Final

Third Five-Year Review Report

for

Wasatch Chemical
National Priority List Site

Salt Lake City, Utah

September 2007

PREPARED BY:

U.S. Environmental Protection Agency, Region 8
Denver, Colorado

Approved by: Date:

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Third Five-Year Review Report

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Attachments

List of Acronyms

1,1-DCE	1,1-Dichloroethylene
2,4-D	2,4-Dichlorophenoxyacetic acid
ACLs	Alternate Concentration Limits
ARARs	Applicable or Relevant and Appropriate Requirements
BDI	Bio-Dechlor INOCULUM™
CD	Consent Decree
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CFR	Code of Federal Regulations
COCs	Contaminants of Concern
EA	Endangerment Assessment
EPA	United States Environmental Protection Agency
HRC	Hydrogen Release Compound
HQ	Hazard Quotient
IC	Institutional Control
ISV	In-situ Vitrification
DCE	Dichloroethene
MCL	Maximum Contaminant Level
NCP	National Contingency Plan
NPL	National Priority List
O&M	Operation and Maintenance
PCE	Perchloroethene
PCP	Pentachlorophenol
PRP	Potentially Responsible Party
RA	Remedial Action
RCRA	Resource Conservation and Recovery Act
RD/RA	Remedial Design/Remedial Action
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
TCE	Trichloroethene
UDEQ	Utah Department of Environmental Quality
UDWR	Utah Division of Water Rights
UDWQ	Utah Division of Water Quality
ug/L	Microgram per Liter
WQS	Water Quality Standards
VOCs	Volatile Organic Compounds

Executive Summary

The U.S. Environmental Protection Agency (EPA) Region 8 conducted the third Five-Year Review of the remedial actions implemented at the Wasatch Chemical Site (the Site) in Salt Lake City, Utah. The purpose of the Five-Year Review is to determine whether the Site remedy is protective of human health and the environment. The trigger action for this review is the completion of the second Five-Year Review in September 2002. Because hazardous substances, pollutants or contaminants remain at the Site above levels that allow for unrestricted use and unlimited exposure, another Five-Year Review is required by statute.

The Site is located in an industrial area of Salt Lake City, Utah, near the intersection of 700 West and 2100 South Street. As a result of ground water contamination to the north of the Site, the original boundaries delineated in the Record of Decision (ROD) were modified. The current boundary extends onto the adjacent Steelco property, as discussed in the Explanation of Significant Differences (ESD) to the ROD. The Site is comprised of approximately 18 acres, containing the former Wasatch Chemical property and portions of adjacent properties. Ground water occurs at shallow depth (<5 feet) and flows towards the north-northwest. Some ground water is thought to discharge to a ditch located along the west margin of the Site (700 West Ditch).

The remedy for the Site was considered operational and functional in 1994. Remedial activities included landfarming, collection and treatment of soils/wastes through In-Situ Vitrification (ISV), a ground water collection and treatment system, and environmental monitoring programs. Institutional controls prohibiting residential land use and restricting ground water use are also components of the remedy.

In January 2003, EPA granted approval to discontinue ground water extraction and treatment, and monitoring of natural attenuation (MNA) processes began. Ground water monitoring was conducted on a quarterly basis from 1995 through 2003, but was reduced to semiannual frequency thereafter. In addition, certain analytes whose concentrations have persistently remained below performance standards were dropped from the analyte list. Enhanced biodegradation activities were conducted in May 2004 and July 2006. Activities included injection of Hydrogen Release Compound Primer™ (HRC Primer), Hydrogen Release Compound (HRC), and Bio-Dechlor INOCULUM™ (BDI).

Monitored natural attenuation and the use of enhanced biodegradation processes is considered to be an interim pilot study. The efficacy of these alternative remedial measures will be evaluated before a final decision is reached regarding disposition of the ground water extraction and treatment system.

Based on time-series chemical concentration plots provided in Progress Reports and statistical tests applied to these data as described in the Progress Reports, overall ground water conditions at the Site have not demonstrated a meaningful improvement since the last Five-Year Review.

Concentrations of contaminants of concern (COCs) are either below the MCL or the concentration trend is inferred to be asymptotic at a concentration above the MCL using data between May 2004 and April 2007.

In addition, a 50% reduction in COC concentrations has been achieved (since the establishment of a baseline condition in 1995) at all but one monitoring station based on the best fit line to data roughly spanning the past 12 years as well as during the most recent measurement (April 2007).

The Consent Decree (CD) specifies conditions related to the above described analyses that would permit the establishment of alternative performance standards for the Site. It is recommended that Site conditions be evaluated against the requirements for alternative performance standards eligibility.

No major concerns were identified during this review. However, an institutional control restricting the use of ground water in the vicinity of the Site has not been formalized with the Utah Division of Water Rights. In addition, the presence of vinyl chloride in ground water suggests this chemical may need to be included as an indicator chemical with an associated performance standard. The need for an additional institutional control on future structures may exist based on the results of screening-level vapor intrusion modeling conducted as part of this Five-Year Review.

The remedy as implemented is currently protective of human health and the environment. Contaminated soils/wastes have been treated successfully and permanently. No evidence was found to suggest ground water use at the Site. Land use restrictions have been implemented in conformance with EPA requirements.

Five-Year Review Summary Form

SITE IDENTIFICATION		
Site name: Wasatch Chemical Site		
EPA ID: UTD000716399		
Region: 8	**State:** UT	**City/County:** Salt Lake City
SITE STATUS		
NPL status: Final		
Remediation status: Operating; Natural Attenuation Monitoring		
Multiple OUs: No		**Construction completion date:** 01/1996
Has site been put into reuse? No		
REVIEW STATUS		
Lead agency: EPA		
Author name: Rebecca Thomas		
Author title: Project Manager		**Author affiliation:** U.S.EPA, Region 8
Review period: 7/13/07 to 9/30/07		
Date(s) of site inspection: 08/03/07		
Type of review: Statutory		
Review number: 3 (third)		
Triggering action: Previous Five-Year Review Report		
Triggering action date: 09/02		
Due date: 9/07		

* ["OU" refers to operable unit.]

Five-Year Review Summary Form, cont'd.

Issues:

Item No.	Issues	Affects Current Protectiveness	Affects Future Protectiveness
1	Site conditions may meet the requirements for a waiver or modification of the Action Level Performance Standards for ground water as defined in the Consent Decree.	No	No
2	Hypothetical future occupied buildings constructed over portions of the remaining ground water contaminant plume may result in unacceptable human exposure to volatile organic vapors.	No	Potentially
3	Utah Division of Water Rights does not report the Site and vicinity as restricted for ground water use.	Potentially	Potentially
4	Vinyl chloride is present at concentrations up to 80 times the MCL but is not considered to be an indicator chemical subject to the requirements of the CD or ROD.	No	Potentially

Five-Year Review Summary Form, cont'd.

Recommendations and Follow-up Actions:

Item No.	Issues	Recommendations and Follow-up Actions	Party Responsible	Due Date
1	Site conditions may meet the requirements for a waiver or modification of the Action Level Performance Standards for ground water as defined in the Consent Decree.	Evaluate Site data against criteria for waiver or modification of the Action Level Performance Standards for ground water	EPA	September 30, 2008
2	Hypothetical future occupied buildings constructed over portions of the remaining ground water contaminant plume may result in unacceptable human exposure to volatile organic vapors.	Modify land use restriction institutional control to require an assessment of risks related to contaminant vapor intrusion prior to approval of a building permit for occupied structures.	Questar	September 30, 2008
3	Utah Division of Water Rights does not report the Site and vicinity as restricted for ground water use.	Implement restriction through Utah Division of Water Rights.	Questar	December 31, 2007
4	Vinyl chloride is present at concentrations up to 80 times the MCL but is not considered to be an indicator chemical subject to the requirements of the CD or ROD.	Consider the addition of vinyl chloride to the list of Indicator Chemicals.	EPA	September 30, 2008

Five-Year Review Summary Form, cont'd.

Protectiveness Statement(s):

The remedy as implemented is currently protective of human health and the environment. Contaminated ground water remains within the Site boundaries and no evidence of ground water use was identified. Soils and wastes containing contaminants above performance standards were successfully and permanently treated. Institutional controls prohibiting residential land use are in place.

Other Comments:

The CD specifies conditions related to the rate of decline of contaminant concentrations in ground water that would permit the establishment of alternative performance standards for the Site. It is recommended that Site conditions be evaluated against the requirements for alternative performance standards eligibility.

A ground water use restriction should be formalized with the Utah Division of Water Rights.

Consideration should be given to establishing vinyl chloride as an indicator chemical with an associated performance goal.

Consideration should also be given to the establishment of an institutional control in connection with the potential for intrusion of VOC vapors into a hypothetical future building in the vicinity of ground water contamination.

The soils/sludge remedy is completed and should be considered for deletion from the NPL. If Site ground water is deemed eligible for alternative performance standards, consideration should be given to Site deletion from the NPL.

Five-Year Review Report

I. Introduction

Purpose of the Review

The purpose of Five-Year Reviews is to determine whether the remedy at a site is protective of human health and the environment. The methods, findings, and conclusions of reviews are documented in Five-Year Review reports. In addition, Five-Year Review reports identify issues found during the review, if any, and recommendations to address them.

Authority for Conducting the Five-Year Review

The U.S. Environmental Protection Agency (EPA) is preparing this third Five-Year Review pursuant to CERCLA §121 and the National Contingency Plan (NCP). CERCLA §121 states:

> *If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each five years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented. In addition, if upon such review it is the judgment of the President that action is appropriate at such site in accordance with section [104] or [106], the President shall take or require such action. The President shall report to the Congress a list of facilities for which such review is required, the results of all such reviews, and any actions taken as a result of such reviews.*

The EPA interpreted this requirement further in the National Contingency Plan (NCP); 40 CFR §300.430(f)(4)(ii) states:

> *If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action.*

Who Conducted the Five-Year Review

The EPA Region 8 conducted the third Five-Year Review of remedial actions implemented at Wasatch Chemical Site (the Site) in Salt Lake City, Utah. This review was conducted from July 2007 through September 2007. This report documents the results of the review. HDR Engineering, Inc. (HDR) of Denver, Colorado was retained by US Army Corps of Engineers, Kansas City District to provide technical support during preparation of the Five-Year Review Report.

Other Review Characteristics

This is the third Five-Year Review for the Site. The triggering action for this review is the completion of the second Five-Year Review in September 2002. Because hazardous substances, pollutants or contaminants remain at the Site above levels that allow for unrestricted use and unlimited exposure, another Five-Year Review is required.

Introductory portions of this report are taken directly from the second Five-Year Review report.

