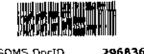
RECORD OF DECISION FOR OPERABLE UNIT 9 BASEWIDE GROUNDWATER



SOMS DocID

296836

NAVAL SUBMARINE BASE NEW LONDON **GROTON, CONNECTICUT**

COMPREHENSIVE LONG-TERM **ENVIRONMENTAL ACTION NAVY (CLEAN) CONTRACT**

Submitted to: **Naval Facilities Engineering Command** Mid-Atlantic 9742 Maryland Avenue Norfolk, Virginia 23511-3095

Submitted by: Tetra Tech NUS, Inc. 600 Clark Avenue, Suite 3 King of Prussia, Pennsylvania 19406-1433

CONTRACT NUMBER N62467-04-D-0055 **CONTRACT TASK ORDER 431**

SEPTEMBER 2008

TABLE OF CONTENTS

SECTION				
LIST	OF ACRO	NYMS	vi	
GLO:	SSARY O	F TECHNICAL TERMS	x	
1.0	DECLA	RATION	2-1	
	1.1	SITE NAME AND LOCATION		
	1.2	STATEMENT OF BASIS AND PURPOSE		
	1.3	ASSESSMENT OF SITE		
	1.4	DESCRIPTIONS OF SELECTED REMEDIES	2-2	
	1,4,1	Sites 3 and 7		
	1.4.2	Sites 9 and 23	2-3	
	1.4.3	Sites 2A, 2B, 14, 15, 18, and 20	2-3	
	1.5	STATUTORY DETERMINATIONS		
	1.6	ROD DATA CERTIFICATION CHECKLIST.		
	1.7	AUTHORIZING SIGNATURES		
2.0	DECISI	ON SUMMARY	2-1	
2.0	2.1	SITE NAME, LOCATION, AND BRIEF DESCRIPTION	2 ₋₁	
	2.1.1	Site 2A – Area A Landfill and Site 2B – Site A Wetland		
	2.1.2	Site 3 – Area A Downstream Watercourses and OBDA		
	2.1.3	Site 7 – Torpedo Shops		
	2.1.4	Site 9 – Waste OT-5		
	2.1,5	Site 14 – OBDANE		
	2.1.6	Site 15 - Spent Acid Storage and Disposal Area		
	2.1.7	Site 18 – Solvent Storage Area, Building 33		
	2.1.8	Site 20 – Area A Weapons Center		
	2.1.9	Site 23 – Tank Farm		
	2.2	SITE HISTORY AND ENFORCEMENT ACTIVITIES		
	2.2.1	Site History		
	2.2.2	Enforcement Activities		
	2.3	COMMUNITY PARTICIPATION		
	2.4	SCOPE AND ROLE OF OPERABLE UNIT		
	2.5	SITE CHARACTERISTICS		
	2.5.1	Physical Setting		
	2.5.2	Nature and Extent of Contamination	2-25	
	2.6	CURRENT AND POTENTIAL FUTURE LAND AND RESOURCE USES		
	2.7	SUMMARY OF SITE RISKS	2-43	
	2.7.1	Human Health Risk Assessment		
	2.7.2	Summary of Ecological Risk Assessment		
	2.8	REMEDIAL ACTION OBJECTIVES		
	2.8.1	Sites 3 and 7 Groundwater RAOs	2-61	
	2.8.2	Site 7 Groundwater RAOs		
	2.8.3	Sites 9 and 23 Groundwater RAOs		
	2.9	DESCRIPTION OF ALTERNATIVES		
	2.9.1	Description of Remedial Alternatives		
	2.9,2	Common Elements and Distinguishing Features of Each Alternative		
	2.9.3	Expected Outcomes of Each Alternative		

TABLE OF CONTENTS

SECTION		PAGE NO.			
2.10	SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES	2-70			
2.10.					
2.10.					
2.10.		2-75			
2.10.		2-77			
2.10.					
2.10.					
2.10.					
2.10.					
2.10.					
2.11	PRINCIPAL THREAT WASTE				
2,12	SELECTED REMEDY				
2.12.					
2.12.					
2.12.		2-86			
2.13	STATUTORY DETERMINATIONS				
2.13,		2-86			
2.13.					
2.13.					
2.13.					
2.13.					
2.13.	- · · · - · · - · · - · - · - · - · - ·	2-89			
2.14	DOCUMENTATION OF SIGNIFICANT CHANGES	2-90			
	ICO/PAICOC CLIBBLE NOV				
	ISIVENESS SUMMARY				
3.1	OVERVIEW				
3.2	BACKGROUND ON COMMUNITY INVOLVEMENT				
3.3	SUMMARY OF COMMENTS RECEIVED DURING THE PUBLIC COMP PERIOD AND NAVY RESPONSES				
	PERIOD AND NAVY RESPONSES				
REFERENCE	S	R-1			
-					
<u>APPENDICE</u>	<u>s</u>				
A	STATE OF CONNECTICUT CONCURRENCE LETTER				
В	SOPA (ADMIN) NEW LONDON INSTRUCTION 5090.18D				
C	PROPOSED PLAN AND PUBLIC NOTICE				
D	PUBLIC MEETING TRANSCRIPT				
E	2008 HUMAN HEALTH RISK ASSESSMENT MEMORANDA E.1 HUMAN HEALTH RISKS ASSOCIATED WITH SITE 2 GROUND E.2 HUMAN HEALTH RISKS ASSOCIATED WITH SITE 23 GROUN E.3 VAPOR INTRUSION EVALUATION FOR GROUNDWATER AT (UNIT (OU) 9	DWATER			
F	HUMAN HEALTH RISK ASSESSMENT, RAGS PART D TABLES				
G	SELECTED REMEDY COST ESTIMATE				

TABLES

<u>NUMBER</u>

2.4	V 4	Groundwater	1.4	Dogulto for	OUA 2
2-1	real (Groundwater	MODITOLICIA	results for	Oute o

- 2-2 Year 1 Groundwater Monitoring Results for Site 7
- 2-3 Summary of Groundwater Analytical Results for Site 15
- 2-4 Summary of Groundwater Analytical Results for Site 18
- 2-5 Summary of Groundwater Analytical Results for Site 20
- 2-6 Summary of Data from 2007 Underdrain Metering Pit Quarterly Sampling Events at Site 23
- 2-7 Selection of Human Health Risk Assessment Exposure Pathways for Operable Unit 9
- 2-8 Summary of Cancer Risks and Hazard Indices for Site 3 Groundwater, Reasonable Maximum Exposures
- 2-9 Summary of Cancer Risks and Hazard Indices for Site 3 Groundwater, Central Tendency Exposures
- 2-10 Summary of Cancer Risks and Hazard Indices for Site 7 Groundwater Reasonable Maximum Exposures
- 2-11 Summary of Cancer Risks and Hazard Indices for Site 7 Groundwater, Central Tendency Exposures
- 2-12 Comparisons of Site 14 Groundwater Analytical Results to Screening Criteria
- 2-13 Summary of Cancer Risks and Hazard Indices for Site 15, Reasonable Maximum Exposures
- 2-14 Summary of Cancer Risks and Hazard Indices for Site 15, Central Tendency Exposures
- 2-15 Summary of Cancer Risks and Hazard Indices for Site 20 Groundwater, Reasonable Maximum Exposures
- 2-16 Summary of Cancer Risks and Hazard Indices for Site 20 Groundwater, Central Tendency Exposures
- 2-17 Summary of Cancer Risks and Hazard Indices for Site 23, Reasonable Maximum Exposures
- 2-18 Selection of Ecological COPCs in Groundwater, Site 3 NSA
- 2-19 Site 3 Remedial Goals
- 2-20 Site 7 Remedial Goals
- 2-21 Assessment of Chemical-Specific ARARs and TBCs for Groundwater, Alternatives GW1-1, GW2-1, and GW3-1 No Action
- 2-22 Assessment of Chemical-Specific ARARs and TBCs for Groundwater, Alternatives GW1-2 and GW2-2 Selected Remedy
- 2-23 Assessment of Action Specific ARARs and TBCs for Groundwater, Alternatives GW1-2 and GW2-2 Selected Remedy
- 2-24 Assessment of Location-Specific ARARs and TBCs for Groundwater, Alternatives GW1-2 and GW2-2 Selected Remedy
- 2-25 Assessment of Chemical Specific ARARs and TBCs for Groundwater, Alternative GW2-3 Extraction and Off-Site Discharge
- 2-26 Assessment of Action-Specific ARARs and TBCs for Groundwater, Alternative GW2-3 Extraction and Off-Site Discharge
- 2-27 Assessment of Location-Specific ARARs and TBCs for Groundwater, Alternative GW2-3 Extraction and Off-Site Discharge
- 2-28 Assessment of Chemical-Specific ARARs and TBCs for Groundwater, Alternative GW3-2 Selected Remedy
- 2-29 Assessment of Action-Specific ARARs and TBCs for Groundwater Alternative GW3-2 Selected Remedy

FIGURES

<u>NUMBER</u>

2-1	Location Map
2-2	Site Location Map
2-3	Site 2 General Site Layout and Sample Locations
2-4	Sites 3 and 14 General Site Layout and Sampling Locations
2-5	Site 7 General Site Layout and Sampling Locations
2-6	Sites 9 and 23 General Site Layout and Sampling Locations
2-7	Site 15 General Site Layout and Sampling Locations
2-8	Site 18 General Site Layout and Sampling Locations
2-9	Site 20 General Site Layout and Sampling Locations
2-10	Shallow Overburden Potentiometric Surface Map, August 2000, Northern Region
2-11	Bedrock Potentiometric Surface Map, August 2000, Northern Region
2-12	Shallow Overburden Potentiometric Surface Map for Sites 3 and 14, October 2002
2-13	Bedrock Potentiometric Surface Map for Sites 3 and 14, October 2002
2-14	Shallow Overburden Potentiometric Surface Map, August 2000, Southern Region
2-15	Bedrock Potentiometric Surface Map, August 2000, Southern Region
2-16	Site 15 Shallow Overburden Potentiometric Surface Map
2-17	Site 20 Shallow Overburden Potentiometric Surface Map
2-18	Site 2 Year 7 Groundwater Monitoring Exceedances
2-19	Year 1 Groundwater Monitoring Exceedances for Site 3 and 7
2-20	Ecological Conceptual Site Model, Site 3 - New Source Area
2-21	Areas with Groundwater Land Use Controls

CTO 431

LIST OF ACRONYMS

ARAR Applicable or Relevant and Appropriate Requirement

AS/SVE Air sparging/soil vapor extraction

AST Above-ground storage tank

Atlantic Atlantic Environmental Services, Inc.

B&RE Brown & Root Environmental

BGOURI Basewide Groundwater Operable Unit Remedial Investigation

bgs Below ground surface

CB Chlorobenzene

CERCLA Comprehensive Environmental Response, Compensation, and Liability Act

CERCLIS Comprehensive Environmental Response, Compensation, and Liability Act Information

System 5 4 1

CFR Code of Federal Regulations
CGS Connecticut General Statutes

CLEAN Comprehensive Long-Term Environmental Action Navy

COC Chemical of concern

COPC Chemical of potential concern

CTDEP Connecticut Department of Environmental Protection

CTE Central tendency exposure

DCB Dichlorobenzene

DDD 1,1-Dichloro-2,2-bis(4-chlorophenyl)ethane
DDT 1,1,1-Trichloro-2,2-bis(4-chlorophenyl)ethane

DGI Data Gap Investigation

DRMO Defense Reutilization and Marketing Office

EEQ Ecological effects quotient
Envirodyne Envirodyne Engineers, Inc.

EPA United States Environmental Protection Agency

ERA Ecological risk assessment

ESQD Explosive Safety Quantity Distance

FFA Federal Facility Agreement FFS Focused Feasibility Study

FS Feasibility Study

FWEC Foster Wheeler Environmental Corporation
GA/GAA/GB CTDEP Groundwater Quality Classifications

GAC Granular activated carbon

GMP Groundwater Monitoring Plan

HCB Hexachlorobenzene

HDPE High-density polyethylene

HHRA Human health risk assessment

HI Hazard index
HQ Hazard quotient

HSWA Hazardous and Solid Waste Amendment

IAS Initial Assessment Study
ICR Incremental cancer risk
IR Installation Restoration

LUC Land use control

MCL Maximum Contaminant Level

mg/kg Milligrams per kilogram (parts per million)
mg/L Milligrams per liter (parts per million)

NAVD North American Vertical Datum

NCP National Oil and Hazardous Substances Pollution Contingency Plan

NEX Naval Exchange
NFA No Further Action

ng/kg Nanograms per kilogram (parts per million)

NPDES National Pollutant Discharge Elimination System

NPL National Priorities List

NSA New Source Area

NSB-NLON Naval Submarine Base New London
NTCRA Non-Time-Critical Removal Action

NTU Nephelometric turbidity unit
O&M Operation and maintenance
OBDA Overbank Disposal Area

OBDANE Overbank Disposal Area Northeast

OSWER Office of Solid Waste and Emergency Response

OU Operable Unit

PAH Polynuclear aromatic hydrocarbon

PCB Polychlorinated biphenyl

POTW Publicly owned treatment works
PPE Personnel protective equipment
PRG Preliminary Remediation Goal

RA Remedial action

RAB Restoration Advisory Board

RAGS Risk Assessment Guidance for Superfund

RAO Remedial action objective
RBC - Risk-Based Concentration

RCRA Resource Conservation and Recovery Act
RCSA Regulations of Connecticut State Agencies

RD Remedial Design
RfD Reference dose
RG Remedial goal

RI Remedial Investigation

RME Reasonable maximum exposure

ROD Record of Decision

RSR Remediation Standard Regulations (Connecticut)
SARA Superfund Amendments and Reauthorization Act

SCS Soil Conservation Service

SVOC Semivolatile organic compound
SWPC Surface water protection criterion
SwSV Surface water screening value
TAG Technical Assistance Grant

TAL Target Analyte List
TBC To Be Considered
TCE Trichloroethene

TCL Target Compound List

TPH Total petroleum hydrocarbons

TSS Total suspended solids
TINUS Tetra Tech NUS, Inc.
U.S.C. United States Code

USGS United States Geological Survey

UST Underground storage tank

VC Vinyl chloride

VOC Volatile organic compound WQS Water Quality Standard

µg/kg Micrograms per kilogram (parts per billion)

iΧ

μg/L Micrograms per liter (parts per billion)

GLOSSARY OF TECHNICAL TERMS

This glossary defines terms used in this Record of Decision (ROD). The definitions apply specifically to this ROD and may have other meanings when used in different circumstances.

Administrative Record File: A file that contains all information used by the lead agency to make its decision in selecting a response under CERCLA. This file is to be available for public review, and a copy is to be established at or near the site, usually at one of the Information Repositories. Also, a duplicate is filed in a central location such as a regional or state office.

Applicable or Relevant and Appropriate Requirements (ARARs): Federal environmental and state environmental and facility siting rules, regulations, statutes, and criteria that must be met by the Selected Remedy under Superfund.

Carcinogen: A substance that may cause cancer.

Chemical of concern (COC): A regulated chemical that is present at a concentration deemed to pose an unacceptable risk to human health or the environment, taking into account the acceptable level of risk land use definitions (i.e., current and reasonable potential future), and exposure scenario (i.e., completed pathways).

Chemical of potential concern (COPC): A chemical identified as a potential concern to human health or the environment through a screening-level assessment because its concentration exceeds regulatory criteria.

Comment period: A time during which the public can review and comment on various documents and actions taken either by the Navy, EPA, or CTDEP. For example, a comment period is provided when EPA proposes to add sites to the National Priorities List. A minimum 30-day comment period is held to allow community members to review the Administrative Record file and review and comment on the Proposed Plan.

Community relations: The Navy and NSB-NLON program to inform and involve the public in the Superfund process and to respond to community concerns.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 U.S.C. 9601 et seq.: A federal law passed in 1980 and modified in 1986 by the Superfund Amendments and

Reauthorization Act (SARA), Public Law 99-499. The act created a special tax that goes into a trust fund to investigate and clean up abandoned or uncontrolled hazardous waste sites.

Contamination: Any physical, biological, or radiological substance or matter that, at a certain concentration, could have an adverse effect on human health and the environment.

Data Gap Investigation (DGI): A follow-up investigation performed to address data gaps identified in the results of the previous investigation.

Feasibility Study (FS): A report that presents the development, analysis, and comparison of remedial alternatives.

Five-Year Review: Review of any remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site. The review is conducted no less often than each 5 years after the initiation of the remedial action.

Groundwater: Water found beneath the earth's surface. Groundwater may transport substances that have percolated downward from the ground surface as it flows towards its point of discharge.

Hazard index (HI): Sum of the HQs for all chemicals and all routes of exposure.

Hazard quotient (HQ): The ratio of the daily intake of a chemical from on-site exposure divided by the reference dose (RfD) for that chemical. The RfD represents the daily intake of a chemical that is not expected to cause adverse health effects.

Incremental cancer risk (ICR): The incremental increase in the probability of developing cancer during one's lifetime from exposure to carcinogenic chemicals in addition to the background probability of developing cancer. The EPA ICR goal is between 1x10⁻⁶ (1 in a million) and 1x10⁻⁴ (1 in ten thousand) chance of cancer. Cancer risk less than or within the risk goal is considered an acceptable risk level by the EPA. The CTDEP ICR Guideline is 1x10⁻⁵ (1 in a hundred thousand) and applies to cumulative risk posed by multiple contaminants. The state's acceptable carcinogenic risk for individual pollutants is 1x10⁻⁶ (1 in a million).

Information Repository: A file containing information, technical reports, and reference documents regarding a Superfund site that is made available to the public.

Installation Restoration (IR) Program: The purpose of the program is to identify, investigate, assess, characterize, and clean up or control releases of hazardous substances, and to reduce the risk to human health and the environment from past waste disposal operations and hazardous material spills at Navy activities in a cost-effective manner.

Institutional controls: Institutional Controls are a subset of land use controls and are primarily legal mechanisms (non-engineering) imposed to ensure the continued effectiveness of land use restrictions imposed as part of a remedial decision. Legal mechanisms include restrictive covenants, negative easements, equitable servitudes, and deed notifications. Administrative mechanisms include notices, adopted local land use plans and ordinances, construction permitting, or other existing land use management systems that may be used to ensure compliance with use restrictions.

JP-10: A popular missile fuel which is a single-component hydrocarbon (C₁₀H₁₆), rather than a mixture of many hydrocarbons. **JP-10** fuel is a storable liquid.

Land use controls (LUCs): Any type of physical, legal, or administrative mechanism that restricts the use of, or limits access to, real property including water resources to prevent or reduce risks to human health and the environment. Physical mechanisms encompass a variety of engineered remedies to contain or reduce contamination and/or physical barriers to limit access to property, such as fences or signs. The legal mechanisms used for LUCs are generally the same as those used for institutional controls.

Monitoring: Periodic or continuous surveillance or testing to determine the level of compliance with statutory requirements and/or pollutant levels in various media or in humans, plants, and animals.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 CFR Part 300: Federal regulations that provide the organizational structure and procedures for preparing for and responding to discharges of oil and release of hazardous substances, pollutants, or contaminants.

National Priorities List (NPL): The EPA's list of the most serious uncontrolled or abandoned hazardous waste sites identified for possible long-term remedial response. The list is based on the score a site receives in the Hazard Ranking System. EPA is required to update the NPL at least once a year.

Natural degradation: Natural degradation processes include a variety of physical, chemical, or biological processes that, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil and groundwater. These in-situ

processes include biodegradation, dispersion, dilution, sorption, volatilization, and chemical or biological stabilization, transformation, or destruction of contaminants.

Operable Unit (OU): Operable units are site management tools that define discrete steps towards comprehensive actions as part of a Superfund site cleanup. They can be based on geological portions of a site, specific site problems, initial phases of action, or any set of actions performed over time or concurrently at different parts of the site.

Organic compounds: Naturally occurring or man-made chemicals containing carbon. Volatile organics can evaporate more quickly than semivolatile organics. Some organic compounds may cause cancer; however, their strength as cancer-causing agents can vary widely. Other organics may not cause cancer but may be toxic. The concentrations that can cause harmful effects can also vary widely.

Otto Fuel II: Otto Fuel II is a distinct-smelling, reddish-orange, oily liquid that the Navy uses as a fuel for torpedoes and other weapon systems. It is a mixture of three synthetic substances: propylene glycol dinitrate (the major component), 2-nitrodiphenylamine, and cibutyl sebacate and produces hydrogen cyanide when burned. Propylene glycol dinitrate, a colorless liquid with an unpleasant odor, is explosive. 2-Nitrodiphenylamine is an orange solid used to control the explosion of propylene glycol dinitrate. Dibutyl sebacate is a clear liquid used for making plastics, many of which are used for food packaging. It is also used to enhance flavor in some foods such as ice cream, candy, baked goods, and nonalcoholic drinks, and is found in some shaving creams.

Polynuclear aromatic hydrocarbons (PAHs): High molecular weight, relatively immobile, and moderately toxic solid organic chemicals featuring multiple benzenic (aromatic) rings in their chemical formula. Typical examples of PAHs are naphthalene and phenanthrene.

Proposed Plan: A public participation requirement of SARA in which the lead agency summarizes for the public the preferred cleanup strategy and the rationale for preference and reviews the alternatives presented in the detailed analysis of the FS. The Proposed Plan may be prepared either as a fact sheet or as a separate document. In either case, it must actively solicit public review and comment on all atternatives under consideration.

Record of Decision (ROD): An official document that describes the selected Superfund remedy for a site. The ROD documents the remedy selection process and is issued by the Navy and EPA following the public comment period.

Remedial Investigation (RI): A report that describes the site, documents the nature and extent of contaminants detected at the site, and presents the results of the risk assessment.

Remedial action: The actual construction or implementation phase that follows the remedial design for the selected cleanup alternative at a site on the NPL.

Response action: As defined by CERCLA Section 101(25), response actions include removal or remedial actions, including enforcement activities.

Responsiveness Summary: A summary of written and oral comments received during the public comment period, together with the Navy's and EPA's responses to these comments.

Risk assessment: Evaluation and estimation of the current and future potential for adverse human health or environmental effects from exposure to contaminants.

Site Use Restrictions document: SOPA (ADMIN) New London Instruction 5090.18D, Installation Restoration Site Use Restrictions at Naval Submarine Base New London defines Navy policy and procedures regarding disturbance of contaminated soil/sediment and/or extraction of contaminated groundwater. The locations of impacted media are also identified in figures provided in the Instruction.

Source: Area(s) of a site where contamination originates.

Superfund: The trust fund established by CERCLA that can be drawn on to plan and conduct cleanups of past hazardous waste disposal sites and current releases or threats of releases of non-petroleum products. Superfund is often divided into removal, remedial, and enforcement components.

Superfund Amendments and Reauthorization Act (SARA): The public law enacted on October 17, 1986, to reauthorize the funding provisions and amend the authorities and requirements of CERCLA and associated laws. Section 120 of SARA requires that all federal facilities be subject to and comply with this act in the same manner and to the same extent as any non-government entity.

TH Dimer: Tetrahydromethylcyclopentadiene, also called RJ-4, is a fuel developed for ram-jet missiles. It has been used for the Navy Sea Launched Cruise Missile. It can be used alone or blended with other fuels (e.g., a component of JP-9 jet fuel).

1.0 DECLARATION

1.1 SITE NAME AND LOCATION

This Final Record of Decision (ROD) includes the groundwater at the following sites:

- Site 2A Area A Landfill
- Site 2B Area A Wetland
- Site 3 Area A Downstream Watercourses and Overbank Disposal Area (OBDA)
- Site 7 Torpedo Shops
- Site 9 Waste OT-5
- Site 14 Overbank Disposal Area Northeast (OBDANE)
- Site 15 Spent Acid Storage and Disposal Area
- Site 18 Solvent Storage Area, Building 33
- Site 20 Area A Weapons Center
- Site 23 Tank Farm.

These sites comprise the Basewide Groundwater Operable Unit (OU) 9.

Naval Submarine Base – New London (NSB-NLON)

Groton, Connecticut

CERCLIS ID No. CTD980906515

1.2 STATEMENT OF BASIS AND PURPOSE

This Final ROD for OU9 presents the Selected Remedies for the groundwater at Siles 2A, 2B, 3, 7, 9, 14, 15, 18, 20, and 23 at NSB-NLON, Groton, Connecticut. Sites 2A, 2B, 3, 7, 14, and 20 are located in the northern portion of NSB-NLON in close proximity to each other, and the groundwater beneath these sites is hydraulically connected. Siles 9, 15, 18, and 23 are located in the southern portion of NSB-NLON in close proximity to each other, and the groundwater beneath these sites is hydraulically connected. Groundwater at Sites 9, 15, 18, and 23 is also included in OU9. The Selected Remedies were chosen in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), 42 United States Code (U.S.C.) 9601 et seq., as amended by the Superfund Amendments and Reauthorization Act (SARA), Public Law 99-499, and, to the extent practicable, the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), 40 Code of Federal Regulations (CFR) Part 300. These decisions are based on information contained in the Administrative Record file for these sites.

The United States Department of the Navy and the United States Environmental Protection Agency (EPA) Region I issue this Final ROD jointly. The State of Connecticut Department of Environmental Protection (CTDEP) concurs with the Selected Remedies (see Appendix A).

1.3 ASSESSMENT OF SITE

The remedial actions (RA) selected in this Final ROD for Sites 3, 7, 9, and 23 groundwater are necessary to protect public health or welfare or the environment from actual or threatened releases of pollutants or contaminants from these sites.

The Navy has determined that No Further Action (NFA) is necessary for the groundwater at Sites 14, 15, 18, and 20 to protect public health or welfare or the environment. Groundwater at Sites 2A and 2B is currently monitored under a groundwater monitoring program selected as part of the remedy for OU1. Institutional controls, required under the OU1 ROD, will remain in place at Sites 2A and 2B as described in the Site Use Restrictions document.

1.4 DESCRIPTIONS OF SELECTED REMEDIES

A total of 12 OUs have been defined at NSB-NLON to address the 23 sites included in the NSB-NLON Installation Restoration (IR) Program. This Final ROD only applies to the Basewide Groundwater OU9, which includes groundwater at Sites 2A, 2B, 3, 7, 9, 14, 15, 18, 20, and 23. Before final remedies were chosen for Sites 2A, 2B, 9, and 23, an Interim ROD was signed to document selection of interim remedies for groundwater at the remaining OU9 sites (Navy, 2004e). This ROD documents the final actions for all of OU9.

The Selected Remedies for groundwater at Sites 3 and 7 and Sites 9 and 23 require the development and implementation of response measures that will protect human health and the environment from contaminated groundwater at these sites. NFA is necessary for groundwater at Sites 14, 15, 18, and 20. Groundwater monitoring and institutional controls will continue at Sites 2A and 2B as part of the OU1 remedy. The soil at Site 2 (OU1), Site 3 (OU3), Site 3 – New Source Area (NSA), Site 7 (OU8), Site 14 (OU8), Site 15 (OU6), Site 18 (a portion of OU11), and the soil and sediment at Site 20 (OU7) were addressed in separate RODs or other decision documents.

1.4.1 Sites 3 and 7

The final Selected Remedy for groundwater at Sites 3 and 7 is Institutional Controls with Monitoring. The Selected Remedy complies with regulatory requirements and includes the following major components:

- Continuation of institutional controls that identify the location and magnitude of groundwater contamination, restrict extraction and use of the groundwater, and control vapor intrusion (Site 3 only) based on land use. Institutional controls were initially implemented at Sites 3 and 7 in December 2006 in accordance with the Interim ROD. These interim controls are incorporated into this Final ROD. In the event of property transfer and with confirmation that contaminated groundwater remains at the sites, an environmental land use restriction pursuant to state law will be used to prohibit the use of groundwater.
- Continued monitoring of the degradation and potential migration of groundwater contaminants until
 concentrations decrease to levels at which unrestricted use of and unlimited exposure to groundwater
 may be permitted. The monitoring program at Sites 3 and 7 was initiated in May 2006 in accordance
 with the Interim ROD.
- Five-year reviews until the results of the monitoring program indicate that remedial goals have been reached.

1.4.2 Sites 9 and 23

The final Selected Remedy for groundwater at Sites 9 and 23 is Institutional Controls [SOPA (ADMIN) New London Instruction 5090.18D (Appendix B)]. The Selected Remedy complies with regulatory requirements and involves implementation of institutional controls that identify the location and magnitude of groundwater contamination and restrict extraction and use of the groundwater. In the event of property transfer and with confirmation that contaminated groundwater remains at the sites, an environmental land use restriction pursuant to state law will be used to prohibit the use of groundwater. Five-year reviews will be conducted until contaminant concentrations are shown to be protective of human health and the environment.

1.4.3 Sites 2A, 2B, 14, 15, 18, and 20

Groundwater at Sites 14, 15, 18, and 20 poses no current or future potential threat to human health or the environment; therefore, NFA is the Selected Remedy and the Navy will not implement any treatment, engineering controls, or institutional controls at these sites.

At Sites 2A and 2B, groundwater monitoring as described in the OU1 ROD (Navy, 1995) and institutional controls as described in the NSB-NLON IR Site Use Restrictions document will continue. No additional action is required under OU9 to address groundwater at these sites.

1.5 STATUTORY DETERMINATIONS

The final remedies for Sites 2A, 2B, 3, 7, 9, 14, 15, 18, 20, and 23 groundwater are protective of human health and the environment, comply with federal and state requirements that are applicable or relevant and appropriate to the remedial actions, and are cost effective.

The Selected Remedies for groundwater at Sites 3 and 7 and Sites 9 and 23 do not satisfy the statutory preference for treatment as a principal element of the remedy. Due to the sporadic and relatively low concentrations of contaminants in groundwater, the Navy has determined that incorporating technologies to actively reduce the toxicity of the contaminants on site would not be cost effective. Treatment is not necessary for groundwater at Sites 2A and 2B based on the OU1 ROD or at Sites 14, 15, 18, and 20 because the Selected Remedy is NFA.

Because the Selected Remedies will result in contaminants remaining on site in excess of remedial goals, institutional controls will be implemented to prevent exposure to contaminated groundwater and to ensure that the RAOs are achieved. The Selected Remedies for Sites 3 and 7 and Sites 9 and 23 will result in contaminants remaining in groundwater at the sites at concentrations that do not allow for unrestricted use and unlimited exposure; therefore, statutory reviews will be conducted within 5 years of initiation of remedial action, and every 5 years thereafter, to ensure that the remedies continue to protect human health and the environment. If the remedies are determined not to be protective of human health and the environment because the institutional controls have failed, the Navy will be required to undertake additional remedial action.

The selection of NFA remedies for groundwater at Sites 14, 15, 18, and 20 is based on investigation and risk assessment results indicating that no additional remedial actions are necessary to ensure protection of human health and the environment. Because the remedies will not result in hazardous substances, pollutants, or contaminants remaining on site in excess of levels that allow for unlimited use and unrestricted exposure, five-year reviews of these sites as part of OU9 will not be required. Five-year reviews of Sites 2A and 2B will continue under OU1.

1.6 ROD DATA CERTIFICATION CHECKLIST

The following information is included in the Decision Summary section of this ROD:

- Chemicals of concern (COCs) and their respective concentrations.
- Baseline risk represented by the COCs.

- Cleanup levels (i.e., remedial goals) established for COCs and the basis for these levels.
- If present, how source materials constituting principal threats would be addressed.
- Current and reasonably anticipated future land use assumptions and current and potential future beneficial uses of groundwater used in the baseline risk assessments and ROD.
- Potential land and groundwater uses that will be available at the sites as a result of the Selected Remedies.
- Estimated capital, annual operation and maintenance (O&M), and total present worth costs, discount rates, and the number of years over which the remedy cost estimates are projected.
- Key factor(s) that led to selecting the remedies (i.e., description of how the Selected Remedies
 provide the best balance of tradeoffs with respect to the balancing and modifying criteria, highlighting
 criteria key to the decision).

Additional information can be found in the Administrative Record file for Sites 2A, 2B, 3, 9, 7, 14, 15, 18, 20, and 23.

1.7 AUTHORIZING SIGNATURES

The signatures provided on the following pages validate the selection of the final remedies for groundwater at OU9, Sites 2A, 2B, 3, 9, 7, 14, 15, 18, 20 and 23 by the Navy and EPA. CTDEP concurs with the Selected Remedies.

020806/P 1-5 CTO 431

SEPTEMBER 2008

Concur and recommend for implementation:

Mark S. Ginda, USN

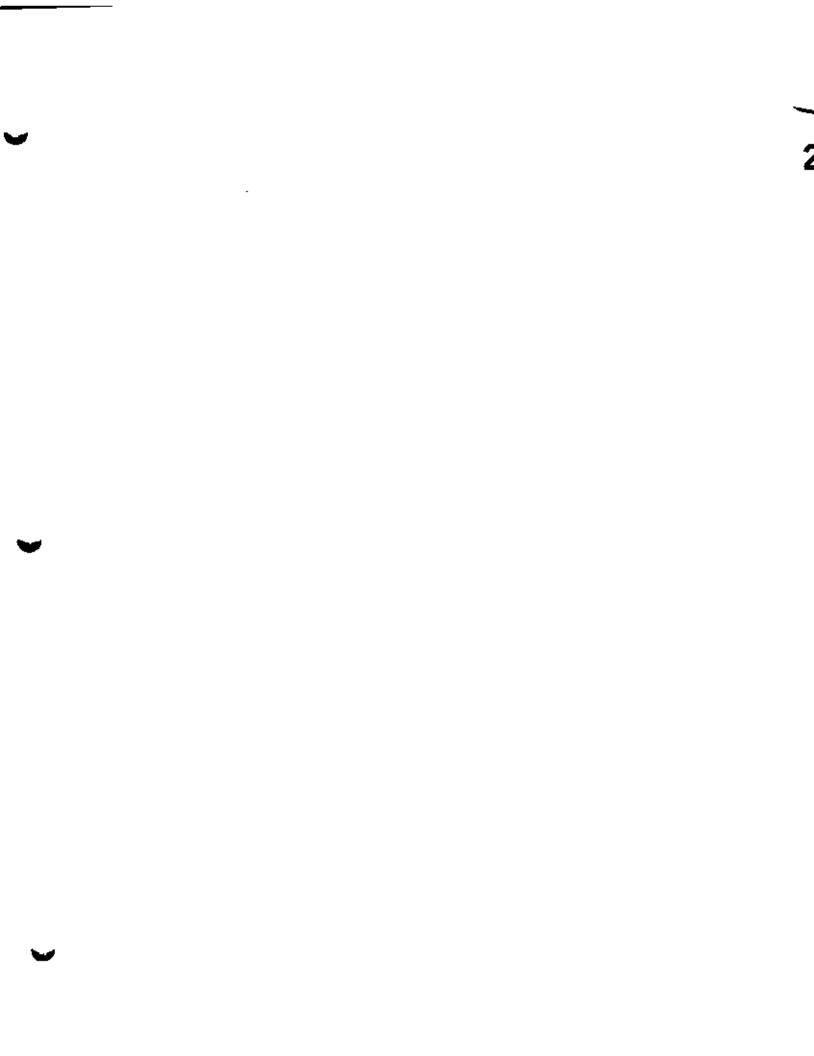
Naval Submarine Base - New London

ZASEPT 2008

Date

Concur and recommend for implementation:

James T. Owens, III, Director
Office of Site Remediation and Restoration
EPA Region I



2.0 DECISION SUMMARY

This ROD describes the remedies selected by the Navy and EPA for OU9, Sites 2A, 2B, 3, 7, 9, 14, 15, 18, 20, and 23 groundwater to protect human health and the environment. The Navy is the lead agency for CERCLA activities at NSB-NLON and provides the funding for the cleanup activities. EPA provides the primary regulatory oversight and enforcement for CERCLA activities at NSB-NLON, and CTDEP is also actively involved in supporting the activities as required under the Federal Facility Agreement (FFA) (EPA, 1995).

2.1 - SITE NAME, LOCATION, AND BRIEF DESCRIPTION

NSB-NLON is located in southern Connecticut in the Towns of Ledyard and Groton. NSB-NLON is situated on the eastern bank of the Thames River, approximately 6 miles north of Long Island Sound. It is bordered on the east by Connecticut Route 12, on the south by Crystal Lake Road, and on the west by the Thames River. The northern border is a low ridge that trends approximately east-southward from the Thames River to Baldwin Hilf. A general facility location map is presented as Figure 2-1. The location of each IR Program site within NSB-NLON is shown on Figure 2-2.

2.1.1 Site 2A - Area A Landfill and Site 2B - Site A Wetland

Site 2 is located in the northeastern and north-central portions of NSB-NLON and includes Site 2A, the Area A Landfill, and Site 2B, the Area A Wetland. The Area A Landfill encompasses approximately 13 acres and is a relatively flat area bordered by a steep, wooded hillside that rises to the south, a steep wooded ravine to the west, and the Area A Wetland to the north. The general configuration of Site 2 and adjacent areas is shown on Figure 2-3.

The Area A Landfill opened around 1957. Incinerated combustible wastes were disposed at the site until 1963, followed by refuse and debris disposal until 1973, when landfilling operations ceased. The thickness of landfill materials is estimated to range from 10 to 20 feet. After closure, a concrete pad was constructed on a portion of the landfill. In the early 1980s, transformers and electrical switches stored on the pad were reported to be leaking. Petroleum compounds were poured from containers at the landfill and flowed into the Area A Wetland. Spent sulfuric acid solution from batteries was poured into trenches dug into the Area A Landfill for disposal and subsequently covered with soil.

The location of the Area A Wetland was undeveloped wooded land and possibly wetland until the late 1950s when dredge spoils from the Thames River were pumped to the Area A Wetland and contained within an earthen dike that extends from the Area A Landfill to the southern side of the Area A Weapons

Center. The thickness of dredge spoils ranges from 35 feet to 10 feet. A small pond is located at the southern portion of the wetland, within which 1 to 3 feet of standing water is present during all seasons. Phragmites is the predominant type of vegetation. It was reported that formulated (water-soluble) 1,1,1-trichloro-2,2-bis(4-chlorphenyl)ethane (DDT) was used in this area in the 1960s prior to the 1972 ban on DDT. The Area A Wetland encompasses approximately 26 acres.

2.1.2 Site 3 – Area A Downstream Watercourses and OBDA

Site 3 is located in the northern portion of NSB-NLON and includes undeveloped wooded areas featuring several small ponds, streams, and wetlands and recreation areas (golf course and lake for swimming). Site 3 covers approximately 75 acres. Site 3 receives surface water and groundwater recharge from the Area A Landfill (Site 2A), Area A Wetland (Site 2B), Site 7, Site 14, and surrounding areas and convey them to the Thames River. Site 3 includes North Lake and several small ponds (Upper Pond, Lower Pond, and OBDA Pond) and interconnected streams (Streams 1 through 6). The major sources of contamination to Site 3 included historical application of pesticides, abandoned disposal areas, and the septic system leach fields at Site 7. The general configuration of Site 3 and adjacent areas is shown on Figure 2-4.

The primary discharge points from Site 28 to Site 3 are through four 24-inch-diameter metal culvert pipes located within the dike that separates Site 28 from Site 3. The discharge from these culverts forms a small stream (Stream 4) that flows westward for approximately 200 feet into Upper Pond. Upper Pond discharges to Stream 3, which flows northward and then westward toward Triton Road (past the OBDANE site) to the entrance of Site 7. At this location, it meets the drainage channel from Site 7 and forms Stream 5. Stream 5 flows westward along Triton Road through the Small Arms Range, under Shark Boulevard, and eventually discharges to the Thames River at the Defense Reutilization and Marketing Office (DRMO) outfall. Upper Pond also has a discharge structure on the southern side. A second pond (Lower Pond), northwest of Upper Pond, is a natural depression and is recharged by groundwater inflow. The outlet of the pond forms Stream 2, which enters a storm sewer and flows to the west around North Lake.

Groundwater discharges from Site 2A to a small pond (the OBDA Pond) located at the base of the dike and the OBDA. Stream 1 flows from this pond westward toward North Lake, a recreational swimming area for Navy personnel. Under normal flow conditions, the stream enters a culvert that bypasses North Lake and discharges to a stream (Stream 6) below the outfall of the lake. Stream 6, which is formed by Stream 1, Stream 2, and the outflow of North Lake, flows westward under Shark Boulevard and through the golf course to the Thames River. North Lake is filled with potable water every year and drained at the end of the season. Surface water levels in North Lake do not appear to coincide with groundwater levels

in adjacent monitoring wells, indicating little hydraulic connection between surface water of North Lake and the shallow groundwater.

A nine-hole golf course covers a majority of the western portion of Site 3. It was reported that groundwater wells were used to provide irrigation water for the golf course until the early 1980s. These wells were eliminated, and municipal potable water is currently used for irrigation purposes.

Most of Site 3 is within designated Explosive Safety Quantity Distance (ESQD) arcs of Site 20; therefore, further development is not planned for this area. Navy regulations prohibit construction of inhabited buildings or structures within these arcs and, although existing buildings operate under a waiver of these regulations, no further construction is planned.

2.1.3 Site 7 - Torpedo Shops

Site 7 is located in the northern portion of NSB-NLON on the northern side of Triton Road. Figure 2-5 shows the general site arrangement. The site is bordered on the east and north by 60-foot-high bedrock cliffs. The remainder of the site slopes to the southwest towards Site 3. An earthen berm extends along the base of the eastern portion of the exposed rock face. Four buildings (325, 450, 477, and 528) exist at the site.

Building 325 is a torpedo overhaul facility. A variety of fuels, solvents, and petroleum products have been used in Building 325 including Otto Fuel II (which is comprised of propylene glycol dinitrate (76 percent), 2-nitrodiphenylamine (1.5 percent), and di-n-butyl sebacate (22.5 percent) and produces hydrogen cyanide when burned], high-octane alcohol (190-proof grain alcohol), and TH-Dimer (jet rocket fuel). Solvents including mineral spirits, alcohol, and 1,1.1-trichloroethane and petroleum products such as motor oil and grease were also used in this building. A sink in one area was previously used for film development, and another sink was used for the overhaul of alkaline batteries. This plumbing drained into the on-site septic system until 1983. A maintenance area has a shallow sump covered with flush-mounted steel grating. The area surrounding this sump was previously a washdown/blowdown area for weapons. It is not known where this sump drains, although it may drain into the south leach field. Two underground and one above-ground storage tanks were located on the southern side of Building 325 and used to store fuel oil.

A smaller building attached to the eastern side of Building 325 was previously used as an assembly shop for torpedoes and as a paint shop. A closet in this building was used to store containers of 1,1,1-trichloroethane and methyl ethyl ketone (2-butanone). Drums and cylinders were stored outside on the eastern side of this building. The vessels were labeled as containing propane, isobutane,

2-butanone, xylot, methylene chloride, propellant, and zinc chromate. An addition to the northern side of Building 325, completed in 1990, is also used as a torpedo maintenance shop.

