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FIVE-YEAR REVIEW REPORT

SECOND FIVE-YEAR REVIEW REPORT FOR THE FORMER DEFENSE DEPOT OGDEN OGDEN, UTAH

MARCH 2001

PREPARED BY:
DEFENSE DISTRIBUTION DEPOT HILL UTAH
OGDEN SITE

APPROVED BY:

JOE ROBLES
ACTING COMMANDER

DATE: 5 Mar 2001

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 8
999 18TH STREET - SUITE 300
DENVER, CO 80202-2466
http://www.epa.gov/region08

September 19, 2001

MEMORANDUM

SUBJECT: Five Year Review
former Defense Depot Ogden, Utah (DDOU)

FROM: Judith McCulley
Remedial Project Manager

THRU: Terry Anderson
FF Program Director

TO: Max H. Dodson, Assistant Regional Administrator
Office of Ecosystems Protection and Remediation

The Defense Logistics Agency (DLA) has prepared and submitted to EPA for concurrence the Five Year Review for the former Defense Depot Ogden, Utah (DDOU). Attached to this Memo is the Five Year Review and the concurrence letter to the DLA. Please sign the letter.

The DDOU Five Year Review did not include any information about the remedial work that was performed pursuant to a RCRA Part-B permit issued by the State of Utah. Although we have no concerns with respect to the RCRA work, EPA decided that the RCRA corrective actions should be included in the review process. I have obtained the necessary information from UDEQ, and have included it in the attached EPA letter.

DDOU was closed in September, 1997 and much of the Facility has been transferred from the Army to the City of Ogden. The DLA continues to perform ground water extraction and treatment pursuant to the Federal Facilities Agreement. At this time, all remedies at DDOU appear to continue to be protective of human health and the environment.

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September 19, 2001

Ref: 8EPR-F

Col. David L. Dinning
Commander, Defense Distribution Depot Hill
5851 F Avenue, Building 849
Hill Air Force Base, Utah 84056

Ref: Second Five-Year Review Report
for The Former Defense Depot Ogden
Ogden, Utah

Dear Col. Dinning:

The United States Environmental Protection Agency (EPA) has reviewed the March 2001, Five Year Review Report for the former Defense Depot Ogden,Utah (DDOU) and has determined that it followed EPA guidance and that the Department of Defense (DoD) has met all National Contingency Plan (NCP) requirements for conducting a five-year review at the former DDOU Facility.

EPA believes that the cleanup actions at DDOU are generally protective of human health and the environment and that all immediate threats have been or are being adequately addressed.

EPA supports and concurs with DoD's recommendations and follow-up actions as outlined in Chapter IX of the Five-Year Review. Specifically:

(1) Operable Unit 1 (OU 1) (ground water extraction and treatment system) will be modified to expedite the accomplishment of the remedial objective, while reducing operating costs. The current system has successfully addressed the contamination problem that existed prior to 1995, but it is no longer ideally suited to the different distribution of contaminants that exists today.

(2) As a contingency, DDOU can modify the existing OU 2 extraction system to contain ground water migrating from the source area in case contaminant concentrations reach unacceptable levels at extraction wells. The extraction system would be turned off when the concentration for a contaminant exceeding its Maximum Concentration Limits (MCL)

is below the MCL for two consecutive semi-annual monitoring events.

(3) OU 4 may be modified to improve the efficiency and effectiveness of the active ground water remediation systems.

In addition to the above mentioned items, EPA believes that corrective actions undertaken at DDOU pursuant to a Resource Conservation and Recovery Act (RCRA) Part-B Permit should in included in the Five Year Review process. The State of Utah Department of Envirionmental Quality (UDEQ) has provided to EPA a summary of those actions:

SWMU 1. This Solid Waste Management Unit (SWMU) is a Water Wall Paint Booth in the Facility Engineers Paint Shop In Building 5. Painting operations have been conducted in the southwest corner of the building for at least 18 years. The paint booth which was upgraded in 1988, is a three sided structure with a water wall on the backside with no drains. The water wall traps paint residues that then accumulate in the settling basin at the base of the water wall. Potential contaminants include laquer thinner, urethane, enamel paint, latex paint, zinc chromate paints and mineral spirit solvent Phase I RFI sampling detected BNAEs and fuel related VOCs in the soil and ground water adjacent to the south side of the building. Phase II sampling was conducted to determine the extent of soil and ground water sampling. Results of the human health risk assessment indicate that the soil and ground water contamination pose a risk to human health and the environment. An interim corrective action plan was submitted to remove the soil contamination and to add an oxygen reducing compound (ORC) to the ground water to help reduce the organic contamination. The contaminated soil has been removed and an ORC added to the exposed ground water. Results of confirmation samples by both the facility and the State indicated that all of the contaminated soil has been removed. Monitoring wells were installed and sampled below, upgradient and downgradient from the excavated area in June and July, 2000. Based upon sampling data, a request for No Further Action (NFA) was granted.

SWMU 2. This SWMU is a paint clean-out station outside of Building 15 in the engineering and maintenance complex of the facility. Soil boring and ground water sampling programs were conducted at the station to determine if paint brush and container cleaning activities had contaminated the surrounding soil and ground water. Results from the Phase I sampling and analysis of metals, VOCs (volatile organic compounds) and SVOCs (semi-volatile compounds) did not indicate that any significant contamination exists. A request for NFA was granted on August 4, 1998. The request and the data are in the Phase II RCRA Facility Investigation (RFI) Report.

SWMU 3. This SWMU is a pesticide storage and mixing building. A 1,000 gallon storage tank was used to contain rinse water from the cleaning and filling of pesticide and herbicide containers. A Phase I ground water and soil sampling program was conducted to determine if the tank or its piping had leaked and contaminated the soil and groundwater. Chlordane was detected in the soil adjacent to the tank's piping and immediately below the tank. The tank, associated piping and contaminated soil were removed as an interim

measure. Confirmation samples were collected and indicated that all of the contaminated soil was removed. Ground water samples were collected and no contamination was detected. A request for NFA was granted on August 4, 1998. The results and the request for NFA are in the Phase II RFI Report.

SWMU 4. This SWMU is a roundhouse (Building S17) that is used to clean and maintain the locomotives at the facility. The engines sit atop of two large concrete lined pits during maintenance. Previously, the concrete pits were unlined. A hydro-punch, soil boring and ground water sampling program was conducted to determine if the maintenance activities and an oil-water separator had contaminated the soil or the groundwater. Samples were analyzed for VOCs, SVOCs, TPH, metals and pH. No concentrations of contaminants were detected above background or above concentrations that pose a risk to the public or the environment. A request for NFA at the SWMU was granted on August 4, 1998. The results and the request for NFA are in the Phase II RFI Report.

SWMU 5. Bay 2 of building 5A was previously used as a 90-day storage area for hazardous waste including PCBs. The area was closed for use in July 1995. A Closure Plan was approved by the Division on May 16, 1995, and the Certificate of Closure was approved by the Division on November 28, 1995. The floors of the bay were cleaned and the final rinse water analyzed for various contaminants. Significant concentrations of contaminants are not present on the floor of the building. A request for NFA was granted on November 28, 1995.

SWMU 7. The northeast corner of building 269 was constructed in 1950 and previously used for heavy machinery repair and maintenance and contained a dip tank for rinsing drained batteries. In the Phase I RFI a soil and groundwater sampling program was conducted to determine if the vehicle and battery maintenance activities had contaminated the soil and ground water under and adjacent to the building. The Phase I samples were analyzed for TPH, VOCs, SVOCs and metals. One of the ground water samples collected under the north side of the building contained elevated concentrations of TePH, identified as jet fuel or diesel fuel. No other contaminants were detected in the soil or the ground water. Previously, aboveground fuel storage tanks and a fueling station were located outside the northeast side of the building. In the Phase II investigation, a hydro-punch sampling program was initiated to determine the extent of the TePH contamination.

Results from the hydro-punch sampling program did not detect any TPH contamination above regulatory or risk based concentrations. The TePH detected in the one sample from the Phase I study was determined to be an anomaly as the concentration could not be duplicated by further sampling. NFA for the battery maintenance area was granted on August 4, 1998.

