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September 1989

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Superfund Record of Decision:

Sand Creek Industrial, CO

50272-101

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15. Supplementary Notes

16. Abstract (Limit: 200 words)

The Sand Creek Industrial site is in Commerce City, Adams County, Colorado. Land use in the vicinity of the site is industrial, including trucking firms, petroleum and chemical production and supply companies, warehouses, small businesses and several residences. The site contains the property and buildings of the Colorado Organic Chemical Company (COC) and approximately 13 residences. Production wells north and downgradient of the [illegible]y area are the source of water supply to the county. Pesticide manufacturing [illegible]ations began at COC in the 1960s. Fires in 1968 and 1977 and improper pesticide storage practices resulted in high levels of organiphosphate pesticides, chlorinated hydrocarbons, and thermally-altered pesticides being released at the site. In 1978 COC removed some contaminated soil, and in 1984 COC removed drums of waste, excess product, and contaminated soil, and installed fencing at the site in response to an EPA order. This Record of Decision represents the first of five planned operable units for the site and addresses soil, buildings, and tanks contaminated by pesticides, volatile organics, and metals. The primary contaminants of concern affecting the soil, onsite buildings, and tanks are VOCs including TCE and PCE; and other organics including pesticides.

The selected remedial action for the site includes in situ vacuum extraction to remove VOCs from contaminated soil and onsite treatment of off-gas by air stripping; excavation and offsite incineration of approximately 1,000 cubic yards (Continued on next page)

17. Document Analysis a. Descriptors

Record of Decision -Sand Creek Industrial, CO
First Remedial Action
Contaminated Media: soil, debris
Key Contaminants: VOCs (PCE, TCE), other organics (pesticides)

b. Identifiers/Open-Ended Terms

c. COSATI Field/Group

[illegible]ilability Statement	19. Security Class (This Report) None	21. No. of Pages 82
	20. Security Class (This Page) None	22. Price

(See ANSI-Z39.18) *See Instructions on Reverse*

OPTIONAL FORM 272 (4-77)
(Formerly NTIS-35)
Department of Commerce

1 Abstract (Continued)

of soil contaminated with greater than 1000 mg/kg halogenated organic compounds (HOC), with offsite residual disposal in a RCRA landfill; backfilling of excavated areas with clean soil; demolition and offsite disposal of buildings in conformance with land disposal regulations; and ground water monitoring at the site for 30 years following remediation. The estimated present worth cost for the selected remedy is $5,349,600.

RECORD OF DECISION

DECLARATION STATEMENT

SITE NAME AND LOCATION

Sand Creek Industrial Site
Commerce City, Colorado
Redefined Operable Unit No. 1
Colorado Organic Chemical Area Soils (subset), Buildings, and Tanks

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected remedy for remediation of contaminated soil, buildings, and tanks from the redefined Operable Unit One (OU1) of the Sand Creek Industrial Site. The document was developed 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) and the National Contingency Plan. This decision is based on the Administrative Record for this site. The State of Colorado concurs with the selected remedy.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this Record of Decision (ROD), may present an imminent and substantial endangerment to public health, welfare, or the environment.

DESCRIPTION OF SELECTED REMEDY

The remedy selected for OU1 addresses soils, buildings, and tanks contaminated with pesticides and volatile organic chemicals. The remedies for the other operable units of the Sand Creek Industrial Site will be addressed in separate Record of Decision documents. The action described herein represents a remedial action to control the source of soil contamination by addressing the principal threats of contaminated soil to groundwater, surrounding populace, and on-site workers. The components associated with this remedy are:

- Excavation and off-site incineration of approximately 1,000 cubic yards of soils heavily contaminated with Halogenated Organic Compounds (HOCs), and disposal of incinerated soil residuals in a RCRA Subtitle C minimum technology landfill, in conformance with the Land Disposal Restrictions.

- Backfilling of excavated areas with clean soil.

- o Vacuum extraction of volatile organics in soils.

- o Demolition and off-site disposal of buildings in conformance with the Land Disposal Regulations.

The remedy selected for OU1 is consistent with overall remediation goals for the Sand Creek Industrial Site. The remedial action will address a significant portion of contaminated soils from the site which are a potential source of groundwater contamination and adjacent surface soil contamination. Present net worth cost of the remedial actions described in this ROD to clean-up contaminated soils at OU1 are $5,349,600. Groundwater contamination (Operable Unit No. 4) will be most effectively implemented when sources of contamination have been remediated.

In addition to the 1000 cubic yards addressed by this ROD, approximately 38,000 cubic yards of soil contaminated with lesser levels of HOCs within the OU1 area will require treatability studies. Remediation of these soils (hereafter considered OU5) will proceed separate from OU1 remediation activities.

The selected remedy will protect groundwater resources and prevent direct contact risks through the removal and subsequent destruction or disposal of contaminated soils. The selected remedy will ensure the long-term protection for the public and the environment through destruction or containment of hazardous substances. Incineration will be used to destroy highly HOC-contaminated soils.

STATUTORY DETERMINATIONS

Consistent with CERCLA as amended by SARA and the National Contingency Plan, I have determined that the selected remedy for Operable Unit No. 1 of the Sand Creek Industrial Site is protective of human health and the environment. I have also determined that the selected remedy complies with Federal and State requirements that are legally applicable or are relevant and appropriate to the remedial action, and is cost effective. The selected remedy utilizes permanent solutions and alternative treatment technologies to the maximum extent practicable and satisfies the statutory preference for remedies that employ treatment that result in the reduction of the volume, mobility, and toxicity of soil contamination at the site as a principal element.

Because this remedy will result in hazardous substances remaining on site above health-based levels, a review of the remediation will be conducted within five years after commencement of the remedial action, to ensure that the remedy continues to provide adequate protection of human health and the environment.

James J. Scherer
Regional Administrator
EPA Region VIII

9-29-89
Date

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RECORD OF DECISION SUMMARY

Record of Decision

Sand Creek Industrial Site
Colorado Organic Chemical Company Area
Operable Unit No. 1

Decision Summary

I. Site Name, Location, and Description

This Record of Decision (ROD) describes the remedial action for hazards located within and immediately adjacent to the Colorado Organic Chemical Company (COC) property. The hazards addressed in this remedial action are: 1) a portion of the pesticide contaminated soils 2) all of the volatile organic compound (VOC) contamination in the soils; and 3) contaminated buildings and tanks used in the formulation and storage of pesticides. The area subject to this ROD within and immediately adjacent to the COC property will hereafter be referred to as the COC area.

The COC area is located within the Sand Creek Industrial Site. The Sand Creek Industrial Site is located in Commerce City, a suburb north of Denver, Colorado (Figure 1). The site and surrounding area are industrialized and contain trucking firms, petroleum and chemical production/supply companies, warehouses, small businesses, and several residences. The site study area is bounded on the north by Sand Creek, on the south by 48th Avenue, and on the east by Ivy Street. The western boundary is approximated by Dahlia Street, Colorado Boulevard. and Vasquez Boulevard. Figure 2 illustrates the location and boundaries of the COC area.

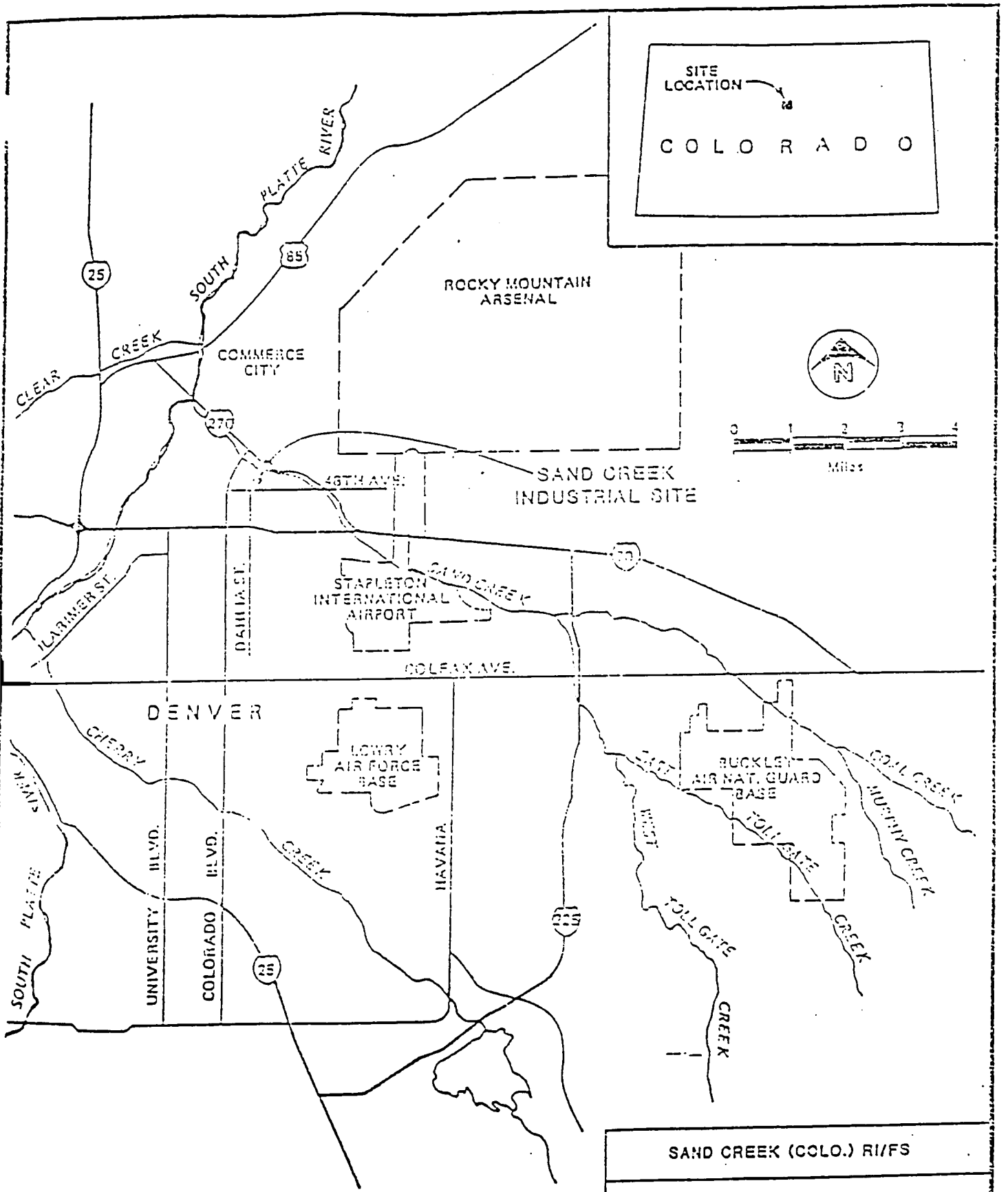
Within the Sand Creek Industrial Site, there are approximately 13 residences with a total population of about 25. The day use population, however, reaches several hundred due to the business and industrial nature of the study area. Water users within the site study area are served by the South Adams County Water and Sanitation District (SACWSD). Private wells exist on the site; however, this water is used for industrial and irrigation purposes.

Groundwater is the source of water supply to the SACWSD. Production wells are located north (downgradient) of the study area. Approximately 30,000 customers in Commerce City and Adams County are served by the SACWSD.

The COC area is located above the 100-year floodplain of Sand Creek. The majority of the COC area is located on a bench of relatively flat terrain that slopes down to railroad tracks to the north and rises to an alluvial terrace to the south.

II. Site History and Enforcement Activities

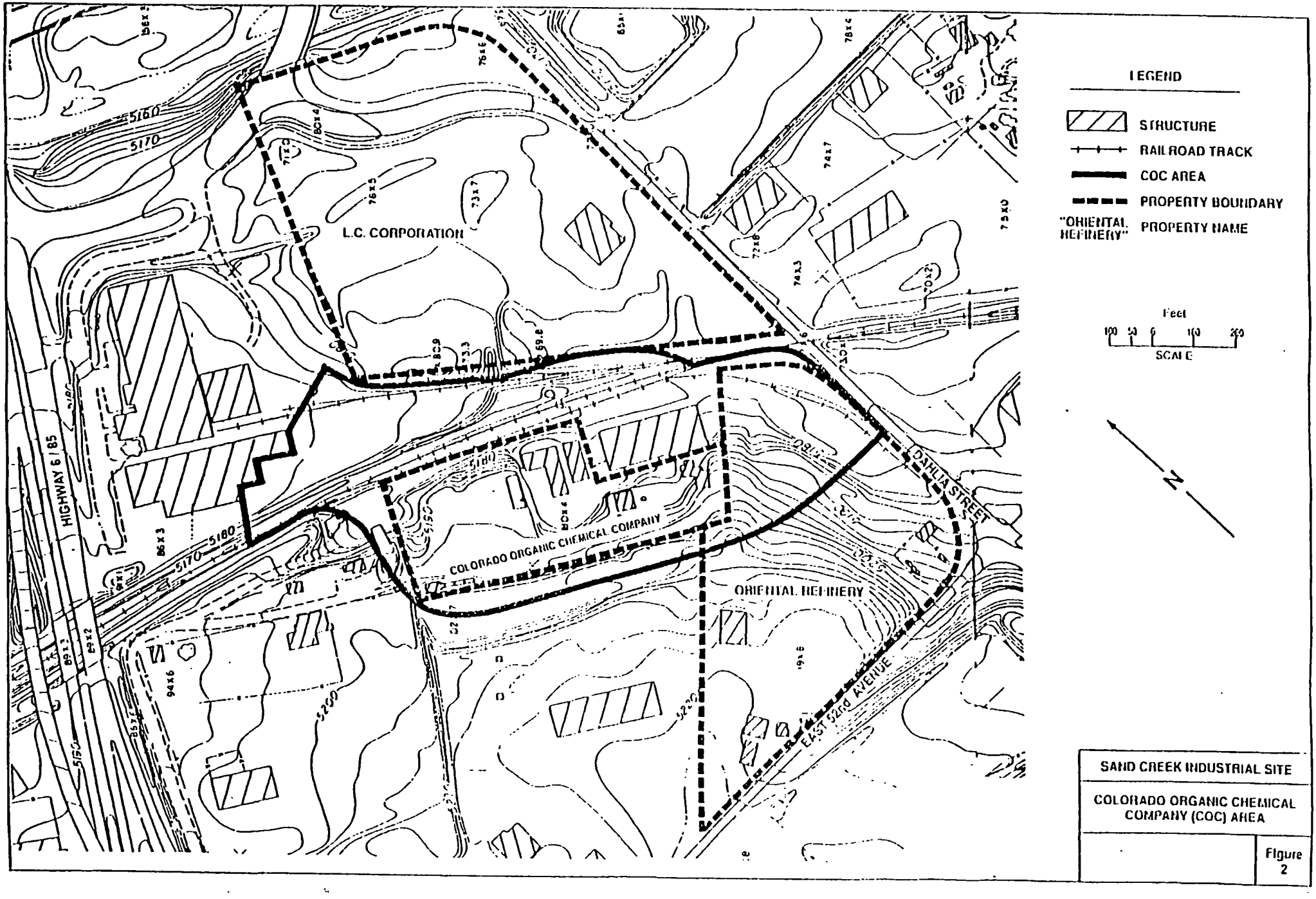
The Colorado Organic Chemical Company plant was first operated by Times Chemical in the 1960s to manufacture pesticides. The company name was later changed to Colorado International Company (CIC). In 1968, a fire destroyed three buildings at the CIC plant.



SAND CREEK (COLO.) RI/FS

SAND CREEK INDUSTRIAL SITE LOCATION MAP

Figure 1


LEGEND
STRUCTURE
RAILROAD TRACK
COC AREA
PROPERTY BOUNDARY
"ORIENTAL REFINERY" PROPERTY NAME
Feet
100 50 0 100 200
SCALE
N
L.C. CORPORATION
COLORADO ORGANIC CHEMICAL COMPANY
ORIENTAL REFINERY
HIGHWAY 6 / 85
DAHLIA STREET
EAST 52nd AVENUE
5160
5170
5180
5200
5220
SAND CREEK INDUSTRIAL SITE
COLORADO ORGANIC CHEMICAL COMPANY (COC) AREA
Figure 2

An inspection of CIC by Tri-County District Health Department personnel in June 1974 indicated unsatisfactory waste management practices and unsatisfactory worker safety conditions.