Building 450 is the primary MK-48 torpedo overhaul/assembly facility. Petroleum products including TL-250 motor oil and hydraulic fluid have also been used in this building for torpedo maintenance. Torpedo overhaul/assembly operations at Building 450 generate fuels, solvents, and petroleum products as wastes. An Otto fuel and seawater mixture is drained from the torpedoes and replenished with fresh fuel. The Initial Assessment Study (IAS) Report [Envirodyne Engineers, Inc. (Envirodyne), 1983] indicated that Building 450 generates approximately 3,000 gallons of Otto fuel wastewater per month. This building was constructed with a waste collection system that collected waste products from floor drains and discharged them to an underground waste tank/sump with a capacity of approximately 1,500 gallons. The waste tank was pumped periodically and the contents were disposed off site. Otto fuel product was previously stored in a 4,000-gallon underground tank south of Building 450. The hazardous waste sump was decommissioned in 1987. It was replaced with three 1,000-gallon above-ground tanks located south of the building. The floor drains were sealed and replaced with a new system for pumping waste products to the new tanks. A 4,000-gallon above-ground Otto fuel storage tank replaced the previous tank and is located south of the building.

Building 477, approximately 65 feet east of Building 450, was formerly used to store drums of Otto fuel. Solvents including 1,1,1-trichloroethane, trichloroethene (TCE), toluene, mineral spirits, alcohol, and bulk Freon have been used at this facility.

2.1.4 <u>Site 9 – Waste OT-5</u>

Site 9 included OT-5, a former underground concrete storage tank, located within Site 23 (see Section 2.1.9 and Figure 2-6). The soil at Site 9 was investigated and remediated and a corrective action was completed under the CTDEP RCRA UST Program; therefore, no decision documents were required or prepared for Site 9 soil. The tank was constructed in the 1940s and was used to store fuel oil. The tank had a capacity of approximately 750,000 gallons. In the late 1970s, the tank was converted to a storage tank for bilge water and other waste solutions. Use of OT-5 was discontinued in 1993, and all tank contents were removed. A residual sludge layer of approximately 2 to 3 inches was left in the tank during purging. This sludge contained polychlorinated biphenyls (PCBs) at concentrations exceeding 500 mg/kg. After OT-5 was emptied, groundwater infiltrated through cracks in the concrete surface and partially refilled the tank. Residual materials were removed in 1994. After the contents of OT-5 were removed, the tank was cleaned and the top of the tank was crushed. The tank was closed in place by filling it with inert material. Because Site 9 is located within the site boundaries of Site 23, Site 9 groundwater was evaluated and is being addressed with Site 23 groundwater.

2.1.5 Site 14 - OBDANE

Site 14 is located between Sites 7 and 20 in a wooded area on the edge of a ravine just north of Stream 3 in Site 3 (see Figure 2-4). Miscellaneous wastes were dumped at the site in the past. Historical reports state that the vegetation at the site indicated that no dumping had occurred within 10 years prior to 1982. Inspection of the site verified the presence of several empty fiber drums. No visual soil staining or stressed vegetation was observed. The site was circular and approximately 80 feet in diameter. A dirt road provides limited access to the site. A nearly vertical 20-foot-high bedrock face is located at the eastern edge of the site. The rest of the site slopes to the southwest.

2.1.6 Site 15 – Spent Acid Storage and Disposal Area

Site 15 is located in the southern portion of NSB-NLON and was used before and after World War II for the temporary storage of waste battery acid in a rubber-lined underground tank located between the southern sides of Buildings 409 and 410. The site location and historical and recent sampling locations are shown on Figure 2-7. The site's location relative to other IR Program sites is depicted on Figure 2-2.

2.1.7 Site 18 – Solvent Storage Area, Building 33

Site 18 consists of Building 33, the Solvent Storage Area. The building was used for the storage of gas cylinders and 55-gallon drums of solvents. The location of Building 33 is shown on Figure 2-2 and Figure 2-8.

2.1.8 Site 20 - Area A Weapons Center

Site 20 consists of Building 524 and the weapons storage bunkers. The storage bunker area is divided into two portions (north and south areas) that were constructed at different times and are of different design. The site is located at the eastern end of Triton Road, adjacent to the northern side of the Site 28. The general configuration of Site 20 is shown on Figure 2-9.

Site 20 is located near the top of a local topographic and bedrock high. Building 524 was constructed in 1990 and 1991. Portions of the site were blasted to remove bedrock to accommodate construction of the building. The weapons storage bunkers are located southeast and downhill of Building 524 and are adjacent to and at a slightly higher elevation than the Area A Wetland.

Building 524 is used for administration, minor torpedo assembly, and storage of simulator torpedoes. No weapons production takes place in this building. Small quantities of chemicals and chemical waste generated by activities in this building are stored in 1- to 5-gallon containers in seven metal storage

cabinets located on a paved area south of the building. The chemicals include cleaning and lubricating compounds, paints, and adhesives. Many of these materials are classified as corrosive or flammable.

Liquid fuels present in the weapons storage bunkers include Otto fuel, JP-10, and TH Dimer (jet rocket fuel). The group of southern area bunkers was reconstructed in the last 15 years. A major part of the reconstruction involved removal of structurally unsuitable soil from the site.

2.1.9 Site 23 - Tank Farm

Site 23, Tank Farm, is located in the southern portion of NSB-NLON and includes nine former USTs that were demolished and closed in place, a 30,000-gallon, double-walled UST (OT-10), a 10,000-gallon waste oil tank, a fuel oil loading area, a tanker truck dumping pad and trough, associated UST piping systems, baseball/softball fields, buildings that housed the former air sparging/soil vapor extraction (AS/SVE) facility for the Naval Exchange (NEX) service station, two 150,000-gallon diesel above-ground storage tank (ASTs), and other buildings. The general configuration of Site 23 is shown on Figure 2-6.

Each of the nine USTs had a holding capacity of 750,000 gallons. No. 6 fuel oil was stored in tanks OT-1 through OT-3 from the date of construction until they were removed from service in the summer of 1991. Tanks OT-7 through OT-9 were decommissioned in the summer of 1990 and were used exclusively for storage of diesel during all 48 years of service. A reduced demand for diesel fuel at NSB-NLON in the mid-1970s led to the decommissioning and demolition of tank OT-6. The reduced demand for diesel also led to the modification of tank OT-5 for waste oil storage purposes. Tank OT-4 was used to store tank bottom wastes from OT-1. Tank OT-5 was used as part of an oil/water separator system (see Site 9 discussion below). Tanks OT-4 and OT-5 were reportedly decommissioned after installation of a new 30,000-gallon waste oil underground tank (OT-10) in 1990. Tanks OT-1 through OT-9 have been demolished and closed in place. A number of petroleum releases were documented by the Navy in the vicinity of the Tank Farm, and evidence of releases of petroleum products from these tanks, their associated piping, and possibly from other nearby sources was detected during previous investigations.

2.2 SITE HISTORY AND ENFORCEMENT ACTIVITIES

2.2.1 Site History

2.2.1.1 Site 2

Site 2A

A Phase I Remedial Investigation (RI) (Atlantic, 1992), Focused Feasibility Study (FS) (FFS) (Atlantic, 1995b) and Phase II RI (B&RE, 1997) were conducted for the Site 2A, Area A Landfilt. The Phase II RI

concluded that shallow groundwater contamination existed at the site, that the landfill soil may pose a threat to human receptors due to concentrations of PCBs, and that chemicals in soil could adversely impact ecological receptors. To address Site 2A soil (OU1), an RA that involved the construction of a 13-acre low-permeability cover system over the landfill area was performed in 1997. The groundwater at the Area A Landfill is currently being monitored as part of the OU1 compliance monitoring program. Groundwater at the site was also investigated as part of the BGOURI (TtNUS, 2002a), which recommended that the monitoring program be continued to gather data to evaluate long-term trends in contaminant concentrations and the decision to proceed to an FS should be made after sufficient data have been collected and evaluated. Land use controls (LUCs) have been implemented at the landfill to meet the requirements in the soil ROD. A majority of the Area A Landfill is paved and is currently used for storage of equipment and vehicles.

The initial Groundwater Monitoring Plan (GMP) (TtNUS, 1999) for Site 2 called for monitoring groundwater and surface water for semivolatile organic compounds (SVOCs), volatile organic compounds (VOCs), polynuclear aromatic hydrocarbons (PAHs), metals, pesticides/PCBs, and various field parameters. After 4 years of monitoring, the monitoring program was revised to discontinue monitoring for VOCs, pesticides, and PCBs because no exceedances of these compounds were detected in 4 years.

Site 2 has now been monitored for 8 years. The most recent results available, those from Year 7 (2006), determined that the only contaminant detected in groundwater in excess of criteria is copper, and this was in a reference well, not a downgradient well. Overall, the results of 8 years of monitoring indicate that the cap system is working properly and that significant contaminant migration from the site to surrounding areas is not occurring.

Site 2B

The Phase I and II RIs (1992 and 1997, respectively) and the BGOURI (2002) included investigations of the Site 2B, Area A Wetland. Area A Wetland sediment was identified as OU12 and is still being investigated under CERCLA.

A phased RI was conducted to determine the nature and extent of contamination at the Area A Wetland. The Phase I RI field conducted from 1990 to 1992 (Atlantic, 1992) concluded that risks associated with several exposure scenarios exceeded acceptable regulatory levels and that an FS should be performed for the Area A Wetland site. The Phase II RI (B&RE, 1997) concluded that little surface water or groundwater contamination exists at the site, that the site may pose a risk to a construction worker due to potential exposure to manganese in the groundwater, and that significant pesticide, PCB, and PAH concentrations exist in site soil and sediment. The Phase II RI recommended that an FS should be

conducted for this site to evaluate a limited action alternative including groundwater monitoring and access/use restrictions.

A Phase Itt investigation of the sediments at the Area A Welland was conducted in October 2007. The major objectives of the investigation were to further refine the nature and extent of contamination in sediments and to provide sufficient data to determine potential risks to ecological receptors from contaminated sediments. A secondary objective of the investigation was to determine the thickness of the overlying organic layer that has formed above the dredge spoils. The evaluation of the investigation results was ongoing at the time of preparation of this ROD; therefore, no conclusions from the investigation were available.

Groundwater at the Area A Wetland is currently being monitored under the Area A Landfill long-term groundwater monitoring program (OU1).

2.2.1.2 Site 3

Site 3, Area A Downstream Watercourses, covers approximately 75 acres and contains mainly undeveloped wooded areas and recreational areas. The Site 3 watercourses include several small ponds and interconnected streams (Figure 2-4) that convey surface water to the Thames River. The major sources of contamination at Site 3 include historical application of pesticides for mosquito control, abandoned disposal areas, and the septic system leach fields at Site 7. There are relatively few buildings (Buildings 223, 281, 282, 376, 454, and 468) at Site 3. Most of these buildings are associated with the recreational area at North Lake and the golf course, which comprises a large portion of the site area. Further development is not planned for this area because most of it is within designated ESQD arcs of Site 20.

An earthen dike was constructed in 1957 in the area between Sites 2 and 3. The valley on the eastern side of the dike was filled with dredge spoils from the Thames River, which created Site 2B. The Site 3 ponds were created to act as settling ponds for any dredge spoil that was discharged from the Site 2B.

Site 3 also included the OBDA. The OBDA was located on the slope of the dike below and adjacent to the Area A Landfill. It was located on the southwestern end of the dike, and a small wetland exists at the base of the dike. The OBDA was used as a disposal site after the earthen dike was constructed in 1957. Materials disposed at the site included thirty 200-gallon metal fuel tanks (unlabeled), scrap lumber/old creosote telephone poles, several empty unlabeled 55-gallon drums, and rolls of wire.

Site 3 was investigated during several phases from 1990 to 2002, including the Phase I RI (Atlantic, 1992), FFS (Atlantic, 1994b), Phase II RI (B&RE, 1997), BGOURI (TtNUS, 2002a), and Data Gap.

Investigation (DGI) for the BGOURI Update/FS (TtNUS, 2004). During completion of the Phase II Ri, the Navy and regulators decided that the best strategy was to address the source area OUs at the site first and then address the groundwater OU. Groundwater at Site 3 was further investigated during the BGOURI in 2000, but the results of the investigation were inconclusive and data gaps remained.

During the RA for OU3, Site 3 - NSA was discovered adjacent to Stream 5 at Site 3. Sediment that exhibited potential petroleum contamination (i.e., odor and sheen on pooled water) was encountered during excavation activities along the northern side of Stream 5. Upon further investigation, rusted drums and steel cable intermingled with boulders and soil were evident in a small disposal area upgradient (north) of Stream 5 (see Figure 2-4). A sample of the contaminated sediment was collected and analyzed. Elevated levels of total petroleum hydrocarbons (TPH) were detected in the sample, indicating the presence of petroleum contamination. The NSA was not remediated at the time of the OU3 RA; however, absorbent booms and hay bales were put in place during construction activities to minimize migration of the contamination downstream, and plastic sheeting was placed along the stream bank prior to backfilling to minimize further contaminant migration to Stream 5.

To address the newly found Site 3 - NSA and the data gaps identified during the BGOURI, a DGI (TtNUS, 2002b) was completed in the fall of 2002 prior to initiating an FS. The results of the DGI were presented and evaluated in the BGOURI Update/FS (TtNUS, 2004), and remedial alternatives were developed to address the petroleum-contaminated soil associated with Site 3 - NSA. A ROD (Navy, 2004d) was signed for the site in October 2004. The ROD called for NFA under the CERCLA Program for the petroleum-contaminated soil because petroleum is excluded from consideration under CERCLA; however, the Navy's cleanup plan to address the petroleum-contaminated soil under other applicable regulations was detailed in an appendix of the ROD. The Site 3 – NSA soil corrective action was completed to meet Connecticut regulations in October 2007.

2.2.1.3 Site 7

Site 7, Torpedo Shops, is located in the northern portion of NSB-NLON on the northern side of Triton Road (Figure 2-2). The Navy conducts maintenance activities on torpedoes at the site. OU8 is the soil OU associated with Site 7. The major sources of contamination at Site 7 included potential historic disposal of solvents/chemicals into two on-site septic systems and leaks or spills associated with on-site underground storage tanks (USTs). Contaminated soil was found on the southern side of Building 325 and appeared to be related to former USTs used to store fuel oil. Groundwater and suspected soil contamination on the western side of the building appeared to be related to the septic tank, sewer lines, or leach field associated with the former septic system. The USTs were closed in the 1990s, and the septic systems were abandoned when sanitary sewers were installed in 1983.

Building 325 (Figure 2-5) is a torpedo overhaul facility, and it was built in 1955 and had an on-site septic system until 1983, when all of the building's plumbing facilities were connected to sanitary sewers. The original septic leach field for Building 325 is located southwest of the building, adjacent to Triton Road. This leach field became clogged in 1975 and was abandoned. A new leach field (south teach field) was constructed next to the original leach field and was used until sanitary sewers were installed in 1983.

Two underground No. 2 fuel oil tanks were located on the southern side of Building 325. One of the tanks was closed in 1995. A third tank, which was located above ground adjacent to the building, was used for temporary storage of No. 2 fuel oil but, based on field reconnaissance, had been removed as of March 15, 1995.

Building 450 (Figure 2-5) is the primary MK-48 torpedo overhaul/assembly facility. It was built in 1974 and was served by its own septic system until 1983, when it was connected to sanitary sewers. Only domestic wastewater from toilets, lavatories, and showers in Building 450 had been directed to the septic field (north leach field).

Site 7 was investigated during the Phase I RI (Atlantic, 1992), Phase II RI (B&RE, 1997), and BGOURI (TINUS, 2002a). The combined soil and groundwater data sets from the three investigations were evaluated during the BGOURI. No additional investigations were conducted at the site during the DGI for the BGOURI Update/FS (TINUS, 2004).

A ROD (Navy, 2004b) was signed for the soil at the site (OU8) in September 2004 which called for the excavation and off-site disposal of contaminated soil. This remedy was selected because there were potentially significant risks associated with exposure to the contaminated soil. The Site 7 soil remedial action was completed in 2006.

2.2.1.4 Site 14

Site 14, OBDANE, where miscellaneous wastes were dumped in the past, was located adjacent to Sites 3 and 7 in a wooded area on the edge of a ravine just north of Stream 3 (Figure 2-4). Site 14 was investigated during the Phase I RI (Atlantic, 1992), Phase II RI (B&RE, 1997), and BGOURI (TtNUS, 2002a). A Non-Time-Critical Removal Action (NTCRA) was completed at the site in 2001 to address the contaminated soil and debris identified at the site during the Phase II RI. A ROD (Navy, 2004b) was signed for the soil at the site (OU8) in September 2004 which called for NFA. This remedy was selected because the NTCRA addressed all significant risks associated with the soil and debris.

Because Site 14 was located adjacent to Site 3 and groundwater from Site 14 flows toward Site 3, it was decided to evaluate the groundwater OU beneath both sites jointly and this approach was taken in the

BGOURI. Subsequently, it was decided that groundwater at Sites 3 and 14 should be evaluated separately because of the different remedial strategies that might be applicable to the different sites. This approach was used in the BGOURI Update/FS (TtNUS, 2004). No additional sampling was conducted at Site 14 during the DGI for the BGOURI Update/FS because no significant contamination was discovered in the groundwater during the BGOURI.

2.2.1.5 Site 15

Site 15, Spent Acid Storage and Disposal Area, was used before and after World War II for the temporary storage of waste battery acid in a rubber-lined underground tank. The tank was reportedly 12 feet long by 4 feet wide by 4 feet high. The batteries were placed on a concrete pad next to the tank onto which some acids occasionally leaked. No major spills were ever recorded. A 1951 aerial photograph shows that the area around the tank was not paved. Acid from the batteries was stored in the tank and was subsequently pumped into a tank truck and disposed in the Area A Landfill (Site 2). The tank was filled in place with soil and capped with bituminous pavement.

Historical investigations completed at Site 15 include the Phase I RI (Atlantic, 1992), FFS (Atlantic, 1994a), Phase II RI (B&RE, 1997). Supplemental Sampling Event (CTDEP, 1997), and BGOURI (TtNUS, 2002a). An NFA Decision Document for Soil at Site 15 was submitted in September 2007. Groundwater and soil data collected at Site 15 during the DGI was included and evaluated in the BGOURI Update/ FS Report (TtNUS, 2004). Soil results from this investigation confirmed that the NFA Decision Document was appropriate and not need to be amended.

2.2.1.6 Site 18

The solvent storage area at Building 33 was identified during the IAS (Envirodyne, 1983) for NSB-NLON. The site was identified as Study Area F in the FFA and is now identified as Site 18, Solvent Storage Area, Building 33, in the IR Program. Site 18 was used for the storage of gas cylinders and 55-gallon drums of solvents such as TCE and dichloroethene. The site was not identified as a high priority site and as a result, no investigation of Site 18 was conducted during the early phases of investigation at NSB-NLON (e.g., Phase I or Phase II RIs). The Navy investigated the site during the BGOURI in 2000 to determine the impact of the operation of the storage facility. Both soil and groundwater samples were collected to characterize the site. The results of the investigation were documented in the BGOURI Report (TtNUS, 2002a). A ROD (Navy, 2004c) was subsequently signed for the soil at Site 18 (OU11) in September 2004. The Selected Remedy documented in the ROD was NFA because no significant risks associated with exposure to site soil were identified during the RI.

2.2.1.7 Site 20

Site 20, Area A Weapons Center, consists of Building 524, which is used for administration, minor torpedo assembly, and storage of simulator torpedoes, and the weapons storage bunkers (see Figure 2-9). Small quantities of chemicals (cleaning and tubricating compounds, paints, and adhesives) and chemical waste generated by on-site activities are stored at the site. Liquid fuels present in the weapons storage bunkers include Otto fuel, JP-10, and TH Dimer (jet rocket fuel).

Site 20 was indirectly investigated during the Phase I RI (Atlantic, 1992) as part of the investigation of Sile 2B. The site was further investigated during the Phase II RI (B&RE, 1997), BGOURI (TtNUS, 2002a), and DGI for the BGOURI Update/FS (TtNUS, 2004). The DGI (TtNUS, 2002b), which included collection and analysis of additional groundwater samples, was conducted at the site in the fall of 2002 to address data gaps identified during the BGOURI. A ROD (Navy, 2000) for the site soil and sediment (OU7) was signed and called for excavation and off-site disposal of the contaminated soil and sediment. The remedial action was completed in 2001 and consisted of excavation and off-site disposal of less than 200 cubic yards of PAH- and arsenic-contaminated soil and sediment.

2.2.1.8 Site 23

Site 23, Tank Farm, comprises various former and current tanks and associated facilities including nine former USTs, a 30,000-gallon, double-walled UST (OT-10), 10,000-gallon waste oil tank, fuel oil loading area, tanker truck dumping pad and trough, two 150,000-gallon diesel ASTs, and other buildings. Five of the nine former tanks at Site 23 (OT-1, OT-2, OT-3, OT-4, and OT-6) had perimeter underdrains installed around them during their construction to depress groundwater levels. In addition, the storm sewers that the underdrains tie into were constructed of perforated corrugated metal pipe to help dewater the area. The underdrain at OT-6 was subsequently abandoned by the Navy around 1966 during completion of improvements to the storm sewer system. The soil at Site 23 was remediated in 1997 and 2000 under the CTDEP Resource Conservation and Recovery Act (RCRA) UST Program.

The Site 23 USTs were properly closed in place; however, the tank underdrain systems were allowed to remain in place to help reduce groundwater levels in the area. Evidence of releases of petroleum products from the tanks, their associated piping, and possibly from other nearby sources was detected in soil during previous investigations. No significant groundwater contamination was detected; however, petroleum hydrocarbons were detected periodically at the outfall of the storm sewer system near Goss Cove. The stormwater drainage system was rehabilitated in 2000 such that the original combined groundwater and stormwater system was separated into a deep groundwater and a new shallow stormwater system. The groundwater underdrain system continues to collect groundwater from the old tank drains. In 2000, new storm drain was installed using solid wall HDPE piping and much of the underdrain was relined

with perforated plastic pipe. An existing manhole was modified to become a groundwater flow-metering and sampling pit. Beyond the metering pit, the groundwater underdrain pipe and stormwater collection pipes are recombined such that groundwater then enters the storm sewer system.

The objectives of the BGOURI at Site 23 were to further characterize the nature and extent of groundwater contamination and to quantify the risks to human receptors from the groundwater. Groundwater sampling results for Site 23 indicated that the water quality is generally good, with only sporadic, low-concentration detections of VOCs, SVOCs, and metals in site monitoring wells. A preliminary evaluation of natural attenuation data indicated that biodegradation and other natural attenuation processes might be acting to reduce organic contaminants to relatively insignificant levels in the Tank Farm. However, it was not recommended that a monitored natural attenuation alternative be pursued for the site. The BGOURI recommended that the decision for preparation of an FS for the groundwater OU at the Tank Farm be postponed until site conditions stabilize and the results of the sampling and analysis program for the groundwater collection system determined the trends in groundwater contaminant concentrations.

The Site 23 underdrain metering pit was sampled after construction and quarterly for a period of 1 year starting in June 2007. Samples were collected from the metering pit that collects groundwater from the Site 23 area underdrains from four former tanks. All relevant concentrations were less than established Connecticut criteria (with the exception of anomalous results as discussed in Section 2.5.2.7). Based on these results, Site 23 groundwater (including Site 9 groundwater) being collected and conveyed in the storm sewer system does not pose a significant threat to human health or the environment under the current land use scenario; however, risks would be unacceptable if groundwater at the site was used as a drinking water supply.

2.2.2 Enforcement Activities

On August 30, 1990, NSB-NLON was placed on the National Priorities List (NPL) by the EPA pursuant to CERCLA of 1980 and SARA of 1986. The NPL is a list of uncontrolled or abandoned hazardous waste sites identified by EPA as requiring priority RAs. The Navy, EPA, and the State of Connecticut signed the FFA for NSB-NLON in 1995 (EPA, 1995). The agreement is used to ensure that environmental impacts associated with past and present activities at NSB-NLON are thoroughly investigated and that the appropriate RA is pursued to protect human health and the environment. In addition, the FFA establishes a procedural framework and timetable for developing, implementing, and monitoring appropriate responses at NSB-NLON, in accordance with CERCLA (and SARA amendment of 1986, Public Law 99-499), 42 U.S.C. §6620(e)(1); the National Oil and Hazardous Substance Pollution Contingency Plan (NCP), 40 CFR 300; Resource Conservation and Recovery Act (RCRA), 42 U.S.C. §6901 et seq., as amended by the Hazardous and Solid Waste Amendment (HSWA) of 1984, Executive Order 12580; and

applicable state laws. There have been no cited violations under federal or state environmental law or any past or pending enforcement actions pertaining to the cleanup of OU9.

2.3 COMMUNITY PARTICIPATION

The Navy has been conducting community relations activities for the IR Program at NSB-NLON since it began. From 1988 to November 1994, Technical Review Committee meetings were held on a regular basis. In 1994, a Restoration Advisory Board (RAB) was established to increase public participation in the IR Program process. Many community relations activities for NSB-NLON involve the RAB, which historically met quarterly and recently has met annually. The RAB provides a forum for discussion and exchange of information on environmental restoration activities between the Navy, regulatory agencies, and the community, and it provides an opportunity for individual community members to review the progress and participate in the decision-making process for various IR Program sites, including Sites 2A, 2B, 3, 7, 9, 14, 15, 18, 20, and 23.

The following community relations activities are conducted at NSB-NLON as part of the Community Relations Plan:

Information Repositories: The Public Libraries in Groton and Ledyard are the designated information repositories for the NSB-NLON IR Program. All pertinent reports, fact sheets, and other documents are available at these repositories.

Key Contact Persons: The Navy has designated information contacts related to the NSB-NLON. Materials distributed to the public, including any fact sheets and press releases, will indicate these contacts. The Public Affairs Officer will maintain the site mailing list to ensure that all interested individuals receive pertinent information on the cleanup.

Mailing List: To ensure that information materials reach the individuals who are interested in or affected by the cleanup activities at the NSB-NLON, the Navy maintains and regularly updates the site mailing list.

Regular Contact with Local Officials: The Navy arranges regular meetings to discuss the status of the IR Program with the RAB.

Press Releases and Public Notices: The Navy issues press releases as needed to local media sources to announce public meetings and comment periods, the availability of reports, and to provide general information updates.

Public Meetings: The Navy conducts informal public meetings to keep residents and town officials informed about cleanup activities at NSB-NLON, and at significant milestones in the IR Program. Meetings are conducted to explain the findings of the RI; to explain the findings of the FS; and to present the Proposed Plan, which explains the preferred alternatives for cleaning up individual sites.

Fact Sheets and Information Updates: The Navy develops fact sheets to mail to public officials and other interested individuals and/or to use as handouts at the public meetings. Each fact sheet includes a schedule of upcoming meetings and other site activities. Fact sheets are used to explain certain actions or studies, to update readers on revised or new health risks, or to provide general information on the IR Program process.

Responsiveness Summary: The Responsiveness Summary for the Proposed Plan summarizes public concerns and issues raised during the public comment period and documents the Navy's formal responses. The Responsiveness Summary may also summarize community issues raised during the course of the FS.

Announcement of the ROD: The Navy announces the signing of the ROD through a notice in actions or studies, to update readers on revised or new health risks, or to a major local newspaper of general circulation and a press release sent to everyone on the mailing list. The Navy places the signed ROD in the information repositories before any RAs begin.

Public Comment Periods: Public comment periods allow the public an opportunity to submit oral and written comments on the proposed cleanup options. Citizens have at least 30 days to comment on the Navy's preferred alternatives for cleanup actions as indicated in the Proposed Plan.

Technical Assistance Grant: A Technical Assistance Grant (TAG) from the EPA can provide up to \$50,000 to a community group to hire technical advisors to assist them in interpreting and commenting on site reports and proposed cleanup actions. Currently, no TAG funds have been awarded.

Site Tours: The Office of Public Affairs periodically conducts site tours for media representatives, local officials, and others.

A notice of availability of the Proposed Plan for Sites 2A, 2B, 3, 7, 9, 14, 15, 18, 20, and 23 groundwater (Navy, 2008) was published on June 14, 2008, in *The New London Day* newspaper. The Proposed Plan and other documents related to these sites are available to the public in the NSB-NLON Information Repositories located at the Groton Public Library in Groton, Connecticut, and the Bill Library in Ledvard.

Connecticut. The notice also announced the start of the 30-day comment period that ended on July 14, 2008. A copy of the notice and the Proposed Plan are included in Appendix C of this ROD.

The Proposed Plan notice of availability invited the public to attend a public meeting at the Best Western Olympic Inn in Groton, Connecticut on June 26, 2008. The public meeting presented the proposed remedies and solicited oral and written comments. At the public meeting, personnel from the Navy, EPA, and the CTDEP answered questions from the attendees during the informal portion of the meeting. In addition, public comments on the Proposed Plan were formally received and transcribed. The transcript for the public meeting is provided in Appendix D. Responses to the comments received during the public comment period are provided in the Responsiveness Summary in Section 3.0.

2.4 SCOPE AND ROLE OF OPERABLE UNIT

Sites 2A, 2B, 3, 7, 9, 14, 15, 18, 20, and 23 are 10 of the 23 IR Program sites within the 12 OUs currently included in the NSB-NLON IR Program. The overall goal of the IR Program at NSB-NLON is to cleanup sites to achieve compliance with State of Connecticut Remediation Standard Regulations (RSRs) and other ARARs. As with many Superfund sites, the problems at these sites are complex. As a result, the media at Sites 2A, 2B, 3, 7, 9, 14, 15, 18, 20, and 23 have been divided into separate OUs as follows:

- QU1 Site 2A, Area A Landfill soil and groundwater.
- OU3 Site 3 soil and sediment.
- OU6 Sile 15 soil.
- OU7 Site 20 soil and sediment.
- OU8 Sites 7 and 14 soil.
- OU9 All groundwater in the Upper Subase of NS8-NLON including Sites 2A, 2B, 3, 7, 9, 14, 15, 18, 20, and 23.
- OU11 Sites 16 and 18 soil.
- OU12 Site 2B, Area A Wetland, sediment.

Interim remedies were selected for Sites 3, 7, 14, 15, 18, and 20 groundwater in the Interim ROD (Navy, 2004e). This Final ROD documents the selection of final remedies for all portions of OU9. The remedies selected for Site 2 soil and groundwater, Site 3 - NSA soil, Sites 7 and 14 soil, and Site 18 soil were documented in separate RODs (Navy, 1995, 2004b, 2004c, and 2004d). Site 15 soil (OU 6) was previously addressed by the Navy in a NFA Source Control ROD in 1997 (Navy, 1997b).

The Selected Remedies for groundwater at Sites 3 and 7 and Sites 9 and 23 will prevent potential future unacceptable risks to human health and the environment associated with contaminants in groundwater at

these sites. The results of the risk assessments indicated no unacceptable risks to current receptors from exposure to groundwater at Sites 3 and 7 and Sites 9 and 23, but exposure to maximum concentrations of contaminants in groundwater at the sites could result in unacceptable risks to hypothetical future human receptors if they regularly consume the groundwater. In addition, based on the results of a 2008 vapor intrusion evaluation, vinyl chloride concentrations in groundwater at one well at Site 3 present unacceptable risks to humans if a building was built for residential purposes in the vicinity of this well.

Evaluation of the available analytical data indicated that no unacceptable health effects are anticipated from exposure to the groundwater at Sites 2A, 2B, 14, 15, 18, and 20. An NFA remedy was selected for the groundwater at Sites 14, 15, 18, and 20. Groundwater monitoring and institutional controls will continue at Sites 2A and 2B as part of the OU1 remedy.

2.5 SITE CHARACTERISTICS

2.5.1 Physical Setting

2.5.1.1 Site 2A – Area A Landfill and Site 2B – Area A Wetland

Sites 2A and 2B are located within a northwest-trending valley (northern valley) situated between the topographic/bedrock high that occupies the central area of the NSB-NLON and the topographic/bedrock high that forms the northern border of the NSB-NLON. Figure 2-4 shows the topography and surface features of these sites. The northern valley is relatively narrow in the eastern portion of the site near the earthen dike, but it widens to the west. Runoff from Site 2A drains as overland flow north into the Area A Wetland (Site 2B), which discharges to Area A Downstream Watercourses, Site 3.

Site 2A

Site 2A, located in the eastern portion of the northwest-trending valley, contains 10 to 20 feet of miscellaneous fill that consists of fine- to coarse-grained sand and gravel and ash, wood and brick fragments, paper, and asphalt. The fill is generally underlain by 10 to 20 feet of dredge spoils, mainly beneath the easternmost portion of the landfill. Where no spoils underlie the fill material, the fill directly overlies a thin alluvial layer or the bedrock surface. Along the southeastern border of the landfill, fill material is underlain by an alluvial layer consisting of silty sand. The alluvial layer is underlain by gravel and gneiss boulders. Bedrock beneath Site 2 has been identified as the biotite-quartz-feldspar gneiss of the Mamacoke Formation. The bedrock surface stopes to the northeast toward Site 2B from the large bedrock high in the center of the facility. In the western portion of the site, the landfill is situated immediately adjacent to a bedrock ridge, and depth to bedrock is typically less than 20 feet. The eastern portion of the landfill is located further from the hillside, and depth to bedrock increases to 70 feet in this area.

Groundwater is present within the dredge spoils, alluvium, and bedrock underlying the Area A Landfill. Depth to groundwater averages approximately 10 feet across the landfill, and in some areas, the lower portion of the fill materials is below the water table. The saturated thickness of the overburden materials ranges from less than 10 feet to at least 65 feet across the landfill. Overburden and bedrock groundwater flow northeast across most of Site 2A, from the topographic/bedrock high to Site 2B, the Area A Wetland. Upward groundwater gradients from bedrock to the overburden/fill are predominant, although a downward gradient exists at the 2LMW18 well cluster, located in the central portion of the landfill. Hydrautic potentials between bedrock and overburden groundwater differ by 3 to 7 feet, suggesting that although groundwater flow directions are similar, the degree of hydrautic connection varies spatially, and there is no restriction of flow between the overburden and bedrock in some areas. East of Site 2A, local groundwater flow is to the north and west into Site 2B. In this area, groundwater elevations in bedrock and the overburden are similar, and vertical gradients are minimal. In the western portion of the landfill near the dike, groundwater flows northwest toward Site 3.

The geometric mean hydraulic conductivity for the overburden, based on Phase II RI pumping test data, is 2.7 feet per day. This value corresponds to overburden hydraulic conductivities estimated based on slug tests conducted during the Phase II RI. Based on a hydraulic gradient of 0.033 across the landfill (from 1993 water level measurements), hydraulic conductivity of 2.7 feet per day, and an assumed effective porosity of 30 percent, the average seepage velocity is estimated at 0.3 foot per day. Figures 2-10 and 2-11 show regional groundwater flow patterns across Sites 2, 3, and 14 in the shallow overburden and bedrock, respectively, based on the August 2000 round of water-level measurements taken during the BGOURI.

Site 2B

Site 2B is underlain by dredge spoils that consist of silt and clay with traces of fine sand and shell fragments. The dredge spoils extend across the site southeast to 2WMW3 and southwest beneath the Area A Landfill. The thicknesses of dredge spoils are 25 to 35 feet on the southern side of the wetland and 10 to 15 feet on the northeastern side of the wetland. Where dredge spoils do not directly overlie bedrock, they are underlain by a thin remnant of topsoil consisting of organic-rich silt, clay, and traces of roots and underlain by alluvial deposits. The alluvial deposits consist primarily of sand with silt and/or gravel and are significantly coarser grained than the overlying dredge spoils. The thickness of the alluvium in Site 2B borings ranged from 0 to 36 feet. Bedrock beneath the southern portion of the wetland has been identified as the Mamacoke Formation; the northernmost portion of the wetland is underlain by the Granite Gneiss, a gneissic biotite granite. The bedrock surface slopes to the valley occupied by the wetland from northern, eastern, and central bedrock highs toward the center of the wetland.

Groundwater is present within the overburden and bedrock underlying the Area A Wetland, and the water table is close to the ground surface throughout most of the area. The dredge spoils and alluvium making up the overburden exist largely under saturated conditions. Groundwater flow in the overburden is from the northeast and southwest into the wetland and then west toward Site 3 (see Figures 2-10 and 2-11). Groundwater flow in the bedrock mimics the shallow overburden pattern and flows from higher elevations toward the bedrock valley and ultimately to site 3 through a combination of discharge to local streams and aquifer underflow. Groundwater elevations are similar in the overburden and bedrock, but the vertical gradient varies from upward to downward. Based on 1994 water level measurements, the hydraulic gradient in dredge spoils at the site is 0.00255, and hydraulic conductivity is 1.0 foot per day based on slug testing during the Phase I Ri. Assuming an effective porosity of 0.30, the estimated groundwater seepage velocity through the dredge spoils is 0.008 foot per day. For the alluvium, a hydraulic conductivity of 6.8 feet per day was calculated based on Phase I Ri slug testing. Using the same gradient and porosity, a flow velocity of 0.063 foot per day was calculated for the alluvium.

2.5.1.2 Site 3 - Area A Downstream Watercourses and OBDA and Site 14 - OBDANE

Sites 3 and 14 are located in the same northern valley as Sites 2A and 2B. Site 3 receives surface water and groundwater recharge from Sites 2A, 2B, 7, and 14, and surrounding areas. The streams within Site 3 convey the water to the Thames River. Site 14 is located adjacent to Stream 3.

The geology of Sites 3 and 14 consists of overburden deposits overlying metamorphic bedrock. The overburden consists of sitty sand and gravel and is mapped as stratified drift of former meltwater streams [United States Geological Survey (USGS, 1960)]. Although these are natural materials, they have most likely been reworked in the area of the golf course. In general, the overburden thickness increases from the valley margins to the center of the valley and from southeast to northwest along the valley axis. The overburden thickness is less than 5 feet at well 2DMW10D and less than 15 feet at wells 2DMW25D and 2DMW27D. The overburden is thicker in the golf course area, and bedrock was not encountered in the 50-foot boring at well 2DMW26D. Well locations are shown on Figure 2-4.

The surface of the bedrock at Sites 3 and 14, identified as the Mamacoke Formation, slopes from the northern and central bedrock highs that surround the area toward the northwest-trending valley. There appears to be a localized bedrock high at well 2DMW15D. The depth to bedrock is only 4 feet at this location, and the bedrock surface elevation is higher than was encountered in surrounding boreholes. This local bedrock high corresponds to a local topographic high within the valley. The boring logs for monitoring wells installed near OBDA indicate that the overburden locally consists of sand and boulders. The depth to bedrock at Site 3 was approximately 15 feet. There are bedrock exposures upslope of Site 14, and bedrock was encountered at the site at depths of 12 feet below ground surface (bgs).

Groundwater is present in both the overburden and bedrock underlying Sites 3 and 14. The saturated thickness of the overburden ranges from a few feet along the valley margins to greater than 40 feet in the central portion of the stream valley. Depth to groundwater ranges from a few feet in the eastern portion to over 15 feet in the golf course area to the west. Figures 2-10 and 2-11 show regional groundwater flow patterns across Sites 3 and 14 in the shallow overburden and bedrock, respectively, based on the August 2000 round of water-level measurements taken during the BGOURI. Figures 2-12 and 2-13 show the local groundwater flow patterns in the shallow overburden and bedrock, respectively, based on October 2002 measurements. The figures show that groundwater flows from topographic/bedrock highs and Site 2B to Site 3. From the downstream area, groundwater flows west toward and discharges into the Thames River. Vertical gradients between the overburden and bedrock are mixed across Site 3 but are predominantly upward. A downward gradient was observed at well cluster 2DMW24S/D, and upward head differentials were observed at well clusters 2DMW16S/D, 2DMW25S/D, and 2DMW28S/D.

Along the valley margins and near the Site 2B dike, local groundwater flow gradients are steep. As the bedrock slope flattens and the overburden thickens, hydraulic gradients also flatten. The overall hydraulic gradient in the direction of groundwater flow across Site 3 within both the overburden and bedrock is approximately 0.024 based on the BGOURI 2000 water level data. In both the overburden and bedrock, the hydraulic gradient steepens slightly toward the Thames River.

Slug test results for Site 3 alluvium and bedrock wells, summarized in the BGOURI (TtNUS, 2002a), show that the average horizontal hydraulic conductivity of the alluvium is approximately 5.3 feet per day and that the average horizontal bulk hydraulic conductivity of the bedrock is approximately 1.8 feet per day. Using a flow gradient of 0.024, a hydraulic conductivity of 5.3 feet per day, and a measured porosity of 0.33, the average groundwater flow velocity through the predominantly sandy alluvial materials across Site 3 was calculated to be approximately 0.4 foot per day.

2.5.1.3 Site 7 – Torpedo Shops

Figure 2-4 shows the lopography and surface features of Site 7. Site 7 is surrounded on the north and east by an exposed bedrock cliff. The cliff is the result of quarry activity along the northern bedrock high. The ground surface slopes gently to the southwest, and there is an earthen berm along the eastern boundary of the site. Surface water runoff from Site 7 flows southwestward to drainage swales and storm sewers located on the southern side of Buildings 325 and 450. Runoff contained by the berm and the storm sewer system drains through culverts under Triton Road into Site 3 (Stream 5) and eventually into the Thames River.

The geology of Site 7 consists of a southwestward-thickening wedge of overburden materials overlying metamorphic bedrock. Surficial deposits underlying Site 7 consist of fill material that varies in thickness from 2 to 10 feet and consists primarily of sand and gravel. The fill either lies directly on bedrock (in the northeastern portion of the site) or is underlain by up to 30 feet of silty sand (along the southwestern edge of the site). This area has a history of quarrying and filling, and the silty sand is natural alluvium. The bedrock in this area has been identified as the Mamcoke Formation. In the northeastern portion of the site, the bedrock surface is relatively flat and has a mild slope toward the southwest. The bedrock surface between groundwater monitoring wells 7MW1D and 7MW7S slopes at a grade of approximately 2 percent. The bedrock surface in this area has been altered by quarry activity. Overburden thickness is typically less than 6 feet in this area. Southwest of groundwater monitoring wells 7MW7S and 7MW2D and southwest more steeply. The bedrock surface between groundwater monitoring wells 7MW7S and 7MW3D slopes at a steeper grade of approximately 14 percent. The overburden thickness increases to 30 to 40 feet in this area.

Groundwater was encountered in both the overburden and bedrock underlying Sile 7. Depths to groundwater average less than 10 feet across the site. Within the overburden, the water table was generally encountered near the fill/alluvium interface at locations where both units were present. Figure 2-10 shows the overburden groundwater flow pattern across the Site 7 area based on August 2000 water level data. The figure shows that the general direction of shallow groundwater flow is to the west-southwest toward Site 3. Groundwater flow directions in the shallow bedrock, as determined during the BGOURI, are to the west and southwest (Figure 2-11). In the overburden, the hydraulic gradient across the site is approximately 0.02. Within the bedrock, the flow gradient appears to be slightly lower at 0.015.

Downward vertical gradients were consistently observed at Site 7. Groundwater monitoring well clusters 7MW2S/2D (alluvium/bedrock), 7MW3S/3D (combined fill and alluvium/deep alluvium), and 7MW5S/5D (combined overburden and bedrock/deeper bedrock) all had downward vertical gradients, indicating that the Site 7 area is a local recharge area for groundwater.

Stug tests were performed in three alluvium and two bedrock wells at Site 7 over the course of the various RI field investigations. The estimated site-specific average hydraulic conductivity for the alluvium, based on slug test results, is 11.4 feet per day. Using a hydraulic gradient of 0.02 and a measured porosity of 0.37, the estimated groundwater seepage velocity in the alluvium at the site is 0.62 foot per day.