SWMU 8. This SWMU is a truck-wash facility in the northwest corner of Building 269. The wash water is collected in floor drains which are connected to the sanitary sewer. The floor drains were connected only recently (around 1980) to the sewer. In addition, an

old construction drawing indicates that acid storage tanks, acid dip tanks and a paint spray booth were once located where the truck wash facility is currently located. Samples were collected of the soil and ground water in the Phase I RFI and analyzed for VOCs, BNAE, TPH, metals and pH. No organic contaminants were detected and no metals were detected in concentrations above background in the soil. Some fuel related VOCs (ethylbenzene, toluene and xylenes) and arsenic and barium were detected in trace concentrations in the ground water significantly below Maximum Concentration Levels (MCLs). A request for NFA was requested for the truck-wash facility and granted on February 19, 1997.

SWMU 9. This SWMU is a 2,000 gallon, above ground, used oil, storage tank on the west side of Building 269. The tank and the concrete, secondary containment structure were installed in 1962. In 1988, less than 55 gallons of used oil was spilled onto the pavement adjacent to the tank when it was being emptied by the recycling vendor. The facility response team cleaned the spill area. Soil and groundwater samples collected adjacent to the tank and below the concrete in the Phase I RFI were analyzed for VOCs, BNAEs, TePH, total and dissolved metals and pH to determine if the used oil had contaminated the soil or the ground water. No significant concentrations of contaminants were detected in the soil or the ground water. A request for NFA was granted on February 19, 1997.

SWMU 10. This SWMU is on the northeast side of Building 259. Beginning in the late 1950s, five dip tanks were used to strip paint from metal parts. The process was replaced with a Wheelobrator in 1991. Samples of the soil and groundwater were analyzed for VOCs, BNAEs, metals and pH in the Phase I RFI to determine if the paint stripping operations had impacted the underlying soil and ground water. No organic contaminants were detected in the soil samples. Selenium was the only metal contaminant detected in the soil above background concentrations. No organic or metal analytes were present in the ground water samples above their MCLs.

During the Environmental Baseline Survey conducted in 1996, as a requirement for facility closure under the Base Realignment and Closure Act (BRAC), a 1950s photograph of the building was found which showed the presence of paint stripping dip tanks not only on the northeast side of the building but also on the east and north side of the building. As a result, in the Phase II RCRA investigation, a hydro-punch program was initiated to collect soil and ground water samples on the north and east sides of the building and down gradient from the building operations. Samples were analyzed for VOCs, SVOCs and metals. No significant contaminant concentrations were detected in the soil samples. TCE was detected at a concentration of 6 ug/l, in one ground water sample, which is above its MCL of 5 ug/l. Between February 1997 and November 1998, several rounds of ground water samples were collected to confirm the TCE concentration in the ground water and to delineate the extent of the ground water contamination as well as to examine seasonal variations in the TCE concentration with seasonal ground water surface levels. Ground water contamination of TCE above the MCL could not be replicated. TCE was detected but at concentrations below its MCL. A NFA for soil was granted in August 4, 1998. A NFA for ground water

was granted in October 1998.

SWMU 11. This Shot Blast Facility consisted of a conveyor belt and blast chamber which used steel shot to remove paint and/or rust from compressed gas cylinders. The steel shot was used and reused until it was ineffective. Shot-blast dust was collected in a bag house with three hoppers and 55-gallon drums outside the west wall of the building. Potential contaminants are paint constituents. Rust and paint stained soil were found near the front roll-up doors and along a path towards Building 259. Shallow soil samples collected and analyzed during the Phase I investigation detected significant concentrations of lead and chromium. Ground water samples did not contain detectable contaminant concentrations. An Interim Corrective Measures Plan was approved on July 28, 1997, to place an asphalt overlay on the contaminated soil to reduce exposure to the soil. The overlay was placed in October 1977, and included a geo-textile fabric to minimize the potential for cracking of the surface.

A Corrective Measures Study and Corrective Measures Plan for removal of Building 270 and all contaminated soil and debris, including the asphalt overlay, was approved on February 22, 1999. A NFA for the SWMU was approved on March 24, 2000 with approval of the Corrective Measures Implementation Report.

SWMU 12. This SWMU involves the battery storage area at Building 251. The area was used to store drained and rinsed damaged batteries and undrained, undamaged sealed batteries. The batteries are then reused or sold by the DRMO. Battery acids and metals are potential contaminants. Based on a review of historical records and a site visit, which did not reveal any evidence of spills, this SWMU was removed from the list with the Class 3 permit modification approved

SWMU 13. This SWMU is a water wall paint booth against the south wall of Bay 12 of Building 5D. Potential contaminants include lacquers, thinners, enamel paints and red-oxide primers. The Phase I investigation collected soil and ground water samples adjacent to the paint booth in and outside of the building. BNAE and VOC compounds as well as cadmium, chromium, lead and mercury were detected above background concentrations in the surface soil and TCE was detected in the ground water above its MCL. Expanded investigation was conducted and subsequent rounds of sampling indicated no further action required. Request for NFA was approved.

SWMU 14. This SWMU is two water wall paint booths located along the south wall of Building 246. Potential contaminants are paint constituents. Arsenic, chromium and lead were detected above background concentrations but below risk based concentrations in the soil and TCE was detected in the ground water above its MCL. Additional samples were collected during the Phase II investigation to try to located the source of the TCE contamination. All necessary remedial actions are now complete. Request for NFA was approved.

SWMU 17. This storm water discharge area is located approximately two miles west of DDOU and discharges into Mill Creek. NFA request was approved.

SWMU 19. Building 260 is a drive-through vehicle paint booth. Soil and ground water samples were collected and analyzed for VOCs, SVOCs and metals to determine if the painting operations had contaminated the surrounding environment. Lead and arsenic were detected in near surface soils surrounding the building but the concentrations are not above a residential exposure scenario screening levels. A request for an NFA was granted on August 4, 1998.

SWMU 23. This SWMU is the sanitary and storm water sewer systems at the facility. A video survey of the systems was conducted in 1995 and detected some damaged sections. A soil boring and groundwater sampling program was initiated to determine if damaged sections of the systems had released any contaminates to the soil and groundwater. It was reported that historically some drains in the industrial area of the facility were connected to the sanitary and storm water system. Soil samples were collected from the soil and the groundwater surrounding the damaged areas and analyzed for VOCs, SVOCs, chlorinated herbicides, chlorinated pesticides and metals. No VOCs, SVOCs, pesticides, herbicides or metals were detected in the soil or groundwater at concentrations that pose a risk to the public or the environment. A NFA was granted on August 4, 1998.

EPA appreciates the highly responsive and cooperative style in which DoD has managed the CERCLA and BRAC programs at the former DDOU facility. Assuming that resources are maintained at adequate levels, EPA does not foresee any major threats to DoD's ability to maintain adequately protective cleanup during the next five years.

Should you have any questions, please feel free to contact Judith McCulley at (303) 312-6667.

Sincerely,

Max H. Dodson
Assistant Regional Administrator
Office of Ecosystems Protection
and Remediation

cc: Mo Slam - UDEQ
Connie Rauen - UDEQ

LIST OF ACRONYMS

ARARs	Applicable and Appropriate Requirements
BRAC	Base Realignment and Closure
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CSS	Contaminant Screening Site
DCE	cis 1,2-dichloroethene
DDHU	Defense Distribution Depot Hill Utah
DDOU	Defense Depot Ogden Utah
EPA	Environmental Protection Agency
ESD	Explanation of Significant Difference
FFA	Federal Facility Agreement
IRB	Iron-Related Bacteria
MCL	Maximum Cleanup Levels
NCP	National Contingency Plan
NPL	National Priorities List
OLRA	Ogden Local Redevelopment Authority
OU	Operable Unit
PCBs	Polychlorinated Biphenyls
PCE	Tetrachloroethene
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
TCE	Trichloroethene
UDEQ	Utah Department of Environmental Quality

FIVE-YEAR REVIEW REPORT

SECOND FIVE-YEAR REVIEW REPORT FOR
DEFENSE DISTRIBUTION DEPOT HILL UTAH – OGDEN SITE

I. INTRODUCTION

Defense Distribution Depot Hill Utah – Ogden Site (DDHU) has conducted a second Five-Year Review of the three operable units and the contaminant screening sites (CSSs) located at the former Defense Depot Ogden Utah (DDOU). This report has been prepared under requirements of Section 121(c) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended, and Section 300.430(f)(4)(ii) of the National Contingency Plan (NCP). This Five-Year Review was conducted in accordance with procedures in OSWER Directive 9355.7-02, Structure and Components of Five-Year Reviews dated May 23, 1991; OSWER Directive 9355.7-02A, Supplemental Five-Year Review Guidance dated June 26, 1994; OSWER 9355.7-03A, Supplemental Five-Year Review Guidance dated December 21, 1995 and the Draft OSWER Directive 9355.7-03B-P, Comprehensive Five-Year Review Guidance dated October 1999.

