

Public Health Assessment for

**OGDEN DEFENSE DEPOT
OGDEN, WEBER COUNTY, UTAH
CERCLIS NO. UT9210020922
SEPTEMBER 30, 1992**

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
PUBLIC HEALTH SERVICE
Agency for Toxic Substances and Disease Registry



PUBLIC HEALTH ASSESSMENT

OGDEN DEFENSE DEPOT

OGDEN, WEBER COUNTY, UTAH

CERCLIS Number UT9210020922

Prepared by:

Federal Programs Branch
Division of Health Assessment and Consultation
Agency for Toxic Substances and Disease Registry

THE ATSDR PUBLIC HEALTH ASSESSMENT: A NOTE OF EXPLANATION

This Public Health Assessment was prepared by ATSDR pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund) section 104 (i)(6) (42 U.S.C. 9604 (i)(6)), and in accordance with our implementing regulations 42 C.F.R. Part 90). In preparing this document ATSDR has collected relevant health data, environmental data, and community health concerns from the Environmental Protection Agency (EPA), state and local health and environmental agencies, the community, and potentially responsible parties, where appropriate.

In addition, this document has previously been provided to EPA and the affected states in an initial release, as required by CERCLA section 104 (i)(6)(H) for their information and review. The revised document was released for a 30 day public comment period. Subsequent to the public comment period, ATSDR addressed all public comments and revised or appended the document as appropriate. The public health assessment has now been reissued. This concludes the public health assessment process for this site, unless additional information is obtained by ATSDR which, in the Agency's opinion, indicates a need to revise or append the conclusions previously issued.

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FOREWORD

The Agency for Toxic Substances and Disease Registry, ATSDR, is an agency of the U.S. Public Health Service. It was established by Congress in 1980 under the Comprehensive Environmental Response, Compensation, and Liability Act, also known as the Superfund law. This law set up a fund to identify and clean up our country's hazardous waste sites. The Environmental Protection Agency, EPA, and the individual states regulate the investigation and clean up of the sites.

Since 1986, ATSDR has been required by law to conduct a public health assessment at each of the sites on the EPA National Priorities List. The aim of these evaluations is to find out if people are being exposed to hazardous substances and, if so, whether that exposure is harmful and should be stopped or reduced. (The legal definition of a health assessment is included on the inside front cover.) If appropriate, ATSDR also conducts public health assessments when petitioned by concerned individuals. Public health assessments are carried out by environmental and health scientists from ATSDR and from the states with which ATSDR has cooperative agreements.

Exposure: As the first step in the evaluation, ATSDR scientists review environmental data to see how much contamination is at a site, where it is, and how people might come into contact with it. Generally, ATSDR does not collect its own environmental sampling data but reviews information provided by EPA, other government agencies, businesses, and the public. When there is not enough environmental information available, the report will indicate what further sampling data is needed.

Health Effects: If the review of the environmental data shows that people have or could come into contact with hazardous substances, ATSDR scientists then evaluate whether or not there will be any harmful effects from these exposures. The report focuses on public health, or the health impact on the community as a whole, rather than on individual risks. Again, ATSDR generally makes use of existing scientific information, which can include the results of medical, toxicologic and epidemiologic studies and the data collected in disease registries. The science of environmental health is still developing, and sometimes scientific information on the health effects of certain substances is not available. When this is so, the report will suggest what further research studies are needed.

Conclusions: The report presents conclusions about the level of health threat, if any, posed by a site and recommends ways to stop or reduce exposure in its public health action plan. ATSDR is primarily an advisory agency, so usually these reports

identify what actions are appropriate to be undertaken by EPA, other responsible parties, or the research or education divisions of ATSDR. However, if there is an urgent health threat, ATSDR can issue a public health advisory warning people of the danger. ATSDR can also authorize health education or pilot studies of health effects, full-scale epidemiology studies, disease registries, surveillance studies or research on specific hazardous substances.

Interactive Process: The health assessment is an interactive process. ATSDR solicits and evaluates information from numerous city, state and federal agencies, the companies responsible for cleaning up the site, and the community. It then shares its conclusions with them. Agencies are asked to respond to an early version of the report to make sure that the data they have provided is accurate and current. When informed of ATSDR's conclusions and recommendations, sometimes the agencies will begin to act on them before the final release of the report.

Community: ATSDR also needs to learn what people in the area know about the site and what concerns they may have about its impact on their health. Consequently, throughout the evaluation process, ATSDR actively gathers information and comments from the people who live or work near a site, including residents of the area, civic leaders, health professionals and community groups. To ensure that the report responds to the community's health concerns, an early version is also distributed to the public for their comments. All the comments received from the public are responded to in the final version of the report.

Comments: If, after reading this report, you have questions or comments, we encourage you to send them to us.

Letters should be addressed as follows:

Attention: Chief, Program Evaluation, Records, and Information Services Branch, Agency for Toxic Substances and Disease Registry, 1600 Clifton Road (E-56), Atlanta, GA 30333.

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SUMMARY

Defense Depot Ogden, Utah (DDOU), which is within the city limits of Ogden, Weber County, Utah, is part of the Defense Logistics Agency (DLA). DDOU has stored, maintained, and issued ordnance and non-ordnance items to military installations since 1941. In the past, liquid and solid wastes were disposed at DDOU. Several waste disposal areas have been identified at which materials were either burned or buried, wastes were rinsed out onto the ground, or wastes were spilled. Wastes included chemical warfare agents, solvents, oils, polychlorinated biphenyls (PCBs), pesticides, and metals.

Groundwater on post is contaminated with volatile organic compounds (VOCs), base/neutral or acid extractable compounds (BNAEs), pesticides, and metals. Contaminant concentrations above the Maximum Contaminant Level (MCL) have not been detected in groundwater off post (beyond the DDOU boundaries). It is possible that the higher contaminant concentrations detected on post will migrate off post. Because of that, DDOU will begin remediation of the shallow aquifer once the treatment system design is complete. An off-post survey by DDOU determined that seven private wells west of the depot boundary are in use. DDOU will sample those wells and determine their use if requested by the residents. The groundwater contamination plume in the upper aquifer has been defined. EPA and the state agree that to date the deep aquifer has not been contaminated by DDOU sources. EPA is requesting routine sampling of existing deep wells. If routine sampling shows that the deep aquifer is not contaminated and DDOU implements measures to treat the shallow aquifer, then it is likely the deep groundwater would not represent a pathway of exposure.

Burning of waste solvents, oils, and other debris took place at DDOU from the 1940s to the mid-1960s. Air monitoring was not conducted during the burning, however, large volumes of solvents and oils were not reported to have been burned and the burning was likely infrequent.

Drum remnants are visible in several areas of the Ogden Nature Center. An electromagnetometer survey done on Burial Site 1 showed subsurface anomalies, possibly indicating additional burial areas and other ground disturbances. Several areas at the nature center have been excavated to create ponds; none of the ponds were constructed in known or suspected disposal areas.

ATSDR concluded that DDOU poses no apparent public health hazard. The available data do not indicate that humans are now or have been exposed to contamination at levels of public health concern.

Until remediation is complete, continued surveillance of the shallow groundwater is recommended to ensure that the

contamination plume does not affect off-post potable or irrigation wells.

DDOU has no plans at this time to remove debris from the Ogden Nature Center. ATSDR recommends that DDOU and the Ogden Nature Center collaborate when future pond sites are selected and that subsurface surveys be conducted in any areas scheduled for excavation. Using those surveys to guide land management decisions should prevent human exposure.

The public health action plan (PHAP) for the DDOU NPL site contains a description of actions to be taken at and in the vicinity of the site subsequent to the completion of this public health assessment. The purpose of the PHAP is to ensure that this public health assessment not only identifies public health hazards, but provides a plan of action designed to mitigate and prevent adverse human health effects resulting from exposure to hazardous substances in the environment. Included is a commitment on the part of ATSDR to follow up on this plan to ensure that it is implemented. In accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended, DDOU has been evaluated for public health actions. Because there is no indication that human exposures to site contaminants at levels of public health concern are occurring or have occurred, the site is not being considered for ATSDR follow-up health activities at this time. If during the remediation process, however, data become available indicating that people are being exposed to hazardous substances at levels of public health concern, ATSDR will reevaluate the site for any indicated follow-up activities. ATSDR will reevaluate and expand the PHAP when needed. New environmental, toxicological, or health outcome data, or the results of implementing the proposed actions may determine the need for additional actions at the DDOU NPL site. The PHAP is included in this public health assessment.

BACKGROUND

A. Site Description and History

Defense Depot Ogden (DDOU) is a 1,139 acre installation at 1200 South Tomlinson Road, northwest of the city of Ogden, Weber County, Utah (Figure 1). As part of the Defense Logistics Agency (DLA), DDOU provides logistics support to the military services, including procurement and supply support, and contract administration. Since 1941, DDOU's mission has included receipt, storage, maintenance, inventory, and issue of centrally managed, ordnance and non-ordnance items to military installations, other Department of Defense (DOD) agencies, and federal civil agencies. Those items include food, clothing, textiles, packaged petroleum and industrial/commercial chemicals, and general medical, industrial, construction, and electronic supplies (1). As a result of the documented contamination of soil and groundwater, DDOU was placed on the U.S. Environmental Protection Agency (EPA) National Priorities List (NPL) for hazardous waste sites on July 1, 1987.

ATSDR is authorized by the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) to conduct public health assessments on NPL sites to evaluate their public health significance. ATSDR determines whether health effects are possible and recommends actions to reduce or prevent them. ATSDR prepared a preliminary public health assessment of DDOU that was released March 15, 1989. The preliminary public health assessment identified direct contact with and ingestion of contaminants as the routes of human exposure. Ingestion of contaminated groundwater by area residents and direct contact with and inhalation of hazardous materials by on-site employees and remediation workers were listed as possible exposure pathways. ATSDR recommended characterizing off-site soil contaminants, determining the status of the waste disposal areas, and characterizing area hydrology. Those recommendations have been adequately addressed.

A federal facilities agreement between EPA, the State of Utah, and DDOU for the cleanup became effective on November 30, 1989. DDOU has completed its Remedial Investigation/Feasibility Study (RI/FS). The RI/FS characterized the extent of contamination and evaluated alternatives for cleaning up the site. Cleanup will begin when the remedial design is complete.

To identify waste disposal areas, DDOU conducted a records search on property currently and formerly controlled by DDOU. In the past, liquid and solid wastes were disposed at DDOU. Oil, liquid materials, and combustible solvents were ignited in burning pits, and solid materials were buried or burned. Based on that records search, 43 areas needed further investigation. Fifteen of those

areas contained contaminants. To facilitate remediation, the contaminated areas have been divided into four Operable Units (OUs) (Figure 2). Shallow groundwater is considered part of OUs 1, 2, and 4.

Operable Unit 1: Riot control agent (chloroacetophenone) and white smoke containers (hexachloroethane) were reportedly buried in trenches at OU 1 at the southwest corner of DDOU. Part of that OU is outside existing DDOU property boundaries on property owned by the City of Ogden. That property encompasses approximately nine acres of the Ogden Nature Center (Figure 3). OU 1 consists of the following:

- Burial Site 1 - riot control agent and white smoke disposal area;
- Burial Site 3-B - rubber boots; and the Plain City Canal (backfilled in 1973 with burning pit ash from 4-A).

Burial Site 1 was reported to be used for disposing riot control agent or tear gas and white smoke containers in 1945. Field observations by DDOU identified 55 gallon drum remnants and small containers on or near the ground surface.

Burial Site 3-B lies west of 17th Street and is approximately 100 square feet. It is reported that over 1,000 arctic-style rubber boots were buried there during the 1960s.

Plain City Canal flowed north from Mill Creek until it was backfilled between 1969-1973 with ash from the open burning conducted at Burial Site 4-A.

Operable Unit 2: Empty pesticide and herbicide containers were rinsed, and the rinsate was discharged into the French drain on the southeast portion of the depot between the early 1970s and 1985 (Figure 4). OU 2 consists of the following:

- French Drain Area;
- Pesticide Storage Building (Building 51); and the Parade Ground Oil Burning Pits.

The French Drain is an area 8.5 feet by 20 feet that was excavated to a depth of three to four feet and filled with gravel. The drain was covered by a series of railroad rails spaced about three inches apart and surrounded by an asphalt parking and storage area. Rinsate containing pesticides and herbicides percolated into the ground.

The Former Pesticide Storage Building is approximately 800 feet southwest of the French Drain. The building was used for storage and mixing of pesticides until 1984, when a new facility was

built. As of 1980, the most frequently used pesticides were chlordane, diazinon, malathion, and lindane.

The Parade Ground is a grassy lawn southwest of the French Drain. Two oil-burning pits approximately 6 feet by 9 feet are suspected to be in the area.

Operable Unit 3: OU 3 consists of the disposal area and the WWII Mustard Gas Storage Area (Figure 3). Chemical warfare agent identification and detection kits were disposed in Burial Site 3-A.

Burial Site 3 covers approximately 8.5 acres near the southwest corner of DDOU. The area is bounded on the west by 17th Street, on the north by Perry Ditch and the railroad tracks, on the east by undeveloped land, and on the south by open land. Burial Site 3-A is near the center of Burial Site 3, encompasses approximately 70,625 square feet, and is enclosed by a six-foot chain link fence. The site is reported to contain chemical warfare agents, riot control agents, empty 55-gallon drums, and industrial-type compressed gas cylinders with unknown content. The reported disposal method included digging a trench, emptying the contents of the containers and the containers themselves into the pits (with chlorinated lime and soil), and backfilling the trench. During the sampling program in May 1988, 100 vials of chemical surety items were recovered, including tear gas (CN), lewisite (L), and mustard (HD). In addition, 132 defused irritant riot grenades were recovered. Further actions to identify additional waste containers are expected (2).

Historically, the WWII Mustard Gas Storage Area was 1,600 feet east of Burial Site 3-A. The area is currently used as a horse stable and grazing area. From 1942-1946, more than one million pounds of mustard gas was stored in one-ton containers in the igloo area. None of the igloos currently contain chemical warfare agents.

Burial Site 3-C is near the intersection of 17th Street and Perry Ditch and is approximately 75 square feet. It has been reported that excess or unusable water purification tablets (containing Halzone, or chlorine) were buried there between the 1950s and 1960s.

Operable Unit 4: In the past, fluorescent tubes, methyl bromide, waste oils, and waste in solid form were buried or burned at seven sites on the northern property boundary (Figure 5). OU 4 includes the following:

Burial Site 4A-E - burning pits; and the
Oil Burning pits fire training area.

Burial Site 4 is approximately 11.25 acres along the northern property boundary of DDOU. Five disposal areas have been identified. Wastes were burned at 4-A beginning in the early 1950s; the burning continued through the late 1970s (3).

The Contamination Screening Sites (CSSs)

CSSs were identified as the polychlorinated biphenyls (PCBs) screening sites, p, p' dichloro-diphenyl-trichloroethane (DDT)/Pesticide Contaminant Screening Study Areas, and the Lead Screening Study Area (1).

The PCB sites include several different DDOU locations where leaking PCB transformers were removed during the early 1980s.

The DDT/pesticide screening sites include Buildings 4X, 5X, and 4A. Approximately 100,000 liters of DDT solutions are stored in Buildings 4X and 5X. Building 4A was used to store DDT.

The lead screening site was identified as the pistol range target area.

Table 1 lists all of the study areas.

DESCRIPTION OF DDOW STUDY AREAS

Area No.	Site Description	Area No.	Site Description	Area No.	Site Description
1	Septic Tanks	16	DDT and Hazardous Chemical Storage	31	World War II Mustard Gas Storage
2	Burial Site 1 - Riot Control Agent	17	Hazardous Chemical Storage	32	Smoke and Incendiary Grenade Burning Ground
3	Burial Site 3 - Water Purification Tablets	18	Pesticide Storage	33	Nonvaulted Leaking Transformers
4	Burial Site 3 - Rubber Boots	19	Air Force Printing Plant	34	Municipal Domain
5	Burial Site 3 - Mustard, Phosgene, Methyl Bromide and HC Smoko Cylinders	20	Chemical and Electronics Laboratories	35	Weber County
6	Burial Site 4 - Methyl Bromide Cylinders	21	Photography Laboratory	36	U.S. Army Reserve
7	Burial Site 4 - Burning Pits	22	X-Ray Laboratory	37	Harrisville Heights
8	Burial Site 4 - Ono Gallon Cans of Jelly and Jam	23	Elevated Water Tank	38	Privato Citizen Parcel
9	Burial Site 4 - Fluorescent Tubes	24	Water Reservoir	39	Internal Revenue Service
10	Burning Pits	25	Laser Operation	40	Oil Burning Pits
11	Burial Site - Mosquito Repellent	26	Petroleum, Oil and Lubricants (POL)	41	Old Plain City Canal*
12	Classified Material Incinerator	27	Metal Plating Shop	42	Parade Ground Oil Burning Pit*
13	Small Arms Storage	28	Vaulted Leaking Transformers	43	Western Boundary Area*
14	Chemical Equipment Repair and Testing	29	Transformer Storage		
15	DDT Storage Area	30	Pistol Range and Old Skeet Range		

*Study areas not part of original USAEHA 40 Sites

OPERABLE UNITS

Operable Unit 1 (Soil and Groundwater)	Operable Unit 2 (Soil and Groundwater)	Operable Unit 3 (Soil)	Operable Unit 4 (Soil and Groundwater)
Burial Site 1 - Riot Control Agent (2)	Pesticide Storage (18)	Burial Site 3-A - Mustard, Phosgene, Methyl Bromide and HC Smoko Cylinders (5)	Burial Site 4 - Methyl Bromide Cylinders (6)
Burial Site 3-B - Water Purification Tablets (3)	French Drain Area (18)	World War II Mustard Storage Area (31)	Burial Site 4 - Burning Pits (7,10)
Plain City Canal (41)	Parade Ground Burning Pit (42)	Burial Site 3 - C - Rubber Boots (4)	Burial Site 4 - Jelly and Jam (8)
			Burial Site 4 - Fluorescent Tubes (9)
			Oil Burning Pits (40)

CONTAMINANT SCREENING STUDY SITES

DDT/Pesticide Screening Study	PCB Screening Study	Lead Screening Study
DDT Storage Area (15)	Vaulted Leaking Transformers (28)	Pistol Range and Old Skeet Range (30)
DDT and Hazardous Chemical Storage (16)	Transformer Storage Area (29)	
Hazardous Chemical Storage (17)	Nonvaulted Leaking Transformers (33)	

B. Site Visit

ATSDR representatives Diane Jackson, Lorna Bozeman, and Vicky Carter conducted a site visit March 12-15, 1991. ATSDR staff toured DDOU with representatives from the Utah Department of Health, and the Environmental Protection Agency (EPA) and installation officials. The installation officials visited included representatives from environmental, public affairs, industrial hygiene, clinic, water, and natural resources departments. ATSDR staff collected information on monitoring and clean-up activities, on- and off-post community concerns, on-post housing and day care locations, worker safety and medical surveillance, drinking water monitoring, and land use. During the visit, ATSDR staff also met with county and city officials to obtain information about locations, sources, and monitoring of potable water supplies, planning and demographics, natural resource use, and community concerns. ATSDR contacted the state engineers' office to identify private well use near DDOU.