II. Site Chronology

Table 1 - Chronology of Site Events

Event	Date
Site used for warehousing, producing, and packaging industrial chemical products.	1957-1971
Operations were expanded to include the manufacture of fertilizers.	1971
A liquid and dry pesticide formulation building was constructed.	1973
The agricultural chemical, industrial chemical and cleaner businesses were sold. The agricultural chemical business was moved off-Site. The industrial chemical business continued to operate, on a limited extent, on-Site through August 1992.	1978-1992
EPA conducted Site inspection for removal action.	September 1985
Unilateral Administrative Order issued ordering removal action and sampling of soils and water.	March 1986
EPA proposes Lot 6 to be listed on NPL.	January 1987
Remedial Investigation completed by Questar InfoComm, Inc. (Questar), the facility owner/operator.	March 1990
Feasibility Study completed by Questar.	August 1990
The Site was placed on NPL.	February 1991
EPA/UDEQ issue ROD.	March 1991
Consent Decree finalized and accepted by EPA, UDEQ and Questar.	November 1991
EPA and UDEQ certify completion of the land farm remedy.	January 1994
Remedial Design/Remedial Action Reports completed.	June 1995
Explanation of Significant Differences to the ROD issued by EPA.	November 1995
Construction Completion Report for soils completed.	January 1996
EPA and UDEQ certify completion of the ISV Remedial Action work.	May 1996
Ground Water Monitoring Plan completed.	August 1996
Final soil and ground water institutional controls submitted to EPA for approval.	February 1997
Construction Completion issued by EPA and UDEQ for ground water extraction and water treatment component of the remedy.	August 1997

Table 1 - Chronology of Site Events, cont'd

Event	Date
Extraction trench system, designated ES-01, was designed and installed in the general area of EX-01.	September 1997
First Five-Year Review completed.	October 1997
Remedial actions construction considered complete with the submittal of the Remedial Action Completion Report.	April 1998
The Site was paved with asphalt in anticipation of future short-term use for vehicle storage and other activities during July 2001 to April 2002.	Late 2000/Early 2001
Quarterly ground water quality monitoring relaxed to semi-annual monitoring.	May 2001
Ground water extraction operations were modified, as approved by the EPA, with extraction occurring only at ES-01 and EX-11.	December 2001
Eleven monitoring wells (MW-18, MW-16, MW-07, EX-03, WP-05, WP-01, MW-13, MW-05, WP-03, MW-03, and MW-04) were abandoned with EPA and UDEQ approval and in accordance with State regulations.	July 2001
Site used temporarily for vehicle storage, warehousing and office space for the Olympic games.	July 2001 – April 2002
EPA-approved temporary modification to the ground water extraction scheme to avoid damage to pumps during drought-related, low-water conditions. Pumping performed only during the day to allow night time recovery to water levels above pump intakes.	August 2002
Second Five-Year Review completed.	September 2002
EPA-approved discontinuation of ground water extraction and treatment.	January 2003
Natural Attenuation Monitoring Program (MNA) implemented, as approved by the EPA and UDEQ.	January 2003
Vinyl chloride, though not included in the ROD as an indicator chemical, was added as an analyte to aid in monitoring of natural attenuation.	January 2003
Monitoring for PCP and 2,4-D is discontinued in all monitoring wells designated "MW," and kept for those wells designated "EX" and "ES," as approved by the EPA and UDEQ.	January 2003
Ground water quality monitoring frequency increased from semi-annual to quarterly to establish baseline condition in support of MNA.	January 2003
Ground water quality monitoring relaxed to semi-annual frequency.	January 2004
Enhanced biodegradation activities include injection of Hydrogen Release Compound Primer™ (HRC Primer), Hydrogen Release Compound® (HRC), and Bio-Dechlor INOCULUM™ (BDI) to contaminant plume "hot spot" areas in the vicinity of wells ES-01, EX-02, EX-11, and MW-20.	May 2004
MW-26A was inadvertently destroyed in October 2004, and EPA approved PZ-3 as a replacement monitoring point.	April 2005
Enhanced biodegradation activities include injection of Hydrogen Release Compound Primer™ (HRC Primer) and Hydrogen Release Compound® (HRC) across the core of the contaminant plume near wells EX-02, EX-04, EX-07, EX-11, and MW-20.	July 2006

III. Background

Location and Setting

The Wasatch Chemical Site is located in Salt Lake City, Utah near the intersection of 700 West and 2100 South Street. It is comprised of approximately 18 acres in an industrial area including property owned by Questar InfoComm, Inc. (Questar), and portions of adjacent properties (Figure 1, Appendix A). As a result of ground water contamination to the north of the Site, the original boundaries delineated in the Record of Decision (ROD) were modified. The current boundary extends onto the adjacent Steelco property, as discussed in the Explanation of Significant Differences (ESD) to the ROD.

The topography of the Site is flat with an elevation variance of no more than several feet across the property. Soils are a mixture of natural and fill material, consisting of clays, silts, and fine to medium sand. Most surface drainage flows west toward a small drainage ditch (700 West Ditch) that connects to other industrial drainage ways, with ultimate discharge to the Great Salt Lake. Ditch sediments consist of locally derived materials and are similar to Site soils. Directly beneath the Site is a shallow aquifer that flows to the north and northwest with some discharge suspected to occur to the drainage ditch. Annual precipitation is 12 to 13 inches.

Site History and Extent of Contamination

The Site was used for warehousing, producing, and packaging industrial chemical products between 1957 and 1971. In 1970 and 1971, operations were expanded to include the manufacture of fertilizers. In 1973, construction of a liquid and dry pesticide formulation building took place. Pesticides, herbicides, fertilizers, industrial chemicals, and cleaners were blended and packaged at the Site from 1973 until June1978. In 1978, the agricultural chemical business was moved off-Site. The industrial chemical business remained on-Site and continued to operate on a limited basis through August 1992. The Site was used for vehicle storage, warehousing, and office space from July 2001 to April 2002. Currently, the Site is the location of a plumbing supply company and an occupied office building. The Site is otherwise unoccupied.

Throughout the history of the Site, hazardous substances were released at the Site primarily from past disposal practices and spills. During the 1970s, industrial and process waste materials were discharged to a septic tank and drain field until waste lines were realigned. In the late 1970s, following closure of an evaporation pond and discontinuation of the blending of pesticides, herbicides and fertilizers at the Site, the connections to the evaporation pond were reportedly severed. Wastewater from the remaining operations was discharged onto the ground surface through underground drains or from surface runoff.

In early 1986, the Utah Department of Environmental Quality (UDEQ) required proper disposal of drums, containers, cylinders, and contaminated soils and waters. In June of 1986, an emergency removal action was conducted by EPA.

In April 1988, a CD among Entrada Industries, Inc. (subsidiary to Questar), UDEQ, and others initiated a Remedial Investigation/Feasibility Study (RI/FS) for the Site. The Site was then placed on the National Priorities List (NPL) on February 11, 1991.

Contamination at the Site was divided into three categories: (1) source areas, (2) soils, and (3) ground water. Source areas consisted of the process drain system (including the former evaporation pond), yard drain system, and septic system. The remainder of the source material consisted of dioxin waste that was consolidated during the EPA removal action. Soils contamination was prevalent all throughout Lot 6, which contains the former evaporation pond and drums consolidated during the removal action. Ground water contamination at the Site was continuous throughout the shallow portion of the aquifer, which is approximately 18 feet thick from the land surface to the confining unit.

The contaminants of concern are herbicides, pesticides, dioxins, semi-volatile organic compounds (SVOCs) and volatile organic compounds (VOCs).

Baseline Risk Assessment

The exposure assessment was completed in two steps:

1. Endangerment Assessment (EA) conducted by Questar in January 1990 – Evaluated *current* exposure only
2. Follow-up by Questar and the EPA - Evaluated potential *future* risk

Current Risks

Initially, an EA was performed by Questar in January 1990 to evaluate potential adverse impacts to human health and the environment. This evaluation accounted for current exposure only. Using the data collected during the RI in March 1990, twelve indicator chemicals were chosen, exposure pathways were identified, and risk levels were calculated.

Indicator chemicals represent the most prevalent, mobile, persistent, and toxic compounds found at the Site. These compounds are listed in Table 2.

Table 2 - Contaminants at the Wasatch Chemical Site

Chemical Class	Indicator Chemicals	Toxicity
VOCs	Trichoroethene (TCE)	Suspected carcinogen
	Tetrachloroethylene (PCE)	Suspected carcinogen
SVOCs	Hexachlorobenzene (HCB)	Probable carcinogen
	Pentachlorophenol (PCP)	Suspected carcinogen
Pesticides	Chlordane	Suspected carcinogen
	4,4'-DDT	Probable carcinogen
	4,4'-DDE	Probable carcinogen
	4,4'-DDD	Probable carcinogen
	Heptachlor	Probable carcinogen
Herbicides	2,4-D	Suspected carcinogen
	2,4,5-T	Suspected carcinogen
Dioxins and Furans	Dioxins (all detected congeners)	Probable carcinogen

Three potential receptor populations were examined in the EA. These included an off-Site residential population, an off-Site worker population, and an on-Site worker population. Exposure pathways with the highest potential for exposure (primary pathways) included:

1. Incidental ingestion of soil
2. Dermal contact with soil
3. Inhalation of fugitive dusts
4. Inhalation of chemicals volatizing from soil and ground water

Since ground water was not used for drinking water, bathing, or recreational use, it was not identified as a pathway. Risk levels were quantified for each receptor population and exposure pathway. The EA concluded that there are no significant current risks at the Site.

Future Risks

Although current risks were analyzed, it was determined that future potential risks were of greatest concern. Subsequent calculations were performed by Questar and EPA to further evaluate future on-Site workers, residential exposures, and acute exposures. Additional evaluations were performed by the EPA to assess potential acute and/or subchronic exposure risks associated with direct exposure to contaminants found in sludges within the process and yard drain system. Action levels for soils, sludges, and dioxin removal wastes were developed based on the potential risks to human health and the environment identified in the risk assessment process. Table 3 details the soil action levels and the concentrations of indicator chemicals found at the Wasatch Chemical Site, as reported in the ROD.

Table 3 - Action Levels and Concentrations of Indicator Chemicals Found in Source Area Sludge and Soils

Compound	Maximum Sludge Value (ppb)[1]	Maximum Soil Value (ppb)	Action Levels (ppb)
Volatile Organic Compounds			
TCE	440,000	1,800	103,000
PCE	200,000	22,000	22,000
Semi-Volatile Organic Compounds			
Hexachlorobenzene	49,000	66,0000	7,000
PCP	460,000	250,000	----
Herbicides			
2, 4-D	634	30,768	----
2,4,5-T	300	1,111	----
Pesticides			
4,4'-DDD	280	400	26,000
4,4'-DDE	6,300	4,500	19,000
4,4-DDT	2,800	8,100	19,000
Alpha-Chlordane	520,000	520,000	7,000
Gamma-Chlordane	680,000	890,000	7,000
Heptachlor	26,000	5,300	2,000
Dioxins			
TCDD[2] (Total)	13	11	20

[1]-part per billion

[2]-Tetrachlorodibenzodioxin

As indicated in the Site Event Chronology (Table 1), the Construction Completion Report for the soils remedy was issued by the EPA and UDEQ in January 1996. This signified attainment of performance standards and completion of remedial activities for soils, sludges, and dioxin removal wastes. Accordingly, the focus of the remainder of this Five-Year Review does not include the soils remedy.