Five-Year Reviews are intended to evaluate whether the remedy selected in the Record of Decision (ROD) and implemented during remedial action remains protective of public health and the environment. Statutory Five-Year Reviews are required no less often than each five years after the initiation of the remedial action. The first Five-Year Reviews were conducted on each operable unit separately five years counting from the initiation of remedial action at each operable unit. The Five-Year Reviews were completed for Operable Unit 2 in June 1996, Operable Unit 1 in July 1998, and Operable Unit 4 in September 1998. This Five-Year Review will cover all three operable units and the CSSs.

II. SITE CHRONOLOGY

In September 1997, DDOU underwent closure as part of the 1995 Base Realignment and Closure (BRAC) Act. The provision of the Defense Base Closure and Realignment Act of 1990 (P.L. 101-510)(BRAC 91, 93 and 95) will be used to transfer DDOU property to the Ogden Local Redevelopment Authority (OLRA).

The former DDOU site is located in the northern reaches of the City of Ogden, Weber County, Utah. The former Depot is situated in a semi-rural setting with the small communities of Harrisville to the north, Mariott/Slaterville to the west, and numerous small farms and a few small businesses located to the west, east, and south. The former DDOU covered approximately 1,100 acres in a topographically flat area within the Great Salt Lake Valley. It is drained by Mill and Four-Mile Creeks, both of which traverse the installation from east to west.

In the past, both liquid and solid materials were disposed of at DDOU. Oily liquid materials and combustible solvents were burned in burning pits, and solid materials were

buried in pits, burned, or taken off-site for disposal. Several waste disposal areas have been identified on property formerly controlled by DDOU. In July 1987, DDOU was placed on the National Priorities List (NPL) as a Federal Facility requiring CERCLA investigation. On 30 November 1989, DDOU, EPA Region VIII, and the State of Utah signed a Federal Facility Agreement (FFA). The FFA divided the burial sites at DDOU into four operable units. Under the NCP, "an operable unit is a discrete part of a remedial action that can function independently as an unit and contributes to preventing or minimizing a release or threat of a release".

III. BACKGROUND

A. Operable Unit 1

Operable Unit 1 (OU1) is located in the southwest part of DDOU and is composed of Burial Sites 1 and 3B, as well as the backfill material in the Plain City Canal. Burial Site 1 was reportedly used for the disposal of riot control agent and white smoke containers in about 1945. Only non-toxic materials were placed in Burial Site 3-B, including over 1,000 artic-style rubber boots. The Plain City Canal was backfilled in the early 1970s with debris from the Burial Site 4A. Burial Site 4A was located along the northern boundary of the Depot in Operable Unit 4. Also in the OU1 area but not part of OU1 are Burial Site 3A and the World War II Mustard Storage Area which were grouped together in their own operable unit (OU3) based on similar chemicals which were managed at both sites. The soil of the two areas was remediated as part of OU3 but the ground water is considered part of OU1. Of the five potential sources of contamination at OU1, only two areas were identified in the OU1 ROD, the Plain City Canal and Burial Site 3A, to have contaminated soil and were identified as sources of ground water contamination.

The Plain City Canal was an irrigation canal that flowed northwest between two branches of Mill Creek until it was backfilled during the period from 1969 to 1973 with burning pit debris from Burial Site 4A. Backfill in the Plain City Canal consisted of glass, ash, charcoal, asphalt, partially burned plastic-coated electrical wire, wood, concrete, plastic, and metal fragments mixed with silty sand and gravel.

Burial Site 3A occupied an area slightly larger than one acre. Sampling conducted in 1988 and in 1990 indicated that six distinct burial areas containing various types of buried items were located in Burial Site 3A. One suspected source of contamination in the OU1 ground water is the Miscellaneous Items Burial Area where numerous items, including World War II-style gas mask air purification canisters and two one-gallon jars of oil-based paint, were found during sampling activities.

The contaminants detected in the soil and ground water at OU1 were present in relatively low concentrations. In general, only semi-volatile organic contaminants, pesticides, polychlorinated biphenyls (PCBs), dioxins, and furans were detected in the soil at OU1, and they were in the localized area of the Plain City Canal. Volatile organic compounds (VOCs) were not detected in the Plain City Canal soil and debris. The groundwater in the shallow aquifer underlying OU1 is contaminated by a variety of VOC breakdown

products including vinyl chloride and cis-1,2-dichloroethene (DCE). The backfill material used to fill the Plain City Canal is considered the original source of these contaminants.

DDOU, the State of Utah, and EPA Region VIII signed the ROD for OU1 in June 1992.

Remedial Design/Remedial Action contract was awarded in September 1993. The soil remedial action was completed in August 1994. Ground water cleanup began in December 1994 and is still ongoing.

Because of BRAC closure, the DDOU was required to do further environmental site investigations before the Depot could be turned over to the City of Ogden. In the BRAC Site Investigation Report, the Plain City Canal was identified as requiring further investigation prior to ownership transfer. During this investigation, it was discovered that there was additional soil contamination in the Plain City Canal further to the north of the original soil cleanup action at OU1. It was decided by EPA, the State of Utah, and DDOU to investigate the entire length of the Plain City Canal where it had originally flowed through the Depot. Thirteen separate areas along the canal were identified from the Plain City Canal Remedial Investigation Report as requiring remediation. The initial excavation boundaries were set at least 37.5 feet along the axis of the canal from designated potholes with sample results above the cleanup levels. The total linear length excavated was approximately 2,250 feet. The soil was excavated and removed off-site during this remedial action. Debris encountered during remedial excavation activities were segregated, tested for underlying hazardous constituents, and disposed of in accordance with the classification of the materials. Following remedial activities, the work areas were restored to previously existing conditions. The additional soil remediation was completed in December 1999. Because of this additional remediation action, an Explanation of Significant Difference (ESD) was done for the OU1 ROD in July 2000. The ESD explained the significant difference between the soil remediation cleanup level, the costs associated with cleanup, and the increased amount of soil excavated from the old Plain City Canal as listed in the original ROD.

B. Operable Unit 2

Operable Unit 2 (OU2) is located on DDOU just north of the Facilities Engineering Complex, Building 23. OU2 is composed of the French Drain Area, the former Pesticide Storage Building, and the Parade Ground Area. The French Drain Area consists of an 8.5 foot by 20 foot area which was excavated to a depth of 2.5 to 4 feet, filled with gravel, and used as a mixing and loading area for pesticides and herbicides. The former Pesticide Storage Building (Building 52) was used in the past for storing and mixing pesticides. The Parade Ground is a grassy area south of the French Drain, where two oil burning pits were identified in DDOU records. The exact locations of these pits were not known. However, soil gas and groundwater survey revealed evidence of possible waste disposal sites in this area.

Soil contamination at OU2 included the pesticide chlordane and the herbicide bromacil. The parade ground soil contamination consisted of organic solvents such as

trichloroethene, dichloroethene, tetracloroethene, toluene, ehtylbenzene and xylene. The volatile organic compound trichloroethane (TCE) is the primary contaminant of concern in the groundwater. Other VOC's detected in samples from the wells at OU2 include PCE and DCE.

The ROD for OU2 was signed in September 1990 by DDOU, the State of Utah, and EPA Region VIII. After the 1990 ROD, additional information was obtained which warranted modifications to the ROD. A Health Based Risk Assessment and Explanation of Significant Difference was prepared by DDOU in 1994 to change cleanup levels for bromacil. An ESD to the ROD was issued in September 1994, incorporating these modifications. A second ESD was done in October 1996 to change cleanup level for ground water from "below Maximum Cleanup Levels (MCL)" to "at or below MCL".

Remedial design for OU2 began in July 1991 and remedial action was started in November 1991. The soil remedial action was completed in 1994. Groundwater cleanup began in 1992. The system was shut down between October 1996 and September 1997 because cleanup levels had been achieved. It was started again in October 1997 after the cleanup levels were exceeded in groundwater samples, and operated until September 1998. Because the further operation of the plant did not seem to be effective, the system was shut down in October 1998 pending the results of a remedial alternative analysis study being done.

