involvement and Concerns. This section provides a brief history of community interest and concerns regarding site activities.

Section 3.0 Summary of Major Comments Received During the Public Comment Period and Response to the Comments. Both verbal and written comments are categorized by relevant topics. EPA's responses to these major comments are also provided.

Section 4.0 Remaining Concerns. This section describes remaining community concerns that EPA should consider in planning the cleanup activities at the site.

1.0 Overview.

The Washington State Department of Ecology (Ecology), as lead agency under a cooperative agreement with the U.S. Environmental Protection Agency (EPA) conducted the Remedial Investigation and Feasibility Study (RI/FS) for the Frontier Hard Chrome (Frontier) Site in Vancouver, Washington. The site was the location of a chrome plating operation from 1958 until 1983. During the period of 1976 to 1983 process waste water containing chromium and other metals was discharged to an on-site dry well.

During the FS process for evaluating potential site cleanup alternatives, the EPA and Ecology agreed that some form of soil/source control would be necessary. However, they decided that further evaluation of the need and extent of a ground water remedial action is required. In order to allow initial cleanup to move forward, the agencies agreed to split the remedial action selection process into two phases, or operable units: a soil/source control remedy is selected in this Record of Decision (ROD) document, and an appropriate action for ground water will be addressed in a subsequent ROD.

Potential cleanup alternatives for both soil/source control and ground water were presented in the Feasibility Study, proposed plan,

and public meeting. Ecology solicited and received public comment regarding the entire range of alternatives. However, since this ROD only addresses the soil/source control alternative selection, this Responsiveness Summary will only address that portion of public comment pertaining to soil/source control options. A subsequent ROD and Responsiveness Summary will address the ground water cleanup options and public comment regarding those.

The soil/source control cleanup alternative chosen in this ROD would remove surface and subsurface soil exceeding 550 ug/g chromium. The soil would be treated with a stabilization material, and be replaced on-site. The existing on-site structures would be removed and disposed in accordance with applicable state and federal regulations. Institutional controls would be necessary to restrict access to ground water within the contaminated plume and to protect the integrity of stabilized soils. This alternative is described in more detail in Chapter 6 of the Feasibility Study and in the text of this ROD.

This Responsiveness Summary describes concerns which the community has expressed in regard to the recommended soil/source control cleanup alternative, the purpose of the public participation process, and health issues. The most vocal and interested individuals, the site owners and adjacent businesses, have felt that the site studies have been too costly and time consuming and that the site does not present environmental or health impacts of enough significance to warrant much remedial action. On the other hand, the City of Vancouver public officials acknowledge that cleanup action of the magnitude recommended by this decision document is necessary.

2.0 Background on Community Involvement and Concerns.

Throughout the Frontier studies, Ecology has conducted a community relations program. This program involved identifying interested parties and public concerns, and conducting activities to meet the public's information needs and address concerns.

Interested Parties

Ecology and the Vancouver Public Works Department have been involved with the Frontier site since 1975 when the metals in Frontier's wastewater were first identified as a problem.

Since that time the news media has covered developments at the site. This media coverage has included project background, status, budget and funding, public meetings, and future plans.

Other than the news media attention, there has been little public concern shown. Parties who have expressed some interest or concern include: responsible local public agencies--such as the Vancouver Department of Public Works and the Southwest Washington Health District; owners of neighboring wells--such as the Washington School for the Deaf; neighboring business owners and those who were directly involved with past or current ownership or operation of the Frontier

site.

Public Concerns

Since studies began at the Frontier site, the following concerns have been raised.

- Chemical contamination of drinking water sources from: chromium, lead, nickel and chlorinated solvents that have been detected in soil and water at Frontier and can affect human health. The original designation of Frontier as a National Priority Site was primarily a result of agency concern over the potential of chromium contaminated ground water originating from the Frontier site to contaminate Vancouver Well Fields 1 and 4.

  AGENCY RESPONSE: Thirty-seven ground water monitoring wells were installed during the Remedial Investigation (RI). The direction of ground water flow and location-specific changes in ground water contaminant levels over time were determined from periodic monitoring activities at each well location. Aquifer pump testing was also conducted during the RI and all these data were used to model the long-term migration of ground water contamination. These studies have shown that it is very unlikely that the site contaminants would impact existing drinking water wells.