In March 1976, the Colorado Department of Health (CDH) conducted a field inspection at CIC. The inspectors observed 55-gallon drums containing pesticides stored at various places across the COC area. They observed washwater, storm drainage, and boiler feed water draining into a common surface drainage that flowed off property towards Sand Creek. CIC was cited for storage and handling violations. A fire occurred at CIC in December 1977, releasing parathion fumes over northeast Denver. The State of Colorado issued an Emergency Cease and Desist Order against CIC to clean up the COC property and adjacent areas contaminated by the fire. CIC declared bankruptcy and re-opened the operations as Colorado Organic Chemical (COC). COC operations were essentially the same as CIC operations.

Soil sampling at COC in early 1978 revealed high levels of organophosphate pesticides, chlorinated hydrocarbons, and thermally-altered pesticides. The State filed a preliminary injunction against COC/CIC to clean up the residues of the fire. Some contaminated soil was removed in October 1978.

COC was cited for unsafe drum storage and improper storage areas in 1980. Samples of surface liquids collected during the inspection revealed that surface water discharge contained pesticides (dieldrin, heptachlor, DDE, and DDT), inorganics (chromium and arsenic), and other organics (chlorinated benzenes and phenols).

Subsequently, EPA filed a number of complaints against COC for Resource Conservation and Recovery Act (RCRA) violations. In 1982, a consent agreement and final order were issued for the RCRA case. In March 1983, EPA referred to the Department of Justice the matter of COC's RCRA violations and violation of the previous settlement. In June of 1983 a spill of the herbicide 2, 4-D resulted in an additional compliance order to clean up the spill and to comply with previous orders. EPA issued a CERCLA 106 order in March 1984 for cleanup of the site. Between April and September 1984, removal action was taken by COC which resulted in the removal of drummed wastes and product, contaminated soil, and fencing of the site.

III. Highlights of Community Participation

All requirements for public participation as specified in Section 113(k) (2) (B) (i-v) of CERCLA were satisfied during the remedial action process.

Community relations activities for the Sand Creek site began in April 1985 when EPA distributed an introductory fact sheet to residents, businesses, and agencies in the area. The fact sheet described the site and explained the Superfund process, with emphasis on the Remedial Investigation/Feasibility Study (RI/FS). In the next few months, EPA personnel attended a public meeting organized by Citizens Against Contamination; they also compiled a list of people who owned property in the study area.

EPA mailed a second fact sheet in November 1985. This fact sheet provided information typically requested during investigation and cleanup of hazardous waste sites. That same month, EPA also provided a report on water contamination for another public meeting of Citizens Against Contamination.

In January 1986, EPA contacted property owners and Commerce City officials to inform them of activities at the site. In the spring, EPA prepared a photo display illustrating the RI/FS process.

Because ground-water contamination and its effects on household supplies were of concern, EPA surveyed residents about their water use habits during April 1987. Later that year, EPA spoke with residents and businesses to check the status of methane venting systems near the 48th and Holly landfill (Sand Creek Operable Unit Three). The landfill owners had installed these systems after an explosion in 1977 resulting from a buildup of methane that had migrated from the landfill.

A Remedial Investigation report describing the extent of contamination within the COC area was released for public review in March 1988. In May 1988, EPA contacted property owners to obtain permission to sample and monitor soils on those properties.

In October 1988, EPA met with Commerce City officials to inform them of plans for the site. The Commerce City representatives also gave their reactions to the cleanup methods being considered.

In January 1989, the Feasibility Study (FS) which focused primarily on the COC area was completed, and an initial remedial alternative was chosen. The remedial action initially selected would have involved: excavation and off-site incineration of the most highly contaminated surface soils; excavation and off-site disposal of the approximately 38,000 cubic yards of surface soils contaminated above industrial-use action levels; vacuum extraction for the volatile organic compounds in the subsurface soils immediately above the ground-water table; and demolition and off-site disposal of the contaminated tanks and buildings in the COC area.

EPA took several measures to announce the remedial alternative choice and to seek comments and questions from the public. First, EPA made copies of the FS Report available to the public in the Adams County Public Library, the Colorado Department of Health, and the EPA Region VIII library in downtown Denver. At the same time, EPA mailed its third fact sheet, which described a proposed plan as well as four other remedial alternatives that had been evaluated. Third, EPA announced a public comment period during which the public was invited to submit comments and questions. The comment period originally ran from January 13 to February 13, but at the request of the potentially responsible parties (PRPs), EPA extended the period to February 22. Fourth, EPA conducted a public meeting on January 31 to describe the results of the RI/FS and answer questions from the public. EPA published a press release and a public notice in each of the Commerce City newspapers, The Commerce City Sentinel and The Commerce City Beacon, announcing all of these activities.

In response to public comment and subsequent re-examination of the site, a FS Addendum was completed in July 1989 which presented two additional and innovative remedial technologies for potential use on the contaminated surface soils in the COC area: biological treatment and soil washing. It was concluded from the FS Addendum that treatability studies would be required before implementing either of the additional alternatives.

EPA made copies of the FS Addendum report available to the public and mailed its fourth fact sheet describing the new proposed plan. The remedy selected in the new proposed plan included: excavation and off-site incineration of approximately 1,000 cubic yards (CY) of highly HOC-contaminated shallow (<5ft) soils; vacuum extraction of the volatile organic compounds in the subsurface soils above the ground-water table; demolition and off-site disposal of the contaminated tanks and buildings; and either bioremediation or soil washing for the approximately 38,000 CY of shallow soils contaminated with HOCs above industrial-use action levels. It was proposed that excavation and off-site disposal of the 38,000 CY of contaminated surface soils be retained as a contingency remedy, since the implementation of bioremediation and/or soil washing depended upon the results of treatability studies to be performed subsequent to this Record of Decision. An absence of proven field bioremediation and/or soil washing results on soils contaminated with similar compounds warranted retention of the off-site disposal option.

EPA announced a public comment period in effect from July 19 through August 21, 1989 during which the public was invited to submit comments and questions regarding the FS Addendum and the new proposed plan. EPA conducted another public meeting on August 1 to describe the new remedial alternative and answer questions from the community. Press releases and public notice were again published in The Commerce City Sentinel and The Commerce City Beacon announcing all these activities.

Only the City of Commerce City responded in writing, and there was limited comment on the selected remedy during the August 1 public meeting. The primary concern of the City of Commerce City was that the COC property be remediated to residential-use standards. A complete response to written comments received during the public comment period and oral comments made at the community meeting are addressed in the Responsiveness Summary, an attachment to this Record of Decision.

IV. Scope and Role of Operable Unit Response Action

During the course of the remedial investigation, conducted from 1984 to 1988, EPA determined, in accordance with 40 CFR Section 300.68(c), that the Feasibility Study should be divided into operable units in order to remediate site-specific problems.

Originally, the Sand Creek Industrial Site was subdivided into four operable units according to the type of contamination present, type of media affected, and physical characteristics of the units. The four operable units are described below:

Operable Unit No. 1 - Soils contaminated by pesticides, volatile organics, arsenic and chromium in the Colorado Organic Chemical (COC) area; contaminated buildings and tanks in the COC area;

Operable Unit No. 2 - Contaminated soils and ground water in the vicinity of the L.C. Corporation property;

Operable Unit No. 3 - Gaseous emissions, contaminated surface water and ground water in the vicinity of the 48th Avenue and Holly Street Landfill;

Operable Unit No. 4 - Contaminated ground water underlying the site.

As discussed in section III, treatability tests are required to determine the effectiveness of the bioremediation and/or soil washing options for soils contaminated with lesser amounts of HOCs prior to implementation. In an effort to expedite remediation for those areas not suitable for bioremediation and/or soil washing, the original scope of the remediation described in the proposed plan has been reduced. Accordingly, OU1 has been reduced in scope to exclude the lesser HOC-contaminated soils and a new operable unit, OU5, has been defined to include these soils.

Although this action reduces the original scope of the proposed plan, the change will not reduce the overall plan for remediation at the Sand Creek Industrial Site. OUs 2, 3 and 4 remain unchanged. As of the date of this ROD, the Sand Creek Industrial Site has been subdivided into the five operable units described below:

Operable Unit No. 1 - Within the COC area, 1,000 CY soils highly contaminated with pesticides (concentrations $\geq$ 1,000 ppm Halogenated Organic Compounds); volatile organic compound contaminated soil; and contaminated buildings and tanks;

Operable Unit No. 2 - Contaminated soils and ground water in the vicinity of the L.C. Corporation property;

Operable Unit No. 3 - Gaseous emissions, contaminated surface water and ground water in the vicinity of the 48th Avenue and Holly Street Landfill;

Operable Unit No. 4 - Contaminated ground water underlying the site;

Operable Unit No. 5 - Within the COC area, approximately 38,000 CY soils contaminated with pesticides (concentrations < 1,000 ppm Halogenated Organic Compounds).

This Record of Decision addresses remediation of the newly defined Operable Unit No. 1. Remediation of the remainder of the site will be addressed in separate decision documents.

The response action for OU1 will protect surface water and ground-water resources, prevent direct contact with contaminated soils by the public and site workers, and allow remediation of the remaining operable units without concern for the health threats posed by the highly contaminated soils, VOC contaminated soils, and contaminated buildings and tanks. This action represents the first remedial action for this site.

V. Site Characteristics

The site-wide Remedial Investigation was initiated in 1985 and completed in March 1988. The field investigations revealed that the site is underlain by alluvial deposits comprised of high-permeability sands and gravels, interbedded with low-permeability clayey and silty layers. Two ground-water units underlie the site, separated by a relatively impermeable layer 10 to 20 feet thick. The upper unit is up to 40 feet thick and is primarily unsaturated (i.e., contains little to no ground water). The lower unit is up to 44 feet thick and generally exists under confined conditions.

Source of Contamination

Analytical results of soil samples collected on the COC area indicated the following:

- Chlorinated pesticides are present in the surficial and/or shallow soils throughout the COC area,
- Organophosphate pesticides, herbicides, and volatile organic compounds are present in surficial and/or shallow soils within the eastern half and northwest corner of the COC property, and along the Colorado and Eastern Railroad between Dahlia Street and Colorado Boulevard,
- Polycyclic aromatic hydrocarbons are present in surficial soils in portions of the COC property,
- High concentrations of arsenic have been detected in surficial and shallow soils on the COC property and the northern portion of the Oriental Refinery,
- Soil contamination to depths of up to 54 feet is present in some locations beneath the Oriental Refinery site, COC, and adjacent areas. These soil contaminants are primarily volatile organic compounds and appear to serve as a source of ground-water contamination.

OU1 includes contaminated soil volumes of approximately 1000 CY of soil containing HOC concentrations greater than or equal to 1,000 parts per million, an action level dictated by the land disposal restrictions.

VI. Summary of Site Risks

An Endangerment Assessment (EA) was conducted for the Sand Creek site (CDM 1988) to evaluate the risks posed by the presence of contaminated soils in the COC area. This EA identified a number of chemical compounds that, because of health risks, are chemicals of concern for the newly defined OU1. These chemicals, their maximum soil concentrations and proposed action (cleanup) levels are presented in Table VI-1.

The most significant health risk associated OU1 involves contaminated soils and potential movement of contaminants into ground water. The EA identified several potential pathways and receptors of concern. These are:

- Direct contact of industrial workers or children with surface soils (includes dermal absorption and ingestion);
- Inhalation of chemicals in soils released by wind-entrained and/or vehicle generated dust;
- Inhalation of volatile organics released from soils;
- Off-site use of contaminated ground water which has moved from OU1;
- Future use of ground water on or downgradient of OU1.

For those soils highly contaminated with HOCs, the EPA Land Disposal Regulations require incineration. The disposal of OU1 hazardous substances during the course of remedial actions is subject to the special restrictions on land disposal of hazardous waste established by the 1984 Hazardous and Solid Waste Amendments (HSWA) to the Resource Conservation and Recovery Act (RCRA). Land Disposal Restrictions (LDRs) are applicable because placement will occur after November 8, 1990 (53 FR 31216). Specifically, the California list treatment standards for HOCs are applicable to the site, if soils are treated or land disposed. Land disposal restrictions for California list wastes originated in California, and EPA adopted them effective July 8, 1989 for nonliquid HOCs.

A number of the hazardous substances found on the COC area are RCRA listed wastes and appear on the California list. The California list wastes consist of liquid PCBs, liquid and nonliquid halogenated organic compounds, acid wastes with a pH < 2.0, liquids containing heavy metals, and free cyanides. HOC wastes at the COC area include dieldrin, heptachlor, chlordane, chloroform, DDT, and 2, 4-D. Under the California list treatment standards, nonliquid hazardous wastes containing HOCs in total concentrations greater than or equal to 1,000 mg/Kg (ppm) are prohibited from land disposal without prior treatment by incineration. EPA projects that the incinerated soil will not meet health risk-based criteria; however, the selected remedy still meets the CERCLA protectiveness requirements since the incineration residuals will be disposed of in a RCRA subtitle C facility and will require disposal in a Subtitle C facility residuals, in compliance with RCRA. As noted in the table, risk-based action levels are not relevant for these highly HOC-contaminated soils.

TABLE VI-1

CHEMICALS OF CONCERN, MAXIMUM SOIL CONCENTRATIONS, AND ACTION LEVELS FOR OU1

Chemicals of Concern	Maximum Concentration	Action Level	Risk Level
Pesticides/herbicides			
2,4-D	15,000,000 (µg/kg)*	1000 ppm	N/A
Volatiles (µg/Kg)			
Chloroform	820	165	10^{-6}
Methylene Chloride	5,800	75	10^{-6}
Tetrachloroethene	9,340	1,095	10^{-6}
Trichloroethene	87	285	10^{-6}

*Soil concentration may reflect hot spot.

Reference CDM RI Report 1989

The EA determined that the exposure scenarios presenting the highest risk at OU1 include direct contact with HOC contaminated soils (ingestion and dermal absorption) and potential ingestion of contaminated ground water for VOC contaminated subsurface soils. Other exposure scenarios for the site (inhalation of contaminated dust and inhalation of compounds volatilizing from the soil) generally present lower risks.

The exposure to the potential carcinogens in soil by direct contact with contaminated soils was evaluated for industrial workers using the site and children playing at the site. The routes of exposure considered were dermal absorption and incidental ingestion of the soil. However, as noted above, the action levels for HOCs are not based on health risk but rather on the LDRs.

The acceptable site-specific soil concentrations were calculated during the EA with the use of a soil-water leaching model which assumed ground-water concentrations corresponding to a 10^{-6} risk for consumption of drinking water. It was assumed that a 70 Kg individual ingests 2 liters of water each day over a 70-year lifetime. Excess lifetime cancer risks were determined by multiplying the intake level with the cancer potency factor. These risks are probabilities that are generally expressed in scientific notation (e.g., $1x10^{-6}$ or 1E-6). An excess lifetime cancer risk of $1x10^{-6}$ indicates that, as a plausible upper bound, an individual has a one in one million chance of developing cancer as a result of site-related exposure to a carcinogen over a 70-year lifetime under the specific exposure conditions at a site. The assumptions used in estimating exposure are given in Table VI-2.

The soil leaching model indicated that travel times for all volatiles are much less than for pesticides because the K_d (the partitioning coefficient) values for volatiles are much lower than those for the pesticides. Therefore it was recommended, for volatile organic compounds, that the risk-based soil action level based on the ground-water pathway be used as the cleanup goal.

VII. Description of Alternatives

The detailed analysis of remedial technologies, presented in the Feasibility Study and Feasibility Study Addendum reports, resulted in the development of seven alternatives and two prerequisite remedial activities for site remediation. These alternatives and prerequisite remedial activities are summarized below. Since alternatives dealing with soil contamination < 1,000 ppm HOCs were included in the OU1 FS completed before the recent designation of OU5, they are also included in this ROD for discussion purposes. The decision on remediation of the approximately 38,000 cubic yards of soil contaminated with < 1,000 ppm HOCs will be made in the ROD for OU5, not herein.