During the environmental baseline survey, new information was uncovered about the location of the two oil burning pits that were listed in the ROD as the possible source for ground water contamination and these pits were investigated as part of the BRAC Cleanup Plan. It was decided during the remedial alternative analysis study that soil excavation and off-site disposal would remove the source area for the water contamination at OU2. Soil excavation and off-site disposal from these two burning pits was completed in July 2000. It was felt that excavation of the source area as the only means of source control might not prove effective. A carbon addition of vegetable oil to create a biologically active permeable-barrier wall across the leading edge of the course area was installed. This was considered the best and most cost-effective technology for mitigating or controlling the dissolved plume. Carbon addition coupled with excavation should reduce the time required to achieve MCLs and increase the possibility of achieving MCLs at the source area.

C. Operable Unit 4

Operable Unit 4 (OU4) is located at the north end of DDOU adjoining Weber County Fairground's western entrance way and parking area. OU4 consists of open burning trenches, an oil-holding/burning pit, fire training oil burning pit, fluorescent tubes burial areas, sanitary landfill and a methyl bromide cylinder/water purification tablet burial area.

OU4 is composed of Burial Sites 4-A through 4-E. Burial Site 4-A contained two shallow burning pits that were used from the mid-1950s to 1975. Materials disposed of and burned in this location include wood, crating material, paper, dispensary wastes, and

used motor oils and greases. Burial Site 4-B was reportedly used for the disposal of fluorescent tubes from the mid-1950s to the late 1960s. Burial Site 4-C consisted of four shallow trenches that were used as a sanitary landfill from 1969 to 1972. Materials disposed of in Burial Site 4-C included numerous cans of jam and jelly. Burial Site 4-D was reportedly used as a burial site for cylinders of methyl bromide from the mid-1940s to the mid-1960s. Although no methyl bromide cylinders were found during site investigations, large quantities of bottles containing water purification tablets were encountered. Burial Site 4-E consists of a shallow trench that was used as an oil holding and burning pit from the mid-1950s to mid-1960s. This site was used to dispose of refuse, waste oils, combustible solvents, and industrial wastes several times a year. Depot records indicate that this area was also used as a fire training area.

Analysis of soil samples revealed that the soil in Burial Site 4-E is the primary source of ground water contamination. Burial Site 4-A is considered a potential secondary source. Investigations in the other burial sites did not reveal any evidence that the materials disposed of at those locations are contaminating the shallow ground water or the soil.

OU4 consisted of both soil and groundwater contamination. The contaminants of concern in the soil are lead, arsenic, PCBs, VOCs, and debris associated with the burial areas. The contaminants associated with the groundwater are VOCs (including benzene, DCE, TCE, and vinyl chloride), dioxins/furans and PCBs.

DDOU, the State of Utah and EPA Region VIII signed the ROD for OU4 in September 1992.

Remedial Design/Remedial Action Contract was awarded in October 1993 to perform the selected cleanup. The soil remediation action was completed in June 1995. Groundwater cleanup began in July 1995 and is still ongoing.

During the installation of the OU4 groundwater treatment system, vinyl chloride contamination was detected at some of the proposed injection well locations, which were previously believed to be free of subsurface contamination. It was decided at this time that further investigation was needed in the delineation of the extent of vinyl chloride contamination. After further investigation, the plume was redefined and expanded to include areas beyond the original plume boundary. Most of the newly discovered groundwater plume is being captured by the existing pump and treat system; however, the northern lobe of the new plume is not. DDOU determined that the addition of an extraction trench instead of more extraction wells would quickly and more efficiently capture this northern lobe of the groundwater plume. An extraction trench was installed and an ozonation treatment system was constructed. This system treats the extracted ground water by an advanced oxidation process using ozone and hydrogen peroxide. The treated ground water is discharged into the sanitary sewer. The new system was operational in March 1999. During the BRAC Environmental Baseline Survey, aerial photographs of the Depot from 1950 were discovered which revealed the presence of a five former disposal trenches and an oil pit in the area where Buildings 15C and 16C were later constructed. It was felt that the oil pit was the probable source of the volatile

organic compounds detected in the northern lobe of the plume. Additional investigations were done in this area and an exploration trench was made to ascertain the exact location of the disposal trenches and the oil pit. The results from these investigations necessitated that additional soil excavation and off-site soil removal be done. The excavation and off-site removal was completed in January 1999. Because fundamental changes were made to the final Remedial Action Plan described in the ROD, a ROD Amendment was made in September 2000.

IV. REMEDIAL ACTIONS

A. Remedy Selection:
The selected remedy for OU1, OU2, and OU4 was on-site groundwater treatment and off-site landfill disposal of contaminated soil.

The purpose of excavation and off-site landfill disposal of soil and debris was to protect people and the environment by removing the potential for contact with contaminants present in the material. This would also eliminate any possibility of the contaminants leaching into the shallow groundwater in the future.

The purpose of the groundwater treatment facilities was to eliminate/contain the off-site migration of contaminated groundwater and to treat it to at or below MCLs. This will also result in compliance with all applicable or relevant and appropriate requirements (ARARs).

B. Evaluation of Remedy Selected for Soil Remediation Treatment:
The remediation standards for soil cleanup activities were the concentrations of contaminants in soil at their designed cleanup levels. Verification testing was required to ensure that all soils having contaminant concentrations above cleanup levels were removed.

C. Evaluation of Remedy Selected for Ground Water Treatment:

Operable Unit 1
The ground water is extracted from 16 ground water extraction wells and then the water is pumped through an air stripper. The treated water is injected (pumped) back into the same aquifer with 16 ground water injection wells. This ground water extraction and treatment is employed to control potential future exposure and risks associated with consumption or contaminated ground water. The ground water extraction and treatment began in December 1994.

Operation of the OU1 treatment system has resulted in a general remediation of impacted ground water through time. The area of attainment, measured contaminant concentrations in ground water, and measured contaminant concentrations in treatment plant influent has all decreased since the treatment system began operating. The area of attainment (that area where ground water contaminant concentrations exceed the cleanup objectives) has diminished since the system began operating in October 1994. The

ground water treatment system has removed approximately 95% of the VOC contaminants that were detected during the original Remedial Investigation/Feasibility Study (RI/FS) for OU1. With the exception of groundwater in the vicinity of monitoring well JMM-22, the ground water remediation program appears to have reached the cleanup goals established by the ROD for this operable unit.

The ground water treatment system has had a problem with iron-related bacteria (IRB). This has caused a major concern because of the difficulty maintaining the system design flow rates. This difficulty is due in part to the presence of indigenous IRB in the aquifer and its tendency to flourish within the treatment system, thereby reducing the system performance. The problem is compounded by the shallow water table which limits the dynamic head available to the injection system and the relatively low aquifer transmissivity which inhibits both extraction and injection rates. The extraction well lines were replaced to clear the lines of foreign material, which increased the flow to and from the plant. An aggressive well maintenance and accelerated ground water extraction program has been implemented. Also, a biocide injection system is currently being tested at two extraction wells to see if it will prevent the fouling of the new influent piping and reduce biofouling throughout the system.

Operable Unit 2

A ground water pump-and-treat system of 10 extraction wells along the plume centerline and a total of 21 injection wells on either side of the plume were installed in 1992. The OU2 dissolved contaminant plume has been reduced to approximately one-third its original size since the ground water extraction and re-injection remedial measure was implemented in 1992, and was successful in reducing contaminant concentrations to below MCLs throughout the plume. The system was shut down between October 1996 and September 1997 because cleanup levels had been achieved. The system was restarted due to the monitoring well results indicating that contaminant levels exceeded regulatory standards in some wells. It was operated between October 1997 and September 1998. An interim shutdown of the system was started in October 1998 while an optimization study was done to select a more effective remedy for the ground water at OU2. It was felt that the existing treatment system had little effect on the contaminated ground water plume during the preceding three years. The behavior of the plume was virtually the same whether the system was on or off. The maximum TCE concentrations followed a clear seasonal cycle, probably driven by seasonal fluctuations within the shallow aquifer. Every year, maximum concentrations were the highest in the winter and early spring and were lowest in the early summer. This pattern persisted whether the system was on or off.

The apparent source of the ground water contamination is the site of two or more former burn pits used for fire training exercises approximately between 1955 and 1965. The burn pits were located at the northwest end of the Parade Ground, which was covered by a baseball field. It was decided that soil excavation and off-site disposal of these burning pits would remove the source area for the water contamination at OU2. This removal action was completed in July 2000. It was felt that excavation of the source area as the only means of source control might not prove effective. A carbon addition of vegetable

oil to create a biologically active permeable-barrier wall across the leading edge of the course area was installed. This was considered the best and most cost-effective technology for mitigating or controlling the dissolved plume. Carbon addition coupled with excavation should reduce the time required to achieve MCLs and increase the possibility of achieving MCLs at the source area. A revised OU2 Groundwater Sampling Plan was initiated in January 2000 to continue monitoring the OU2 contaminated ground water plume. The ground water extraction and re-injection system is being maintained and kept operational in the event that its use becomes necessary to control an expanding plume originating at the source, but remain off-line unless required.