2.5.1.4 Site 15 - Spent Acid Storage and Disposal Area

Figure 2-7 shows the surface features of Site 15. The entire area is covered with concrete or bituminous pavement. The site is located southwest of the central bedrock high, which narrowly extends to the

south. The ground surface in the vicinity of the site and southwest is relatively flat. Surface water runoff from this site is collected by a storm sewer system that passes through the Tank Farm (Site 23) and Goss Cove Landfill (Site 8) sites and eventually discharges to the Thames River.

Geologic conditions at Site 15 consist of variable thicknesses of fill and natural alluvial deposits overlying metamorphic bedrock. The overburden at Site 15 consists primarily of silty sand alluvium. Boring logs indicate that in some intervals, there are traces of clay and in others, there are traces of gravel and rock fragments. Site 15 has been mapped as stratified drift deposited by glacial meltwater streams (USGS, 1960). Minor thicknesses of fill may be present overlying the silty sand in some areas of the site. The borings for wells 15MW1D and 15MW4S encountered silt layers of 26- and 24-foot thicknesses, respectively, beneath the silty sand interval. These deposits are also most likely stratified drift.

The bedrock surface slopes to the southwest across the site. Monitoring well 15MW1D was drilled to a depth of 46.5 feet bgs, where gneiss fragments of the Mamacoke Formation were encountered. Monitoring well 15MW4S was drilled to a total depth of 43 feet bgs. Bedrock was not positively identified in this boring; however, auger refusal was reached, suggesting that the bedrock surface may have been encountered. Northeast of the site along Rasher Avenue, bedrock crops out at ground surface.

During historical and recent investigations at this site, groundwater was encountered in the alluvium at depths of less than 10 feet bgs. Most overburden groundwater flow is expected to be through the silty sand layer, with the underlying silt deposit acting as a semi-confining unit. The groundwater generally flows to the south-southwest. There is a downward vertical gradient at the 15MW1 well cluster.

Water level measurements were taken in Site 15 monitoring wells during the BGOUR) in 2000. The elevations were used in conjunction with water level data from other sites to create regional shallow overburden and bedrock potentiometric surface maps (see Figures 2-14 and 2-15, respectively). Water level measurements were also taken in Site 15 monitoring wells during a DGI in 2002. These data were used to prepare a site-specific potentiometric surface map for the shallow overburden groundwater at Site 15 (see Figure 2-16). Based on Figures 2-14 and 2-16, groundwater flow direction (southwest) in the shallow overburden groundwater was consistent during both rounds.

Based on information presented in the BGOURI Report (TtNUS, 2002a), the hydraulic gradient in shallow overburden across the site is approximately 0.024. During Phase II RI field work, slug tests were performed in wells 15MW1S and 15MW3S. The geometric mean of the calculated hydraulic conductivities is 0.76 feet per day. Assuming a porosity of 0.30, the estimated groundwater seepage velocity at Site 15 is 0.06 feet per day.

2.5.1.5 Site 18 – Solvent Storage Area, Building 33

Figure 2-8 shows the surface features of Site 18, located north of Site 15 and Site 23. A steep embankment exists on the northern and eastern sides of Building 33. The embankment slopes at an approximate gradient of 50 percent toward the south and west. The gradient flattens to approximately 5 percent on the southern and eastern sides of Building 33. Surface water runoff from this site is collected by a storm sewer system that passes through Site 23 and Site 8 and eventually discharges to the Thames River.

The SCS Soils Map (SCS, 1983) classifies the soil on the southern and western sides of Building 33 as Urban land. Upgradient of the site (north and east), bedrock exposures (Hollis-Charlton-Rock outcrop complex) are prevalent as the central bedrock high extends toward the south. The soils overlying the bedrock range from very stony fine sandy loam to gravelly loam.

Minimal subsurface investigation work has been performed at Site 18. The site has a veneer of silty sand overlying shallow metamorphic bedrock. The sand is fine to medium grained and contains trace to some gravel and rock fragments.

Groundwater levels were measured in temporary wells 18TW2 and 18TW4 on June 14, 2000. The elevations associated with these measurements are presented on Figure 2-8. The general direction of groundwater flow in the shallow overburden at Site 18 is to the south. Groundwater from this site eventually discharges to the Thames River. The saturated thickness of the overburden at the site varies from approximately 1 foot to greater than 5 feet.

2.5.1.6 Site 20 – Area A Weapons Center

Site 20 is located along the southern side of the northern topographic and bedrock high (see Figure 2-9). The ground surface generally slopes from the northern bedrock high across the site to the south toward the Site 2B. The ground surface across Sile 20 was altered (flattened) when the bedrock was blasted during construction of Building 524. To the west and southwest, the ground surface slopes to a ravine (Site 3) and toward Site 14.

Two drainage culverts (one along the northwestern side and one along the southeastern side of the site) collect runoff from the surrounding hillsides and from Site 20 and discharge it to Site 2B. The drainage culvert along the northwestern side eventually discharges to a storm sewer that passes along the southern side of the site and discharges into Site 2B. The drainage culvert along the southeastern side collects runoff from the hillside north of the site and continues along the southeastern side of the site,

eventually discharging to another area of Site 2B. Site 2B discharges to Site 3 and subsequently into the Thames River. Water typically flows in these drainage culverts immediately following precipitation events.

The overburden materials at Site 20 consist of 4 to 16 feet of coarse sand, gravel, and rock fill underlain by up to 17 feet of fine-grained dredge spoils. Test borings showed that 4 to 8 feet of fill material rests directly on 'bedrock (Mamacoke Formation) across Site 20. The overburden thickness generally increases to the south and east, toward the Site 2B.

The bedrock surface generally slopes to the southwest across the site, toward the valley occupied by Site 2. Bedrock elevations in the Site 20 area indicate that the bedrock surface does not slope uniformly and that localized bedrock surface depression(s) are present. The depressions are most likely the result of the blasting activities that occurred during the construction of Building 524.

Groundwater is present in both the overburden and bedrock underlying Site 20. The saturated thickness of the overburden deposits is variable, ranging up to 25 feet or more. Overburden groundwater is primarily found within the dredge spoil materials, and only the lowermost few feet of the coarser-grained fill deposits are saturated. Shallow overburden and bedrock groundwater contours for Site 20 and nearby areas, based on August 2000 water levels, are shown on Figures 2-10 and 2-11, respectively. Groundwater in both the overburden and bedrock at Site 20 flows to the west and southwest. Shallow overburden groundwater contours at Site 20 generated from water levels measured during the October 2002 DGI are shown on Figure 2-17. The site-specific contours and groundwater flow directions are generally similar to those measured in 2000.

The hydraulic gradient in the shallow overburden varies considerably across Site 20; it is steeper in the area of Building 524 and flatter at the storage bunkers near the Area A Wetlands. The overall groundwater flow gradient in the overburden, based on 2000 water level data, averages approximately 0.04. Assuming an average horizontal hydraulic conductivity in dredge spoil of 0.017 foot per day and in alluvium/fill of 2.0 feet per day (based on hydraulic testing completed at Site 2A) and a porosity of 0.30, the horizontal seepage velocity for overburden groundwater in this area ranges from approximately 0.0023 to 0.27 foot per day.

2.5.1.7 Site 9 – Waste OT-5 and Site 23 – Tank Farm

Site 23, within which Site 9 is located, is in the southern northwest-trending valley and is bordered on the north and south by bedrock highs. In this valley, the ground slopes mildly from approximately 50 feet above mean sea level in the eastern portion to near sea level along the Thames River. A former topographic depression at the former Crystal Lake between Tang Avenue and Crystal Lake Road was filled during construction of the Tank Farm. Figure 2-6 shows surface topography at the Tank Farm.

Due to the cover material and topography of the Tank Farm, a majority of the rain that falls on this site will infiltrate into the ground. Groundwater at this site is collected by a dewatering system. Surface runoff from some portions of the site is collected by a stormwater collection system. Both groundwater and surface water collected by the systems discharge to the Thames River at the Goss Cove Landfill.

The predominant overburden materials observed during the BGOURI at Site 23 were fill and reworked soil. The soils were generally silty, fine- to medium-textured sands with trace amounts of rock fragments. Below the fill deposits are natural alluvium consisting primarily of silty sand. The thickness of the alluvium is variable. In the western portion of the site, the alluvium extends to a depth of over 50 feet. The depth to bedrock encountered during the 1998 hydrogeologic investigation varied from 15 to 58 feet. The greatest depths to bedrock were encountered along the eastern and western site boundaries. The shallowest depths to bedrock were encountered in the central portion of the site, along its northern and southern boundaries.

Groundwater is present in both the overburden and bedrock underlying Site 23. Shallow overburden groundwater generally flows into the central area of Site 23 then west toward the Thames River. The flow pattern reflects the presence of the tank underdrain system and groundwater collection system in this area, both of which act as groundwater sinks (collection points). The shallow groundwater flow gradient varies widely across the site but averages about 0.01. Bedrock groundwater flow is generally to the west and southwest. The Tank Farm underdrains and groundwater collection system that have a significant influence on shallow groundwater flow patterns do not affect bedrock groundwater flow directions to any significant degree. The flow gradient in the bedrock averages about 0.014 across Site 23. Figures 4-14 and 4-15 show groundwater flow patterns in the shallow overburden across Site 23, based August 2000 of water-level measurements.

The average overburden hydraulic conductivities based on slug testing during the BGOURI was 2.3 feet per day. For bedrock wells, the hydraulic conductivities were 0.73 feet per day and 652 feet per day. The large range is typical of the difference between highly transmissive bedrock fractures and less transmissive fractures. Using an average gradient of 0.01, an average hydraulic conductivity of 2.3 feet per day, and an assumed porosity of 0.3, the average groundwater flow velocity in the overburden is approximately 0.8 foot per day.

2.5.2 Nature and Extent of Contamination

The Navy conducted various field investigations at Sites 2A, 2B, 3, 9, 7, 14, 15, 20, and 23 from 1990 to the present to assess the nature and extent of groundwater contamination. The investigations at Sites 2A, 2B, 3, 7, 20, and 23 focused on groundwater present in the overburden and bedrock, and the

investigations at Sites 9, 14, 15, and 18 only focused on groundwater in the overburden. Sites 2A and 2B are located hydraulically upgradient of Site 3, Sites 14 and 20 are hydraulically upgradient of Sites 3 and 7, and Sites 15 and 18 are hydraulically upgradient of Sites 9 and 23.

Only one round of investigation was conducted at Site 18 to assess the nature and extent of contamination. The investigation focused on groundwater present in the overburden.

2.5.2.1 Sites 2A and 2B

Phase II Ri

For Site 2A, the Phase II RI concluded that shallow groundwater contamination (i.e., VOCs, PCBs, and inorganics) exists at the site and recommended that institutional controls including groundwater monitoring and use restrictions be implemented. For Site 2B, the Phase II RI concluded that the site may pose a risk to construction workers due to potential exposure to manganese in groundwater and recommended that an FS be conducted to evaluate a limited action alternative that included groundwater monitoring and use restrictions.

BGOUR!

Six VOCs were detected in groundwater samples collected during the BGOURI. Several of the VOCs were detected during previous soil and groundwater sampling events. Acetone was the only VOC COPC identified at Site 2. In general, acetone concentrations were less than 10 µg/L, with the exception of a concentration of 120 µg/L in well 2WMW39DS. Acetone is also known to be a common laboratory artifact.

Three SVOCs were detected in groundwater samples collected during the BGOURI. None of the detected concentrations exceeded any of the relevant screening criteria. One pesticide, 4,4'-DDD, was detected in a single groundwater sample. High dissolved solids were detected in the groundwater sample, and it is likely that the DDD was bound to the solids.

Fifteen metals were detected in unfiltered groundwater samples, and 13 metals were detected in filtered groundwater samples. Arsenic, barium, and mercury were the only metals identified as COPCs. Exceedances of background levels for these metals were sporadic; only one well (2WGW47DS) had concentrations of more than one metal in excess of background levels. Concentrations of the other detected metals were less than screening criteria. In general, metals concentrations were lower in the BGOURI than in previous investigations. This result was generally expected because only downgradient monitoring wells and not monitoring wells within the Area A Landfill were sampled during the BGOURI.

The BGOURI report recommended that the groundwater monitoring program being conducted in accordance with the OU1 ROD be continued to gather data to evaluate long-term trends in contaminant concentrations and that the decision about whether to proceed to an FS should be made after sufficient data were collected and evaluated.

Annual Groundwater Monitoring

Eight years of groundwater monitoring under the OU1 ROD have been completed. Year 7 (2006) results, the most recent available, indicate that copper was the only contaminant detected in groundwater at concentrations in excess of criteria, and the well in which it was detected was a reference well not a downgradient well. Based on the results of the monitoring program to date, the landfill cap is working properly and significant contaminant migration from the landfill to groundwater is not occurring. Also based on monitoring results, it was decided that an FS was not necessary for this site. Figure 2-18 presents the groundwater exceedance detected during Year 7 sampling.

2.5.2.2 Sites 3 and 14

Groundwater at Sites 3 and 14 was investigated independently and collectively throughout the various investigations. The nature and extent of contamination found during each investigation is discussed below.

<u>Phase II RI</u>

Site 3 - Overburden

Seven VOCs, including six halogenated aliphatics and benzene, were detected in groundwater samples collected from overburden wells at Site 3. Each VOC was detected in from 1 to 3 of 25 samples. Most of the VOCs were detected in well 2DMW29S, located along Triton, Road in the north-central portion of the site. Maximum concentrations of total 1,2-dichloroethene [28 micrograms per liter (µg/L)], bromodichloromethane (2 µg/L), chloroform (12 µg/L), methylene chloride (11 µg/L), and vinyl chloride (VC) (130 µg/L) were detected in samples from this well. None of these chemicals were identified in the surface water samples collected from the adjacent drainageway (Stream 5) along Triton Road. The source(s) of this groundwater contamination is not known.

Two phthalate esters (plasticizers that are common field and laboratory contaminants) and benzoic acid were each detected in from one to three of the groundwater samples collected from overburden wells.

Twenty-three metals were detected in unfiltered groundwater samples collected from overburden wells, and 19 metals were detected in associated filtered groundwater samples. Greater than two-thirds of the

maximum concentrations of metals were associated with samples collected from overburden wells 2DMW30S and 3MW12S. Notable results for metals included maximum concentrations of aluminum (97,400 μ g/L), arsenic (23.9 μ g/L), barium (835 μ g/L), manganese (6,710 μ g/L), vanadium (229 μ g/L), and zinc (800 μ g/L).

Site 3 - Bedrock

Five halogenated aliphatics (1,1,2,2-tetrachloroethane, total 1,2-dichloroethene, chloroform, methylene chloride, and TCE) were detected in groundwater samples collected from bedrock wells at Site 3. Each VOC was detected in from 1 to 4 of the 25 groundwater samples. TCE concentrations ranged from 1 µg/L to 17 µg/L. Maximum concentrations of 1,1,2,2-tetrachloroethane, total 1,2-dichloroethene, and TCE were detected during the Phase I RI in the groundwater sample collected from well 2DMW16D, located approximately 125 feet southeast of North Lake.

Eleven semivolatile organic compounds (SVOCs) were also detected in groundwater samples from Site 3 bedrock wells. Six PAHs, ranging in concentration from 1 to 4 μ g/L, were detected in the groundwater sample from well 3MW12D collected during Round 1 of the Phase II RI. In addition, bis(2-ethylhexyl) phthalate was detected in five groundwater samples at concentrations ranging from 2 to 20 μ g/L. Two additional phthalates, benzoic acid, and phenol were each detected in one or two groundwater samples at concentrations ranging from 0.5 to 5 μ g/L. As previously noted, phthalates are considered to be common laboratory contaminants.

Twenty-two metals were detected in unfiltered groundwater samples from bedrock wells, and 18 metals were detected in associated fittered groundwater samples. Approximately 42 percent of the maximum concentrations of metals were associated with samples from bedrock well 3MW12D.

Site 14 - Overburden

One VOC (carbon disulfide) and one SVOC [bis(2-ethylhexyl) phthalate] were detected in the two groundwater samples collected from well 14MW1S. Both chemicals were detected at an estimated concentration of 1 µg/L. The results indicate that Site 14 is not a significant source of organic groundwater contamination.

Eleven metals were detected in unfiltered Site 14 groundwater samples, and 12 metals were detected in associated filtered groundwater samples. With the exception of aluminum (at 171 µg/L in unfiltered sample 14GW1S only), filtered and unfiltered results were at the same order of magnitude. Maximum concentrations of arsenic in filtered samples and of boron and cobalt in unfiltered samples exceeded

respective concentrations of these metals detected in unfiltered groundwater samples from off-site residential wells.

BGOUR!

Sites 3 and 14 - Overburden

Four VOCs (chloroform, cis-1,2-dichloroethene, TCE, and VC) were detected in one or more of the 10 groundwater samples collected from the overburden aquifer. Detected concentrations of these VOCs ranged from 1,71 μ g/L (cis-1,2-dichloroethene) to 31.3 μ g/L (VC) and were less than in samples collected during previous investigations. Acetone was detected at estimated concentrations of 27.8 and 28.9 μ g/L in two samples collected from temporary wells installed in the overburden aquifer. VC (4.65 μ g/L) and cis-1,2-dichloroethene (1.71 μ g/L) were detected in one groundwater sample collected from a temporary well.

Several PAHs and 4-methylphenol were the only SVOCs detected in groundwater at Site 3. Concentrations of most of these SVOCs were low, ranging from 0.03 µg/L [benzo(k)fluoranthene] to 2 µg/L (4-methylphenol). With the exception of fluoranthene, which was detected in three groundwater samples, each SVOC was detected in only one groundwater sample. PAHs and 4-methylphenol were not detected in overburden groundwater samples collected during previous investigations.

Trace levels of 1,1-dichloro-2,2-bis(4-chlorophenyl)ethane (DDD) (0.019 µg/L) and 1,1,1-trichloro-2,2-bis(4-chlorophenyl)ethane (DDT) (0.034 µg/L) were detected in overburden well 2DMW30S. High levels of total suspended solids were measured in this well and are the likely cause of the detections of DDD and DDT in groundwater. Pesticides were not detected in overburden groundwater samples collected during previous investigations.

Fifteen metals were detected in unfiltered overburden groundwater samples, and nine metals were detected in filtered overburden groundwater samples. Concentrations of metals in filtered and unfiltered samples were relatively similar (i.e., at the same order of magnitude). In general, the detected concentrations of metals were low. Concentrations of all metals were lower in groundwater samples collected during the BGOURI than in samples collected during previous investigations.

Site 3 - Bedrock

Three VOCs (chloroform, cis-1,2-dichloroethene, and TCE) were detected in nine groundwater samples collected from the bedrock aquifer. TCE concentrations were low, ranging from 1.88 to 8.76 µg/L. In general, VOCs were detected infrequently in bedrock groundwater during the BGOURI. Chloroform,

1,2-dichloroethene (total), and TCE were also detected in bedrock groundwater samples collected during previous investigations. Concentrations of 1,2-dichloroethene and TCE detected during the BGOURI were less than concentrations detected during previous investigations. No SVOCs, pesticides, or PCBs were detected in groundwater samples collected from the bedrock aquifer.

Fourteen metals were detected in unfiltered bedrock groundwater samples, and eight metals were detected in filtered bedrock groundwater samples. Reported concentrations of metals in filtered and unfiltered samples were relatively similar (i.e., at the same order of magnitude). In general, the detected concentrations of metals were low. Concentrations of all metals were lower in groundwater samples collected during the BGOURI than in samples collected during previous investigations, with the exception of silver and zinc.

BGOURI Update/FS

Eight VOCs were detected in Site 3 groundwater samples collected during the DGI. Data collected during the DGI were used to evaluate the nature and extent of contamination associated with Site 3-NSA and to confirm the nature and extent of groundwater contamination detected during previous investigations. 1,1,2-Trichloroethane, carbon disulfide, toluene, and trans-1,2-dichloroethane were detected during the DGI but were not detected during the BGOURI. These VOCs were detected infrequently (less than 25 percent of the samples) and at relatively low concentrations (less than 2 μg/L). The compounds cis-1,2-dichloroethene, TCE, and VC were detected at lower concentrations (less than 3 μg/L) during the DGI than the BGOURI (less than 32 μg/L). All of these wells are located along Stream 5 in the northern portion of Site 3.

Chlorinated VOCs have been consistently detected in several Site 3 wells since the Phase II Rt. It appears that VOC contamination (TCE) was originally released in the Site 7 area (leach fields) and migrated to Site 3.

Seven SVOCs, all PAHs, were infrequently detected in groundwater samples collected during the DGI. No PAHs were detected in the samples collected from permanent monitoring wells, and all of the maximum concentrations were less than 1 µg/L in one temporary well. The source of the detected PAHs may be the PAH-contaminated soil (i.e., suspended solids in the temporary well) or the petroleum hydrocarbon contamination associated with the NSA.

The only pesticides detected in groundwater were alpha- and beta-BHC, and they were detected only in the sample from one temporary well (same well as the PAH detections). These pesticides were detected at low concentrations in soil samples, but it is unlikely that they have leached at significant dissolved concentrations to groundwater. It is more likely that these groundwater detections were the result of suspended solids incorporated into the groundwater sample during sampling.

Thirteen inorganics were detected in unfiltered samples collected during the DGI, but only eight inorganics were detected in filtered samples. It is likely that elevated inorganics concentrations in unfiltered samples are related to suspended solids incorporated into groundwater samples from temporary wells. Overall, DGI results indicate that Site 3 - NSA is not a significant source of inorganic contamination at Site 3.

Quarterly Groundwater Monitoring

The first year of quarterly groundwater monitoring at Site 3 was conducted from May 2006 to April 2007. (TtNUS, 2007) in accordance with the Work Plan for Remedial Action at Sites 3 and 7 (TtNUS, 2006b) and Operation and Maintenance (O&M) Manual for IR Program Siles (TtNUS, 2006a). Site 3 COCs, as presented in the Remedial Action Work Plan, are TCE and VC. Groundwater samples were collected from nine wells at Site 3 during quarterly sampling. No COCs were detected in six of the nine wells sampled during Year 1 of the monitoring program. Year 1 exceedances of remedial goals (RGs) included TCE in 3MW16D during the first quarter and in 2DMW16D during all four quarters and VC in 2DMW29S. during the second and fourth quarters. Wells 3MW16D and 2DMW29S are located near Stream 5 and are downgradient of the former Site 7 leach fields. The TCE concentration in 3MW16D during the first quarter was 5.1 µg/L, slightly greater than the RG of 5 µg/L. VC concentrations in 2DMW29S have decreased from a maximum of 130 µg/L in 1994 to 4 µg/L during the last sampling round (slightly greater than the RG of 1.6 µg/L). Well 2DMW16D is located on the southern side of Site 3 and is not downgradient of the former Site 7 leach fields. It appears that the Area A Landfill or an unknown upgradient area of contamination is the source of TCE in this well. TCE concentrations in 2DMW16D have decreased from a maximum of 17 µg/L in 1991 to a maximum of 7 µg/L during Year 1 monitoring. Based on the results of Year 1 monitoring, no changes to the Site 3 monitoring program were recommended in the Year 1 Annual Groundwater Monitoring Report. Tables 2-1 and 2-2 present Year 1. groundwater monitoring data from Sites 3 and 7, respectively, and Figure 2-19 presents exceedances detected during the first year of monitoring.

2.5.2.3 Site 7

Historical Investigations - Combined Results of Phase I and II RIs.

Overburden

Eight VOCs, including six chlorinated aliphatics, 2-butanone, and carbon disulfide were detected in groundwater samples collected from Site 7 overburden wells. 1,1,1-Trichloroethane and

1,1-dichloroethane were each detected in 6 of 20 groundwater samples, at concentrations ranging from 2 µg/L to 42 µg/L. 1,1-Dichloroethene was detected in four groundwater samples at concentrations ranging from 1 µg/L to 2 µg/L. The remaining VOCs were detected in one or two samples at concentrations ranging from 1 µg/L to 10 µg/L. Maximum concentrations of all VOCs except 2-butanone, chlorobenzene (CB), and methylene chloride were associated with the sample collected from well 7MW3\$, located west of Building 325 in the southern leach field.

Thirteen SVOCs, including six PAHs, three phthalates, 1,4-dichlorobenzene (1,4-DCB), benzoic acid, dibenzofuran, and phenol, were detected in the 20 groundwater samples collected from overburden wells at Site 7. Benzoic acid and di-n-butyl phthalate were detected in six and four samples, respectively. The remaining SVOCs were each detected in only 1 or 2 of 20 samples. With the exception of bis(2-ethylhexyl) phthalate, which was detected in a single groundwater sample at a concentration of 380 µg/L, all SVOC concentrations ranged from 0.5 µg/L to 9 µg/L. Maximum concentrations of eight SVOCs were associated with groundwater samples collected from well 7MW8S, located along Triton Road in the western portion of the site.

Twenty-two metals were detected in unfiltered groundwater samples collected from overburden wells, and 15 metals were detected in the corresponding filtered groundwater samples. In general, maximum concentrations of metals in unfiltered and filtered samples were within the same order of magnitude. Close to half of the maximum concentrations of metals were associated with groundwater samples collected from well 7MW3D, located near Triton Road and west of the southern leach field.

Analyses for oil and grease were performed on four of the groundwater samples. The sample from well 7MW3D had an oil and grease a concentration of 600 μ g/L. TPH analyses were performed for nine of the groundwater samples collected from overburden wells. TPH was detected in two samples (both collected from well 7MW8S) at concentrations of 700 μ g/L and 1,200 μ g/L. This well is located along Triton Road, downgradient of Buildings 325, 450, and 477.

Bedrock

Minimal organic contamination was detected in groundwater samples collected from Site 7 bedrock wells. 1,1,1-Trichloroethane (2 μg/L), methylene chloride (1 μg/L), benzoic acid (0.7 μg/L), and phenol (0.8 μg/L) were detected in samples collected from well 7MW5D. 4-Methyl-2-pentanone, methylene chloride, and total xylenes were detected in one well each. No other VOCs, SVOCs, pesticides, or PCBs were detected.

Twenty-four metals were detected in unfiltered groundwater samples from bedrock wells, and 14 metals were detected in the corresponding filtered groundwater samples. Maximum concentrations of barium,

copper, iron, lead, and zinc in unfiltered samples were more than five times greater than maximum concentrations of respective concentrations in filtered samples. This indicates that the concentrations in unfiltered samples may be caused by the presence of suspended sediments and may not actually represent contamination of the groundwater. More than half of the maximum concentrations of metals were associated with groundwater samples collected from well 7MW5D, located near the southwestern corner of Building 450. In addition, several maximum concentrations were associated with groundwater samples collected from well 7MW4S, located near the southeastern corner of Building 325.

BGOUR!

Overburden - Temporary Wells

The VOCs 1,4-DCB, benzene, and CB were detected in overburden temporary monitoring wells. 1,4-DCB concentrations ranged from 1.83 to 90.5 μg/L, benzene was detected in one sample at 2 μg/L, and CB was detected at concentrations of 6.66 μg/L and 165 μg/L. Based on the locations of the wells (see Figure 2-5), it is likely that these detections are related to the septic tank located along the western side of Building 325. The septic system is no longer used, but the disposition of the tank is not known.

Three of the 10 temporary monitoring wells were analyzed for SVOCs. The only SVOC detected in temporary monitoring wells was bis(2-ethylhexyl) phthalate at concentrations of 44 and 49 µg/L.

Seventeen metals were detected in the groundwater samples collected from Site 7 temporary monitoring wells. Maximum detected concentrations were all detected in one well, and arsenic, barium, chromium, cobalt, copper, nickel, silver, vanadium, and zinc were detected only in this well. Calcium, magnesium, manganese, potassium, and sodium were detected in all three samples. Aluminum, iron, and lead were detected in two of three samples. Of these detected metals, aluminum, arsenic, barium, chromium, iron, lead, nickel, silver, vanadium, and zinc were detected at concentrations in excess of background concentrations. The total suspended solids content in sample S7TW0901 was two orders of magnitude higher than in the other two samples; this may account for the elevated metals concentrations in this sample.

Overburden - Permanent Monitoring Wells

The VOCs 1,3-DCB, 1,4-DCB, and TCE were detected in permanent overburden monitoring wells at Site 7. 1,3-DCB and 1,4-DCB were detected only in one well at 2 μg/L. TCE was detected in four wells at concentrations ranging from 1.93 to 23 μg/L. The SVOCs detected in permanent monitoring wells were bis(2-ethylhexyl) phthalate, fluorene, hexachlorobenzene (HC8), and phenanthrene. Phenanthrene and bis(2-ethylhexyl) phthalate were detected in one sample at concentrations of 6.5 and 190 μg/L,

respectively. HCB was detected in one sample at 3 µg/L. Fluorene was detected in two samples at 0.26 and 6.5 µg/L, respectively.

Seventeen inorganics were detected in unfiltered groundwater samples from Site 7 permanent bedrock monitoring wells. Maximum detected concentrations were scattered among the 13 wells. Arsenic, cadmium, chromium, selenium, and vanadium were detected in only 1 of 13 samples. Aluminum, copper, iron, and fead were detected in 4 to 5 of 13 samples. Barium, cobalt, and zinc were detected in 8 of 13 samples. Manganese was detected in 11 of 13 samples. Calcium, magnesium, potassium, and sodium were detected in all 13 samples. Arsenic, cadmium, lead, selenium, and zinc were detected at concentrations in excess of background concentrations. Arsenic was detected at 2.9 µg/L, in excess of the risk-based COPC screening level (Region 9 PRG) but not in excess of the CTDEP surface water protection criterion (SWPC) (CTDEP, 1996). Zinc, detected at a maximum concentration of 194 µg/L, was the only analyte present at a concentration in excess of CTDEP pollutant mobility criteria.

Bedrock - Permanent Wells

TCE was the only VOC detected in Site 7 bedrock groundwater samples collected during the BGOURI. TCE was detected in three samples at concentrations ranging from 1.54 to 7.58 µg/L, all in excess of the risk-based COPC screening level (Region 9 PRG) but less than the CTDEP SWPC.

Eleven metals were detected in unfiltered bedrock groundwater samples, with the majority of maximum concentrations detected in two samples. Calcium, magnesium, potassium, and sodium were the only metals detected in all four bedrock groundwater samples. Copper and nickel were only detected in one sample. The remaining detected metals were detected in two to three of the four samples collected. The concentrations of lead, nickel, and zinc were in excess of background concentrations.

Quarterly Groundwater Monitoring

The first year of quarterly groundwater monitoring at Site 7 was conducted from May 2006 to April 2007 (TtNUS, 2007) in accordance with the Work Plan for Remedial Action at Sites 3 and 7 (TtNUS, 2006b) and O&M Manual for IR Program Sites (TtNUS, 2006a). Groundwater samples were collected from eight wells at Site 7 during quarterly sampling. Site 7 COCs, as presented in the Remedial Action Work Plan, are 1,4-DCB, benzene, CB, HCB, and TCE. No COCs were detected at concentrations greater than RGs during Year 1 monitoring. Based on the results of Year 1 monitoring, no changes to the Site 7 monitoring program were recommended in the Year 1 Annual Groundwater Monitoring Report. Tables 2-1 and 2-2 present Year 1 groundwater monitoring data from Sites 3 and 7, respectively, and Figure 2-19 presents exceedances detected during the first year of monitoring at Sites 3 and 7.

2.5.2.4 Site 15

Phase II RI

Ten groundwater samples were collected from five overburden wells at Site 15 during Rounds 1 and 2 of the Phase II RI in 1994. Carbon disulfide was detected at a concentration of 3 µg/L in one well during Round 1 of the Phase II RI. No other VOCs were detected. Five SVOCs [1,4-DCB, bis(2-ethylhexyl) phthalate, di-n-butyl phthalate, naphthalane, and phenanthrene] were detected in groundwater samples. The two phthalates, plasticizers that are common field and laboratory contaminants, were each detected in 4 of 10 samples. The remaining SVOCs were each detected in 1 or 2 of 10 samples. Concentrations of bis(2-ethylhexyl) phthalate ranged from 0.6 to 45 µg/L. Concentrations of the remaining SVOCs ranged from 0.5 to 1 µg/L. The pesticide heptachlor was also detected at a concentration of 0.54 µg/L.

Twenty-one metals were detected in unfiltered groundwater samples, and 17 metals were detected in corresponding filtered groundwater samples. A majority of the maximum concentrations were associated with samples collected from wells 15MW3S and 15MW2S, located downgradient and upgradient, respectively, of Site 15. Notable results reported for Site 15 groundwater samples include maximum concentrations of manganese in both filtered and unfiltered groundwater samples at 3,080 µg/L and maximum concentrations of zinc in filtered and unfiltered groundwater samples at 450 µg/L and 453 µg/L, respectively. The maximum lead concentration in one unfiltered groundwater sample from 15MW3S (21.2 µg/L) was significantly higher than subsequent filtered (2 µg/L) and unfiltered (4.4 µg/L) samples collected from the same well.

<u>BGOURI</u>

Four additional groundwater samples were collected at Site 15 during the BGOURI in 2000. TCE, the only VOC detected during the BGOURI, was not detected in groundwater at this site during previous sampling events. TCE was detected in three of four groundwater samples at concentrations ranging from 2.32 to 16 µg/L. The source of the TCE was unknown. Anthracene, fluoranthene, and pyrene were detected in one well at concentrations less than 100 µg/L. None of these SVOCs were detected in groundwater samples collected during the Phase II RI.

Fifteen inorganics were detected in groundwater samples collected from Site 15. Seven of the 15 metals were detected in all four samples. Cadmium, chromium, lead, nickel, and silver were detected at elevated concentrations. Lead was the only inorganic detected at significant levels during both the Phase II RI and BGOURI. Chromium and lead were detected in all four BGOURI samples.

Lead was detected at concentrations less than the risk-based COPC screening criterion in all samples except in 15MW1S01 (24.7 μ g/L). Lead concentrations exceeded the background concentration in samples 15MW1S01 and 15MW2S01. The groundwater in 15MW2S was acidic (pH = 4.44), the groundwater in 15MW1S and 15MW3S was slightly acidic (pH = 5.75 and 5.91, respectively), and the groundwater in 15MW1D was near neutral (pH = 6.9). Lead was detected at 2.8 J μ g/L in the deep overburden aquifer well 15MW1D. The pH data and the detected concentrations of lead indicate that residual contamination from the former SASDA is impacting the shallow overburden groundwater.

Silver was detected in 3 of 3 samples at concentrations ranging from 79.1 µg/L (15MW1D) to 615 µg/L (15MW2S). The maximum silver concentration was found in well 15MW2S, which also had the lowest pH (4.44). Concentrations of silver decrease in the downgradient direction, but the existing monitoring well network at Site 15 does not extend far enough downgradient to fully define the most downgradient extent of silver in groundwater. Even though the monitoring well network is limited at Site 15, silver was not detected in any downgradient groundwater samples at Site 23. Therefore, it does not appear that silver is migrating to downgradient locations at significant concentrations.

Of the 10 remaining detected metals, concentrations of aluminum, beryllium, and zinc were in excess of background concentrations.

BGOURI Update/FS

Additional groundwater samples were collected at Site 15 during a DGI in 2002 and analyzed to further define the nature and extent of contamination at the site. The sampling program focused on the groundwater contaminants, including TCE, chromium, and silver, identified during the BGOURI.

Groundwater samples were analyzed for TCL VOCs, TAL metals, and acidity. Table 2-3 summarizes the results for Site 15 groundwater samples collected for the BGOURI Update/FS.

Chloroform was the only VOC detected in the six groundwater samples. It was detected once in the sample from 15TW03 at a concentration of 3 µg/L. TCE, which was detected in groundwater samples from three monitoring wells (15MW1S, 15MW2S, and 15MW3S) during the BGOURI, was not detected in the groundwater samples collected from these wells or the three new temporary monitoring wells during the DGI. Considering both soil and groundwater data from Site 18 (and BGOURI groundwater data from other sites), it was determined that the detections of TCE in groundwater samples during the BGOURI were anomalies (apparently related to laboratory or field sampling issues) and are not indicative of a site or upgradient source issue.

Fifteen inorganics were detected in both total and filtered groundwater samples collected from Site 15 during the DGI. Zinc was detected at total and dissolved concentrations in excess of the background concentration. The dissolved concentrations of aluminum in two samples were also greater than the background level. The total and dissolved concentrations of inorganics were similar for the DGI samples, indicating that proper low-flow sampling techniques were used and that turbidity/total suspended solids (TSS) did not influence analytical results.

The inorganics cadmium, chromium, lead, nickel, silver, and zinc were identified as groundwater COPCs during the BGOURI. Cadmium was detected in only one sample (15TW02) during the DGI at a concentration (4.4 μ g/L), similar to the maximum concentration (3.4 μ g/L) detected during the BGOURI. Chromium, lead, and silver were detected at total concentrations that were one to three orders of magnitude lower during the DGI than the BGOURI. Nickel was not detected in any of the groundwater samples collected during the DGI. The maximum total zinc concentration during the DGI (365 μ g/L) was detected in the same well (15MW2S) and at the same magnitude (349 μ g/L) as during the BGOURI.

2.5.2.5 Site 18

An evaluation of the nature and extent of groundwater contamination at Site 18 is provided below. The discussion includes groundwater data collected during the BGOURI in 2000. Groundwater sample locations are shown on Figure 2-8, and Table 2-4 presents a summary of groundwater analytical results from the BGOURI.

No VOCs, SVOCs, pesticides, or PCBs were detected in the groundwater samples collected at Site 18.

Aluminum, beryllium, calcium, iron, magnesium, manganese, potassium, and sodium were detected in one or both of the groundwater samples collected at Site 18. The concentrations of these metals were all less than background levels except beryllium, which was not detected in background samples. The concentration of beryllium was les than the risk-based COPC screening level (Region 9 PRG) and CTDEP SWPC.

2.5.2.6 Site 20

Phase II RI

Overburden

No overburden groundwater samples were collected from Site 20 during the Phase I RI. Three overburden wells were installed and sampled during the Phase II RI; however, no VOCs were detected. Five SVOCs were detected at low concentrations. A common field and laboratory contaminant,

bis(2-ethylhexyl)phthalate, was detected in three of six samples at concentrations ranging from 2 μ g/L to 3 μ g/L. 1,3-DCB (0.6 μ g/L), benzo(g,h,i)perylene (1 μ g/L), dibenzo(a,h)anthracene (0.8 μ g/L), and indeno(1,2,3-cd)pyrene (1 μ g/L) were each detected in one of two groundwater samples collected from well 2WCMW1S.

Nineteen metals were detected in unfiltered groundwater samples collected from the overburden wells. Sixteen metals were detected in the corresponding filtered groundwater samples. A majority of the maximum concentrations of metals were associated with groundwater samples collected from well 2WCMW3S, located south of the site along the drainageway into Site 2B. Concentrations of metals in filtered and unfiltered samples were relatively similar (i.e., at the same order of magnitude). Notable concentrations reported for groundwater samples include the maximum concentrations of arsenic (19.9 µg/L), boron (3,810 µg/L), manganese (6,540 µg/L), and sodium (3,580,000 µg/L).

Bedrock

Three groundwater samples were collected (during the Phase I Rt and Rounds 1 and 2 of the Phase II Rt) from a single Site 20 bedrock well (2WMW4D). Six VOCs, including three ketones and three halogenated aliphatics, were detected at concentrations ranging from 1 μ g/L to 12 μ g/L. Three SVOCs were detected at concentrations ranging from 2 μ g/L. Benzoic acid and di-n-octyl phthalate were each detected in one of three samples, and bis(2-ethylhexyl)phthalate was detected in two of three samples.

Thirteen inorganics were detected in unfiltered groundwater samples collected from the bedrock. Seven inorganics were detected in the corresponding filtered groundwater samples. The maximum concentrations of a majority of inorganics in overburden well samples were more than an order of magnitude greater than respective maximum concentrations of inorganics detected in bedrock well samples.

BGOURI

Overburden.

TCE and 4-methyl-2-pentanone were the only VOCs detected in the groundwater samples collected from the overburden wells at Site 20. TCE and 4-methyl-2-pentanone were detected in one sample from well 2WCMW2S at concentrations of 5.02 µg/L and 1.29 J µg/L, respectively. VOCs were not detected in groundwater samples collected from the overburden aguifer during previous investigations.

PAHs and 4-methylphenol were the only SVOCs detected in groundwater samples collected from the overburden aquifer. PAHs were detected in one groundwater sample from well 2WCMW2S at

concentrations ranging from 0.03 μ g/L [benzo(k)fluoranthene] to 0.13 μ g/L (fluoranthene). 4-Methylphenol was detected in one sample from well 2WCMW3S at a concentration of 9 μ g/L. PAHs were also detected at low concentrations in groundwater samples collected during previous investigations.

Sixteen metals were detected in unfiltered overburden groundwater samples, and two metals (calcium and zinc) were detected in filtered overburden groundwater samples. The concentrations of the metals were higher in unfiltered samples than in filtered samples. In general, metals were also detected at similar concentrations (i.e., at the same order of magnitude) in groundwater samples collected during the previous investigations.

Bedrock

TCE, at a concentration of 3.8 µg/L, was the only VOC detected in the groundwater sample collected from the bedrock aquifer. TCE was also detected at similar concentrations in groundwater samples from the bedrock aquifer during previous investigations.

No SVOCs were detected in the groundwater sample collected from the bedrock aquifer. Benzoic acid, bis(2-ethylhexyl) phthalate, and di-n-octyl phthalate were detected at low concentrations in groundwater from the bedrock aquifer during previous investigations.

Calcium, magnesium, potassium, and sodium were the only inorganics detected in the groundwater sample from the bedrock aquifer. These inorganics were also detected at similar concentrations (i.e., at the same order of magnitude) in groundwater samples collected from the bedrock aquifer during previous investigations.

BGOURI Update/FS

Monitoring wells 2WCMW1S and 2WCMW2S were resampled during the DGI and analyzed for total and dissolved TAL inorganics. Wells 2WCMW1S and 2WCMW2S were resampled because elevated concentrations of silver were detected during the BGOURI. Other groundwater COCs identified during the BGOURI risk assessment included TCE, benzo(a)pyrene, arsenic, and thallium. These COCs were further evaluated during the preparation of the DGI Work Plan. Factors such as the frequency and magnitude of the detections and the source of the contamination were evaluated, and it was determined that additional investigation of these four COCs was not warranted during the DGI.

Table 2-5 summarizes the analytical results for chemicals detected in groundwater at Site 20 during the DGI. The concentrations of inorganics detected during the DGI were typically lower than concentrations

detected during the BGOURI. Concentrations of arsenic, chromium, copper, lead, silver, and zinc were significantly lower in well 2WCMW1S. The silver concentration in 2WCMW2S also decreased significantly. Some exceptions were aluminum and zinc, which were detected at higher concentrations in well 2WCMW2S during the DGI.

2.5.2.7 Sites 9 and 23

BGOURI

During BGOURI field activities in 2000, groundwater samples were collected from monitoring wells at Site 23 completed in the overburden and bedrock aquifers (TtNUS, 2002a). VOCs and SVOCs were detected infrequently in groundwater samples collected during the BGOURI. Metals were detected frequently in groundwater samples, but the detections are likely related to the fill material used to construct the fuel farm. The RI recommended postponing any decisions on the groundwater at Site 23 until a sufficient amount of data was available from the groundwater collection system monitoring program to properly characterize the groundwater.