ATSDR staff observed that DDOU is fenced, and a guard is on duty 24 hours a day. Most of the OUs are burial sites covered with fill dirt and grass. Burial Site 3-A is the only site fenced within the DDOU boundaries.

ATSDR representatives toured the Ogden Nature Center property (part of OU 1, Burial Site 1). Empty drum remnants and canisters were visible on the surface at Burial Site 1. The nature center director pointed out a "dead zone" containing many dead trees and several visible drum remnants and canisters. Access to the area is not restricted. Both of these areas (Burial Site 1 and the dead zone) are not used much by the nature center.

DDOU decommissioned (took out of service) PCB transformers during the 1980s. The transformers were stored in the facilities engineering area while awaiting disposal. Soil contamination resulted when oil from the transformers leaked in the storage area. Although the area is fenced, the gate was open during the initial ATSDR site visit. According to the Installation Restoration Program (IRP) manager, there are no reported incidences of unauthorized persons accessing this area. ATSDR saw a playground adjacent to the storage area (on the other side of the fence) and within 100 feet of the spill area; run-off flows to that area. ATSDR recommended that the playground be sampled.

ATSDR representatives Diane Jackson and Lorna Bozeman re-visited DDOU on March 30, 1992, to discuss updates on the environmental characterization. During that visit, ATSDR and DDOU representatives toured the Ogden Nature Center. The nature center director pointed out the dead zone to DDOU officials. DDOU officials showed ATSDR and the nature center director the areas where test pits and borehole samples were taken. Locations

of monitoring wells were also noted. DDOU agreed to share a copy of the test pit data with the nature center. Several areas at the nature center have been excavated to create ponds. None of the ponds were constructed in known or suspected disposal areas.

C. Demographics, Land Use, and Natural Resources Use

Demographics

During the initial site visit, local sources were contacted for demographic and land use information on DDOU and the surrounding area.

Population figures from the 1990 Census are presented for the census tract containing the site, the tracts which surround the site on the north, east, and south, and the large tract to the west of the site. Total population figures are also presented for the city of Ogden and Weber County (4).

Approximately 1,840 civilian and 13 military personnel are employed at DDOU. A military housing development consisting of 16 residential buildings containing a total of 18 living units is located in Sub-Area No. 4; these units are currently occupied. Sub-Area No. 10, which is designated as the Wherry Housing Area, contains an unknown number of rental units; this area was once leased to the Harrisville Heights Corporation, but was recently deeded to Weber County.

The census tract which contains the site had a 1990 population of 3,647. Approximately 52 percent of the population were female and 48 percent were male. Just over 90 percent of all persons were white and two percent were black; the remainder were of other races. Over 23 percent of the population were under age 10; this is a relatively high percentage and indicates the presence of a substantial number of young families in their childbearing years. Just under 10 percent were age 65 or older. There were 1,367 households (occupied housing units) in this tract in 1990 for an average of 2.67 persons per household. Sixty percent of all households were owner-occupied and 40 percent were renter-occupied; over 20 percent were mobile homes. Residents of mobile homes and apartments tend to not remain in that particular residence for an extended period of time, so many of the residents of this tract are likely to move after a relatively short time.

The census tracts surrounding the site had a total 1990 population of 12,858. Approximately 51 percent were female and 49 percent were male. Over 92 percent of the population were white, 2.6 percent were black, and 5.2 percent were of other races. Similar to the tract containing the site, 23.9 percent were under age 10 and 10 percent were age 65 or older. There were 4,151 households and an average of 3.07 persons per

household. Nearly 70 percent of all households were owner-occupied and there were few mobile homes, which suggests a less transient population than in the tract containing the site.

Data for the tract to the west of the site are presented separately because the tract covers an extremely large area as compared to the other tracts; many of the residents likely do not live near the site. This tract had a 1990 population of 8,339 persons, 50.5 percent of whom were male and 49.5 percent female. Nearly 98 percent were white. Just under 23 percent were under age 10 and eight percent were age 65 or older. There were 2,341 households and an average of 3.55 persons per household. Almost 90 percent of all households are owner-occupied, which suggests a low level of transiency.

The Ogden Nature Center had 17,000 visitors in 1991; 10,000 were children.

Land Use and Natural Resource Use

Residential districts are east, north, and south of DDOU. As stated previously, population density west of the installation is low. Light industry and some commercial areas are also west of the installation. According to a 1991 DDOU well survey of the area outside the western boundary, wells are used for irrigation and not human consumption. City water is available to residents in the area. DDOU believes that most of the wells are used to water lawns and gardens; a few are used for commercial crops, including alfalfa, barley, and wheat. DDOU plans to gather additional information about specific water uses. DDOU uses city water for consumption.

The Ogden Nature Center, which contains Burial Site 1, covers 151 acres adjacent to the southwestern corner of DDOU. The property was acquired from DDOU by the City of Ogden in 1973 and has been leased by Ogden Nature Center since 1975. The nature center has a natural history museum, picnic areas, a tree house, restrooms, and trails. The nature center uses city water. No activities take place in the area containing buried and partially buried drums; however, access to the area is unrestricted.

Approximately 400 acres of DDOU property are leased to local farmers for dry farming, which requires no water.

D. Health Outcome Data

Health data for the area surrounding DDOU were not reviewed because no completed exposure pathways were identified, and no specific community health concerns were identified for which health outcome databases are available.

COMMUNITY HEALTH CONCERNS

ATSDR identified community health concerns by reviewing citizens' correspondence with elected officials; reviewing citizens' interviews conducted during development of the Community Relations Plan; and by holding discussions with Ogden city officials. ATSDR will gather additional information on community health concerns during the public review period for this document.

Several residents expressed concerns about potential adverse health effects, which they believed could be caused by environmental contamination from the installation. Several interviewees using water from the Plain City Canal for lawns and gardens wanted to know if the canal water was safe to use. Another interviewee's children seemed to have an inordinate number of colds and allergies since living near the depot. Another resident reported seeing dirt removed from DDOU and used as fill in surrounding neighborhoods; he was concerned that the dirt could be contaminated (5).

According to the Community Relations Plan, the principal of the junior high school and the head of the off-post day care center both asked DDOU to be informed of possible health risks so that they could inform parents. A representative of the Ogden Nature Center stated that attendance at the nature center has declined since DDOU was listed on the NPL.

ATSDR staff interviewed the mayor of Ogden and representatives of the Ogden Nature Center during the initial visit. The mayor was unaware of complaints related to environmental problems at the installation. The nature center representatives expressed concerns about whether the drums would be removed from the burial area. According to the DDOU community relations specialist, "a couple of employees" inquired about health concerns related to the contamination. Concerns are addressed in the "Commander's Corner" section of the DDOU newsletter. There is no organized community activism related to the installation and, other than the cases mentioned here.

ATSDR staff interviewed representatives from the county health department, the Utah Department of Health, Ogden Department of Water Quality, the EPA remedial project manager, and the Ogden and Weber County planning offices. None of those contacted were aware of complaints related to the contamination at DDOU.

Defense Depot Ogden, Utah

Specific community health concerns identified are presented in the following paragraphs:

Are there potential health effects that might be caused from environmental problems at the Depot? Could Depot activities cause children living nearby to experience an increase in colds and allergies?

Is water from the Plain City Canal safe to use for watering lawns and gardens?

Will drums be removed from the Ogden Nature Center, and what actions are planned for the "dead zone"?

Is dirt removed from DDOU and used for fill in surrounding neighborhoods contaminated?

The community health concerns will be evaluated in the subsequent Community Health Concerns Evaluation Section.

ENVIRONMENTAL CONTAMINATION AND OTHER HAZARDS

The contaminants discussed in subsequent sections of this public health assessment will be evaluated to determine whether exposure to them has public health significance. ATSDR selects and discusses contaminants based on several factors: sample design, field and laboratory data quality, and comparison of chemical concentrations to levels that could cause cancer or other health effects. In addition, community health concerns are considered.

Evaluating the sample design may involve reviewing the installations' approach to locating contamination. Spatial distribution of sampling locations, sampling frequency, concentration changes over time, medium-to-medium differences, and correlation between the selected list of analytic parameters and suspected environmental contaminants are factors considered by ATSDR when determining the contaminants to which humans could be exposed.

Review of sampling field quality control procedures may include interpreting data on background (or regional) concentrations of chemicals. Additionally, the adequacy and number of replicate, spiked, and blank samples may be checked to verify detection of contaminants. To assess laboratory quality control, procedures used to verify instrument reliability may be reviewed.

Contaminant concentrations detected on and off site are compared to values developed by environmental (e.g., EPA) and health agencies (e.g., ATSDR) to provide an estimate of concentrations present in each environmental medium that should be evaluated for possible health effects if exposure to a contaminant occurs. Those values, in many cases, have been derived from animal studies. Health effects are not only related to the exposure dose, but to the route of entry into the body and the amount of chemical absorbed by the body. For those reasons, comparison values used in ATSDR public health assessments are contaminant concentrations in specific media and for specific exposure routes. The potential for adverse health effects from contaminants of health concern will be discussed in the Public Health Implications Section of this document.

Listing a contaminant in the data tables that follow does not mean that it will cause adverse health effects after exposure. Rather, the list indicates which contaminants will be further evaluated. The maximum media concentration is compared to an appropriate health assessment comparison value. The potential carcinogenicity of contaminants is also evaluated. When selected as a contaminant of concern in one medium, that contaminant will be reported in all media in which it is found.

These terms will be used in the information to follow:

- LTHA** Lifetime Health Advisory. LTHAs represent contaminant concentrations that EPA deems protective of public health over a lifetime (70 years) at an exposure of two liters of water per day. LTHAs are not enforceable through EPA regulations.
- MCL** Maximum Contaminant Level. MCLs represent contaminant concentrations that EPA deems protective of public health over a lifetime (70 years) at an exposure rate of two liters of water per day. While MCLs are regulatory concentrations, PMCLGs and MCLGs are not.
- MCLG** Maximum Contaminant Level Goal
- ppb** parts per billion
- ppm** parts per million
- PMCL** Proposed Maximum Contaminant Level

A. On-Site Contamination

In the past, both liquid and solid wastes were disposed at DDOU in burning and burial pits. Contaminants have been detected in soil, surface water, sediment, groundwater, and indoor air samples.

Soil

Surface Soils (<3" in depth)

Surface soil analyses were not listed for any of the OUs in the available documents. Because, wastes were principally buried, or burned in pits, then covered, surface soil contamination is unlikely. Soil gas surveys were conducted at most of the OUs. Soil gas results identify the location of volatile contaminant zones and can be used to simplify surface and subsurface sampling plans. Volatile contaminants can leach into groundwater or migrate through the soil to collect in confined spaces such as buildings. Based on the soil gas survey, and the location of several buildings, DDOU chose OUs 2 and 4 for confined space sampling. Those results will be discussed in the discussion on air contamination.

OUs - Soil Gas

OU 1 - Soil gas concentrations were low. Concentrations of 1,1 dichloroethene (1,1-DCE) were slightly above the detection limit in a soil gas survey of the area near Burial Site 1. The detection limit was 1 ppb (1).

OU 2 - Soil gas concentrations were low to moderate. Trichloroethene (TCE) concentrations were detected in the Parade Ground area; the highest concentration was 10 ppb. The highest 1,1-DCE concentrations detected were less than 1 ppb and were in the French Drain area. TCE concentrations in the Parade Ground area were between 0.6 to 10.2 ppb (1) (2).

OU 3 - No soil gas survey was conducted.

OU 4 - Soil gas concentrations were low. Elevated levels of 1,1-DCE (0.1 - 0.3 ppb) and TCE (0.2 - 1.6 ppb) were detected near Burial Site 4. The maximum concentrations of TCE were observed west and north of the burning pits and in areas 4-E and 4-B.

CSS Sites - surface sampling

PCB field-screening kits were used to detect soil contamination. The kit detection limit for PCBs was >50 ppm. Field screening detected PCBs in 21 samples. Those samples were further analyzed in the laboratory to quantify the PCB concentrations. PCB Study Area 1, where a power pole was reported to have a leaking transformer, showed surface soil levels of PCBs as high as 83 ppm within a three-foot radius. The second area, a vaulted transformer area, had wipe sample concentrations ranging from 8,800 - 58,000 ppm. Wipe samples are collected by wiping or scraping an area, then analyzing the wipe or scrape. The wipe samples were taken from concrete pads adjacent to the vaulted transformers inside the buildings. Oily deposits were visible in the sample areas, and the reported values reflect the PCB concentration in the oil collected on the wipe (1).

PCB transformer oil has contaminated soil in the storage area used during the decommissioning of the installation's PCB transformers. The PCB transformers were stored outdoors in the facility engineering section. PCB contamination as high as 23 ppm was measured in surface soil near the transformer storage area. During the initial site visit, ATSDR recommended sampling surface soil in the adjacent playground area because runoff from the transformer storage area drains to the playground area. Surface soil samples were collected from the playground and adjacent drainage areas in April 1992 (24 samples). PCBs were detected in five samples at concentrations ranging from 0.17-2.13 ppm. PCBs are not considered a contaminant of concern at those levels (6). The highest concentrations were detected in the drainage ditch adjacent to the fenceline. DDOU plans to excavate soil from areas on the playground where PCBs were detected above 0.5 ppm (6). Additionally, the IRP manager has asked the facility engineers' to move the transformers to an impervious concrete pad in a bermed area (6).

Soil and wipe samples were taken from concrete surfaces in storage buildings at the DDT/pesticide screening sites. A

surface area was marked, wetted, then scraped onto a filter for analysis. Low concentrations of contaminants were detected. Wipe samples in Building 4A were the highest for p, p' dichlorodiphenyl dichloroethylene (DDE) and DDT (100 and 150 ppm, respectively) (1).

A lead contaminant screening study was conducted at the Pistol Range Target Area. Total lead analysis concentrations were low (<150 ppm).

Figure 2 shows the location of CSS sites.

Subsurface Soils (>3" depth)

Borehole and test pits were excavated in suspected burial areas at all of the OUs. The burial areas were identified by historical information or interpretation of past aerial photographs. The average test pit was eight feet deep, 15 feet long, and three feet wide. Most of the test pit soil analyses did not show elevated contaminant concentrations. The soil data could indicate that the contaminant source has dissipated, or they could indicate that the source was not found.

OUs- subsurface sampling

OU 1 - (Figure 6) Thirty-nine subsurface soil samples were collected at OU 1 during the four phases of the Remedial Investigation and Feasibility Study (RI/FS). Borehole sample analyses were low for VOCs (<1 ppm). No base neutral or acid extractable (BNAEs) compounds, pesticides, metals, or PCBs were detected in any of the samples at levels above ATSDR comparison values. One test pit (TP-1) and one borehole sample (SB-27) were collected from the Ogden Nature Center near Burial Site 1. The soil in the test pit appeared to be previously undisturbed possibly indicating that this area was not used as a burial site. The sample was analyzed for BNAEs, pesticides/PCBs, and metals; no soil contamination was detected to a sampling depth of 6.5 feet.

The Plain City Canal test pit, TP-2, had elevated levels of cadmium (9.8 ppm), lead (9,580 ppm), and zinc (11,000 ppm). Phase III (July-August 1990) and Phase IV (April 1991) sampling analyses included dioxins/furans and high-boiling-point hydrocarbons. Dioxins and furans were detected in several subsurface soil samples, and, according to the RI/FS, are most likely the result of combustion of wood and paper products, plastics, and plastic insulation on electrical wiring disposed at Burial Site 4-A (7).

OU 2 - (Figure 7) Borehole sample analyses were low (<1 ppm). The samples were analyzed for BNAEs, VOCs, pesticides/PCBs and metals. The test pit (TP-3) was excavated near the French Drain

Area. A composite sample from 0-6" showed elevated levels of bromacil (3,700 ppm) and chlordane (450 ppm).

OU 3 - (Figure 7) Contaminants were detected in subsurface soil samples (2 to 6 feet deep) in the chemical agent materials area (Burial Site 3-A). Soil samples confirmed chloroacetophenone (2.5 ppm), adamsite (134 ppm), mustard gas (2,750 ppm), and thiodiglycol (1,200 ppm) at three locations (1). Thiodiglycol is a degradation product of mustard gas.

OU 4 - (Figure 7) Sixty-five subsurface soil samples have been collected from soil borings, monitoring well borings, and test pits at OU 4. Low levels of BNAEs, VOCs, pesticides, PCBs, and metals were detected in most of the test pits. Test pits TP-4 and TP-5 were excavated in the two burn pits that make up Burial Site 4-A. Elevated concentrations of mercury (2.0 ppm) and lead (308 ppm) were detected at sample depths of eight feet.

Surface Water

DDOU is traversed by two surface-water systems, Four-Mile Creek on the north and Mill Creek on the south; each flows generally east to west (8) (9). Figure 8 shows the flow and direction of site surface waters. The streams are primarily shallow irrigation canals, for which easements have been granted to cross the depot. Except for approximately 300 yards just west of Burial Site 4, and the final 100 yards on the depot, Four-Mile Creek is completely enclosed in a cast-iron pipe as it traverses the northern boundary. The industrial area's storm sewers discharge into the encased portion of Four-Mile Creek. Surface runoff from areas adjacent to Mill Creek flow into the creek. DDOU has conducted two surface stream studies; one in May 1985 during high-water conditions and the other in January 1990 during low-water conditions. Surface-water samples were analyzed for VOCs, BNAEs, pesticides/PCBs, metals, and physical characteristics.