Operable Unit 4

The ground water treatment system at OU4 is functioning as designed and is resulting in an overall reduction of contaminants of concern on the site, and capture of the contaminant plume. The hydraulic control continues to be effective, with injection well mounds on either side of extraction well depressions within the plume. The artesian head in the deeper water supply aquifer continues to be above the shallow water table, precluding downward seepage and contamination of the deeper aquifer. The analytical results from the semi-annual sampling of the monitoring wells indicate an overall reduction in the contaminants of concern inside the plume.

The ground water treatment system has had a problem with IRB. This difficulty is due in part to the presence of indigenous IRB in the aquifer and its tendency to flourish within the treatment system, thereby reducing system performance. The problem is compounded by the shallow water table, which limits the dynamic head available to the injection system, and the relatively low aquifer transmissivity, which inhibits extraction and injection rates. The contractor has initiated a vigorous preventive maintenance program to try to combat this problem.

During installation of the OU4 ground water treatment system, vinyl chloride contamination was detected at some of the proposed injection well locations, which were previously believed to be free of subsurface contamination. It was decided at this time that further investigation was needed to in the delineation of the extent of vinyl chloride contamination. After further investigation, the plume was redefined and expanded to include areas beyond the original plume boundary. Most of the newly discovered ground water was being captured by the existing pump and treat system; however, the northern lobe of the new plume was not. It was determined that the addition of an extraction trench instead of more extraction wells would quickly and more efficiently capture this northern lobe of the ground water plume. The pump and treat system was already operating near its design capacity and would have required extensive retrofitting to handle the additional water. The cost-effective approach was the installation of an extraction trench and treatment of extracted water by an ozonation system, and discharge of treated water to a sanitary sewer system to address this portion of the redefined plume. The new system became operational in March 1999.

D. Operation and Maintenance: The following outlines the continuing work that will be ongoing:

Environmental/performance monitoring will continue to be conducted in accordance with applicable monitoring plans.

Operation and maintenance of the ground water treatment facilities at OU1 and OU4 will continue. The ground water treatment facility at OU2 is being maintained and kept operational in the event that its use becomes necessary but remains off-line as required.

V. FIVE-YEAR REVIEW PROCESS

The five-year review was conducted by DDHU environmental personnel. This five-year review consisted of a review of relevant documents and a site inspection. A letter will be sent to the individuals listed in the Community Relations Plan advising them that a new five-year review has been conducted and the report is available in the Administrative Record maintained at the former DDOU.

VI. FIVE-YEAR REVIEW FINDINGS

Site Inspection: Representatives of the DDHU Environmental Office took part in a site inspection on October 15, 2000. During the site inspection, remedial systems were inspected and groundwater-monitoring efforts were observed. The inspection evaluated the groundwater treatment systems at OU1 and OU4. The groundwater treatment systems were found to be operating and functioning properly. All groundwater extraction and injection well covers were intact and locked, with no signs of damage. The treatment systems at OU1 and OU4 are maintaining an average rate of 100 gpm. Visual inspection of the pumps and treatment system showed limited signs of wear and minimal rust. In the past, the groundwater treatment systems have had a problem with IRB. The contractor has initiated a vigorous preventive maintenance program to combat this problem.

Progress Reports: The data received from our quarterly reports demonstrates that the treatment systems have reduced the contaminant levels at the two operable units (OU1 and OU4). Documents are attached which show this reduction. (Enclosures 1 and 2)

VII. ASSESSMENT

The following conclusions support the determination that the remedies selected at the former DDOU are protective of human health and the environment.

Question A: Are the remedies functioning as intended by the decision documents?

The remedies at the operable units are functioning as intended by the decision documents.

Question B: Are the assumptions used at the time of remedy selection still valid?

The assumptions used at the time of remedy selection are still valid.

Questions C: Has any other information come to light that could call into question the protectiveness of the remedies?

No additional information has been identified that would call into question the protectiveness of the remedies.

VIII. DEFICIENCIES

No deficiencies were noted during this review.

IX. RECOMMENDATIONS AND FOLLOW-UP ACTIONS

Recommendations are as follows:

Operable Unit 1

Operation of the OU1 treatment system has resulted in a general remediation of impacted ground water through time. The area of attainment, measured contaminant concentrations in groundwater, and measured contaminant concentrations in treatment plant influent has all decreased since the treatment system began operating. In view of this progress, it is appropriate to evaluate whether changes to the remediation system could be made to improve its efficiency. The current system has successfully addressed the contamination problem that existed prior to 1995, but it is no longer ideally suited to the different distribution of contaminants that exists today. DDHU tasked the COE to do an optimization study to see if it was possible to modify the current system to expedite the accomplishment of the remediation objective while reducing operating costs. Accordingly, several alternative scenarios for ground water treatment were examined to address the remediation of residual ground water contamination at OU1. These alternatives include:

No change to the existing system.
Reduced pumping rates of selected extraction wells.
Installation of new extraction wells.
Modification to the compliance ground water monitoring plan.
Reconfiguration of the injection well system.
An investigation to ascertain if there is a continuing source in the vicinity of JMM-22.

Operable Unit 2

As a contingency, DDHU can modify the existing OU2 extraction system to contain ground water migrating from the source area in case contaminant concentrations reach unacceptable levels at Extraction Wells 2, 3 or 4. This modification will allow the sole operation of Extraction Well 2 and possible Extraction Well 3, but only if necessary. New extraction wells are not considered necessary and are not recommended. The

modified system would only be turned on if a VOC exceeds its MCL at point-of-compliance well Extraction Well 2 for two consecutive semi-annual monitoring events or sentinel well Extraction Well 4 for any single event, and an increasing trend in concentrations nearer to the source is evident. The extraction system would be turned off when the concentration for a contaminant exceeding its MCL is below the MCL for two consecutive semi-annual monitoring events.

Operable Unit 4

DLA has initiated a Remedial Process Optimization project to improve the efficiency and effectiveness of active remediation systems. The US Air Force Center for Environmental Excellence is providing technical oversight for this project. They will be evaluating the effectiveness and efficiency of the current ground water extraction, treatment and discharge systems in achieving ground water containment and remediation at OU4. This study should generate recommendations of practical methods for optimizing the existing remediation system at OU4 and to identify those parts of the existing regulatory framework that should be examined for this applicability to current conditions at DDHU. To accomplish these goals, the study will:

Evaluate the effectiveness and efficient of the current ground water extraction, Treatment and discharge systems in achieving ground water containment and Remediation at OU4 and provide recommendations for optimization or improvements;

Use EPA-approved statistical methodology to evaluate the degree to which compliance has been achieved on a site-to-site basis;

Evaluate the existing monitoring networks and long-term monitoring plans and provide recommendations for their optimization;

Evaluate the existing regulatory framework and remedial action objectives for groundwater plumes at OU4;

Provide recommendations for developing site monitoring and closure strategies.

X. PROTECTIVENESS STATEMENT

DDHU certifies that the remedies selected for this site are or will be fully implemented and will remain protective of human health and the environment.

XI. NEXT FIVE-YEAR REVIEW

This is a statutory site that requires ongoing five-year reviews. The next review will be conducted within five years of the completion of this five-year review report. The completion date is the date of the signature cover attached to the front of this report.

XII. OTHER COMMENTS

The CSSs were discussed under the Area of Noncompliance Section in the Five-Year Review for OU2 completed in June 1996. The Federal Facility Agreement listed 9 CSSs to be investigated under the Remedial Investigation/Feasibility Study at DDOU. It was determined that these sites would be investigated after the remediation had taken place at the 4 operable units. The following is a brief description of the original nine CSSs and the status of remedial action:

(1) **DDT Storage.** Building 5X was used to store DDT when DDOU became the collection point for DDT storage for western states after EPA banned its use. The storage areas were regularly checked for damaged or leaking containers and all damaged containers were recontainerized in 55-gallon drums. **STATUS**: The analyses from the wipe sample testing done in this building determined there was no contamination. It was decided by EPA, UDEQ and DDHU that no further action was necessary.