Storm Sewer Rehabilitation

The storm sewer system at Site 23 was rehabilitated in 2000 (FWEC, 2001). After completion of the storm sewer system, groundwater collected from the deep dewatering system around the closed USTs is conveyed to a metering pit within the tank farm. The metering pit is connected to the shallow stormwater system, and the water collected by the system is conveyed to the Thames River. The Navy initiated a sampling program for the deep groundwater collection system after construction activities were completed.

Seven groundwater samples were collected from the metering pil between July 25, 2000 and May 23, 2001. The analytical results varied per round and no comparisons of data to Connecticut criteria were completed, but in general, the groundwater samples did not contain significant concentrations of contaminants typically found in fuel oif.

Quarterly Underdrain Metering Pit Sampling

Metering pit sampling was conducted quarterly beginning in June 2007 to evaluate the quality of groundwater being collected and conveyed by the underdrain piping (TtNUS, 2008c). Table 2-6 summarizes data from quarterly metering pit sampling. Exceedances of applicable Connecticut groundwater criteria (for surface water protection) included arsenic in the unfiltered sample during the second quarterly event (September 2007) and seven SVOCs in one sample during the third sampling event (December 2007). However, both of these exceedances were attributed to suspended solids particles and not site-related contamination. The results of the four quarterly sampling events indicate

that groundwater from Site 23 (which includes Site 9) being collected and conveyed in the storm sewer system does not pose a significant risk to human health or the environment under current and expected future land use (non-residential).

2.5.2.8 Summary of Nature and Extent of Contamination

Site 2

Eight years of groundwater monitoring under the OU1 ROD have been completed. Year 7 (2006) results, the most recent available, indicate that copper was the only contaminant detected in groundwater at concentrations in excess of criteria. Based on the results of the monitoring program to date, the landfill cap is working properly and significant contaminant migration from the landfill to groundwater is not occurring.

Site 3

Chlorinated VOCs (e.g., cis-1,2-dichloroethene, TCE, and VC) and PAHs were the primary contaminants detected in the groundwater at Site 3. Chlorinated VOCs were detected during all of the investigations, and it is likely that their detections are the result of solvents being released to groundwater via the two former septic systems and associated leach fields at Site 7 and migrating downgradient to Site 3. The concentrations of the VOCs detected during the most recent investigation (2002) were less than concentrations detected during previous investigations (1994), indicating that a continuing source of contamination is not present and that natural degradation processes are working. The VOCs were found primarily along the length of Stream 5. The PAHs, which were detected infrequently, were found to be related to suspended solids in samples collected from recently installed and sampled temporary wells and not a site-specific groundwater concern.

Site 7

Investigations at Site 7 found contaminants such as benzene, chlorobenzenes (1,4-DCB, CB, and HCB), phenanthrene, and TCE in the groundwater. The contaminants were probably released to the groundwater via the two historical septic systems and associated leach fields.

<u>Site_14</u>

A single well was installed at Site 14 and sampled in 1994 and 2000. Naturally occurring metals were the only chemicals consistently detected in the groundwater at this site.

Site 15

Historical investigations at Site 15 identified TCE and inorganics (cadmium, chromium, lead, nickel, silver, and zinc) as the primary groundwater contaminants. SVOCs were also detected infrequently at low concentrations. A DGI was conducted to confirm the historic results. TCE was not detected in the DGI groundwater samples. Chromium, tead, nickel, and silver were either not detected or detected at much lower concentrations during the DGI. The DGI results showed that the previous results were anomalies that may have been caused by the groundwater sampling technique used to collect the samples.

Site 18

No VOCs, SVOCs, pesticides, or PCBs were detected in the groundwater samples collected at Site 18. Aluminum, beryllium, calcium, iron, magnesium, manganese, potassium, and sodium were detected at concentrations less than background levels except beryllium, which was less than the risk-based COPC screening level (Region 9 PRG) and CTDEP SWPC.

Site 20

The overburden and bedrock groundwater at Site 20 was characterized during three separate investigations. VOCs and SVOCs were detected sporadically at low concentrations in the overburden and bedrock groundwater during the investigations. Naturally occurring metals were detected consistently in the groundwater.

Sites 9 and 23

The results of the four quarterly sampling events indicate that groundwater from Site 23 (which includes Site 9) being collected and conveyed in the storm sewer system does not pose a significant risk to human health or the environment under current and expected future land use (non-residential).

2.6 CURRENT AND POTENTIAL FUTURE LAND AND RESOURCE USES

NSB-NLON is currently an active Navy base and is expected to remain so into the foreseeable future. Reasonably anticipated future land uses of Sites 2A, 2B, 3, 7, 14, 15, 18, 20, and 23 include continued use for their current Naval functions.

Sites 2A, 2B, 3, 7, and 14 are tocated within designated ESQO arcs of Site 20; therefore, further development is not planned for this area. Navy regulations prohibit construction of inhabited buildings or structures within these arcs and, although existing buildings operate under a waiver of these regulations, no further construction or residential development is planned for of these sites.

Groundwater in the overburden and bedrock at Siles 2A, 2B, 3, 7, 14, 15, 18, 20, and 23 is classified as GB by the State of Connecticut. Based on the GB classification, the groundwater is presumed not suitable for human consumption without treatment. Neither aquifer is currently used as a source of drinking water or for industrial water supply purposes, and there are no current plans to use either aquifer in the future for drinking water or industrial water supply purposes. The overburden groundwater discharges locally to streams that eventually discharge to the Thames River or directly to the Thames River. The overburden aquifer is hydraulically connected to the bedrock aquifer.

2.7 SUMMARY OF SITE RISKS

The purpose of a risk assessment is to estimate the probability and magnitude of potential adverse human health and environmental effects from exposure to contaminated media at a sile. The results of the risk assessment provide the basis for taking action and identify the contaminants and exposure pathways that need to be addressed by the RA.

The human health risks associated with exposure to OU9 groundwater were evaluated as part of the following investigations:

- Phase II RI (B&RE, 1997) Sites 2, 3, 7, 14, 15, and 20
- BGOURI (TtNUS, 2002a) Sites 2A, 3, 7, 14, 15, 18, 20, and 23.
- BGOURI Update/FS (TtNUS, 2004) Sites 3, 7, 14, 15, and 20

In addition, human health risk assessment (HHRA) results for Sites 2 and 23 were re-evaluated in 2008 to evaluate the effects of more recent data and updated guidance. The HHRA memoranda describing these updates are included in Appendix E of this ROD. Also in Appendix E is a 2008 memorandum evaluating risks from vapor intrusion of VOCs from groundwater into the indoor air of current industrial and potential future residential buildings on OU9 sites. The HHRA for Site 20 was also updated in 2008 to evaluate the effects of more recent data and updated guidance. The results of the Site 20 re-evaluation are provided in Appendix F.

Ecological risk assessments were conducted for Sites 2A and 2B as part of the Phase II RI and the ongoing Phase III investigation. Potential ecological risks associated with Site 3 - NSA groundwater after discharging to a surface water body were evaluated in the BGOURI Update/FS.

The results of these risk assessments, as relevant to Sites 2A, 2B, 3, 7, 9, 14, 15, 18, 20 and 23 groundwater, are provided below and tabulated as follows.

Summary of Cancer Risks and Hazard Indices

Risk	Site 2A	Site 2B	Site 3	Site 7
	Construction	on Workers – Direc	t Exposure	
Cancer Risk	1.2 per	3.3 per	1.3 per	4.2 per
	100,000,000	100,000,000	1,000,000	10,000,000
Hazard Index	0.006	0.2	0.001	0.09
Adult Residents - Direct Exposure				
Cancer Risk	1	NA	1.4 per	6.4 per
	3.3 per 10,000		1000	10,000
Hazard Index	6.4	NA NA	2.4	5.6
		Workers – Vapor		
Cancer Risk	1,1 per	1.4 per	2.3 per	6.2 per
	1,000,000,000	100,000,000	1,000,000	1,000,000,000
Hazard Index	0.0000 <u>03</u>	0.00003	0.01	0.00001
Adult Residents – Vapor Intrusion				
Cancer Risk	7.8 per	9.8 per	1.6 per	4.2 per
	1,000,000,000	100,000,000	100,000	100,000,000
<u>Hazard Index</u>	0.00002	0.0001	0.06	0.00008
Risk	Site 15	Sites 14 and 18	Site 20	Sites 9 and 23
Construction Workers – Direct Exposure				
Cancer Risk	No COPCs	No COPCs	1.2 per	8.8 per
			100,000,000	100,000,000
Hazard Index	0.002	No COPCs	0.0002	0.2
	Adult Re	sidents – Direct E		
Cancer Risk	No COPCs	No COPCs	6.5	2.6 per
			per 100,000	10,000
Hazard Index	0.3	No COPCs	0.3	13
	<u>Industrial</u>	Workers - Vapor	Intrusion	
Cancer Risk	5.1 per	No COPCs	1.1 per	3.4 per
	10,000,000		100,000,000	10,000,000
Hazard Index	0.001	No COPCs	0.00003	0.0008
		esidents – Vapor Ir		
Cancer Risk	3.5 per	No COPCs	7.4 per	2.3 per
	1,000,000		100,000,000	1,000,000
Hazard Index	0.007	No COPCs	0.0001	0.005

NA - Not applicable. A residential scenario was not evaluated because Site 2B is a wetland.

No COPCs - Maximum concentrations of all chemicals were less than the screening criteria; therefore, no evaluation was required.

2.7.1 Human Health Risk Assessment

The major components of a HHRA include data evaluation, exposure assessment, toxicity assessment, risk characterization, and uncertainty analysis. Data evaluation is a task that uses a variety of information to determine which of the chemicals detected in site media are most likely to present a risk to potential receptors. The end result of the evaluation is a list of COPCs and representative exposure point

concentrations for each medium. During the exposure assessment, potential human exposure pathways are identified at the source areas under consideration. Chemical-specific toxicity criteria for the identified COPCs are identified during the toxicity assessment and are used in the quantification of potential human health risks. Risk characterization involves quantifying the risks associated with exposure to the COPCs using algorithms established by EPA and CTDEP. Risks from chemicals are calculated for either carcinogenic or noncarcinogenic effects. The uncertainty analysis identifies limitations in the risk assessment that might affect the final risk results. The final result of the risk assessment is the identification of medium-specific COCs and exposure pathways that need to be addressed by an RA.

For the Phase II RI HHRA, COPCs for groundwater were identified by comparing maximum concentrations to EPA Region 3 Risk-Based Concentrations (RBCs) for tap water ingestion. For the BGOURI and BGOURI Update/FS, COPCs for groundwater were identified by comparing maximum detected concentrations of contaminants to EPA Region 9 Preliminary Remediation Goals (PRGs) for tap water, Region 3 RBCs for tap water, CTDEP Groundwater Protection Criteria (GA/GAA), EPA Maximum Contaminant Levels (MCLs), Connecticut MCLs, CTDEP RSRs for migration of groundwater to surface water, CTDEP RSRs for volatilization from groundwater to indoor air, and background concentrations. If the maximum concentration exceeded any criterion, the chemical was retained as a COPC for all associated exposure routes.

Potential receptors for the HHRAs for exposures to groundwater included construction workers and future adult residents, with the exception of the Phase II HHRA, which only evaluated potential exposures to groundwater for construction workers. Future residential receptors were evaluated only to provide an indication of potential risks if the facility was closed and subsequently developed for residential use. Potential exposure pathways are summarized in Table 2-7. These pathways consider the potential for exposure based on present use, potential future use, and location of the sites. Exposure assumptions for the receptors and toxicity information for the COPCs were presented in the Phase II RI (B&RE, 1997); BGOURI (TtNUS, 2002a), and BGOURI Update/FS (TINUS, 2004) and are not reiterated in this ROD.

Exposure point concentrations for each of the COPCs were developed for reasonable maximum exposure (RME) and central tendency exposure (CTE) scenarios. For the Phase II and BGOURI HHRAs, the maximum and average concentrations were used for the groundwater exposure point concentrations under the RME and CTE scenarios, respectively. Based on the limited data set in the BGOURI Update/FS, the maximum detected concentration was used as the groundwater exposure point concentration under the RME and CTE scenarios.

Potential human health risks resulting from exposure to COPCs were estimated using algorithms established by EPA and CTDEP. The algorithms are used to calculate risk as a function of chemical

concentration, human exposure parameters, and toxicity. Risks attributable to exposure to chemical carcinogens were estimated as the probability of an individual developing cancer over a lifetime [incremental cancer risk (ICR)]. According to EPA, risks less than 1 x 10⁻⁶ (or a risk of less than one in one million) are generally considered to be "acceptable," and risks greater than 1 x 104 (1 in 10,000) are generally considered to be "unacceptable." According to CTDEP, risks less than 1 x 10⁻⁵ (1 in 100.000). for cumulate risk or 1 x 10^{-6} (1 in 1,000,000) for individual chemicals are generally considered to be "acceptable." while risks greater than 1 x 10⁻⁵ for cumulative risk or 1 x 10⁻⁶ for individual chemicals are generally considered to be "unacceptable." The hazards associated with the effects of noncarcinogenic chemicals were evaluated by comparing an exposure level or intake to a reference dose. If the ratio of the intake of a chemical to the reference dose [hazard quotient (HQ)] exceeds unity, noncarcinogenic (toxic) effects may occur. A hazard index (Hi) was generated by summing the individual HQs for all the . COPCs associated with a specific pathway. If the value of the HI exceeds unity, noncarcinogenic health effects associated with that particular chemical mixture may occur, and therefore it is necessary to segregate the HQs by target organ effects or mechanism of action. The HQ should not be construed as a probability in the manner of the ICR, but rather as a numerical indicator of the extent to which a predicted intake exceeds or is less than a reference dose (RfD). The results of the HHRAs for Sites 2, 3, 7, 14, 15, 18, 20, and 23 (which includes Site 9) are discussed below.

2.7.1.1 Site 2

Human health risks associated with Site 2 groundwater were evaluated during the Phase II RI and BGOURI (Site 2A only) and were re-evaluated in a 2008 technical memorandum based on changes to risk assessment guidance and collection of additional data.

The HHRA for Site 2B groundwater performed as part of the Phase II RI evaluated cancer and non-cancer risks for current and future construction workers (the only receptor expected to be exposed to site groundwater under current and reasonably anticipated future land uses). The estimated cancer risk of 4 x 10⁻⁷ for construction workers was less than EPA's target risk range and CTDEP's target risk. The cumulative non-cancer risk associated with exposure to groundwater for the construction worker was less than the EPA and CTDEP acceptable level of 1.0 for the CTE scenario but exceeded 1.0 for the RME scenario. The elevated non-cancer hazard was primarily attributed to dermal exposure to manganese, which is relatively abundant in the environment. The chemical-specific risk for manganese via dermal contact (1.7) slightly exceeded 1.0 and was based on very conservative exposure assumptions (exposure of construction workers to groundwater for 8 hours per day for 120 days per year). A re-evaluation of manganese data based on more realistic exposure assumptions (4 hours per day for 30 days) results in an HI of 0.2, less than the EPA and CTDEP acceptable level.

The results of the Phase II Rt risk assessment for Site 2A indicated potentially unacceptable cancer and non-cancer risks based on exposure of construction workers to groundwater at the site. However, this risk assessment was conducted using data collected prior to capping of the landfill. The risk assessment was updated as part of the BGOURI, as discussed below.

Potential groundwater receptors evaluated included only construction workers potentially exposed to groundwater via dermal contact while excavating building foundations. Because of the nature of the site (i.e., a covered former landfill), a future residential exposure scenario was not considered. Maximum and average concentrations were used to represent exposure point concentrations for the RME and CTE scenarios, respectively. No carcinogenic toxicity factors were available for the identified COPCs; consequently, cancer risks were not estimated for construction workers exposed to groundwater. HIs for construction workers exposed to groundwater were 0.00008 and 0.00004 for the RME and CTE scenarios, respectively, less than EPA's and CTDEP's acceptable level of 1.0.

The HHRA conducted for Site 2 groundwater during the BGOURI was re-evaluated in 2008 to determine if changes in EPA and CTDEP risk assessment guidance and recently collected groundwater data (August and December 2006 groundwater monitoring results) affected the risk assessment conclusions. The most recent VOC data were also re-evaluated to estimate risks associated with vapor intrusion. The following is a summary of the results of these re-evaluations:

- The HHRA for Site 2A prepared during the BGOURI evaluated potential risks from exposures to
 groundwater by construction workers. The HHRA determined that risks for construction workers were
 within USEPA and CTDEP acceptable levels. Potential risks for construction workers exposed to
 Site 2A groundwater would still be acceptable using the analytical results from the most recent rounds
 of groundwater sampling.
- Risks to hypothetical future residents using Site 2 groundwater as a drinking water supply would exceed USEPA and CTDEP acceptable levels, although residential development of Site 2A is prohibited.
- The vapor intrusion evaluation for groundwater determined that risks from vapor intrusion were within USEPA and CTDEP acceptable levels for residential and industrial scenarios. The evaluation concluded that no further action was required for vapor intrusion issues at Site 2.

The memoranda for these re-evaluations are included in Appendix E.

2.7.1.2 Site 3

The BGOURI Update/FS HHRA evaluated risks from exposure to Site 3 groundwater for construction workers and hypothetical future adult residents. Dermal contact with groundwater was the exposure route evaluated for construction workers, and exposures to groundwater through direct ingestion, dermal contact while showering/bathing, and inhalation of volatiles while showering/bathing were evaluated for hypothetical adult residents.

Tables 2-8 and 2-9 present the risk estimates from the BGOURI Update/FS HHRA for Site 3 under the RME and CTE scenarios, respectively. Although not presented in Tables 2-8 and 2-9, the risk estimates from the Phase II HHRA and BGOURI HHRA are comparable to those presented in the BGOURI Update/FS HHRA. Risk Assessment Guidance for Superfund (RAGS) Part D tables for Site 3 (Summary of Receptor Risks and Hazards for COPCs) are included in Appendix F.

Cumulative ICRs and HIs for exposures to groundwater by construction workers were within the EPA and CTDEP acceptable ranges for both the RME and CTE scenarios. ICRs and HIs exceeded the EPA and CTDEP acceptable ranges for hypothetical adult residents under the RME and CTE scenarios. Carcinogenic PAHs, VC, and arsenic were the major contributors to the unacceptable risks. These risks are subject to several sources of uncertainty as discussed below.

Carcinogenic PAHs were only detected in one groundwater sample, which was collected from a temporary monitoring well. The turbidity associated with this groundwater sample was elevated: consequently, the carcinogenic PAHs detected in the groundwater sample from this well are believed to be associated with suspended solids in the groundwater sample and are not believed to be dissolved constituents in groundwater. Therefore, the cancer risks presented in the HHRA for exposures to carcinogenic PAHs in groundwater were determined to be overestimated and not representative of actual site risks. PAHs were not retained as final COCs for Site 3 groundwater.

Arsenic was only detected in two of eight groundwater samples collected during the DGI. The concentrations of dissolved arsenic in the groundwater samples are comparable to the background dissolved arsenic concentration. It is likely that the elevated arsenic concentration detected in one unfiltered groundwater sample (2DMW29S) is related to the suspended solids in the groundwater sample. Therefore, the carcinogenic and noncarcinogenic risks presented in the HHRA for exposures to arsenic in groundwater were determined to be overestimated and not representative of actual site risks. Arsenic was not retained as a final COC for Site 3 groundwater.

1,1,2-Trichloroethene and alpha-BHC were only detected once in groundwater samples collected from temporary wells. The 1,1,2-trichloroethane concentration was less than federal and State MCLs and the

CTDEP RSR. No other criteria were available to evaluate the detection of alpha-BHC. The risk associated with alpha-BHC (dermal = 2.1×10^{-8} and ingestion = 1.2×10^{-8}) marginally exceeded CTDEP's 1 x 10⁻⁶ risk level for individual chemicals. Based on the low frequencies of detections, the uncertainty associated with data from temporary wells, and the marginal risks associated with the two chemicals, 1,1,2-trichloroethene and alpha-BHC were determined not be COCs for Site 3 groundwater.

Although estimated risks from exposure to concentrations of TCE in groundwater from Site 3 did not exceed acceptable levels, TCE was included as a final COC for Site 3 groundwater because it was detected at concentrations that exceeded federal and state MCLs and the CTDEP RSR. Therefore, based on the results of the risk assessment and comparisons to risk-based criteria, COCs for Site 3 groundwater include TCE and VC.

Groundwater data from the Year 1 Annual Groundwater Monitoring Report for Sites 3 and 7 (TtNUS, 2007) were used to evaluate the potential for vapor intrusion at Site 3 (see Appendix E.3). Based on comparisons of detected VOC concentrations to EPA and CTDEP screening criteria for vapor intrusion, chloroform, TCE, and VC were retained for further evaluation using the Johnson and Ettinger Vapor Intrusion Model (EPA, 2004). Modeling results showed that cancer risks and hazard indices for residential and industrial scenarios did not exceed EPA acceptable levels. Cancer risks for chloroform and VC for residential exposures exceeded CTDEP acceptable risk levels. Cancer risks for TCE based on California Environmental Protection Agency toxicity criteria (as recommended by EPA Region 1) were within CTDEP acceptable levels for residential and industrial scenarios, but cancer risks based on draft EPA toxicity criteria exceeded CTDEP acceptable levels.

The Johnson and Ettinger Vapor Model was also used to calculate site-specific, risk-based, residential and industrial PRGs and CTDEP RSRs for vapor intrusion. The maximum detected concentration of chloroform exceeds the site-specific PRG for residential exposures but is less than the site-specific PRG for Industrial exposures, EPA MCL, and CTDEP RSRs for vapor intrusion. Because the modeling only showed potential cancer risks exceeding CTDEP acceptable levels and because the maximum chloroform concentration did not exceed CTDEP RSRs for vapor intrusion, it is determined that there are no vapor intrusion issues associated with chloroform and no further action is required. The maximum detected concentration of TCE exceeds the EPA MCL but is less than the site-specific PRGs and CTDEP RSRs for vapor intrusion. A groundwater monitoring program and LUCs are in place to address the exceedance of the EPA MCL for trichloroethene. Therefore, no further action is required for vapor intrusion issues associated with TCE.

The maximum detected concentration of VC (at well 2DMW29S) exceeds the EPA MCL, site-specific PRGs, and residential CTDEP RSR for vapor intrusion. A groundwater monitoring program and LUCs are in place to address the exceedance of the EPA MCL for VC. Based on comparisons to CTDEP RSRs for vapor

intrusion, the VC concentration detected in groundwater at monitoring well 2DMW29S does not represent a vapor intrusion issue under the current industrial scenario but may be an issue under a future residential scenario. Risks associated with a building constructed in the vicinity of monitoring well 2DMW29S for industrial purposes would be acceptable; however, associated risks for a building within 100 feet of 2DMW29S for residential use would be unacceptable unless steps were taken to mitigate vapor intrusion.

2.7.1.3 Site 7

The BGOURI Update/FS HHRA evaluated risks from exposure to Site 7 groundwater for construction workers and hypothetical future adult residents. Dermal contact with groundwater was the exposure route evaluated for construction workers, and exposures to groundwater through direct ingestion, dermal contact while showering/bathing, and inhalation of volatiles while showering/bathing were evaluated for hypothetical adult residents.

Tables 2-10 and 2-11 present the risk estimates from the BGOURI HHRA for Site 7 under the RME and CTE scenarios, respectively. Only the results from the BGOURI HHRA are presented in these tables because no new data were collected during the DGI for the BGOURI Update and no changes to the HHRA were made during the BGOURI Update. Although not presented in Tables 2-10 and 2-11, the risk estimates from the Phase II HHRA are comparable to those presented in the BGOURI HHRA. RAGS Part D tables for Site 7 (Summary of Receptor Risks and Hazards for COPCs) are included in Appendix F.

Cumulative ICRs and HIs resulting from exposure to groundwater by construction workers were within EPA and CTDEP acceptable ranges for both the RME and CTE scenarios. ICRs and His exceeded EPA and CTDEP acceptable ranges for hypothetical adult residents under the RME and CTE scenarios. Benzene, bis(2-ethylhexyl) phthalate, HCB, 1,4-DCB, TCE, arsenic, and chromium were the major contributors to the unacceptable risks. These risks are subject to several sources of uncertainty as discussed below.

Bis(2-ethylhexyl) phthalate was detected infrequently in groundwater and is a common laboratory contaminant is typically associated with plastics (well casings, plastic bottleware, etc). It is unlikely that the detections of bis(2-ethylhexyl) phthalate are associated with a Site 7 source. Based on this information, it was determined that the elevated risks from exposures to bis(2-ethylhexyl) phthalate were overestimated and limited to a small section of Site 7. Bis(2-ethylhexyl) phthalate was not retained as a final COC for site 7 groundwater.

Arsenic and chromium were detected infrequently in groundwater samples collected during the BGOURI, Detected concentrations of arsenic were less than the Connecticut MCL in all samples and only exceeded the EPA MCL in the sample from temporary monitoring well 7TW09. Detected concentrations of chromium only exceeded the EPA MCL and Connecticut MCL in the groundwater sample from temporary monitoring well 7TW09. The detected concentrations of most other metals were significantly higher in the sample from temporary monitoring well 7TW09 compared to concentrations in samples from other monitoring wells. The total suspended solids content in the groundwater sample from 7TW09 was two orders of magnitude greater than in any of the groundwater samples from the other wells. It is likely that the elevated arsenic and chromium concentrations detected in the groundwater sample from 7TW09 are related to the suspended solids in the groundwater sample and are not believed to be dissolved constituents in groundwater. Therefore, the cancer risks and HIs presented for arsenic and chromium were determined to be overestimated and not representative of actual site risks. Arsenic and chromium were not retained as final COCs for Site 7 groundwater.

Although estimated risks from exposure to concentrations of CB in groundwater from Site 7 did not exceed acceptable levels. CB was included as a final COC for Site 7 groundwater because it was detected at concentrations that exceeded federal and state MCLs and the CTDEP RSR. Therefore, based on the results of the risk assessment and comparisons to risk-based criteria, COCs for Site 7 groundwater include benzene, CB, 1,4-DCB, HCB, and TCE.

The results of the 2008 vapor intrusion evaluation indicated that NFA is required for vapor intrusion issues at Site 7 (see Appendix E.3).

2.7.1.4 Site 14

The BGOURI Update/FS HHRA evaluated risks from exposure to Site 14 groundwater for construction workers and hypothetical future adult residents. Dermal contact with groundwater was the exposure route evaluated for construction workers, and exposures to groundwater through direct ingestion, dermal contact while showering/bathing, and inhalation of volatiles while showering/bathing were evaluated for hypothetical adult residents.

A summary of Site 14 groundwater data from the BGOURI Update/FS is presented in Table 2-12. Concentrations of all chemicals in Site 14 groundwater were less than all available screening criteria and basewide background levels. Iron and manganese concentrations exceeded secondary MCLs; however, secondary MCLs are non-enforceable guidelines regulating contaminants that may cause cosmetic effects (such as skin or tooth discoloration) or aesthetic effects (such as taste, odor, or color) in drinking water and are not associated with unacceptable health risks. Consequently, no COCs were retained for Site 14 groundwater, and no adverse health effects are anticipated from exposure to Site 14 groundwater.

The results of the 2008 vapor intrusion evaluation indicated that NFA is required for vapor intrusion issues at Site 14 (see Appendix E.3).

2.7.1.5 Site 15

The BGOURI Update/FS HHRA evaluated risks from exposure to Site 15 groundwater for construction workers and hypothetical future adult residents. Dermal contact with groundwater was the exposure route evaluated for construction workers, and exposures to groundwater through direct ingestion, dermal contact while showering/bathing, and inhalation of volatiles while showering/bathing were evaluated for hypothetical adult residents.

Tables 2-13 and 2-14 present the risk estimates from the BGOURI Update/FS HHRA for Site 15 under the RME and CTE scenarios, respectively. RAGS Part D tables for Site 15 (Summary of Receptor Risks and Hazards for COPCs) are included in Appendix F.

No carcinogenic COPCs were identified in groundwater; therefore, no ICRs were calculated for exposures to groundwater. His for exposures to groundwater by construction workers and future adult residents were within the EPA and CTDEP acceptable ranges for both the RME and CTE scenarios. Consequently, no COCs were retained for Site 15 groundwater, and no adverse health effects are anticipated from exposure to Site 15 groundwater.

The results of the 2008 vapor intrusion evaluation indicated that NFA is required for vapor intrusion issues at Site 15 (see Appendix E.3).

2.7,1.6 Site 18

The Site 18 groundwater COPCs and the screening criteria used to identify them are summarized in Tables 2-15 and 2-16. No human health COPCs were identified for groundwater; therefore, no ICRs and HIs were calculated for exposures to groundwater.

Manganese in groundwater was the only chemical with a maximum detected concentration that exceeded its direct contact screening criteria but was not retained as a COPC based on a comparison to background levels. Exposures to groundwater were not evaluated in the HHRA because no COPCs were identified for groundwater at Site 18, although potential receptors for exposures to groundwater would be construction workers and adult residents. Potential risks from dermal exposures to manganese in water are insignificant (EPA, 2001); consequently, the elimination of manganese as a COC on the basis of background would not affect risk estimates for the construction worker because this receptor would only be evaluated for dermal exposures to groundwater. Potential exposure pathways for future adult

residents include ingestion and dermal contact with groundwater. If exposure to manganese in groundwater by a future adult resident were evaluated in the HHRA, the resulting HQ for manganese would be 0.4, which is less than the EPA and CTDEP acceptable level of 1.0, indicating that no adverse health effects are anticipated for adult residents exposed to manganese in groundwater at Site 18.

The HHRA, data screening results, and uncertainty analysis showed that there are no groundwater COCs for Site 18, and no adverse health effects are anticipated form exposure to Site 18 groundwater.

Because no VOCs were detected in groundwater samples collected at Site 18 during the BGOURI, vapor intrusion is not an issue at the site.

2.7.1.7 Site 20

Risks from exposures to Site 20 groundwater for construction workers and hypothetical adult residents were evaluated in the Phase II HHRA and BGOURI HHRA. A screening risk evaluation was presented in the BGOURI Update/FS, although the data set from the BGOURI Update/FS only included metals. In 2008, the risks for exposures to groundwater at Site 20 were re-evaluated using the most recent data set, which consisted of organic sample results from the BGOURI and inorganic sample results from the DGI. The re-evaluation estimated risks from exposure to Site 20 groundwater for construction workers and hypothetical future adult residents. Dermal contact with groundwater and inhalation of volatiles were the exposure routes evaluated for construction workers, and exposures to groundwater through direct ingestion, dermal contact while showering/bathing, and inhalation of volatiles while showering/bathing were evaluated for hypothetical adult residents.

Tables 2-15 and 2-16 present the latest risk estimates for the combined DGI and BGOURI groundwater data set under the RME and CTE scenarios, respectively. RAGS Part D tables for Site 20 (Summary of Receptor Risks and Hazards for COPCs) are included in Appendix F. Cumulative ICRs and His for exposures to groundwater by construction workers were within EPA and CTDEP acceptable risk ranges for both the RME and CTE scenarios. For hypothetical adult residents, cumulative ICRs and His were within EPA acceptable risk ranges for both the RME and CTE scenarios. ICRs for hypothetical adult residents exceeded the CTDEP acceptable risk level of 10⁻⁵ for cumulative exposures under the RME scenario and the CTDEP acceptable level of 10⁻⁶ for individual chemicals under the CTE scenario. Benzo(a)pyrene and arsenic were the major contributors to the unacceptable CTDEP risks. The risks estimated in the re-evaluation are subject to several sources of uncertainty as discussed below.

ICRs for benzo(a)pyrene and arsenic exceeded CTDEP acceptable levels in the risk re-evaluation. Benzo(a)pyrene was not detected in groundwater samples collected during the Phase II RI and was only detected in one groundwater sample collected during the BGOURt. The detected concentration of

benzo(a)pyrene (0.05 µg/L) was less than the federal MCL (0.2 µg/L) and the Connecticut GA/GAA groundwater criterion (0.2 µg/L). Therefore, benzo(a)pyrene was not considered as a COC in Site 20 groundwater.

The concentration of arsenic in one well (2WCMW1S) during the DGI was near the background concentration and less than the federal MCL, Connecticut GA/GAA groundwater criterion, and Connecticut MCL. Arsenic is known to be related to dredge spoils in the area, and it is not likely to be related to a Site 20 source. Consequently, arsenic was not retained as a COC for groundwater at Site 20. Therefore, no COCs for direct contact exposures to groundwater at Site 20 were identified, and no adverse health effects are anticipated from exposure to Site 20 groundwater.

The results of the 2008 vapor intrusion evaluation indicated that NFA is required for vapor intrusion issues at Site 20 (see Appendix E.3).

2.7.1.8 Site 23

Human health risks associated with groundwater at Site 23 were evaluated during the BGOUR! (TtNUS, 2002) and were re-evaluated in a 2008 technical memorandum based on changes to risk assessment guidance and collection of additional data.

Maximum detected concentrations of PCE, naphthalene, and lead in groundwater during the BGOURI exceeded risk-based screening levels (Region 9 PRGs) and were retained as COPCs.

ICRs for construction workers exposed to groundwater were 1.3 x 10⁻⁹ and 1.1 x 10⁻¹⁰ for the RME and CTE scenarios, respectively, which are less than USEPA's target risk range of 10⁻⁴ to 10⁻⁶ and CTDEP's acceptable risk level of 10⁻⁵ for cumulative exposures. The ICRs for future adult residents exposed to groundwater were 4.5 x 10⁻⁶ and 1.6 x 10⁻⁷ for the RME and CTE scenarios, respectively, which are less than or within USEPA's target risk range and less than CTDEP's acceptable risk level for cumulative exposures. The chemical-specific ICR for tetrachloroethene under the RME scenario exceeded CTDEP's target level of 1 x 10⁻⁶ for individual chemicals; however, the maximum detected concentration for tetrachloroethene was less than its CTDEP RSR.

His for construction workers exposed to groundwater were 0.0002 and 0.0001 for the RME and CTE scenarios, respectively, which are less than USEPA's and CTDEP's acceptable level of 1.0. His for adult residents exposed to groundwater were 0.02 and 0.005 for the RME and CTE scenarios, respectively.

Risks estimated during the BGOURI for the RME scenario at Site 23 are presented in Table 2-17. The conclusions of the HHRA conducted for Site 23 groundwater as part of the BGOURI were as follows:

- Cancer risks for construction workers and non-cancer risks for construction workers and hypothetical
 future adult residents exposed to groundwater at Site 23 were within USEPA and CTDEP acceptable
 levels for the RME and CTE scenarios.
- Cancer risks for adult residents exposed to groundwater at Site 23 were less than or within USEPA's target risk range and less than CTDEP's acceptable risk level for cumulative exposures. The chemical-specific cancer risk for PCE exceeded CTDEP's target level of 1 x 10⁻⁶ for individual chemicals; however, the maximum detected concentration for tetrachloroethene was less than its CTDEP RSR.
- Because groundwater at Site 23 is not used for human consumption and it is not likely to be used for human consumption in the foreseeable future because of its current classification (i.e., GB groundwater which indicates that it is unsuitable for direct human consumption without treatment), it was determined that an FS was not warranted. However, it was recommended that the decision for preparation of an FS for Site 23 groundwater be postponed until site conditions stabilize and the results of the metering pit sampling and analysis program are evaluated.

The HHRA conducted for Site 23 groundwater during the BGOURI was re-evaluated in 2008 to determine if changes in EPA and CTDEP risk assessment guidance and recently collected groundwater data (data from quarterly underdrain meter pit sampling) affected the risk assessment conclusions (see Appendix E). The following is a summary of the results of the re-evaluation:

- Changes in risk assessment guidance since the BGOURI did not affect the conclusions of the BGOURI risk assessment.
- During the BGOURI, the chemical-specific cancer risk for PCE exceeded CTDEP's target level for individual chemicals, although the maximum detected concentration was less than the CTDEP RSR.
 Concentrations of tetrachloroethene decreased from 3 µg/L during the BGOURI to 0.4 µg/L during September 2007 metering pit sampling. The chemical-specific risk associated with tetrachloroethene is now less than the CTDEP target level for individual chemicals.
- Concentrations of all chemicals detected in groundwater collected during the first four quarters of
 underdrain metering pit sampling were less than CTDEP surface water protection and volatilization
 criteria with the exception of arsenic and several SVOCs. The concentration of total arsenic in the
 sample collected in September 2007 exceeded the surface water protection criterion, although the
 concentration of arsenic in the filtered sample was less than the criterion. Arsenic detected in the

unfiltered sample is believed to be a result of suspended solid particles in the water, and the filtered sample is more indicative of groundwater quality. Concentrations of six PAHs and hexachlorobenzene exceeded surface water protection criteria in December 2007; however, these chemicals were not detected in the duplicate sample and were not detected in February 2008.

- Potential risks for construction workers exposed to Site 23 groundwater would still be acceptable
 using the analytical results from the most recent rounds of groundwater sampling. Potential risks for
 hypothetical residents exposed to Site 23 groundwater exceed acceptable levels, but Site 23 is not
 suilable for residential development (based on petroleum cleanup to industrial standards and GB
 groundwater classification).
- The vapor intrusion evaluation for Site 23 groundwater determined that risks from vapor intrusion did
 not exceed EPA and CTDEP acceptable levels for residential and industrial scenarios. The
 evaluation concluded that no further action was required for vapor intrusion issues at Site 23.
- Based on existing information, Site 23 groundwater does not pose a significant threat to human health or the environment under current and expected future land use. Adverse health effects are possible under hypothetical future residential land use.

2.7.2 Summary of Ecological Risk Assessment

An ERA for Site 3 groundwater at the NSA was performed for the BGOURI Update/FS. A summary of this ERA is presented in the following subsections. Ecological risks for the remaining portions of Site 3 and Sites 7, 14, and 20 were evaluated during the Phase II RI. Groundwater was not identified as an ecological issue at those sites. No ecological risk assessments were performed at Sites 15 or 18 because there were no ecological issues identified at the sites. Site 15 is located within a paved parking area and Site 18 is a building. Both sites are in well developed portions of NSB-NLON and neither provide habitats suitable for supporting a wildlife population.

2.7.2.1 Site 2

The Area A Landfill, Site 2A, currently represents generally limited habitat due to the pavement covering the landfill and its proximity to areas of high human activity (e.g., Area A Weapons Center). Site 2A does border areas that represent potential wildlife habitat or may provide cover for ecological receptors. An ecological risk assessment was conducted as part of the Phase II RI (conducted in 1993 and 1994) and considered site conditions prior to construction of the landfill cap in 1997. Based on conditions after capping, the Phase II RI concluded that the Area A Landfill represents little potential risk to ecological receptors.

Exposure of ecological receptors to groundwater or surface water affected by groundwater was not expected and was therefore not evaluated in the ecological risk assessment for Site 2A. Groundwater from Site 2A discharges to surface water in the Area A Wetland (Site 2B), and surface water contamination at Site 2B was evaluated in the ecological risk assessment for this site, which was also conducted as part of the Phase II RI.

Using conservative exposure assumptions, maximum and average chemical concentrations in surface water, sediment, and soil at Site 2B were compared to benchmark values protective of various terrestrial and aquatic receptors. The results of these comparisons indicated that chemicals associated with these media at Site 2B could adversely impact aquatic biota, terrestrial vegetation, soil invertebrates, and terrestrial vertebrates. These risks are being evaluated and will be addressed as necessary under OU12, Site 2B sediment, as part of the Phase III Rt.

2.7.2.2 Site 3

Introduction

The goal of the ERA was to determine whether adverse ecological impacts are present as a result of exposure to chemicals released to the environment at Site 3 - NSA. The ERA methodology used was the Finat Guidelines for Ecological Risk Assessment (EPA, 1998), the Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments (EPA, 1997), and Navy Policy for Conducting Ecological Risk Assessments (Navy, 1999b). The ERA consisted of Steps 1, 2, and 3a of the ERA process. A summary of the ERA conducted for the groundwater at Site 3 is provided below.

Exposure Assessment

A general description of Site 3 is presented in Section 2.5 of this ROD. Site 3 – NSA, located adjacent to Stream 5 in the northern portion of Site 3, is very small and consists primarily of a steep embankment. The embankment slopes to an intermittent stream (Stream 5) separated from Triton Road by a narrow strip of grassed land (approximately 10 to 15 feet wide). The embankment is covered by large rocks, boulders, and small trees. Figure 2-20 presents the conceptual site model. In summary, the primary source of contamination was assumed to originate at the surface. It is likely that the contamination migrated through the soil to groundwater. In addition, contamination that migrated to groundwater could have discharged to Stream 5. There is also a possibility that contamination could have migrated to Stream 5 sediment as a result of erosion of the embankment. Ecological receptors can be exposed to

contaminants in the surface water, sediment, and surface soil by direct exposure, ingestion of media, and ingestion of contaminated food items.

Assessment and Measurement Endpoints

For the ERA, the assessment endpoint associated with exposure to groundwater included the protection of aquatic invertebrates from a reduction in growth, survival, and/or reproduction caused by site-related chemicals.

The following measurement endpoint was used to evaluate the assessment endpoint in this ERA:

Decreases in survival, growth, and/or reproduction of aquatic invertebrates were evaluated by
comparing the measured concentrations of chemicals in the groundwater to surface water screening
values designed to be protective of these ecological receptors. Groundwater sample concentrations
were compared to surface water screening values as a conservative measure to evaluate the
potential migration pathway of groundwater discharge to Stream 5.

Identification of Chemicals of Potential Concern

Potential risks to aquatic receptors resulting from exposure to chemicals were evaluated by comparing the chemical concentrations in the groundwater to screening levels. Table 2-18 presents the sources of the screening levels. An ecological effects quotient (EEQ) approach was used to characterize the risk to potential ecological receptors. This approach characterizes potential effects by comparing exposure concentrations to effects data. The EEQs for aquatic receptors were calculated as follows:

$$EEQ = \frac{C_{SW}}{SwSV}$$

where:

EEQ = Ecological effects quotient (unitless)

C_{sw} = Contaminant concentration in surface water (µg/L or mg/L)

SwSV = Surface water receptor screening value (µg/L)

Ecological COPCs were selected by the following procedures:

 Chemicals with EEQs greater than 1.0 (using maximum concentrations) were retained as COPCs for further evaluation because they have a potential to cause risk to ecological receptors. Contaminants without screening levels were retained as COPCs but were only evaluated qualitatively.

One VOC, five SVOCs, seven total metals, and three filtered metals were retained as COPCs in groundwater for the potential future exposure scenario of migration to surface water in Stream 5 (Table 2-18). Benzo(a)pyrene, aluminum, barium, copper, iron, lead, and manganese were retained as COPCs because their maximum concentrations exceeded associated surface water screening values (SwSVs). All other chemicals were retained as COPCs because no toxicity information was available for comparison.

Step 3A - Refinement of Conservative Exposure Assumptions

Step 3a consists of a refinement of the conservative exposure assumptions used to select COPCs to more realistically estimate potential risks to ecological receptors. This refinement is qualitative in nature and discusses items such as habitat, exposure concentrations, and alternate benchmarks. The chemicals discussed in the following paragraphs were retained as COPCs because their maximum detections in groundwater exceeded SwSVs or because SwSVs were not available for comparison.