OU 1 - Mill Creek branches flow east to west adjacent to OU 1 (Figure 9). Low (≤ 0.3 ppb) concentrations of VOCs (primarily benzene and xylenes) were found in samples collected from points M1 and M2 during the 1990 sampling. M1 is upstream from DDOU. The metals detected (and their highest concentrations) included cadmium (4 ppb at M4 in 1985), chromium (160 ppb at M1 in 1985), lead (8 ppb at M2 in 1990), and mercury (0.3 ppb at M2 in 1990). All were below comparison values. There are few differences in concentrations between upstream and downstream samples. DDOU will conduct further stream analysis.

Sediment

Sediment samples were analyzed for VOCs, BNAEs, pesticides/PCBs, and metals. Metals were detected in the 1985 sediment samples at

concentrations ranging from 0.6 to 1.4 ppm (cadmium), 6.9 to 14 ppm (chromium), 14 to 96 ppm (lead), 0.7 to 0.14 ppm (mercury), 7.1 to 18 ppm (nickel), 34 to 179 ppm zinc, 20 to 29 ppm (antimony) and 2.2 to 6.4 ppm (arsenic). Cadmium, chromium, antimony, and arsenic were above comparison values. Metals detected in the 1990 sediment samples include barium (37 to 57 ppm), chromium (5.6 to 9.0 ppm), lead (32 to 53 ppm), nickel (4.4 to 5.2 ppm), and zinc (57 to 120 ppm). As with surface waters, the sediment studies do not identify sources of contamination; there are few differences in concentration between upstream and downstream samples. DDOU will conduct further sediment analysis. -ATSDR will review the information as it becomes available.

Groundwater

Shallow Aquifer (<50 feet)

Lenses of silty sand and clay and coarse-grained sand and gravel, underlain by dark brown silty clay, make up the shallow aquifer (1). The water-bearing zone is between 6 and 40 feet. Groundwater has been monitored by the Army since 1981; contaminants are at low concentrations. The most widespread VOCs detected were cis-1,2-DCE, TCE, and vinyl chloride. Groundwater flow is generally west at a rate between 6 and 50 feet per year.

Shallow Groundwater - VOCs

Cis-1,2-DCE shallow groundwater contamination is centered near OUs 1, 2, and 4. Although cis-1,2-DCE is the most widely dispersed contaminant in OU 1, it was not detected at concentrations exceeding EPA's Maximum Contaminant Level (MCL) promulgated under the National Safe Drinking Water Act. The highest concentration detected at OU 1 was 26 ppb (April 1991); the MCL for cis-1,2-DCE is 70 ppb. The highest concentration of cis-1,2-DCE at 84,000 ppb was detected at OU 4 (August 1990). Figures 10, 11, and 12 show the concentrations and locations of the cis-1,2-DCE groundwater plumes.

TCE contamination is centered around OUs 2 and 4. TCE concentrations were as high as 17 ppb (April 1991) in OU 4. Figure 13 shows the concentrations and locations of the TCE groundwater plumes.

Vinyl chloride contamination is centered near OUs 1 and 4. Vinyl chloride concentrations in OU 1 were as high as 7.8 ppb (April 1991). The MCL for vinyl chloride is 2 ppb. OU 4 had concentrations as high as 440 ppb during the April 1991 sampling. Figures 14 and 15 show the concentrations and locations of the vinyl chloride groundwater plumes.

Other VOCs detected in groundwater during 1991 sampling at OU 4 include ethylbenzene at levels as high as 150 ppb,

toluene (34 ppb), trans-1,2-DCE (0.7 ppb), 1,2-dichlorobenzene (45 ppb), 1,4-dichlorobenzene (32 ppb), and benzene (30 ppb).

Fluctuating VOC concentrations in the shallow groundwater make it difficult to determine whether the contaminant concentrations are increasing or decreasing (7). DDOU has recently changed its monitoring well sampling technique and attributes some of the increase in contaminant concentrations to the new procedure. The new procedure should capture more VOCs; the previous technique might have purged VOCs from the sample before it could be collected. The most recent samples probably represent more accurate concentrations, but they are not significantly different in most cases.

Groundwater - Metals

Groundwater samples have been analyzed for VOCs, BNAEs, pesticides/PCBs, and metals. In addition, OU 3 wells have been monitored for the degradation products of mustard. Since the 1986 Environmental Science and Engineering (ESE) analyses, groundwater samples have been field-filtered, a procedure which removes particulate-sorbed metals. Thus, metal results are for dissolved metal only, resulting in low metal concentrations. ATSDR does not consider the filtered samples adequate for comparison to EPA drinking water standards (MCLs), which are based on unfiltered samples.

The 1986 samples were **not** field-filtered and showed concentrations of metals that were more than four times the drinking water standard (10). Regional soils are naturally high in metals (Table 2). DDOU attributes the elevated metals concentrations to suspended soil particulates rich in naturally occurring metals, rather than dissolved metals in groundwater resulting from a source of contamination (1). EPA and the state agree with DDOU that the source of metals contamination in groundwater cannot be attributed to DDOU (11)(12). However, if the leaching assumption is correct, then arsenic and chromium would likely have been present at levels above comparison values in OUs 1 and 4 as well, but this was not the case. Since the groundwater samples have been filtered after 1986, no trends could be determined. Based on this limited information, a source can not be determined.

DDOU has collected at least 156 soil samples and considers 60 of those samples to represent background concentrations based on their location outside contaminated areas affected by human activities (7). Table 2 is a summary of the background mean calculated from those 60 samples. The background mean concentrations fall within the concentrations detected regionally (7). Based on this soils data, it seems likely that the metals contamination detected in the unfiltered groundwater samples could be attributed, at least partially, to leaching from

naturally high concentrations of metals in soil. Because groundwater may be used for potable purposes west of the DDOU boundary, and because the drinking water is probably not filtered before use, the metals could be ingested.

DDOU disregarded metals as contaminants of concern in the baseline risk assessment (1). Table 3 lists risk assessment contaminants of concern that DDOU has chosen for inclusion in future analyses and metals will not be included.

OU 1 - Cis-1,2-DCE is the most widespread VOC. The major source of VOC contamination is backfill in the Plain City Canal. Other potential, low-level sources of VOCs include unidentified areas in the Ogden Nature Center and Burial Sites 1, 3-B, and 3-C. VOCs and metals have been detected in groundwater samples taken from Ogden Nature Center and south. That property, which was previously owned by DDOU, and was the site of the Smoke and Incendiary Grenade Burning Ground. Contaminants have not been detected in monitoring wells placed at the Ogden Nature Center south of Mill Creek (Figure 10). Suspected disposal areas are east of those wells. Groundwater flow in this area is generally east to west.

OU 2 - TCE and cis-1,2-DCE are the most widespread contaminants. TCE (25 ppb), cis-1,2-DCE (200 ppb), tetrachloroethene (PCE) (7.8 ppb), methylene chloride (6.1 ppb), benzene hexachloride (delta BHC) (6.7 ppb) and chlordane (4.6 ppb) exceeded their respective MCLs. Historical data indicate that concentrations have not changed consistently over time. Arsenic (0.23 ppm) and chromium (0.25 ppm) also exceeded their respective MCLs.

OU 3 - Using the available data, there appears to be no groundwater contamination associated with the chemicals buried at OU 3 (1). No contaminants exceeding the MCL were detected in three downgradient monitoring wells.

OU 4 - Cis-1,2-DCE (360 ppb), trans-1,2-DCE (594 ppb), 1,2-dichloropropane (300 ppb), TCE (5.1 ppb), and vinyl chloride (330 ppb) were detected in concentrations above the MCLs during the October 1988 sampling. Benzene (26 ppb), cis-1,2-DCE (210 ppb), vinyl chloride (220 ppb) were all detected at levels above their respective MCLs in samples collected in December 1989 and January 1990. In the August 1990 sampling, the vinyl chloride detection limit was high at 10,000 ppb and was not exceeded and TCE was not detected above the 5,000 ppb laboratory detection limit. The MCLs for vinyl chloride and TCE are 2 ppb and 5 ppb respectively. The August 1990 detection limits were set too high to compare the concentrations with other standards. Cis-1,2-DCE was detected at levels as high as 84,000 ppb during the August 1990 sampling. The high detection limits may mask the presence of other halogenated hydrocarbons in the samples. The detection limits were high because cis-1,2-DCE was found in high concentrations

Table 2. DDOU Background Metals Concentrations in Soil

METAL	BACKGROUND MEAN (ppm)	TYPICAL REGIONAL RANGE (ppm)
Arsenic	5.1	<0.1-97
Barium	47	0.7-50,000
Cadmium	0.22	0.01-0.7
Chromium	7.9	0.3-2,000
Lead	6.3	<10-700
Mercury	0.02	<0.01-4.6
Nickel	6.6	5.0-700
Selenium	1.8	<0.1-4.3
Silver	0.45	0.01-5.0
Zinc	26	10-2,100

Adapted from Reference 7

Table 3. DDOU Risk Assessment* Contaminants of Concern For All Media

CONTAMINANT	OU 1	OU 2	OU 3	OU 4
Benzene	X	X		X
Bromacil		X		
Chlordane	X	X		
Chloroform		X		
Delta-BHC		X		
1,1-Dichloroethane	X			
1,1-Dichloroethene	X			
cis-1,2-Dichloroethene	X	X		X
trans-1,2-Dichloroethene	X			X
1,4-Dichlorobenzene				X
Tetrachloroethene		X		
Trichloroethene	X	X		X
Vinyl Chloride	X			X

Adapted from Reference 1

* These chemicals will be included in future analyses of all media sampled by DDOU.

(84,000 ppb) and sample dilution was required to permit analysis. The zone of vinyl chloride contamination probably originates beneath Burial Site 4-E and extends downgradient south and southwest in the direction of groundwater flow (7).

BNAE compounds detected at levels above their comparison values during the August 1990 sampling included dibenzofuran (12 ppb), naphthalene (76 ppb), pentachlorophenol (40 ppb), 1,2,4 trichlorobenzene (26 ppb), and PCBs (Arochlor 1260, 130 ppb). Table 4 lists the groundwater contaminants that exceeded an MCL or other comparison values. Some listed contaminants are different from those DDOU chose for future analyses (Table 3). Because all of the contaminants exceeding comparison values will not be included in future analyses, the groundwater contamination plume movement may not be adequately tracked.

Deep Aquifer (110 to 125 feet)

Three monitoring wells were installed in the deep aquifer, one near OU 2 and two near OU 4. Low levels of barium (as high as 1.5 ppm) and arsenic (as high as 0.039 ppm) were detected in all of the wells. The January 1990 sample from OU 2 exceeded the MCL (1 ppm) for barium. Lead (at 0.002 ppm) was also present in the sample. During the August 1990 sampling of OU 4, arsenic was detected at 0.049 ppm. The MCL for arsenic is 0.05 ppm. Barium was detected at 0.69 ppm.

Air

Air contaminants may have been released during past burning. Waste solvents, oils, and other debris were burned at OU 4 from the 1940s to the mid-1960s. During that period, particulates from the burning were likely carried downwind. Air was not sampled during the burning.

DDOU investigated whether air contamination was resulting from VOCs (detected in soil and groundwater samples) volatilizing and collecting in nearby buildings. DDOU conducted indoor air monitoring in building where the groundwater below had high concentrations of contaminants. High concentrations of vinyl chloride in groundwater at OU 4 prompted DDOU to monitor indoor air in Building 326. No contaminants were detected (3). Likewise, DDOU conducted air sampling in one house in the depot housing area (immediately west of the Parade Ground and near OU 2). Some VOCs were detected at low levels: TCE (10.8 ppb), 1,1,1 trichloroethane (TCA) (9.40 ppb), and PCE (6.34 ppb) (13). DCE, however, was not detected in indoor air samples although it was detected in groundwater at concentrations as much as 25 times any other groundwater contaminant. The VOC levels detected in indoor air samples were below the Occupational Safety and Health Administration (OSHA) air exposure limits. The OSHA permissible exposure limits (PELs) for airborne contaminants are

concentrations of chemicals that are protective of health in the workplace. PELs are usually listed as 8-hour time-weighted averages and apply to healthy adult employees working 40-hour weeks (14). The PELs for these contaminants are much higher than

Table 4. DDOU Shallow Groundwater Contaminants Exceeding the Comparison Value and their Highest Detected Concentration

CONTAMINANT	CONCENTRATION (ppb) and SAMPLE DATE			COMPARISON VALUE	
	OU 1	OU 2	OU 4	CONCENTRATION (ppb)	REF.
VOCs					
Benzene			28 (04/25/91)	5	MCL
Cis-1,2-DCE		200 (12/13/89)	84,000 (8/15/90)	70	MCL
1,2-Dichloropropane			300 (10/88)	5	MCL
Methylene Chloride		6.1 (12/04/89)	<5,000(08/15/90)	5	PMCL
Tetrachloroethene (PCE)		7.8 (12/14/89)		5	MCL
Trans-1,2-DCE			594 (10/88)	100	MCL
Trichloroethene (TCE)		25 (12/13/89)	17 (04/23/91)	5	MCL
Vinyl Chloride	7.8 (04/10/91)		360 (04/19/91)	2	MCL
BNAEs					
Dibenzofuran			12 (08/16/90)	NA	NA
Naphthalene			76 (08/16/90)	20	LTHA
Pentachlorophenol			40 (08/15/90)	1	PMCL
1,2,4 Trichlorobenzene			26 (08/16/90)	9	PMCL
PCB (Arochlor 1260)			130 (08/16/90)	0.5	PMCL
METALS (ppm)					
Arsenic		0.23 (01/10/90)		0.05 ppm	MCL
Chromium		0.25 (01/10/90)		0.1 ppm	MCL
PESTICIDES					
Chlordane		4.6 (01/10/90)		2	MCL
Delta benzene hexachloride (BHC)		6.7		NA	NA

Adapted from references (1), (2), (3), (7)

MCL = Maximum Contaminant Levels represent contaminant concentrations that EPA deems protective of public health (considering the availability and economics of water treatment technology) over a lifetime (70 years) at a consumption rate of two liters per day. **PMCL** = Proposed MCL

LTHA = Drinking Water Health Advisory for a lifetime (70 years). Published by EPA.

NA = None Available

the values detected in the indoor air samples: TCE (PEL=50,000 ppb), 1,1,1 trichloroethane (350,000 ppb), and PCE (25,000 ppm).

TCE, TCA, and PCE have been identified in urban, rural, and indoor air throughout the United States. These chemicals are present in many household items. All are solvents and used in adhesives, degreasers, textile processing, and pesticides to name a few uses. They may be emitted from such household items as carpets, carpet glue, wallpaper glue, and spray and solid insecticides. Their ambient air background values are generally in the low-ppb range in urban areas. Studies have shown that median values for TCE indoor air samples range from 0.2 to 4.8 ppb, with maximum values ranging from 0.2 to 12.2 ppb (15 - 17).

DCE was detected in groundwater at higher concentrations, and more frequently, than any other compound at DDOU. The groundwater concentrations of cis-1,2-DCE detected in OU 2 (the closest OU to the depot housing) were as much as 25 times higher than any the other VOC-groundwater contaminant. The DDOU investigation stated that DCE would be expected to be detected in air quality samples more frequently than TCE or PCE because it is in groundwater at higher concentrations than those compounds and is more volatile (13). DDOU speculated that the presence of TCE and PCE in indoor samples could be associated with dry-cleaned clothes and/or carpet cleaners. A contributing factor in this conclusion is the fact that the houses do not have basements or crawl spaces; therefore accumulation of volatile compounds is somewhat inhibited. DDOU concluded that there was no definitive evidence that contaminants found in the air inside the house are a result of contaminant migration from OU 2 groundwater (13). DDOU does not plan to conduct any additional indoor air monitoring.

Because the chemicals detected are found at similar concentrations in indoor air samples throughout the United States and they are common components in many household items, their origin may be associated with products found in the house. Based on the available analytical information, the concentrations of TCE, TCA, and PCE are not at levels of public health concern.

Food Chain

No fishing or hunting takes place at DDOU. Land is leased to local farmers for pasture or crops. None of the leases are in contaminated areas, and water is not used for irrigation.

B. Off-Site Contamination

Soil

Burial Sites 1 and 5 have been deeded to the City of Ogden and to Weber County, respectively. Burial Site 1 is on the Ogden Nature

Center property. In 1985, a series of magnetic surveys (by electromagnetometer) were used to locate buried ferrous materials. Two burial areas have been identified: the first was near the backfilled trench, the second along the western margin of the site (Figure 3). Drum remnants are visible on the surface. The property was the site of the Smoke and Incendiary Grenade Burning Ground. No surface sampling data were provided. Although access is not restricted, the burial areas are seldom used.

An area of stressed vegetation on the southeastern corner of the Ogden Nature Center (referred to as the "dead zone") has not been characterized. DDOU officials have no documentation that the area was ever used as a landfill. An electromagnetometer survey of another part of the nature center (Burial Site 1) showed subsurface anomalies; indicating the presence of buried materials or some other ground disturbance. During an ATSDR site visit in March 1992, DDOU agreed to share those data with nature center employees in order to avoid future excavation in suspected contaminated areas.

Burial Site 5 is currently used by the Weber County fairgrounds. Soil sampling found no contamination at levels above comparison values.

Groundwater

The DDOU monitoring wells in the upper aquifer have successfully defined the groundwater contamination plume. During the RI/FS, DDOU surveyed well use on the western boundary. Seven private wells are used near the western boundary; DDOU believes they are used for irrigation and not human consumption. City water is available to residents in the area. DDOU will gather additional information on well use, including whether crops are irrigated, in late 1992.

The state has installed three shallow groundwater monitoring wells at the Ogden Nature Center; groundwater contamination has not been detected.