(2) **DDT and Hazardous Chemical Storage**. Building 4X was used to store DDT, acids, bases and solvents. DDT was managed in this building under the same procedures as in Building 5X. **STATUS**: The analyses from the wipe sample testing done in this building determined there was no contamination. It was decided by EPA, UDEQ, and DDHU that no further action was necessary.

(3) **Hazardous Chemical Storage.** Building 275 was used for chemical storage under procedures similar to Building 4X and 5X. **STATUS:** The analyses from the wipe sample testing done in this building determined there was no contamination. It was decided by EPA, UDEQ, and DDHU that no further action was necessary.

(4) **Vaulted Leaking Transformers.** This site included several different locations where a total of forty vault-enclosed transformers showed signs of light seeping or leaking. The transformers, containing Pyranol Oil composed of PCBs were replaced, and seepage on the vaults was cleaned up. The PCB transformers and residue was then disposed of in 1982 and 1983. The vaults contained serviceable transformers, which showed no signs of seepage or leakage. **STATUS:** Remedial activities were completed at the indoor vaulted transformers in June 1998.

(5) **Transformer Storage**. Leaking transformers removed from the vaults were held in Building 11B-2 prior to disposal by the Defense Property Disposal Office. The transformers were stored in metal pans in order to catch any leaking oils. **STATUS:** Initial sampling conducted at this site determined that PCBs were not present. It was decided by EPA, UDEQ and DDHU that no further action was necessary.

(6) **Nonvaulted Leaking Transformers**. Eleven leaking transformers, mounted on racks in four areas, were found to be filled with Pyronal PCB Oil. These leaking PCB transformers had contaminated the mounting racks and surface soil beneath them. The transformers, mounting racks and contaminated soil were removed and disposed of in 1982 and 1983 and new transformers and mounting racks were installed. **STATUS**: Remedial action was completed in May 1998.

(7) **Pistol Range and Old Skeet Range**. The pistol and skeet ranges have never had extensive use and the spent cartridges from both ranges and the lead from the pistol range have already been cleaned up and turned in to the Defense Property Disposal Office. **STATUS:** Remedial action was completed in December 2000.

(8) **World War II Mustard Storage Area.** Over one million pounds of mustard gas was stored in one-ton containers in the igloo area near Building 118 from 1942 to 1946. Chemical agent identification sets were also stored in this area. No problems were reported with storage of the one-ton containers. However, several substandard containers of the chemical agent identification sets were received and immediately disposed of in Operable Unit 3. **STATUS**: Upon further investigation of CSS #8, it was determined that no further action was necessary. This was agreed upon by the State of Utah and EPA Region VIII in July 1991.

(9) **Western Boundary Area**. The western boundary occupies a strip measuring approximately 7,000 feet along the western property boundary of the DDOU facility. Tomlinson Road (1200 West) extends in a north-south direction and lies just outside the entire western margin of the western boundary area. **STATUS:** During investigation, it was determined that this area comprised the northern part of the Old Plain City Canal. Remediation action was completed during the second phase of the OU1 cleanup of the Plain City Canal and was completed in December 1999.

SUPPORTING DATA
FOR
OPERABLE UNIT 1

ENCLOSURE 1

SUMMARY OF VINYL CHLORIDE AND TCE CONCENTRATIONS FROM OU1 COMPLIANCE WELLS

		VINYL CHLORIDE ug/L			TCE ug/L		
WELL ID	LOCATION AND PURPOSE	APR 91	YEAR 1 QTR 1	YEAR 6 QTR 3	APR 91	YEAR 1 QTR 1	YEAR 6 QTR 3
JMM-47R	WELLS INSIDE OF PLUME	7.8	2.2	ND	ND	ND	ND
AEHA-9		10.0	4.0	3.7	ND	ND	0.5
JMM-59		ND	--	0.8	ND	ND	2.3
JMM-22		7.8	5.6	5.3	ND	ND	ND
JMM-3		ND	ND	ND	ND	ND	ND
ESE-15		2.9	1.4	ND	0.9	ND	ND
JMM-60R		--	1.1	0.9	--	ND	ND
JMM-19		5.6	3.3	2.5	ND	ND	ND
JMM-17	WELLS DOWN GRADIENT	--	ND	ND	--	ND	ND
JMM-29		--	ND	ND	--	ND	ND
JMM-63		--	ND	ND	--	ND	ND
JMM-48	WELLS CROSS GRADIENT	--	ND	ND	--	ND	ND
JMM-6		1.3	ND	ND	ND	ND	ND
JMM-62		--	ND	ND	--	ND	ND
JMM-20	WELL UPGRADIENT	ND	ND	ND	ND	ND	ND

Treatment Plant Influent
Contaminant Versus Time
Operable Unit -1
Defense Depot, Hill, Utah
July 1999

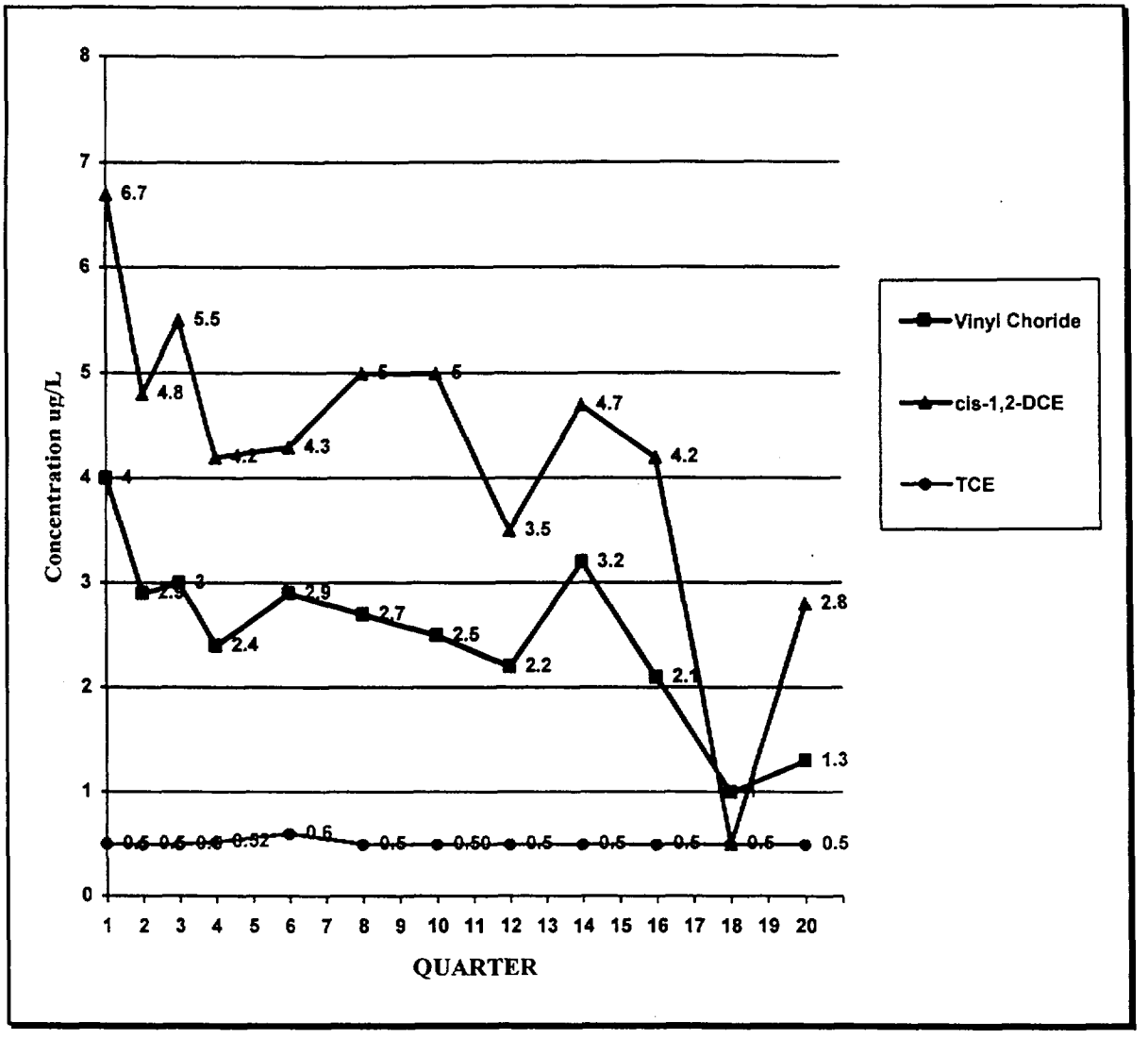

Figure 6. Plot of VOC concentration versus time for plant influent.