Prerequisite Remedial Activities

For all alternatives except the No Action alternative, two remedial activities will begin prior to any other activity: (1) in-place air stripping (i.e. vacuum extraction) will be conducted to remove VOCs in the soil, and (2) any contaminated structures or tanks currently at the COC area will be removed.

TABLE VI-2
ASSUMPTIONS USED IN ESTIMATING EXPOSURE VIA DIRECT CONTACT WITH SOILS IN THE COC AREA

Parameter	Average Exposure	Plausible Maximum Exposure
Children		
Frequency of Exposure	10 visits/year	40 visits/year
Duration of Exposure	5 years	5 years
Average Weight Over Period of Exposure	30 Kg	30 Kg
Incidental Ingestion of Contaminated Soil	50 mg/visit	250 mg/visit
Workers		
Frequency of Exposure	130 visits/year	130 visits/year
Duration of Exposure	10 years	20 years
Average Weight Over Period of Exposure	70 Kg	70 Kg
Incidental Ingestion of Contaminated Soil	20 mg/visit	100 mg/visit
General		
Percent of Organic Compounds Absorbed from Ingested Soil	50%	50%
Soil Contact Rate	0.25 g/visit	1.5 g/visit
Percent of Organic Compound Absorbed Dermally from Skin	2%	4%
Percent of Arsenic Absorbed Dermally from Skin	Negligible	Negligible
Average Lifetime	70 years	70 years

Reference CDM 1989

Soil vacuum extraction is a remedial process proven highly effective for the removal of VOCs from contaminated subsurface soils. Soil vacuum extraction will be employed primarily to reduce VOC contamination in the soils. Emissions resulting from the vacuum extraction system will be treated via carbon adsorption.

Demolition and disposal of several contaminated structures and tanks located on the COC area must occur prior to excavation activities. All structures, tanks and debris will be treated in accordance with LDRs.

Alternative No. 1 - No Action

The No Action alternative is presented as a basis for comparison with the other alternatives. Under no action, soil would remain contaminated with toxic chemicals and the risks described above would remain. No action could be considered feasible only if the other alternatives could not substantially reduce toxicity, mobility, volume, or the health risk associated with the site. Selection of the no action alternative would require monitoring of ground-water for thirty years to evaluate movement of contaminants from the site. The Public Health Evaluation (PHE) would be performed at 5-year intervals as is required under CERCLA/SARA when contaminated material is left on site.

Alternative No. 2 - Capping/Institutional Controls

Alternative No. 2 would involve reducing the areal extent of contaminated soil by excavating approximately 6,000 CY of the contaminated soil, placing of the excavated soil in a designated area of contamination, and constructing a cap over the entire contaminated area. The excavation of soil would be completed to the action levels identified in the FS and EA. The cap, constructed of a three-layer design to comply with RCRA requirements, would prevent direct contact with contaminated soil, minimize airborne emissions, and minimize surface infiltration (thereby protecting ground-water resources). Alternative No. 2 would be considered on-site containment. Deed restrictions would be required to ensure long-term maintenance of the cap and to prevent activities that would disturb the cap or result in contact with or release of contaminated soil. The long-term effectiveness is questionable because of the possible failure of the cap. Also, because no treatment would occur, toxicity and volume of contaminants would not be reduced. Because contaminants are left on-site, monitoring of ground-water would be required for thirty years, and re-evaluation of the PHE would be performed at 5- year intervals.

Alternative No. 3 - On-Site Landfill Disposal of Contaminated Soil/Institutional Controls

Alternative No. 3 would involve excavation of all contaminated soil with concentrations exceeding action levels, temporary storage of contaminated soil, construction of a landfill meeting the minimum technology requirements of RCRA Subtitle C requirements within the excavated area, backfilling the landfill unit with contaminated soil, and construction of a cap over the landfill unit. This alternative creates on-site containment of contaminated soil. It would prevent long-term emissions, direct contact and leaching of contaminants into surface water and ground water. Deed restrictions would be required to ensure long-term maintenance of the cap. Restrictions would also be required to ensure long-term maintenance of the cap and to prevent activities that would disturb the landfill. Although

more protective than Alternative No. 2, because the double landfill liner would provide additional short-term ground water protection, the long-term effectiveness is similarly questionable because of the possible failure of either the cap or liner. The alternative would not reduce toxicity or volume of contaminants. Because contaminants are left on-site, ground water monitoring would be required for thirty years, and re-evaluation of the PHE would be performed at 5-year intervals.

Alternative No. 4 - Off-Site Incineration of > 1,000 ppm HOC Contaminated Soil/Off-Site Landfill Disposal/Institutional Controls

Alternative No. 4 involves excavation and off-site incineration of approximately 1,000 CY of soil contaminated with > 1000 ppm HOCs, and off-site landfilling of the incinerated residual soil. In addition, it includes excavation of the approximately 38,000 CY of contaminated soil with concentrations above action levels identified in the FS and EA, but below 1,000 ppm HOC contamination, transport and disposal at an off-site landfill, backfilling with clean soil and revegetation of the site. Institutional controls prohibiting certain uses may be required for the area. This alternative would reduce toxicity and volume through destruction (incineration) of a portion of site contaminants. Mobility of contaminants would be reduced through off-site containment. Long-term effectiveness is considered high and no surface use would be restricted to industrial use. A PHE would be required every 5 years based on the NCP proposed rule (53 FR 51430).

Alternative No. 5 - On-Site Incineration of Contaminated Soils/On-Site Fixation of Treated Residuals/On-Site Landfill of Treated Residuals/Institutional Controls

Alternative No. 5 would involve excavation of all contaminated soil with concentrations above action levels, incineration of contaminated soil in an on-site incinerator, fixation of incineration residuals containing arsenic above action levels, construction of a landfill on-site, and backfilling the landfill with fixed residual and incinerated residual soil. Land use restrictions would be required for the site to ensure long-term stability of the landfill. This alternative would provide a significant reduction in toxicity, mobility, and volume through destruction of most contaminants and fixation of arsenic. Long-term effectiveness would be high but land use restrictions would be necessary. Deed restrictions would be required to ensure long-term maintenance of the cap and to prevent activities that would disturb the landfill. A PHE would be required every five years based on the NCP proposed rule.

Alternative No. 6 - Off-Site Incineration of > 1,000 ppm HOC Contaminated Soil/On-Site Biological Treatment of Remaining Contaminated Soil/Institutional Controls

Alternative No. 6, referred to as the biological treatment alternative in this document, involves excavation and off-site incineration of the approximately 1,000 CY of soil contaminated with ≥ 1,000 ppm HOCs and disposal of the incinerated residual soil in a Subtitle C landfill. In addition, approximately 38,000 CY of remaining soil with HOCs < 1,000 ppm, but contaminant concentrations above action levels, would be excavated, physically pretreated to the soil grain size required for treatment, and biologically treated on-site. The biological treatment would be performed in a lined treatment facility. Once

the soil is remediated to health risk-based action levels, excavated areas would be backfilled, graded, and revegetated in order to minimize erosion and wind-blown dust. Institutional controls may be required for the site prohibiting certain uses.

Since biological treatment of hazardous substances is an innovative technology, treatability tests would have to be performed to determine: which contaminants are amenable to biodegradation and what their specific breakdown products are, what clean-up levels can be attained, how long remediation will take to complete, and what the spatial requirements of the treatment area will be. It is anticipated that it will take 5 to 7 years to complete the remediation of OU1 with this alternative. Contaminant toxicity and volume would be reduced through destruction (incineration) and degradation (biological treatment). This would provide a permanent solution. Ground-water monitoring would be required for 30 years following completion, and the PHE would be reevaluated every 5 years.

Alternative No. 7 - Off-Site Incineration of > 1,000 ppm HOC Contaminated Soil/On-Site Soil Washing Treatment of Remaining Contaminated Soil/Off-Site Incineration and Disposal of Soil Washing Residuals/Institutional Controls

Alternative No. 7, referred to as the soil washing alternative in this document, involves excavation and off-site incineration of soil contaminated with > 1000 ppm HOCs and subsequent disposal of the incinerated residuals in a RCRA Subtitle C landfill. In addition, approximately 38,000 CY of remaining soil with concentrations above health risk-based action levels would be excavated, physically pretreated to the proper soil grain size, and treated to acceptable risk levels. Excavated areas would be backfilled, graded, and revegetated in order to minimize erosion and wind-blown dust. The contaminated liquids and extracted solids generated during soil washing would be incinerated off-site and contained in an off-site landfill. Institutional controls may be required for the site prohibiting certain uses.

As with biological treatment, soil washing treatment of hazardous substances is an innovative technology. Therefore, treatability tests will need to be performed to evaluate the effectiveness of the process and aid in designing the treatment system. Completion of the soil remediation at OU1 is expected to take 5 to 6 years with this alternative. Toxicity and volume of the contaminated soils would be reduced through destruction (incineration) and extraction (soil washing). This alternative would offer a permanent solution for the site. Ground-water monitoring would be required for 30 years following completion, and the PHE would be re-evaluated after 5 years.

VIII. Summary of Comparative Analysis of Alternatives

This section presents a comparison of alternatives using nine component criteria. These criteria, which are set forth in OSWER Directive 9355.3-02.

1. Protection of human health and the environment

2. Compliance with ARARs

3. Reduction of toxicity, mobility, or volume

4. Long-term effectiveness and permanence

5. Short-term effectiveness

6. Implementability

7. Cost

8. State acceptance

9 Community acceptance

Prerequisite Remedial Activities - Demolition/Disposal of Buildings and Tanks/Soil Vacuum Extraction

The prerequisite remedial activities would be protective of human health and the environment. Removing contaminated structures would eliminate direct contact with contaminated materials. Vacuum extraction would reduce volatile organics from the soil to appropriate action levels, precluding their movement into the ground water.

Alternative No. 1 - No Action

Under the No Action alternative, no remediation would take place and risk to public health and the environment would not be reduced, eliminated, or controlled. Toxicity, mobility, and volume of contaminants would be unchanged. Thirty-year monitoring of ground water would be required. Re-evaluation of the PHE at 5-year intervals would be necessary to determine whether future action was warranted.

Alternative No. 2 - Capping/Institutional Controls

The cap would protect human health to the extent that it eliminates exposure via dermal contact, ingestion, and inhalation. It would also reduce the potential for leaching of contaminants into ground water. Because contaminants would also be left on-site, revision of the PHE would be required at 5-year intervals to evaluate remaining risks and to develop necessary corrective actions to reduce the risk.

Alternative No. 3 - On-Site Landfill Disposal/Institutional Controls

The on-site landfill would provide greater human health protection than capping because contaminants would be encapsulated and the landfill cap liner would significantly reduce the potential for leachate to move into ground water. Overall protectiveness would be related to maintenance of the cover and monitoring for failure of the liner. Because contaminants would remain on-site, revision of the PHE at 5-year intervals would be required to evaluate overall protectiveness of the alternative.

Alternative No. 4 - Off-Site Incineration/Off-Site Disposal of Residuals and Soils

Alternative No. 4 provides a high degree of protectiveness of human health. Highly contaminated soils would be incinerated off-site, thereby destroying a significant portion of contaminants. Remaining contaminated soils would be excavated and removed from the site, eliminating the health threat that the contaminated soils presently pose through direct contact and potential migration to ground water. A portion of the risk would be transferred to an off-site landfill that is designed and managed to contain the contaminants.

Alternative No. 5 - On-Site Incineration/On-Site Fixation of Treated Residuals/On-Site Landfill Disposal/Institutional Controls

Alternative No. 5 would be protective of human health through destruction of organic contamination and immobilization of remaining residuals. Long-term protectiveness would require maintenance of the landfill and re-evaluation of the PHE at 5-year intervals.

Alternative No. 6 - Off-Site Incineration of Highly Contaminated Soil/On-Site Biological Treatment of Remaining Contaminated Soil/Institutional Controls
Alternative No. 6, the biological treatment alternative, provides a high degree of protectiveness to human health and the environment. Highly contaminated soils would be incinerated off-site, thereby destroying a significant portion of the contaminants.
The less contaminated remaining soil would be excavated and biologically treated on-site in a lined treatment facility. Soils would be remediated to acceptable health risk-based action levels and backfilled. This alternative would reduce the health threat posed by direct contact to levels which would safely allow industrial use of the OU1 area.

Alternative No. 7 - Off-Site Incineration of Highly Contaminated Soil/On-Site Washing Treatment of Remaining Contaminated Soil/Off-Site Incineration and Disposal of Soil Wash Residuals/Institutional Controls
Alternative No. 7, the soil washing alternative, provides a high degree of protectiveness to human health and the environment. Highly contaminated soils would be incinerated off-site, thereby destroying a significant portion of the contaminants. The less contaminated remaining soil would be excavated and treated on-site with a soil washing process. Once soils are treated to acceptable health risk-based action levels, they would be backfilled and the site revegetated. Residuals from the soil washing process would be incinerated off-site and disposed of in a RCRA Subtitle C landfill. This alternative would reduce the health threat posed by direct contact to levels which would safely allow industrial use of the OU1 area.

CRITERION 2: COMPLIANCE WITH ARARs

CERCLA Section 121 requires selection of a remedial action that is protective of human health and the environment. The determination of protectiveness is based on compliance of the selected remedy with ARAR - or health-based action levels.

Applicable requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site.

Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site.

The universe of possible ARARs for the alternatives described above is set forth in Table VIII-1.

Prerequisite Remedial Activities - Demolition/Disposal of Buildings and Tanks/Soil Vacuum Extraction
All ARARs pertaining to prerequisite remedial activities can be attained. OSHA health and safety regulations would be followed during all phases of remedial activities. Air

quality emission standards govern emissions resulting from vacuum extraction. Disposal of contaminated structures must meet LDRs. The requirements for these ARARs are found in Table VIII-1.

Alternative No. 1 - No Action
No action at OU1 does not attain ARARs, cleanup goals, or the protection of human health and the environment.

Alternative No. 2 - Capping/Institutional Controls
Capping could be performed in compliance with ARARs. ARARs include OSHA worker protection regulations, ambient air quality standards for particulate and vapor emissions and Colorado noise abatement standards. The cap would be constructed to comply with substantive and technical requirements of RCRA. These substantive and technical requirements for RCRA caps are found in Table VIII-1.

Alternative No. 3 - On-Site Landfill Disposal/Institutional Controls
Compliance with ARARs is feasible for the on-site landfill. ARARs include construction of the landfill to RCRA minimum technology requirements, OSHA worker protection regulations, particulate and vapor emission regulations, Colorado noise abatement standards, and Land Disposal Restrictions. The requirements for these ARARs are found in Table VIII-1.

Alternative No. 4 - Off-Site Incineration/Off-Site Disposal of Residuals and Soils
All ARARs pertaining to Alternative No. 4 can be attained. ARARs include OSHA worker protection regulations, particulate and vapor emission regulations, the rules and regulations governing the transportation of hazardous materials within Colorado, hazardous materials transportation regulations, and Land Disposal Regulations. The requirements for these ARARs are found in Table VIII-1.

Alternative No. 5 - On-Site Incineration/On-Site Fixation of Treated Residuals/On-Site Landfill Disposal/Institutional Controls
Alternative No. 5 involves a significant amount of soil handling during preparation for incineration, and the production of on-site incinerator emissions. These activities have the potential for the generation of significant quantities of fugitive dusts. Air quality emission standards, Colorado noise abatement standards, LDRs, and RCRA destruction and removal efficiencies for the incinerator would be critical ARARs to be met. This alternative has the most stringent ARARs of those evaluated, although it is possible to meet all requirements. the most stringent ARARs of the alternatives evaluated. The requirements for these ARARs are found in Table VIII-1.