Based on Site hydrogeology, the EPA and UDEQ determined that a potential for future human exposure to contaminated ground water does exist. Maximum Contaminant Levels (MCLs) and proposed MCLs, established under the Safe Drinking Water Act, were therefore adopted as ground water cleanup standards fully protective of human health.

The concentrations of indicator chemicals present in ground water at the Site are presented in Table 4 below.

Table 4 - Action Levels and Concentration of Indicator Chemicals Found in Ground Water

Compound	Maximum Value (µg/L)	Geometric Mean (µg/L)	Action Level / MCL (µg/L)
Volatile Organic Compounds			
PCE	1400 (MW-12)	21	5
TCE	8,000 (MW-07)	78	5
1,1-DCE[1]	230 (MW-12)	53	7
Semivolatile Organic Compounds			
PCP	630 (MW-10)	508	1
Herbicides and Pesticides			
2,4-D	26 (MW-12)	7.6	70

[1]-dichloroethene

The risk analysis evaluated future uses of ground water, including:

- Ingestion by future workers using a shallow well in the contaminated aquifer.
- Household use of ground water by residents.

Residential exposure assessment included ingestion of contaminated ground water, as well as inhalation of volatile chemicals while showering and cooking. Results of the analysis suggest the following:

- Chronic exposure to contaminated ground water could result in unacceptable risks of cancer to both of the populations listed above.
- Exposure to TCE and PCE present substantial potential risk for both workers and residents.
- The potential exposure concentration for PCP exceeded the proposed MCL.

Ecological Risks

The risk assessment process included analysis of potential risks to the environment. Vegetation samples and tissue samples from mice and pigeons were collected on-Site and analyzed for pesticides, herbicides, and metals. In addition, dioxins and furans were analyzed in aquatic and upland vegetation samples. The ecological risk assessment reached the following conclusion:

- No critical wildlife habitats, endangered species, or habitats of endangered species are affected by Site contaminants.

Based on the results of the exposure assessment and derived action levels, a remedy was selected to achieve the remediation goals of the Wasatch Chemical Site.

IV. Response Actions

In September of 1991, EPA, UDEQ, and Entrada Industries, Inc. (a subsidiary of Questar) signed a Consent Decree (CD) for Questar to implement the remedy selected in the ROD. This agreement was lodged in the U.S. District Court, District of Utah on November 12, 1991. The selected remedy described in the ROD included the following components.

Landfarming

Questar began the landfarming portion of the Remedial Action (RA) on October 23, 1992. Approximately 1,000 cubic yards of hydrocarbon-contaminated material was excavated and placed in an on-Site containment cell. Excavation occurred to a depth of approximately two feet below the ground water table, which ranged from one to four feet below the ground surface. Soil excavation and consolidation into containment cells was completed on April 26, 1993.

Nutrients were added to the landfarm cell, as well as pH adjustment, which aided in optimum biodegradation of the hydrocarbon wastes. Confirmation sampling was performed, and those soil sections meeting the standard were used as backfill in their original location. Remaining landfarm soils were applied as cover material to the former evaporation ponds, which were subsequently treated with In-Situ Vitrification (ISV). The landfarming portion of the RA was completed in December 1994. EPA certified its completion in January 1994.

In-Situ Vitrification

ISV was selected to remediate soil which exceeded the Action Levels. Contaminated soils, sludges, and debris were placed in the on-Site concrete evaporation pond. The evaporation pond was formerly used for evaporation of liquid process wastes, which entered the pond through an underground process drain system that received wastes from multiple buildings at the Site. The residual soils from the landfarm remediation were placed on top of the consolidated material in the evaporation pond. A clean soil cap was placed over the treatment zone, and a clean soil berm was placed around the concrete evaporation pond.

Thirty seven melts (process of melting soil in place using electricity) were required to complete ISV for the entire area of the evaporation pond. Verification samples of the vitrified material showed the ISV process to be effective in reducing chemical concentrations below the risk-based action levels established for the Site.

Approximately 5,600 tons of contaminated material was remediated. The ISV portion of the Remedial Action was completed in January 1996, and the EPA and UDEQ certified completion in May 1996.

Ground Water Remediation

The baseline risk assessment concluded that there is an unacceptable risk associated with future human exposure to contaminated ground water. As defined in the ROD, remediation goals for the ground water remediation system are:

- Restore the contaminated ground water to its potential future uses.
- Protect uncontaminated ground water by minimizing the migration of contaminants within the ground water.
- Ensure that the level of contaminants remaining in ground water poses no unacceptable risk to human health and the environment.

The following performance standards were set to attain these remediation goals:

1. Reduce the levels of contaminants by at least 50 percent within the first five years, as compared to baseline levels prior to remediation.
2. Reduce contaminant levels in ground water within the area of attainment to MCLs and proposed MCLs.
3. Meet all ARARs identified in the ROD.

As set forth in the CD, if the concentrations of the indicator chemicals remain below MCLs for three years during the post compliance period, an application for Certificate of Completion may be made. If evaluation of hydraulic enhancements and treatment enhancement indicate no reasonable alternatives for improving system operations exist, a petition for alternate performance standards may be submitted for consideration.

Ground Water Extraction and Treatment

The ground water remedial action consists of ground water extraction and treatment and ground water monitoring. Installation of the extraction wells and construction of the treatment facility was completed in March 1995. The current locations of each extraction well, monitoring well, and piezometer are depicted in Figure 2 (Appendix A). The first quarterly ground water sampling event, representing baseline conditions, occurred in March 1995. System operations began in August 1995.

In accordance with the Ground Water Monitoring Plan, ground water samples were collected on a quarterly basis from 1995 through 2000. Samples were then collected and analyzed semi-annually, beginning in May 2001. Quarterly sampling resumed in 2003 in order to obtain a representative baseline for Monitored Natural Attenuation and then reverted back to semi-annual frequency in 2004.

EPA approved discontinuation of ground water extraction and treatment in January 2003, and a Monitored Natural Attenuation Program began. Monitored natural attenuation and the use of enhanced biodegradation processes (described below) is considered to be an interim pilot study. The efficacy of these alternative remedial measures will be evaluated before a final decision is reached regarding disposition of the ground water extraction and treatment system.

Monitored Natural Attenuation Program

Two types of monitoring points are used to evaluate natural attenuation:

1. Performance Monitoring Wells (PMWs) are located upgradient, within, and just downgradient of the plume to verify indicator compound concentrations and plume boundaries are progressing toward the remediation goals.
2. Contingency Monitoring Wells (CMWs) are located outside of the plume boundary and are used to verify that the plume is not expanding. CMWs serve as points of compliance per requirements of the CD.

Table 5 identifies the PMWs and CMWs that were originally proposed in the *Monitored Natural Attenuation Workplan* (2002).

Table 5 - Natural Attenuation Monitoring Stations

#	Well No.	Well Location and Rationale
Performance Monitoring Wells		
1	EX-08	Monitor water quality on upgradient edge of plume
2	MW-23	Alternate to EX-08
3	ES-01	Monitor water quality within plume in suspected source area
4	EX-07	Monitor water quality within plume downgradient of suspected source area and near eastern edge of plume
5	EX-02	Monitor water quality within western edge of plume
6	EX-11	Monitor water quality within plume
7	MW-20	Monitor water quality within plume
8	EX-05	Monitor water quality near downgradient edge of plume
9	EX-09	Monitor water quality near downgradient edge of plume
10	EX-04	Monitor water quality near downgradient edge of plume
Contingency Monitoring Wells		
11	MW-24A	Monitor water quality downgradient of plume to confirm plume is not expanding beyond currently understood boundaries. Point of compliance
12	MW-25	Same as above
13	MW-26A (replaced by PZ-3)	Same as above

To allow adequate monitoring of natural attenuation, vinyl chloride was added to the list of VOCs reported in order to assess the presence of all transformation products of PCE and TCE. Sulfate/sulfite, nitrate/nitrite, and iron(II)/iron(III) were also added to assess the availability of electron acceptors used in microbial metabolism.

Enhanced In-Situ Bioremediation

In an effort to accelerate degradation of chlorinated hydrocarbons at the Site, enhanced biodegradation activities were conducted in May 2004 and July 2006. These activities involved the use of Regenesis products - Hydrogen Release Compound Primer™ (HRC Primer), Hydrogen Release Compound (HRC), and Bio-Dechlor INOCULUM™ (BDI).

HRC Primer and HRC are products that release lactate once injected into the subsurface. Microorganisms metabolize this lactate, producing hydrogen which is used to remove chlorine atoms from chlorinated hydrocarbons. BDI is a natural microbial consortium of microorganisms, such as dehalococcoides, with PCE and TCE reduction capabilities.

During the May 2004 biostimulation event, HRC Primer, HRC, and BDI were applied at four "hot spots" within the core of the plume. A total of eighty 1-1/2 inch diameter holes were pushed with cone penetrometer equipment, and the biodegradation enhancement products were injected from May 17th through May 20th at well locations ES-01, EX-02, EX-11, and MW-20 (Figure 2, Appendix A).

An additional round of biostimulation activities began in June 2006 and was completed in July 2006. HRC Primer and HRC were applied at five "hot spots" near wells EX-02, EX-07, EX-11, MW-20, and EX-04.

Institutional Controls

Institutional controls for the Site consist of access and land use restrictions. Implementation of these restrictions is the responsibility of the Questar and entails the following:

- Posting/maintaining fencing and associated warning signs along the Site perimeter to restrict access.
- Notification of the Site's Superfund status to potential future owners.
- Notification within each deed that the property is subject to the CD, and any restrictions stated therein.
- Inclusion of a covenant prohibiting residential use of the property

Mr. Brad Baird of Questar was contacted on August 10, 2007 regarding the status of land use controls. Mr. Baird reported that land use restrictions have been implemented in conformance with EPA requirements (3/97 letter from Max Dodson of EPA to Roland Gow of Questar).

In addition, the ROD calls for denial of well permits or acquisition of water rights as practicable and to extent allowable by law. Based on conversations with the Utah Division of Water Rights (UDWR), such restrictions have not been formalized. This is discussed further in Section VII.

Operation and Maintenance

Operation and maintenance (O&M) is currently limited to monitoring of ground water conditions and reporting. Costs associated with O&M for 2006 were reported by Questar to be $220,500.