OU1 EXTRACTION WELL DATA FOR VINYL CHLORIDE

	JAN 97*	AUG 98	JUL99
EW-1	1.4	0.68	0.5
EW-2	--	0.58	0.8
EW-3	0.97	0.54	0.8
EW-4	--	2.30	1.8
EW-5	--	4.30	1.5
EW-6	--	1.20	1.6
EW-7	--	1.90	1.8
EW-8	3.00	0.53	1.8
EW-9	--	2.80	0.8
EW-10	--	ND	1.5
EW-11	--	ND	ND
EW-12	--	0.91	ND
EW-13	--	0.81	1.40
EW-14	--	1.20	0.60
EW-15	--	ND	ND
EW-16	--	3.10	1.20

*ONLY 3 EXTRACTION WELLS WERE SAMPLED IN JAN 97.

OU1 EXTRACTION WELL DATA FOR TCE

	JAN 97*	AUG 98	JUL 99
EW-1	ND	ND	ND
EW-2	--	ND	ND
EW-3	0.93	0.95	ND
EW-4	--	2.60	1.0
EW-5	--	ND	ND
EW-6	--	ND	ND
EW-7	--	ND	ND
EW-8	ND	0.59	ND
EW-9	--	ND	2.1
EW-10	--	0.70	ND
EW-11	--	ND	0.8
EW-12	--	ND	0.5
EW-13	--	2.70	0.5
EW-14	--	ND	0.9
EW-15	--	0.97	ND
EW-16	--	ND	ND

*ONLY 3 EXTRACTION WELLS WERE SAMPLED IN JAN 97.

OU1 EXTRACTION WELL DATA FOR DCE

	JAN 97*	AUG 98	JUL 99
EW-1	4.5	2.30	1.70
EW-2	--	2.00	2.00
EW-3	4.0	3.60	2.20
EW-4	--	7.60	5.20
EW-5	--	4.70	2.50
EW-6	--	3.00	2.90
EW-7	--	4.40	3.00
EW-8	6.6	2.50	4.10
EW-9	--	7.10	3.10
EW-10	--	7.50	4.40
EW-11	--	0.99	1.30
EW-12	--	2.10	1.90
EW-13	--	4.10	3.00
EW-14	--	2.40	2.00
EW-15	--	ND	0.60
EW-16	--	3.50	2.20

*ONLY 3 EXTRACTION WELLS WERE SAMPLED IN JAN 97.

SUPPORTING DATA
FOR
OPERABLE UNIT 4

ENCLOSURE 2

Summary of TCE and Benzene Concentrations from OU-4 Compliance Monitoring Wells

Well ID	Location and Purpose	TCE, µg/L		Benzene, µg/L	
		Year 1 Q1	Year 5 Q3	Year 1 Q1	Year 5 Q3
Cleanup Level		**5.0 µg/L**		**5.0 µg/L**	
JMM-44	Well upgradient of plume	1.9	0.63	ND	0.5U
JMM-7R[a]	Wells inside of plume	ND	0.5U	**18**	0.5U
JMM-9		ND	0.5U	3.8	0.5U
JMM-57		ND	0.5U	0.6	0.5U
JMM-56		5.8	0.49	ND	0.5U
JMM-8		ND	0.5U	2.5	0.55
JMM-46		4.6	0.5U	ND	0.5U
JMM-64		0.7	0.5U	ND	0.5U
JMM-41D	Deep groundwater (artesian) wells used to monitor quality of lower aquifer	4.8	0.5U	ND	0.5U
JMM-42D		ND	0.5U	ND	0.5U
JMM-43D		1.4	0.5U	ND	0.5U
JMM-30	Wells downgradient of the plume used to monitor remediation progress of plume	ND	0.5U	ND	0.5U
JMM-15	Wells cross-gradient of the plume used to monitor whether plume is being contained during remediation	0.9	0.5U	ND	0.5U
JMM-14R[b]		ND	0.5U	ND	0.5U
JMM-33		ND	0.5U	ND	0.5U
JMM-65		ND	0.5U	ND	0.5U

[a] *Well JMM-7R replaced JMM-52R in the First Quarter of the Fourth Year. Groundwater samples from JMM-52R foamed in the lab due to the presence of surfactants.*

[b] *Well JMM-14R was re-installed March 1999.*

"—" denotes the well did not exist at this time.

µg/L denotes micrograms per liter.

J qualifier indicates that the compound was positively identified but the quantitation is an estimate.

NA denotes the sample was not analyzed for this compound.

ND denotes the compound was not detected above the method detection limit.

Q denotes Quarter.

Results in bold indicate values above the cleanup level.

Shaded cells indicate values above the method detection limit.

U qualifier indicates that the compound was not detected above the specified quantitation limit.

Summary of Vinyl Chloride and DCE Concentrations from OU-4 Compliance Monitoring Wells

Well ID	Location and Purpose	Vinyl Chloride, µg/L			DCE, µg/L		
		April 1991	Year 1 Quarter 1	Year 5 Quarter 3	April 1991	Year 1 Quarter 1	Year 5 Quarter 3
Cleanup Level		**2.0 µg/L**			**70 µg/L**		
JMM-44	Well upgradient of plume	NA	ND	0.5U	NA	ND	1.3
JMM-7R[a]	Wells inside of plume	**<10,000**	**180**	0.5U	**60,000**	**480**	0.98
JMM-9		**360**	**130**	6.2	**260**	55	5.5
JMM-57		22	17	2.8	23	21	7.8
JMM-56		53	3.5	1.2	68	6.5	2.3
JMM-8		34	49	7.8	97	110	16
JMM-46		17	13	2.4	82	39	8.4
JMM-64		—	22	2.8	—	45	14
JMM-41D	Deep groundwater (artesian) wells used to monitor quality of lower aquifer	—	ND	0.5U	—	ND	0.5U
JMM-42D		—	ND	0.5U	—	ND	0.5U
JMM-43D		—	ND	0.5U	—	ND	0.5U
JMM-30	Wells down-gradient of the plume used to monitor remediation progress of plume	NA	ND	0.5U	NA	ND	0.5U
JMM-15	Wells cross-gradient of the plume. Used to monitor if plume is being contained during remediation.	<1	ND	0.5U	4.7	3.3	3.1
JMM-14R[b]		NA	ND	0.5U	NA	0.5	0.43J
JMM-33		<1	ND	0.5U	<0.5	ND	0.5U
JMM-65		—	ND	0.5U	—	0.5	0.5U

[a] *Well JMM-7R replaced JMM-52R in the First Quarter of the Fourth Year. Groundwater samples from JMM-52R foamed in the lab due to the presence of surfactants.*

[b] *Well JMM-14R was re-installed March 1999.*

"—" denotes the well did not exist at this time.

µg/L denotes micrograms per liter.

DCE denotes cis-1,2-dichloroethene.

J qualifier indicates that the compound was positively identified but the quantitation is an estimate.

NA denotes the sample was not analyzed for this compound.

ND denotes the compound was not detected above the method detection limit.

Results in bold indicate values above the cleanup level.

Shaded cells indicate values above the method detection limit.

U qualifier indicates that the compound was not detected above the specified quantitation limit.

Comparison of First Year and Fifth Year Analytical Results from the OU-4 Air Stripper Treatment Plant

Sample Location	Vinyl Chloride µg/L		DCE µg/L		TCE µg/L		Benzene µg/L	
Effluent Discharge Limits	1.0		35		2.5		2.5	
Year	**1**	**5**	**1**	**5**	**1**	**5**	**1**	**5**
Frequency of Collection	Monthly	1st & 3rd Quarters	Monthly	1st & 3rd Quarters	Monthly	1st & 3rd Quarters	Monthly	1st & 3rd Quarters
SP-201 (influent)	7.7–90	29–30	35–560	38–53	ND–8	3.3–4.1	0.6–6.0	1.5–2.2
SP-204 (effluent)	ND	0.5U	ND–13	0.5U	ND–0.5	0.5U	ND	0.5U

µg/L denotes micrograms per liter.

U qualifier indicates that the compound was not detected above the specified quantitation limit.

ND denotes not detected above the method detection limit, which varied between samples and quarters, but never exceeded the effluent discharge limits.

SP denotes sample port.