- Soil Contamination: Exposure to chromium and other heavy metals could occur through direct contact with contaminated dust or soil.

  AGENCY RESPONSE: Sampling and analysis of surface and subsurface soils was conducted to determine the distribution and levels of soil contamination, and to evaluate potential health impacts caused by the soil contamination.

- Project Expenses and Schedule: Vancouver public officials and Vancouver area newspaper articles have focused on the expenses of the project. They have suggested that the time and money spent studying the problem could have been spent on cleanup.

  AGENCY RESPONSE: Rationale for the nature and extent of site studies have been explained to the City officials and the media. The requirements of the Superfund study process and the complexities of the environmental contamination at the Frontier site dictated the extent and cost of site studies necessary to protect public health and the environment.

- Effect on Property Development: Ground water and soil contamination have affected the current use of the site. The proposed remedial measures will further limit development potential of the site and probably of neighboring properties because of the regulatory controls necessary to protect the stabilized soil and restrict the development of the contaminated ground water. The area is generally considered a prime location for industrial development.

AGENCY RESPONSE: It is acknowledged that development potential of the site and property adjoining the contaminated plume may be limited as a result of the contamination.

- Communications: Vancouver officials have expressed concern that there be clear channels of communication between Ecology and the City, and that the City be notified of any critical developments and schedules.

  AGENCY RESPONSE: Periodic communication has been maintained with various City officials throughout the duration of project activities. A separate briefing was provided to these officials to describe study results, to discuss alternative plans for remedial action, to receive comments, and to answer questions.

Community Relations Activities

Ecology prepared the initial Community Relations Plan in 1984. This plan outlined community concerns, interested parties, and the scheduled community relations activities. Prior to preparation of the plan, Ecology interviewed local officials to identify concerns. Information repositories for project documents were established at the main branch of the Vancouver Public Library and at the City of Vancouver Public Works Department.

To explain the Remedial Investigation and the planned field work, Ecology issued a fact sheet and held a public meeting in October 1984. The fact sheet was distributed to the mailing list of local officials and other interested parties. The meeting was announced through a news release and a public notice. Thirteen citizens, primarily the Potentially Responsible Parties (PRP's) and Vancouver city officials attended the meeting.

Throughout the studies, Ecology notified the press at key points in the project. In August 1987, a revised Community Relations Plan was prepared for Ecology and the mailing list was updated. In preparing the plan, four local officials were interviewed.

At completion of the Remedial Investigation and Draft Feasibility Study, Ecology issued a Proposed Plan summarizing the results of these studies and presenting the proposed alternatives for 1) controlling the source of contamination and 2) correcting ground water contamination problems. This proposed plan, as well as a news release and public notice, also announced the public comment period and the public meeting of November 4, 1987. This public meeting was held to present the results of the Remedial Investigation and Feasibility Study, to discuss alternative plans for remedial action, to answer questions, and to receive written and oral comments. Thirteen citizens and five news media representatives attended the meeting.

As the project developed, Ecology periodically briefed local officials regarding project activities. A formal public officials briefing on the results of the Remedial Investigation and Feasibility Study was held prior to the public meeting November 4, 1987. The briefing was

attended by about 11 local officials.

3.0 Summary of Major Comments Received During the Public Comment Period and Agency Responses to the Comments.

The public comment period occurred from October 29 to November 19, 1987. A transcript of the public meeting proceedings is provided as Appendix B to this decision document. Written comments were received from the City of Vancouver Public Works Department and are included as Appendix A.1 to this responsiveness summary.

Comments from the public, (e.g., the site owners, site tenant, neighboring businesses and City of Vancouver public officials) obtained during the public comment period are summarized below. Comments are grouped under the following headings: human health and environmental concerns, alternative preferences, public participation process, and general.

In summary, comments from the City of Vancouver Public Works Department favor the agency recommended alter-native for source/soil control. The City has also suggested that the subsequent Record of Decision regarding ground water cleanup should include consideration for a limited extent of ground water treatment. The site owners, tenant, and neighboring businesses favor only limited action toward soil/source control, possibly to cover part of the site surface with a paving material and do nothing more. That position is predicated on the notion that risk to the environment and public health is not significant enough to warrant much cleanup action, and that residential development of the area is very unlikely.