Other Potential Sources

In order to identify other facilities that could contribute to contamination near DDOU, ATSDR conducted a search of the Toxic Chemical Release Inventory (TRI) for the Weber County area. The TRI database was developed by EPA using chemical release information provided by certain industries. The database compiles annually quantities of toxic chemicals entering each environmental medium from manufacturing facilities that employ more than 10 people. DDOU is not a manufacturing facility and therefore not subject to this reporting requirement. Data have

been compiled for the years 1987-1989. No local releases were listed for the contaminants detected above comparison values.

C. Quality Assurance And Quality Control

The findings of this public health assessment are based largely upon data developed by DDOU and reviewed by EPA and the state. When descriptions were provided, the QA/QC measures appeared consistent with measures normally taken during environmental sampling and analysis. The data are assumed to be accurate within the limits of the QA/QC procedures employed.

D. Physical and Other Hazards

The source of contamination from the operable units is reported to be buried. Operable units on the installation are not fenced, except for Burial Site 3-A, which contains chemical warfare identification and detection kits, empty 55-gallon drums, and compressed gas cylinders. Because access is restricted, 3-A is not a physical hazard at this time. Burial Site 4-D is reported to contain methyl bromide cylinders. Burial Site 1, which reportedly contains riot control agent (chloroacetophenone) and white smoke (hexachloroethane) containers, is partially on property now owned by the Ogden Nature Center. Empty drum remnants are visible on the surface in some areas. Because the Center has not fenced those areas, they are a physical hazard. The extent of the buried drum contamination or debris is not known. A physical hazard also exists for workers if ponds are constructed in past disposal areas at the Ogden Nature Center. Thus far, none of the ponds have been constructed in known or suspected disposal areas.

E. Environmental Contamination Summary

DDOU collected **surface soil** samples in the housing unit playground area in April 1992. PCBs were detected in five samples at concentrations ranging from 0.17-2.13 ppm. Those concentrations are not at levels of public health concern.

Subsurface soils on post are contaminated with VOCs, metals, and pesticides and could be sources of groundwater contamination.

Surface water and sediment studies showed insignificant differences in contaminant concentrations taken from sample points entering (upstream) and leaving (downstream) DDOU. Some of the contaminants detected in sediment samples were above comparison values. DDOU will conduct further surface water and sediment sampling. ATSDR will review the information as it becomes available.

Groundwater on post is contaminated with VOCs, BNAEs, pesticides, and metals. Groundwater off post (beyond the DDOU boundaries) is

not contaminated at levels above MCLs, although the plume could migrate. Some of the contaminants exceeding comparison values in Table 4 are not listed scheduled for inclusion future analyses (Table 3). If the groundwater contamination plumes move off post toward private wells (used for crop irrigation or drinking water), those analytes should be considered because the groundwater contamination plume movement may not be adequately tracked. The groundwater contamination plume in the upper aquifer has been defined, and DDOU will remediate the shallow aquifer once the treatment-system design is complete.

Water samples analyzed for metals have been field-filtered. A 1986 unfiltered metals analysis showed concentrations more than four times the drinking water standard. EPA and the state agree with DDOU that the source of metals contamination in groundwater is not attributed to DDOU (11) (12). Soils in the region contain naturally occurring metals at high concentrations that may leach into the groundwater.

Contaminants have not been detected in monitoring wells on the Ogden Nature Center south of Mill Creek (Figure 10). Suspected disposal areas are east of those wells. The general groundwater flow in the area is east to west. The inability to detect contaminants may indicate that the suspected disposal areas are not sources of contamination.

Analyses of indoor air samples for VOCs revealed no contamination at levels above comparison values in buildings on DDOU. The buildings are in areas where subsurface soil contamination was detected, and the groundwater table was closest to the surface. None of the buildings have basements or crawl spaces where contaminants could collect. DDOU concluded from the indoor air monitoring that there was no definitive evidence that contaminants in air in homes are a result of contaminant migration from OU 2; this conclusion seems reasonable. Based on the available analytical information, the concentrations of TCE, TCA, and PCE are not at levels of public health concern

Waste solvents, oils, and other debris were burned at OU 4 from the 1940s to the mid-1960s. Air was not sampled during the period when burning took place.

Drum remnants are visible on the surface in areas of the Ogden Nature Center. Burial Site 1 and the dead zone are not used much by the nature center, but because the areas are not fenced, they could be a **physical hazard**. The extent of the buried drum contamination or debris is not known. Several areas at the nature center have been excavated to create ponds. None of the ponds were constructed in known or suspected disposal areas.

Analysis of the historical use of chemicals, their disposal, coupled with sampling results, establishes that contaminants

exist and are moving through the environment. This section has documented that contaminants have been found in all of the sampled media. The next section will evaluate the mechanism for human exposure to those contaminants. Exposure points (e.g., potable water supplies) and routes (e.g., ingestion) and receptor populations will be examined in the Pathways Analyses Section.

PATHWAYS ANALYSES

Rainwater percolating through on-post soils and the past storage and disposal of wastes has contaminated the groundwater underlying the installation. Similarly, in the past, rainfall running off the study areas could have contaminated nearby surface water streams and sediments. Past contaminant releases associated with fugitive organic vapor emissions from waste handling, chemical agent disposal, and blowing soils and dusts are examples of possible on-post air contamination.

To determine whether people are exposed to contaminants migrating from a site, ATSDR evaluates the environmental and human components leading to human exposure. This pathways analysis consists of five elements: A source of contamination, transport through an environmental medium, a point of exposure, a route of human exposure, and an exposed population.

A. Completed Exposure Pathways

No completed exposure pathway are evident in the areas with sufficient sampling information. In general, the first two components (a source of contamination and transport through an environmental medium) of a completed pathway are present at DDOU. Usually, one or more of the remaining components are missing. Because of the isolated location and the access restrictions surrounding the DDOU, little contact of humans with contamination through appropriate routes is present.

B. Potential Exposure Pathways

An exposure pathway is defined as potential if at least one of the components of a completed pathway is missing, or if information is not available for evaluating the pathway. The pathways discussed here, however, are listed as potential, primarily because of documented contamination, but they have no confirmed points of exposure, routes of exposure, or exposed populations. If exposures occurred, they primarily would be through incidental exposure to various contaminated media unless drinking water supplies become contaminated.

Three potential exposure pathways at DDOU were identified: 1) contact with or ingestion of surface soil contamination by humans; 2) migration of contaminated groundwater to drinking water wells downgradient from DDOU; and 3) past migration of contaminated dust and vapors in air to people.

SURFACE SOIL PATHWAYS

A trench near the center of Burial Site 1 was reported to be used for disposal of riot control agent and white smoke containers in

1945. Two burial areas have been identified: the first near the backfilled trench, the second along the western margin of the site. Field observations revealed 55-gallon drum remnants and smaller canisters on the ground and partially buried. An electromagnetometer survey conducted on Burial Site 1 and the study found subsurface anomalies. During the ATSDR site visits, a second possible disposal area was pointed out by nature center employees. Drum remnants, concrete blocks, and other debris were visible on the western margin of the nature center (called the dead zone by employees there). Although Burial Site 1 and the dead zone are not used much by the nature center, several other areas on the nature center have been excavated to create ponds. None of the ponds were constructed in known or suspected disposal areas. During an ATSDR site visit in March 1992, DDOU agreed to share those data with nature center employees so that areas of suspected contamination would not be excavated. Contaminants have not been detected in monitoring wells at the Ogden Nature Center south of Mill Creek (Figure 10). Suspected disposal areas are east of those wells. Groundwater in the area generally flows east to west. The inability to detect contaminants in those wells could indicate that the suspected disposal areas are not sources of contamination. Table 5 describes this pathway.

PRIVATE WELL PATHWAY

Contaminant releases to groundwater from buried waste have occurred and continue to occur as indicated by the sampling data. The contaminated groundwater plumes (exceeding the MCLs) are still within the installation boundaries. Monitoring wells have been installed on the western boundary and are sampled quarterly to track the plume migration. Since 1947, DDOU's drinking water has been supplied by two water districts, the City of Ogden and the Bona Vista Water District. Both of the districts draw water from the deeper groundwater aquifer and are outside the shallow groundwater contamination plume from DDOU. The monitoring well sampling data have satisfactorily defined the plume for the shallow aquifer. Concentrations of contaminants near the DDOU boundary are below the MCLs, although large groundwater contamination plumes of cis-1,2-DCE and TCE on post exceed the MCL. The state engineers' office has identified 11 families drinking water drawn from the shallow aquifer less than one mile downgradient from the plume area. DDOU has conducted a well usage survey and identified seven private wells are used near the western boundary. DDOU believes they are used for irrigation, not human consumption. City water is available to residents in the area. Only one well has been designated for domestic use (1). DDOU will gather additional information on the specific water usage and whether crops are irrigated when they sample the wells in late 1992. There has been a five-year drought in the area; groundwater may be drawn to areas that it generally would not influence. The Bona Vista Water District has one public well

within a fourth of a mile of DDOU. The well is upgradient and in a deeper aquifer.

Since the 1986 ESE analyses, groundwater samples have been field-filtered. Metals analyses during the 1986 sampling showed concentrations more than four times the drinking water standard. Low metals concentrations have been detected in monitoring wells since that time. Soils in the region contain naturally occurring metals at high concentrations that may leach into the groundwater. Because groundwater may be used for potable purposes west of the DDOU boundary, and drinking water is probably not filtered before use, those metals could be ingested. Table 6 describes this potential pathway.

AIR PATHWAY

Air releases likely occurred from the 1940s until the mid 1960s during open burning of waste solvents, oils and various other debris. Large volumes of solvents and oils were not reported to have been burned. Although burning was likely infrequent, the particulate and vapors associated with that burning are a past potential pathway. Wind rose information from 1967 to 1976 indicates that winds are predominantly from the east southeast. Approximately 30% of the time, winds exceeded 12 knots (2). The closest housing area is approximately 1,500 feet west of the burning areas. If contaminants travelled to that area, the residential population potentially exposed during the burning periods was estimated at 158 (2). Ogden's population has not changed significantly since the 1960s. DDOU employed 8,000 workers during that period. No air sampling data are available from that period, however, based on the available information, it is likely this pathway would have represented only incidental, short-term exposure. Table 7 describes the air pathway.

Table 5. Pathway Analysis of Soil and Drum Remnant Contamination Associated With Burial Site 1 on The Ogden Nature Center

SOURCE	MEDIA & TRANSPORT	POINT OF EXPOSURE	ROUTE OF EXPOSURE	POTENTIALLY EXPOSED POPULATION(S)	FACTORS THAT INFLUENCE EXPOSURE
<p>Unknown (Burial Site 1 was used for riot control agent and white smoke disposal. A few 55-gallon drum remnants and canisters are on the ground surface) No data is available for some areas.</p>	<p>ST-Surface Soil < 3" SS-Subsurface Soil SH- Drums on the surface at the Ogden Nature Center</p>	<p>Soil at the Ogden Nature Center and drum parts</p>	<p>D-Dermal O-Oral Children may touch the drums and accidentally ingest soil</p>	<p>soil GP-Children playing and other visitors to the Ogden Nature Center. The center had 17,000 visitors; 10,000 were children. WK-Workers during the construction of new ponds in known or suspected disposal areas</p>	<p>An electromagnetometer survey conducted in Burial Site 1 showed subsurface anomalies, possibly indicating buried materials. During an ATSDR site visit in March 1992, DDOU agreed to share those data with nature center employees so that areas of suspected contamination would not be excavated. A test pit was excavated near Burial Site 1. Soil samples taken from the pit showed no contamination. This soil data may indicate that the contaminant source has dissipated or was not located. No surface soil sampling has been conducted in the suspect disposal areas and is not planned. Drum remnants are visible, but the areas (Burial Site 1 and the dead zone) are not used much by the Nature Center.</p>

Table 6. Pathway Analysis of Groundwater Contamination Associated with OUs 1-4

SOURCE	MEDIA & TRANSPORT	POINT OF EXPOSURE	ROUTE OF EXPOSURE	POTENTIALLY EXPOSED POPULATION(S)	FACTORS THAT INFLUENCE EXPOSURE
<p>OUs 1-4 (groundwater monitoring wells reveal contamination of the surficial aquifer. Contaminant concentrations beyond the DDOU boundaries are below the MCLs.</p>	<p>Groundwater</p>	<p>Groundwater used for drinking water or crop irrigation near the western boundary of the installation</p>	<p>O-Oral D-Dermal</p>	<p>Citizens may be drinking from private wells downgradient from the contamination plume (state engineers' water rights records show at least 11 families within one mile west of the boundary, DDOU will confirm water use)</p>	<p>No drinking water monitoring program is in effect. DDOU has conducted a well survey and identified seven private wells near the western boundary. According to the IRP manager, DDOU will sample those wells and determine their use if requested by the residents. The groundwater contamination plume in the upper aquifer has been defined. No contamination (attributable to DDOU) has been detected in three deep monitoring wells on post. Groundwater flow may be influenced by the area's five-year drought.</p>

Table 7. Pathway Analysis of Potential Air Contamination Associated with Burial Site 4

SOURCE	MEDIA & TRANSPORT	POINT OF EXPOSURE	ROUTE OF EXPOSURE	POTENTIALLY EXPOSED POPULATION(S)	FACTORS THAT INFLUENCE EXPOSURE
Burial Site 4 (Oil burn pits and burn pits) (No data available for the period of burning)	MA-Air aerosolization and deposition from the open burning.	Air outdoors On and off site	I-Inhalation of fumes and particulates	Workers conducting the burning; 8,000 workers were at DDOU during 1940s-1960s. Residents downwind to the W-NW; closest housing population estimated at 158	From the 1967-1976 windrose data, the winds were blowing from the E-SE > 12 knots 30% of the time. Based on the available information, it is likely this pathway would have represented only incidental, short-term exposure.

PUBLIC HEALTH IMPLICATIONS

A. Toxicologic Evaluation

Using the pathways analysis and available data, no completed exposure pathways have been identified at DDOU. A potential pathway is associated with Burial Site 1 on the grounds of the Ogden Nature Center. People who could be exposed to contaminants through incidental ingestion of and dermal contact with surface soil include children, other visitors to the nature center, and workers. Those incidental exposures would not be sufficient to cause adverse health effects. However, sampling was not conducted at all of the potential burial areas at that site. From a review of at the map of groundwater contamination plume at OU 1, contamination does not appear to be centered near Burial Site 1. No contamination has been detected in monitoring wells placed by the state south of Burial Site 1.

Contamination of groundwater in the shallow aquifer on post has been confirmed (primarily low levels of VOCs and metals). No adverse health effects would be expected from exposure to contaminants at the levels detected at the DDOU boundaries even if contamination migrated off post.

A past pathway was the open burning of waste in pits at Burial Site 4. Waste solvents, oils, and other debris were burned at the site from the 1940s to the mid-1960s. During that period, particulates from the burning could have potentially been carried downwind to a housing area some 1,500 feet west-northwest; approximately 158 residents live in that area. On-site workers were also potentially exposed. Air was not sampled during the burning period; therefore potential human exposures to contaminants in air cannot be evaluated, however, based on the available information, it is likely this pathway would have represented only incidental, short-term exposure.

B. Health Outcome Data Evaluation

Health data for the area surrounding DDOU were not reviewed because there were no completed exposure pathways identified, and no specific community health concerns were identified for which health outcome databases are available.

C. Community Health Concerns Evaluation

ATSDR has addressed each of the community concerns about health:

Are there potential health effects that might be caused from environmental problems at the Depot? Could Depot activities cause children living nearby to experience an increase in colds and allergies?

Currently, no exposures are occurring unless a well survey shows drinking water is contaminated off the post; this is not likely. Incidental exposures may be occurring at Burial Site 1 on the grounds of the Ogden Nature Center, however those incidental exposures would not be sufficient to cause adverse health effects. Waste solvents, oils, and other debris were burned at the site from the 1940s to the mid-1960s. Air was not sampled during the burning period, however, if exposures occurred, they would have been incidental, and short-term.

Allergy is a term originally used in 1906 to describe a "changed reaction" in an individual in response to an agent (allergen) on a subsequent exposure to the agent. Allergic reactions can include the range from asthma, eczema, hayfever, and urticaria. A genetic component to allergies has been demonstrated with early studies suggesting that with two allergic parents, there is a 50% chance of the children having allergies. A variety of non-genetic factors, such as quantity of exposure, nutritional status of the individual, viral illnesses, or chronic underlying infections, also play a role in the development of allergies. It has been suggested that 15% of the population may respond at some time to the stimulus of an allergen (18 - 19). Without any exposure, it is unlikely that the site contamination has caused any increase in the occurrence of these very common conditions.

There are no community-specific health outcome databases available to evaluate the concern about increased colds and allergies.

Is water from the Plain City Canal safe to use for watering lawns and gardens?

DDOU is drained by Mill and Four-Mile creeks, both of which traverse the installation east to west. The Plain City Canal was once connected to the two forks of Mill Creek, but was backfilled in 1972. Four-Mile Creek, the northern-most of the two creeks, flows north along the eastern border of DDOU before turning abruptly to the west where it flows across the depot. It is enclosed in a cast-iron pipe most of that distance. Mill Creek, approximately 1.5 miles to the south, also flows westward across DDOU, where it splits into two branches. A feeder runs into the south branch at the Nature Center property, where a small spring-fed pond is located. Both Mill and Four-Mile creeks are irrigation ditches fed by mountain runoff and springs (2) (Figure 8). Surface water and sediment studies showed insignificant differences in contaminant concentrations taken from sample points entering (upstream) and leaving (downstream) DDOU. Industrial areas are upstream of DDOU. Although limited, the current surface water data indicate that contamination does not exist at levels of concern and the water could be used for

watering crops, lawns, or livestock. DDOU will conduct further surface water and sediment sampling. ATSDR will review the information as it becomes available.

Will drums be removed from the Ogden Nature Center, and what actions are planned for the "dead zone"?

Drum remnants are visible in several areas of the Ogden Nature Center. Burial Site 1 and the dead zone are not used much by the nature center, but because the areas are not fenced, they may be a physical hazard. The extent of the buried drum contamination or debris has not been established. The area of stressed vegetation on the southeastern corner of the Ogden Nature Center has not been characterized. DDOU officials have no documentation that the area was ever used as a landfill. An electromagnetometer survey done in another part of the nature center (Burial Site 1) showed subsurface anomalies; indicating the presence of buried materials or some other ground disturbance.