Alternative No. 6 - Off-Site Incineration of Highly Contaminated Soil/On-site Biological Treatment of Remaining Contaminated Soil/Institutional Controls
The ARARs associated with the biological treatment alternative pertain to excavation, stockpiling, demolition, air stripping, backfilling, and bioremediation activities for on-site operations and hazardous waste transport, incineration emissions and land disposal for off-site activities. During on-site activities, dust generation, excavation and incineration noise, and vapor emissions would be of concern. Workers would be required to follow OSHA health and safety regulations throughout the remediation activities as required in the

TABLE VIII-1
ARARs FOR SAND CREEK OU1
CONTAMINANT-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment
Federal ARARs				
Safe Drinking Water Act	40 USC Sec. 300g			
National Primary Drinking Water Standards	40 CFR Part 141	Establishes health-based standards for public water systems (maximum contaminant levels)	TBC	The MCLs for inorganic and organic contaminants are to be considered because they were used to back-calculate acceptable soil concentrations for contaminants in OU1

TABLE VIII-1 (continued)
ARARs FOR SAND CREEK OU1
LOCATION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment
Federal ARARs				
National Historic Preservation Act	40 USC Sec. 470 40 CFR Sec. 6.301(b) 36 CFR Part 800	Requires federal agencies to take into account the effect of any Federally-assisted undertaking or licensing on any district, site, building, structure, or object that is included in or eligible for inclusion in the National Register of Historic Places.	No/No	The remedy does not effect any district, site, building, structure, or object listed on or eligible for the National Register.
Archeological and Historic Preservation Act	16 USC Sec. 469 40 CFR Sec. 6301(c)	Establishes procedures to provide for preservation of historical and archeological data which might be destroyed through alteration of terrain as a result of a federal construction project or a federally licensed activity or program.	No/No	The remedy does not effect historical or archeological data.
Historic Sites, Buildings and Antiquities Act	16 USC Sec. 461-467 40 CFR Sec. 6.301(a)	Requires federal agencies to consider the existence and location of landmarks on the National Registry of Natural Landmarks to avoid undesirable impacts on each landmarks.	No/No	The remedy does not effect any Natural Landmark.
Fish and Wildlife Coordination Act	16 USC Sec. 661-666 40 CFR Sec. 6.302(g)	Requires consultation when Federal department or agency proposes or authorizes any modification of any stream or other water body and adequate provision for protection of	No/No	Alternatives developed will not modify streams.

TABLE VIII-1 (continued)
ARARs FOR SAND CREEK OU1
LOCATION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment
::				
		fish and wildlife resources.		
Endangered Species Act	16 USC 1531 50 CFR Part 200 50 CFR Part 402	Requires action to conserve endangered species within critical habits upon which endangered species depend, includes consultation with Department of Interior.	No/No	No endangered species are present on the COC site.
Clean Water Act	33 USC Sec. 1251-1376			
Dredge or Fill Requirements (Section 404)	40 CFR Parts 230, 231	Requires permits for discharge of dredged or fill material into navigable waters.	Yes/No	A permit is not required for onsite CERCLA response actions, but substantive requirements would be met if an alternative developed would involve discharge of dredged or fill material into navigable waters. This is not anticipated.
Executive Order on Floodplain Management	Exec. Order No. 11,988 40 CFR Sec. 6.302(b) Appendix A	Requires Federal agencies to evaluate the potential effects of actions they may take in a floodplain to avoid, to the maximum extent possible, the adverse impacts associated with direct and indirect development of a floodplain.	No/No	If an alternative developed that would affect a floodplain this would be applicable. This is not anticipated. Operable Unit No. 1 is located outside of the 100-year floodplain.
Wilderness Act	16 USC Sec. 1131 50 CFR 35.1	Administer federally owned wilderness area to leave it unimpacted.	No/No	No wilderness area on-site or adjacent to site.

TABLE VIII-1 (continued)
ARARs FOR SAND CREEK OU1
LOCATION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment
National Wildlife Refuge System	16 USC Sec. 668 50 CFR Part 27	Restricts activities within a National Wildlife Refuge.	No/No	No wilderness area on-site or adjacent to site.
Scenic River Act	16 USC Sec. 1271 40 CFR Part 6.302(e)	Prohibits adverse effects on scenic river.	No/No	No scenic river in area.
Coastal Zone Management Act	16 USC Sec. 1451	Conduct activities in accordance with state-approved management program.	No/No	Area is not in the coastal zone.
State ARARs				
Requirements for Siting of Hazardous Waste Disposal Sites	6 CCR 1007-2, Pt II, Sections 2.1, 2.4, and 2.5	Geologic/Hydrologic conditions must assure waste isolation from exposure pathways for 1000 years. Siting must assure short- and long-term protection of human health and environment.	Yes/No	Applicable if an on-site hazardous waste disposal facility is planned.
Colorado Hazardous Waste Management Regulations	6 CCR 1007-3	Siting is restricted in vicinity of recent faulting. No hazardous waste disposal can occur in a 100 year floodplain. Disposal into or below surface waster and ground water is prohibited.	Yes/No	Applicable if an on-site hazardous waste disposal facility is contemplated.

TABLE VIII-1 (continued)
ARARs FOR SAND CREEK OU1
LOCATION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment
Regulations Pertaining to Solid Waste Disposal Sites and Facilities	6 CCR 1007-2, Sections 1.3.2, 2.1, 2.2, 2.4, 4.1, 6.1	Siting must maximize wind protection and minimize upstream drainage area. No solid waste disposal can occur in a 100-year floodplain. Disposal into or below surface water and ground water is prohibited. Impoundment design is controlled by a site's location in relation to the upper-most aquifer and by water quality in the aquifer.	Yes/No	Applicable if an on-site solid waste disposal facility is cntemplated.
Colorado State Historical Society	Sections 24-80-201, 202,211; Sections 24-801-101,102 103,104,108	Sites within state of federal historic preservation areas will be required to preserve historic character.	No/No	No regulated sites.

TABLE VIII-1 (continued)
ARARs FOR SAND CREEK OU1
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment
Federal ARARs				
Land Disposal of Hazardous Waste				
California List Treatment Standards for HOCs	40 CFR Part 268.32	Treatment of wastes subject to ban on land disposal.	Yes/No	Nonliquid hazardous wastes containing HOCs in total concentrations greater than 1,000 mg/kg must be incinerated prior to land disposal. 1,000 CY of OU1 soils exceed this limit. These soils will be incinerated if excavated and land disposed.
Interim Treatment Standards for Soil and Debris		BDAT standards have not been developed for the P and U wastes present in OU1 soils. Interim treatment standards should be considered.	TBC	See Table VIII-1A for interim treatment standards for soil and debris.
Occupational Safety and Health Act	29 USC Sec. 651-678	Regulates worker health and safety.	Yes/No	Under 40 CFR Section 300.38, requirements of this Act apply to all response activities under the NCP.
Hazardous Materials Transportation Act	49 USC Sec. 1801-1813			
Hazardous Materials Transportation Regulations	49 CFR Parts 107, 171-177	Regulates transportation of hazardous materials.	Yes/No	Applicable only if an alternative developed would involve transportation of hazardous materials.

TABLE VIII-1A

LAND DISPOSAL RESTRICTION GUIDELINES TO BE CONSIDERED

FOR SOILS IN OPERABLE UNIT NO. 1

SAND CREEK INDUSTRIAL SITE

Chemical of Concern	Interim Treatment Range for Soil and Debris Based on Land Disposal Restrictions (a,b)	Threshold Concentration	Percent Reduction Range
VOLATILES(c)			
Chloroform	500 - 2,000 ppb	40,000 ppb	95 - 99.9
Methylene chloride	500 - 2,000 ppb	40,000 ppb	95 - 99.9
Tetrachloroethane	500 - 2,000 ppb	40,000 ppb	95 - 99.9
Trichloroethene	500 - 2,000 ppb	40,000 ppb	95 - 99.9
PESTICIDES AND HERBICIDES(c)			
4,4-DDT	500 - 10,000 ppb	100,000 ppb	90 - 99.9
Chlordane	500 - 20,000 ppb	200,000 ppb	90 - 99.9
Dieldrin	500 - 10,000 ppb	100,000 ppb	90 - 99.9
Heptachlor	500 - 20,000 ppb	200,000 ppb	90 - 99.9
2,4-D	0.01 - 50 ppb	500 ppb	90 - 99.9
METALS(d)			
Arsenic	0.3 - 1.0 ppb	10 ppb	90 - 99.9
Cadmium	0.2 - 2.0 ppb	40 ppb	95 - 99.9
Chromium	0.5 - 6.0 ppb	120 ppb	95 - 99.9
Lead	0.1 - 3.0 ppb	300 ppb	99 - 99.9
Nickel	0.5 - 1.0 ppb	20 ppb	95 - 99.9

(a) Source: June 1, 1988 memorandum from OERR regarding interim treatment levels for soil and debris.

(b) When the untreated concentration is between the treatment level and the threshold concentration, the treatment should reduce the concentration in the residuals to no more than the maximum of the treatment range (in this case, the percent reduction does not apply). When the untreated concentration is above the threshold concentration, the treatment should achieve at least the minimum of the percent reduction range.

(c) Concentration based on total waste analysis.

(d) Concentration based on extract analysis (EP Toxicity or TCLP).

TABLE VIII-1 (continued)
ARARs FOR SAND CREEK OU1
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment
State ARARs				
Rules and Regulations Governing the Transportation of Hazardous Materials Within Colorado	4 CCR 723-18, HMT 1-9	Establishes specific requirements for the transportation of hazardous materials, especially regarding labeling and placarding.	Yes/No	Applicable if hazardous material is transported off site.
Colorado Noise Abatement Statute	Sections 25-12-101, 102, 103, 104, 105, 106, 108	Establishes standards for controlling noise.	Yes/No	Applicable to alternatives that would generate noise.

TABLE VIII-1 (continued)
ARARs FOR SAND CREEK OU1
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment
Colorado Wildlife Enforcement and Penalties	Sections 33-6-101, 102, 103, 104, 105, 108, 109, 110, 111, 113, 114, 116, 117, 119, 120, 124, 126, 128, 129, 130	Prohibits specific actions in order to protect wildlife.	Yes/No	Relevant and appropriate for protecting wildlife near the site during construction activities.
Wildlife Commission Regulations	2 CCR 406-0, Articles I, III, IV, V, VI, VII, VIII, IX, X, XI,	Establishes specific requirements for the protection of wildlife.	Yes/No	
General Closure	6 CCR 1007-3, Part 264.111	Colorado Hazardous Waste Management Regulations. Must minimize the need for further maintenance; control, minimize or eliminate (to the extent needed to protect human health and environment) the post-closure escape of hazardous wastes, hazardous waste constituents, leachate, contaminated rainfall, or waste decomposition products to ground water, surface water, or the atmosphere.	Yes/No	COC generated and managed corrosive hazardous wastes and spilled commercial chemical products. COC generated and managed RCRA hazardous wastes after November 19, 1980.
Stationary Emissions Sources; General controls for remedial activities	5 CCR 1101-5, Section IVD	Source cannot cause emissions to exceed any attainment area of any NAAQS.	Yes/No	COC site is in a non-attainment area. The site could be considered a major source if it emits more than 100 tons/year of CO or VOCs.

TABLE VIII-1 (continued)
ARARs FOR SAND CREEK OU1
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment
	5 CCR 1001-5, Section IVD	Source cannot interfere with attainment and maintenance of any State NAAQS.	Yes/No	COC site is in a non-attainment area.
	5 CCR 1001-3 Sections IIID	Minimize fugitive dust emissions.	Yes/No	Demolition and construction activities, storage and handling operations, and haul roads.
Stationary Emission Sources; General controls for remedial activities	5 CCR 1001-3 Section II	No emissions exceeding 20% capacity are allowed.	Yes/No	Specific sources may have other limitations.
	5 CCR 1001-4 Section 2A	Design action to provide odor-free operation.	Yes/No	
Tank Closure	6 CCR 1007-3 Part 264.197	All hazardous wastes and residues must be removed from tanks, discharge control equipment and discharge confinement structures.	Yes/No	Commercial chemical products in tanks become hazardous wastes when closure begins. See clean closure requirements for generator/transporter requirements. COC managed their hazardous wastes on tanks.
Container Closure	6 CCR 1007-3 Part 264.178	All hazardous wastes and residues must be removed from containment system, if any. Remaining containers, liners, bases, and soil containing or contaminated with residues must be decontaminated or removed.	Yes/No	Commercial chemical products in tanks become hazardous wastes when closure begins. See clean closure requirements for generator/transporter requirements.

TABLE VIII-1 (continued)
ARARs FOR SAND CREEK OU1
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment
Closure of hazardous waste management facilities (HWMF):	6 CCR 1007-3, Part 264.111	General closure, as above. includes waste management facilities, waste piles, surface impoundments and tank systems.	Yes/No	Closure performance standards.
Closing in place (capping)	6 CCR 1007-3 Part 264.310(a)	Design and construct cover to: - Provide long term minimization of migration of liquids through the cap. - Function with minimum maintenance. - Promote frainage and minimize erosion or abrasion of the cover. - Accommodate setting and subsidence to maintain the cover's integrity. - Have a permeability less than or equal to the permeability of the bottom liner or natural sub-soils present.	Yes/No	Spilled commercial chemical products are mixed with soils. Design, construction and monitoring requirements described herein also apply to caps placed over fixed wastes.

TABLE VIII-1 (continued)
ARARs FOR SAND CREEK OU1
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment
	6 CCR 1007-3 Part 264.310(b)	Cap integrity must be maintained and repaired as necessary. Leak detection, leachate collection, and leachate removal systems must be operated and maintained. Surveyed benchmarks must be protected and maintained.	Yes/No	
	6 CCR 1007-3 Part 264.301(c)	Run-on control must be designed and constructed to prevent flow onto the cap during construction. The peak discharge from at least a 100-year storm must be controlled.	Yes/No	Also applies to run-on control during fixed waste disposal cell construction.
Closure of HWMF: Closing in place (capping)	6 CCR 1007-3 Part 264.301(d) and (e)	Runoff control must be designed and constructed to collect and control the runoff from a 100-year 24-hour storm, both during cap construction and maintenance. Collection/holding facilities associated with run-on and run-off control must be designed to expeditiously maintain capacity after storms.	Yes/No	Also applies to fixed waste cell, liner and cap construction.
	6 CCR 1007-3 Part 264.303(a)	During construction, cap systems must be inspected for uniformity, damage and imperfections. Synthetic membranes must be inspected to ensure tight seams and joints and the absence of tears, punctures or blisters. Soil-based and admixed caps must be inspected for holes, or	Yes/No	Also applies to fixed waste cell, liner and cap construction.

TABLE VIII-1 (continued)
ARARs FOR SAND CREEK OU1
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment
		other structural nonuniformities that may cause an increase in the permeability of the cap.		
	6 CCR 1007-3, Part 264.309	The exact location and dimension, including depth, of disposal cells must be shown on site maps relative to permanently surveyed benchmarks. The contents of each cell and location of each hazardous waste type must also be shown.	Yes/No	Also applies to fixed waste disposal cells and caps.
Closure of HWMF: **Closing in place(capping)**	6 CCR 1007-3 Part 264.91(4 Part 264.92) Part 264.94(a)	Implement a ground water detection monitoring program to ensure that the ground water protection standard is complied with. Concentrations of hazardous constituents cannot exceed: - table values, or - background levels, where no table value is specified.	Yes/No	Will also apply to waste treatment/on-site disposal alternatives like fixation and soil washing or incineration, if residues cannot be delisted.
	Part 264.97(a)	Ground water monitoring must consist of a sufficient number of wells with appropriate depths and locations to yield samples capable of determining backgrounxl water quality and water quality passing a point of compliance.	Yes/No	Existing well field will need to be reviewed during remedial design.