V. Progress Since The Last Review

Resolution of Issues Identified in Previous Five-Year Review

Three issues were identified in the last Five Year Review including:

1. Temporary modification of ground water pumping scheme due to drought-related, low-water conditions to avoid damage to remedial equipment.
2. Questar had proposed to discontinue ground water collection and treatment.
3. Increase in TCE concentrations observed in upgradient well EX-08.

These issues have been resolved as follows:

In August 2002, the EPA approved temporary modifications to the ground water extraction scheme in order to avoid damage to pumps during drought-related, low-water conditions. Current protectiveness of the remedy was upheld, and Questar implemented the follow-up recommendations.

Questar proposed to discontinue ground water extraction and treatment shortly after the first modification to the ground water remedy. A long-term monitoring plan had also been submitted to the EPA and UDEQ for review and approval. In January 2003, EPA approved the discontinuation of ground water extraction and treatment, provided a Natural Attenuation Monitoring Program was implemented to monitor progress and demonstrate ongoing protectiveness of the remedy. Questar initiated this program in January 2003.

Though the second Five-Year Review concluded an overall 50% reduction in the concentrations of indicator chemicals on a plume-wide basis, an increase in TCE concentrations in upgradient well EX-08 was identified as a potential issue. Questar implemented the follow-up recommendations, which involved continued monitoring of TCE trends in EX-08 and notification to EPA and UDEQ of changes in conditions that may affect contaminant capture in quarterly progress reports.

Remedy Operation

In addition to the changes to the remedy described above and as discussed in Section IV, enhanced in-situ bioremediation was implemented at the Site in 2004. Other activities included ongoing ground water level and quality monitoring.

Progress Towards Achievement of RAOs

Based on time-series chemical concentration plots provided in Progress Reports and statistical tests applied to these data as described in the Progress Reports, overall ground water conditions at the Site have not demonstrated a meaningful improvement since the last Five-Year Review. Concentrations of indicator chemicals are either below the MCL or the concentration trend is inferred to be asymptotic at a concentration above the MCL using data between May 2003 and May 2006.

In addition, a 50% reduction in indicator chemical concentrations has been achieved (since the establishment of a baseline condition in 1995) at all but one monitoring station based on the best fit line to data roughly spanning the past ten years.

The CD specifies conditions related to the above described analyses that would allow Questar to submit a petition for the establishment of alternative performance standards for the Site. These conditions may have been met, however, a formal determination on this issue is beyond the scope of this Five-Year Review.

VI. Five-Year Review Process

Administrative Components

This is the third Five-Year Review for the Site. The Wasatch Chemical Five-Year Review team was led by Rebecca Thomas, EPA Remedial Project Manager for the Site. The following Team Members participated in the review:

- Rebecca Thomas, EPA Remedial Project Manager
- Tony Howes, UDEQ Remedial Project Manager
- Pat Courtney, EPA Community Involvement Coordinator

EPA Contractors:

- Kenneth Napp, HDR Engineering, Inc.
- Tara Fishbain, HDR Engineering, Inc.

This Five-Year Review consisted of the following activities: a review of relevant documents; a meeting with representatives of Questar and their contractors; risk assessment review; data review; and a Site visit. The schedule for the review extended through September 2007.

Community Involvement

A notice that the third Five-Year Review was in progress was placed in the Salt Lake City Tribune on July 7, 2007. The notice invited members of the public to submit their questions or comments regarding the review to EPA.

As part of the Wasatch Chemical Five-Year Review, community interviews were conducted to address issues and concerns for area property owners. The low-density area is zoned for commercial and industrial buildings with no residential properties existing near the Wasatch Chemical site boundaries.

EPA interviewed Wasatch Chemical area stakeholders on September 7, 2007. Included in the interviews were business owners and potentially responsible parties involved in the Site's cleanup. All respondents said they were aware of the history of the Site and the cleanup activities currently underway.

Most of the persons interviewed expressed satisfaction with the remedial actions to date. They thought the work was well done and the cleanup is a benefit to the area's communities.

One respondent was concerned about the long-term effectiveness of the ground water cleanup. She was concerned that the MCLs haven't been met and wasn't sure if the MCLs would ever be met. Another concern she had was that a few of the monitoring wells on the railroad property have been torn out.

A few respondents expressed a desire to wrap up the sampling and get the monitoring wells off the Site. They would like the monitoring wells removed, the pump and treat plant demolished and the Site delisted.

All of the respondents said they were not aware of any community concerns regarding the Wasatch Chemical Site and believe the Site remedy is protective of human health and the environment.

In October 2007, a notice will be placed in the Salt Lake City Tribune announcing that the third Five-Year Review has been completed and that copies of the report are available for the public to review at the:

U.S. EPA Region 8 Records Center
1595 Wynkoop Street
Denver, CO 80202-1129
(303) 312-6473

Utah Department of Environmental Quality
168 N. 1950 W.
Salt Lake City, UT 84116
(801) 536-4100

Document Review

In preparing this Five-Year Review Report, the following documents were reviewed:

- Record of Decision (EPA, 1991).
- Consent Decree, Civil Action No. 91-C-1194S (consolidated with 86-C-0023G). U.S. District Court, District of Utah, Central Division. 1991.
- Final Design Report Ground Water Remediation Remedial Action/ Remedial Design (HLA, 1994).
- Ground water Monitoring Plan Remedial Design/Remedial Action (HLA, 1994).
- Construction Completion Report Remedial Action/Remedial Design – Soils (HLA, 1996).
- Final Wasatch Chemical Site Ground-Water Monitoring Plan (MW, 1996).
- Superfund Explanation of Significant Differences for the Record of Decision (EPA, 1996).

- Letter from USEPA to Questar approving Final Soil and Ground Water Institutional Controls with attached copy of institutional controls (1997).
- Wasatch Chemical Site Ground Water Model (Amended) (MW, 1997).
- Ground water Extraction Trench and Conveyance System Technical Specifications (MW, 1997).
- Construction Completion Report (MW, 1997).
- Superfund Preliminary Site Close Out Report (EPA, 1997).
- Wasatch Chemical Company Superfund Site Five-Year Review Report (EPA, 1997).
- Ground water Extraction and Treatment System Operation and Maintenance Manual (MW, 1997).
- Wasatch Chemical Site Progress Report No. 74 (MWH, 2001).
- Wasatch Chemical Site Progress Report No. 75 (MWH, 2001).
- Wasatch Chemical Site Progress Report No. 76 (MWH, 2001)
- Letter from Questar to the EPA and UDEQ, RE: Reduced Pumping at Wasatch (Questar, 2001).
- Letter from EPA to Questar, RE: Wasatch Chemical Superfund Site Reduced Pumping Proposal (EPA, 2001).
- Salt Lake Valley Ground-Water Management Plan (Utah Division of Water Rights, 2002)
- Wasatch Chemical Site Progress Report No.77 (MWH, 2002).
- Letter from Questar to the EPA, RE: Proposal to Discontinue Pumping at Wasatch Chemical (Questar, 2002), with attached Technical Memorandum for Wellfield Operation Modification (MWH, 2002).
- Wasatch Chemical Company Superfund Site Second Five-Year Review Report (MFG, 2002).
- Letter from EPA to Questar, RE: Wasatch Chemical Superfund Site Proposal to Discontinue Pump and Treat (EPA, 2002).
- Letter from Questar to the EPA, RE: Monitoring Plan for Natural Attenuation at Wasatch Chemical (Questar, 2002), with attached Wasatch Chemical Site Monitored Natural Attenuation Work Plan (MWH, 2002).
- Letter from EPA to Questar, RE: Wasatch Chemical Superfund Site Proposed Monitoring Program (EPA, 2003).
- Wasatch Chemical Site Progress Report No. 81 (MWH, 2004).
- Letter from Questar to the EPA and UDEQ, RE: Wasatch Chemical Site Technical Memorandum Plume Mass Estimates and Downgradient Plume Evaluation (Questar, 2006).
- Wasatch Chemical Site Progress Report No. 84 (MWH, 2006).
- Wasatch Chemical Site Progress Report No. 85 (MWH, 2006).
- Wasatch Chemical Site Progress Report No. 86 (MWH, 2007).
- Wasatch Chemical Site Progress Report No. 87 (MWH, 2007).

Interviews were conducted with the following individuals to provide supplemental technical information:

- Kim Heimsath, Questar
- Brad Baird, Questar
- Duane Mortensen, UDEQ
- Tony Howes, UDEQ
- Boyd Clayton, Utah Division of Water Rights
- Susan Eyzaguirre, Montgomery Watson Harza (MWH, Project Mgr.)

Data Review

The remedy includes a ground water monitoring program designed to track ground water levels and quality. Since the second Five-Year Review, the original monitoring program has been extended and modified to form the Natural Attenuation Monitoring Program. The purpose of this program is to monitor natural attenuation and evaluate contaminant migration. The results of ground water sampling are documented in progress reports prepared by Questar's consultant, MWH. In preparing this Five-Year Review Report, data from the following reports were reviewed and evaluated:

- Wasatch Chemical Site Progress Report No. 81 (MWH, 2004).
- Letter from Questar to the EPA and UDEQ, RE: Wasatch Chemical Site Technical Memorandum Plume Mass Estimates and Downgradient Plume Evaluation (Questar, 2006).
- Wasatch Chemical Site Progress Report No. 84 (MWH, 2006).
- Wasatch Chemical Site Progress Report No. 85 (MWH, 2006).
- Wasatch Chemical Site Progress Report No. 86 (MWH, 2007).
- Wasatch Chemical Site Progress Report No. 87 (MWH, 2007).

A water table contour map as well as maps illustrating the inferred extent of TCE and vinyl chloride taken from the April 2007 Progress Report is provided as Figures 3, 4, and 5 (Appendix A).

Based on time-series chemical concentration plots provided in Progress Reports and statistical tests applied to these data as described in the Progress Reports, overall ground water conditions at the Site have not significantly improved since the last Five-Year Review. Concentrations of indicator chemicals are now either below the MCL or the concentration trend is inferred to be asymptotic at a concentration above the MCL using data between May 2004 and April 2007. In addition, a 50% reduction in the indicator chemical concentrations has been achieved (since the establishment of a baseline condition in 1995) at all but one monitoring station based on the best fit line to data roughly spanning the past 12 years as well as the latest individual measurement (April 2007).

The CD specifies conditions related to the above described analyses that would allow Questar to submit a petition for the establishment of alternative performance standards for the Site. These conditions may have been met, however, a formal determination on this issue is beyond the scope of this Five-Year Review.

Site Inspection

The Site Inspection was performed on August 3, 2007 by the following personnel:

- Rebecca Thomas, EPA Remedial Project Manager for the Site
- Duane Mortensen, UDEQ
- Tony Howes, UDEQ Remedial Project Manager
- Kenneth Napp, HDR Engineering, Inc.