During the initial site visit, ATSDR recommended further investigation to determine the extent of physical and chemical contamination at the Ogden Nature Center. During the March 1992 site visit, ATSDR discovered that several areas at the nature center had been excavated to create ponds. None of the ponds were constructed in known or suspected disposal areas. ATSDR recommends that the location of subsurface anomalies be identified throughout the nature center, and that the information be shared with the center so that those areas are not excavated in the future. There are no plans at this time to remove debris from the Ogden Nature Center.

Is dirt removed from DDOU used for fill in surrounding neighborhoods contaminated?

According to DDOU officials, all contaminated soils removed from DDOU are taken to state or federally permitted disposal sites. All shipments are documented. Since fill taken from DDOU should be taken from uncontaminated areas, it is unlikely that dirt removed from DDOU for use as fill would be contaminated with hazardous wastes.

CONCLUSIONS

ATSDR concluded that DDOU poses no apparent public health hazard. The available data do not indicate that people are being exposed to contamination. Community-specific health outcome data were not reviewed because there were no completed exposure pathways identified, and no specific community health concerns were identified for which health outcome databases are available.

1. Groundwater on post is contaminated with VOCs, BNAEs, pesticides, and metals. Groundwater off post (beyond the DDOU boundaries) is not currently contaminated at levels above MCLs, although the plume could migrate. Cis-1,2-DCE shallow groundwater contamination is centered near OUs 1, 2, and 4. TCE contamination is centered around OUs 2 and 4. Vinyl chloride contamination is centered near OUs 1 and 4. Groundwater, which is used as drinking water downgradient from the contaminant plume, is a future potential pathway, particularly for residents who live adjacent to the DDOU western boundary. The state engineers' office has identified 11 families drawing water from the shallow aquifer less than one mile downgradient from the plumes. DDOU has conducted an off-post survey of well usage, and determined that seven private wells west of the depot boundary are in use. DDOU will sample those wells and determine their use if requested by the residents. The groundwater contamination plume in the upper aquifer has been defined, and DDOU will begin remediating the shallow aquifer once the treatment system design is complete. Some contaminants exceeding comparison values are not listed for inclusion in future analyses.

2. Water samples have been field-filtered before analysis for metals. A 1986 unfiltered metals analysis showed concentrations more than four times the drinking water standard. EPA and the state agree with DDOU that the source of metals contamination in groundwater is not attributed to DDOU (11)(12). Soils in the region contain naturally occurring metals at high concentrations that may leach into the groundwater. EPA and the state agree that the deep aquifer has not yet been contaminated by DDOU sources. EPA is requesting routine sampling of existing deep wells (10). If routine sampling shows that the deep aquifer is not contaminated and DDOU implements measures to treat the shallow aquifer, then it is likely the deep groundwater would not represent a pathway of exposure.

3. A potential pathway may be associated with Burial Site 1 and other suspected burial areas on the grounds of the Ogden Nature Center (formerly part of DDOU). Drum remnants are visible in several areas at the nature center, but in areas that are infrequently used. An electromagnetometer survey of Burial Site 1 showed subsurface anomalies, possibly indicating additional burial areas or other ground disturbances. Several areas have

been excavated to create ponds. None of the ponds were constructed in known or suspected disposal areas. One test pit (TP-1) and one borehole sample (SB-27) were collected from the Ogden Nature Center near Burial Site 1. Undisturbed soil was encountered in the test pit, indicating that the excavation was not in the burial site. The sample was analyzed for BNAEs, pesticides/PCBs, and metals. No soil contamination was detected to a sampling depth of 6.5 feet. If contamination is encountered, people who could be exposed to contaminants through incidental ingestion of and dermal contact with surface soil. The potentially exposed population includes children, other visitors to the nature center, and workers. Those incidental exposures would not be sufficient to cause adverse health effects. The partially exposed metallic debris could be a physical hazard.

5. Waste solvents, oils, and other debris were burned at DDOU from the 1940s to the mid-1960s. Particulates from the burning could have potentially been carried downwind to a housing area some 1,500 feet west-northwest. On-site workers were also potentially exposed. Air was not sampled during the burning period, however, based on the available information, it is likely this pathway would have represented only incidental, short-term exposure.

6. DDOU is drained by Mill and Four-Mile creeks. Both Mill and Four-Mile creeks are irrigation ditches fed by mountain runoff and springs (2). Surface water and sediment studies showed insignificant differences in contaminant concentrations taken from sample points entering (upstream) and leaving (downstream) DDOU. Industrial areas are upstream of DDOU. DDOU will determine if further surface water and sediment analyses are needed. ATSDR will review the information as it becomes available. Although limited, the current surface water data indicate that contamination does not exist at levels of concern and the water could be used for watering crops, lawns, or livestock.

RECOMMENDATIONS

Until remediation is complete, continued surveillance of the shallow groundwater is recommended to ensure that the contamination plume does not affect off-post potable or irrigation wells.

1. All contaminants exceeding their comparison values should be included in the list of future analytes (Table 4).
2. A systematic means of continued surveillance of private well use should be established. Institutional controls should be implemented to prevent future well construction in or near the groundwater contamination areas. The Technical Review Committee (TRC) may be a means to arrange implementation of both surveillance and institutional controls.
3. Because groundwater may be used for drinking by residents west of the DDOU boundary, and because the drinking water is probably not filtered prior before use, metals could be ingested. Seven private wells west of the depot boundary will be sampled and their use determined if requested by the residents. ATSDR recommends that the analyses include unfiltered metals samples.
4. Sampling should be conducted periodically to ensure that contamination does not reach the deep aquifer. ATSDR agrees with routine sampling of existing DDOU deep wells that was requested by EPA.
5. There are no plans at this time to remove debris from the Ogden Nature Center. Areas with suspected debris or visible debris should be restricted and marked such as with signs. ATSDR, also, recommends that DDOU and the Ogden Nature Center collaborate when future pond sites are selected and that subsurface surveys be conducted in any areas scheduled for excavation. Using those surveys to guide land management decisions should prevent human exposure.

PUBLIC HEALTH ACTIONS

The public health action plan (PHAP) for DDOU NPL site contains a description of actions to be taken at and in the vicinity of the site subsequent to the completion of this public health assessment. The purpose of the PHAP is to ensure that this public health assessment not only identifies public health hazards, but provides a plan of action designed to mitigate and prevent adverse human health effects resulting from exposure to hazardous substances in the environment. Included is a commitment on the part of ATSDR to follow up on this plan to ensure that it is implemented. The public health actions to be implemented by are as follows:

Actions Undertaken

1. In accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended, DDOU has been evaluated for public health actions. The public health assessment for the above NPL site was reviewed by the Health Activities Recommendation Panel. Because there is no indication that human exposures to site contaminants at levels of public health concern are occurring or have occurred, the site is not being considered for ATSDR follow-up health activities at this time. If during the remediation process, however, data become available indicating that people are being exposed to hazardous substances at levels of public health concern, ATSDR will reevaluate the site for any indicated follow-up activities.
2. PCB transformers were stored outdoors in the facility engineering section. PCB contamination as high as 23 ppm was measured in surface soil near the transformer storage area. During the initial site visit, ATSDR recommended sampling surface soil in the adjacent playground area because runoff from the transformer storage area drains to the playground area. DDOU collected surface soil samples from the playground and adjacent drainage areas in April 1992 (24 samples). PCBs were detected in five samples at concentrations ranging from 0.17-2.13 ppm. PCBs are not considered a contaminant of concern at those levels.

Actions Planned

1. DDOU plans to excavate soil from areas on the playground where PCBs were detected above 0.5 ppm (6). Future runoff from the storage area will be prevented by berming or some other means.

2. DDOU has conducted an electromagnetometer survey of Burial Site 1 and it showed subsurface anomalies, possibly indicating additional burial areas or other ground disturbances. During the second ATSDR visit, DDOU agreed to share the study with the Ogden Nature Center. Additionally, ATSDR recommends collaboration between DDOU and the Ogden Nature Center when future pond sites (or other construction projects) are selected so that they are not constructed in suspected burial areas. ATSDR recommends that subsurface surveys are also conducted in any areas of suspected contamination for which construction projects are scheduled, but no previous surveys exist.
3. EPA is requesting routine sampling of existing deep wells on DDOU. Results of the data on those samples will be used to evaluate the potential for adverse public health effects from exposure to contaminants in groundwater.
4. DDOU will sample seven private wells west of the depot boundary and determine their use if requested by the residents. Results of the data on those samples will be used to evaluate the potential for adverse public health effects from exposure to contaminants in groundwater. ATSDR recommends that the analyses include unfiltered metals samples.
5. ATSDR will provide an annual follow up to this PHAP, outlining the actions completed and those in progress. This report will be placed in repositories that contain copies of this public health assessment, and will be provided to persons who request it.

ATSDR will reevaluate and expand the PHAP as needed. New environmental, toxicological, or health outcome data, or the results of implementing the above proposed actions may determine the need for additional actions at the DDOU NPL site.

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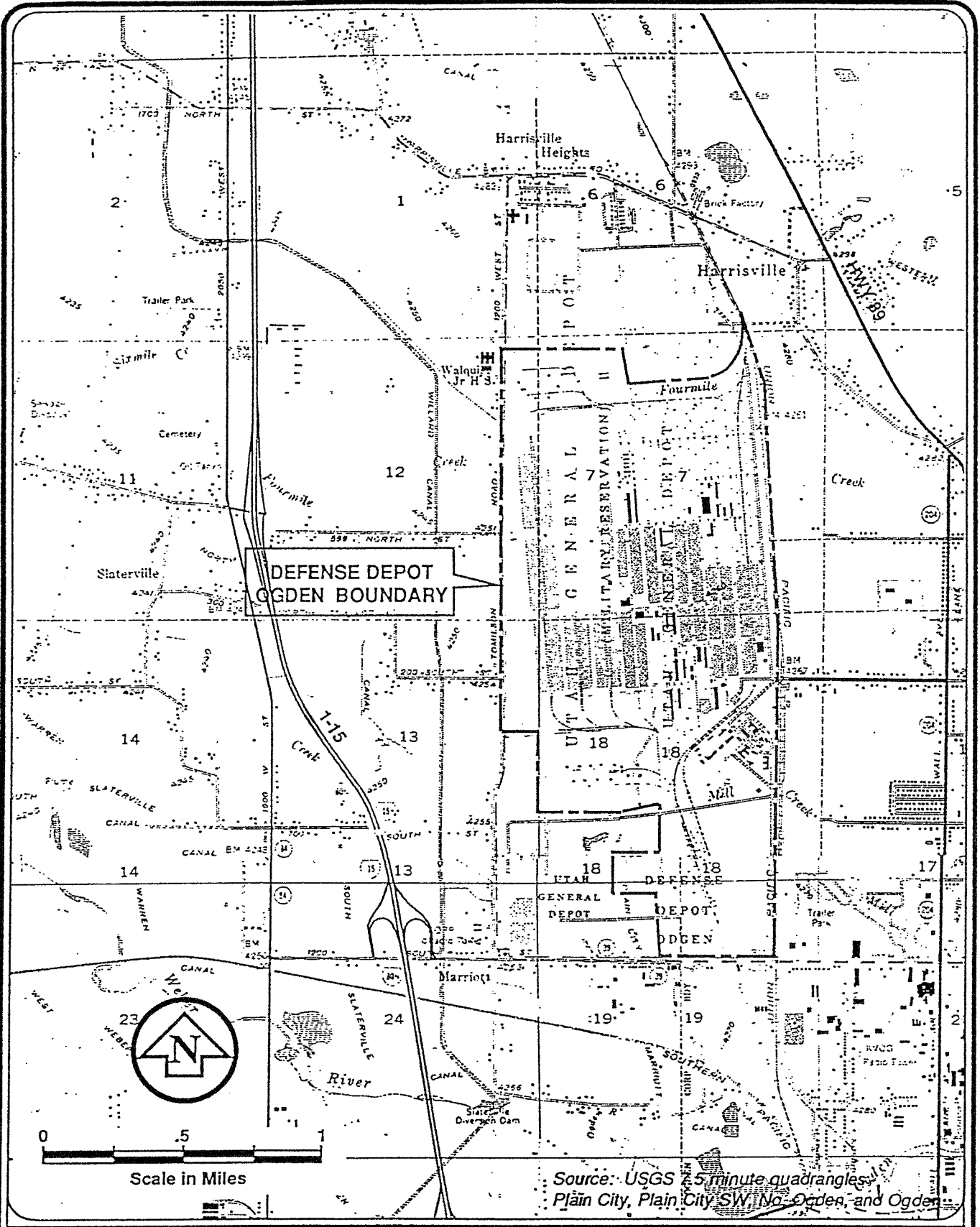
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FIGURES



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DDOU RVFS

FIGURE 1. DDOU Location Map

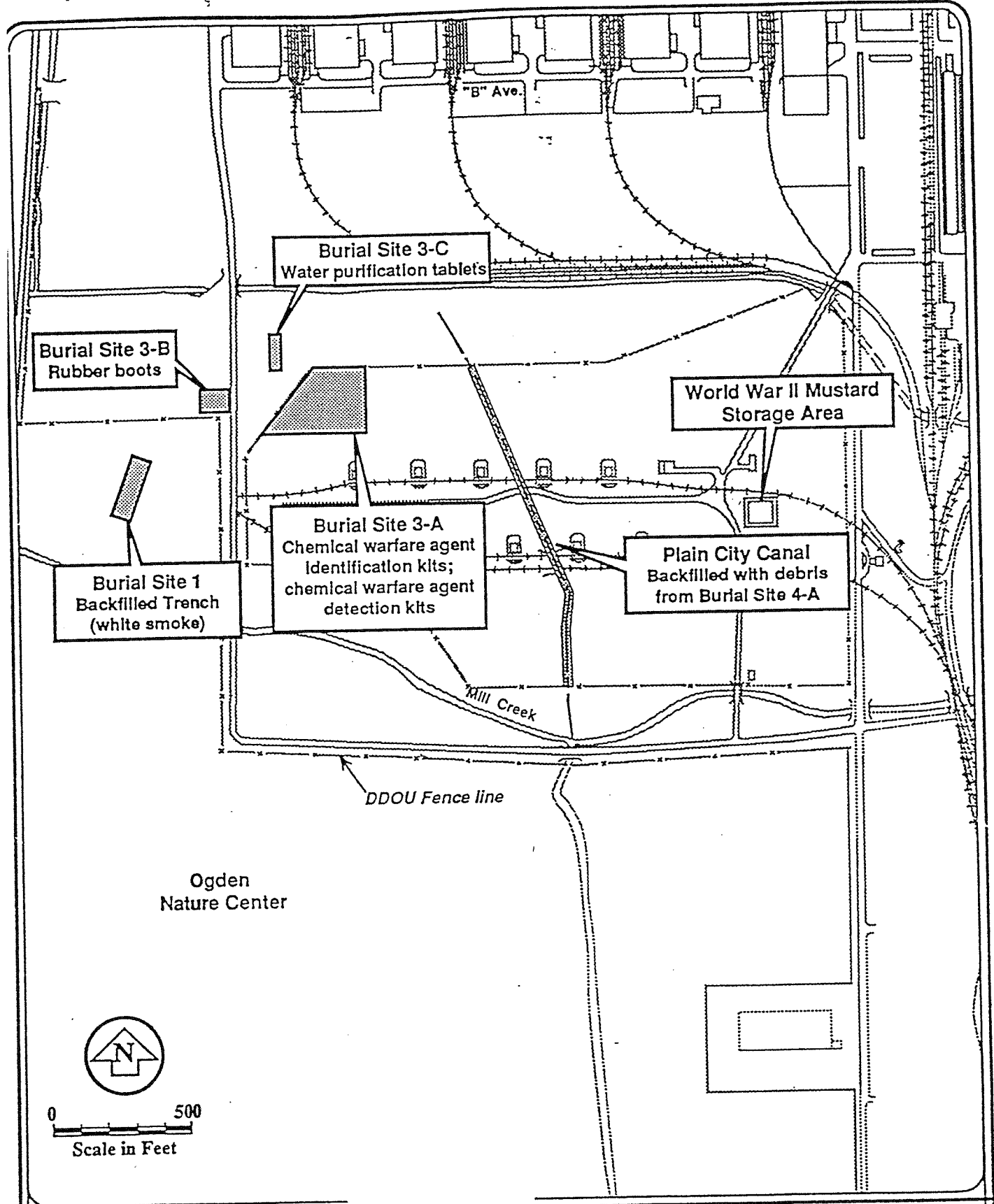



FIGURE 3.