TABLE VIII-1 (continued)
ARARs FOR SAND CREEK OU1
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment
	Part 264.97(c), (d) and (e)	Ground water wells must be cased in a manner ensuring well integrity, and sampled using methods ensuring sample/analysis integrity.	Yes/No	Existing well field and any additional wells placed at the site must be assessed.
	Part 264.97(h)	Ground water samples must be collected and analyzed at a frequency that allows for valid statistical analysis integrity.	Yes/No	Applicable to ground water sampling at the site.
	6 CCR 1007-2 Part 2, Sections 2.4, 1-2.4.5	Design facility to prevent long-term adverse effects on ground water, surface water, air quality, public health, and the environment.	Yes/No	Part 2 of the State solid waste regs contains siting and design criteria for hazardous waste disposal sites built after July 1, 1981.
Closure of HWMF:				
Closing in place (capping)	6 CCR 1007-2 Part 2 Section 2.4.7	Design runoff control system with sufficient capacity to prevent advese effects on ground water, surface wate, air quality, public health, and the enviroment.	Yes/No	
	6 CCR 1007-2 Part 2 Section 2.4.8	Close facility to assure prevention of long-term adverse effects.	Yes/No	
	6 CCR 1007-2 Part 2 Sections 2.4.9, 2.4.10	Monitor ground water, surface water, and provide quality control during construction.	Yes/No	
	6 CCR 1007-3 Part 264.117	Restrict post-closure use of property as necessary to prevent cover damage.	Yes/No	

TABLE VIII-1 (continued)
ARARs FOR SAND CREEK OU1
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment
Clean Closure (Removal with off-site disposal	6 CCR 1007-3 Part 264.111	Genereral closure, as above.	Yes/No	To estmate soil volumes, containment concentrations above which clenup will occur are set at background or the value corresponding to one excess cancer in on million cases.
	5 CCR 1001-9 Section II.D.1 and 2	VOC source can emit no more than 450 lbs/hour or 3000 lbs/day of VOCs without applying reasonably available control technology (RACT).	Yes/No	Soils at COC also have VOCs in them. Design to use RACT is made after a health-based risk assessment using air modeling.
	6 CCR 1007-3 Part 264.114	Dispose of or decon all facility equipment and structures by removing all hazardous wastes and residues.	Yes/No	
Notification	6 CCR 1007-3 Part 99	Any person who generates or transports hazardous wastes must file a notification of hazardous waste activity before beginning such activity.	Yes/No	If tank contents, containers and contaminated soils are being shipped offsite as part of closure activities.
Manifests	6 CCR 1007-3 Part 262, subpart B	A manifest must be prepared by a generator before it is offered for transportation offsite. The manifest must identify the facility permitted to handle the waste describe thereon, and may designate an alternative facility. The manifest format must be consistent with those offered by the	Yes/No	For off-site transportation.

TABLE VIII-1 (continued)
ARARs FOR SAND CREEK OU1
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment
		consignment (destination) state or generator state, respectively. Generator must sign the manifest, obtain the signature of the initial transporter, retain one copy, and give remaining copies to the initial transporter.		
Pre-transport requirements	6 CCR 1007-3 Part 262.3, .31, and .33	A generator must package the waste in accordance with PUC or DOT regulations in 40 CFR Parts 173, 178 and 179. Each package must be labeled or marked in accordance with PUC or DOT regulations in 49 CFR Part 172. For containers of 110 gallons or less, markings must comply with requirements of 40 CFR 172.304. The generator must placard, or offer placards to the initial transporter, in accordance with 49 CFR Part 172 Subpart F.	Yes/No	For off-site transportation.
Transportation	6 CCR 1007-3 Part 263.11(A)	A transporter must not transport hazardous wastes without an EPA ID number.	Yes/No	For off-site transportation.
Clean Closure (Removal with off-site disposal)	6 CCR 1007-3 Part 263.20	A transporter may not receive hazardous waste from a generator unless it is accompanied by a manifest. The transporter must sign and date the manifest, acknowledging acceptance, and must leave on copy	Yes/No	For off-site transportation.

TABLE VIII-1 (continued)
ARARs FOR SAND CREEK OU1
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment
		with the generator. Upon delivery to the designated facility, the transporter must obtain the date of delivery and the signature of the owner/operator. The transporter must retain one copy of the signed manifest.		
Transportation	6 CCR 1007-3 Part 263, Subpart C	If a discharge of hazardous waste occurs during transportation, the transporter must take appropriate immediate action to protect human health and environment. The transporter must report the discharge and ultimate resolution to PUC, DOT and CDH. The transporter must clean up the discharge or take other appropriate action so that the discharge no longer presents a hazard to human health or environment.	Yes/No	For off-site transportation.
Clean closure (removal with treatment in tanks)	6 CCR 1007-3 Part 264.191(a)	Tanks must have sufficient shell strength, foundation strength, structural support, and for closed tanks, pressure controls to assure that they do not collapse or rupture.	Yes/No	Soils will be mixed with fixing agents or soil washing solvents in tanks.

TABLE VIII-1 (continued)
ARARs FOR SAND CREEK OU1
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment
	6 CCR 1007-3 Part 264.192(a)	Wastes and other material (e.g., treatment reagents) that are incompatible with the material of construction of the tank must not be placed in the tank, unless it is protected from accelerated corrosion, erosion, or abrasion through the use of an inner liner or coating that is compatible with tank contents and that is free of leaks, cracks, holes, or other deterioration, or through alternative means of protection.	Yes/No	Applicable if incombatible wastes are placed in tanks.
	6 CCR 1007-3 Part 264.192(b)	Overfilling must be prevented by including control methods or, for uncovered tanks, maintenance of a sufficient free-board to prevent overtopping by wave or wind action, or by precipitation.	Yes/No	Applicable if waste is placed in tanks.
	6 CCR 1007-3 Part 264.194(a)(1-3)	Daily inspections must be conducted on overfilling control equipment, tank integrity, monitoring equipment, and the level of wastes in uncovered tanks.	Yes/No	Applicable if waste is placed in tanks.

TABLE VIII-1 (continued)
ARARs FOR SAND CREEK OU1
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment
Clean closure (removal with treatment in tanks)	6 CCR 1007-3 Part 264.194(a)(4) and (5)	Weekly inspections must be conducted on the construction materials of above-ground tanks and of the area around them for obvious signs of tank deterioration and leakage.	Yes/No	Applicable if waste is placed in tanks.
	6 CCR 1007-3 Part 264.341; Part 100.22(c)(3) and (4)	Analyze the waste feed.	Yes/No	Additional waste analyses will be needed during remedial design.
Clean closure (removal with incineration onsite)	Part 264.340	No further requirements, except waste analyses and closure, apply to incinerators that only burn wastes listed as hazardous solely by virtue of the characteristic or ignitability, corrosivity, or both; or the characteristic of reactivity if the wastes will not be burned when other hazardous wastes are present in the combustion zone; and if the waste analysis shows that the wastes contain none of the hazardous constituents listed in Appendix VIII which might reasonably be expected to be present. Performance standards for incinerators:	No/No	Hazardous wastes at COC are listed for toxicity and acute toxicity, not ignitability or corrosivity alone.

TABLE VIII-1 (continued)
ARARs FOR SAND CREEK OU1
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment
	6 CCR 1007-3 Part 264.343(a)(1)	- Achieve a destruction and removal efficiency of 99.99 percent for each principal organic hazardous constituent in the waste feed and,	Yes/No	Applicable if waste is incinerated.
Clean closure (removal with incineration onsite)	6 CCR 1007-3 Part 264.343(a)(2) and Part 264.343(b)	- 99.9999 percent for F020, F021, F022, F023, F026, F027 wastes.	Yes/No	If waste is a F020, F021, F022 F023, F027 or F029 waste.
		- Reduce hydrogen chloride emissions to 1.8 kg/hr or 1 percent of the HCl in the stack gases before entering any pollution control devices.		
	6 CCR 1007-3 Part 264.343(c) also, 5 CCR 1001-8, Sect. III C.1	- Emissions of particulate matter cannot exceed 0.08 grains per dry standard cubic foot when corrected for the amount of oxygen in the stack gas.	Yes/No	General capacity limitation also applies to new incineration sources.
	6 CCR 1007-3 Part 264.345(c)	Operate within specified limits during startup and shutdown.	Yes/No	
	Part 264.345(d)	Control fugitive emissions from the combustion zone.	Yes/No	
	Part 264.374	Monitoring of various parameters during operation of the incinerator is required. These parameters include:	Yes/No	

TABLE VIII-1 (continued)
ARARs FOR SAND CREEK OU1
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment
Clean closure (removal with incineration onsite)	6 CCR 1007-3 Part 264.347(a)	- Combustion temperature - Waste feed rate - An indicator of combustion gas velocity - Carbon monoxide - Waste and exhaust emissions upon request.	Yes/No	
	Part 264.347(b)	Daily visual inspections of incinerator and associated equipment.	Yes/No	
	Part 264.347(c)	Operate with an automatic feed cutoff system; inspect weekly	Yes/No	
	Part 264.351	At closure, all hazardous waste and residues, including ash, scrubber water, and scrubber sludge must be removed from the site.	Yes/No	
Clean closure (removal with incineration onsite)	5 CCR 1001-3 Sec. VIB	Sources can emit no more than 2 tons/day of sulfur dioxide.	Yes/No	Specific sources may have other limitations. Use best available control technology.

TABLE VIII-1 (continued)
ARARs FOR SAND CREEK OU1
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment
	5 CCR 1001-3 Sec. III.A	Comply with particulate limitations.	Yes/No	Functions of heat input. Applies to the operation of fuel burning equipment.
Emission of metals from incinerators		Colo. Air Quality Control Commission Regulation #8, Sec. 6	TBC	The ambient air quality standard for lead is 1.5 ug/m (avg. monthly modeled standard).
		Ambient air quality standards for State of Massachusetts. Currently used as guideline for State of Colorado.	TBC	The State has metals emissions guidelines of 0.0003 ug/m for cadmium, 0.69 ug/m chromium, and 0.18 ug/m for nickel.
On-site disposal of treatment residues	6 CCR 1007-3 Part 260.22(a)	A demonstration must be made that the waste no longer meets any of the criteria under which it was listed as hazardous under Part 261, subpart D.	Yes/No	If the waste is listed with code "I", the petition must demonstrate that the residues do not contain the constituent (app. 7) that caused it to be listed, using the appropriate app. 7 test method; or the waste does not meet the criterion of Part 261.11(a)(3), considering the factors in 40 CFR Parts 261.11(a)(i) through (xi).
On-site disposal of treatment residues	6 CCR 1007-2 Part 2, Sec. 2.4.1-2.4.5.	Design facility to prevent long term adverse effects on grounds water, surface water, air quality, public health, and the environment.	Yes/No	Part 2 of the State solid waste regs contains siting and design criteria for hazardous waste disposal sites built after July 1, 1981. These requirements are applicable if a hazardous waste disposal site is built.

TABLE VIII-1 (continued)
ARARs FOR SAND CREEK OU1
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment
	Part 2 Sec. 2.4.6	Protect the function and integrity of liner(s)	Yes/No	
	Part 2 Sec. 2.5.3	Isolate wastes for 1000 years.	Yes/No	
	Part 2, Sec. 2.4.9, 2.4.10	Monitor ground water, surface water, and provide quality control during contruction.	Yes/No	

TABLE VIII-1 (continued)
ARARs FOR SAND CREEK OU1
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment
On-site disposal of treatment residues	Part 2, Sec. 2.4.8	Close facility to assure prevention of long-term adverse effects.	Yes/No	
	Part 2, Sec. 2.4.7 2.5.5	Design leachate and runoff control system to prevent adverse effects on ground water, surface water, air quality, public health, and the environment.	Yes/No	
	6 CCR 1007-3 Part 264.301(a)(1)	Use liner which prevents waste migration into adjacent soil, ground water, surface water, or liner itself during the active life of the landfill, including closure. Design and construct liner to prevent failure due to pressure gradients, contact with wastes, climate, and stress of installation and daily operations. The liner must be placed on a foundation that will provide support and resistance to pressure gradients above and below the liner, to prevent failure due to settlement, compression or uplift. The liner must cover all areas likely to be in contact with waste or leachate.	Yes/No	Fixation alternative as now proposed does not meet these ARARs. Assumes treatment residues cannot be delisted.

TABLE VIII-1 (continued)
ARARs FOR SAND CREEK OU1
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment
On-site disposal of treatment residues	6 CCR 1007-3 Part 264.301(a)(2)	Install leachate collection system shove the liner that the depth of leachate on the lines does not exceed thirty centimeters (one foot). The system must be constructed of materials that are compatible with wastes and leachate in the landfill, and that have sufficient strength to prevent collapse under pressures exerted by overlying wastes, caps and equipment. The system must be designed and operated to function without clogging.	Yes/No	
	6 CCR 1007-3 Part 264.301(c)(d)(e)	Construct run-on and runoff control systems capable of handling the peak discharge of a 100-year 24-hour storm. Associated collection and holding facilities must be designed to expeditiously maintain system capacity after storms.	Yes/No	
	6 CCR 1007-3 Part 264.303(a)	During construction, liners must be inspected for uniformity, damage and imperfections. Synthetic membranes must be inspected to ensure tight seams and joints and the absence of tears, punctures or blisters. Soil-based and ad-mixed caps must be inspected.	Yes/No	Substantive standards for inspection are applicable.

TABLE VIII-1 (continued)
ARARs FOR SAND CREEK OU1
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment
On-site disposal of treatment residues	6 CCR 1007-3 Part 264.309	The exact location and dimensions including depth, of disposal cells must be shown on site maps relative to permanently surveyed benchmarks. The contents of each cell and location of each hazardous waste type must also be shown.	Yes/No	
	6 CCR Part 264.90 Subpart F	Conduct a ground water monitoring and response program, including corrective action, as required.	Yes/No	
	6 CCR Part 264.312, 264.313, 317	Comply with special requirements for ignitable, reactive, incompatible wastes, and F020, F021, F022, F023, F026, F027 wastes.	Yes/No	
	6 CCR 1007-3 Part 264.310(a)	Design and construct cover to: - Provide long-term minimization of migration of liquids through the cap - function with minimum maintenance - Promote drainage and minimize erosion or abrasion of the cover - Accomodate settling and subsidence to maintain the cover's integrity	Yes/No	

TABLE VIII-1 (continued)
ARARs FOR SAND CREEK OU1
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment
		· Have a permeability less than or equal to the permeability of the bottom liner or natural subsoils present.		
On-site disposal of treatment residues	6 CCR 1007-3 Part 264.310(b)	Cap integrity must be maintained and repaired as necessary. Leak detection, leachate collection, and leachate removal systems must be operated and maintained. Surveyed benchmarks must be protected and maintained.	Yes/No	
	6 CCR 1007-2 Sec. 2.1.2	Disposal sites shall comply during operations with applicable rules and regulations of the water and air quality control commissions, and with local zoning laws and ordinances.	Yes/No	
	6 CCR 1007-2 Sec. 4.2	Ground water shall be protected from pollution by leachate. Permanent diversions shall control run-on and runoff from the 100-year event. Facility design shall address geologic hazards. Ground water monitoring wells shall be designed in accordance with applicable state engineer's rules and regulations. Sufficient amounts of cover must exist on site or be readily available offsite. Cap design must demonstrate that two feet of cover is sufficient to establish vegetation	Yes/No	Compliance with these design standards is demonstrated by providing the data called for in 6 CCR 1007-2 sections 4.3 through 4.8.

TABLE VIII-1 (continued)
ARARs FOR SAND CREEK OU1
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable or Relevant and Appropriate	Comment
		and isolate wastes after closure. Adequate amounts of water must be available for construction		
	6 CCR 1007-2 Sec. 2.1	Operations shall contorl odors and prevent rodent and insects by being adequately covered. Nuisance conditions shall be minimized. Wastes shall be placed as densely as practicable. Disposal sites shall be adequately fences.	Yes/No	These are minimum operating standards mandated by the statue.
On-site disposal of treatment residues	6 CCR 1007-2 Sec. 2.2	During operations, run-on shall be diverted from the working area. Ground water shall be monitored regularly upgradient and downgradient of the facility. Operations shall cease when high wind warnings are verified. Hazardous wastes and sludges shall not be disposed during operations.	Yes/No	These are additional operation standards for solid waste disposal sites.