Human Health and Environmental Concerns

1) A general issue was raised by the Potentially Responsible Parties to suggest that any major cleanup actions proposed for the site are not warranted because impact to the environment or to public health is not imminent. The health significance of contaminated soils, ground water, and migration of ground water contaminants to the Columbia River were questioned.

AGENCY RESPONSE: Based upon the data and information generated in the RI, the City of Vancouver Well Fields 1 and 4 are located upgradient from the Frontier Hard Chrome site. There is no indication that the pumping capacity, drawdown, or extent of any cone of depression from these two well fields influences the movement direction of the contaminant plume of Cr+6 emanating from the FHC site. The studies show that the contaminant plume does not presently and is not expected in the future to impact existing drinking water wells. Continued monitoring well observations in the FHC vicinity will be conducted to ascertain any changes in contaminant levels or gradient of the ground water. There is concern however, that there could be serious implications to public health if drinking water wells were to be installed within the area of the ground water contaminant plume. For this reason, certain land use restrictions, or institutional

controls will be defined and applied to restrict access to the contaminant plume. Additionally, some form of institutional control(s) may be implemented to ensure that future land use activities will not interfere with the stability or integrity of stabilized soils. These institutional controls may be required regardless of future decisions about ground water cleanup needs. Contaminated subsurface soils are not expected to cause any direct public health impacts. High concentrations of chromium occur in these soils, however and serve as a supply of continual contamination to the ground water. A response regarding health concerns per-taining to surface soils is provided in part 2 of this section. Based upon data and information gathered and presented in the RI and FS, there appears to be no adverse effects on the public health or on water quality as chromium contaminated ground water discharges into and is diluted by the Columbia River.

However, the agencies jurisdiction to respond with site cleanup is not predicated solely on actual or demonstrated risk to the public or the environment. While actual environmental damage has been documented, we are very fortunate that actual or current public health risk is insignificant. However, substantial risk would be certain if the contaminated ground water is used for drinking. We are allowed to conduct a site response solely on that potential risk, if necessary.

2) A question was raised by the current site tenant regarding what if any occupational health risks may be present at the site.

AGENCY RESPONSE: The potential for human health hazard associated with inhalation of contaminated surface soils (i.e., dust) were evaluated in two ways. A limited number of direct measure-ments were obtained from personal air monitors worn by workers using the FHC building and site. Direct measurements collected from workers showed no concen-trations of chromium or nickel over occupational standards.

Modeling of air concentrations of chromium, nickel, and lead was conducted to assess the expected long-term health impact associated with contamination found at the FHC site. This modeling work showed that the long-term risk associated with inhalation of re-suspended contaminated soil at FHC is minimal. The model could not evaluate the short-term inhalation hazard; however, based on the direct measurements and long-term modeling con-ducted, it is not expected that the short term inhalation hazard is significant.

Alternative Preferences

1) The general tone of the public meeting comments favored the "no-action" alternative for the site cleanup. The "no-action" preference for ground water remedy was based primarily on the feeling that it would be very unlikely for someone to be inter-

ested in installing a drinking water well in the contam-inated ground water plume since the area could be adequately served by the City of Vancouver public water system. A specific comment from the Potentially Responsible Parties suggested preference for a form of the "SO" or "surface only" alternative as identified in the Feasibility Study (FS). The comment proposed that blacktop (i.e., asphalt) could be used to pave the site and isolate surface dust.

AGENCY RESPONSE: The contaminated ground water does not currently impact existing drinking water wells because the wells are located upgradient of the contaminated plume. However, the studies conclude that under the "no-action" alternative, serious health impacts from drinking the contaminated ground water could occur for 200 to 300 years. At this time we cannot predict the future public demand of this ground water over the next 300 years. More importantly, the ground water is regulated under both federal and state laws as a drinking water resource because of its potential use as drinking water.