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 DDOU OU 1RVFS

Waste Disposal Areas, Operable Units 1 and 3

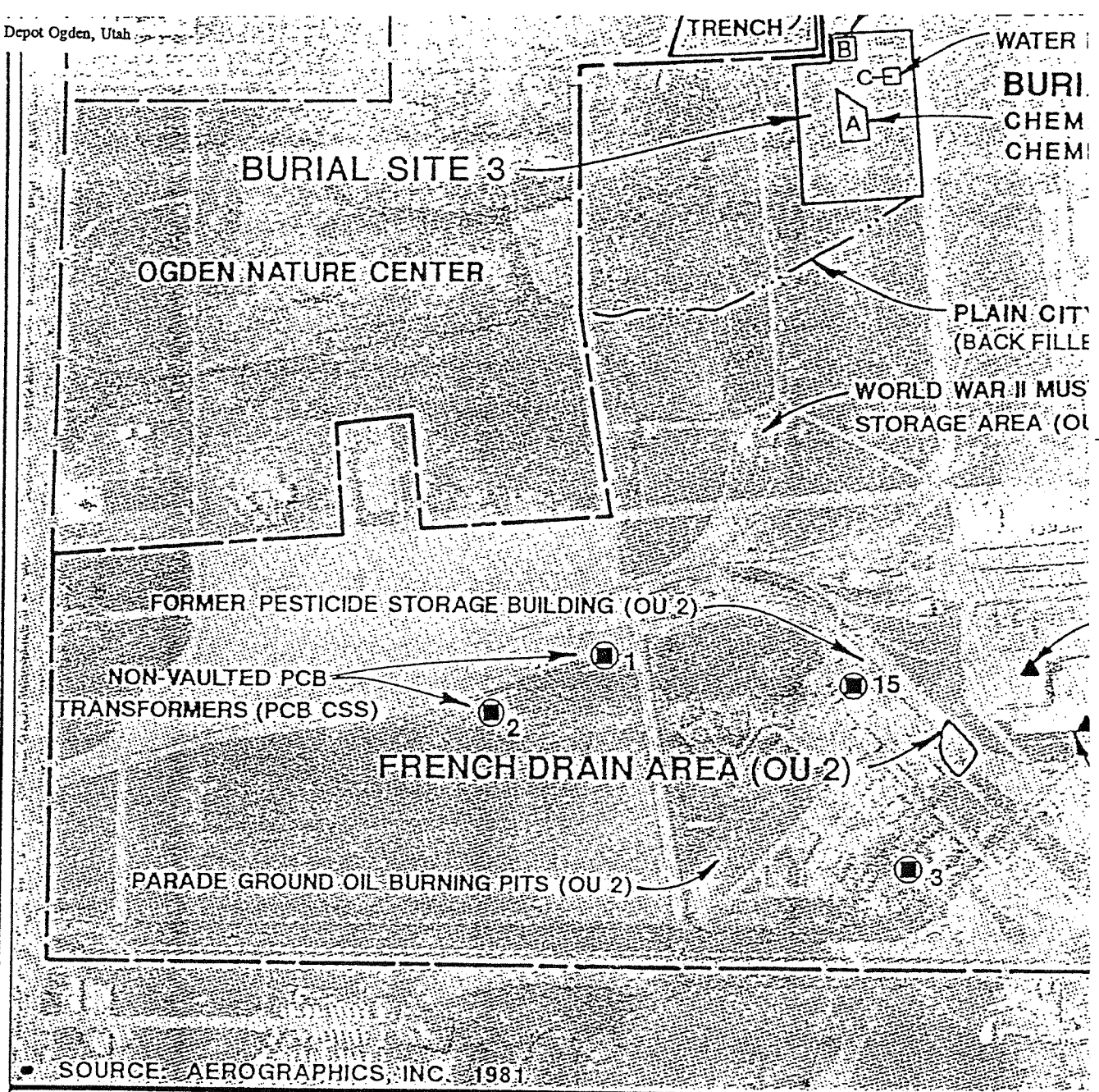
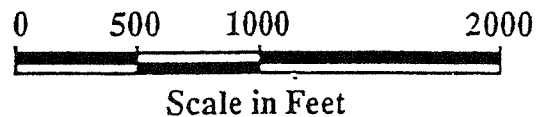
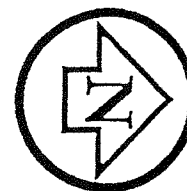


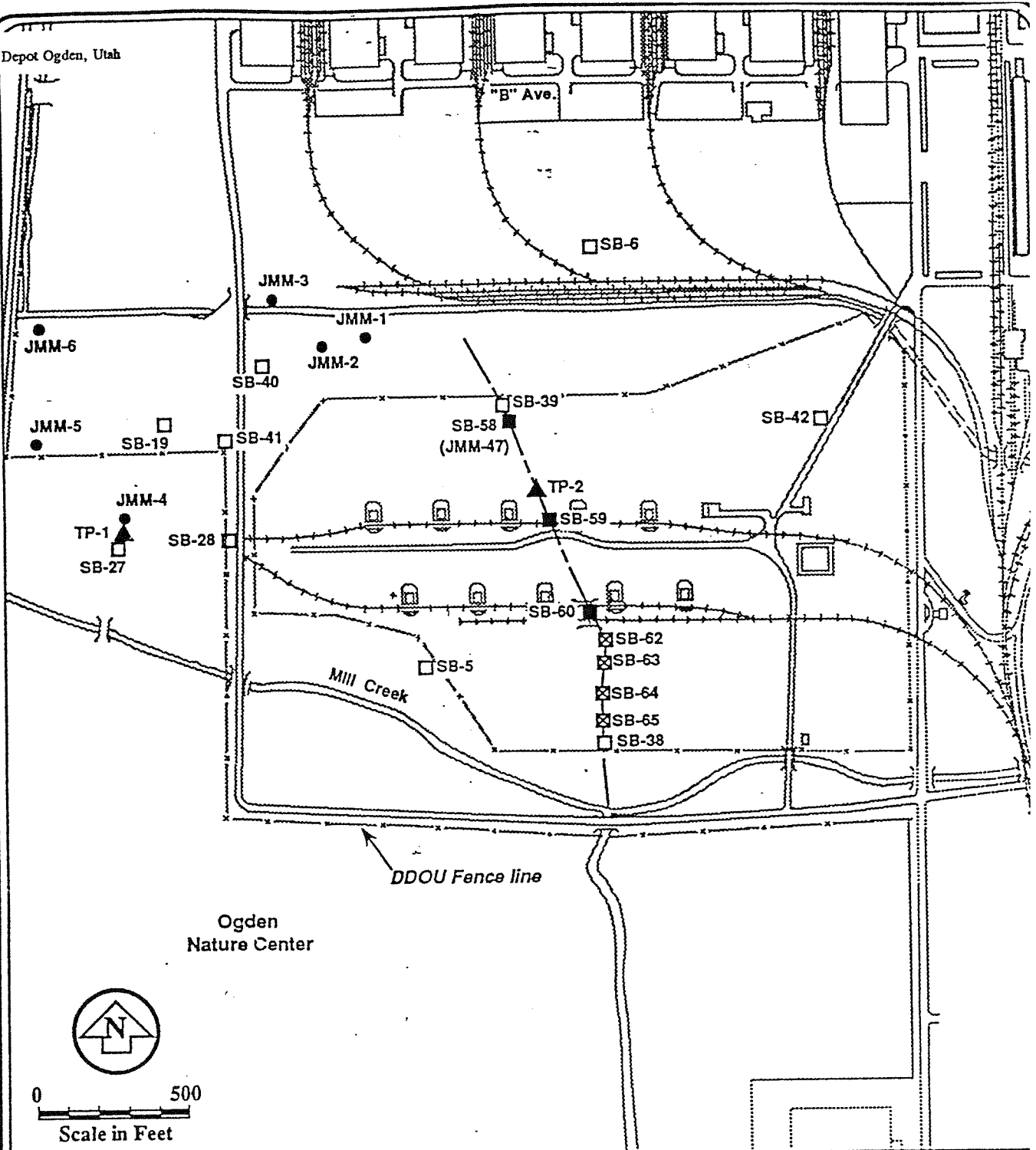
FIGURE 4. Waste Disposal Areas, Operable Unit 2





5. Waste Disposal Areas, Operable Unit 4






EXPLANATION

- Pre-Phase III soil boring location
- Phase III soil boring location
- ▣ Phase IV soil boring location
- ▲ Phase II test pit location
- Pre-Phase III shallow monitoring well location

FIGURE 6.

Test Pit and Soil Boring Locations at OU 1

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 DDOU OU 1 RI/FS

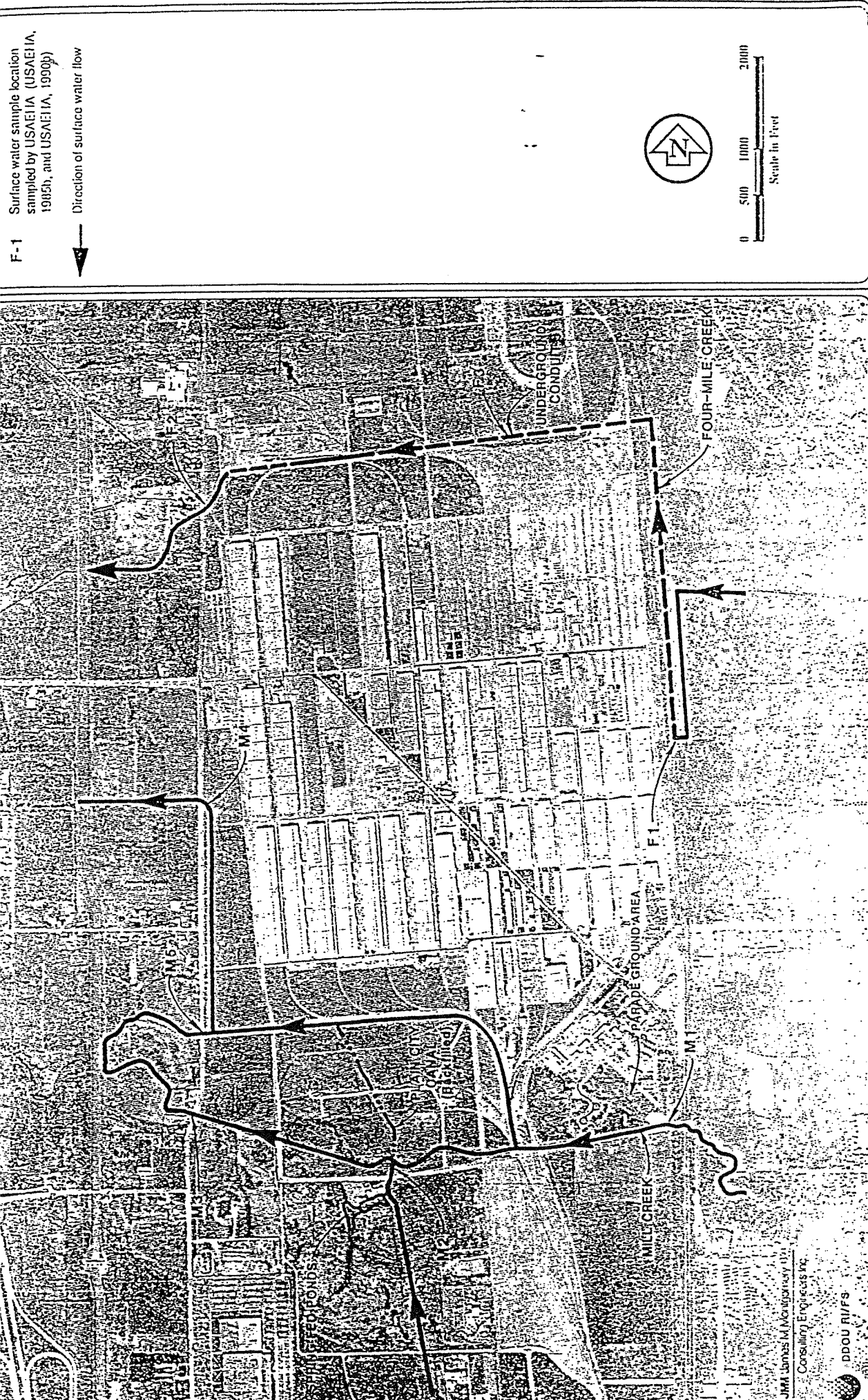
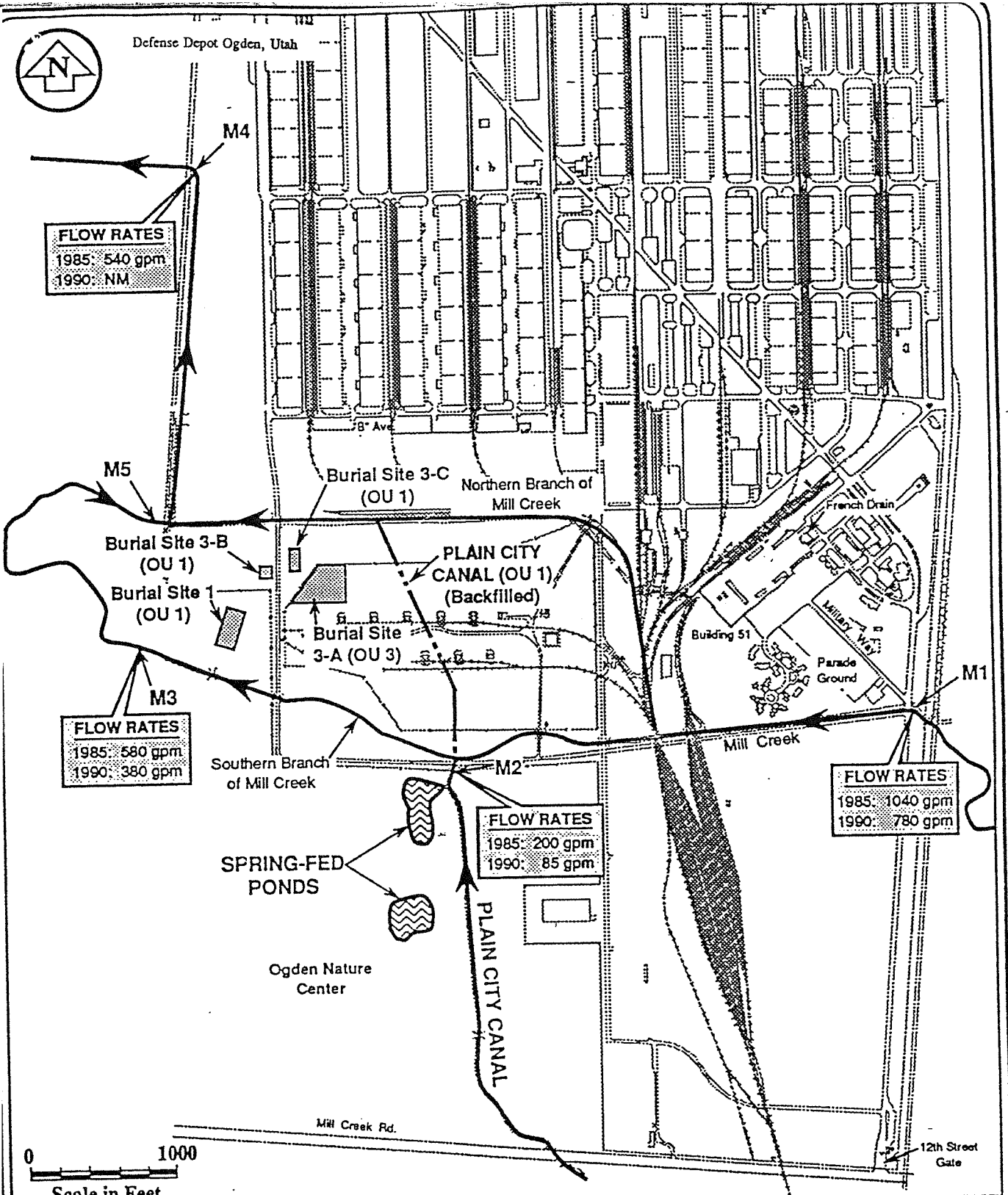


FIGURE 8. Surface Waters at DDOU



EXPLANATION



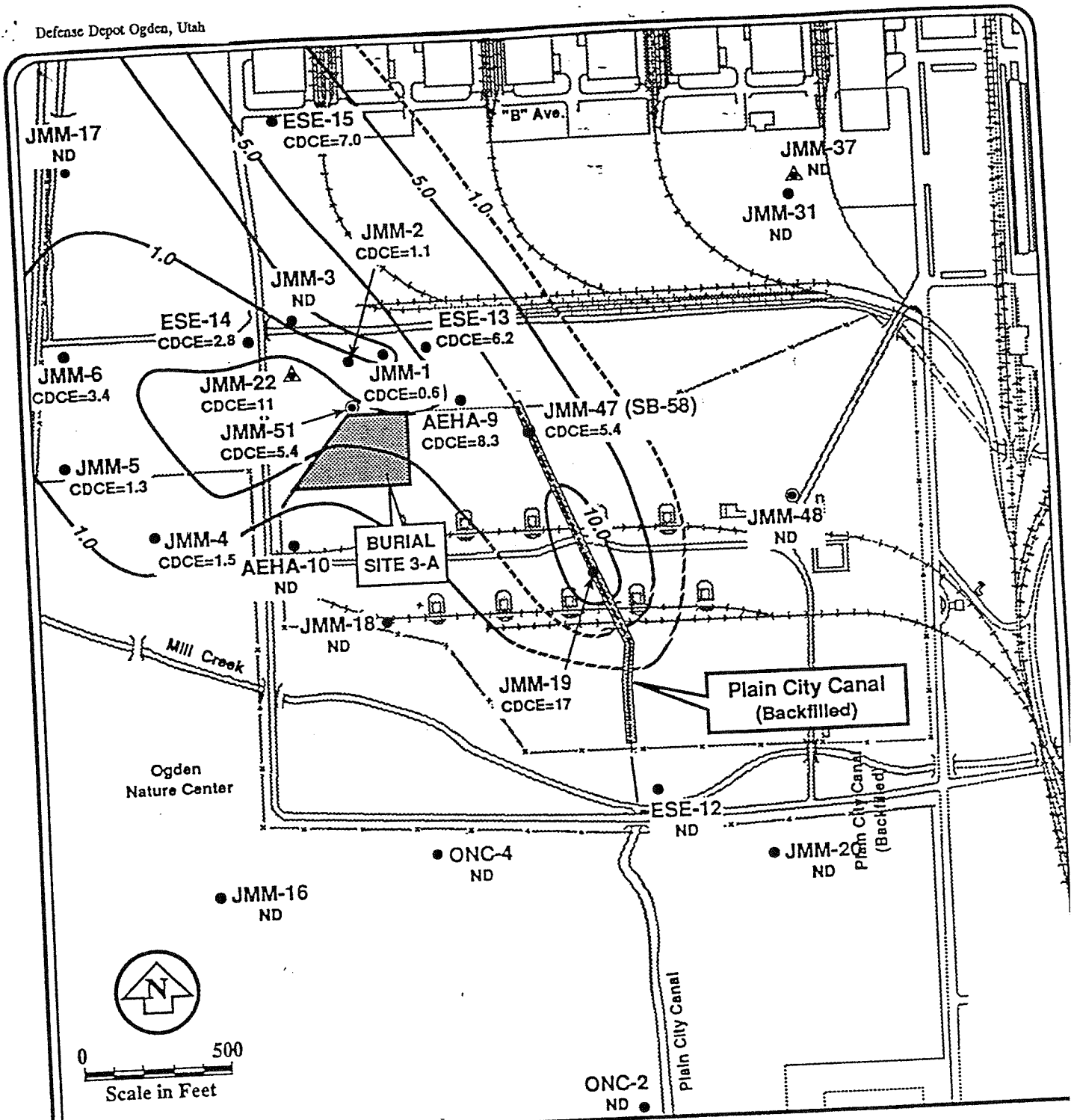
- M1 Surface water locations sampled by USAEHA (1985b and 1990a)
- ← Direction of surface water flow
- NM Not measured
-  James M. Montgomery Consulting Engineers Inc.
-  DDOU OU 1 RI/FS