TABLE VIII-1
ARARs FOR SAND CREEK OU1 (continued)
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable/ Relevant And Appropriate	Comments
Chemical, Physical and Biological Treatment (Soil Washing and Biological Treatment)	40 CFR 265.400	Chemical, physical or biological treatment of hazardous waste must comply with Section 265.17 (b)	Yes/No	Would be applicable if biological or soil washing treatment treatment is performed at OU1.
General Requirements for Ignitable, Reactive, or Incompatible wastes	40 CFR 265.17(b)	Where specifically required by other sections of this part, the treatment, storage, or disposal of ignitable or reactive waste, and the mixture of commingling of incompatible wastes, or incompatible wastes and materials, must be conducted so that it does not: Produce uncontrolled toxic mists, fumes, dusts, or gases in sufficient quantities to threaten human health; Produce uncontrolled flammable fumes or gases in sufficient quantities to pose a risk of fire or explosions.		Would be applicable if biological or soil washing treatment treatment is performed at OU1.
Waste Pile	40 CFR 264.251	Use a single liner and leachate collection system.	Yes/No	Would be applicable if waste is held in a waste pile prior to biological treatment.

TABLE VIII-1
ARARs FOR SAND CREEK OU1 (continued)
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable/ Relevant And Appropriate	Comments
Chemical, Physical and Biological Treatment (Soil Washing and Biological Treatment)	40 CFR 265.400	Chemical, physical or biological treatment of hazardous waste must comply with Section 265.17 (b)	Yes/No	Would be applicable if biological or soil washing treatment treatment is performed at OU1.
General Requirements for Ignitable, Reactive, or Incompatible wastes	40 CFR 265.17(b)	Where specifically required by other sections of this part, the treatment, storage, or disposal of ignitable or reactive waste, and the mixture of commingling of incompatible wastes, or incompatible wastes and materials, must be conducted so that it does not: Produce uncontrolled toxic mists, fumes, dusts, or gases in sufficient quantities to threaten human health; Produce uncontrolled flammable fumes or gases in sufficient quantities to pose a risk of fire or explosions.		Would be applicable if biological or soil washing treatment treatment is performed at OU1.
Waste Pile	40 CFR 264.251	Use a single liner and leachate collection system.	Yes/No	Would be applicable if waste is held in a waste pile prior to biological treatment.

TABLE VIII-1
ARARs FOR SAND CREEK OU1 (continued)
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable/ Relevant And Appropriate	Comments
Transportation (Off-Site)	40 CFR 107, 171-177	Regulates transportation of hazardous materials (Department of Transportation)	Yes/No	
	Nov. 15, 1985 Federal Register	Superfund Offsite Policy	Yes/No	
Standards Applicable to Generators of Hazardous Wastes	40 CFR Part 262	Regulations for Transporting Hazardous Wastes: Before an owner or generator disposes of any hazardous waste, he must obtain a detailed chemical and physical analysis of a representative sample of the waste. At a minimum, this analysis must contain all the information which must be known to treat, store, or dispose of the waste in accordance with Part 265 and Part 268.	Yes/No	

TABLE VIII-1
ARARs FOR SAND CREEK OU1 (continued)
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable/ Relevant And Appropriate	Comments
Requirements for Miscellaneous Units	52 FR 46946 (Dec. 10, 1987) Subpart X of Part 264	A RCRA permit is not required for on-site CERCLA action; however, the requirements of the permit must be met. The subpart X permit requirements include but is not limited to: (a) Prevention of any releases that may have adverse effects on human health or the environment due to migration of waste constituents in the ground water or subsurface environment, considering: (1) The volume and physical and chemical characteristics of the waste in the unit, including its potential for migration through soil, liners, or other containment structures; (2) The hydrologic and geologic characteristics of the unit and surrounding area; (3) The existing quality of ground water, including other sources of contamination and their cumulative impact on the ground water; (4) The quality and direction of ground-water flow; (5) The proximity to and withdrawal rates of current and potential ground-water users;	Yes/No	Applicable if waste is treated in a miscellaneous unit.

TABLE VIII-1
ARARs FOR SAND CREEK OU1 (continued)
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable/ Relevant And Appropriate	Comments
		(6) The patterns of land use in the region; (7) The potential for deposition or migration of waste consitituents into subsurface physical structures, and into the root zone of food-chain crops and other vegetation; (8) The potential for health risks caused by human exposure to waste constituents; and (9) The potential for damage to domestic animals, wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents; (b) Prevention of any releases that may have adverse effects on human health or the environment due to migration of waste constituents in surface water or wetlands or on the soil surface considering; (1) The volume and physical and chemical characteristics of the waste in the unit; (2) The effectiveness and reliability of containing, confining, and collecting systems and structures in preventing migration;		

TABLE VIII-1
ARARs FOR SAND CREEK OU1 (continued)
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable/ Relevant And Appropriate	Comments
		(3) The hydrologic characteristics of the unit and the surrounding area, including the topography of the land around the unit; (4) The patterns of precipitation in the region; (5) The quantity, quality, and direction of ground-water flow; (6) The proximity of the unit to surface waters; adverse effects on human health or the environment; considering: (7) The current and potential uses of nearby surface waters and any other water quality standards established for those surface waters; (8) The existing quality fo surface waters and surface soils, including other sources of contamination and their cumulative impact on surface waters and surface soils; (9) The patterns of land use in the region; (10) The potential for health risks caused by human expopsure to waste constituents; and		

TABLE VIII-1
ARARs FOR SAND CREEK OU1 (continued)
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable/ Relevant And Appropriate	Comments
		(11) The potential for damage to domestic animals, wildlife, crops, vegetation, and physical structures caused by exposure to waste constitiuents. (c) Prevention of any release that may have adverse effects on human health or the environment due to migration of waste constituents in the air, considering; (1) The volume and physical and chemical characteristics of the waste in the unit, including its potential for the emission and dispersal of gases, aerosols and particulates; (2) The effectiveness and reliability of systems and structures to reduce or prevent emissions of hazardous constituents to the air; (3) The operating characteristics of the unit; (4) The atmospheric, meteorologic, and topographic characteristics of the unit and the surrounding area; (5) The existing quality of the air, including other sources of contamination and their cumulative impact on the air; (6) The potential for health risks caused by human exposure to waste constituents; and		

TABLE VIII-1
ARARs FOR SAND CREEK OU1 (continued)
ACTION-SPECIFIC ARARs AND TBCs

Standard, Requirement, Criteria, or Limitation	Citation	Description	Applicable/ Relevant And Appropriate	Comments
		(7) The potential for damage to domestic animals, wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents.		

Federal CAA National Air Quality Standards and State of Colorado Air Quality Regulations. Treated soils would have to meet the requirements of the Land Disposal Restrictions. The requirements for these ARARs are found in Table VIII-1.

Alternative No. 7 - Off-Site Incineration of Highly Contaminated Soil/On-Site Washing Treatment of Remaining Contaminated Soil/Off-Site Incineration and Disposal of Soil Wash Residuals/Institutional Controls
The ARARs associated with the soil washing alternative pertain to excavation, stockpiling, demolition, air stripping, soil washing, and backfilling activities for on-site operations, and hazardous waste transport, incineration emissions and land disposal for off-site activities. During on-site activities, dust generation, excavation and incineration noise, and vapor emissions would be of concern. Workers would have to follow OSHA health and safety regulations during all phases of remedial action. Federal CAA National Air Quality Standards and State of Colorado Air Quality Regulations necessitate the control of vapor and particulate emissions. The Land Disposal Restrictions would require treated soils to reach appropriate health risk-based treatment levels. The requirements for these ARARs are found in Table VIII-1.

CRITERION 3: REDUCTION OF TOXICITY, MOBILITY, OR VOLUME

Prerequisite Remedial Activities - Demolition/Disposal of Buildings and Tanks/Soil Vacuum Extraction
Demolition and disposal of contaminated buildings and tanks will reduce the volume and toxicity of contaminated structures on-site. All fluids used in the decontamination procedure will require further treatment or disposal. Vacuum extraction will reduce the toxicity, mobility and volume of contaminants present in the soils at the COC area.

Alternative No. 1 - No Action
No reduction in toxicity, mobility, or volume would be achieved under the No Action alternative. Contaminants would continue to move from the site, affecting surface water, ground water, and soils.

Alternative No. 2 - Capping/Institutional Controls
The capping alternative would not reduce toxicity or volume because the waste would not be treated. Mobility would be reduced to the extent that the cap prevents surface water and soil movement from the site and to the extent that the cap prevents infiltration of water and potential movement of contaminants to ground water. A significant reduction in mobility compared to No Action is expected for the capping alternative.

Alternative No. 3 - On-Site Landfill Disposal/Institutional Controls
Because contaminants would remain on-site untreated, no reduction in toxicity or volume would be achieved. A greater reduction in mobility would be achieved relative to capping because the contaminants would be encapsulated instead of merely capped. A long-term reduction in mobility would be achieved only through continuous monitoring and maintenance of the landfill.

Alternative No. 4 - Off-Site Incineration/Off-Site Disposal of Residuals and Soils
Alternative No. 4 would achieve a significant reduction in toxicity, mobility, and volume through incineration (destruction) of highly contaminated soils. A large volume of less-contaminated soil would not be treated, but the soil would be transferred to a facility designed to contain hazardous wastes. The potential for movement of contaminants into groundwater beneath OU1 from the soils would be eliminated.

Alternative No. 5 - On-Site Incineration/On-site Fixation of Treated Residuals/On-Site Landfill Disposal/Institutional Controls
Alternative No. 5 would result in a significant reduction in the toxicity, mobility, and volume of organic contaminants through destruction of the organics in the incinerator. The volume of residual soil from the incinerator would increase slightly due to the fixative agent used to solidify the soil. Mobility of residuals would be further decreased by containment of the fixed mass within a landfill.

Alternative No. 6 - Off-Site Incineration of Highly Contaminated Soil/On-Site Biological Treatment of Remaining Contaminated Soil/Institutional Controls
This alternative would result in a significant reduction in the toxicity, mobility, and volume through destruction (incineration) and containment of highly contaminated soils. Biological treatment of less contaminated soils would also significantly reduce the toxicity and volume of contaminants on-site. However, implementation of biological treatment would result in a slight increase in soil volume due to the addition of growth substrate and soil amendments. Mobility of remaining contaminants would not be affected, but the reduction in concentrations to acceptable levels eliminates the risk associated with mobile organic compounds.

Alternative No. 7 - Off-Site Incineration of Highly Contaminated Soil/On-site Washing Treatment of Remaining Contaminated Soil/Off-Site Incineration and Disposal of Soil Wash Residuals/Institutional Controls
The soil washing alternative would result in a significant reduction in the toxicity, mobility, and volume through incineration and containment of highly contaminated soils. Soil washing treatment of less contaminated soils would also significantly reduce the toxicity and volume of contaminants on-site and virtually eliminate the potential for movement to ground water.

CRITERION 4: LONG-TERM EFFECTIVENESS AND PERMANENCE

Prerequisite Remedial Activities - Demolition/Disposal of Buildings and Tanks/Soil Vacuum Extraction
Eliminating all structures provides a permanent solution for buildings and tanks contaminated with hazardous substances. Vacuum extraction of volatile organic compounds to action levels will provide long-term effectiveness for protection of human health and the environment.

Alternative No. 1 - No Action
Because contaminants would continue to move from the site, posing a potential health threat, the No Action alternative would not provide a long-term or permanent solution. Continued monitoring of the site would provide data on how natural attenuation and

chemical degradation could reduce the threat to human health and the environment and the time period to reduce the threat.

Alterative No. 2 - Capping/Institutional Controls
Capping is not considered a permanent solution because wastes would remain untreated on site. Long-term effectiveness for protection of human health and the environment would be related to maintenance and monitoring the effectiveness of the cap. Long-term maintenance of the cap could provide control of contaminant movement and prevent risk of direct contact with contaminants and exposure to airborne emissions. With proper maintenance, the cap would be effective in preventing leaching of contaminants into the ground water.

Alternative No. 3 - On-Site Landfill Disposal/Institutional Control
A RCRA Subtitle C landfill could provide long-term effectiveness by significantly reducing or eliminating the potential for human contact, airborne emissions, and infiltration into ground water. Effectiveness would be directly related to a stringent operations and maintenance and monitoring program. The landfill alternative would not be a permanent solution because contaminants would be left untreated on-site.

Alternative No. 4 - Off-Site Incineration/Off-Site Disposal of Residuals and Soils
Alternative No. 4 would achieve significant long-term effectiveness through contaminant destruction and removal, and would result in a permanent solution for a portion of the site. However, because some contaminants and incinerator residuals would be transferred to an off-site facility, alternative No. 4 cannot be considered a completely permanent environmental solution.

Alternative No. 5 - On-Site Incineration/On-Site Fixation of Treated Residuals/On-Site Landfill Disposal/Institutional Controls
This alterative would result in an almost complete destruction of organic contaminants through incineration, with immobilization of inorganics by fixation, and subsequent placement of all residuals in an on-site landfill. Although the alternative would provide long-term public health protection, it cannot be considered a permanent remedy because some contamination would remain on site and there would be a need for long-term maintenance of the landfill.

Alternative No. 6 - Off-Site Incineration of Highly Contaminated Soil/On-Site Biological Treatment of Remaining Contaminated Soil/Institutional Controls
This alternative provides the potential for complete remediation of all contaminated soil above action levels. Assuming the biological treatment process degrades all the contaminants to acceptable levels, this alternative would provide a permanent solution for the site. The off-site incineration and disposal of highly contaminated soils in a RCRA Subtitle C landfill would effectively immobilize incinerated soil residuals, and long-term risk would be negligible.

Alternative No. 7 - Off-Site Incineration of Highly Contaminated Soil/On-Site Washing Treatment of Remaining Contaminated Soil/Off-Site Incineration and Disposal of Soil Wash Residuals/Institutional Controls
This alternative would achieve significant long-term effectiveness and permanence through incineration and containment of highly contaminated soils. The soil washing process would extract chemicals of concern from less contaminated soils and achieve acceptable health risk-based levels on-site. This would provide a permanent solution for the site. Off-site landfilling of all incinerated residuals would effectively immobilize any remaining contaminants, and long-term risks would be negligible.

CRITERION 5: SHORT-TERM EFFECTIVENESS

Prerequisite Remedial Activities - Demolition/Disposal of Buildings and Tanks/Soil Vacuum Extraction
Destruction and demolition of structures will increase exposure risk in the short-term due to dust and vapor generation. Monitoring would be required to ensure protection of workers and the surrounding population. Soil vacuum extraction would slightly increase exposure risks to on-site workers in the short-term due to related construction activities.

Alternative No. 1 - No Action
The No Action alternative would not provide any short-term effectiveness.

Alternative No. 2 - Capping/Institutional Controls
Short-term effectiveness is related to the degree that production of airborne particulates and vapor is controlled during remediation, to minimize exposure risk to workers and the surrounding populace. The degree of short-term risks would be less than that of other alternatives due to a relatively quick construction period. Air monitoring during implementation would be required to evaluate risk and institute any corrective action.

Alternative No. 3 - On-Site Landfill Disposal/Institutional Controls
The landfill alternative would take approximately 2.5 years to implement and would pose an elevated risk to workers and surrounding populace due to the need to excavate and handle contaminated soils. Monitoring during construction would be required to ensure that protection of worker and public health is achieved.

Alternative No. 4 - Off-Site Incineration/Off-Site Disposal of Residuals and Soils
The short-term risks presented by alternative No. 4 would be fewer than those of the on-site landfill alternative because excavated soils would not be stockpiled and would be immediately removed from the site. Implementation time would be reduced because there would not be a need to construct a landfill or backfill soils into it. The off-site incinerator and landfill would have the necessary facilities and pollution control equipment to contain soils and prevent emissions during treatment/disposal.