The surface soil removal alternative (SO) which involves removal and disposal of the upper 18" of soil contaminated over 550 ppm Cr; replacement of the soil with clean fill; cleaning and sealing of the building; and monitoring of ground water was not selected since it does not eliminate the major portion of soil contamination which acts as a continued source of chromium to the ground water. Capping of the site surface with an impermeable cap was not evaluated in detail in the FS since an impermeable cap would not prevent leaching of chromium from subsurface soils to the ground water. Chromium is present in these soils at high concentrations, particularly within the silt/clay layer at a depth of approximately 15 feet. These soils are in contact with ground water and act as a continual source of chromium to the ground water.

2) Written comment from the City of Vancouver favored the agency proposed alternative and also suggested that some degree of ground water extraction and treatment should be conducted. A copy of the correspondence is provided as Appendix A.1 to this Responsiveness Summary.

AGENCY RESPONSE: The soil/source control preferred alternative as described in the FS report and this decision document is consistent with the wishes of the City of Vancouver, except that it does not provide for treatment of the groundwater. A subsequent Record of Decision will address the extent of ground water remedial action needed for this site.

Public Participation Process

1) The Potentially Responsible Parties (PRP's) asked what steps are involved in the cleanup selection process. It was asked: who makes the decision, how and when is the decision made, and does

the public really have any influence to the decision?

AGENCY RESPONSE: EPA and Ecology have encouraged the public to comment on the proposed alternatives for the site by providing a public comment period and by holding a public meeting. However, the final decision is to be made by EPA. Although it is an agency process once the comment period is closed, the decision must be responsive to public concerns. Comments from the public meeting on November 4, 1987 and from the comment period of October 29 to November 19, 1987 are summarized in this Responsiveness Summary. This document is part of the decision-making process and is an integral part of the Record of Decision to show how the agencies have responded to public concerns. The Record of Decision on the soil alternatives will be finalized and available by December 31, 1987, and a separate Record of Decision on the ground water alternatives will be finalized and available in spring 1988.

2) A point was made that the community interest in the site is limited to the site owners, tenants, and nearby businesses. The public, (i.e., Vancouver residents) were obviously absent from public meetings about the site and therefore appeared unconcerned.

AGENCY RESPONSE: We acknowledge this comment.

General Issues

1) Strong opinion was voiced by the PRP's that the site should not have qualified for nomination to the National Priorities List (NPL). It was felt that information pertaining to the vulnerability of the nearby municipal water supply wells had been misrepresented and that unfairly influenced the sites' nomination to the NPL.

AGENCY RESPONSE: The Frontier Hard Chrome site was nominated to the NPL based upon the potential of a public water supply well serving greater than 10,000 people of becoming contaminated with hexavalent chromium. Additionally, the fact that an industrial supply well showed a concentration of hexavalent chromium (Cr+6) exceeding the Drinking Water Standard for Cr+6 also was a factor in NPL nomination.

2) Concern was raised regarding the long-term reliability of the stabilized soil mixture as identified in the preferred alternative.

AGENCY RESPONSE: Several stabilization technologies will be explored as part of the remedial design process. The long-term stability and effectiveness of these technologies will be assessed through leach and strength testing as part of this design phase. It is expected that the stabilization technology

selected will provide long-term immobilization of metals in the soil and produce a substance of adequate load-bearing capacities.

4.0 Remaining Concerns

Several issues have been addressed but are not yet completely resolved. These issues include:

- What mechanisms are available for implementing and enforcing institutional controls to restrict access to the plume of contaminated ground water and protect the integrity of stabilized soils? The availability of existing institutional controls is being researched in order to define the need and appropriate authorities for additional land use controls.

- How will storm water runoff be drained from the site area? An estimate of site storm water runoff volume will be calculated, and that information applied to select and design an appropriate storm water drainage system.

- What processes are appropriate for disposition of water encountered during excavation of source soils? This will be addressed as part of the remedial design process.

- To what degree is cleanup of the contaminated ground water appropriate? This will be addressed during the Record of Decision for ground water cleanup in the spring of 1988.

- How would the governments resolve potential problems if business operations are dislocated as a result of remedial operations. Agency legal counsel are evaluating the legal implications of remedial operations upon business activities.