FIGURE 9. Surface Waters near OU 1



EXPLANATION

- Pre-Phase III shallow monitoring well location
- ▲ Phase II dense non-aqueous phase liquid (DNAPL) shallow monitoring well location
- Phase III shallow monitoring well location

- JMM-23 Well number
- CDCE=17 Cis-1,2-DCE and concentration (µg/L)
- ND Not detected
- - - 7.0 Contour line (dashed where inferred)

Sampled July-August 1990

PROJECT NO. 1587.0732

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 DDOU OU 1 RI/FS

FIGURE 10. Cis-1,2-DCE Groundwater Contamination at DDOU, OU

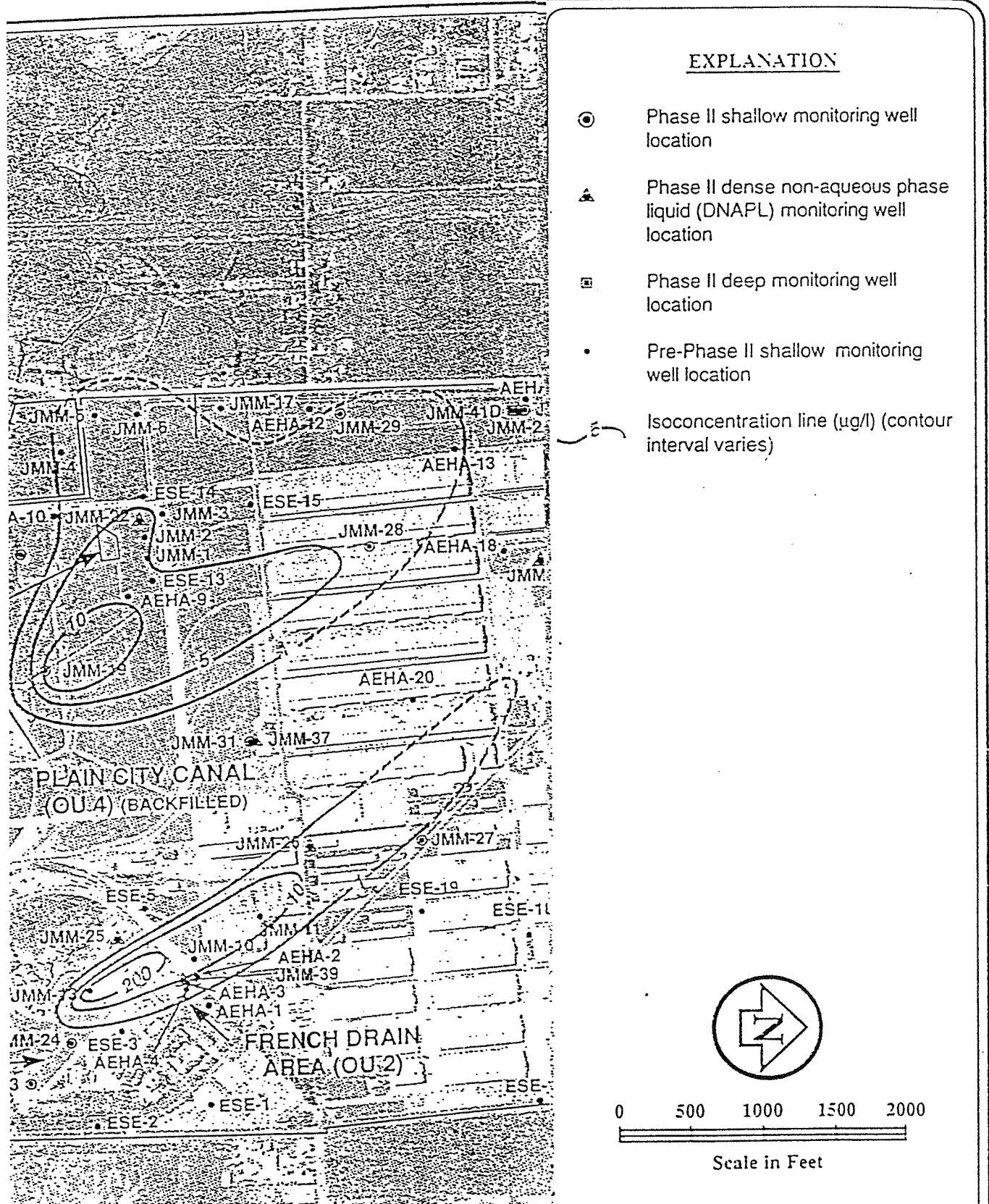
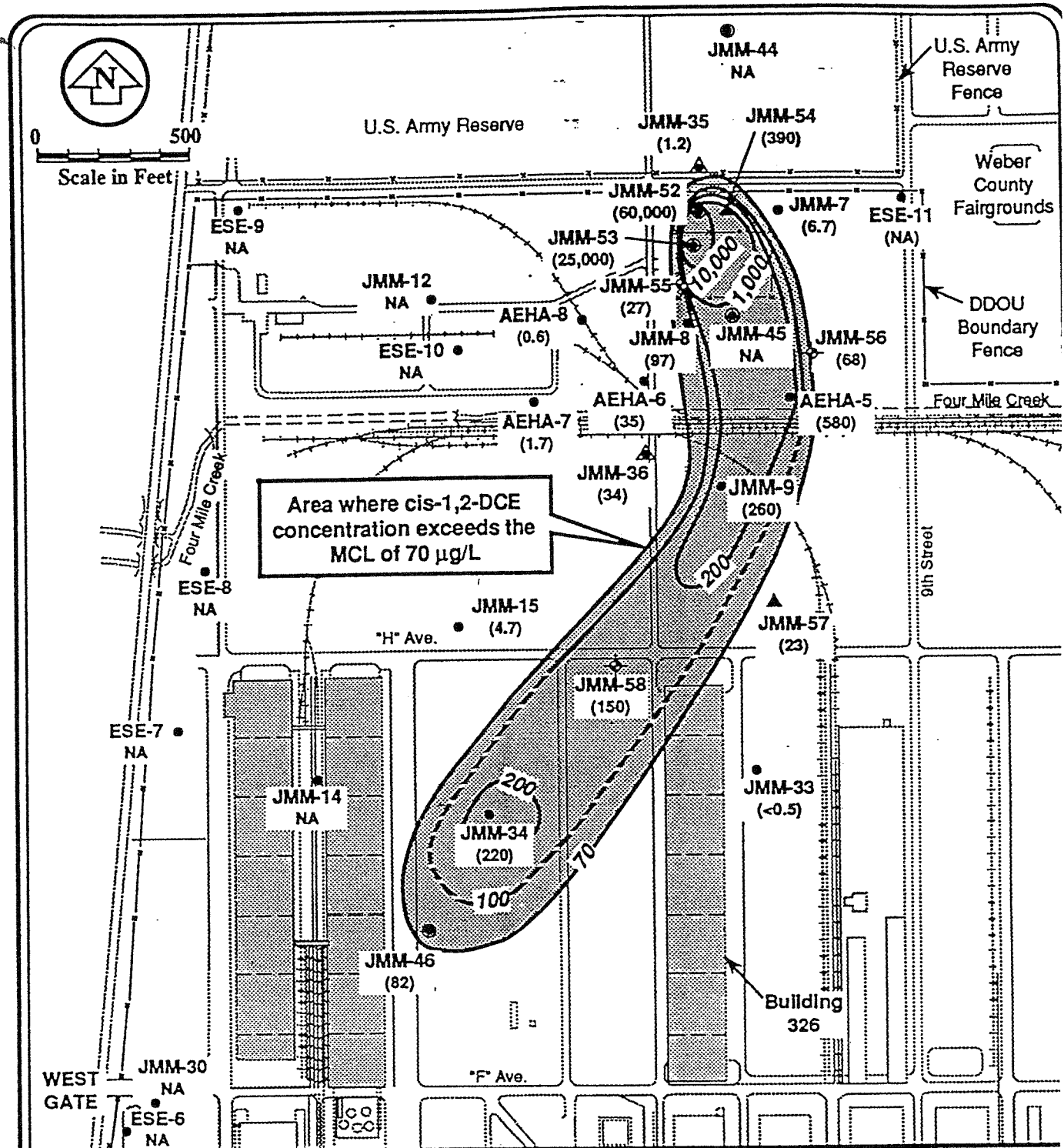


FIGURE 11. Cis-1,2-DCE Groundwater Contamination at DDOU, OU 2



Area where cis-1,2-DCE concentration exceeds the MCL of 70 µg/L

EXPLANATION

Note: Bladder pump sampling technique used.

- ▲ Phase IV dense non-aqueous phase liquid (DNAPL) shallow monitoring well location
- ⊕ Phase IV shallow monitoring well location
- Phase III shallow monitoring well location
- ▲ Phase II dense non-aqueous phase liquid (DNAPL) shallow monitoring well location
- Pre-phase III shallow monitoring well location

- JMM-23 Well number
- (23) Vinyl chloride concentration (µg/L)
- (<1) Vinyl chloride concentration less than detection limit shown (µg/L)
- 10- Isoconcentration line (µg/L); contour interval varies; contour lines are dashed where inferred

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 DDOU OU 4 RI/FS

FIGURE 12. Cis-1,2-DCE Groundwater Contamination at DDOU, OU

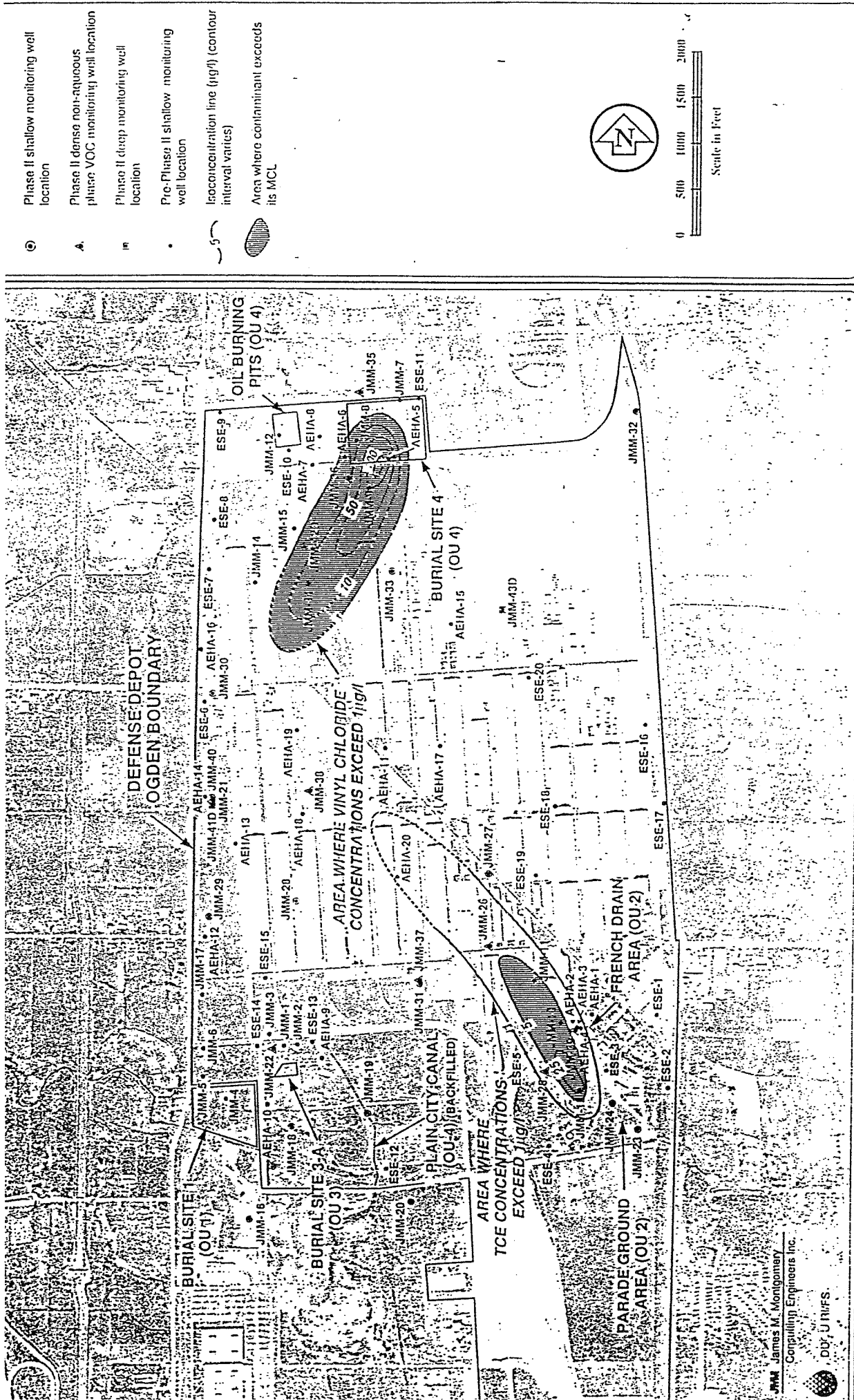
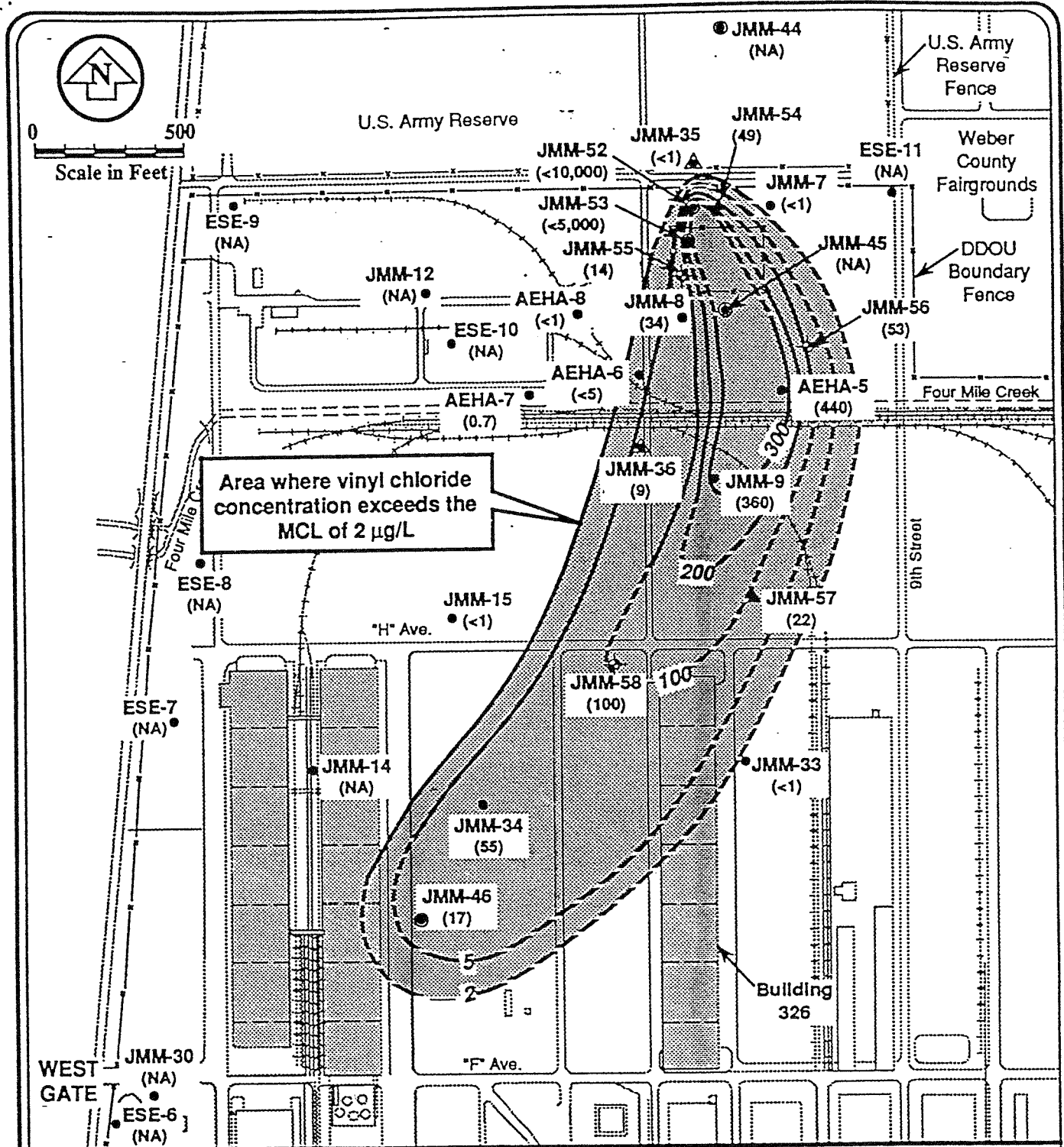


FIGURE 13. TCE Groundwater Contamination at DDOU, OU 2



EXPLANATION

Note: Bladder pump sampling technique used.

- ▲ Phase IV dense non-aqueous phase liquid (DNAPL) shallow monitoring well location
- ◆ Phase IV shallow monitoring well location
- Phase III shallow monitoring well location
- ▲ Phase II dense non-aqueous phase liquid (DNAPL) shallow monitoring well location
- Pre-phase III shallow monitoring well location
- JMM-23 Well number
- (23) Vinyl chloride concentration (µg/L)
- (<1) Vinyl chloride concentration less than detection limit shown (µg/L)
- - - Isoconcentration line (µg/L); contour interval varies; contour lines are dashed where inferred

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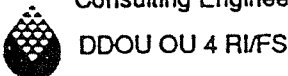


FIGURE 15. Vinyl chloride Groundwater

— Contamination, DDOU, OU 4

PROJECT NO. 1587.0742

APPENDIX 1

Comments on Defense Depot Ogden Utah Public Health Assessment
Comment Period July 13 - August 13, 1992

Question #1. In the Summary (paragraph #1) it is stated that non-ordnance items were present, but later there are descriptions of chemical warfare agents (ordnance) stored and disposed on DDOU. The "non" should be removed as a prefix for ordnance.