VC was retained as a COPC because no SwSV was available for comparison to the maximum groundwater concentration. It should be noted, however, that VOCs are typically not detected in surface water samples due to their high degree of volatility. Also, based on SwSVs for the other VOCs, VC is not expected to be detected in groundwater at sufficient concentrations to cause ecological risks to aquatic receptors if discharged to Stream 5. VC was not retained as a COC.

Benzo(a)pyrene was retained as a COPC because the single detected concentration exceeded the conservative SwSV. However, the SwSV seems overly conservative when compared to SwSVs for other PAHs from different sources (e.g., SwSV for acenaphthene is 23 µg/L, SwSV for fluorene is 3.9 µg/L). Additionally, benzo(a)pyrene was detected in only one of five groundwater samples (i.e., the sample from 3TW28). At such a low groundwater concentration, it is unlikely that benzo(a)pyrene would be detected in surface water upon discharge to Stream 5 due to dilution. Benzo(a)pyrene and other PAHs were also detected in the surface soil sample from this location indicating that its presence in groundwater may be attributable to a lack of proper development (turbidity) in this temporary well. Benzo(a)pyrene was not retained as a COC.

Benzo(g,h,i)perylene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene were retained as COPCs because no individual SwSVs were available for comparison. Alternate surface water benchmarks for these PAHs could not be located; therefore, further evaluation of these chemicals was not possible. However, these chemicals were only detected in one of five groundwater samples (i.e., the

sample from 3TW28). As with benzo(a)pyrene, these PAHs are unlikely to be detected in surface water upon discharge to Stream 5 due to dilution. These PAHs were also detected in the surface soil sample from this location indicating their presence in groundwater may be attributable to a lack of proper development in this temporary well. For these reasons, benzo(g,h,i)perylene, benzo(k)fluoranthene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene were not retained as COCs.

Aluminum, barium, copper, iron, lead, and manganese in total metals samples were retained as COPCs because their maximum detected concentrations in groundwater exceeded corresponding SwSVs. Barium, iron, and manganese were additionally retained as COPCs in filtered metals samples because their maximum filtered groundwater concentrations exceeded associated SwSVs. Vanadium was additionally retained as a COPC because an SwSV was not available for comparison (see Table 2-18).

Aluminum, copper and lead were detected at maximum concentrations in unfiltered groundwater samples that exceeded their respective SwSVs. Vanadium was detected at a maximum concentration that slightly exceeded background. Aluminum, copper, lead, and vanadium were not detected in filtered samples, however, and detections of these metals in unfiltered samples could be attributable to a lack of proper development of the temporary wells. Only concentration levels that occur in filtered samples are considered to be bioavailable to aquatic organisms. For these reasons, these metals are not likely to be present in groundwater at concentrations that would present unacceptable risks to aquatic receptors after migration to surface water. Aluminum, copper, lead, and vanadium were not retained as COCs.

Barium was detected at a maximum concentration of 74.8 µg/L in unfiltered groundwater sample S3GW3TW3001, exceeding the SwSV of 4 µg/L. However, the background concentration of 227 µg/L is nearly three times greater than the maximum groundwater detection, indicating that barium concentrations are naturally occurring and not likely attributable to a contamination source. Barium was also detected in filtered samples at a maximum concentration of 75.6 µg/L, well below the background filtered concentration of 124 µg/L. For these reasons, site-related risks from barium are not considered likely, and barium was not retained as a COC.

Iron was detected at a maximum concentration of 20,000 μ g/L in unfiltered groundwater sample S3GW3TW2801, exceeding the SwSV of 1,000 μ g/L. However, the maximum concentration is less than the unfiltered background concentration of iron at 28,200 μ g/L. Iron was also detected in filtered samples at a maximum concentration of 15,200 μ g/L, well below the background filtered concentration of 25,300 μ g/L. For these reasons, site-related risks from iron are not considered likely, and iron was not retained as a COC.

Manganese was detected at a maximum concentration of 764 µg/L in groundwater sample S3GW3TW2701, exceeding the SwSV of 120 µg/L. However, the background manganese concentration of 11,700 µg/L is nearly 15 times greater than the maximum detected groundwater concentration. Additionally, manganese was detected in filtered samples at a maximum concentration of 496 µg/L, well below the background filtered concentration of 9,400 µg/L. For these reasons, site-related risks from manganese are not considered likely, and manganese was not retained as a COC.

Summary and Conclusions of Site 3 ERA

Several chemicals detected in groundwater were initially retained as COPCs because their chemical concentrations exceeded screening levels resulting in EEQs greater than 1.0 based on conservative exposure scenarios. These chemicals were then re-evaluated in Step 3a of the ERA to determine which chemicals have the greatest potential for causing risks to ecological receptors, and therefore, should be retained as COCs for further discussion and evaluation. The ecological endpoints evaluated in this ERA were aquatic receptors. In summary, no chemicals were retained as ecological COCs.

2.7.2.3 Site 23

An ecological risk assessment was not conducted for Site 23 groundwater because there are no ecological receptors for groundwater at the site.

2.8 REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) provide a general description of what the response actions will accomplish. These goals typically serve as the design basis for many of the remedial alternatives discussed in the next section. The RAOs provide the basis for evaluating remedial options for Sites 3 and 7 groundwater and an understanding of how the risks identified in the previous section will be addressed by the response actions. No RAOs were necessary for Sites 2, 9, 14, 15, 18, 20, and 23 because there were no unacceptable risks and therefore no remedial actions proposed for the sites.

RAOs were developed to address the COCs detected exclusively at Site 3 (VC) and the COCs detected at both Sites 3 and 7 (TCE and HCB). Separate RAOs were developed to address the COCs detected at Site 7 exclusively (1,4-DCB, benzene, and CB).

2.8.1 Sites 3 and 7 Groundwater RAOs

Sites 3 and 7 groundwater RAOs are as follows:

- RAO A-1: To protect current receptors (construction workers) from incidental exposure to groundwater contaminated with chlorinated hydrocarbons at concentrations greater than PRGs.
- RAO A-2: To protect potential future receptors from regular ingestion (potable water supply) of groundwater contaminated with chlorinated hydrocarbons at concentrations greater than RGs (see Tables 2-19 and 2-20) and to protect future residential receptors from exposure to contaminated groundwater via vapor intrusion (Site 3 only).
- RAO A-3: To protect aquatic ecological receptors by preventing the migration of groundwater contaminated with petroleum hydrocarbons at concentrations greater than PRGs to surface water.

2.8.2 Site 7 Groundwater RAOs

Site 7 groundwater RAOs are as follows:

- RAO B-1: Protect current receptors (construction workers) from incidental exposure to groundwater contaminated with organics at concentrations greater than PRGs.
- RAO B-2: Protect potential future receptors from regular ingestion (potable water supply) of groundwater contaminated with benzene and chlorinated hydrocarbons at concentrations greater than RGs.
- RAO 8-3: Protect aquatic ecological receptors by preventing the migration of groundwater contaminated with COCs at concentrations greater than PRGs to surface water.

RGs for the protection of potential future receptors are presented in Tables 2-19 and 2-20 for Sites 3 and 7, respectively.

2.8.3 Sites 9 and 23 Groundwater RAOs

RAOs for groundwater at Sites 9 and 23 are as follows:

- RAO C-1: Protect potential future receptors from exposure to contaminated groundwater via ingestion (potable water supply).
- RAO C-2: Protect aquatic ecological receptors.

2.9 DESCRIPTION OF ALTERNATIVES

Separate FSs were prepared to evaluate remedial alternatives for the groundwater contamination identified jointly at Sites 3 and 7 and the groundwater contamination identified exclusively at Site 7. One FS involved development and evaluation of alternatives that would address the COCs detected exclusively at Site 3 (VC) and the COCs detected jointly at Sites 3 and 7 (TCE and HCB). The other FS involved preparation and evaluation of alternatives that addressed the COCs detected exclusively at Site 7 (1,4-DCB, benzene, and CB). No FSs were prepared for Sites 14, 15, 18, and 20 because there were no unacceptable risks and therefore no COCs for the sites. Groundwater at Sites 2A and 2B is currently monitored under the post-closure groundwater monitoring program implemented as part of the remedy for OU1 as required by the September 1995 ROD (Navy, 1995). Institutional controls will remain in place at Sites 2A and 2B as described in the NSB-NLON IR Site Use Restrictions document.

2.9.1 Description of Remedial Alternatives

2,9.1.1 Sites 3 and 7 Groundwater

Alternatives were formulated from the technologies and process options that passed the screening process. The two alternatives selected for detailed evaluation in the FS for combined Sites 3 and 7 groundwater included Alternative GW1-1 (No Action) and Alternative GW1-2 (Institutional Controls with Monitoring). Alternative GW1-1 was evaluated for comparison purposes, and the other alternative was evaluated because of site conditions (generally low concentrations of contaminants, groundwater not classified as a suitable potable water source, and the availability and use of a public water supply) and its ability to meet the RAOs. Active remedial alternatives (e.g., pump and treat) were not considered for Sites 3 and 7 groundwater because they are not effective for the site conditions discussed above.

Alternative GW1-1: No Action

Under this alternative, no activities other than mandatory five-year reviews would be conducted at the sites. The No Action Alternative for groundwater is not expected to be fully protective of human health and the environment. In particular, even though site groundwater is classified as GB, indicating that it is not suitable for regular human consumption, it could potentially be reclassified and used in the future as a potable water supply. Based on the concentrations and sporadic distribution of site groundwater contamination, these risks are possible but not very likely. Also, if groundwater is encountered and removed during construction projects, contaminated groundwater could be discharged to adjacent streams. Based on the concentrations and distribution of groundwater contamination, potential impact to aquatic ecological receptors may not be significant, but potential risks would not be known. This alternative will be retained to serve as a basis for evaluating other alternatives.

Estimated Time for Design and Construction: NA

Estimated Time for Operation: 30 years

Estimated Capital Cost:
 \$0

Estimated O&M Costs (Present Worth): \$89,600

Estimated Total Present Worth: \$89,600

Alternative GW1-2: Institutional Controls with Monitoring

This alternative was developed to protect human health by placing restrictions on groundwater extraction and use at the sites. Under this alternative, institutional controls would be implemented to prohibit the placement of groundwater extraction wells in or use of groundwater from this area without first testing the groundwater. Also, if groundwater is encountered and removed during construction projects (e.g., trench dewatering), the groundwater would have to be characterized and properly handled, discharged, or disposed.

The NSB-NLON IR Site Use Restrictions document would note the location and types of groundwater contamination observed at the sites. Future commercial land use would be permitted as long as institutional controls are maintained. However, at Site 3, construction of a building for residential purposes would be prohibited within 100 feet of well location 2DMW29S unless steps are taken to mitigate vapor intrusion (e.g., subslab depressurization system). In the event of property transfer and with confirmation that contaminated groundwater remains at the sites, an environmental land use restriction pursuant to state law would be used to prohibit the use of groundwater. Compliance monitoring to determine whether there are any violations of institutional control restrictions would also occur.

New and existing monitoring wells would be used to monitor the natural degradation of VOC and SVOC contaminants. Monitoring would continue until contaminant concentrations have decreased below the PRGs and the resulting concentrations are shown to be protective of human health and the environment.

6 months

Estimated Time for Operation: 30 years
 Estimated Capital Cost: \$59,200
 Estimated O&M Costs (Present Worth): \$260,300

Estimated Time for Design and Construction:

Estimated Total Present Worth: \$319,500

2.9.1.2 Site 7 Groundwater

Alternatives were formulated from the technologies and process options that passed the screening process. The three alternatives selected for detailed evaluation in the FS for Site 7 groundwater included Alternative GW2-1 (No Action), Alternative GW2-2 (Institutional Controls with Monitoring), and Alternative GW2-3 (Extraction and Off-Site Discharge). Alternative GW2-1 was evaluated for comparison purposes, and the other alternatives were evaluated because of site conditions and their ability to meet the RAOs for Site 7 groundwater.

Alternative GW2-1: No Action

Under this alternative, no activities other than mandatory five-year reviews would be conducted at this site. The No Action Alternative for groundwater is not expected to be fully protective of human health and the environment. In particular, even though site groundwater is classified as GB, indicating that it is not suitable for regular human consumption, it could potentially be used in the future as a potable water supply. Also, if groundwater is encountered and removed during construction projects, contaminated groundwater could be discharged to adjacent streams and potentially impact aquatic ecological receptors. However, this alternative will be retained to serve as a basis for evaluating other alternatives.

Estimated Time for Design and Construction: NA

Estimated Time for Operation: 30 years

Estimated Capital Cost: \$0

Estimated O&M Costs (Present Worth): \$89,600

Estimated Total Present Worth: \$89,600

Alternative GW2-2: Institutional Controls with Monitoring

This alternative was developed to protect human health and the environment by placing restrictions on extraction and use of groundwater at this site. Under this alternative, institutional controls would be implemented to prohibit the placement of groundwater extraction wells in or use of groundwater from this area. If groundwater is encountered and removed during construction projects (e.g., trench dewatering), the groundwater would have to be characterized and properly disposed.

The NSB-NLON IR Site Use Restrictions document would note the location and types of contamination observed at the site. Future commercial or residential land use would be permitted as long as institutional controls are maintained. In the event of property transfer and with confirmation that contaminated groundwater remains at the site, an environmental land use restriction pursuant to state law would be

used to prohibit the use of groundwater. Compliance monitoring to determine whether there are any violations of institutional control restrictions would also occur.

New and existing monitoring wells would be used to monitor the natural degradation of VOC and SVOC contaminants. Monitoring would continue until contaminant concentrations have decreased below the PRGs and the resulting concentrations are shown to be protective of human health and the environment.

•	Estimated Time for Design and Construction:	6 months
•	Estimated Time for Operation:	30 years
•	Estimated Capital Cost:	\$59,700
•	Estimated O&M Costs (Present Worth):	\$244,100
•	Estimated Total Present Worth:	\$303,800

Alternative GW2-3: Extraction and Off-Site Discharge

This alternative was developed to protect human health and the environment by extracting all contaminated groundwater (approximately 1,250,000 gallons) through one groundwater extraction well and discharging the water to the Groton publicly owned treatment works (POTW) for treatment. Based on the level of contamination found, pre-treatment of the water is not expected. However, if pre-treatment is necessary, filtration and granular activated carbon (GAC) adsorption could be considered. If implemented, the alternative would represent a clean closure for groundwater at the site with no long-term requirements.

Additional temporary and permanent monitoring wells would be installed to better define the extent of groundwater contamination and to monitor groundwater contaminant capture and cleanup. Collected data would be used to characterize groundwater for treatment needs, if any, and discharge requirements.

•	Estimated Time including Design and Completion:	1.5 years
•	Estimated Capital Cost:	\$1,018,600
•	Estimated O&M Costs (Present Worth);	\$105,500
•	Estimated Total Present Worth:	\$1,121,000

2.9.1.3 Sites 9 and 23 Groundwater

The two alternatives evaluated for Sites 9 and 23 groundwater included Alternative GW3-1 (No Action) and Alternative GW3-2 (Institutional Controls). Active groundwater remedial technologies were not evaluated because of the absence of a contaminant plume and other site conditions (generally low concentrations of contaminants, groundwater not classified as a suitable potable water source, and

availability and use of a public water supply). Alternative GW3-1 was evaluated for comparison purposes and Alternative GW3-2 was evaluated because of site conditions and its ability to meet the RAOs.

Alternative GW3-1: No Action

Under this alternative, no activities other than mandatory five-year reviews would be conducted at this site. The No Action Alternative for groundwater is not expected to be fully protective of human health and the environment. In particular, even though site groundwater is classified as GB, indicating that it is not suitable for regular human consumption, it could potentially be used in the future as a potable water supply. Also, if groundwater is encountered and removed during construction projects, contaminated groundwater could be discharged to adjacent streams and potentially impact aquatic ecological receptors. However, this alternative will be retained to serve as a basis for evaluating the other alternative.

•	Estimated Time for Design and Construction:	NA
٠	Estimated Time for Operation:	30 years
•	Estimated Capital Cost:	\$0
•	Estimated O&M Costs (Present Worth):	\$89,600
٠	Estimated Total Present Worth:	\$89,600

Alternative GW3-2: Institutional Controls

This alternative was developed to protect human health and the environment by placing restrictions on extraction and use of groundwater at this site. Under this alternative, institutional controls would be implemented to prohibit the placement of groundwater extraction wells in or use of groundwater from this area. If groundwater is encountered and removed during construction projects (e.g., trench dewatering), the groundwater would have to be characterized and properly disposed.

The NSB-NLON IR Site Use Restrictions document would note the location and types of contamination observed at the site. Future commercial or residential land use would be permitted as long as institutional controls are maintained. In the event of property transfer and with confirmation that contaminated groundwater remains at the site, an environmental land use restriction pursuant to state law would be used to prohibit the use of groundwater. Compliance monitoring to determine whether there are any violations of institutional control restrictions would also occur:

٠	Estimated Time for Design and Construction:	6 months
•	Estimated Time for Operation:	30 years
•	Estimated Capital Cost:	\$10,295
٠	Estimated O&M Costs (Present Worth):	\$108,705

\$119,000

2.9.2 Common Elements and Distinguishing Features of Each Alternative

2.9.2.1 Sites 3 and 7 Groundwater

Alternatives GW1-1 and GW1-2 are similar in that neither of the alternatives would actively treat the contaminated groundwater. Ultimately, site contaminants would be expected to degrade through natural biological, chemical, and physical processes. For Alternative GW1-1, no action would be taken except mandatory five-year site reviews.

Both Alternatives GW1-1 and GW1-2 allow the contaminated groundwater to remain in place, but Alternative GW1-2 includes institutional controls to restrict extraction and use of groundwater, monitoring at predetermined intervals until contaminant concentrations have decreased to less than PRGs and the resulting concentrations are shown to be protective of human health and the environment, and periodic site reviews that would be conducted every 5 years. Alternative GW1-2 would address the exposure pathways and risk issues with Sites 3 and 7 groundwater but would not open the sites for unrestricted future use.

2.9.2.2 Site 7 Groundwater

Alternatives GW2-1 and GW2-2 are similar in that neither of the alternatives would actively treat the contaminated groundwater. Ultimately, site contaminants would be expected to degrade through natural biological, chemical, and physical processes. For Alternative GW2-1, no action would be taken except mandatory five-year site reviews.

Alternatives GW2-1 and GW2-2 allow the contaminated groundwater to remain in place, but Alternative GW2-2 includes institutional controls to restrict extraction and use of groundwater, monitoring at predetermined intervals until contaminant concentrations have decreased to less than PRGs and the resulting concentrations are shown to be protective of human health and the environment, and periodic site reviews that would be conducted every 5 years.

Alternatives GW2-2 and GW2-3 are similar in that they both address the exposure pathways. However, Alternative GW2-2 addresses the exposure pathways associated with Site 7 groundwater by controlling construction and development activities, and Alternative GW2-3 addresses the exposure pathways by removing the contaminated groundwater and sending it to a POTW for treatment. Both alternatives address the risk issues with Site 7 groundwater, but Alternative GW2-3 opens the site for unrestricted future use.

Alternative GW2-3 is the alternative that provides active remediation of Site 7 groundwater. Alternative GW2-2, a passive alternative that allows for natural degradation of site contaminants, includes periodic inspection of compliance with institutional controls and monitoring.

2.9.2.3 Sites 9 and 23 Groundwater

Alternatives GW3-1 and GW3-2 are similar in that neither of the alternatives would actively treat the contaminated groundwater. For Alternative GW3-1, no action would be taken except mandatory five-year site reviews. Both Alternatives GW3-1 and GW3-2 allow contaminated groundwater to remain in place, but Alternative GW3-2 includes institutional controls to restrict extraction and use of groundwater and periodic site reviews that would be conducted every 5 years. Alternative GW3-2 would address the exposure pathways and risk issues with Sites 9 and 23 groundwater but would not open the sites for unrestricted future use.

2.9.3 Expected Outcomes of Each Alternative

2.9.3.1 Sites 3 and 7

Under Alternatives GW1-1 (No Action) and GW1-2 (Institutional Controls with Monitoring), Sites 3 and 7 could not be released for unrestricted use. In the event that the sites were released for unrestricted use, Alternative GW1-1 would not be protective of human health for potential future receptors. Institutional controls would be implemented to restrict extraction and use of groundwater at Sites 3 and 7 under Alternative GW1-2 until the contaminants in groundwater naturally degrade to concentrations less than the selected PRGs and the resulting concentrations are shown to be protective of human health and the environment.

2.9.3.2 Site 7

Under Alternatives GW2-1 (No Action) and GW2-2 (Institutional Controls with Monitoring), Site 7 could not be released for unrestricted use. In the event that the site was released for unrestricted use, Alternative GW2-1 would not be protective of human health for potential future receptors. Institutional controls and monitoring would be implemented to restrict extraction and use of groundwater at Site 7 under Alternative GW2-2 until the contaminants in groundwater naturally degrade to concentrations less than the selected PRGs and the resulting concentrations are shown to be protective of human health and the environment.

After implementation of Alternative GW2-3 (Extraction and Off-Site Discharge), Site 7 would be released for unrestricted use. Under this alternative, human health and the environment would be protected

because the contaminated groundwater would be extracted from the site, treated as necessary, and discharged.

2.9.3.3 Sites 9 and 23

Under Alternatives GW3-1 (No Action) and GW3-2 (Institutional Controls), Sites 9 and 23 could not be released for unrestricted use. In the event that the sites were released for unrestricted use, Alternative GW3-1 would not be protective of human health for potential future receptors. Institutional controls would be implemented to restrict extraction and use of groundwater at Sites 9 and 23 under Alternative GW3-2 until contaminants concentrations are shown to be protective of human health and the environment.

2.10 SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

This section of the ROD summarizes the comparative analysis of alternatives presented in the detailed analysis sections of the two FS Reports. The major objective is to evaluate the relative performance of the alternatives with respect to the nine evaluation criteria so that the advantages and disadvantages of each are clearly understood. The first two evaluation criteria, Overall Protection of Human Health and the Environment and Compliance with ARARs are threshold criteria that must be satisfied by any remedial alternative chosen for the site. The primary balancing criteria are then considered to determine which alternative provides the best combination of attributes. The primary balancing criteria are as follows:

- Long-term effectiveness and permanence
- Reduction in toxicity, mobility, or volume through treatment.
- Implementability
- · Short-term effectiveness
- Cost

The alternatives are evaluated further against the following two modifying criteria:

- Acceptance by the state
- Acceptance by the community

2.10.1 Overall Protection of Human Health and the Environment

2.10.1.1 Sites 3 and 7

The No Action Alternative, GW1-1, would not be protective of human health or the environment. Under this alternative, without monitoring or institutional controls, contamination would remain at the site without

adequate notification. Groundwater could potentially be used for human consumption in a future residential scenario (RAO A-2), could be extracted and discharged during construction activities (e.g. excavation dewatering), and/or could migrate without degradation to a local stream and impact ecological receptors (RAO A-3). Based on existing characterization, groundwater is not anticipated to represent a significant risk to current receptors (construction workers) through incidental contact (RAO A-1) or to ecological receptors through migration (RAO A-3).

Under Alternative GW1-2, Institutional Controls with Monitoring, potential future risks associated with groundwater would be addressed by restricting a future residential scenario (RAO A-1), providing requirements for groundwater that could be extracted and discharged during construction activities (e.g., excavation dewatering), and monitoring the migration and natural degradation of groundwater contaminants (RAO A-3). Based on existing characterization, groundwater is not anticipated to represent a significant risk to current receptors (construction workers) through incidental contact (RAO A-2) or to ecological receptors through migration (RAO A-3).

The groundwater is currently classified as G8, groundwater concentrations are relatively low and sporadic or the magnitude of PRG exceedances are minor, and the sites are under military control. As a result, the potential for significant impact to human health and the environment is low. In addition, public potable water is available and used in the area, and local groundwater resources are not normally considered for use. Also, the COCs in Sites 3 and 7 groundwater are organic and are subject to slow natural biological and chemical degradation. Without active cleanup, groundwater concentrations should decrease to less than PRGs, but several years to several decades may be required.

2.10.1.2 Site 7

The No Action Alternative, GW2-1, would not be protective of human health or the environment. Under this alternative, without monitoring or institutional controls, contamination would remain at the site without adequate notification. Groundwater could be used for human consumption in a future residential scenario (RAO B-2), could be extracted and discharged during construction activities (e.g., excavation dewatering), and/or could migrate without degradation to a local stream and impact ecological receptors (RAO B-3). Based on existing characterization, groundwater is not anticipated to represent a significant risk to current receptors (construction workers) through incidental contact (RAO B-1) or to ecological receptors through migration (RAO B-3).

Under Alternative GW2-2, Institutional Controls with Monitoring, potential future risks associated with groundwater would be addressed by restricting a future residential scenario (RAO B-1), providing requirements for groundwater that could be extracted and discharged during construction activities (e.g., excavation dewatering), and monitoring the migration and natural degradation of groundwater

contaminants (RAO B-3). Based on existing characterization, groundwater is not anticipated to represent a significant risk to current receptors (construction workers) through incidental contact (RAO B-2) or to ecological receptors through migration (RAO B-3).

The groundwater is currently classified as GB, groundwater concentrations are relatively low level and sporadic or the magnitude of PRG exceedances are minor, and the site is under military control. As a result, the potential for significant impact to human health and the environment is low. In addition, public potable water is available and used in the area and local groundwater sources are not normally considered for use. Also, the COCs in Site 7 groundwater are organic and are subject to slow natural biological and chemical degradation. Without active cleanup, groundwater concentrations should decrease to less than PRGs, but several years to several decades may be required.

For Site 7, Alternative GW2-3 would protect human health and the environment by removing contaminated groundwater from the site, pre-treating the extracted water, if necessary, and discharging the water to the POTW for final treatment and discharge. Groundwater monitoring would be completed to monitor groundwater contaminant capture and cleanup. After removal of the contaminated groundwater from the site, there would be no remaining risks associated with Site 7 groundwater.

2.10.1.3 Sites 9 and 23

The No Action Alternative is not protective of human health or the environment. Under this alternative, without institutional controls, contamination would remain at the site without adequate notification. Groundwater could potentially be used for human consumption in a future residential scenario (RAO C-1), could be extracted and discharged during construction activities (e.g. excavation dewatering), and/or could migrate without degradation to a local stream and impact ecological receptors (RAO C-2). Based on existing characterization, groundwater is not anticipated to represent a significant risk to current receptors (construction workers) through incidental contact or to ecological receptors through migration.

Under Alternative GW3-2, Institutional Controls, potential future risks associated with groundwater would be addressed by restricting a future residential scenario (RAO C-1) and providing requirements for groundwater that could be extracted and discharged during construction activities (e.g., excavation dewatering). Based on existing characterization, groundwater is not anticipated to represent a significant risk to current receptors (construction workers) through incidental contact or to ecological receptors through migration.

The groundwater is currently classified as GB, groundwater concentrations are relatively low and sporadic, and the sites are under military control. As a result, the potential for significant impact to human

health and the environment is low. In addition, public potable water is available and used in the area, and local groundwater resources are not normally considered for use.

2.10.2 Compliance with ARARs

Section 121(d) of CERCLA and the NCP, 40 CFR 300.430(f)(1)(ii)(8), require that RAs at CERCLA sites at least attain legally applicable or relevant and appropriate federal environmental rules, regulations, and criteria, and state environmental and facility siting statutes, regulations, and requirements, unless such ARARs are waived under CERCLA section 121(d)(4).

2.10.2.1 Sites 3 and 7

An assessment of ARARs and To Be Considereds (TBCs) for Alternative GW1-1 is provided in Table 2-21. The No Action Alternative would not comply with chemical-specific ARAR or TBCs. Considering TBCs, the No Action Alternative would result in unacceptable risks from exposure to contaminated groundwater. No restrictions on groundwater use would be implemented under the alternative, and future groundwater use could result in unacceptable risks to receptors. Location- and action-specific ARARs are not applicable to Alternative GW1-1.

An assessment of ARARs and TBCs for Alternative GW1-2 is provided in Tables 2-22, 2-23, and 2-24. This alternative would comply with all chemical-specific ARARs and TBCs. Institutional Controls would be established for the active base through the NSB-NLON IR Site Use Restriction document. If the Navy was to transfer ownership of the property, the institutional controls would be established through environmental land use restrictions, pursuant to state law, that would prevent use of contaminated groundwater. Monitoring of compliance with institutional controls would also be required.

Even though contaminants in site groundwater currently exceed groundwater quality standards (Class GA), site groundwater is classified as GB. GA groundwater quality should ultimately be obtained through natural degradation. Monitoring would be used to track this decrease until concentrations are less than acceptable levels. This alternative would meet chemical-specific TBCs by preventing exposure to contaminated groundwater until concentrations are below acceptable levels that meet human health concerns. This alternative would also comply with all action-specific ARARs. Monitoring would continue until concentrations are less than acceptable levels that meet human health concerns. Any waste (soil or groundwater) generated during the installation of monitoring wells or monitoring activities will be properly characterized and disposed. Because the sites are in a coastal zone management area, activities associated with this alternative would meet the substantive requirements of location-specific ARARs.

2.10.2.2 Site 7

An assessment of ARARs and TBCs for Alternative GW2-1 is provided in Table 2-21. The No Action Alternative would not comply with chemical-specific ARARs and TBCs. Considering TBCs, the No Action Alternative would result in unacceptable risks from exposure to contaminated groundwater. No restrictions on groundwater use would be implemented under the alternative, and future groundwater use could result in unacceptable risks to receptors. Location- and action-specific ARARs are not applicable to Alternative GW2-1.

An assessment of ARARs and TBCs for Alternative GW2-2 is provided in Tables 2-22, 2-23, and 2-24. This alternative should comply with all chemical-specific ARARs and TBCs. Institutional controls would be established for the active base through the NSB-NLON IR Site Use Restriction document. If the Navy was to transfer ownership of the property, the institutional controls would be established through environmental land use restrictions, pursuant to state law, that would prevent use of contaminated groundwater. Monitoring of compliance with institutional controls would also be required.

Even though contaminants in site groundwater currently exceed groundwater quality standards (Class GA), site groundwater is classified as GB. GA groundwater quality should ultimately be obtained through natural degradation. Monitoring would be used to track this decrease until concentrations are below acceptable levels. This alternative would meet chemical-specific TBCs by preventing exposure to contaminated groundwater until concentrations are below acceptable levels that meet human health concerns. This alternative would also comply with all action-specific ARARs. Monitoring would continue until concentrations are less than acceptable levels that meet human health concerns. Any waste (soil or groundwater) generated during the installation of monitoring wells or monitoring activities will be properly characterized and disposed. Because Site 7 is in a coastal zone management area, activities associated with this alternative would meet the requirements of location-specific ARARs.

An assessment of ARARs and TBCs for Alternative GW2-3 is provided in Tables 2-25, 2-26, and 2-27. This alternative would comply with all chemical-specific ARARs and TBCs. Site groundwater with contaminant concentrations that currently exceed groundwater quality standards (Class GA) would be removed and there would be no remaining unacceptable risks to human health. Monitoring would be used to track and confirm this cleanup.

Alternative GW2-3 would comply with action-specific ARARs associated with monitoring and the pretreatment requirements with the Groton POTW. Monitoring would continue until concentrations are below acceptable levels that meet human health concerns. Any waste (soil or groundwater) generated during the installation of monitoring wells or monitoring activities would be properly characterized and disposed. If pre-treatment residues are generated (filter media and GAC), the off-site disposal of this residue would trigger federal and State solid waste regulations and based on characterization, could trigger hazardous waste regulations. During pre-treatment, these residues would be characterized for hazardous waste properties and recycling value and would be managed accordingly. Location-specific ARARs are not applicable to Alternative GW2-3.

2.10.2.3 Sites 9 and 23

An assessment of ARARs and TBCs for Alternative GW3-1 is provided in Table 2-21. The No Action Alternative would not comply with chemical-specific ARARs and TBCs. Considering TBCs, the No Action Alternative would result in unacceptable risks from exposure to contaminated groundwater. No restrictions on groundwater use would be implemented under the alternative, and future groundwater use could result in unacceptable risks to receptors. Location- and action-specific ARARs are not applicable to Alternative GW3-1.

An assessment of ARARs and TBCs for Alternative GW3-2 is provided in Tables 2-28 and 2-29. This alternative would comply with all chemical-specific ARARs and TBCs. Institutional controls would be established for the active base through the NSB-NLON IR Site Use Restriction document. If the Navy were to transfer ownership of the property, the institutional controls would be established through environmental land use restrictions, pursuant to state law, that would prevent use of contaminated groundwater. Monitoring of compliance with institutional controls would also be required. Even though contaminants in site groundwater currently exceed groundwater quality standards (Class GA), site groundwater is classified as GB. This alternative would meet chemical-specific ARARs and TBCs and action-specific ARARs by preventing exposure to contaminated groundwater until concentrations are less than acceptable levels. Location-specific ARARs are not applicable to Alternative GW3-2.

2.10.3 Long-Term Effectiveness and Permanence

2.10.3.1 Sites 3 and 7

There is an estimated 24,700,000 gallons of contaminated groundwater present at Sites 3 and 7, based on data from the BGOURI Update/FS. VC was detected at a maximum concentration of 31.5 µg/L during the BGOURI sampling events (2000 and 2002), and the corresponding PRG for VC is 1.6 µg/L. TCE (23 µg/L) and HCB (3 µg/L) were also detected during the BGOURI in site groundwater at concentrations greater than their respective PRGs (5 and 1 µg/L, respectively). Groundwater monitoring was initiated in 2006 at the sites, and the Year 1 results, which are discussed in Section 2.5.2.2, have shown that contaminant concentrations are generally decreasing and nearing the PRGs. These results suggest that a limited action alternative (e.g., institutional controls and monitoring) will be an effective and permanent remedy for the sites.

Alternative GW1-1 may not be effective in the long term. Groundwater contaminants could remain at the site for extended periods of time. Groundwater use, handling, and/or discharge would not be restricted. Ultimately, the site contaminants would be expected to degrade through natural biological, chemical, and physical processes. However, the duration and magnitude of contamination would not be monitored, and the residual risks would not be known.

Alternative GW1-2 is expected to be relatively effective in the long term and will ultimately be permanent. The presence of both federal (NSB-NLON institutional controls) and state (groundwater classifications) controls should effectively prevent the use and exposure to contaminated groundwater. Potential migration and degradation of contaminated groundwater would be monitored and the results would be used to identify the need for additional action. Ultimately, it is expected that improvements in groundwater quality would occur, but it would depend on relatively slow natural biological, chemical, and physical processes. The magnitude of residual contamination would be monitored over time, and potential risks associated with the contamination could be quantified.

2.10.3.2 Site 7

At Site 7 alone, there is estimated to be 170,000 gallons of contaminated groundwater, based on data from the BGOURI Update/FS. CB was detected in groundwater at a maximum concentration of 165 µg/L, and the corresponding PRG for CB is 100 µg/L. DCB (90.5 µg/L) and benzene (2 µg/L) were also detected at the site at concentrations greater than PRGs (75 and 1 µg/L, respectively) during the BGOURI. Groundwater monitoring was initiated at Site 7 in 2006, and the results, which are discussed in Section 2.5.2.3, have shown that contaminant concentrations have generally decreased to less than the PRGs. These results suggest that a limited action alternative (e.g., institutional controls and monitoring) will be an effective and permanent remedy for the site.

Alternative GW2-1 may not be effective in the long term. Groundwater contaminants could remain at the site for extended periods of time. Groundwater use, handling, and/or discharge would not be restricted. Ultimately, the site contaminants would be expected to degrade through natural biological, chemical, and physical processes. However, the duration and magnitude of contamination would not be monitored, and the residual risks would not be known

Alternative GW2-2 is expected to be relatively effective in the long term and will ultimately be permanent. The presence of both federal (NSB-NLON institutional controls) and state (groundwater classifications) controls should effectively prevent the use of contaminated groundwater as a potable water supply. Potential migration and degradation of contaminated groundwater would be monitored, and the results would be used to identify the need for additional action. Ultimately, the site contaminants would be

expected to degrade through natural biological, chemical, and physical processes. The magnitude of residual contamination would be monitored over time, and potential risks associated with the contamination could be quantified.

It is estimated that 1,250,000 gallons of groundwater need to be extracted to remove the 170,000 gallons of contaminated groundwater. By removing and treating the Site 7 contaminated groundwater, Alternative GW2-3 would be very effective and permanent. Future monitoring or other actions would not be required. In the unlikely event that a continuing source of contaminants is present, then recontamination of the groundwater could occur.

2.10,3.3 Sites 9 and 23

Alternative GW3-1 may not be effective in the long term. Groundwater contaminants could remain at the site for extended periods of time. Groundwater use, handling, and/or discharge would not be restricted. Alternative GW3-2 is expected to be relatively effective in the long term and will ultimately be permanent. The presence of both federal (NSB-NLON institutional controls) and state (groundwater classifications) controls should effectively prevent the use and exposure to contaminated groundwater.

2.10.4 Reduction of Toxicity, Mobility, or Volume through Treatment

2.10.4.1 Sites 3 and 7

Alternatives GW1-1 and GW1-2 do not use active treatment of site contaminants; therefore, this criterion is not applicable.

2.10.4.2 Site 7

Alternatives GW2-1 and GW2-2 do not use active treatment of site contaminants; therefore, this criterion is not applicable.

Alternative GW2-3 uses pre-treatment at the site or treatment at the POTW to remove and ultimately destroy more than 0.36 pound of VOCs. The ultimate fate of the organics would depend on pre-treatment requirements. If pre-treatment is used, the organics would adsorb onto GAC. During off-site regeneration of the GAC, the organics would be thermally oxidized into mineral compounds. If the organics are treated in the POTW, they would be subject to biological degradation, volatilization (and photochemical destruction), and adsorption onto sludge for ultimate disposal in a landfill.

2.10.4.3 Sites 9 and 23

Alternatives GW3-1 and GW3-2 do not use active treatment of site contaminants; therefore, this criterion is not applicable.

2,10.5 Short-Term Effectiveness

2.10.5.1 Sites 3 and 7

Both groundwater alternatives are expected to be effective in the short term. The groundwater is currently classified as GB, and the contamination is sporadically distributed across Sites 3 and 7. Groundwater is not used for human consumption, and public potable water is available and used.

There would not be any short-term risks to the community, workers, or environment under Alternative GW1-1 because no active RA would be taken. Alternative GW1-2 remedial actions, including well installation and monitoring, along with implementation of institutional controls, would pose no short-term risk as long as proper worker safety precautions were made when handling potentially contaminated soil and groundwater during well installation and monitoring.

Alternative GW1-1 would not achieve the RAOs. Alternative GW1-2 would achieve the RAOs within approximately 6 months, the time required to implement institutional controls and start monitoring. Under both alternatives, final degradation of site groundwater contamination is expected to require years to decades to complete.

2,10.5.2 Site 7

All three groundwater alternatives are expected to be effective in the short term. The groundwater is currently classified as GB at Site 7. Groundwater is not used for human consumption, and public potable water is available and used.

There would not be any short-term risks to the community, workers, or environment under any of the three alternatives. Under Alternatives GW2-2 and GW2-3, no short-term risks would result as long as proper worker safety precautions were taken during implementation of the alternatives.

Alternative GW2-1 would not achieve the RAOs. Alternative GW2-2 would achieve the RAOs within approximately 6 months, the time required to implement institutional controls and start monitoring. Under both alternatives, final degradation of site groundwater contamination is expected to require years to decades to complete. Alternative GW2-3 can be completed within 1.5 years after the start of design activities. RAOs would be achieved at that time.

2.10.5.3 Sites 9 and 23

Both groundwater alternatives are expected to be effective in the short term. The groundwater is currently classified as GB, groundwater is not used for human consumption, and public potable water is available and used. There would not be any short-term risks to the community, workers, or environment under Alternative GW3-1 because no active RA would be taken. Implementation of institutional controls under Alternative GW3-2 would pose no short-term risk as long as proper worker safety precautions were taken when site inspections are performed.

2.10.6 <u>Implementability</u>

2.10.6.1 Sites 3 and 7

Alternatives GW1-1 and GW1-2 would be easy to implement. All the necessary documents for Alternatives GW1-2 (groundwater monitoring plan, institutional controls, etc.) can be handled internally by the Navy. Vendors and equipment to perform groundwater monitoring are common and readily available.

2.10.6.2 Site 7

Because no active RA is occurring, Alternatives GW2-1 and GW2-2 would be easy to implement. All the necessary documents for Alternatives GW2-2 (groundwater monitoring plan, institutional controls, etc.) can be handled internally by the Navy. Vendors and equipment to perform groundwater monitoring are common and readily available.

Alternative GW2-3 should be readily implementable. Vendors and equipment to perform this work are common and readily available. POTW facility capacity is also adequate.

2.10.6.3 Sites 9 and 23

Alternatives GW3-1 and GW3-2 would be easy to implement. All the necessary documents for Alternatives GW3-2 associated with institutional controls can be handled internally by the Navy.

2.10.7 <u>Cost</u>

The estimated costs for the alternatives are presented below. It should be noted that for the alternatives evaluated, capital costs and annual O&M costs were calculated using present dollars, and do not account for inflation or the future value of money when calculating annual costs.

Alternative	Capital Cost	O&M Cost (Present Worth)	Total Cost (Present Worth)
Sites 3 and 7			<u> </u>
Alternative GW1-1	\$0	\$89,600	\$89,600
Alternative GW1-2	\$59,200	\$260,300	\$319,500
Site 7		<u> </u>	
Alternative GW2-1	\$0	\$89,600	\$89,600
Alternative GW2-2	\$59,700	\$244,100	\$303,800
Alternative GW2-3	\$1,018,600	\$105,500	\$1,121,000
Sites 9 and 23			
Alternative GW3-1	\$0	\$89,600	\$89,600
Alternative GW3-2	\$10,295	\$108,705	\$119,000

2.10.8 State Acceptance

The State of Connecticut has expressed their support with the Selected Remedy (described in Section 2.12). The state's concurrence letter is provided in Appendix A.

2.10,9 Community Acceptance

Based on comments expressed at the Public Meeting on June 26, 2008 and the written comments received during the public comment period, it appears that the community generally agrees with the Selected Remedy presented in the Proposed Plan. Specific responses to issues raised by the community can be found in the Responsiveness Summary in Section 3.0 of this ROD.

2.11 PRINCIPAL THREAT WASTE

The NCP establishes an expectation that treatment will be used to address the principal threats posed by a site wherever practicable [40 CFR 300.430(a)(1)(iii)(A)]. Based on the results of the investigations and studies, the contaminants in the groundwater at Sites 2, 3, 7, 9, 14, 15, 18, 20, and 23 do not constitute principal threat wastes as defined by the NCP.

2.12 SELECTED REMEDY

This section identifies the Selected Remedy and expands on the details provided in Section 2.9 (Description of Alternatives) of the ROD.