OU4 EXTRACTION WELL DATA FOR VINYL CHLORIDE

	AUG 00	JAN 99	JUL 96	JAN 96	OCT 95	JUL 95
EW-01	81.1	56.0	310.0	320.0	ND	ND
EW-02	22.7	56.0	47.0	170.0	ND	ND
EW-03	14.3	53.0	53.0	57.0	65.0	ND
EW-04	ND	0.7	1.7	10.0	17.0	22.0
EW-05	ND	0.7	ND	ND	140.0	3.0
EW-06	121.0	150.0	110.0	110.0	360.0	330.0
EW-07	93.9	71.0	12.0	45.0	77.0	30.0
EW-08	156.0	100.0	180.0	340.0	170.0	380.0
EW-09	10.2	15.0	7.7	5.4	4.8	12.0
EW-10	ND	0.5	ND	ND	ND	3.6
EW-11	ND	16.0	ND	140.0	180.0	480.0
EW-12	ND	ND	0.7	ND	ND	13.0
EW-13	ND	ND	0.5	1.5	ND	2.2
EW-14	7.2	19.0	65.0	160.0	200.0	260.0
EW-15	ND	ND	0.8	2.8	ND	2.8
EW-16	ND	1.6	11.0	23.0	13.0	16.0
EW-17	ND	ND	ND	ND	ND	ND
EW-18	2.7	8.1	9.0	15.0	17.0	15.0
EW-19	5.2	33.0	68.0	150.0	180.0	130.0
EW-20	ND	ND	ND	ND	ND	ND
EW-21	5.0	7.0	6.8	19.0	33.0	22.0
EW-22	3.2	23.0	15.0	41.0	20.0	36.0
EW-23	ND	0.6	ND	1.7	ND	ND
EW-24	5.2	5.8	6.5	12.0	51.0	20.0
EW-25	1.9	4.3	11.0	10.0	40.0	38.0
EW-26	ND	ND	ND	ND	ND	ND
EW-27	7.7	12.0	15.0	26.0	43.0	66.0
EW-28	ND	1.5	0.8	2.8	40.0	13.0
EW-29*	1.4	6.2	3.2	4.6	ND	8.2
EW-30*	ND	3.7	1.5	5.8	ND	3.7
EW-31*	ND	4.3	2.5	6.8	ND	6.5

*Located by West Gate

OU4 EXTRACTION WELL DATA FOR DCE

	AUG 00	JAN 99	JUL 96	JAN 96	OCT 95	JUL 95
EW-01	167.0	200.0	3400.0	5700.0	2100.0	2200.0
EW-02	148.0	950.0	970.0	8100.0	1100.0	3400.0
EW-03	7.5	25.0	53.0	59.0	19.0	100.0
EW-04	ND	0.9	1.6	11.0	14.0	52.0
EW-05	1.7	0.8	1.7	2.6	190.0	3.1
EW-06	276.0	1100.0	2000.0	1100.0	770.0	92.0
EW-07	115.0	130.0	59.0	130.0	170.0	52.0
EW-08	59.8	32.0	610.0	340.0	190.0	640.0
EW-09	12.9	43.0	40.0	23.0	5.8	26.0
EW-10	2.5	3.7	6.1	13.0	11.0	12.0
EW-11	ND	1.9	30.0	46.0	16.0	220.0
EW-12	2.9	0.9	2.3	5.0	1.2	14.0
EW-13	1.5	3.2	5.6	15.0	6.6	9.7
EW-14	21.3	14.0	65.0	110.0	54.0	74.0
EW-15	12.9	1.3	2.6	5.7	ND	3.6
EW-16	2.7	8.3	20.0	37.0	16.0	20.0
EW-17	6.6	ND	ND	ND	ND	ND
EW-18	11.6	21.0	30.0	48.0	35.0	32.0
EW-19	7.6	33.0	74.0	190.0	63.0	60.0
EW-20	ND	ND	ND	ND	ND	ND
EW-21	11.6	18.0	30.0	81.0	45.0	52.0
EW-22	6.6	29.0	21.0	57.0	15.0	26.0
EW-23	0.7	1.5	1.0	3.4	ND	1.1
EW-24	10.6	14.0	29.0	58.0	58.0	44.0
EW-25	4.1	7.7	16.0	2.0	33.0	25.0
EW-26	ND	ND	ND	0.5	ND	ND
EW-27	12.5	21.0	30.0	45.0	31.0	42.0
EW-28	1.0	3.8	2.7	5.6	21.0	7.6
EW-29	5.4	15.0	10.0	16.0	ND	13.0
EW-30	2.8	15.0	7.4	27.0	6.1	11.0
EW-31	0.2	14.0	9.4	25.0	4.7	14.0

OU4 EXTRACTION WELL DATA FOR TCE

	AUG 00	JAN 99	JUL 96	JAN 96	OCT 95	JUL 95
EW-01	ND	1.3	30.0	ND	ND	ND
EW-02	1.1	4.2	4.4	ND	ND	ND
EW-03	ND	0.7	0.9	ND	ND	ND
EW-04	ND	ND	0.5	ND	ND	ND
EW-05	ND	ND	0.5	ND	ND	ND
EW-06	9.5	46.0	55.0	31.0	ND	ND
EW-07	0.7	0.7	1.4	ND	ND	ND
EW-08	ND	ND	6.8	ND	ND	ND
EW-09	6.9	52.0	56.0	ND	ND	ND
EW-10	ND	ND	ND	ND	ND	ND
EW-11	ND	ND	0.6	ND	ND	ND
EW-12	ND	ND	1.0	ND	ND	ND
EW-13	ND	ND	ND	ND	ND	0.7
EW-14	ND	0.6	1.1	ND	ND	ND
EW-15	ND	ND	ND	ND	ND	ND
EW-16	ND	ND	ND	ND	ND	ND
EW-17	ND	ND	ND	ND	ND	0.7
EW-18	ND	ND	ND	ND	ND	ND
EW-19	ND	0.8	1.0	ND	ND	ND
EW-20	ND	ND	ND	ND	ND	ND
EW-21	ND	ND	ND	ND	ND	ND
EW-22	ND	0.6	0.5	ND	ND	ND
EW-23	ND	ND	ND	ND	ND	ND
EW-24	ND	ND	ND	ND	ND	ND
EW-25	ND	ND	ND	ND	ND	ND
EW-26	ND	ND	ND	ND	ND	ND
EW-27	ND	0.6	0.6	ND	ND	ND
EW-28	ND	ND	ND	ND	ND	ND
EW-29	ND	ND	ND	ND	ND	ND
EW-30	ND	ND	ND	ND	ND	ND
EW-31	ND	ND	ND	ND	ND	ND

OU4 EXTRACTION WELL DATA FOR BENZENE

	AUG 00	JAN 99	JUL 96	JAN 96	OCT 95	JUL 95
EW-01	9.6	13.0	84.0	98.0	ND	ND
EW-02	9.0	49.0	35.0	72.0	ND	ND
EW-03	4.1	6.7	4.1	5.7	1.7	8.0
EW-04	ND	ND	ND	0.5	ND	ND
EW-05	ND	ND	ND	ND	2.9	ND
EW-06	8.8	24.0	34.0	31.0	ND	28.0
EW-07	4.6	4.8	1.6	3.5	2.5	1.0
EW-08	5.4	4.4	15.0	17.0	9.6	16.0
EW-09	ND	ND	ND	ND	ND	ND
EW-10	ND	ND	ND	ND	ND	ND
EW-11	ND	ND	5.6	6.0	ND	14.0
EW-12	ND	ND	ND	ND	ND	ND
EW-13	ND	ND	ND	ND	ND	ND
EW-14	0.9	0.7	3.1	2.6	ND	ND
EW-15	0.6	ND	ND	ND	ND	ND
EW-16	ND	ND	ND	ND	ND	ND
EW-17	0.4	ND	ND	ND	ND	ND
EW-18	ND	ND	ND	ND	ND	ND
EW-19	ND	0.5	1.3	1.6	ND	ND
EW-20	ND	ND	ND	ND	ND	ND
EW-21	ND	ND	ND	ND	ND	ND
EW-22	ND	ND	ND	ND	ND	ND
EW-23	ND	ND	ND	ND	ND	ND
EW-24	ND	ND	ND	ND	ND	ND
EW-25	ND	ND	ND	ND	ND	ND
EW-26	ND	ND	ND	ND	ND	ND
EW-27	ND	ND	ND	0.6	ND	ND
EW-28	ND	ND	ND	ND	ND	ND
EW-29	ND	ND	ND	ND	ND	ND
EW-30	ND	ND	ND	ND	ND	ND
EW-31	ND	ND	ND	ND	ND	ND