Alternative No. 5 - On-Site Incineration/On-Site Fixation of Treated Residuals/On-site Landfill Disposal/Institutional Controls
This alternative poses a high health risk due to a significant amount of soil handling, on-site incineration emissions, and the long time frame (five to six years) for the alternative to be completed. Stringent dust and emissions controls would be required in order for the alternative to maintain public health protection. Site-wide monitoring of emissions would be necessary for this alternative.

Alternative No. 6 - Off-Site Incineration of Highly Contaminated Soil/On-Site Biological Treatment of Remaining Contaminated Soil/Institutional Controls
It is anticipated that remediation of the site would take 5 to 7 years to complete with the biological treatment alternative. During early stages of remedial activities, soil handling and treatment operations may produce fugitive dust which might slightly elevate health risks. Stringent dust and emissions controls would be required in order to ensure public health protection. A site-wide air monitoring program would be instituted during remedial activities with this alternative.

Alternative No. 7 - Off-Site Incineration of Highly Contaminated Soil/On-Site Washing Treatment of Remaining Contaminated Soil/Off-Site Incineration and Disposal of Soil Wash Residuals/Institutional Controls
Remediation of soils at the COC area employing soil washing would take approximately 5 to 6 years to complete. Workers and the nearby community could potentially be exposed to slightly elevated risks during soil handling and treatment activities. These risks, however, can be reduced to acceptable levels by instituting protective and preventative measures. A site-wide air monitoring program would be in operation during remedial activities with this alternative.

CRITERION 6: IMPLEMENTABILITY

Prerequisite Remedial Activities - Demolition/Disposal of Buildings and Tanks/Soil Vacuum Extraction
These activities are readily implementable using standard demolition and construction techniques. The time required for implementation of vacuum extraction is highly variable and dependent upon subsurface conditions, soil permeability, contaminant characteristics, air temperature and vacuum/blower pressure. Implementation is estimated to take 6 months to 1 year.

Alternative No. 1 - No Action
The No Action alternative is readily implementable.

Alternative No. 2 - Capping/Institutional Controls
The cap alternative is highly implementable using standard construction techniques. The alternative poses logistical problems associated with the presence of a building, railroad, underground pipeline, and other utilities adjacent to the site. Detailed planning would be required to address reconstruction or rerouting of these rights-of-way.

Alternative No. 3 - On-Site Landfill Disposal/Institutional Controls
The landfill alternative is implementable using standard construction techniques and equipment. The alternative poses similar logistical problems as described for the cap alternative, but through proper planning the problems can be solved.

Alternative No. 4 - Off-Site Incineration/Off-Site Disposal of Residuals and Soils
The construction aspects of Alternative No. 4 are highly implementable using standard construction techniques and equipment. Implementability of off-site incineration and landfill disposal would be dependent on the capacity of these facilities at the time of remedial action. These problems could result in a delay in remedial action, but do not preclude off-site incineration or disposal.

Alternative No. 5 - On-Site Incineration/On-Site Fixation of Treated Residuals/On-Site Landfill Disposal/Institutional Controls
Although Alternative No. 5 is implementable using existing equipment and technologies, this alternative faces the greatest challenges to be implemented successfully. The alternative combines incineration, fixation, and containment technologies. Due to limited staging and operation space at the site, detailed planning would be necessary. Incineration emissions modeling and planning would also be necessary. Implementability of this alternative depends upon delisting the treated waste. Availability of specialty equipment is another critical component which affects the time required for implementation. This alternative includes specialty equipment to prepare the soil for incineration, portable incinerators, and fixation equipment.

Alternative No. 6 - Off-Site Incineration of Highly Contaminated Soil/On-Site Biological Treatment of Remaining Contaminated Soil/Institutional Controls
The construction and excavation aspects of the biological treatment alternative are highly implementable using standard techniques and equipment. The limited staging and operations space on-site, however, would necessitate a phased construction and treatment approach. Implementability of off-site incineration and landfill disposal would be dependent on the capacity of these facilities at the time of remedial action. These factors could result in a delay in remediation, but do not preclude off-site incineration or disposal. The biological treatment process, however, is an innovative technology and has not been demonstrated under full-scale conditions with the complex mixture of contaminants present at OU1. The implementability and applicability of this technology for the remediation of the COC will be determined during the treatability tests.

Alternative No. 7 - Off-Site Incineration of Highly Contaminated Soil/On-site Washing Treatment of Remaining Contaminated Soil/Off-Site Incineration and Disposal of Soil Wash Residuals/Institutional Controls
This alternative combines incineration, containment, and soil washing technologies. The limited staging and operations space at OU1 would necessitate a phased construction and treatment approach. Off-site incineration and land disposal are implementable with standard techniques and equipment, but are dependent on the capacity of these facilities at the time of remedial action. Although soil washing has been successfully demonstrated with certain types of compounds, its effectiveness in treating the area's complex mixture of

contaminants is uncertain. As with the biological treatment alternative, treatability tests would be required to determine if all the contaminants can be removed and to aid in designing the treatment system.

CRITERION 7: COST

Prerequisite Remedial Activities - Demolition/Disposal of Buildings and Tanks/Soil Vacuum Extraction
The estimated costs for demolition and disposal of structures is approximately $325/CY for buildings and foundations and $1,600/tank. Soil vacuum extraction is estimated to cost $1,600,000. The costs have been included in each of the following alternatives.

Alternative No. 1 - No Action
The cost of the No Action alternative includes site operations and maintenance, periodic sampling, inspection, and performance of a PHE at 5-year intervals. Annual cost is estimated at $53,000 and present worth cost over 30 years is estimated at $604,000.

Alternative No. 2 - Capping/Institutional Controls
The estimated present worth cost for construction of a cap at OU1 is approximately $6,529,000. This cost includes construction, O&M, and periodic monitoring.

Alternative No. 3 - On-Site Landfill Disposal/Institutional Controls
The estimated cost for construction of a Subtitle C landfill at OU1 is approximately $10,807,000. This cost includes construction, O&M, and periodic monitoring.

Alternative No. 4 - Off-site Incineration/Off-site Disposal of Residuals and Soils
The estimated present worth cost for Alternative No. 4 is $18,594,000, the fourth highest cost for the action alternatives. The cost assumes disposal at an in-state landfill, and the cost may be higher if transport out of state is required.

Alternative No. 5 - On-Site Incineration/On-Site Fixation of Treated Residuals/On-Site Landfill Disposal/Institutional Controls
Alternative No. 5 is the most costly of the seven alternatives. The estimated present worth cost for Alternative No. 5 is $33,878,000.

Alternative No. 6 - Off-Site Incineration of Highly Contaminated Soil/On-Site Biological Treatment of Remaining Contaminated Soil/Institutional Controls
The exact cost of this alternative is uncertain until treatability tests are performed. The estimated present worth cost for the biological treatment alternative is $20,736,000. This includes capital costs of $20,539,000 and annual O&M costs (excluding the required 5-year PHE) of $40,000 per year. Major contingencies have been factored into the capital costs to allow for complications in instituting a bioremediation technology.

Alternative No. 7 - Off-Site Incineration of Highly Contaminated Soil/On-Site Washing Treatment of Remaining Contaminated Soil/Off-Site Incineration and Disposal of Soil Wash Residuals/Institutional Controls
Costs associated with the soil washing alternative are uncertain since treatability tests have not yet been performed on soils from the COC area. The estimated present worth cost for

this alternative is $29,441,000. This includes capital costs for $29,254,000 and annual O&M costs (excluding the required 5-year PHE) of $40,000 per year. Major contingencies have been factored into the capital costs to allow for complications in instituting a soil washing technology.

CRITERION 8: STATE ACCEPTANCE

The State has concurred with the remedy described in Section IX.

Prerequisite Remedial Activities - Demolition/Disposal of Buildings and Tanks/Soil Vacuum Extraction
The State has concurred with these remedial activities.

Alternative No. 1 - No Action
The State would prefer an alternative that reduces the risk present at the COC area.

Alternative No. 2 - Capping/Institutional Controls
Due to the need for long-term maintenance and several restrictions for land use, state acceptance of the capping alternative was expected to be greater than No Action, but less than for alternatives that destroy or remove waste .

Alternative No. 3 - On-Site Landfill Disposal/Institutional Controls
State acceptance of the landfill alternative was expected to be greater than for No Action, but less than for alternatives that destroy or remove waste, due to the need for long-term maintenance and several restrictions for land use.

Alternative No. 4 - Off-Site Incineration/Off-Site Disposal of Residuals and Soils
It was expected that Alternative No. 4 would be highly acceptable to the State. Contaminants would be destroyed and removed from the COC area.

Alternative No. 5 - On-Site Incineration/On-site Fixation of Treated Residuals/On-Site Landfill Disposal/Institutional Controls
State acceptance was expected to be less for this alternative due to concerns over incinerator emissions, length of remediation time, and the presence of a landfill which would restrict future use of the area.

Alternative No. 6 - Off-Site Incineration of Highly Contaminated Soil/On-Site Biological Treatment of Remaining Contaminated Soil/Institutional Controls
It was expected that the biological treatment alternative would be highly acceptable to the State. Contaminants would be eliminated from the site, and the area could be returned to industrial use. The length of remediation time (5 to 7 years) may be a concern.

Alternative No. 7 - Off-Site Incineration of Highly Contaminated Soil/On-Site Washing Treatment of Remaining Contaminated Soil/Off-Site Incineration and Disposal of Soil Wash Residuals/Institutional Controls
It was expected that the soil washing alternative would be acceptable to the State. Contaminants would be eliminated from the site, and the area could be returned to industrial use. The relatively long remediation time (5 to 6 years) and high cost, however, may be a concern.

CRITERION 9: COMMUNITY ACCEPTANCE

The City of Commerce City has criticized EPA's use of industrial exposure and action levels, and has suggested EPA use only residential numbers. As set forth in the attached Responsiveness Summary, EPA believes use of such industrial exposures and action levels are consistent with CERCLA, the NCP, and EPA guidance.

Prerequisite Remedial Activities - Demolition/Disposal of Buildings and Tanks/Soil Vacuum Extraction
These prerequisite activities are acceptable to the community since VOCs will be reduced to action levels and contaminated structures will be eliminated.

Alternative No. 1 - No Action
It is assumed that the community would prefer an alternative that reduces the risk present at the COC area.

Alternative No. 2 - Capping/Institutional Controls
Community acceptance of capping is expected to be greater than for no action.

Alternative No. 3- On-Site Landfill Disposal/Institutional Controls
Community acceptance of the landfill alternative is expected to be greater than for No Action, but less than for alternatives that destroy or remove waste, due to the need for long-term maintenance and several restrictions on land use.

Alternative No. 4 - Off-Site Incineration/Off-Site Disposal of Residuals and Soils
Alternative No. 4 would be highly acceptable to the local community. Contaminants would be destroyed and removed, and the health threat would be reduced such that certain uses of the land would be permissible.

Alternative No. 5 - On-Site Incineration/On-Site Fixation of Treated Residuals/On-site Landfill Disposal/Institutional Controls
Community acceptance is expected to be reduced for this alternative due to concerns over emissions from the incinerator. Costs of remediation and length of remediation time is also expected to be of concern.

Alternative No. 6 - Off-Site Incineration of Highly Contaminated Soil/On-Site Biological Treatment of Remaining Contaminated Soil/Institutional Controls
It is anticipated that this alternative will be highly acceptable since contaminants would be destroyed and removed, and the health threat would be reduced to the point where industrial use of the land would be permissible. The relatively long remediation time may be of concern.

Alternative No. 7 - Off-Site Incineration of Highly Contaminated Soil/On-Site Washing Treatment of Remaining Contaminated Soil/Off-Site Incineration and Disposal of Soil Wash Residuals/Institutional Controls
It is anticipated that this alternative would be acceptable since contaminants would be destroyed and removed, and the health threat would be reduced to permit industrial use of the land. Both the cost and the length of remediation time may be a concern.

Minimal comments were submitted on the second proposed plan. This plan included soil vacuum extraction, excavation and incineration of 1,000 CY of highly HOC-contaminated soil, and on-site biological and/or soil washing treatment of the lesser HOC-contaminated soil.

IX. The Selected Remedy

Based on consideration of the requirements of CERCLA, the detailed evaluation of the alternatives, a statutory preference for treatment, and public comments, EPA has decided to implement the prerequisite remedial activities (including demolition and treatment of contaminated buildings and tanks in accordance with the LDRs; and SVE for VOCs) and the off-site incineration of soils contaminated with greater than or equal to 1,000 ppm HOCs. The selected remedy is a portion of the preferred alternatives 6 and 7, as referenced above and in the proposed plan. Ground water on-site would be monitored for thirty years and a Public Health Evaluation (PHE) would be performed every five years following remediation. The net present worth for the selected remedy is $5,349,600 and implementation will take approximately 18 months.

Scope and performance of the selected remedy are consistent with the proposed remedy because the elements of remedial actions to be implemented are the same. The difference is that there will be an additional Record of Decision and public comment period on the remedy for those lower level HOC-contaminated soils which are now considered OU5. Correspondingly, the cost of the remedy selected herein is less than what was anticipated in the FS and FS addendum; however, the cost of remediating the overall COC area, i.e. OU1 and OU5, will be approximately the same as that presented in the proposed plan.

Remediation Goals

Target clean-up objectives have been developed based on (1) ARARs, (2) concentrations which correspond to carcinogenic health risks from $1x10^{-7}$ to $1x10^{-4}$. Except as noted below, acceptable contaminant levels for the chemicals of concern are, in general, the 10^{-6} risk-based action levels derived through the EA.

ARARs specify the cleanup objectives for the pesticide 2,4-D, a HOC found at the site. As stated earlier, the LDRs dictate the treatment for concentrations of HOCs ≥ 1,000 ppm. Treatment standards have been established based on the best demonstrated available technology (BDAT). Health-based action levels for soils contaminated with lower levels of HOCs will be addressed in the ROD for OU5. For the pesticide 2,4-D, incineration represents the BDAT required by the LDRs.

Pesticide contaminated soils will be excavated and hauled to an incineration facility where high-temperature treatment will achieve 99.99% DRE of the contaminants. Since residuals will be above health risk-based levels, the incinerated soil and ash produced during incineration will be disposed in a subtitle C landfill, and as dictated by the Land Disposal Regulations.

Any metal contamination, in the 1,000 CY of soil contaminated with HOCs ≥ 1,000 ppm to be excavated, will be addressed by disposal of incinerated soil and ash in a Subtitle C landfill.

Soil action levels for the cleanup of volatile organics were based on the 10^{-6} risk due to ground-water ingestion. The ground-water pathway is considered the most significant route for volatiles, because of the low K_d (the partitioning coefficient) values. Treatment of the subsurface VOC contaminated soils with soil vacuum extraction results in residual contaminant concentrations equal to the action levels listed in Table VI-1. Carbon filters provide treatment for the emissions created by the system.

X. Statutory Determinations

EPA's responsibility at Superfund sites is to select and implement remedial actions that are protective of human health and the environment. In addition, Section 121 of CERCLA provides several other statutory requirements and preferences. These statutes specify that the selected remedial action for the site must comply with applicable or relevant and appropriate environmental standards established under Federal and State environmental laws unless a waiver is granted. The selected remedy must also be cost effective and utilize permanent treatment technologies or resource recovery technologies to the maximum extent practicable. The statute also contains a preference for remedies that permanently or significantly reduce the volume, toxicity, or mobility of hazardous substances. The following sections discuss how the selected remedy for the redefined Sand Creek OU1 meet these statutory requirements.

1. Protection of Human Health and the Environment

The selected remedy protects human health and the environment through removal and incineration of the highly HOC-contaminated soils, and vacuum extraction of volatile organic compounds. This remedy will reduce the direct contact threat currently posed by soils and will minimize future adverse effects on ground-water quality by treatment of the most concentrated sources of waste above the water table. There are some short-term risks associated with the selected remedy during soil handling operations, but these can be minimized with protective and preventative measures.

2. Attainment of ARARs

Remedial actions at Sand Creek (OU1) will be undertaken in accordance with all applicable or relevant and appropriate requirements (ARARs).