2.12.1 Sites 3 and 7

The Selected Remedy for Sites 3 and 7 groundwater is to combine Alternatives GW1-2 and GW2-2, Institutional Controls and Monitoring. The Selected Remedy was first documented in the 2004 Interim ROD and has not changed in this Final ROD. The Selected Remedy meets all of the RAOs by restricting access to and use of contaminated groundwater and by monitoring the decay and potential migration of contaminated groundwater at the sites. The Selected Remedy consists of three major components: (1) implementation and long-term monitoring of LUCs at the sites, (2) conducting a comprehensive monitoring program to track the degradation and decay of site contaminants until they reach RGs and the resulting concentrations are shown to be protective of human health and the environment, and to verify that groundwater contaminants are not migrating and impacting other resources, and (3) completion of five-year reviews of the site until the RGs are reached. The RGs for the Selected Remedy are provided in Tables 2-19 and 2-20. The components of the remedy are discussed in more detail below.

2.12.1.1 Institutional Controls

Based on the Interim ROD for groundwater at Sites 3, 7, 14, 15, 18, and 20 (Navy, 2004e), the Navy prepared a LUC Remedial Design (RO) to implement LUCs for Sites 3 and 7 groundwater (Navy, 2005). In accordance with this approved LUC RD, the Navy is responsible for implementing, inspecting, reporting on, and maintaining the institutional controls described in the ROD when the base is active through the NSB-NLON IR Site Use Restrictions document, and if the property is transferred to civilian ownership, through property transfer documents that include environmental land use restrictions. Should any institutional control component of the selected remedy fail, the Navy will ensure that appropriate actions are taken to re-establish the Selected Remedy's protectiveness. The Navy may transfer various operational responsibilities for these actions to other parties through contracts, agreements, and/or deed restrictions. However, the Navy acknowledges its ultimate liability under CERCLA for remedy integrity, including for the performance of any transferred operational responsibilities.

The groundwater institutional controls are required because there are hazardous substances in groundwater at Sites 3 and 7 at concentrations that could result in unacceptable risks if groundwater use was not controlled or restricted. The objectives of the institutional controls for the Selected Remedy are as follows:

 Prevent the withdrawal and/or use of groundwater from Sites 3 and 7 for potable water purposes or other purposes that may result in unacceptable risks to human health and the environment until the RGs identified in this ROD are met.

- Ensure that groundwater extracted from Sites 3 and 7 during groundwater monitoring or construction dewatering activities is handled, stored, and disposed in accordance with applicable state and federal regulatory requirements.
- Maintain the integrity of the proposed groundwater monitoring system for Sites 3 and 7 until the RGs identified in this ROD are met.

Figure 2-21 identifies the areas at NSB-NLON that have groundwater LUCs. The controls on groundwater use at Sites 3 and 7 will be maintained until the results of the groundwater monitoring program show that the concentrations of hazardous substances in groundwater are less than the RGs that allow for unrestricted use and unlimited exposure.

NS8-NLON Installation Restoration Site Use Restrictions Instruction document (5090.18B), dated February 5, 2003, was updated in accordance with the Interim ROD to include groundwater use restrictions at Sites 3 and 7. An updated document, SOPA (ADMIN) New London Instruction 5090.18C was issued on December 14, 2006. The current SOPA (ADMIN) New London Instruction 5090.18D is included in Appendix B. Other EUC implementation actions completed or to be completed are described in the EUC RD (Navy, 2005). Based on the results of the 2008 vapor intrusion evaluation, the institutional controls for Site 3 will be amended to state that additional evaluation or installation of mitigative measures relating to vapor intrusion will be implemented if future residential construction takes place within 100 feet of well 2DMW29S.

NSB-NLON is currently an active Navy base and is expected to remain so into the foreseeable future. Potential future land uses for Sites 3 and 7 while the Navy owns the property include the continued use of the sites under their current Naval functions (i.e., industrial and recreational). Future land uses are limited because portions of Sites 3 and 7 are located within designated ESQD arcs of Site 20. Navy regulations prohibit construction of inhabited buildings or structures within these arcs and, although existing buildings operate under a waiver of these regulations, no further construction or residential development is planned for these sites. In addition, the groundwater aquifers found within the overburden and bedrock at Sites 3 and 7 are classified as GB by the State of Connecticut. Based on the GB classification, the groundwater is presumed not suitable for human consumption without treatment. Neither aquifer is currently used as a source of drinking water or for industrial water supply purposes, and there are no plans to use either aquifer in the future for these purposes. The institutional controls for groundwater implemented for Sites 3 and 7 place further restrictions on the extraction and use of groundwater at these sites until the groundwater RGs are reached. In the event that the Navy sells or transfers the property in the future, and with confirmation that contaminated groundwater remains at Sites 3 and/or 7, an environmental land use restriction pursuant to state law would be needed to prohibit the use of groundwater at the sites during

subsequent site ownership. Future commercial or residential land use would be permitted as long as controls on groundwater extraction and use were maintained. In accordance with the Navy's responsibilities under CERCLA and the FFA, the administrative implementability of institutional controls would require including adequate provisions in any property transfer documents to ensure continuation of these controls should the Navy sell or transfer the property.

2.12.1.2 Monitoring

Groundwater monitoring has been conducted at Sites 3 and 7 since May 2006 in accordance with the Interim ROD and Sites 3 and 7 Groundwater Monitoring Plan (GMP) included in the O&M Manual For IR Program Sites (TINUS, 2006a). After signing of the Interim ROD, a Work Plan for Remedial Action at Sites 3 and 7 (TINUS, 2006b) was submitted describing the field activities required to complete the monitoring well network and the requirements for sampling and analysis. Prior to the start of monitoring, eight new wells were installed and developed, including three overburden wells at Site 3, one bedrock well at Site 3, and four overburden wells at Site 7, and the nine existing wells to be sampled as part of the monitoring program (five wells at Site 3 and four at Site 7) were redeveloped. Year 1 monitoring results for Sites 3 and 7 are presented in Tables 2-1 and 2-2, respectively.

The nine wells at Site 3 and seven of the eight wells at site 7 are analyzed for VOCs. Six wells at Site 7 are also analyzed for SVOCs, and one well at Site 7 is analyzed for PAHs only. The PAH data are used to evaluate the effectiveness of the Site 7 soil remediation; PAHs are not groundwater COCs at Site 7 and do not have associated groundwater RGs. The results are used to confirm that PAHs in the source area did not migrate and impact underlying groundwater.

The Interim ROD stated that monitoring would be conducted quarterly for the first year, annually for the next 4 years, and then every 5 years thereafter until contaminant concentrations have decreased to less than RGs for three consecutive sampling events and the resulting concentrations are shown to be protective of human health and the environment, or until the remedy is otherwise deemed protective or modified. However, based on the results of Year 1 sampling, continued quarterly sampling of Sites 3 and 7 for Year 2 was recommended (TtNUS, 2007). At the completion of the RA, the RGs will be met in groundwater at each of the monitoring wells included in the monitoring well network. A risk assessment following the most recent methodology may need to be completed to show that the resulting concentrations are protective of human health.

The COCs at Sites 3 and 7 are subject to natural degradation processes including biological, chemical, and physical processes. The magnitude and extent of this contamination are expected to decrease naturally overtime, and monitoring results will be used to track these decreases.

If subsurface activities are conducted and groundwater is to be encountered, construction workers must wear appropriate personnel protective equipment (PPE). If contaminated groundwater is to be removed, it must be tested, handled, and disposed properly (e.g., at a POTW or off-site treatment facility and not discharged to an adjacent stream without treatment).

2.12.1.3 Five-Year Reviews

Five-year reviews will be conducted for Sites 3 and 7 groundwater as required under CERCLA until the monitoring program shows that the RGs have been reached and the resulting concentrations are shown to be protective of human health and the environment. The goal of conducting the site reviews is to verify that no changes have occurred that would impact the effectiveness of the Selected Remedy.

2.12.2 Sites 9 and 23

The Selected Remedy for Sites 9 and 23 groundwater is Alternative GW3-2, Institutional Controls. The Selected Remedy meets all of the RAOs by restricting access to and use of contaminated groundwater and consists of two major components: (1) implementation of LUCs at the sites and (3) completion of five-year reviews. The components of the remedy are discussed in more detail below.

2.12.2.1 Institutional Controls

Implementation of institutional controls at Sites 9 and 23 involves identifying the location, magnitude, and type of contamination and documenting it in a LUC RD and in the NSB-NLON IR Site Use Restrictions document. These documents present the LUC objectives and include specific drawings and instructions for Navy personnel so that contaminated groundwater will not be extracted or used in a manner that would threaten human health or the environment. In accordance with the LUC RD to be prepared for Site 9 and 23, the Navy will be responsible for implementing, inspecting, reporting on, and maintaining the institutional controls described in the ROD. Should any institutional control component of the selected remedy fail, the Navy will ensure that appropriate actions are taken to re-establish the Selected Remedy's protectiveness. The Navy may transfer various operational responsibilities for these actions to other parties through contracts, agreements, and/or deed restrictions. However, the Navy acknowledges its ultimate liability under CERCLA for remedy integrity, including for the performance of any transferred operational responsibilities.

The groundwater institutional controls are required because there are hazardous substances in groundwater at Sites 9 and 23 at concentrations that could result in unacceptable risks if groundwater use was not controlled or restricted. The objectives of the institutional controls for the Selected Remedy are as follows:

- Prevent the withdrawal and/or use of groundwater from Sites 9 and 23 for potable water purposes or other purposes that may result in unacceptable risks to human health and the environment.
- Ensure that groundwater extracted from Sites 9 and 23 during construction dewatering activities is handled, stored, and disposed in accordance with applicable state and federal regulatory requirements.

Figure 2-21 identifies the areas at NSB-NLON that have groundwater LUCs. The controls on groundwater use at Sites 9 and 23 will be maintained until the concentrations of hazardous substances in groundwater are less than levels that allow for unrestricted use and unlimited exposure.

NSB-NLON Installation Restoration Site Use Restrictions Instruction document (5090.18D) (Appendix B) has been updated in accordance with this ROD to include groundwater use restrictions at Sites 9 and 23. Other EUC implementation actions completed or to be completed will be described in the EUC RD to be issued by the Navy.

NSB-NLON is currently an active Navy base and is expected to remain so into the foreseeable future. Potential future land uses for Sites 9 and 23 while the Navy owns the property include the continued use of the sites under their current Navat functions (i.e., industrial and recreational). The groundwater at Sites 9 and 23 are classified as GB by the State of Connecticut. Based on the GB classification, the groundwater is presumed not suitable for human consumption without treatment and is not currently used as a source of drinking water or for industrial water supply purposes, and there are no plans to use it in the future for these purposes. The institutional controls for groundwater implemented for Sites 9 and 23 place further restrictions on the extraction and use of groundwater at these sites. In the event that the Navy sells or transfers the property in the future, and with confirmation that contaminated groundwater remains at Sites 9 and/or 23, an environmental land use restriction pursuant to state law would be needed to prohibit the use of groundwater at the sites during subsequent site ownership. Future commercial or residential land use would be permitted as long as controls on groundwater extraction and use were maintained.

2.12.2.2 Five-Year Reviews

Five-year reviews will be conducted for Sites 9 and 23 groundwater as required under CERCLA until contaminant concentrations are shown to be protective of human health and the environment. The goal of conducting the site reviews is to verify that no changes have occurred that would impact the effectiveness of the Selected Remedy.

2.12.3 Sites 2A, 2B, 14, 15, 18, and 20

This ROD selects NFA for groundwater at Sites 14, 15, 18, and 20. Available information indicates that groundwater at these sites does not pose any unacceptable risks to human health or the environment. Groundwater monitoring at Sites 2A and 2B will continue as required by the OU1 ROD and the O&M Manual for IR Program Sites (TtNUS, 2006a). This ROD proposes no change to the OU1 ROD.

2.13 STATUTORY DETERMINATIONS

Under CERCLA Section 121 and the NCP, the lead agency (i.e., Navy) must select remedies that are protective of human health and the environment, comply with ARARs (unless a statutory waiver is justified), are cost effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practical. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of contamination as a principal element and a bias against off-site disposal of untreated wastes.

The following sections discuss how the Selected Remedy for Sites 3 and 7 and Sites 9 and 23 groundwater meet these statutory requirements. Because NFA was selected for groundwater at Sites 14, 15, 18, and 20, an evaluation of statutory requirements for these sites is not necessary.

2.13.1 Protection of Human Health and the Environment

2.13.1.1 Sites 3 and 7

The Selected Remedy for groundwater at Sites 3 and 7 (Institutional Controls with Monitoring, Alternatives GW1-2 and GW2-2) addresses potential future risks and provides adequate protection of human health and the environment. Potential future risks are addressed by restricting future residential use (RAOs A-1 and B-1), providing requirements for groundwater that could be extracted and discharged during construction activities (e.g., excavation dewatering), and monitoring the migration and natural degradation of groundwater contaminants (RAOs A-3 and B-3). Based on existing data and evaluations, groundwater is not anticipated to represent a significant risk to current receptors (construction workers) through incidental contact (RAOs A-2 and B-2) or to ecological receptors through migration (RAOs A-3 and B-3).

2.13.1.2 Sites 9 and 23

The Selected Remedy for groundwater at Sites 9 and 23 (Institutional Controls, Alternative GW3-2) addresses potential future risks and provides adequate protection of human health and the environment.

Potential future risks are addressed by restricting future residential use (RAO C-1) and providing requirements for groundwater that could be extracted and discharged during construction activities (e.g., excavation dewatering). Based on existing data and evaluations, groundwater is not anticipated to represent a significant risk to current receptors (construction workers) through incidental contact or to ecological receptors through migration (RAO C-2).

2.13.2 Compliance with ARARs

2.13.2.1 Sites 3 and 7

An assessment of ARARs and TBCs for the Sites 3 and 7 Selected Remedy is provided in Tables 2-22, 2-23, and 2-24. The remedy will comply with all chemical-specific ARARs and TBCs. Chemical-specific ARARs include the RSRs; these Connecticut regulations provide specific numerical cleanup criteria for contaminants in groundwater. Requirements are based on groundwater in the area being classified by the state as GB. Institutional controls or environmental land use restrictions pursuant to state law (if the Navy sells the property in the future) will be implemented to prevent contact with and use of contaminated groundwater. Even though contaminants in site groundwater currently exceed groundwater quality standards (Class GA), site groundwater is classified as GB. GA groundwater quality should ultimately be obtained through natural degradation. Monitoring would be used to track these decreases until concentrations are less than acceptable levels. The remedy would meet chemical-specific TBCs by preventing exposure to contaminated groundwater until concentrations are less than acceptable levels that meet human health concerns.

The Selected Remedy also complies with all action-specific ARARs. Monitoring would continue until concentrations are less than acceptable tevels that meet human health concerns. Any waste (soil or groundwater) generated monitoring activities will be properly characterized and disposed. Location-specific ARARs are not applicable to the Selected Remedy.

2.13.2.2 Sites 9 and 23

An assessment of ARARs and TBCs for the Sites 9 and 23 Selected Remedy is provided in Tables 2-28 and 2-29. The remedy will comply with all chemical-specific ARARs and TBCs. Chemical-specific ARARs include the RSRs; these Connecticut regulations provide specific numerical cleanup criteria for contaminants in groundwater. Requirements are based on groundwater in the area being classified by the state as GB. Institutional controls or environmental land use restrictions (if the Navy sells the property in the future) will be implemented to prevent contact with and use of contaminated groundwater. Even though contaminants in site groundwater currently exceed groundwater quality standards (Class GA), site groundwater is classified as GB. The remedy would meet chemical-specific TBCs by preventing

exposure to contaminated groundwater until concentrations are less than acceptable levels that meet human health concerns.

The Selected Remedy also complies with all action-specific ARARs. Monitoring would continue until concentrations are less than acceptable levels that meet human health concerns. Location-specific ARARs are not applicable to the Selected Remedy.

2.13.3 Cost Effectiveness

2.13.3.1 Sites 3 and 7

The Selected Remedy for Sites 3 and 7 is considered to be the most cost-effective alternative. The lower cost No Action alternatives (GW1-1 and 2-1) would not satisfy the threshold criteria or RAOs, and Extraction and Off-Site Discharge (Alternative GW2-3) would cost over \$1 million and only address Site 7 groundwater contaminants.

The cost for the Selected Remedy is estimated to be the sum of the costs for Alternatives GW1-2 (\$319,500) and GW2-2 (\$303,800), or \$623,300. Although some economy may be realized when combining the alternatives, any savings are expected to be within the accuracy range of an FS level cost estimate (e.g., -30 to +50 percent); therefore, no attempt was made to further refine this cost. The present worth cost analysis for the Selected Remedy is presented in Appendix G and summarized as follows:

•	Estimated Time for Design and Construction:	6 months
•	Estimated Time for Operation:	30 years
•	Estimated Capital Cost:	\$118,900
•	Estimated O&M Costs (Present Worth):	\$504,400
•	Estimated Total Present Worth:	\$623,300

2.13.3.2 Sites 9 and 23

The Selected Remedy for Sites 9 and 23 is considered to be the most cost-effective alternative. The lower cost No Action alternative (GW3-1) would not satisfy the threshold criteria or RAOs. The present worth cost analysis for the Selected Remedy is presented in Appendix G and summarized as follows:

٠	Estimated Time for Design and Construction:	6 months
•	Estimated Time for Operation;	30 years
•	Estimated Capital Cost:	\$10,295

Estimated O&M Costs (Present Worth):

\$108,705

Estimated Total Present Worth;

\$119,000

2.13.4 <u>Utilization of Permanent Solutions and Alternative Treatment</u>

The Navy, with EPA and state concurrence, has determined that the Selected Remedies represent the maximum extent to which permanent solutions and treatment technologies can be utilized in a practical manner for the groundwater at Sites 3 and 7 and Sites 9 and 23. Of those alternatives that are protective of human health and the environment and comply with ARARs, the Navy has determined that the Selected Remedies provide the best balance of trade-offs in terms of the five balancing criteria.

The Navy also considered the statutory preference for treatment as a principal element, the bias against off-site treatment and disposal, and EPA, state, and community acceptance. In-situ and above-ground treatment technologies for groundwater were screened for Sites 3 and 7 in the technology screening section of the FSs, but based on concerns about effectiveness because of relatively low contaminant concentrations and the sporadic distribution of contamination, coupled with anticipated high costs, these technologies were not retained for development of alternatives. Active remedial technologies were not evaluated for Sites 9 and 23 because of the absence of a contaminant plume and other sites conditions including generally low concentrations of contaminants, groundwater not classified as a suitable potable water source, and availability and use of a public water supply.

2.13.5 Preference for Treatment as a Principal Element

The Selected Remedies do not satisfy the statutory preference for treatment as a principal element. The reasons why treatment of Sites 3 and 7 and Sites 9 and 23 groundwater is not practical are discussed in Section 2.13.4.

2.13.6 <u>Five-Year Review Requirements</u>

Because the Selected Remedy for groundwater at Sites 3 and 7 will result in hazardous substances, pollutants, or contaminants remaining on site in excess of levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within 5 years after initiation of the RA for Sites 3 and 7 groundwater, every 5 years until RGs are met, to ensure that the remedy is, or will be, protective of human health and the environment. Also, because the Selected Remedy for groundwater at Sites 9 and 23 will result in hazardous substances, pollutants, or contaminants remaining on site in excess of levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within 5 years after initiation of the RA and every 5 years thereafter to ensure that the remedy is, or will be, protective of human health and the environment. Five-year reviews are not required under

OU9 for Sites 14, 15, 18, or 20 because hazardous substances, pollutants, or contaminants are not present on site in excess of levels that allow for unlimited use and unrestricted exposure. Five-year reviews of the OU1 remedy will continue for Sites 2A and 2B based on the OU1 ROD (Navy, 1995).

2.14 DOCUMENTATION OF SIGNIFICANT CHANGES

The Proposed Plan for Sites 2A, 2B, 3, 7, 9, 14, 15, 18, 20, and 23 groundwater at NSB-NLON, Groton, Connecticut was released for public comment on June 14, 2008. The Proposed Plan identified institutional Controls with Monitoring (Alternatives GW1-2 and GW2-2) as the Selected Remedy for Sites 3 and 7 groundwater and institutional Controls (Alternative GW3-2) as the Selected Remedy for Sites 9 and 23 groundwater. NFA was recommended for Sites 14, 15, 18, and 20 groundwater in the Proposed Plan. Available information indicates that the groundwater at Sites 2, 14, 15, 18, and 20 do not pose any significant risks to human health or the environment. Groundwater monitoring and institutional controls will continue at Sites 2A and 2B as part of the OU1 remedy.

The Navy reviewed all written and verbal comments submitted during the public comment period. It was determined that no significant changes to these decisions, as originally identified in the Proposed Plan, were necessary or appropriate.

YEAR 1 GROUNDWATER MONITORING RESULTS FOR SITE 3 OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT PAGE 1 OF 3

	REMEDIAL		2DM\	W16D	
CHEMICAL OF CONCERN	GOAL	May-06	Oct-06	Jan-07	Mar-07
VOLATILE ORGANIC COMPOU	NDS (µg/L)				
TRICHLOROETHENE	5	5.7	7	7	7
VINYL CHLORIDE	2	0.5 U	1 U	1 U	1 U

	REMEDIAL.			2DMW16S		
CHEMICAL OF CONCERN	GOAL				Ma	r-07
l <u></u>	GOAL	May-06	Oct-06	Jan-07	Sample	Duplicate
VOLATILE ORGANIC COMPOU	NDS (µg/L)					
TRICHLOROETHENE	5	0.5 U	1 U	1 U	1 U	1 0
VINYL CHLORIDE	2	0.5 U	1 U	1 U	1 Ú	1 U

	REMEDIAL		· ·	2DM	W25S		·
CHEMICAL OF CONCERN	GOAL	May May	y-06	Oct-06	Jan	1-07	Mar-07
	GOAL	Sample	Duplicate		Sample	Duplicate	
VOLATILE ORGANIC COMPOU	NDS (µg/L)						
TRICHLOROETHENE	5	0.5 U	0.5 U	1 U	1 U	1 0	1 Ü
VINYL CHLORIDE	2	0.5 U	0.5 U	1.0	1 U	1 U	1 U

CHEMICAL OF CONCERN	REMEDIAL		2DMV	W28D	······
	GOAL May-06		Oct-06	Jan-07	Mar-07
VOLATILE ORGANIC COMPOU	NDS (µg/L)				
TRICHLORÖETHENE	5	0.5 U	1 U	1 U	1 Ú
VINYL CHLORIDE	2	0.5 _. U	1 U	1 U	1 U

TABLE 2-1

YEAR 1 GROUNDWATER MONITORING RESULTS FOR SITE 3 OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT PAGE 2 OF 3

CHEMICAL OF CONCERN	REMEDIAL	2DMW29S						
	GOAL	May-06	Oc.	1-06	Jan-07	U 07		
	GOAL	May-06	Sample	Duplicate	Jan-ur	Mar-07		
VOLATILE ORGANIC COMPOU	NDS (µg/L)			· · · · · · · · · · · · · · · · · · ·				
TRICHLOROETHENE	5	0.5 U	1 U	1 U	1 ህ	1 Ų		
VINYL CHLORIDE	2	1.7	9	10	1 U	4		

	REMEDIAL	3MW15I						
CHEMICAL OF CONCERN	GOAL	May-06	Oct-06	Jan-07	Mar-07			
VOLATILE ORGANIC COMPOU	NDS (µg/L)		_					
TRICHLOROETHENE	5	0.5 U	1 Ü	10	1 Ü			
VINYL CHLORIDE	2	0.5 U	1 U	1 U	1 U			

CHEMICAL OF CONCERN	REMEDIAL			3MW15S		
	GOAL	May-06		Oct-06	Jan-07	Mar-07
	GOAL	Sample	Duplicate	Q01-00	Jan-01	mar-or
VOLATILE ORGANIC COMPOUR	NDS (µg/L)					
TRICHLOROETHENE	5	0.5 Ú	0.5 U	1 Ų	1 U	1 U
VINYL CHLORIDE	2	0.5 U	0.5 U	1 U	1 U_	1 U

CHEMICAL OF CONCERN	REMEDIAL	3MW16D						
	GOAL	May-06	Oct-06	Jan-07	Mar-07			
VOLATILE ORGANIC COMPOU	NDS (µg/L)							
TRICHLOROETHENE	5	5.1	2	2	4			
VINYL CHLORIDE	2	0.5 U	1 U	1 U	1 U			

YEAR 1 GROUNDWATER MONITORING RESULTS FOR SITE 3 OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT PAGE 3 OF 3

CHEMICAL OF CONCERN	REMEDIAL		3MV	V16S	
	GOAL	May-06	Oct-06	Jan-07	Mar-07
VOLATILE ORGANIC COMPOU	NDS (µg/L)	·			
TRICHLOROETHENE	5	0.5 U	1 U	1 U	1 U
VINYL CHLORIDE	2	0.5 U	1.0	1 U	1 Ü

Shaded cell indicates exceedance of the remedial goal.

- U Not detected at associated detection limit.
- J Estimated concentration.

TABLE 2-2

YEAR 1 GROUNDWATER MONITORING RESULTS FOR SITE 7 OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT PAGE 1 OF 8

	DEMEDIAL	7MW01D						
CHEMICAL OF CONCERN	REMEDIAL GOAL		00	:t-06	Jan-07	May 07		
	GOAL	May-06	Sample	Duplicate	Jan-07	Mar-07		
VOLATILE ORGANIC COMPOUN			•					
1.4-DICHLOROBENZENE	75 ⁽¹⁾	0.5 U	1 U	1 U	1 U	1 U		
BENZENE	1 (1)	0.5 U	10	1.0	1 U	1 U		
CHLOROBENZENE	100 (1)	0.5 U	1 U	1 U	1 U	1 U		
TRICHLOROETHENE	5 (1)	0.5 U	1 U	1 U	1 U	1 U		
SEMIVOLATILE ORGANIC COM	POUNDS (µg/L	}						
HEXACHLOROBENZENE	1 (1)	·	-	-	-	-		
POLYNUCLEAR AROMATIC HYD		(µg/L)						
BENZO(A)ANTHRACENE	0.3 (2)		-	-		_		
BENZO(A)PYRENE	0.3 (2)	-	-		-	-		
BENZO(B)FLUORANTHENE	0.3(2)		-	_	-	-		
INDENO(1,2,3-CD)PYRENE	NC ₍₅₎		-	-	-	-		

TABLE 2-2

YEAR 1 GROUNDWATER MONITORING RESULTS FOR SITE 7 OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT PAGE 2 OF 8

	DEMEDIAL	7MW03!						
CHEMICAL OF CONCERN	REMEDIAL GOAL				Mar-07			
	JOAL	May-06	Oct-06	Jan-07	Sample	Duplicate		
VOLATILE ORGANIC COMPOUN								
1,4-DICHLOROBENZENE	75 (1)	0.5 U	1 U	1 U	10_	1 U		
BENZENE	1 (1)	0.5 U	1 U	1 U	1 U	1 U		
CHLOROBENZENE	100 (1)	0.5 U	1 U	1 U	1 U	1 U		
TRICHLOROETHENE	5 (1)	0.5 U	1 ∪	1 U	1 U	1 U		
SEMIVOLATILE ORGANIC COM	POUNDS (µg/L)	}			·			
HEXACHLOROSENZENE	1 (1)	1 U	10	0.2 U	0.2 U	-		
POLYNUCLEAR AROMATIC HY	DROCARBONS	(µg/L)						
BENZO(A)ANTHRACENE	0.3(2)		,	-	-			
BENZO(A)PYRENE	0.3 (2)	-			_	-		
BENZO(B)FLUORANTHENE	0.3 (2)			·	-	-		
INDENO(1,2,3-CD)PYRENE	NC ⁽²⁾	-	-	-	-	-		

TABLE 2-2

YEAR 1 GROUNDWATER MONITORING RESULTS FOR SITE 7 OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT PAGE 3 OF 8

	BEMERIAL	7MW03\$							
CHEMICAL OF CONCERN	REMEDIAL -		Oct-06	Jai	Mar-07				
	50%	May- <u>06</u>		Sample	Duplicate	Widi W/			
VOLATILE ORGANIC COMPOUN									
1.4-DICHLOROBENZENE	75 (1)	0.5 U	1 U	1 U	1 U	1 U			
BENZENE	1 (1)	0.5 U	1 U	1 U	1 U	1 U			
CHLOROBENZENE	100 (1)	0.5 U	1 U	1 U	1.0	1 U			
TRICHLOROETHENE	5 (1)	0.5 U	1 U	1 Ü	1 U	1 Ü			
SEMIVOLATILE ORGANIC COM	POUNDS (μg/L)								
HEXACHLOROBENZENE	1 (1)	1 U	1 🗓	0.2 U	0.2 U	0.2 Ú			
POLYNUCLEAR AROMATIC HY	DROCARBONS	(μg/L)			·	"			
BENZO(A)ANTHRACENE	0.3 (2)	-	-	-		-			
BENZO(A)PYRENE	0.3 (2)	•	-	-	-	-			
BENZO(B)FLUORANTHENE	0.3 (2)	-	-	-	-	-			
INDENO(1,2,3-CD)PYRENE	NC ⁽²⁾	-	-		_	-			

TABLE 2-2

YEAR 1 GROUNDWATER MONITORING RESULTS FOR SITE 7 OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT PAGE 4 OF 8

	REMEDIAL	7MW05D						
CHEMICAL OF CONCERN	GOAL	May-06	Oct-06	Jan-07	Mar-07			
VOLATILE ORGANIC COMPOUN					1			
1,4-DICHLOROBENZENE	75 ⁽¹⁾	0.5 ∪	1 ∪	1 U _	1 U_			
BENZENE	1 (1)	0.5 U	1 U	1 U	1 U			
CHLOROBENZENE	100 (1)	0.5 U	1 U	1 U	1 Ų			
TRICHLOROETHENE	5 (1)	0.72	1	1	0.9 J			
SEMIVOLATILE ORGANIC COM								
HEXACHLOROBENZENE	1 (1)	-		-	-			
POLYNUCLEAR AROMATIC HY	DROCARBONS	(µg/L)						
BENZO(A)ANTHRACENE	0.3 (2)			- <u></u>	<u> </u>			
BENZO(A)PYRENE	0.3 (2)		-	-	-			
BENZO(8)FLUORANTHENE	0.3 (2)							
INDENO(1,2,3-CD)PYRENE	NC (2)	-	-	-				

TABLE 2-2

YEAR 1 GROUNDWATER MONITORING RESULTS FOR SITE 7 OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT PAGE 5 OF 8

	REMEDIAL	7MW09S								
CHEMICAL OF CONCERN	GOAL	May-06	Oct-06	Jan-07	Mar-07					
VOLATILE ORGANIC COMPOUNDS (µg/L)										
1,4-DICHLOROBENZENE	75 (1)	0.5 U	1 U	1 U	1 U					
BENZENE	1 (1)	0.5 U	1 U	1 U	1 U					
CHLOROBENZENE	100 ⁽¹⁾	0.5 _. U	1 U	1 U	1 U					
TRICHLOROETHENE	5 (1)	0.5 U	1 U	1 U	1 U					
SEMIVOLATILE ORGANIC COM	POUNDS (µg/L)									
HEXACHLOROBENZENE	1 (1)	1 U	0.14 J	0.2 U	0.20 U					
POLYNUCLEAR AROMATIC HY		(µg/L)								
BENZO(A)ANTHRACENE	0.3 (2)	<u> </u>								
BENZO(A)PYRENE	0.3 (2)		-		-					
BENZO(B)FLUORANTHENE	0.3 (2)	-			-					
INDENO(1,2,3-CO)PYRENE	NC (2)	-	-	-						

TABLE 2-2

YEAR 1 GROUNDWATER MONITORING RESULTS FOR SITE 7 OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT PAGE 6 OF 8

	REMEDIAL	7MW12I								
CHEMICAL OF CONCERN	GOAL	May-06	Oct-06	Jan-07	Mar-07					
VOLATILE ORGANIC COMPOUNDS (µg/L)										
1,4-DICHLOROBENZENE	75 (1)	0.5 Ü	1 Ü	1 U	1 U					
BENZENE	1(0)	0.5 U	1 U	1 U	1 0					
CHLOROBENZENE	100 (1)	0.5 U	1 U	1 U	1 U					
TRICHLOROETHENE	5 (1)	0.86	0.9 J	1	0.7 J					
SEMIVOLATILE ORGANIC COM	POUNDS (μg/L)	<u> </u>								
HEXACHLOROBENZENE	1 (1)	1 U	1 Ų	0.2 ↓	0.2 U					
POLYNUCLEAR AROMATIC HY	DROCARBONS	(μg/L)								
BENZO(A)ANTHRACENE	0.3 (2)		-		l					
BENZO(A)PYRENE	0.3 (2)			<u> </u>	<u>-</u>					
BENZO(B)FLUORANTHENE	0.3 (2)	-								
INDENO(1,2,3-CD)PYRENE	NC (2)	-	-	-	-					

TABLE 2-2

YEAR 1 GROUNDWATER MONITORING RESULTS FOR SITE 7 OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT PAGE 7 OF 8

	REMEDIAL	7MW12S						
CHEMICAL OF CONCERN	GOAL	May-06	Oct-06	Jan-07	Mar-07			
VOLATILE ORGANIC COMPOUN	IDS (µg/L)				· · · · · · · · · · · · · · · · · ·			
1,4-DICHLOROBENZENE	75 (1)	0.5 U	1 ∪	1 U	1 U			
BENZENE	1 [1]	0.5 U	1 U	1 U	1 U			
CHLOROBENZENE	100 (1)	1.3	1 J	2	2			
TRICHLOROETHENE	5 (1)	0.5 U	1 U	1 U	1 U			
SEMIVOLATILE ORGANIC COM	POUNDS (µg/L))						
HEXACHLOROSENZENE	1 (1)	1 U	10	0.2 U	0.2 U			
POLYNUCLEAR AROMATIC HY		(μg/L)						
BENZO(A)ANTHRACENE	0.3 (2)	<u> </u>	<u>-</u>		_			
BENZO(A)PYRENE	0.3 (2)		<u> </u>					
BENZO(B)FLUORANTHENE	0.3 (2)							
INDENO(1,2,3-CD)PYRENE	NC (2)		·	-	[

YEAR 1 GROUNDWATER MONITORING RESULTS FOR SITE 7 OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT PAGE 8 OF 8

	DEMEDIA	7MW13\$								
CHEMICAL OF CONCERN	REMEDIAL GOAL	Ma	y-06	Oc	t-06	Jan-07	Mar-07			
	GOAL _	Sample	Duplicate	Sample	Duplicate	Jan-Gr	Sample	Duplicate		
VOLATILE ORGANIC COMPOUN				·						
1,4-DICHLOROBENZENE	75 ⁽¹⁾	<u> </u>				-	-			
BENZENE	1 (1)		-					-		
CHLOROBENZENE	100 (1)	-	-		-	-				
TRICHLOROETHENE	5 (1)	_		-	-	· ·	· -			
SEMIVOLATILE ORGANIC COM	POUNDS (µg/L)	}								
HEXACHLOROBENZENE	1 (1)	1 0	1 U	1 U	10	0.2 U	0.21 U	0.22 U		
POLYNUCLEAR AROMATIC HY	DROCARBONS	(µg/L)								
BENZO(A)ANTHRACENE	0.3 (2)	0.05 U	0.05 U	0.07 UJ	0.27 J	0.07 U	0.074 U	0.075 U		
BENZO(A)PYRENE	D.3 ⁽²⁾	0.05 U	0.05 U	0.05 U	0.05 U	0.2 U	0.21 U	0.22 U		
BENZO(B)FLUORANTHENE	0.3 (2)	0.05 U	0.05 U	0.08 U	U 80.0	0.08 U	0.18 J	0.086 U		
INDENO(1,2,3-CD)PYRENE	NC (2)	0.05 U	0.05 U	0.10 U	0.10 U	0.2 U	0.21 U	0.22 U		

- 1 Remedial goal selected in Interim ROD (Navy, 2004c).
- 2 Monitoring criterion for protection of G8-classified groundwater.

Shaded cell indicates exceedance of the remedial goal.

- U Not detected at associated detection limit.
- J Estimated concentration.
- (-) Parameter not analyzed.

TABLE 2-3

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS FOR SITE 15 OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT

DAGAUETER	4588446	15 M	W2S	1.55.05.25	4571404	4.5734(0.0	4571102
PARAMETER	15MW1S	Sample	Duplicate	15MW3S	15TW01	15TW02	15TW03
Volatile Organic Cor	npounds (µg/L)						
CHLOROFORM	1 0	1 U	1 U	1 U	1 U	1 Ü	3
Unfiltered inorganic	s (µg/L)						· · · ·
ALUMINUM	37,4 U	2780	2820	58.7 U	2240 J	78.8 U	137 U
BARIUM	85.1	50.8	52.7	31.4	50.2	78.2	47.7
BERYLLIUM	0.37 U	1.1 U	1.1 U	0.37 U	0.84	0.37 U	0.37 U
CADMIUM	4.5 U	5.0 U	4.7 U	2.5 ↓	2.5 U	4.4	2.5 U
CALCIUM	26400	11900	12100	18600	8290	16000	34200
CHROMIUM	0.87 J	0.55 U	0.55 U	0.55 U	1.1 U	0.55 U	0.60 U
COBALT	5.1 U	8.4 J	7.8 J	5.1 U	9.5	5.1 U	7.3
COPPER	3.4 U	19.2	21.3	3.4 U	13.9	3.4 U	3.4 U
IRON	24.5 U	32.7 U	36.8 U	7800	427	80.4 U	215
LEAD	1.3 U	1.3 Ü	1.3 U	1.3 U	2.3	1.3 U	1.8
MAGNESIUM	2980	2000	2050	3780	1210	2200	3080
MANGANESE	4.8	223	227	287	340	41.1	702
POTASSIUM	4630	1540	1600	4390	1780	2120	5700
SODIUM	36200	35400	36200	42600	22600	45400	38300
ZINC	2.9 J	356	365	1.6 U	181	60.9	2.8 U
Filtered Inorganics (μg/L)	•••					
ALUMINUM	25.4 U	35.4 U	2770 J	25 4 U	2160	66.1 U	25.4 U
BARIUM	83.6	12.5	52.2	34.6	50.7	77.5	47.8
BERYLLIUM	0.37 U	0.37 U	1.2 U	0.37 U	0.84	0.37 U	0.37 U
CADMIUM	3.2 U	2.7 U	6.3 U	2.5 U_	2.5 U	6.4	2.5 U
CALCIUM	25800	5490	12000	19800	8350	16000	34700
CHROMIUM	0.75 J	0. 55 U	0.55 U	0.56 J	0.80 U	0.55 Ü	0.55 U
COBALT	5.1 U	5.1 U	6.8 J	5.1 U	7.5	5.1 U	5.1 U
COPPER	3.4 U	3.4 Ü	18.2	3,4 U	15.2	3.4 U	3. <u>4 U</u>
IRON	12.0 U	2030 J	6.6 U	6740 J	366	75.7 U	135
LEAD	1.3 U	1.3 U	1,3 J	1.3 U	1.3 U	1.3 U	1.4
MAGNESIUM	2930	1120	2020	3870	1200	2180	3080
MANGANESE	4.2 J	311 J	226 J	279 J	350	40.1	703
POTASSIUM	4570	1420	1880	4900	1760	2050	5550
SODIUM	35500 J	14600 J	35400 J	43600 J	23200	44900	38100
ZINC	3.2 J	50.5 J	362 J	1.6 U_	179	60.4	2 3 Ü

From Basewide Groundwater Operable Unit Remedial Investigation Update/Feasibility Study (TtNUS, 2004).

TABLE 2-4

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS FOR SITE 18 OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT

BADAMETER	18'	TW2	40718/4
PARAMETER	Sample	Duplicate	18TW4
Inorganics (µg/L)			
ALUMINUM	189 U	211 U	880
BERYLLIÜM	0.6 U	0.6 U	0.79 J
CALCIUM	25000	25200	9640
IRON	306	328	1030
MAGNESIUM	1590 Ų	1650 U	2630
MANGANESE	111	111	322
POTASSIUM	1660 U	1670 U	2570
ŞODIUM	9570	9900	15100
Miscellaneous Parameters (mg/l	-)		
TOTAL DISSOLVED SOLIDS	146	174	111
TOTAL SUSPENDED SOLIDS	5 U	5 U	39

From Basewide Groundwater Operable Unit Remedial Investigation Report (TtNUS, 2002).

U - Not detected at associated detection limit.

J - Estimated concentration.

TABLE 2-5

SUMMARY OF GROUNDWATER ANALYTICAL RESULTS FOR SITE 20 OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARIINE BASE NEW LONDON GROTON, CONNECTICUT

PARAMETER	2WCMW1S	2WCMW2S
Unfiltered Inorganics (µg/L)		
ALUMINUM	180 U	257
ARSENIC	3.2 J	2.0 ↓
BARIUM	81,4	14,4
CALCIUM	166000	5410
CHROMIUM	3.4	0.61 J
COPPER	3,4 U	3.6 J
IRON	50900	2970
LEAD	1.3 U	2.3 J
MAGNESIUM	41200	1210
MANGANESE	2350	216
POTASSIUM	44000	1390
SODIUM	353000	15200
ZINC	4.1	58.0
Filtered Inorganics (µg/L)		
ALUMINUM	41.0 U	2760 J
ARSENIC	3.4 J	2.0 U
BARIUM	85.2	52.0
CALCIUM	191000	12000
CHROMIUM	2.1	0.55 U
COBALT	5.1 U	9.3 J
COPPER	3.4 U	18.9
IRON	38000 J	7.7 U
MAGNESIUM	33500	2010
MANGANESE	2220 J	225 J
POTASSIUM	29100	1840
SODIUM	190000 J	35200 J
ZINC	2.3 J	361 J

From Basewide Groundwater Operable Unit Remedial Investigation Update/ Feasibility Study Report (TtNUS, 2004).

- U Not detected at associated detection limit.
- J Estimated concentration.