The purpose of the Site Inspection was to meet with representatives of Questar and their consultants and to observe current Site conditions and remedy elements. A meeting was conducted with the personnel listed above as well as the following Questar representatives and consultants:

- Kim Heimsath, Director, ESS - Questar Project Manager
- Mike Johanson - Questar Environmental Coordinator
- Greg Hadlock - Questar Facilities
- Doug Oliver - MWH
- Susan Eyzaguirre - MWH (Project Mgr)
- Mike Gronseth - MWH

The purpose of the meeting was to brief Questar personnel on the Five-Year Review Process, to provide Questar personnel the opportunity to ask questions of EPA and/or to present new information in connection with monitoring activities or operation of remedy elements. During the meeting, Questar presented an overview of operational changes since the last Five-Year Review as well as data describing remedy performance. The Site visit included a tour of the inactive ground water treatment facility, the location of the ISV process (Photo No. 1, Appendix B), and the 700 West Ditch (Photo No. 2, Appendix B).

Site activities currently are limited to ground water quality monitoring. In addition, all on-Site wells with detectable levels of indicator chemicals are sampled via dedicated pumps and subgrade piping. Therefore, there were no remedy elements that could be subjected to a meaningful inspection. A photograph of the well pump discharge ports (in the building housing the water treatment system) used to collect ground water samples is provided as Photo No. 3 (Appendix A).

VII. Technical Assessment

Question A: Is the remedy functioning as intended by the decision documents?

As discussed in Section IV, the soil/waste portion of the remedy was completed in 1996 and the only ongoing element of this remedy is the need for land use restrictions.

Therefore, this is the only remedy element associated with soil/wastes subjected to a Technical Assessment. The remainder of this section focuses on the ground water remedy.

The remedy for ground water consists of the following elements (as modified through agreements with regulatory agencies):

- Natural Attenuation Monitoring Program to monitor progress and demonstrate ongoing protectiveness of the remedy. This remedy was voluntarily expanded to include enhanced in-situ bioremediation. [Monitored natural attenuation and the use of enhanced biodegradation processes is considered to be an interim pilot study. The efficacy of these alternative remedial measures will be evaluated before a final decision is reached regarding disposition of the ground water extraction and treatment system.]
- Ground water monitoring capable of detecting PCE, TCE, PCP and vinyl chloride at concentrations below the MCL.
- Deed restrictions to prevent the Site from being used for residential development and ground water use restrictions as practicable and to the extent allowed by law.

The performance of each remedy element for ground water is discussed below:

Natural Attenuation Monitoring Program

The following performance goals were set for the ground water remedy. Remedy performance relative to the goals are provided in italics:

1. Reduce the levels of contaminants by at least 50 percent within the first five years, as compared to baseline levels prior to remediation.

   Active remedial measures (pump and treat and enhanced in-situ bioremediation) have reportedly reduced the level of indicator chemicals by at least 50 percent in all but one well (EX-02) as of April 2007.

2. Reduce contaminant levels in ground water within the area of attainment to MCLs and proposed MCLs.

   MCLs have been attained for some or all of the indicator chemicals at some wells. However, a waiver of ARARs based on technical impracticability or the setting of Alternate Concentration Limits (ACLs) is allowed under the CD if certain conditions are met. These conditions may have been met. However, a formal determination on this issue is beyond the scope of this Five-Year Review.

3. Meet all ARARs identified in the ROD.

> *The only ARARs for the ground water remedy as it is currently implemented relate to water quality standards (WQSs). These WQSs are the MCLs. As discussed under remediation goal no. 2, above, MCLs have not been achieved at all locations within the area of attainment.*

Ground Water Monitoring

Ground water monitoring has been performed in accordance with the requirements of the monitoring plan (as modified).

Land and Ground Water Use Restrictions

Mr. Brad Baird of Questar was contacted on August 10, 2007 regarding the status of land use controls. Mr. Baird reported that land use restrictions have been implemented in conformance with EPA requirements (3/97 letter from Max Dodson of EPA to Roland Gow of Questar).

Mr. Bryce Clayton of the Utah Division of Water Rights (UDWR) was contacted on August 9, 2007 to inquire as to the status of ground water use restrictions, if any. Mr. Bryce reported that no formal use restriction had been implemented. However, Ms. Kim Heimsath of Questar indicated that semi-annual reports on ground water quality are provided to the State Engineer and that his office has been informed of the requirement for use restriction.

Opportunities for Optimization

Remedy implementation currently consists of ground water monitoring and reporting. Therefore, no opportunities for optimization are immediately apparent.

Early indicators of potential remedy problems

The remedy has been operating for more than a decade and its performance is within expected limits. Although ARARs have not been met throughout the Site, the decision documents anticipated the potential for technical limitations associated with restoration of ground water impacted by chlorinated VOCs. These technical limitations may form the basis for an ARAR waiver or revision to performance standards. Site data should be reviewed for conformance with the provision of the decision documents allowing ARAR waiver or revision to performance standards.

Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives used at the time of the remedy selection still valid?

Soil

The remedy for soil/wastes has been implemented as required by the ROD and design documents based on the completion certification issued by EPA. No residential land is permitted under the institutional control element of the remedy and none was observed during the Site visit.

In order to determine whether the soil clean-up levels remain protective for the current and intended future land use, forward-going risk computations were performed using currently accepted exposure and toxicity values. It was noted that the first Five Year Review derived revised clean-up levels that differ slightly from those presented in the ROD (USEPA 2002). However, the basis of these cleanup goals was not clearly presented and it was assumed that the clean-up values presented in the Five Year Review were the actual clean-up values used during the remedial action.

The calculations for the indoor worker include exposure by ingestion of outdoor soil and indoor dust and inhalation of volatiles released from soil into the building (evaluated using the Johnson and Ettinger screening level model for soil). The assessment of outdoor workers included ingestion of soil and inhalation of soil particulates in outdoor air. The detailed exposure and toxicity assumptions are presented in Appendix C. The results are presented in Table 6.

Table 6 - Risk Estimates Based on Soil Cleanup Levels

Chemical	Soil Action Level from First Five Year Review (ppb)	Inside Worker		Outside Worker (Contact Intensive)	
		HQ	Cancer Risk	HQ	Cancer Risk
TCDD or Dioxin-Furan TEQ[1]	1	NA	3E-05	NA	2E-04
Tetrachloroethene (PCE)	22,000	0.1	9E-06	0.007	2E-05
Trichloroethene (TCE)	103,000	0.4	7E-06	1	6E-05
Hexachlorobenzene (HCB)	7,000	0.004	2E-06	0.03	2E-05
4,4'DDD	26,000	NA	1E-06	NA	9E-06
4,4'DDE	19,000	NA	1E-06	NA	9E-06
4,4'DDT	19,000	0.02	1E-06	0.01	9E-06
Chlordane	7,000	0.006	4E-07	0.05	3E-06
Heptachlor	2,000	0.002	2E-06	0.01	1E-05

[1]-Toxicity equivalence, expressed in terms of TCDD.
NA = complete risk calculation inputs are not available.

For outside contact intensive workers, cancer risks are slightly above a level of concern for TCDD (2E-04). The primary contributing pathway is soil ingestion. For indoor workers, all chemicals are below a level of concern. These results suggest that current action levels for soil are mainly protective, with the potential exception of TCDD.

Ground Water

For ground water, action levels identified in the ROD are based on drinking water MCLs for five indicator chemicals (Table 7). Upon review, no changes in MCL have been promulgated for these chemicals, so the action levels for these chemicals remains valid.

Table 7 - Action Levels For Ground Water

Chemical	MCL (ug/L)
2,4-Dichlorophenoxyacetic Acid	70
Pentachlorophenol	1
Tetrachloroethene (PCE)	5
Trichloroethene (TCE)	5
1,1-Dichloroethene (DCE)	7

More recently, monitoring has begun for vinyl chloride (a degradation product of TCE and PCE). The MCL for vinyl chloride is 2 ug/L. Additionally, monitoring of 2, 4-dichlorophenoxyacetic acid has ceased because results have been non-detect.

Current strategy at the Site assumes that there are no current exposure pathways to contaminants in ground water. This assumption is based on the recognition that ground water from the Site is not presently used for drinking.

However, human exposure may occur by inhalation of vapors of VOCs in indoor air that arise from intrusion of vapors from groundwater into buildings. Although there are no buildings located over the core area of the ground water contaminant plume, this is an exposure pathway that could be of concern in the future if any building were constructed on-site. Therefore, the screening level vapor intrusion model for groundwater recommended by EPA (Johnson and Ettinger) was used to estimate indoor air concentration in potential future buildings. For screening purposes, the soil type was assumed to be sand, and the maximum well concentration for each chemical was used in the model. Water was assumed to be present at 2.7 feet below the ground surface, and the building slab was assumed to be 15 cm below ground surface.

The resulting estimates of indoor air concentration for each chemical were used to compute non-cancer and cancer risks for Reasonable Maximum Exposure (RME) for workers. Non-cancer and cancer risks were estimated to be above a level of concern due to vinyl chloride.

Table 8 - Screening – Level Risk Estimates For Vapor Intrusion

VOC	Max Conc (ug/L)	HQ	Cancer Risk
Tetrachloroethene (PCE)	23	0.02	1E-05
Trichloroethene (TCE)	130	0.7	2E-05
1,1-Dichloroethene (DCE)	20	0.06	NA
Vinyl chloride (VC)	300	2	4E-04

NA = slope factor not available for risk calculation.

These findings indicate that exposure from intrusion of vinyl chloride should be considered if the Site is redeveloped for human use. Detailed exposure and toxicity assumptions are presented in Appendix C.

In addition to risks associated with vapor intrusion, vinyl chloride is present at levels up to 80 times the MCL. Based on the magnitude of its occurrence on Site, it may be appropriate to include vinyl chloride as an indicator chemical with an associated performance standard.

Question C: Has other information come to light that could call into question the protectiveness of the remedy?

There is no other information that calls into question the protectiveness of the remedy.

Technical Assessment Summary:

According to the data reviewed and the Site inspection, the remedy is largely operating as intended by the ROD. All major physical remedy elements and most administrative remedy elements are in place and functioning. The occurrence of Site contaminants above performance standards in several compliance wells was anticipated by the CD, given the potential technical limitations of ground water restoration technologies. It may be appropriate to evaluate current Site conditions against provisions in the CD for waiver of MCLs or the establishment of Alternate Concentration Limits.

Protectiveness currently is achieved through interruption of exposure pathways. Fencing to restrict access is in place as are land use controls to preclude residential development. Notification to the UDWR of a ground water restricted area reportedly has been made by Questar. However, UDWR indicated they had not formally indentified the Site as a restricted area.