Response #1. The sentence was changed to:

"DDOU has stored, maintained, and issued ordnance and non-ordnance items to military installations since 1941."

Question #2. The last complete paragraph on page 1 should perhaps contain some qualifying language to point out that this assessment is based on current toxicologic and risk assessment knowledge, in the likely event that future risk may change with the improved biomedical knowledge and techniques.

Response #2. ATSDR uses various health criteria to make decisions on whether or not a given situation is likely to pose a threat to public health. Those criteria are subject to change as on-going research efforts generate new data and as public health policies change. When new information becomes available that changes the determinations made in the public health assessment, the assessments are updated. The public health action plan (PHAP) is part of the public health assessment. The PHAP is to ensure that this public health assessment not only identifies public health hazards, but provides a plan of action designed to mitigate and prevent adverse human health effects resulting from exposure to hazardous substances in the environment. Included is a commitment on the part of ATSDR to follow up on this plan to ensure that it is implemented.

Question #3. The Summary states that DDOU is within the city limits, while this (Background) section states DDOU is northwest of the city limits; this disparity should be corrected.

Response #3. The sentence was changed to:

"Defense Depot Ogden (DDOU) is a 1,139 acre installation at 1200 South Tomlinson Road, northwest of the city of Ogden, Weber County, Utah."

Question #4. The first complete paragraph on page four lists burial site 3-C as part of OU1. Burial site 3-C is now being remediated as a part of OU3. This correction should also be made on page five under the description of OU3. In addition, Table 1 should be revised to reflect these recent changes.

Response #4. Burial site 3-C was moved to OU3 and Table 1 was amended.

Question #5. Under the descriptions of operable units 1,2, and 4, the groundwater contaminants should be listed and described since it (shallow groundwater) is considered a part of the OUs.

Response #5. This sentence was added:

"Shallow groundwater is considered part of OUs 1,2, and 4."

The contaminants are discussed in the Environmental Contamination and Other Hazards Section of the document.

Question #6. Table 1. lists phosgene while omitting lewisite for OU3 soil analyses, which conflicts with the report on page 5. Lewisite (an arsenical compound) should be added to Table 1, and the presence of phosgene (a potent toxicant -COCL₂) should be fully described with its associated health risks.

Response #6. Lewisite was added to Table 1. A public health assessment only discusses chemicals in detail when there is evidence of exposure. The public health assessment does not quantitate risk.

Question #7. Surface water should also be listed as a media in which contaminants have been detected (under On-Site Contamination Part A.)

Response #7. Surface water was added to the sentence:

"Contaminants have been detected in soil, surface water, sediment, groundwater, and indoor air samples."

Question #8. Soil gas levels for OU4 as listed appear to be low and not moderate; therefore "moderate" should be removed from paragraph #3, page 15.

Response #8. The soil gas levels at OU4 were less than 1.6 ppb for TCE and would be considered low. Moderate has been removed from the sentence.

Question #9. A major technical problem exists with the questionable assertion in the last paragraph on page 15, where it is stated that the PCB levels are not a contaminant of concern. The EPA calculates that an excess population (1 in one million) risk for cancer would occur at 0.22 mg/kg (ppm) of PCB in residential soils and at 0.37 mg/kg (ppm) of PCB in occupational soils; thus, the levels of 0.17 - 2.13 (ppm) found here would not be considered to be free from health risks. A better reference and solid scientific/medical rationale is needed to support this assertion about PCBs.

Under "Actions Undertaken" on page 41, the premise that PCBs are not a contaminant of concern should be removed or else better justified, especially in light of the exposure at a playground

site where levels exceed those that can pose a risk of cancer greater than one excess in one million people.

Response #9. ATSDR uses various health criteria to make decisions on whether or not a given situation is likely to pose a threat to public health. When existing research or exposure data are available that are adequate to clearly determine what health effects might be associated with exposures to specific chemicals, those data are used. ATSDR used PCB exposure information from a variety of sources. One source, ATSDR's Toxicological Profile for Polychlorinated Biphenyls, compiled data from 19 studies of populations without occupational exposures to PCBs. Beginning in 1982, pilot studies involving 766 subjects exposed to PCBs from 12 toxic waste sites in the United States were conducted. Although PCB contamination levels as high as 2.5 ppb in well water and 330 ppm (330,000 ppb) in soil samples were measured, serum PCB levels in exposed people from 10 of the 12 sites were not higher than serum PCB levels in the nonoccupationally exposed populations. The higher serum PCB levels found in exposed people at two sites may be attributed to the historic prevalence of occupationally related exposures. Therefore, it does not appear that PCB levels in soils are absorbed to an extent that would influence the serum levels. The soils in several of those studies were in residential neighborhoods where children would be expected to have come in contact with them on a daily basis. In the playground at Ogden, it is not expected that children will have daily contact with contaminated soil or that contact would occur over many years (>5); therefore, it is not anticipated that the intermittent exposures of the children to PCB contaminated soil would be of public health concern.

In general, the nonoccupationally exposed population has a serum PCB level in the range of 1-20 ppb. Most people have exposures to PCBs through food. In 1975, approximately 50% of the U.S. fish population had PCBs levels above 0.22 ppm (or 220 ppb) (the EPA cancer risk concentration). That estimate involved an examination of market fish and did not consider the exposures to fish from sport or subsistence fishing. Another nonoccupational exposure route is through the air in areas where there are landfills and PCB incinerators. Indoor air levels of PCBs have been measured as being higher than outdoor levels. Studies have not yet investigated the effects on blood levels from those air exposures as compared to exposures through food. Studies have also not been done to investigate trends in the levels of PCBs in blood or fat tissue. As a part of the Third National Health and Nutrition Evaluation Survey (NHANES III), the levels of PCBs in human blood samples will be evaluated. That study will add more information on background levels in the general population.

There are few studies that examine the bioavailability of PCBs from soil, air, or water. Those studies would help in the evaluation of the exposure estimates that are used.

The references used for the evaluation of potential health effects of the low levels of PCBs detected in the playground area included the following:

- ATSDR. Toxicological Profile for Selected PCBs (Aroclor -1260, -1254, -1248, -1242, -1232, -1221, and -1016). June 1992.
- Sittig M. Handbook of Toxic and Hazardous Chemicals and Carcinogens. 2nd edition. Park Ridge, NJ: Noyes Publications, 1985.
- Shalat SL, True LD, Fleming LE, and PE Pace. "Kidney Cancer in Utility Workers Exposed to Polychlorinated Biphenyls (PCBs)." British Journal of Industrial Medicine 1989; 46:823-824.
- Lawton RW, Ross MR, Feingold J, and JF Brown. "Effects of PCB Exposure on Biochemical and Hematological Findings in Capacitor Workers." Environmental Health Perspectives 1985; 60:165-184.
- Fischbein A. "Liver Function Tests in Workers with Occupational Exposure to Polychlorinated Biphenyls (PCBs): Comparison with Yusho and Yu-Cheng." Environmental Health Perspectives 1985; 60:145-150.
- Fischbein A, Wolff MS, Lillis R, Thornton J, and IJ Selikoff. "Clinical Findings among PCB-Exposed Capacitor Manufacturing Workers." Annals of the New York Academy of Sciences 1979; 320:703-715.
- Reggiani G and R Bruppacher. "Symptoms, Signs, and Findings in Humans Exposed to PCBs and Their Derivatives." Environmental Health Perspectives 1985; 60:225-232.
- Kimbrough RD. "Human Health Effects of Polychlorinated Biphenyls (PCBs) and Polybrominated Biphenyls (PBBs)." Annual Review of Pharmacology and Toxicology 1987; 27:87-111.
- Emmett EA, Maroni M, Schmith JM, Levin BK, and J Jeffreys. "Studies of Transformer Repair Workers Exposed to PCBs: I. Study Design, PCB Concentrations, Questionnaire, and Clinical Examination Results." American Journal of Industrial Medicine 1988; 13:415-427.
- Fischbein A, Wolff MS, Berstein J, Selikoff IJ, and J Thornton. "Dermatological Findings in Capacitor Manufacturing Workers Exposed to Dielectric Fluids Containing Polychlorinated Biphenyls (PCBs)." Archives of Environmental Health 1982; 37(2):69-74.

- Fischbein A, Rizzo JN, Soloman SJ, and MS Wolff.
"Oculodermatological Findings in Workers with Occupational Exposure to Polychlorinated Biphenyls (PCBs)." *British Journal of Industrial Medicine* 1985; 42:426-430.
- Taylor JS. "Environmental Chloracne: Update and Overview." *Annals of the New Academy of Sciences* 1979; 320:295-307.
- Taylor PR, Stelma JM, and CE Lawrence. "The Relation of Polychlorinated Biphenyls to Birth Weight and Gestational Age in the Offspring of Occupationally Exposed Mothers." *American Journal of Epidemiology* 1989; 129(2):395-406.
- Jacobson JL, Jacobson SW, and HEB Humphrey. "Effects of In Utero Exposure to Polychlorinated Biphenyls and Related Contaminants on Cognitive Functioning in Young Children." *Journal of Pediatrics* 1990; 116:38-45.
- Gladen BC, Rogan WJ, Hardy P, Thullen J, Tingelstad J, and M Tully.
"Development after Exposure to Polychlorinated Biphenyls and Dichlorodiphenyl Dichloroethene Transplacentally and Through Human Milk." *Journal of Pediatrics* 1988; 113:991-995.
- Fait A, Grossman E, Self S, Jeffries J, Pellizzari ED, and EA Emmett. "Polychlorinated Biphenyl Congeners in Adipose Tissue Lipid and Serum of Past and Present Transformer Repair Workers and a Comparison Group." *Fundamental and Applied Toxicology* 1989; 12:42-55.
- Emmett EA, Maroni M, Jeffreys J, Schmith J, Levin BK, and A Alvares. "Studies of Transformer Repair Workers Exposed to PCBs: II. Results of Clinical Laboratory Investigations." *American Journal of Industrial Medicine* 1988; 14:47-62.
- Kreiss K. "Studies on Populations Exposed to Polychlorinated Biphenyls." *Environmental Health Perspectives* 1985; 60:193-199.
- Kreiss K, Roberts C, and HEB Humphrey. "Serial PBB Levels, PCB Levels, and Clinical Chemistries in Michigan's PBB Cohort." *Archives of Environmental Health* 1982; 37(3):141-147.

Jacobson JL, Humphrey HEB, Jacobson SW, Schantz SL, Mullin MD, and

R Welch. "Determinants of Polychlorinated Biphenyls (PCBs), Polybrominated Biphenyls (PBBs), and Dichlorodiphenyl Trichloroethane (DDT) Levels in the Sera of Young Children." American Journal of Public Health 1989; 79(10):1401-1404.

Jensen AA. "Background Levels in Humans." In: Kimbrough RD and AA Jensen, eds. Halogenated biphenyls, terphenyls, naphthalenes, dibenzodioxins, and related products. New York: Elsevier, 1989:345-380.

Stehr-Green PA, Burse VW, and E Welty. "Human Exposure to Polychlorinated Biphenyls at Toxic Waste Sites: Investigations in the United States." Archives of Environmental Health 1988; 43(6):420-424.

Question #10. The second to last paragraph on page 16 does not describe what chemical(s) the bore sample analyses tested as low (<1ppm); it is assumed to be VOCs. Please clarify.

Response #10. The following clarification was added:

"Borehole sample analyses were low (<1 ppm). The samples were analyzed for BNAEs, VOCs, pesticides/PCBs and metals."

Question #11. The last paragraph on page 16 describes results for OU3 subsurface soils on adamsite (a previously undescribed arsenical), but not for lewisite which had been identified earlier; this analytical disparity should be clarified.

Response #11. ATSDR reviewed the analytical data for the subsurface soils for OU3. It is reported here. Lewisite was not detected in subsurface soils.

Question #12. The relatively high (9,580 ppm) levels of lead in the subsurface soils at the Plain City Canal (which is now a part of OU1 and not OU4) were not adequately addressed; i.e., was this a single sample or mean, what was the source, and what might be the risk from exposure?

Response #12. The text has been changed to reflect that the Plain City Canal is now part of OU1.

The text states that the lead sample was taken from a test pit (TP-2) and had elevated levels of lead (9,580 ppm). The average test pit was eight feet deep, 15 feet long, and three feet wide and that test pits were excavated in suspected burial areas at all of the OUs. Contaminated soils may expose people who live or work near a site to contaminants at levels of health concern. Ingestion of contaminated soil, particularly by children, is a primary concern. ATSDR has defined surface soil as the top three

inches of soil. At DDOU, personnel can only be exposed to subsurface soil during excavation or construction. If remediation of the Plain City Canal involves excavation, current health and safety regulations require personnel protection to prevent exposure.

Question #13. The public health assessment should document that DDOU is currently planning to further investigate the surface water and sediment pathway.

Response #13. Pages 17 and 18 contain the following information on the proposed sampling:

"DDOU will conduct further stream analysis."

"DDOU will conduct further sediment analysis."

Question #14. A discrepancy exist between the stated high TCE levels of 17 ppb in paragraph 4 on page 18 and the much higher levels shown in Figure 13 on page 61 where TCE levels in groundwater are up to 100 ppb, greatly exceeding the MCL of 1 ppb. Please clarify.

Response #14. The groundwater contamination plume displayed in Figure 13 is for vinyl chloride. The figure will be correctly titled. The current MCL for TCE is 5 ppb.

Question #15. A major difficulty with this report regards the contention made in paragraph 4 on page 19 that the elevated levels of metals in groundwater did not come from DDOU at OU3. The rationale presented actually supports the opposite conclusion, since the authors expected arsenic and chromium to be elevated at OUs 1 and 4 as well, but they were not. The presented argument is not scientifically strong enough to soundly support the report's conclusion; that high metal levels are simply coming from leachates of soils with naturally high metal levels. This conclusion and its consequences for health risk should be strengthened and clarified, or else removed and more quality data obtained to confirm this scientifically weak hypothesis. Furthermore, the public health assessment should state that DDOU modified its methods for obtaining groundwater samples since the Draft (For Public Comment) health assessment was written. New methods do not filter the water prior to analysis.

Again, the third paragraph on page 38 makes a highly questionable assumption that metal contamination does not emanate from DDOU.

Response #15. The information reviewed by ATSDR did not conclusively define the source of the metals contamination in groundwater. However, EPA and the state agreed with DDOU that the source of metals contamination in groundwater cannot be attributed to DDOU (11)(12). From a public health perspective, people may be exposed to contaminated groundwater through the use of their private wells. Groundwater may be used for potable

purposes west of the DDOU boundary. Seven private wells west of the depot boundary will be sampled and their use determined by DDOU if requested by the residents. ATSDR recommends that the analyses include unfiltered metals samples because the source of metals in groundwater is yet undetermined. ATSDR does not consider the filtered samples adequate for comparison to EPA drinking water standards (MCLs), which are based on unfiltered samples. The paragraph has been amended for clarity.

ATSDR reviewed the current workplan for groundwater sampling and analysis in April 1992. That plan included field-filtering the groundwater samples prior to analysis for metals.

Question #16. The reason for the high detection limits cited in the last paragraph on page 20 needs additional clarification, since it implies all (not just other halogenated hydrocarbons) contaminants had detection limits raised because of the very high DCE levels. This depends greatly on the chemical method, sample preparation, and the analyte; thus, such a "blanket" statement cannot be made validly from the information in their report.

Response #16. The sentence was clarified to read:
"The high detection limits may mask the presence of other halogenated hydrocarbons in the samples."

Question #17. The background levels presented in Table 2 seem low, and are suspect as perhaps not being representative, since the entire group of metals is consistently lower than the regional values.

Response #17. The background metals in Table 2 are compiled from a list that DDOU compiled from 60 soil samples they thought represented background concentrations.

Question #18. What about the contaminants of concern for OU3? The information reported (in Table 3) is not taken from the most recent DDOU documents.

Response #18. ATSDR has requested the most recent information from DDOU. DDOU did not comment on Table 3 or the contaminants of concern at OU3.

Question #19. The top line on page 36 should be qualified by reading as "Currently, no significant exposures...".

Response #19. The word "significant" and similar words are not descriptive for characterizing exposures and therefore ATSDR avoids using them in public health assessments. Instead, ATSDR will state whether or not any exposures have occurred in the past, present, or may occur in the future.

Question #20 The last sentence of the last paragraph on page 36 should be revised to reflect DDOU's current plan to reevaluate and investigate the surface water at DDOU. DDOU is currently in the process of developing a work plan for this investigation.

Response #20. The text has been changed to:

"DDOU will conduct further surface water and sediment sampling. ATSDR will review the information as it becomes available."

Question #21. The second sentence on page 38 appears to contradict the first and the overall conclusion; since it says that the data do not indicate that people are not being exposed, implying that people may in reality be exposed.

Response #21. The sentence contained a typo. It has been corrected to:

"The available data do not indicate that people are being exposed to contamination."

Question #22. The second paragraph on page 38 should qualify that "only low levels" of BNAEs, pesticides, and metals were found in comparison to the VOCs.

Response #22. ATSDR is interested in the contaminants that exceed comparison values, not a comparison of contaminant concentrations. While VOCs may be the most concentrated and wide-spread contaminant, some contaminants exceeding comparison values are not listed for inclusion in future analyses. ATSDR would like to see all contaminants exceeding their comparison values included in the list of analytes so we can determine if exposure to the contaminants at the detected levels may be of public health concern.

Question #23. Number 1 on page 40 should expound the need for surveillance by suggesting that all analytes from Table 4 on page 23 be included for testing prior to completion of remediation.

Response #23. The text has been changed to:

"1. All contaminants exceeding their comparison values should be included in the list of future analytes (Table 4)."

Question #24. The Summary on page 2 indicated that no follow-up activities are planned; however, number six on page 42 indicated that there will be follow-up activities annually. Please clarify.

Response #23. The follow-up health activities referred to in the summary are conducted by ATSDR. All public health actions (conducted by ATSDR and others) will be followed up on by ATSDR. The text has been changed to reflect this difference.