TABLE 2-8

SUMMARY OF DATA FROM 2007 UNDERDRAIN METERING PIT QUARTERLY SAMPLING EVENTS AT SITE 23 OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT PAGE 1 OF 3

· · · · · · · · · · · · · · · · · · ·	CTDEP	Criteria	Stormwater			23M	IDA4		
PARAMETER	Surface Water	Residential	Discharge : Permit	- have	n-07	2.58		c-07	
	Protection	Volatifization	Criterian	Sample	Duplicate	Sep-07	Sample	Duplicate	Feb-08
Volatile Organics (µg/L)				<u> </u>			_		
BENZENE	710	130	NA NA	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U	0.2 J
BROMODICHLOROMETHANE	2.3	NE	NA NA	0.3 J	0.5 U	0.5 U	0.5 U	0.5 U	0.5 U
CHLOROFORM	14,100	26	NA NA	3 J	2 0	0.5 U	0.5 ∪	0.5 U	0.5 U
CYCLOHEXANE	NE	NE	NA.	0.5 ป	0.5 U	0.1 J	0.5 Ü	0.5 U	0.5 U
CIS-1,2-DICHLOROETHENE	NE	B30	NA.	0.3 J	0.2 J	0.3)	0.2 J	0.5 V	0.2 J
ISOPROPYLBENZENE	ME	2.800	NA NA	0.1 J	0.09 J	0.13	0.5 Ü	0.5 UJ	0.5 U
METHYL TERT-BUTYL ETHÉR	NÉ	21,000	NA	1	0.9	0.4 J	0.6	0.6	0.7
TETRACHLOROETHENE	88	340	NA	0.3 J	0.3 J	0.4 J	0.3 J	0.20	0.3 J
TRICHLOROETHENE	2,340	27	NA NA	0.4 J	0.3 J	0.5 J	0,4 J	0.3 J	0.4 J
Semivolatile Organics (µg/L)							•		
1-METHYLNAPHTHALENE	NE	NE	NA NA	0.2 U	0.2 U	0.2 U	0.96 J	0.04B J	0.21 U
2-METHYLNAPHTHALENE	NE	NE	NA	0.17 J	0.16 J	0.2 U	1.1 J	0.2 UJ	0.21 UJ
4-NITROANILINE	NE	NE	NA NA	0.2 U	0.2 U	1 UJ	0.75 J	1.0 UR	t.0 UJ
ACENAPHTHENE	NE	NE	NA	0.2 U	0.2 Ú	0.2 U	0.83 J	0.029 J	0.21 Ŭ
ACENAPHTHYLENE	0.3	NÉ	NA	0.2 Ų	0.2 U	0.2 U	0.90 J	0.20 UJ	0.21 U
ANTHRACENE	1,100,000	NE	NA NA	0.2 U	0.2 U	0.2 U	0.92 J	0.20 UJ	0.21 U
BENZO(A)ANTHRACENE	0.3	NE	NA NA	0.07 U	0.07 U	0.041 U	1.0 J	0.042 UJ	0.045 U
BENZO(A)PYRENE	0.3	NE	NA .	0.2 UJ	0.2 ป	0.2 U	0.35 J	0.20 U	0.21 U
BENZO(B)FLUORANTHENE	0.3	NE	NA	0.08 U	Q.08 U	0.075 U	0.64 J	0.078 UJ	0.082 U
BENZO(G,H,I)PERYLENE	NE	ΝE	NA	0.2 UJ	0.2 U	0.2 U	0.31	0.20 U	0.21 U
BENZO(K)FLUORANTHENE	0.3	NE	NA NA	0.2 UJ	0.2 ()	0.2 U	0.53 J	0.20 U	0.21 U
CHRYSENE	NE	NE	NA.	0.2 U	0.2 U	0,2 U	0.76 J	0.20 UJ	0,21 U
DIBENZO(A.H)ANTHRACENE	NE	NE	NA."	0.2 UJ	0.2 U	0.2 U	0.14 J	0.20 U	0.21 U
FLUORANTHENE	3,700	NE	NA	0.2 U	0.2 U	0.2 U	1.1 3	0.20 U.	0.21 U
FLUORENE	140,000	NE	NA	0.2 U	0.2 U	0.2 U	0.97 J	0.20 UJ	0.21 UJ
HEXACHLOROBENZENE	0.077	NE	NA	1 U	1 U	0.2 U	12J	0.20 UJ	0.21 U
HEXACHLOROBUTADIENE	NE	NE	NA NA	0.2 U	0.2 U	0.48 U	0.64 J	0.099 U	0.21 U
INDENO(1,2,3-CD)PYRENE	NE	NË	NA	0.2 UJ	0.2 U	0.2 U	0.22	0.20 U	0.21 UJ
NAPHTHALENE	NE	NE	NA	0.2 U	0.2 U	0.2 U	1.0 J	0.088 J	0.21 U
PHENANTHRENE	0.3	NE	NA NA	0.2 U	0.2 U	0.2 U	L 89.0	0.20 UJ	0.21 U
PYRENE	110,000	NE	NA .	0.2 U	0.2 U	0.2 U	0.84 J	0.20 UJ	0.21 U

TABLE 2-6

SUMMARY OF DATA FROM 2007 UNDERDRAIN METERING PIT QUARTERLY SAMPLING EVENTS AT SITE 23 OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT

PAGE 2 OF 3

Part			Criteria	Stormwaler	_		23MP01				
Sample Duplicate Sample	PARAMETER	Surface Water		Discharge Permit	iut.	n-07	Sec. 07	Öec	c-07	5ab 08	
T-METHYLNAPHTHALENE NE NE NE NE NE NA NA NA NA NA NA 0.0033 J Z-METHYLNAPHTHALENE NE NE NE NE NA NA NA NA NA NA NA 0.2 UJ ANTROPAMILINE NE NE NE NE NA NA NA NA NA NA NA NA 0.2 UJ ACRAPHTHENE NE NE NE NE NA NA NA NA NA NA NA NA NA 0.2 UJ ACRAPHTHENE NE NE NE NE NA 0.2 UJ ANTIFRACENE NE 1,100.000 NE NA 0.2 UJ ANTIFRACENE 1,100.000 NE NA NA NA NA NA NA NA NA NA 0.2 UJ BENZO(AJANTHRACENE 0.3 NE NA 0.2 UJ BENZO(BJFLUORANTHENE 0.3 NE NA		Protection	A O19/11/58/10/1	Criterion	Sample	Duplicate	26h-01	Sample	Duplicate	78B-00	
Image:	Semivolatile Organics , Filtered	(pg/L)		· ·							
A-NITROAMILINE NE NE NE NA NA NA NA NA NA NA NA 10 UJ ACENAPHTHENE NE NE NE NA NA NA NA NA NA NA 0.031 J ACENAPHTHYLENE 0.3 NE NA NA NA NA NA NA 0.2 U ANTHRACENE 1,100,000 NE NA NA NA NA NA NA 0.2 U BENZO(A)PYRENE 0.3 NE NA NA NA NA NA NA NA 0.2 U BENZO(B)FLUORANTHENE 0.3 NE NA NA NA NA NA NA NA NA NA 0.032 U BENZO(B)FLUORANTHENE 0.3 NE NA				NA.	NA.	NA NA	NA	NA	NA	0.093 J	
ACEMAPHTHENE NE NE NA NA NA NA NA NA O.031 J		NE						NA	NA	0.2 UJ	
ACENAPHTHYLENE 0.3 NE NA	4-NITROANILINE	NE	NE	NA	NA	NA NA	NA.	NA	NA	1.0 UJ	
ANTHRACENE	ACENAPHTHENE	NE		NA	NA	NA I	NA	NA	NA	0.031 J	
BENZO(A)ANTHRAÇENE	ACENAPHTHYLENE	0.3		NA_	NA _	NÄ	NA	NA	NA	0.2 U	
BENZO(A)PYRENE	ANTHRACENE	1,100,000	NE	NA	NA	NA	NA -	NA	NA	02. Ų	
BENZO(B)FLUORANTHENE 0.3	BENZO(A)ANTHRACENE		NE	NA	NA	NA	NA	NA	NA.	0.042 U	
BENZO(G,H,I)PERYLENE NE NE NE NA NA NA NA NA NA NA O.13 J	BENZO(A)PYRENE	0.3	NE	NA	NA	NA	NA	NA	NA	0.2 U	
BENZO(G,H,I)PERYLENE	BENZO(B)FLUORANTHENE	0.3	NE	NA .	NA	NA	NA	NA	NA I	0.078 U	
CHRYSENE NE NE NE NE NA NA NA NA NA NA NA O.2 U	BENZO(G.H,I)PERYLENE	NÉ	NE	NA .	NA	NA	NA	NA	NA	0.13 J	
DIBENZO(A,H)ANTHRACENE NE NE NE NA	BENZO(K)FLUORANTHENE	0.3	NE	NA NA	NA	NA NA	NA	NA	NA I	0.2 U	
FLUCRANTHENE 3,700 NE	CHRYSENE	NE	NE .	NA.	NΑ	NA .	ŊĄ	NA.	NA NA	0.2 U	
FLUQRENE 140,000 NE NA NA NA NA NA NA NA 0.2 UJ HEXACHLOROBENZENE 0.077 NE NA NA NA NA NA NA NA NA 0.2 U HEXACHLOROBENZENE 0.077 NE NA NA NA NA NA NA NA NA 0.2 U HEXACHLOROBUTADIENE NE NE NE NA NA NA NA NA NA NA 0.2 U HEXACHLOROBUTADIENE NE NE NE NA NA NA NA NA NA NA 0.2 UJ RNPHTHALENE NE NE NE NA NA NA NA NA NA NA NA NA 0.2 UJ RNPHTHALENE NE NE NE NA NA NA NA NA NA NA NA NA 0.2 UJ PYRENE 110,000 NE NA NA NA NA NA NA NA NA 0.2 UJ Inorganics, Total (µg/L) ALUMINUM NE NA 0.2 UJ BARRUM NE NA NA NA 48.2 52.4 87 55.2 53.4 55.9 CALCIUM NUT NA NA 48.2 52.4 87 55.2 53.4 55.9 CALCIUM NUT NA NA 0.94 U 0.81 U 2 0.41 0.28 U 0.38 U COPPER 48 NA 60 3 U 3 U 4.2 0.44 U 0.22 U 0.8 U ROOPER 48 NA 60 3 U 3 U 4.2 0.44 U 0.22 U 0.8 U ROOPER 48 NA 60 3 U 3 U 4.2 0.44 U 0.22 U 0.8 U RRON NUT NA NA 9,190 11,900 70,800 9,860 10,200 4,380 LEAD 13 NA 30 2.2 9.3 8.4 2.5 U 2.2 U 1.4 U MAGNESIUM NUT NA NA 661 715 845 858 815 784 NICKEL 880 NA NA NA 1,1 U 0.88 U 0.41 U 0.53 0.46 0.54	DIBENZO(A,H)ANTHRACENE	NE	NE	NA	NA .	NA .	NA	ŇA	NA	0.2 U]	
HEXACHLOROBENZÉNE 0.077 NE	FLUORANTHENE	3,700	NE	NA	NA	NA	NA	NA	NA.	0.2 U	
HEXACHLOROBUTADIENE NE NE NA NA NA NA NA NA NA NA 0.2 U INDENO(1.2,3-CO)PYRENE NE NE NE NA NA NA NA NA NA NA NA 0.22 J NAPHTHALENE NE NE NE NA NA NA NA NA NA NA NA NA 0.069 J PHENANTHRENE 0.3 NE NA 0.2 U Inorganics, Total (µg/L)	FLUORENE	140,000	NE	NA .	NA.	NA	NA	ŇA	NA	0.2 UJ	
INDENO(1,2,3-CD)PYRENE	HEXACHLOROBENZÊNE	0.077	NE	NA .	ŅΑ	NA NA	NA	NΑ	NA	0.2 U	
NAPHTHALENE NE	HEXACHLOROSUTADIENE	NE.	NE	NA	NΑ	NA	NA	NA	NA.	0.2 U	
PHENANTHRENE 0.3	INDENO(1,2,3-CD)PYRENE	NÉ	NE	NA ·	NA	NA	NA	NA	NA	0.22 J	
PYRENE 110,000 NE	NAPHTHALENE	NE	NE	NA	NA	NA	NA	NA	NA	0.069 J	
Inorganics, Total (µg/L) ALUMINUM	PHENANTHRENE	0.3	NE	NA	NA.	NA.	NA	NA	NA	0.2 U	
ALUMINUM NE NA NA 473 115 322 38.1 21.8 29.4 ARSENIC 4 NA NA NA 3.7 U 3 U 13.9 2.2 U 4.7 U 3.1 BARIUM NE NA NA NA 48.2 52.4 87 55.2 53.4 55.9 CALCIUM NUT NA NA 93,800 35,800 32,000 35,500 34,700 34,300 CHROMIUM 110 III) NA NA 0.94 U 0.81 U 2 0.41 0.28 U 0.38 U COBALT NE NA NA 0.84 U 0.64 U 0.64 U 0.65 U 0.56 U 0.53 U 0.8 U COPPER 4B NA 60 3 U 3 U 4.2 U 0.44 U 0.22 U 0.8 U IRON NUT NA NA 9,190 11,900 70,800 9,660 10,200 4,380 LEAD 13	PYRENE	110,000	NE	NA	NA	NA	NA NA	NA.	NA	0.2 U	
ALUMINUM NE NA NA 473 115 322 38.1 21.8 29.4 ARSENIC 4 NA NA NA 3.7 U 3 U 13.9 2.2 U 4.7 U 3.1 BARIUM NE NA NA NA 48.2 52.4 87 55.2 53.4 55.9 CALCIUM NUT NA NA 93,800 35,800 32,000 35,500 34,700 34,300 CHROMIUM 110 III) NA NA 0.94 U 0.81 U 2 0.41 0.28 U 0.38 U COBALT NE NA NA 0.84 U 0.64 U 0.64 U 0.65 U 0.56 U 0.53 U 0.8 U COPPER 4B NA 60 3 U 3 U 4.2 U 0.44 U 0.22 U 0.8 U IRON NUT NA NA 9,190 11,900 70,800 9,660 10,200 4,380 LEAD 13	Inorganics, Total (µg/L)					-					
BARIUM NE NA NA 48.2 52.4 87 55.2 53.4 55.9 CALCIUM NUT NA NA NA 33,800 35,800 32,000 35,500 34,700 34,300 CHROMIUM 110 I2) NA NA 0,94 U 0,81 U 2 0,41 0,28 U 0,38 U COBALT NE NA NA 0,84 U 0,64 U 0,26 U 0,56 0,53 0,8 U COPPER 4B NA 50 3 U 3 U 3 U 3.2 U 0,44 U 0,22 U 0,8 U IRON NUT NA NA 9,190 11,900 70,800 9,860 10,200 4,380 LEAD 13 NA 30 2.2 9.3 8.4 2.5 U 2.2 U 1.4 U MAGNESIUM NUT NA NA 7,260 7,660 7,020 7,660 7,490 7,450 MANGANESE NE NA </td <td></td> <td>NE</td> <td>NA "</td> <td>NA</td> <td>473</td> <td>115</td> <td>322</td> <td>38.1</td> <td>21.8</td> <td>29.4</td>		NE	NA "	NA	473	115	322	38.1	21.8	29.4	
CALCIUM NUT NA NA 33,800 35,800 32,000 35,500 34,700 34,300 CHROMIUM 110 12) NA NA 0,94 U 0,81 U 2 0,41 0,28 U 0,38 U COBALT NE NA NA 0,84 U 0,64 U 0,26 U 0,56 U 0,53 0,8 U COPPER 4B NA 60 3 U 3 U 3 U 0,44 U 0,22 U 0,8 U IRON NUT NA NA 9,190 11,900 70,800 9,660 10,200 4,380 LEAD 13 NA 30 2.2 9.3 8.4 2.5 U 2.2 U 1.4 U MAGNESIUM NUT NA NA 7,260 7,660 7,020 7,660 7,490 7,450 MANGANESE NE NA NA 1,1 U 0.98 U 0.41 U 0.53 0.46 0.64 NICKEL 880 NA NA <	ARSENIC	4	NA	NA	3.7 U	ЗŲ	13.9	2.2 U	4.7 U	3.1	
CHROMIUM 110 ¹²⁾ NA NA 0.94 U 0.81 U 2 0.41 0.28 U 0.38 U COBALT NE NA NA NA 0.84 U 0.64 U 0.26 U 0.56 U 0.53 0.8 U COPPER 48 NA 60 3 U 3 U 4.2 U 0.44 U 0.22 U 0.8 U IRON NUT NA NA 9,190 11,900 70,800 9,660 10,200 4,380 LEAD 13 NA 30 2.2 9.3 8.4 2.5 U 2.2 U 1.4 U MAGNESIUM NUT NA NA 7,260 7,660 7,020 7,660 7.490 7,450 MANGANESE NE NA NA 1.1 U 0.98 U 0.41 U 0.53 0.46 0.64 NICKEL 880 NA NA 1.1 U 0.98 U 0.41 U 0.53 0.46 0.64	BARIUM	NE	NA	NA	48.2	52.4	87	55.2	53.4	55.9	
COBALT NE NA NA 0.84 U 0.64 U 0.26 U 0.53 0.8 U COPPER 4B NA 60 3 U 3 U 4.2 0.44 U 0.22 U 0.8 U IRON NUT NA NA 9,190 11,900 70,800 9,660 10,200 4,380 LEAD 13 NA 30 2.2 9.3 8.4 2.5 U 2.2 U 1.4 U MAGNESIUM NUT NA NA 7,260 7,660 7.020 7,660 7.490 7,450 MANGANESE NE NA NA 1.1 U 0.88 U 0.41 U 0.53 0.46 0.64 NICKEL 880 NA NA 1.1 U 0.88 U 0.41 U 0.53 0.46 0.64	CALCIUM		NA	NA	33,800	35,800	32,000	35,500	34.700	34,300	
COBALT NE NA NA 0.84 U 0.64 U 0.26 U 0.53 0.8 U COPPER 4B NA 60 3 U 3 U 4.2 0.44 U 0.22 U 0.8 U IRON NUT NA NA 9,190 11,900 70,800 9,660 10,200 4,380 LEAD 13 NA 30 2.2 9.3 8.4 2.5 U 2.2 U 1.4 U MAGNESIUM NUT NA NA 7,260 7,660 7.020 7,660 7.490 7,450 MANGANESE NE NA NA 1.1 U 0.88 U 0.41 U 0.53 0.46 0.64 NICKEL 880 NA NA 1.1 U 0.88 U 0.41 U 0.53 0.46 0.64	CHROMIUM	110 (2)	NA.	NA.	0.94 U	0.B1 U	2	0.41	0.28 U	0.38 U	
COPPER 4B NA 60 3 U 3 U 4.2 0.44 U 0.22 U 0.8 U IRON NUT NA NA 9,190 11,900 70,800 9,660 10,200 4,380 LEAD 13 NA 30 2.2 9.3 8.4 2.5 U 2.2 U 1.4 U MAGNESIUM NUT NA NA 7,260 7,660 7.020 7,660 7.490 7,450 MANGANESE NE NA NA 1.1 U 0.98 U 0.41 U 0.53 0.46 0.64 NICKEL 880 NA NA 1.1 U 0.98 U 0.41 U 0.53 0.46 0.64				NA			0.26 U	0.58			
IRON NUT NA NA 9,190 11,900 70,800 9,660 10,200 4,380 LEAD 13 NA 30 2.2 9.3 8.4 2.5 U 2.2 U 1.4 U MAGNESIUM NUT NA NA 7,260 7,660 7.020 7,660 7.490 7,450 MANGANESE NE NA NA NA 661 715 845 858 815 784 NICKEL 880 NA NA 1.1 U 0.98 U 0.41 U 0.53 0.46 0.64								0.44 U			
LEAD 13 NA 30 2.2 9.3 8.4 2.5 U 2.2 U 1.4 U MAGNESIUM NUT NA NA 7,260 7,660 7.020 7,660 7.490 7,450 MANGANESE NE NA NA NA 661 715 845 858 815 784 NICKEL 880 NA NA 1.1 U 0.98 U 0.41 U 0.53 0.46 0.64				NÄ	9,190		70,800		10.200	4.380	
MAGNESIUM NUT NA NA 7,260 7,660 7.020 7,660 7.490 7,450 MANGANESE NE NA NA NA 661 715 845 858 815 784 NICKEL 880 NA NA 1.10 0.980 0.410 0.53 0.46 0.64											
MANGANESE NE NA NA 661 715 845 858 815 784 NICKEL 880 NA NA 1.1 U 0.88 U 0.41 U 0.53 0.46 0.64											
NICKEL 880 NA NA 1.1U 0.58U 0.41U 0.53 0.46 0.64											
17 D T T T T T T T T T T T T T T T T T T	POTASSIUM	NUT	NA .	NA NA	5,210	5,490	5.270	5,590	5,490	5,150	

SUMMARY OF DATA FROM 2007 UNDERDRAIN METERING PIT QUARTERLY SAMPLING EVENTS AT SITE 23 OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT PAGE 3 OF 3

	CTDEP	Criteria	Stormwater		23MP01					
PARAMETER	Surface	Residential	Discharge			23N	IPU?			
FARAMCIEN	Water	Volatilization	Permit	Ju	n-07	San A7	De	c-07	·Feb-0B	
	Protection	Volatilization	Criterion	Sample	Duplicate	Sap-07	Sample	Duplicate	-F80-UB	
Inorganics, Total (µg/L) (Cor				_						
SECENIUM	50	NA	NA	1.5 U	2 J	1.5 U	1.5 U	1.50	2.2 U	
SILVER	12	NA	NA	0.46 U	0.46 U	1.5	0.46 U	0.46 €	0.54 U	
SODIUM	NUT	NA NA	NA	46,900	49,600	52,100	53,400	52,300	50,100	
VANADIUM	NE	NA	_ NA	1.3 U	1.4 U	3.7	0.34 U	0.29 U	0.52 U	
ZING	123	NA	200	21.3 J	22.3	47.1	22.8	20	26.6	
inorganics, Filtered (µg/L)										
ALUMINUM	NE NE	NA	NA NA	20.4 J	36.7 J	21,3 J	19.0 U	19.0 U	35.4	
ARSENIC	4	NA	NA NA	3.5 U	2.2 Ū	1.2 J	1.9 U	1.1 U	2.8	
BARIUM	NE	NA NA	, NA	44.6	46.4	50.1	48.9	49.6	56.8	
CALCIUM	NUT	NA	NA.	33,600	34,700	31.400	33,100	33,400	36,000	
CHROMIUM	110 (2)	NA	NA NA	1.2 U	0.44 ป	0.3 J	0.29	0.48	0.38 U	
COBALT	NE_	NA	_ NA	0.67 U	0.86 U	0.47 J	0.48	0.51	0.64	
IRON	NUT	NA	NA .	3,470	3,630	3,600	4,190	4,140	3.750	
LEAD	13	NA .	30	1.3 J	1.B J	1.1 ↓	2,1 U	2.8 ∪	1 <u>.4</u> U	
MAGNESIUM	NUT	NA	NA	7,200	7,480	6,980	7,250	7,300	8,020	
MANGANESE	NE NE	NA	NA _	645	664	708	764	770	815	
NICKEL	880	NA	NA	1.1 U	0.88 U	0.78 J	1	0.64	0.66	
POTASSIUM	NUT	NA NA	NA	5,090	5.390	5,320	5,360	5,390	5,390	
SELENIUM	50	NA.	NA	1.5 U	1.7 J	2.4 U	1.5↓	2.30	2,2 U	
SODIUM	NUT	NA	NA	46,600	48,400	52,600	50,400	51,400	52,100	
ZINC	123	NA	200	21.4 J	19.5 J	15	18.6	20.8	26	
Petroleum Hydrocarbons (µ	g/L)									
ETPH (C09-C36)	NE	NE	2,500 ⁽¹⁾	55 J	79 U	140 J	160 U	1,600 J	75 U	
Petroleum Hydrocarbons, F	fitered (µg/L)						•			
ETPH (C09-G36)	NE NE	NE NE	2,500 ⁽¹⁾	NA	NA I	NA.	NA	NA	75 U	

- 1 Oriterion is for oil and grease.
- 2 Criterion Is for hexavalent chromium.

Shaded cells indicate exceedances of criteria.

- NA Not applicable.
- NE Not established.
- NUT Essential nutrient.
- U Not detected at associated detection limit.
- J Estimated concentration.

SELECTION OF HUMAN HEALTH RISK ASSESSMENT EXPOSURE PATHWAYS FOR OPERABLE UNIT 9 OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT

Scenario Timeframe	Medium	Expasure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	On-Site	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current/Future	Groundwater	Groundwater	Overburden/ Bedrock Aquifer	Construction Workers	Adult	Ingestion Dermai	On-Site	ı	Construction workers may have dermal contact with groundwater during excavation activities
;				Residents	Adult	Ingestion Dermal	On-Site On-Site	Quant Quant	Groundwater may be used as a potable water source in the future.
					Child	Ingestion Dermal	On-Site On-Site	None None	Exposures to a child resident are less than those for an adult resident
		Ąir		Construction Workers	Adult	Inhalation	Qn-site	None	Construction workers exposure via volatilization is expected to be insignificant due to dilution with outdoor air.
				Residents	Adult	Inhalation	On-site	Quant	On-site residents may be exposed to votable emissions from groundwater white showering.
i					Chila	Inhatation	On-site	Noņe	Exposures to a child resident are less than those for an adult resident

TABLE 2-8

SUMMARY OF CANCER RISKS AND HAZARD INDICES FOR SITE 3 GROUNDWATER REASONABLE MAXIMUM EXPOSURES OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT

Receptor	Medium	Exposure Route	Cancer Risk	Chemicals with Cancer Risks > 10 ⁻⁴	Chemicals with Cancer Risks > 10 ⁻⁵ and ≤ 10 ⁻⁴	Chemicals with Cancer Risks > 10 ⁻⁶ and ≤ 10 ⁻⁵	Hazard Index	Chemicals with HI > 1
Construction Worker	Groundwater	Dermal Contact	1.3E-06				0.001	
Adult Resident	Groundwaler	Ingestion	5.1E-04	Arsenic	Vinyl Chloride, Banzo(a)pyrene, Dibenzo(a,h)anthracene	1,1,2-Trichtoroethana, Indeno(1,2,3-cd)pyrene, alpha-BHC	2.4	Arsenic
		Dermal Contact	8.6 E -04	Benzo(a)pyrene. Dibenzo(a,h)anthracene	Indeno(1,2,3-cd)pyrene	alpha-BHC, Arsenic	0.009	
1	1	Inhalation ⁽¹⁾	1.9E-05		Vinyl Chloride	1,1,2-Trichloroethane	0.04	
		Total	1.4E-03	Banzo(a)pyrene, Dibenzo(a,h)anthracene, Arsenic	Vinyl Chloride, Indena(1,2,3-cd)pyrene	1,1,2-Trichloroethane, alpha-BHC	2.4	Arşənic

Taken from Basewide Groundwater Operable Unit Remedial Investigation Update/Feasibility Study (TtNUS, 2004).

¹ Inhalation risk is assumed to be equal to risk from ingestion for volatiles.

SUMMARY OF CANCER RISKS AND HAZARD INDICES FOR SITE 3 GROUNWATER CENTRAL TENDENCY EXPOSURES OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT

Receptor	Medium	Exposure Route	Cancer Risk	Chemicals with Cancer Risks > 10 ⁻⁴	Chemicals with Cancer Risks > 10 ⁻⁵ and ≤ 10 ⁻⁴	Chemicals with Cancer Risks > 10 ⁻⁸ and ≤ 10 ⁻⁵	Hazard Index	Chemicals with HI > 1
Construction Worker	Groundwater	Dermal Contact	4.4E-07				0.0003	
Adult Resident	Groundwater	Ingestion	7.1E-05		Arsenic	Vinyl Chloride, Benzo(a)pyrene, Dibenzo(a,h)anthracene	1,1	Arsenic
		Dermal Contact	1.4E-04		Benzo(a)anthracene, Dibenzo(a,h)anthracene	Indeno(1,2,3-cd)pyrene	0.005	
	i	Inhalation ⁽¹⁾	2.6E-06			Vinyl Chloride	0.02	
		Total	2.2E-04		Benzo(a)anthracene, Diberzo(a,h)anthracene, Arsenic	Vinyl Chloride, Indeno(1,2,3-cd)pyrene	1.1	Arşenic

Taken from Basewide Groundwater Operable Unit Remedial Investigation Update/Feasibility Study (TtNUS, 2004).

¹ Inhalation risk is assumed to be equal to risk from ingestion for volatiles.

TABLE 2-10

SUMMARY OF CANCER RISKS AND HAZARD INDICES FOR SITE 7 GROUNDWATER REASONABLE MAXIMUM EXPOSURES OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT

Receptor	Medium	Exposure Route	Cancer Risk	Chemicals with Cancer Risks > 10 ⁻⁴	Chemicals with Cancer Risks > 10 ⁻⁵ and ≤ 10 ⁻⁴	Chemicals with Cancer Risks > 10 ⁻⁵ and ≤ 10 ⁻⁵	Hazard Index	Chemicals with HI > 1
Construction Worker	Groundwater	Dermal Contact	4.2E-07	<u> </u>			0.09	
Adult Resident	Groundwater Ingestion 3.2E		3.2E-04	Arsenic	Bis(2-ethylhexyl)phthalate, 1,4-Dichlorobenzene, Hexachlorobenzene	Benzene, Trichlorgethene	3.8	Arsenic, Chromium
		Dermal Contact	2.9E-04	Haxachlorobenzene	Bis(2-ethylhexyl)phthalate, 1,4-Dichlorobenzene		1,3	
		Inhalation ⁽¹⁾	3E-05		1,4-Dichlorobenzene	Benzene, Trichloroethene	0.5	
		Total	6.4E-04	Arsenic, Hexachlorobenzene	Bis(2-ethylhexyl)phthalata, 1,4-Dichlorobenzene	Benzene, Trichtoroethene	5.6	Arsenic. Chromium

Taken from Basewide Groundwater Operable Unit Remedial Investigation Report (TtNUS, 2002a).

it inhalation risk is assumed to be equal to risk from ingestion for volatiles.

SUMMARY OF CANCER RISKS AND HAZARD INDICES FOR SITE 7 GROUNDWATER CENTRAL TENDENCY EXPOSURES OPERABLE UNIT 9 RECORD OF DECISION

NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT

Receptor	Medium	Exposure Route	Cancer Risk	Chemicals with Cancer Risks > 10 ⁻⁴	Chemicals with Cancer Risks > 10 ⁻⁵ and ≤ 10 ⁻⁴	Chemicals with Cancer Risks > 10 ⁻⁶ and ≤ 10 ⁻⁶	Hazard Index	Chemicals with HI > 1
Construction Worker	Groundwater	Dermal Contact	1.0E-07				0.05	
Adult Resident	Groundwater	Ingestion	1.2E-05			Arsenic, Hexachlorobenzene	0.2	
		Dermal Contact	3.2E-05		Hexachlorobenzene		0.8	
	ì	Inhalation ⁽¹⁾	8.5E-08				0.02	
		Total	4.4E-05		Hexachlorobenzene	Arsenic, Bis(2-ethylhexyl)phthalate	1.1	

Taken from Basewide Groundwater Operable Unit Remedial Investigation Report (TtNUS, 2002a).

1 Inhalation risk is assumed to be equal to risk from ingestion for volatiles.

COMPARISONS OF SITE 14 GROUNDWATER ANALYTICAL RESULTS TO SCREENING CRITERIA OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT

Parameter	\$14MWD1\$	Basewide Background ⁽¹⁾	EPA Region 9 PRG ⁽²⁾	CTDEP GA/GAA Criterion ⁽³⁾	EPA MCL ⁽⁴⁾	Connecticut MCL ⁽⁵⁾	CTDEP RSR Surface Water Protection Criterion ⁽³⁾
Total Metals (µg/L)	·-	_					
BARIUM	48.8	227	2600 N	1000	2000	2000	NA
CALCIUM	6890	188000	NA	NA NA	ŇĀ	NA NA	NA
IRON	1330	28200	11000 N	NA	300 (6)	: NA	NA
MAGNESIUM	3060	19100	ŇA	NA	NA.	NA	NA
MANGANESE	88.2	11700	880 N	NA	50 ⁽⁶⁾	NA	NA NA
POTASSIUM	2780	70800	NA	NA	NA	NA	NA
SODIUM	31500	1900000	NA	NA	NA	NA "	NA
Miscellaneous Parameters (m	g/L)						
TOTAL DISSOLVED SOLIDS	122 J	6260	NA	NA NA	500 ⁽⁸⁾	NA	NA NA

Taken from Basewide Groundwater Operable Unit Remedial Investigation Update/Feasibility Study (TtNUS, 2004).

- NA Not available.
- RBC Risk-Based Concentration.
- PRG Preliminary Remediation Goal.
- MCL Maximum Contaminant Level.
- 1 96 Percent Upper Tolerance Limit of site background data. BGOUR! Report (TtNUS, 2002a).
- 2 EPA Region 9 PRG Table, Residential, 2002b (ICR = 1E-6, HQ = 1.0).
- 3 CTDEP Residnetial Remediation Standard Regulations, 1996.
- 4 EPA Drinking Water Standards and Health Advisories, 2002a.
- 5 Title 19, Health and Safety, the Public Code of the State of Connecticut.
- 6 Secondary MCL.
- J Estimated concentration.

SUMMARY OF CANCER RISKS AND HAZARD INDICES FOR SITE 15 REASONABLE MAXIMUM EXPOSURES OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT

Receptor	Medium	Exposure Route	Cancer Risk	Chemicals with Cancer Risks _ > 10 ⁻⁴	Chemicals with Cancer Risks > 10 ⁻⁶ and ≤ 10 ⁻⁴	Chemicals with Cancer Risks > 10 ⁻⁶ and ≤ 10 ⁻⁵	Hazard Index	Chemicals with HI > 1
Construction Worker	Surface/Subsurface Soil	Ingestion	3.5E-07	· · · · · · · · · · · · · · · · · · ·			0.2	
		Dermal Contact	1.7E-08				0.003	
		Total	3.7E-07	<u> </u>			0.2	
	Groundwater	Dermal Contact	NC				0.002	
_		Total All Media	3.7E-07				0.2	
Full-Time Employees	Surface Soil ⁽¹⁾	Ingestion	2.3E-06	· ·		Arsenic	0.05	
		Dermal Contact	5.2E-07			• •	0.004	•
	<u> </u>	Total	2.8E-06			Arsenic	0.06	
Adolescent Trespasser	Surface Soil ⁽¹⁾	Ingestion	1.2E-06		[Arsenic	0.07	
·	1	Dermal Contact	2.2E-07	- •			0.004	
		Total	1.4E-06	- +		Arsenic	0.07	
Child Resident	Surface/Subsurface Soil	Ingestion	5.1E-06			Arsenic	0.5	
		Dermal Contact	3.1E-07				0.01	
		Total	5.4E-06	<u>-</u>		Arsenic	0.5	
Adult Resident	Surface/Subsurface Soil	Ingestion	2.2E-06			Arsenic	0.05	<u> </u>
		Dermal Contact	1.7E-07	- -			0.001	
		Total	2.4E-06			Arsenic	0.05	
	Groundwater	Ingestion	NC				0.2	
		Dermal Contact	NC	<u> </u>			0.01	
		Inhalation ⁽⁷⁾	NC				0	
		Total	NC	4-		<u>-</u>	0.3	
		Total All Media	2.4E-06	•			0.3	

From Basewide Groundwater Operable Unit Remedial Investigation Update/Feesibility Study (TtNUS, 2004).

^{1 -} Assumes the pavement is removed.

^{2 -} Inhalation risk is assumed to be equal to risk from ingestion for volatiles.

NC - Not calculated. There were no carcinogenic COPCs identified for groundwater.

SUMMARY OF CANCER RISKS AND HAZARD INDICES FOR SITE 15 CENTRAL TENDENCY EXPOSURES OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT

Receptor	Medium	Exposure Route	Cancer Risk	Chemicals with Cancer Risks > 10 ⁻¹	Chemicals with Cancer Risks > 10 ⁻⁵ and ≤ 10 ⁻⁴	Chemicals with Cancer Risks > 10 ⁻⁶ and ≤ 10 ⁻⁵	Hazard Index	Chemicals with HI > 1
Construction Worker	Surface/Subsurface Soil	Ingestion	1.2E-07			•	0.07	
	1	Dermal Contact	1.1E-09	**	• •	• •	0.0002	
		Total	1,2E-07				0.07	
	Groundwater	Dermal Contact	NC				0.0005	"
		Total All Media	1.2E-07				0.07	_
Full-Time Workers	Surface Soil ⁽¹⁾	Ingestion	2.7E-07				0.03	
		Dermal Contact	1.2E-08	•••		**	0.0004	
<u> </u>	<u> </u>	Total	2.9E-07			7 7	0.03	7.
Adolescent Trespasser	Surface Soil ⁽¹⁾	Ingestion	7.7E-08				T 0.01	
		Dermal Contact	8.8E-09			••	0.0006	
		Total	8.6E-08				0.01	
Child Resident	Surface/Subsurface Soil	Ingestion	8.5E-07				0.2	
		Dermal Contact	1.8E-08				0.002	
<u> </u>	<u> </u>	Total	8.7E-07				0.2	
Adult Resident	[Surface/Subsurface Soil	Ingestion	3.2E-07			····	T 0.03	
	1	Dermal Contact	7.3E-09	·			0.0002	· · · · · · · · · · · · · · · · · · ·
		Total	3.3E-07	- +			0.03	
	Groundwater	Ingestion	NC				0.1	
		Dermai Contact	NÇ				0.005	
		Inhalation ⁽²⁾	NC				0	7.7
	<u>·</u>	Total	NC				0.1	:
		Total All Media	3.3E-07				0.1	 '

From Basewide Groundwater Operable Unit Remedial Investigation Update/Feasibility Study (TtNUS, 2004).

^{1 -} Assumes the pavement is removed.

^{2 -} Inhalation risk is assumed to be equal to risk from ingestion for volatiles.

NC - Not calculated. There were no carcinogenic COPCs Identified for groundwater.

SUMMARY OF CANCER RISKS AND HAZARD INDICES FOR SITE 20 GROUNDWATER REASONABLE MAXIMUM EXPOSURES OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT

Receptor	Medium	Exposure Route	Cancer Risk	Chemicals with Cancer Risks > 10 ⁻⁴	Chemicals with Cancer Risks > 10 ⁻⁵ and ≤ 10 ⁻⁴	Chemicals with Cancer Risks > 10 ⁻⁶ and ≤ 10 ⁻⁵	Hazard Index	Chemicals with HI > 1
Construction Worker	Groundwater	Dermal Contact	1.3E-09				0.0002	
		Inhalation	1.1E-08		-+			٠.
	1	Total	1.2E-08				0.0002	
Adult Resident	Groundwater	Ingestion	6.4E-05		Arsenic	Benzo(a)pyrene	0.3	7.5
		Dermal Contact	2.1E-07				0.0007	
		Inhalation ⁽¹⁾	7.7E-07					
		Total	6.5E-05	• • • • • • • • • • • • • • • • • • • •	Arsenic	Benzo(a)pyrena	0.3	

Risks were calculated using organic sampling results from the BGOURI (TtNUS, 2002a) and inorganic sampling results from the BGOURI Update/FS (TtNUS, 2004).

^{1 -} Inhalation risk is assumed to be equal to risk from ingestion for volatiles.

TABLE 2-16

SUMMARY OF CANCER RISKS AND HAZARD INDICES FOR SITE 20 GROUNDWATER CENTRAL TENDENCY EXPOSURES OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT

Receptor	Medium	Exposure Route	Cancer Risk	Chemicals with Cancer Risks > 10 ⁻⁴	Chemicals with Cancer Risks > 10 ⁻⁵ and ≤ 10 ⁻⁴	Chemicals with Cancer Risks > 10 ⁻⁵ and ≤ 10 ⁻⁵	Hazard Index	Chemicals with Hi > 1
Construction Worker	Groundwater	Dermal Contact	3.3E-10			**	0.00004	
1		Inhalation	2.7E-09					
_		Total	3.0E-09				0.00004	
Adult Resident	Groundwater	Ingestion	8.6E-06			Arsenic	0.1	
1		Dermal Contact	3.1E-08				0.0003	
		Inhalation ⁽¹⁾	1.1E-07					
		Total	8.8F-06			Arsenic	0.1	

Risks were calculated using organic sampling results for the BGOURI (TtNUS, 2002a) and inorganic results for the BGOURI Update/FS (TtNUS, 2004).

^{1 -} Inhalation risk is assumed to be equal to risk from ingestion for volatiles.

TABLE 2-17 SUMMARY OF CANCER RISKS AND HAZARD INDICES FOR SITE 23 REASONABLE MAXIMUM EXPOSURES NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT

Receptor	Medium	Exposure Route	Cancer Risk	Chemicals with Cancer Risks > 10-4	Chemicals with Cancer Risks > 10 ⁻⁵ and ≤ 10 ⁻⁴	Chemicals with Cancer Risks > 10 ⁻⁶ and ≤ 10 ⁻⁵	Hazard Index	Chemicals Contributing to HI > 1
Construction Worker	Groundwater	Dermal Contact	1.3E-09		7-	<u>.</u>	0.0002	
Adult Resident	Groundwater	Ingestion	1.8E-06			Tetrachloroethene	Q.D1	
1	}	Dermal Contact	8.5E-07				0.005	
]		tnhalation ⁽¹⁾	1.8E-06			Tetrachloroethene	0.008	
<u> </u>	<u>.i</u>	Total	4.5E-06			Tetrachloroethene	0.02	

^{1 -} Inhalation risk is assumed to be equal to risk form ingestion for volatiles.

SELECTION OF ECOLOGICAL COPCS IN GROUNDWATER AT SITE 3 - NSA OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT PAGE 1 OF 2

Chamicals Detected in Groundwater	Detection Frequency ⁽¹⁾	Minimum Concentration (2)	Maximum Concentration ⁽²⁾	Location of Maximum Concentration	Background Concentration ⁽³⁾	Surface Water Screening Value	Ecological Effects Quotlent ^[4]	Retain as	Rationale for COPC Selection or Elimination ⁽³⁾
Volatila Organics (µg/L)	•				·			· · · · · · · · · · · · · · · · · · ·	
1,1,2-TRICHLORGETHANE	1/5) 2 J	2 ,	\$3GW3TW2701		1200	0.002	NO I	3SL
				\$3GW20MW29S04					
CIS-1.2-DICHLOROETHENE	4/5	0.7 J	3	\$3GW3TW2801-D	-	590	0.01	NO	- asl
		<u>. </u>		S3GW3TW2701					
TOLUENE	2/5	D.2 J	0.3 J	S3GW3TW2801		9.B	0.03	NO I	8\$L
TOTAL 1.2 DICHLOROETHENE	2/2	0.7 J	3	\$3GW2DMW29S04	_	590	0.01	CN	BSL
•		ŀ		S3GW3TW2801					
TRANS-1,2-DICHLOROETHENE	1/5	0.2 J	0.2 J	\$3GW3TW2801-D	<u>. </u>	590	0.0003	NO	9SL
TRICHLOROETHENE	3/5	05 J	2	\$3GW3TW2801-D		47	0.04	NO	3St
VINYUGHLORIDE	3/5	0.3 J	2 ↓	S3GW3TW2701	•-	NA		YFS	NTX
Semivolatile Organics (µg/L)									
				\$3GW3TW2801]				
ACENAPHTHENE	2/5	Q.11 J	0.13 J	\$3GW3TW2801-D	-	23	0.01	NO !	85L
BENZO(A)PYREME	1/5	Q.13 J	013J	§3GW3TW2801	-	0.014	9.79	YES	A\$L
BENZQ[G]HIJPERYLENE	1/5	D.28	0.26	\$3GW3TW2801		NA.	_	YES	NTX
BENZOIK) FEGGRANIZIENE	1/5	D.03 J	0.08 J	S3GW3TW2801		A.A.	17	YES	NTX
DIBENZO(A,H;ANTHRACENE	1/5	0.3	0.3	\$3GW3TW2801		NA		YES	NTX
FLUORENE	2/5	U 24 J	0.36 1	S3GW3TW2801		39	0.1	NO	₿\$L
INDENO[1.2 + CDp2YRe No.	1/5	0.35	0.35	S3GW3TW2801		NA		YE 59	NTX
Pesticides/PCBs(µg/L)				· · · · · · · · · · · · · · · · · · ·					
ALPHA-BHC	1/3	0.025	0.028	53GW3TW2801		27	0.01	NQ	8SL
BETA-BHC	1/2	0.015 J	0.017	53GW3TW2801-0	<u> </u>	2.2	0.01	NÓ	₽SL
Total Metels(µg/L)					 				
ALUMINUM	2/3	732 J	6780 J	\$3GW3TW2701	356D	87	78	YES	ASL
ARSENIC	2/5	2 J	25.4	\$3GW2DMW29804	1.92	150	0.17	NO	8SL
BARIUM	3/3	30	74.8	\$3GW3TW3001	227	4	1017	YES	A\$L
CALCIUM	3/3	13300	19100	\$3GW3TW3001	188.000	NA .		NO	EN
CHROMIUM	2/3	5.8	8.4	53GW3TW2701	49.9	11	0.76	NO	₫\$L
COPPER	2/3	4.3	14.2	53GW3TW2801	107	4.8	2.96	YES	ASL
IRON	2/3	18000	20000	\$3GW3TW2801	28.200	1000	20	YES	ASL
LEAD	2/3	2.2	8.4	\$3GW3*W2701	6.63	1.2	7	YES	ASL
MAGNESIUM	3/3	4410	5770	\$3GW3TW3001	191,000	NA.	_	NO	EÑ
M/tNts/kNt,St	3/3	56.7	784	\$3GW3TW2701	11,700	120	4 (4)	Y[-2-,	ASL
POTASSIUM	3/3	3650	4540	\$3GW3TW2801-D	70,800	AM		NO.	EN
SODIUM	3/3	52400	6860 0	53GW3TW3001	1.900,000	NΑ		NO	£N .
VANADIUM	2/3	12.1	12.1	\$3GW3TW2701 \$3GW3TW2801	10 2	NA	_	Yt S	NTX.