VIII. Issues

Based on the information collected during the first Five-Year Review, the following issues were identified:

Table 9 - Issues

Item No.	Issues	Affects Current Protectiveness	Affects Future Protectiveness
1	Site conditions may meet the requirements for a waiver or modification of the Action Level Performance Standards for ground water as defined in the Consent Decree.	No	No
2	Hypothetical future occupied buildings constructed over portions of the remaining ground water contaminant plume may result in unacceptable human exposure to volatile organic vapors.	No	Potentially
3	Utah Division of Water Rights does not report the Site and vicinity as restricted for ground water use.	Potentially	Potentially
4	Vinyl chloride is present at concentrations up to 80 times the MCL but is not considered to be an indicator chemical subject to the requirements of the CD or ROD.	No	Potentially

IX. Recommendations and Follow-up Actions

Table 10 - Recommendations and Follow-up Actions

Item No.	Issues	Recommendations and Follow-up Actions	Party Responsible	Due Date
1	Site conditions may meet the requirements for a waiver or modification of the Action Level Performance Standards for ground water as defined in the Consent Decree.	Evaluate Site data against criteria for waiver or modification of the Action Level Performance Standards for ground water	EPA	September 30, 2008
2	Hypothetical future occupied buildings constructed over portions of the remaining ground water contaminant plume may result in unacceptable human exposure to volatile organic vapors.	Modify land use restriction institutional control to require an assessment of risks related to contaminant vapor intrusion prior to approval of a building permit for occupied structures.	Questar	September 30, 2008
3	Utah Division of Water Rights does not report the Site and vicinity as restricted for ground water use.	Implement restriction through Utah Division of Water Rights.	Questar	December 31, 2007
4	Vinyl chloride is present at concentrations up to 80 times the MCL but is not considered to be an indicator chemical subject to the requirements of the CD or ROD.	Consider the addition of vinyl chloride to the list of COCs.	EPA	September 30, 2008

X. Protectiveness Statement(s)

The remedy as implemented is currently protective of human health and the environment. Contaminated ground water remains within the Site boundaries and no evidence of ground water use was identified. Soils and wastes containing contaminants above performance standards were successfully and permanently treated.

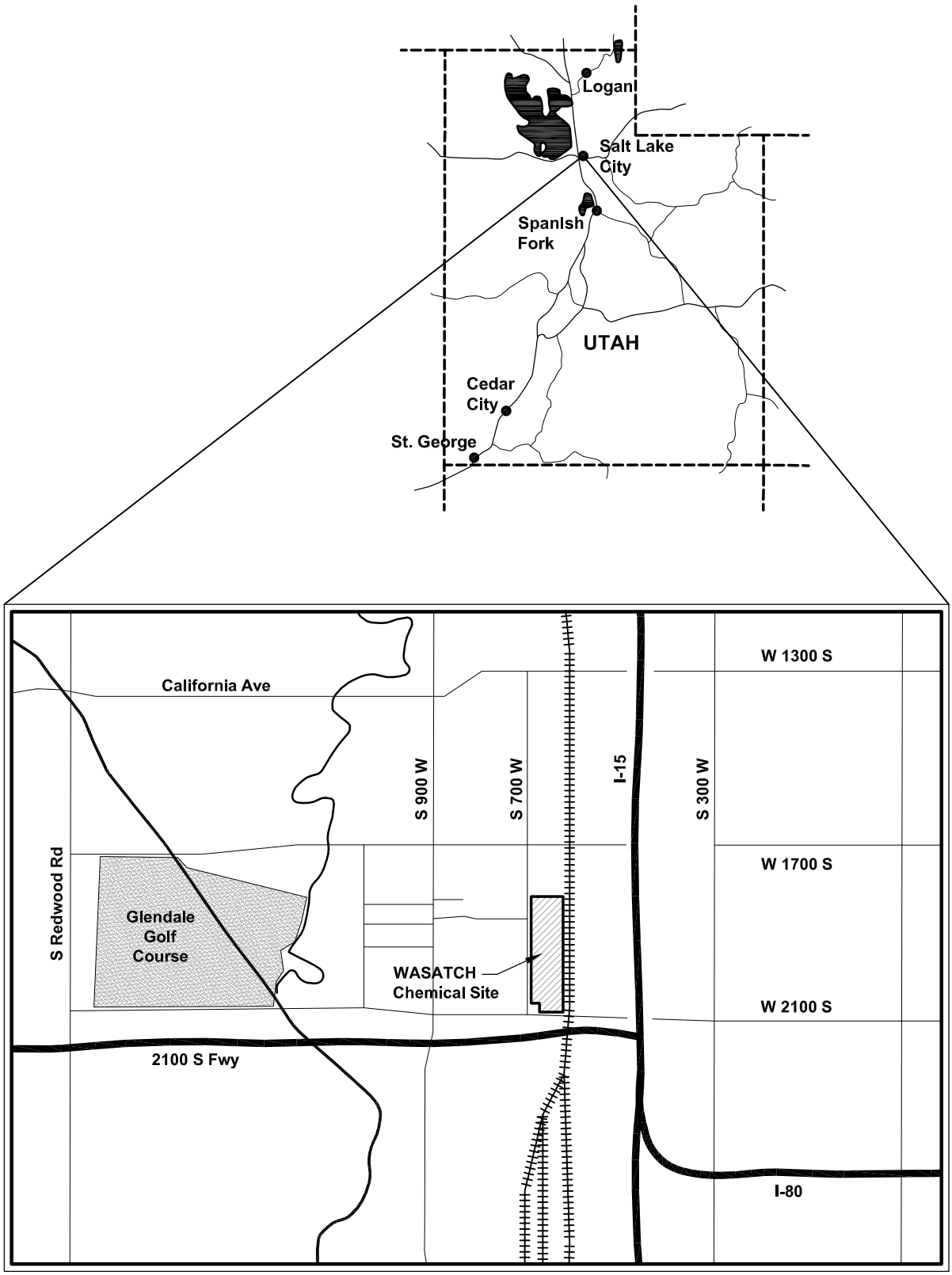
XI. Next Review

The Site requires ongoing Five-Year Reviews in accordance with CERCLA § 121 (c). The next five year review for the Wasatch Chemical Site will be performed by September 2012, five years from the date of this review.

ATTACHMENTS

ATTACHMENT 1

FIGURES



HDR

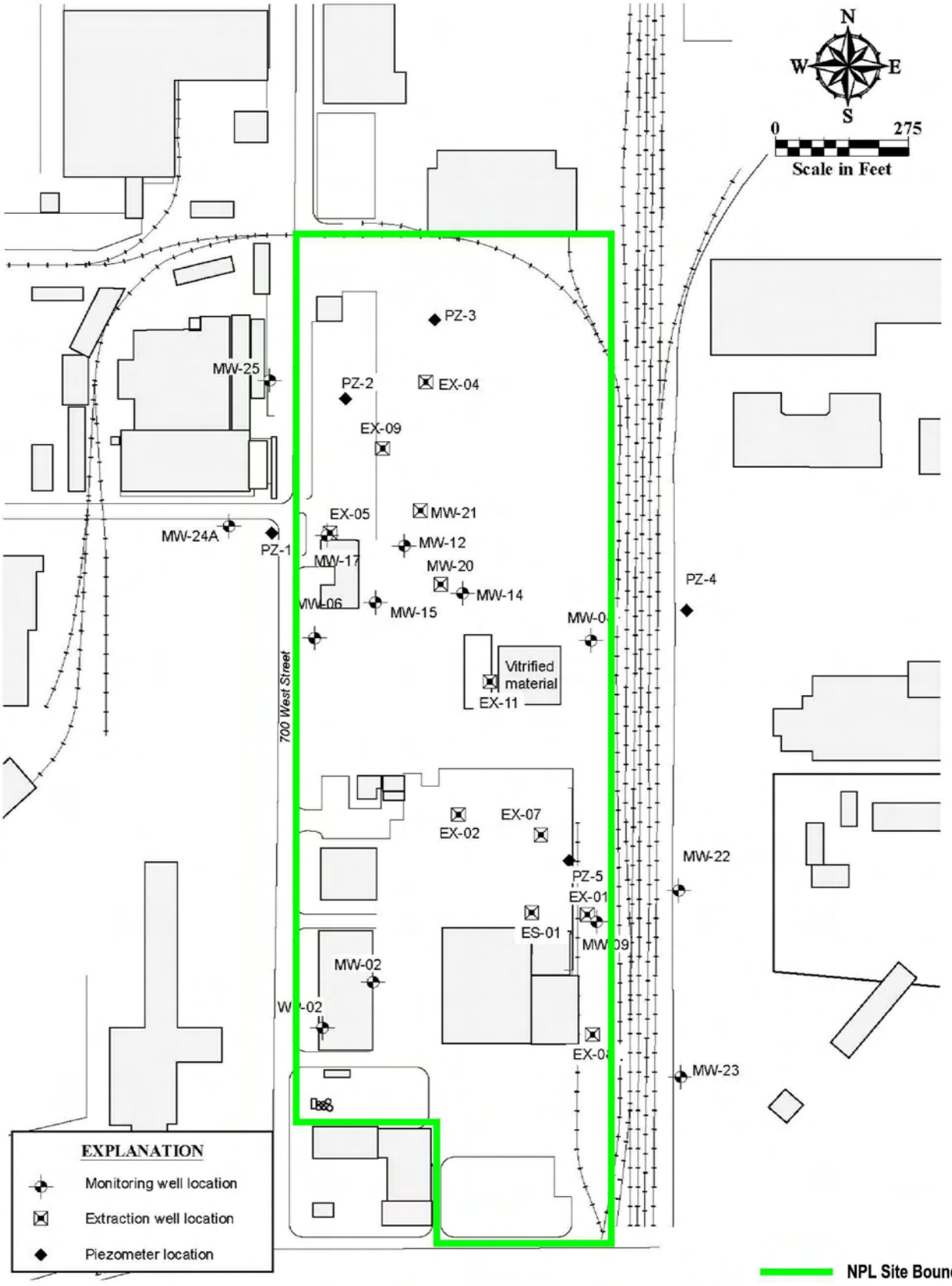
WASATCH Chemical Site
Salt Lake City, Utah

SITE LOCATION MAP

DATE
SEPT. 2007

FIGURE
1

9/12/2007 2:53:44 PM



From Questar/MWH (2007)