Any regulation, standard, requirement, criterion, or limitation under any federal or state environmental law may be either applicable or relevant and appropriate to a remedial action, but not both.

Criteria, advisories and guidelines that are not law may be used to ensure protectiveness in the absence of ARARs, or when ARARs are not sufficient. These criteria, advisories, and guidelines fall in the "to be considered" (TBC) category and can be used to ensure protection.

ARARs may be classified into three general categories:

- Chemical-specific - related to the level of contamination allowed for a specific pollutant in various environmental media (i.e., soil, water, and air),
- Location-specific - related to the presence of a special geographical (e.g., floodplain or wetland) or archeological area at or near the site, and
- Action-specific - related to a method of remedial action identified as an alternative for the site (e.g., disposal requirements or incineration standards).

The selected remedy of off-site incineration of soils contaminated with HOC concentrations greater than or equal to 1,000 ppm, demolition and disposal of contaminated structures and tanks in a Subtitle C facility, and vacuum extraction of soils would comply with all applicable or relevant and appropriate chemical-, location-, and action-specific requirements (ARARs). The ARARs are presented below.

- Chemical-specific ARARs

  None

- Location-specific ARARs

  None

o Action-specific ARARs

Federal

- The Superfund Off-Site Policy found in the November 15, 1985 Federal Register will be complied with concerning off-site incineration and disposal of the structures and tanks.

- A PHE must be performed at least every 5 years (proposed NCP, 53 FR 51430)

Resource Conservation and Recovery Act (RCRA)

- RCRA requirements in 40 CFR Part 268.32(e)(2) prohibit land disposal of nonliquid hazardous wastes containing HOCs in total concentration greater than or equal to 1,000 ppm. Off-site incineration of soils containing HOC concentrations greater than or equal to 1,000 ppm will meet the land disposal requirement, since incineration represents BDAT required by the LDRs.

- 40 CFR 268 Subpart C (Prohibitions on Land Disposal), Subpart D (Treatment Standards) Waste specific prohibitions and treatment standards will be followed in the land disposal of spent carbon filters used for vacuum extraction, the disposal of debris resulting from demolition of buildings and removal of tanks, and disposal of the ash and incinerated soil.

Occupational Safety and Health Act (OSHA)

- The requirements of 29 USC Sections 651-678, which regulates worker health and safety, must be followed.

State of Colorado

- CRS Section 25-123-101, et. seq. must be adhered to maintain compliance with the State of Colorado noise abatement requirements.

- 6 CCR 1007-3 Part 99 will need to be followed. This regulation requires notification of hazardous waste activities when hazardous waste is generated.

- The manifest requirements of 6 CCR 1007-3 Part 262 Subpart B must be followed for off-site transportation of hazardous waste.

- The pre-transport regulations of 6 CCR 1007-3 Part 262.30, .31 and .33 must be adhered to for off-site transportation of hazardous waste.

- An EPA identification number must be obtained for transporting of hazardous waste per the requirements of 6 CCR 1007-3 Part 263.11 (A).

- CCR 1001-3 Section VIB will be followed to regulate air emissions.

3. Cost Effectiveness

The selected remedy is cost effective in mitigating the risk posed by contaminated soils in a reasonable period of time. The selected remedy effectively and permanently reduces contamination to acceptable levels.

Because the scope of the original Operable Unit has been reduced, the cost of this remedy is less than the estimate in the second proposed plan. Employing one of the other alternatives for this modified Operable Unit would greatly increase the cost without a corresponding increase in the protection of human health and the environment.

4. Utilization of Permanent Solutions and Alternative Treatment Technologies or Resource Recovery Technologies to the Maximum Extent Practicable

EPA analyzed the alternatives to determine which would utilize innovative treatment technologies to the maximum extent practicable. The selected remedy will achieve the response objectives of reducing direct contact exposure to high level HOC contaminated soils and minimizing adverse impacts on ground water from both VOC and high level HOC soil contamination.

This remedy involves destruction and treatment of contaminants and an overall reduction in contaminant toxicity and volume. Soils highly contaminated with HOCs will be excavated and incinerated off site. Incineration will achieve a DRE of 99.99%. Soils contaminated with VOCs will be subjected to SVE and will no longer be a source of groundwater contamination. Therefore, a permanent remedy is achieved for those soils included in this decision. Alternative treatment technologies and resource recovery technologies will also be evaluated in OU5, which addresses the remainder of the COC area soils.

5. Preference for Treatment as a Principal Element

By incinerating HOC contaminated soils and vacuum extraction of VOC-contaminated soils, the selected remedy addresses the principal risks at the site through the use of remedies that employ treatment as a principal element.

XI. Documentation of Significant Changes

The Proposed Plan for the Sand Creek Industrial Site, original Operable Unit No. 1 (Colorado Organic Chemical Soils), was released to the public in January 1989. The Proposed Plan identified excavation and off-site incineration of soils contaminated by ≥ 1,000 ppm HOCs, excavation and off-site disposal of soils contaminated by < 1,000 ppm HOCs and backfilling of excavated areas with clean soil as the agency's preferred

alternative. EPA reviewed all the comments submitted verbally and in writing during the public comment period. Based on review of those comments and subsequent re-examination of the site, EPA released a revised Proposed Plan in July 1989 which identified the use of bioremediation and soil washing technologies, as part of the agency's preferred alternative. As the result of a need to perform treatability studies as a basis for reaching the remedial action decision for the entire COC area, EPA has decided to create an additional operable unit (OU5) in which to address the 38,000 cubic yards of soils contaminated with < 1,000 ppm HOCs.

EPA has reviewed the comments and questions received during the latest public comment period and responded in the attached responsiveness summary (Attachment A).

SAND CREEK INDUSTRIAL SUPERFUND SITE
OPERABLE UNIT NO. 1
COMMERCE CITY, COLORADO
RESPONSIVENESS SUMMARY

September 11, 1989

This community relations responsiveness summary for Operable Unit No. 1 (OU1) of the Sand Creek Industrial site contains two sections: (A) a brief description of the site and EPA's selected remedial alternative for OU1, and (B) a summary of oral and written comments received concerning the Remedial Investigation/Feasibility Study (RI/FS) and the selected remedy, and EPA's responses to these comments.

A. OVERVIEW

The Sand Creek Industrial site is located in Commerce City, a suburb north of Denver, Colorado. The site and surrounding area are primarily occupied by trucking firms, petroleum and chemical supply/production companies, warehouses, and small businesses. There is a small residential population in the study area and in the area adjacent to the northeast border of the site.

The site contains the following four known potential source areas, all of which are now inactive: the Oriental Refinery, the Colorado Organic Chemical (COC) property, the L.C. Corporation acid pits, and the 48th and Holly Landfill. Contaminants found on the site include pesticides and herbicides, volatile organic compounds (VOCs), and arsenic. To expedite the study and cleanup of the contaminated areas, EPA has divided the Sand Creek site into five operable units. The operable units were established based on the presence of different types of contaminants or contaminated media, different source areas, and/or physical constraints. This responsiveness summary presents comments on EPA's FS Addendum and the preferred alternative for remediating contaminated buildings and tanks and contaminated soils in OU1, which consists of the COC, the land between COC and the L.C. Corporation, and the northern portion of the Oriental Refinery site with the exception of approximately 38,000 cubic yards

of lesser Halogenated Organic Compound (HOC) contaminated soils on the COC property which are now within the recently designated OU5.

EPA issued a proposed plan in January 1989. The previously proposed alternative for cleaning up contaminated soil at the original OU1 (Alternative No. 4) combined vapor extraction, excavation, incineration, and institutional controls. A soil vapor extraction system was proposed to remove deep volatile contamination. All shallow soils containing contaminant levels that presented a health risk due to contact with the soils were to be excavated for disposal at an off-site landfill. In addition, approximately 1,000 cubic yards of soils with the highest contaminant levels were to be incinerated off-site prior to disposal. Excavated areas were to be filled with clean soil and revegetated, and the rest of the site was to be graded and revegetated to reduce erosion and windblown dust. Ground water was to be monitored on a quarterly basis for the first three years after completion of the cleanup action. Residential use of OU1 land would have been prohibited, and no new irrigation systems or water or sewer lines would be permitted.

EPA reviewed all comments concerning the proposed alternative and re-evaluated the remedial technologies and combinations of technologies. Details of the re-evaluation of remedial technologies and combinations of technologies can be found in the Addendum to the FS. The re-evaluation of technologies resulted in the incorporation of two additional alternatives to the five previously proposed. The two additional alternatives include: (1) biotreatment and (2) soil washing for less HOC contaminated soils. These alternatives are outlined in detail in the FS Addendum and were summarized in a proposed plan issued by EPA in July 1989. Figures 2-1 and 2-2 of the FS Addendum provide a schematic of each alternative. EPA has decided to perform treatability tests on these two alternatives. If the results of the treatability tests indicate that the implementation of either technology would provide successful remediation, then the technologies will be developed to field scale. If the results of treatability tests do not indicate that implementation would be successful, the previously proposed alternative (Alternative 4) will be implemented. Subsequently, EPA decided it was appropriate to perform the treatability studies before a remedial decision on is made on the less HOC contaminated soils. Accordingly, EPA designated a new OU, OU5, to deal with the lesser HOC contaminated soils.

B. SUMMARY OF COMMENTS RECEIVED DURING PUBLIC COMMENT PERIOD

EPA solicited written and oral comments from the community during the public comment period from July 19, 1989 through August 22, 1989. Comments were received from the City of Commerce City and from participants of the August 1, 1989 community meeting. A summary of these comments and EPA's responses are provided below.

Comments from the City of Commerce City

Comment: The City of Commerce City stated that the selected remedial alternative could be acceptable if cleanup levels are established to meet residential standards. The City feels that the industrial-use model used to set action levels restricts future land use at the site and is not a permanent solution. Therefore, the City believes that the intent of Superfund Amendment Reauthorization Act (SARA) is not being achieved since a permanent solution is not being implemented.

The City also believes that technologies exist to remediate the site so that institutional controls would be unnecessary. The City feels that the use of institutional controls at the site could result in physical and economic decay since people may consider the area unsafe for any use.

EPA Response: Action levels at the site were set to industrial-use standards because: (1) the operable unit is located in an area currently under industrial use, (2) the area is zoned as industrial by the City of Commerce City, and (3) the City's long range land-use plans call for continued industrial use of the area. However, the need for and scope of any institutional controls for final remediation of the COC property area will be evaluated and decided later under OU5.

Technologies do exist to clean up the site so that institutional controls would not be required. Numerous technologies were evaluated in the FS and were rejected due to cost, implementability, or effectiveness considerations. EPA feels that the selected remedy represents the best treatment technologies for remediating the site and protecting human health and the environment at a reasonable cost.

Comment: The City of Commerce City stated that if the selected remedy could not be modified to include residential-use standards, the City would accept the remedy if certain conditions are met. The City stipulated that all current PRPs and future owners/operators should be given immunity from future cleanup liabilities once this particular remedial action is completed. They felt that businesses may avoid purchasing and developing property in the area if there were the potential of becoming a PRP.

Concerns about the liabilities of current and future owners was also expressed by a participant of the August 1 community meeting.

EPA Response: EPA recognizes that potential liability can adversely affect property values. EPA can provide for a post-remediation covenant not to sue under CERCLA Section 121(f); however, EPA cannot simply grant "immunity" from all future liability for residual contamination that may remain on site. Under "Superfund," a party can be liable for cleanup of a site whether they were responsible for the contamination or own the contaminated property. CERCLA represents Congress' judgment on how to best address the problem of contamination by hazardous substances, and EPA must abide by the terms of the statute. EPA also suggests an environmental audit which may be a defense against future liability.

Comments from the August 1 Public Meeting

Comment: Has EPA evaluated the possibility of using on-site incineration to remediate soils at OU1?

EPA Response: EPA evaluated the use of on-site incineration during development of remedial alternatives in the FS. Due to the degree of contamination and volume of contaminated soil present at OU1, the use of on-site incineration was rejected due to economic and environmental considerations.

Comment: Several participants asked why dead animals have not been found at OU1 and why weeds grow there if it is contaminated.

EPA Response: The presence of dead wildlife is not the only indication of actual or potential hazards. Similarly, the danger to human health, welfare, and the environment cannot be quantified by the amount of weeds growing. Most of the pesticides contaminating OU1 are classified as insecticides and may not necessarily affect plant life. Risk information on the site is contained in the endangerment assessment documents. These reports present, in statistical terms, what the exposure risks are for various contaminants and how the risks are calculated.

Comment: One of the participants expressed doubts over the potential exposure risks that have been identified at OU1.
EPA Response: EPA has identified potential exposure hazards that may exist at the site, not necessarily current hazards. The purpose of cleaning up soils at the site is to reduce and/or eliminate possible exposures, and to remove the source of groundwater contamination.

Comment: Are site boundaries going to change to include property adjacent to the site?
EPA Response: At present, site boundaries will remain as defined in the FS. However, if contamination is found on property that is located adjacent to a Superfund site, the site boundaries may be correspondingly enlarged.

Comment: What is the potential for exposure to contaminated ground water that may have migrated from the site to adjacent properties?
EPA Response: There should be no current exposure to contaminated ground water since residents and businesses in the area have been advised not to use existing groundwater wells. The entire area is now on a municipal water supply system.

Comment: If property is determined to contain contaminated ground water, will the owner of that property be asked to participate in the operable unit that involves groundwater contamination (OU4)?
EPA Response: Generally, if EPA identifies a contributing source of contamination, the property owner can expect to be contacted about cleanup participation. If the property is not a contributing source, property owners are usually not expected to participate in the cleanup.

Comment: Do attorney's comments in the August 2, 1989 Responsiveness Summary address litigation between EPA and PRPs?

EPA Response: It is routine for property owners or operators to have attorneys represent them and make comments on their behalf. The comments included in the previous responsiveness summaries are of that nature and have nothing to do with litigation. They are simply comments made by the attorneys as representative for the property owner.

Comment: Were there any comments received by EPA that were not identified in the August 2, 1989 Responsiveness Summary?

EPA Response: EPA responded to all comments received. If two or more comments were sufficiently similar, however, they were addressed only once.

Comment: What assurances can be given to potential buyers of property adjacent to OU1 who may be concerned about potential cleanup liabilities and exposures during remedial activities?

EPA Response: In situations where there is prior knowledge that a potential problem may exist, there is certainly a risk on the part of the property buyer concerning the possibility of liability. It is often difficult to determine if property is contaminated unless samples are collected and analyzed. There has been a tremendous effort recently by property buyers to make sure that any properties they may purchase are not contaminated. Consequently, many property buyers and/or sellers have an environmental study performed to ensure that the land is uncontaminated.

Precautionary and preventative measures will be exercised during remedial activities in order to minimize possible releases of hazardous substances into the surrounding community.

Comment: Who performs environmental audits, and how much does one cost?

EPA Response: There are numerous engineering consulting firms that perform environmental audits. Cost will vary greatly depending on the size of the property and the extent to which it needs to be investigated.

Comment: Is it anticipated that dust will migrate off site during remedial activities, and how long will cleanup take to complete?

EPA Response: Dust is a potential exposure problem but can be dealt with using preventative and protective measures. Dust control methods will be implemented during the remedial activities, thereby minimizing the risk. It is estimated that it will take about 5 to 6 years to complete remediation of the site with either the biological treatment or soil washing alternative. The greatest potential for dust exposure problems would occur during the first year of cleanup operations and would not be a concern during the rest of the remediation.

Comment: Have all PRPs at the site been identified and is that public information?

EPA Response: The PRPs at OU1 have been identified and that is public information.

Comment: Is there a time table for addressing contamination at the Sand Creek Industrial site other than for OU1?

EPA Response: Yes. EPA has established a schedule for addressing the contamination associated with the other operable units. The RI/FS for OU3 will begin October - December 1989. Operable Unit 4 will be addressed during July - September of 1991. The RI/FS for OU2 will begin October - December of FY 1991. Treatability Studies will begin during October - December of 1989.