9/12/2007 2:51:10 PM

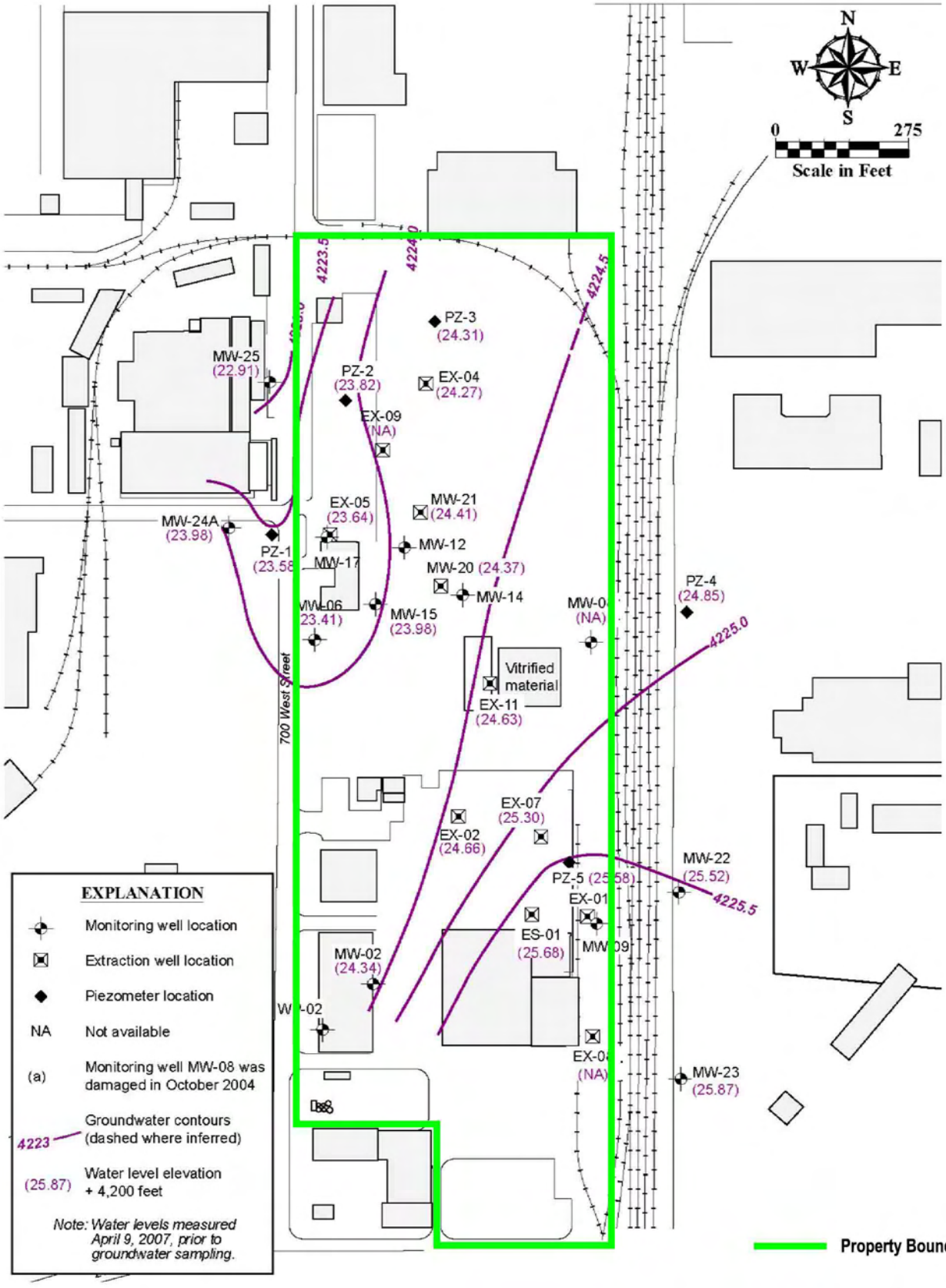
HDR

WASATCH Chemical Site
Salt Lake City, Utah

SITE MAP

DATE
SEPT. 2007

FIGURE
2



From Questar/MWH (2007)

9/12/2007 2:50:41 PM

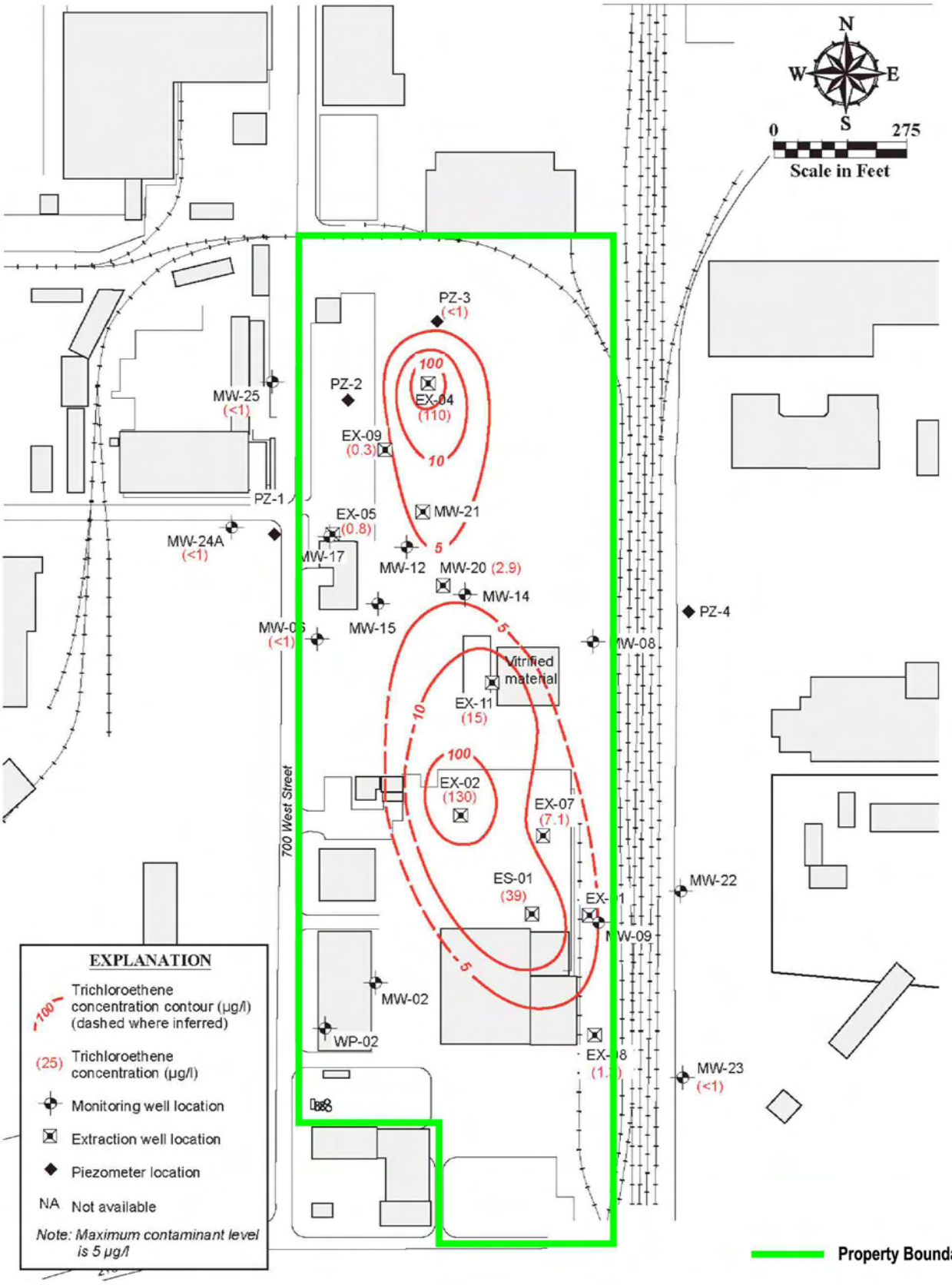
HDR

WASATCH Chemical Site
Salt Lake City, Utah

GROUNDWATER ELEVATIONS (APRIL 2007)

DATE
SEPT. 2007

FIGURE
3



From Questar/MWH (2007)

9/12/2007 2:50:15 PM

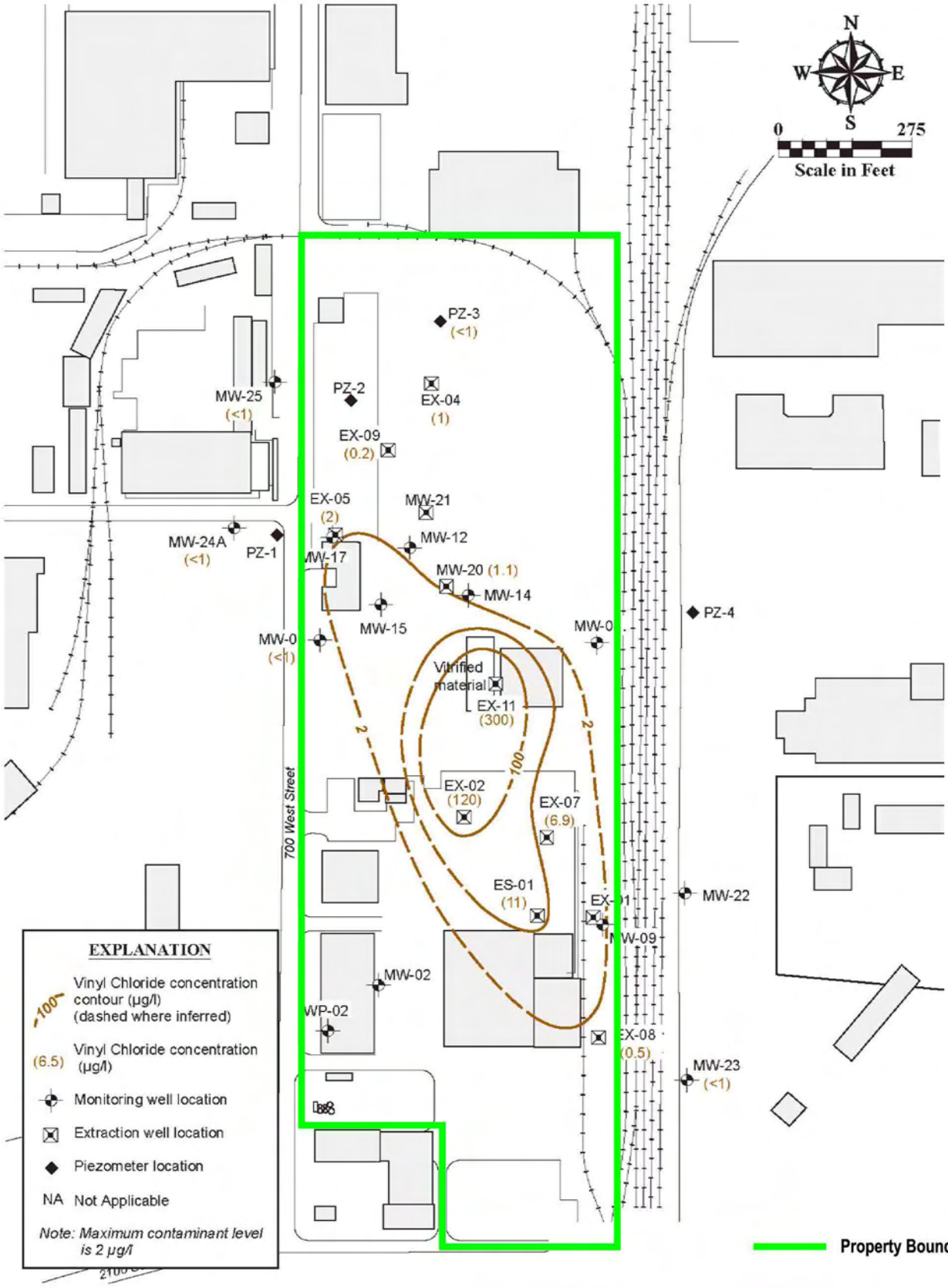
HDR

WASATCH Chemical Site
Salt Lake City, Utah

TRICHLOROETHENE DETECTED IN GROUNDWATER (APRIL 2007)

DATE
SEPT. 2007

FIGURE
4



From Questar/MWH (2007)

9/12/2007 2:48:43 PM

HDR

WASATCH Chemical Site
Salt Lake City, Utah

VINYL CHLORIDE DETECTED IN GROUNDWATER (APRIL 2007)

DATE
SEPT. 2007

FIGURE
5

ATTACHMENT 2

PHOTOS DOCUMENTING SITE CONDITIONS

Wasatch Chemical Superfund Site Photo Log

Photo No.1: West Embankment of ISV Area; View to North.

Photo No 2: 700 West Ditch; View to North.

Photo No 3: Sample Ports for Ground Water Monitoring

ATTACHMENT 3

RISK CALCULATIONS

Detailed Risk Calculations for Indoor Workers From Groundwater

RME Scenario

Analyte	Max well conc Cgw (ug/L)	J&E Output Cair (ug/m^3)	Cair (mg/m^3)	Non-Cancer Risk Inhalation HIFNC (m^3/kg-d)	DI (mg/kg-d)	RfD (mg/kg-d)	RfD Source	HQ	Cancer Risk Inhalation HIFCancer (m^3/kg-d)	DI (mg/kg-d)	SF (mg/kg-d)-1	Inhalation SF Source	Risk
Vinyl Chloride	300	312	3.12E-01	1.96E-01	6.1E-02	2.80E-02	I	2	8.39E-02	2.6E-02	1.54E-02	I	4E-04
Tetrachloroethene	23	8.13	8.13E-03	1.96E-01	1.6E-03	8.00E-02	M	0	8.39E-02	6.8E-04	2.00E-02	Region 3	1E-05
Trichloroethene	130	30	3.03E-02	1.96E-01	5.9E-03	1.00E-02	E	1	8.39E-02	2.5E-03	7.00E-03	Cal EPA	2E-05
1,1-Dichloroethene	20	15.8	1.58E-02	1.96E-01	3.1E-03	6.00E-02	I	0	8.39E-02	1.3E-03	--	--	NA

Sources:
Cal EPA = California EPA value as recommended by EPA Region 8.
E = EPA-NCEA provisional value
I = IRIS (assumes exposure as adult)
M = ATSDR MRL (chronic)
Region 3 =Region 3 EPA value

Detailed Risk Calculations for Indoor Workers From Soil

RME Scenario

Ingestion of Indoor Soil and Dust

Analyte	Chemical Class	CAS	Soil Cleanup Level Csoil (mg/kg)	Ksd	Cdust (mg/kg)	F_{Soil}	Dust Soil Fraction Adj (unitless)	Non-Cancer Risk					Cancer Risk				
								HIFNC (kg/kg-d)	DI (mg/kg-d)	Ingestion RfD (mg/kg-d)	Ingestion RfD Source	HQ	HIFCancer (kg/kg-d)	DI (mg/kg-d)	Ingestion SF (mg/kg-d)-1	Ingestion SF Source	Risk
TCDD	volitile	1746016	0.001	0.7	0.001	0.450	0.84	4.89E-07	4.1E-10	--	--	NA	2.10E-07	1.8E-10	1.50E+05	H	3E-05
Tetrachloroethene	volitile	127184	22	0.7	15	0.45	0.84	4.89E-07	9.0E-06	1.00E-02	I	9.0E-04	2.10E-07	3.9E-06	5.40E-01	Region 3	2E-06
Trichloroethene	volitile	79016	103	0.7	72	0.45	0.84	4.89E-07	4.2E-05	3.00E-04	E	1.4E-01	2.10E-07	1.8E-05	4.00E-01	E	7E-06
Hexachlorobenzene	semi-volitile	118741	7	0.7	5	0.45	0.84	4.89E-07	2.9E-06	8.00E-04	I	3.6E-03	2.10E-07	1.2E-06	1.60E+00	I	2E-06
4,4'DDD	pesticide	72548	26	0.7	18	0.45	0.84	4.89E-07	1.1E-05	--	--	NA	2.10E-07	4.6E-06	2.40E-01	I	1E-06
4,4'DDE	pesticide	72559	19	0.7	13	0.45	0.84	4.89E-07	7.8E-06	--	--	NA	2.10E-07	3.3E-06	3.40E-01	I	1E-06
4,4'DDT	pesticide	50293	19	0.7	13	0.45	0.84	4.89E-07	7.8E-06	5.00E-04	I	1.6E-02	2.10E-07	3.3E-06	3.40E-01	I	1E-06
Chlordane	pesticide	57749	7	0.7	5	0.45	0.84	4.89E-07	2.9E-06	5.00E-04	I	5.7E-03	2.10E-07	1.2E-06	3.50E-01	I	4E-07
Heptachlor	pesticide	76448	2	0.7	1	0.45	0.84	4.89E-07	8.2E-07	5.00E-04	I	1.6E-03	2.10E-07	3.5E-07	4.50E+00	I	2E-06

Inhalation of Vapors

Analyte	Chemical Class	CAS	Soil Cleanup Level Csoil (mg/kg)	Soil to Air Transfer Factor J & E Output (kg/m^3)	Cair (mg/m^3)	Non-Cancer Risk					Cancer Risk				
						HIFNC (m^3/kg-d)	DI (mg/kg-d)	Inhalation RfD (mg/kg-d)	Inhalation RfD Source	HQ	HIFCancer (m^3/kg-d)	DI (mg/kg-d)	Inhalation SF (mg/kg-d)-1	Inhalation SF Source	Risk
TCDD	volitile	1746016	0.001	0	--	2.35E-02	--	--	--	NA	1.01E-02	--	1.50E+05	H	--
Tetrachloroethene	volitile	127184	22	1.5	3.31E-02	2.35E-02	7.8E-04	8.00E-02	M	9.73E-03	1.01E-02	3.3E-04	2.00E-02	Region 3	7E-06
Trichloroethene	volitile	79016	103	1.0	9.96E-02	2.35E-02	2.3E-03	1.00E-02	E	2.34E-01	1.01E-02	1.0E-03	7.00E-03	Cal EPA	7E-06
Hexachlorobenzene	semi-volitile	118741	7	0.00014	9.58E-07	2.35E-02	2.3E-08	--	--	NA	1.01E-02	9.6E-09	1.60E+00	I	2E-08

Sources:
Cal EPA = California EPA value as recommended by EPA Region 8.
E = EPA-NCEA provisional value
H = HEAST
I = IRIS
M = ATSDR MRL (chronic)
Region 3 =Region 3 EPA value

Detailed Risk Calculations for Outside Contact Intensive Workers From Soil

RME Scenario

Ingestion of Soil

Analyte	Soil Cleanup Level Csoil (mg/kg)	Non-Cancer Risk HIFNC (kg/kg-d)	DI (mg/kg-d)	Ingestion RfD (mg/kg-d)	Ingestion RfD Source	HQ	Cancer Risk HIFCancer (kg/kg-d)	DI (mg/kg-d)	Ingestion SF (mg/kg-d)-1	Ingestion SF Source	Risk
TCDD	0.001	3.23E-06	3.2E-09	--	--	NA	1.38E-06	1.4E-09	1.50E+05	H	2E-04
Tetrachloroethene	22	3.23E-06	7.1E-05	1.00E-02	I	0.0071	1.38E-06	3.0E-05	5.40E-01	Region 3	2E-05
Trichloroethene	103	3.23E-06	3.3E-04	3.00E-04	E	1.109	1.38E-06	1.4E-04	4.00E-01	E	6E-05
Hexachlorobenzene	7	3.23E-06	2.3E-05	8.00E-04	I	0	1.38E-06	9.7E-06	1.60E+00	I	2E-05
4,4'DDD	26	3.23E-06	8.4E-05	--	--	NA	1.38E-06	3.6E-05	2.40E-01	I	9E-06
4,4'DDE	19	3.23E-06	6.1E-05	--	--	NA	1.38E-06	2.6E-05	3.40E-01	I	9E-06
4,4'DDT	19	3.23E-06	6.1E-05	5.00E-04	I	0	1.38E-06	2.6E-05	3.40E-01	I	9E-06
Chlordane	7	3.23E-06	2.3E-05	5.00E-04	I	0.05	1.38E-06	9.7E-06	3.50E-01	I	3E-06
Heptachlor	2	3.23E-06	6.5E-06	5.00E-04	I	0	1.38E-06	2.8E-06	4.50E+00	I	1E-05

Inhalation Caused by Human Disturbance

Analyte	Soil Cleanup Level Csoil (mg/kg)	PEF kg/m^3	Cair(mg/m^3)	Non-Cancer Risk HIFNC (m^3/kg-d)	DI (mg/kg-d)	Inhalation RfD (mg/kg-d)	Inhalation RfD Source	HQ	Cancer Risk HIFCancer (m^3/kg-d)	DI (mg/kg-d)	Inhalation SF (mg/kg-d)-1	Inhalation SF Source	Risk
4,4'DDD	26	8.8E-10	2.30E-08	2.35E-02	5.4E-10	--	--	NA	1.01E-02	2.3E-10	--	--	NA
4,4'DDE	19	8.8E-10	1.68E-08	2.35E-02	3.9E-10	--	--	NA	1.01E-02	1.7E-10	--	--	NA
4,4'DDT	19	8.8E-10	1.68E-08	2.35E-02	3.9E-10	--	--	NA	1.01E-02	1.7E-10	3.40E-01	I	6E-11
Chlordane	7	8.8E-10	6.18E-09	2.35E-02	1.5E-10	2.00E-04	I	0.000001	1.01E-02	6.2E-11	3.50E-01	I	2E-11
Heptachlor	2	8.8E-10	1.77E-09	2.35E-02	4.1E-11	--	--	NA	1.01E-02	1.8E-11	4.50E+00	I	8E-11

Calculation of Particulate Emission factor (PEF)
Based on USEPA 1996 (Soil Screening Guidance-Users Guide)
See page 23, Equation Box 5, and Exhibit 11.

Inputs

Parameter	Salt Lake
Q/C	78.09
V	0.5
Um	4.69
Ut	11.32
F(x)	0.194
PEF (kg/m^3)	8.83E-10

Sources:
E = EPA-NCEA provisional value
H = HEAST
I = IRIS
Region 3 =Region 3 EPA value