TABLE 2-1B

SELECTION OF ECOLOGICAL COPCS IN GROUNDWATER AT SITE 3 - NSA OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT

PAGE 2 OF 2

Chemicals Detected In Groundwater	Detection Frequency ⁽¹⁾	Minimum Concentration ⁽²⁾	Naximum Consentration ⁽²⁾	Location of Maximum Concentration	Background Concentration ⁽³⁾	Surface Water Screening Value	Ecological Effects Quotient ⁽⁴⁾	Retain as	Rationale for COPC Selection or Elimination ⁽⁵⁾
ARSENIC-FILTERED	2/5		35	S3GW2DMW29S04-F	2.55	150	0.02	NO 1	BSL
BAROM-FRIERI (1	3/3	23.1	75.6	\$3GW3TW3001-F	124	4	18.9	YES	ASL
ICALCIUM-FILTERED	3/3	13800	19100	\$3GW3TW3001-F	152,000	NA		NO I	EN
IRON LILTERED	2/3	12000	15200	S3GW3TW280 I-F-D	25,300	1000	15.2	YES	ASL
MAGNESIUM-FILTERED	3/3	3730	5810	\$3GW3TW3001-F	150,000	NA	•-	NO.	EN
MANGANI SE FILIERED	3/3	58.6	496	S3GW3TW2701-F	9,400	120	6.13	YES	ASL
POTASSIUM-FILTERED	3/3	365D	4870	S3GW3TW2801-F-D	60,000	NA		NO	ĒΝ
SODIUM-FILTERED	3/3	55600	69400	\$3GW3TW3001-F	1,580,000	NA.		NO	EN

Yaken from Basewide Groundwater Operable Unit Remediat Investigation Update/Feasibility Study (TINUS, 2004).

- 1. Sample and duplicate were counted as one sample when calculating the frequency of detection.
- 2. Sample and duplicate were counted as separate samples in determining the minimum and maximum concentrations.
- 3. Source of the background concentrations is Atlantic, April 1985. Background concentrations of Inorganics in Soil NSB-NLON.
- 4. The acological effects quotient was calculated by dividing the maximum concentration by the screening value.
- 5. Rationale codes for confaminant salection or deletion:

For Selection as a COPC:

ASL = Above COPC screening level.

NTX = No loxicity information available.

For Elimination as a COPC:

3SL = 8slow COPC screening level.

EN = Essential Nutrient,

The background concentrations are presented for informational purposes only and were not used in the selection of COPCs.

Shaded have indicates that the constituent was selected as a COPC. Shaded values indicate that the site concentration(s) exceeds this periodical criterion.

"--" Unavailable; background concentrations are not aveilable for organic chemicals and an EEO could not be calculated due to the tack of screening values.

J = Estimated concentration.

SITE 3 REMEDIAL GOALS OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT

	Ground							
Chemical of Concern	Federat MCL ⁽¹⁾	Connecticut RSRs for Groundwater ⁽²⁾	Remedial Goal					
Volatile Organic Compounds (µg/L)								
Trichloroethene	5	5	5					
Vinyl Chloride	2	2 ^A / 1.6 ^B	1.6					

- 1 Maximum Contaminant Level (MCL) for drinking water (EPA, 2004).
- 2 Connecticut Remediation Standard Regulations
 - A Groundwater Protection Criteria for groundwater classified as GA (CTDEP, 1996).
 - B Groundwater Volatilization Criteria (CTDEP, 2007).

SITE 7 REMEDIAL GOALS OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT

	Ground	<u>.</u>		
Chemical of Concern	Federal MCL ⁽¹⁾	Connecticut RSRs for Groundwater ⁽²⁾	Remedial Goal	
Volatile Organic Compounds (μ	g/L)		· · <u>- · · </u>	
1,4-Dichlorobenzene	75	75	75	
Benzene	5	1	1	
Chlorobenzene	100	100	100	
Trichloroethene	5	5	5	
Vinyl Chloride	2	2 ^A / 1.6 ^B	1.6	
Semivolatile Organic Compoun-	ds (µg/L)	-		
Hexachlorobenzene	1	1	1	

- 1 Maximum Contaminant Level (MCL) for drinking water (EPA, 2004).
- 2 Connecticut Remediation Standard Regulations;
 - A Groundwater Protection Criteria for groundwater classified as GA (CTDEP, 1996).
 - B Groundwater Volatifization Criteria (CTDEP, 2007).

ASSESSMENT OF CHEMICAL-SPECIFIC ARARS AND TBCs FOR GROUNDWATER ALTERNATIVES GW1-1, GW2-1, AND GW3-1 - NO ACTION OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT PAGE 1 OF 2

Requirement	Citation	Status	Synopsis of Requirement	Evaluation/Action to be Taken
Federal		<u>-</u>		
Cancer Slope Factors	Not Applicable	To Be Considered (TBC)	These are guidance values used in risk assessment to evaluate the potential carcinogenic hazard caused by exposure to contaminants.	The No Action Alternatives would result in unacceptable risks from exposure to contaminated groundwater. Because no restrictions on groundwater use would be implemented under the No Action Alternatives, future groundwater use could result in unacceptable risks to receptors.
References Doses	Not Applicable	TBC	These are guidance values used in risk assessment to evaluate the potential non-carcinogenic hazard caused by exposure to contaminants.	The No Action Alternatives would result in unacceptable risks from exposure to contaminated groundwater. Because no restrictions on groundwater use would be implemented under the No Action Alternatives, future groundwater use could result in unacceptable risks to receptors.
Guidelines for Carcinogen Risk Assessment	EPA/630/P- 03/001F (March 2005)	TBC	Guidance for assessing cancer risk from exposures to pollutants and other agents in the environment. As part of the characterization process, explicit evaluations are made of the hazard and risk potential for susceptible lifestages, including children.	The No Action Alternatives would result in unacceptable risks from exposure to contaminated groundwater. Because no restrictions on groundwater use would be implemented under the No Action Alternatives, future groundwater use could result in unacceptable risks to receptors.

ASSESSMENT OF CHEMICAL-SPECIFIC ARARS AND TBCs FOR GROUNDWATER ALTERNATIVES GW1-1, GW2-1, AND GW3-1 - NO ACTION OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT PAGE 2 OF 2

Requirement	Citation	Status	Synopsis of Requirement	Evaluation/Action to be Taken
Federal (continued)			•	
Supplemental Guidance for Assessing Susceptibility from Early- Life Exposure to Carcinogens	EPA/630/R- 03/003F (March 2005)	TBC	Guidance for assessing cancer risks to children. Addresses a number of issues pertaining to cancer risks associated with early-life exposures and also provides specific guidance on potency adjustments for carcinogens acting through the mutagenic mode of action.	The No Action Alternatives would result in unacceptable risks from exposure to contaminated groundwater. Because no restrictions on groundwater use would be implemented under the No Action Alternatives, future groundwater use could result in unacceptable risks to receptors.
State of Connecticut		•		
Remediation Standard Regulations	CGS 22a-133k; RCSA 22a-133k - 1 through 3	Applicable	This regulation provides specific numerical cleanup criteria for contaminants in groundwater. Requirements are based on groundwater in the area being classified by the state as GB.	The No Action Alternatives would not meet this standard because no action would be taken to determine if regulatory standards continued to be exceeded.

ASSESSMENT OF CHEMICAL-SPECIFIC ARARS AND TBCs FOR GROUNDWATER ALTERNATIVES GW1-2 AND GW2-2 - SELECTED REMEDY OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT PAGE 1 OF 2

Requirement	Citation	Status	Synopsis of Requirement	Evaluation/Action to be Taken
Federal				·
Cancer Slope Factors	Not Applicable	To Be Considered (TBC)	These are guidance values used in risk assessment to evaluate the potential carcinogenic hazard caused by exposure to contaminants.	Alternatives would prevent exposure to contaminated groundwater and monitor the migration and degradation of contaminants until concentrations have achieved acceptable levels that meet human health concerns.
Reference Doses	Not Applicable	TBC	These are guidance values used in risk assessment to evaluate the potential non-carcinogenic hazard caused by exposure to contaminants.	Alternatives would prevent exposure to contaminated groundwater and monitor the migration and degradation of contaminants until concentrations have achieved acceptable levels that meet human health concerns.
Guidelines for Carcinogen Risk Assessment	EPA/630/P- 03/001F (March 2005)	TBC	Guidance for assessing cancer risk from exposures to pollutants and other agents in the environment. As part of the characterization process, explicit evaluations are made of the hazard and risk potential for susceptible lifestages, including children.	Alternatives will meet this standard because potential carcinogenic risks caused by exposure to contaminants will be addressed.
Supplemental Guidance for Assessing Susceptibility from Early- Life Exposure to Carcinogens	EPA/630/R- 03/003F (March 2005)	TBC	Guidance for assessing cancer risks to children. Addresses a number of Issues pertaining to cancer risks associated with early-life exposures and also provides specific guidance on polency adjustments for carcinogens acting through the mulagenic mode of action.	Alternatives will meet this standard because potential carcinogenic risks caused by exposure to contaminants will be addressed.

ASSESSMENT OF CHEMICAL-SPECIFIC ARARS AND TBCs FOR GROUNDWATER ALTERNATIVES GW1-2 AND GW2-2 - SELECTED REMEDY OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT PAGE 2 OF 2

Requirement	Citation	Status	Synopsis of Requirement	Evaluation/Action to be Taken
State of Connecticut				
Remediation Standard Regulations	CGS 22a-133k; RCSA 22a-133k - 1 through 3	Applicable	This regulation provides specific numerical cleanup criteria for contaminants in groundwater. Requirements are based on groundwater in the area being classified by the state as GB.	Alternatives will meet these standards by restricting access to contaminated GB groundwater through institutional controls (NSB-NLON Site Use Restrictions document for as long as the Navy owns the property) or environmental land use restrictions (if the Navy transfers ownership of the property). Groundwater monitoring would be conducted to track the location, migration and degradation of contaminants until concentrations have achieved acceptable levels.

ASSESSMENT OF ACTION-SPECIFIC ARARS AND TBCs FOR GROUNDWATER ALTERNATIVES GW1-2 AND GW2-2 - SELECTED REMEDY OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT PAGE 1 OF 3

Requirement	Citation	Status	Synopsis of Requirement	Evaluation/Action to be Taken
Federal				
Clean Water Act, Section 403, Pretreatment Regulations	Section 403	Potentially Applicable	General pretreatment requirements for discharge to a publicly owned treatment works (POTW).	Groundwater extracted during groundwater monitoring activities under this alternative would require testing and disposal. Discharge to a POTW would be considered for disposal of the groundwater, and these requirements would be met if determined to be applicable.
State of Connecticut				
Hazardous Waste Management: Generator and Handler Requirements	RCSA § 22a- 449(c) 100-101	Applicable	Connecticut is delegated to administer the federal Resource Conservation and Recovery Act statute through its state regulations. These sections establish standards for listing and identification of hazardous waste. The standards of 40 CFR 260-261 are incorporated by reference.	Waste generated during the installation of monitoring wells and monitoring activities under these alternatives will be properly characterized for disposal. Any waste determined to be hazardous through characterization will be managed in accordance with these regulations.
Hazardous Waste Management: Treatment, Storage, or Disposal Facility Standards	RCSA § 22a- 449(c) 104	Applicable	These sections establish standards for treatment, storage, and disposal facilities. The standards of 40 CFR 264 are incorporated by reference.	Any hazardous waste generated during the installation of monitoring wells and monitoring activities and temporarily stored on site will be managed in accordance with these regulations.

ASSESSMENT OF ACTION-SPECIFIC ARARS AND TBCs FOR GROUNDWATER ALTERNATIVES GW1-2 AND GW2-2 - SELECTED REMEDY OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT PAGE 2 OF 3

Requirement	Citation	Status	Synopsis of Requirement	Evaluation/Action to be Taken
State of Connecticut (co	ntinued)	•		
Standards of Water Quality/Water Quality Standards (WQSs) IV	CGS 22a-426 and promulgated standards	Applicable	Standards have been promulgated in accordance with GCS22a-426 of the Connecticut General Statutes to preserve and enhance the quality of state groundwater and surface water. Groundwater at the sites is classified as GB.	These standards for groundwater will be met through monitoring of natural degradation processes. Institutional controls will prevent the aquifer from being used as a water supply until these standards are attained.
Connecticul Regulations for the Well Drilling Industry	RSCA 25-128- 33 through 64	Applicable	These rules apply mainly to any new water supply or withdrawal wells. The rules specify that non-water supply wells must be constructed so that they are not a source or cause of groundwater contamination. Procedures for abandonment of wells apply to both water wells and other types of wells.	Non-water supply wells will not be constructed on the site unless it can be shown that they will not be a source of or cause groundwater contamination.
Connecticut Water Pollution Control Act - Permitting Regulations	RSCA 22a-430 1-8	Relevant and Appropriate	Establishes permitting requirements for discharges to surface water, groundwater, and POTWs.	If any remedial activities result in any direct discharges to surface water or groundwater, they must comply with the substantive requirements of these regulations. Specific criteria may be established for discharges so that numeric criteria established in the WQSs are not violated.

ASSESSMENT OF ACTION-SPECIFIC ARARS AND TBCs FOR GROUNDWATER ALTERNATIVES GW1-2 AND GW2-2 - SELECTED REMEDY OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT PAGE 3 OF 3

Requirement	Citation	Status	Synopsis of Requirement	Evaluation/Action to be Taken		
State of Connecticut (continued)						
Connecticut Environmental Land Use Restriction Regulations	RCSA 22A- 133q-1	Applicable	Requirements to prevent disturbance of contaminated soil and to ensure that contaminated groundwater is not used for human consumption.	Implementation of environmental land use restrictions including deed restrictions.		
Connecticut Soil Vapor Remediation Standards Regulations	RCSA 22a-133k- 3(c)	Applicable	These standards establish volatilization criteria to address volatile organic substances in groundwater and soil vapor.	For areas where data show the potential for an unacceptable indoor inhalation risk, remedial actions (e.g., sub-slab depressurization systems) will be applied, as needed, to comply with the substantive provisions of these regulations.		

ASSESSMENT OF LOCATION-SPECIFIC ARARS AND TBCs FOR GROUNDWATER ALTERNATIVES GW1-2 AND GW2-2 – SELECTED REMEDY OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT PAGE 1 OF 2

Requirement	Citation	Status	Synopsis of Requirement	Evaluation/Action to be Taken
FEDERAL	<u> </u>			
Coastal Zone Management Act	15 USC Parts 1451 et. seq.	Applicable	Requires that any actions must be conducted in a manner consistent with state-approved management programs.	The actions associated with these alternatives would comply with the substantive requirements of this act.
Floodplain Management	40 C.F.R. §6.302(b); Appendix A	Applicabl B	This regulation codifies standards established under Executive Order 11988 and requires action to avoid long- and short-term impacts associated with occupancy and modifications related to floodplain development, wherever there is a practicable alternative. Promotes the preservation and restoration of floodplains so that their natural and beneficial value can be realized.	If there is no practicable alternative to groundwater monitoring activities within the 100-year floodplain, all practicable means will be taken to limit harm to and preserve beneficial values of floodplains.
Protection of Wetlands	40 С.F.R. §6:302(a); Арралдіх А	Applicable	This regulation codifies standards established under Executive Order 11990. Under this requirement, no activity that adversely affects a wetland shall be permitted if a practicable alternative with lesser effects is available. If activity takes place, impacts must be minimized to the maximum extent.	If there is no practicable alternative to groundwater monitoring activities that may impact wetlands, measures will be taken to limit impacts.
Clean Water Act Guidelines for Specification of Disposal Sites for Dredged or Fill Material	33 USC §1344; Section 404(b)(1) 40 C.F.R. Parts 230 and 231 and 33 C.F.R. Parts 320 through 323	Applicable	Under this requirement, no activity that adversely affects a wetland shall be permitted if a practicable alternative with lesser effects is available. If activity takes place, impacts must be minimized to the maximum extent. This act controls discharges of dredged or fill material to protect aquatic ecosystems.	These alternatives may include installation, maintenance and/or operation of monitoring wells in or near a wetland. Any remedial activities that will alter wetlands will be conducted in accordance with these standards.

ASSESSMENT OF LOCATION-SPECIFIC ARARS AND TBCs FOR GROUNDWATER ALTERNATIVES GW1-2 AND GW2-2 – SELECTED REMEDY OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT PAGE 2 OF 2

Regulrement	Citation	Status	Synopsis of Requirement	Evaluation/Action to be Taken
STATE OF CONNECTICUT				<u> </u>
Connecticut Coastal Management Act	CGS §22a-444	Applicable	The sites are in a coastal zone management area; therefore, requirements for site planning must include approval of activities within the coastal zone to minimize project impacts to this area.	The activities associated with these alternatives would comply with the substantive requirements of this act.
Inland Wetland and Watercourses Act and Regulations	CGS 22a-36 through 45; RCSA 22a-39-1 through 15	Applicable	These standards regulate any operation in or affecting an inland wetland or watercourse, involving removal or deposition of material or any obstruction, alteration, or pollution of such wetlands. The standards incorporate local wetland regulations, which include additional substantive requirements and a wetland and watercourse boundary map for the Town of Groton.	If there is no practicable alternative to groundwater monitoring activities that may impact designated wetlands or watercourses, measures will be taken to limit impacts.

ASSESSMENT OF CHEMICAL-SPECIFIC ARARS AND TBCs FOR GROUNDWATER ALTERNATIVE GW2-3 – EXTRACTION AND OFF-SITE DISCHARGE OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT PAGE 1 OF 2

Requirement	Citation	Status	Synopsis of Requirement	Evaluation/Action to be Taken
Federal		<u> </u>		•
Cancer Slope Factors	Not Applicable	To Be Considered (TBC)	These are guidance values used in risk assessment to evaluate the potential carcinogenic hazard caused by exposure to contaminants.	Alternative would remove contaminated groundwater from the sites, pre-treat the extracted water if necessary, and discharge the water to the publicly owned treatment works (POTW) for final treatment and discharge. After removal of groundwater with contaminant concentrations greater than acceptable levels from the sites, there would be no remaining unacceptable risks to human health.
Reference Dos es	Not Applicable	TBC	These are guidance values used in risk assessment to evaluate the potential non-carcinogenic hazard caused by exposure to contaminants.	Alternative would remove contaminated groundwater from the sites, pre-treat the extracted water, if necessary, and discharge the water to the POTW for final treatment and discharge. After removal of groundwater with contaminant concentrations greater than acceptable levels from the sites, there would be no remaining unacceptable risks to human health.
Guidelines for Carcinogen Risk Assessment	EPA/630/P- 03/001F (March 2005)	TBC	Guidance for assessing cancer risk from exposures to pollutants and other agents in the environment. As part of the characterization process, explicit evaluations are made of the hazard and risk potential for susceptible lifestages, including children.	Alternative will meet this standard because potential carcinogenic risks caused by exposure to contaminants will be addressed.

ASSESSMENT OF CHEMICAL-SPECIFIC ARARS AND TBCS FOR GROUNDWATER ALTERNATIVE GW2-3 – EXTRACTION AND OFF-SITE DISCHARGE OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT PAGE 2 OF 2

Requirement	Citation	Status	Synopsis of Requirement	Evaluation/Action to be Taken
Federal (continued)	-			
Supplemental Guidance for Assessing Susceptibility from Early- Life Exposure to Carcinogens	EPA/630/R- 03/003F (March 2005)	TBC	Guidance for assessing cancer risks to children. Addresses a number of issues pertaining to cancer risks associated with early-life exposures and also provides specific guidance on potency adjustments for carcinogens acting through the mutagenic mode of action.	Alternative will meet this standard because potential carcinogenic risks caused by exposure to contaminants will be addressed.
State of Connecticut		<u> </u>		
Remediation Standard Regulations	CGS 22a-133k; RCSA 22a- 133k - 1 through 3	Applicable	This regulation provides specific numerical cleanup criteria for contaminants in groundwater. Requirements are based on groundwater in the area being classified by the state as GB.	Groundwater extraction would continue until contaminants concentrations have achieved acceptable levels.

ASSESSMENT OF ACTION-SPECIFIC ARARS AND TBCs FOR GROUNDWATER ALTERNATIVE GW2-3 - EXTRACTION AND OFF-SITE DISCHARGE OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT PAGE 1 OF 3

Requirement	Citation	Status	. Synopsis of Requirement	Evaluation/Action to be Taken
Federal		•	**	
Clean Water Act, Section 403, Pretreatment Regulations State of Connecticut	Section 403	Potentially Applicable	General pretreatment requirements for discharge to a publicly owned treatment works (POTW). If remedial activities include such a discharge to the local sanitary sewer, pretreatment standards would be Applicable or Relevant and Appropriate Requirements (ARARs). Standards would be enforced through the state program.	The extracted water may require pre- lreatment prior to discharge to the sanitary sewer system. Groundwater extracted during groundwater monitoring activities under this alternative will require testing and disposal. Discharge to a POTW would be considered for disposal of the groundwater, and these requirements would be met if determined to be applicable.
Hazardous Waste Management: Generator and Handler Requirements	RCSA § 22a- 449(c) 100-101	Applicable	Connecticut is delegated to administer the federal Resource Conservation and Recovery Act statute through its state regulations. These sections establish standards for listing and identification of hazardous waste. The standards of 40 CFR 260-261 are incorporated by reference.	Waste generated during the installation of extraction wells and extraction activities, as well as monitoring, under this alternative will be properly characterized for disposal. Any waste determined to be hazardous through characterization will be managed in accordance with these regulations.
Hazardous Waste Management: Treatment, Storage, or Disposal Facility Standards	RCSA § 22a- 449(c) 104	Applicable	These sections establish standards for treatment, storage, and disposal facilities. The standards of 40 CFR 264 are incorporated by reference.	Any hazardous waste generated during the installation of extraction wells and extraction activities, as well as monitoring, and temporarily stored on site will be managed in accordance with these regulations.

ASSESSMENT OF ACTION-SPECIFIC ARARS AND TBCs FOR GROUNDWATER ALTERNATIVE GW2-3 - EXTRACTION AND OFF-SITE DISCHARGE OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT PAGE 2 OF 3

Requirement	Citation	Status	Synopsis of Requirement	Evaluation/Action to be Taken
State of Connecticut (continued)			<u> </u>
Standards of Water Quality/Water Quality Standards (WQSs) IV	CGS 22a-426 and promulgated standards	Applicable	Standards have been promulgated in accordance with GCS22a-426 of the Connecticut General Statutes to preserve and enhance the quality of state groundwater and surface water. Groundwater at the sites is classified as GB,	These standards for groundwater will be met through monitoring of natural degradation processes. Institutional controls will prevent the aquifer from being used as a water supply until these standards are attained.
Connecticut Water Pollution Control Act	RCSA §22a - 416 to 599	Applicable	The regulations govern the treatment and discharge of water into surface water bodies in the state.	Applicable sections of the POTW permit would be used to determine pre-treatment requirements for extracted groundwater.
Connecticut Regulations for the Well Drilling Industry	RSCA 25-128- 33 through 64	Applicable	These rules apply mainly to any new water supply or withdrawal wells. The rules specify that non-water supply wells must be constructed so that they are not a source or cause of groundwater contamination. Procedures for abandonment of wells apply to both water wells and other types of wells.	Non-water supply wells will not be constructed on the site unless it can be shown that they will not be a source or cause of groundwater contamination.
Connecticut Water Pollution Control Act - Permitting Regulations	RSCA 22a-430 1-8	Relevant and Appropriate	Establishes permitting requirements for discharges to surface water, groundwater, and POTWs.	If any remedial activities result in any direct discharges to surface water or groundwater, they must comply with the substantive requirements of these regulations. Specific criteria may be established for discharges so that numeric criteria established in the WQSs are not violated.

ASSESSMENT OF ACTION-SPECIFIC ARARS AND TBCs FOR GROUNDWATER ALTERNATIVE GW2-3 - EXTRACTION AND OFF-SITE DISCHARGE OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT PAGE 3 OF 3

Requirement	Citation	Status	Synopsis of Requirement	Evaluation/Action to be Taken
State of Connecticut	(continued)		· · · · · · · · · · · · · · · · · · ·	
Connecticut Environmental Land Use Restriction Regulations	RCSA 22A- 133q-1	Applicable	Requirements to prevent disturbance of contaminated soil and to ensure that contaminated groundwater is not used for human consumption.	Implementation of environmental land use restrictions including dead restrictions.
Connecticut Environmental Land Use Restriction Regulations	RCSA 22A- 133q-1	Applicable	Requirements to prevent disturbance of contaminated soil and to ensure that contaminated groundwater is not used for human consumption.	Implementation of environmental land use restrictions including deed restrictions.

ASSESSMENT OF LOCATION-SPECIFIC ARARS AND TBCs FOR GROUNDWATER ALTERNATIVE GW2-3 – EXTRACTION AND OFF-SITE DISCHARGE OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT PAGE 1 OF 2

Requirement	Citation	Status	Synopsis of Regulrement	Evaluation/Action to be Taken
FEDERAL				
Coastal Zone Management Act	16 USC Parts 1451 et. seq.	Applicable	Requires that any actions must be conducted in a manner consistent with state-approved management programs.	The actions associated with Alternative GW2-3 would comply with the substantive requirements of this act.
Floodplain Management	40 C.F.R. §6.302(b); Appendix A	Applicable	This regulation codifies standards established under Executive Order 11988 and requires action to avoid long- and short-term impacts associated with occupancy and modifications related to floodplain development, wherever there is a practicable alternative. Promotes the preservation and restoration of floodplains so that their natural and beneficial value can be realized.	If there is no practicable alternative to the extraction and discharge remedy within the 100-year floodplain, all practicable means will be taken to limit harm to and preserve beneficial values of floodplains.
Protection of Wetlands	40 C.F.R. §6.302(a); Appendix A	Applicable	This regulation codifies standards established under Executive Order 11990. Under this requirement, no activity that adversely affects a wetland shall be permitted if a practicable atternative with lesser effects is available. If activity takes place, impacts must be minimized to the maximum extent.	If there is no practicable alternative to implementing the extraction and discharge remedy in a manner that may impact wellands, measures will be taken to limit impacts.
Clean Water Act Guidelines for Specification of Disposal Sites for Dredged or Fill Material	33 USC §1344; Section 404(b)(1) 40 C.F.R. Parts 230 and 231 and 33 C.F.R. Parts 320 through 323	Applicable	Under this requirement, no activity that adversely affects a welland shall be permitted if a practicable alternative with lesser effects is available. If activity takes place, impacts must be minimized to the maximum extent. This act controls discharges of dredged or fill material to protect equatic ecosystems.	This alternative includes instaltation. maintenance and/or operation of the extraction and off-site discharge remedy in or near a wetland. Any remedial activities that will alter wetlands will be conducted in accordance with these standards.

ASSESSMENT OF LOCATION-SPECIFIC ARARS AND TBCs FOR GROUNDWATER ALTERNATIVE GW2-3 – EXTRACTION AND OFF-SITE DISCHARGE OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT PAGE 2 OF 2

Requirement	Citation	Status	Synopsis of Requirement	Evaluation/Action to be Taken
STATE OF CONNECTICUT				
Connecticut Coastal Management Act	CGS §22a-444	Applicable	The site is in a coastal zone management area; therefore, requirements for site planning must include approval of activities within the coastal zone to minimize project impacts to this area.	The activities associated with Alternative GW2- 3 would comply with the substantive requirements of this act.
Inland Wetland and Watercourses Act and Regulations	CGS 22a-36 (hrough 45; RCSA 22a-39-1 (hrough 15	Applicable	These standards regulate any operation in or affecting an inland wetland or watercourse, involving removal or deposition of material or any obstruction, alteration, or politution of such wetlands. The standards incorporate local wetland regulations, which include additional substantive requirements and a wetland and watercourse boundary map for the Town of Groton.	If there is no practicable alternative to implementing the extraction and discharge remedy in a manner that may impact designated wetlands or watercourses, measures will be taken to limit impacts.

ASSESSMENT OF CHEMICAL-SPECIFIC ARARS AND TBCs FOR GROUNDWATER ALTERNATIVE GW3-2 - SELECTED REMEDY OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT PAGE 1 OF 2

Requirement	Citation	Status	Synopsis of Requirement	Evaluation/Action to be Taken
Federal				
Cancer Slope Factors	Not Applicable	To Be Considered (TBC)	These are guidance values used in risk assessment to evaluate the potential carcinogenic hazard caused by exposure to contaminants.	Alternatives would prevent exposure to contaminated groundwater until concentrations have achieved acceptable levels that meet human health concerns.
Reference Doses	Not Applicable	TBC	These are guidance values used in risk assessment to evaluate the potential non-carcinogenic hazard caused by exposure to contaminants.	Alternatives would prevent exposure to contaminated groundwater until concentrations have achieved acceptable levels that meet human health concerns.
Guidelines for Carcinogen Risk Assessment	EPA/630/P- 03/001F (March 2005)	TBC	Guidance for assessing cancer risk from exposures to pollutants and other agents in the environment. As part of the characterization process, explicit evaluations are made of the hazard and risk potential for susceptible lifestages, including children.	Alternative will meet this standard because potential carcinogenic risks caused by exposure to contaminants will be addressed.
Supplemental Guidance for Assessing Susceptibility from Early- Life Exposure to Carcinogens	EPA/630/R- 03/003F (March 2005)	TBC	Guidance for assessing cancer risks to children. Addresses a number of issues pertaining to cancer risks associated with early-life exposures and also provides specific guidance on potency adjustments for carcinogens acting through the mutagenic mode of action.	Alternative will meet this standard because potential carcinogenic risks caused by exposure to contaminants will be addressed.

ASSESSMENT OF CHEMICAL-SPECIFIC ARARS AND TBCS FOR GROUNDWATER ALTERNATIVE GW3-2 - SELECTED REMEDY OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT PAGE 2 OF 2

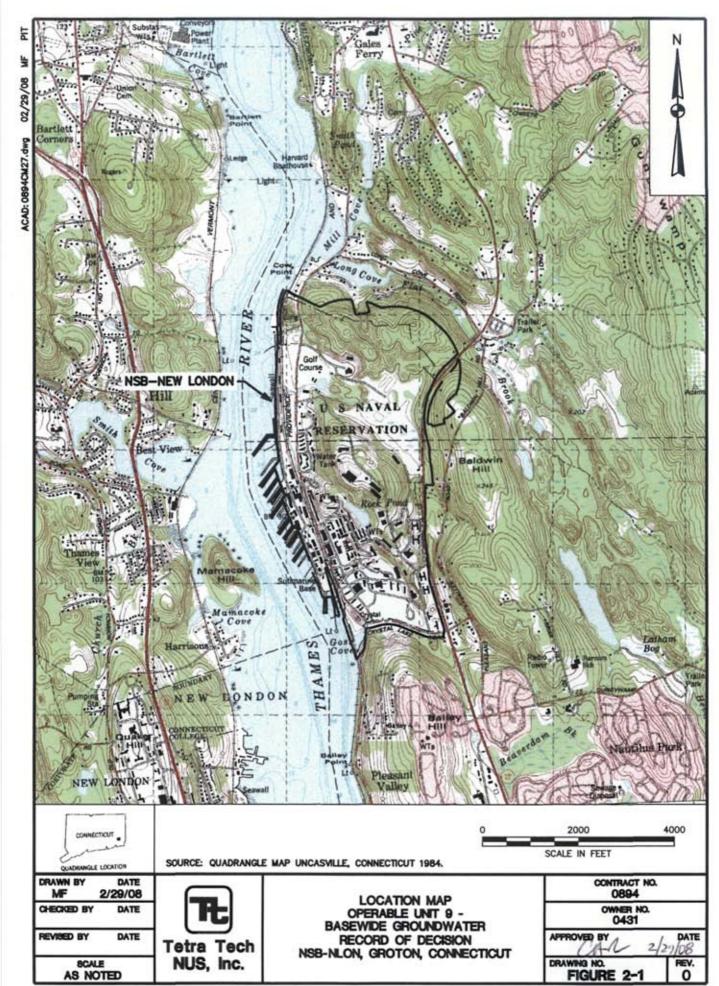
Requirement	Citation	Status	Synopsis of Requirement	Evaluation/Action to be Taken		
State of Connecticut						
Remediation Standard Regulations	CGS 22a-133k; RCSA 22a-133k - 1 through 3	Applicable	This regulation provides specific numerical cleanup criteria for contaminants in groundwater. Requirements are based on groundwater in the area being classified by the state as GB.	Alternatives will meet these standards by restricting access to contaminated GB groundwater through institutional controls (NSB-NLON Site Use Restrictions document for as long as the Navy owns the property) or environmental land use restrictions if the Navy transfers ownershill of the property).		

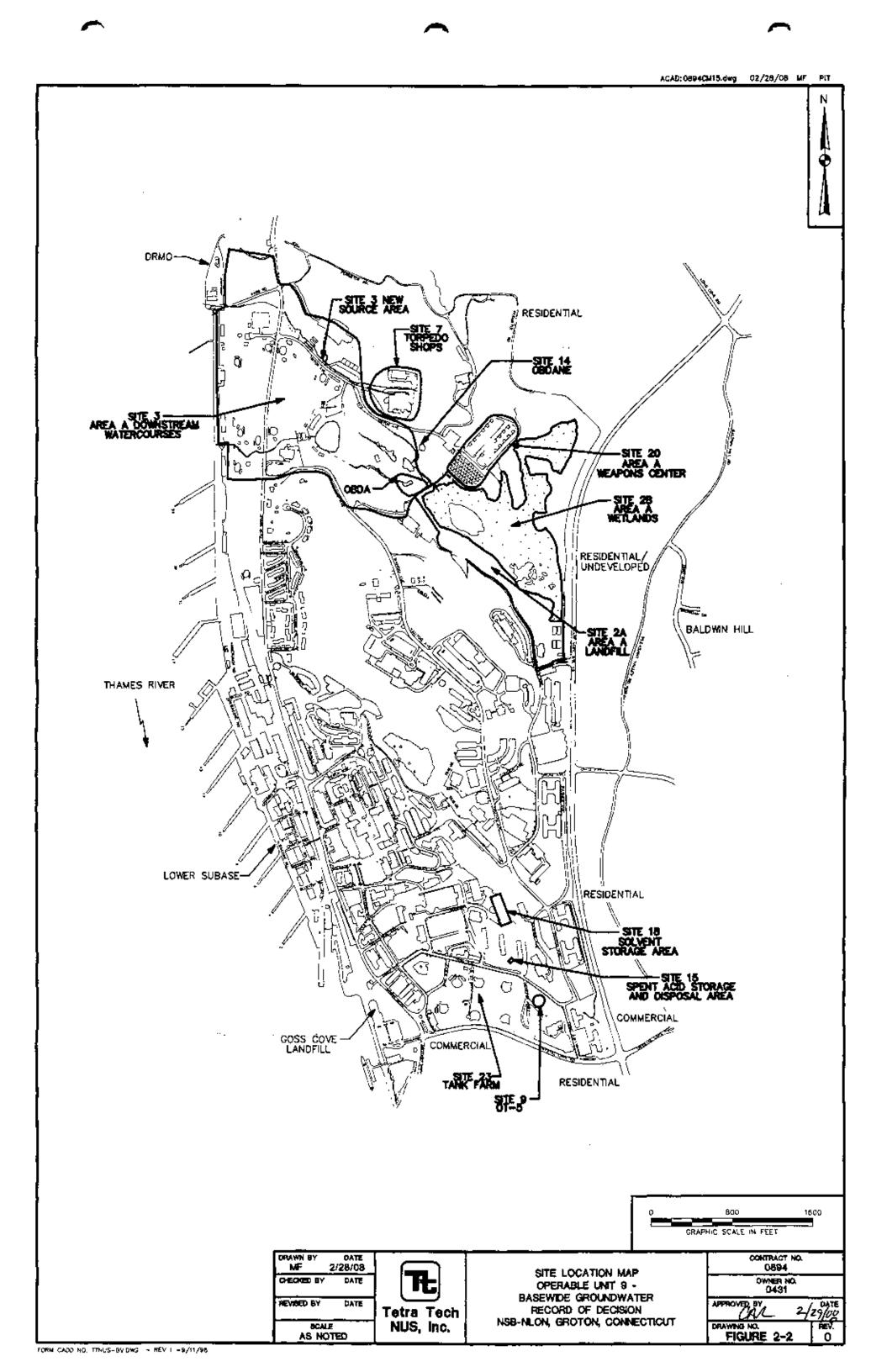
ASSESSMENT OF ACTION-SPECIFIC ARARS AND TBCs FOR GROUNDWATER ALTERNATIVE GW3-2 - SELECTED REMEDY OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT PAGE 1 OF 2

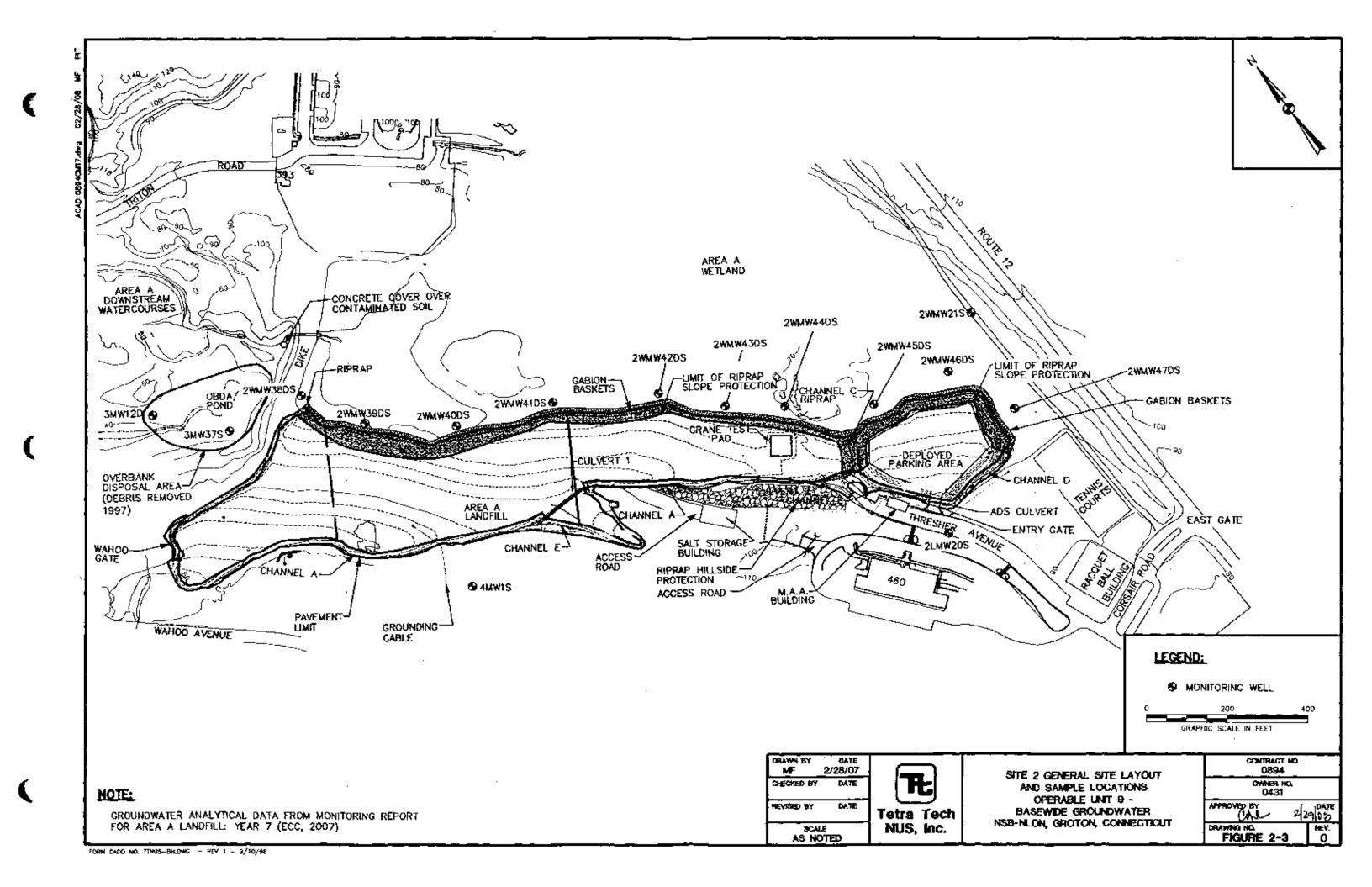
Requirement	Citation	Status	Synopsis of Requirement	Evaluation/Action to be Taken		
State of Connecticut						
Standards of Water Quality/Water Quality Standards (WQSs) IV	CGS 22a-426 and promulgated standards	Applicable	Standards have been promulgated in accordance with GCS22a-426 of the Connecticut General Statutes to preserve and enhance the quality of state groundwater and surface water. Groundwater at the sites is classified as GB.	These standards for groundwater will be met through monitoring of natural degradation processes. Institutional controls will prevent the aquifer from being used as a water supply until these standards are attained.		
Connecticut Regulations for the Well Drilling Industry	RSCA 25-128- 33 through 64	Applicable	These rules apply mainly to any new water supply or withdrawal wells. The rules specify that non-water supply wells must be constructed so that they are not a source or cause of groundwater contamination. Procedures for abandonment of wells apply to both water wells and other types of wells.	Non-water supply wells will not be constructed on the site unless it can be shown that they will not be a source or cause of groundwater contamination.		
Connecticut Water Pollution Control Act - Permitting Regulations	RSCA 22a-430 1-8	Relevant and Appropriate	Establishes permitting requirements for discharges to surface water, groundwater, and POTWs.	If any remedial activities result in any direct discharges to surface water or groundwater, they must comply with the substantive requirements of these regulations. Specific criteria may be established for discharges so that numeric criteria established in the WQSs are not violated.		

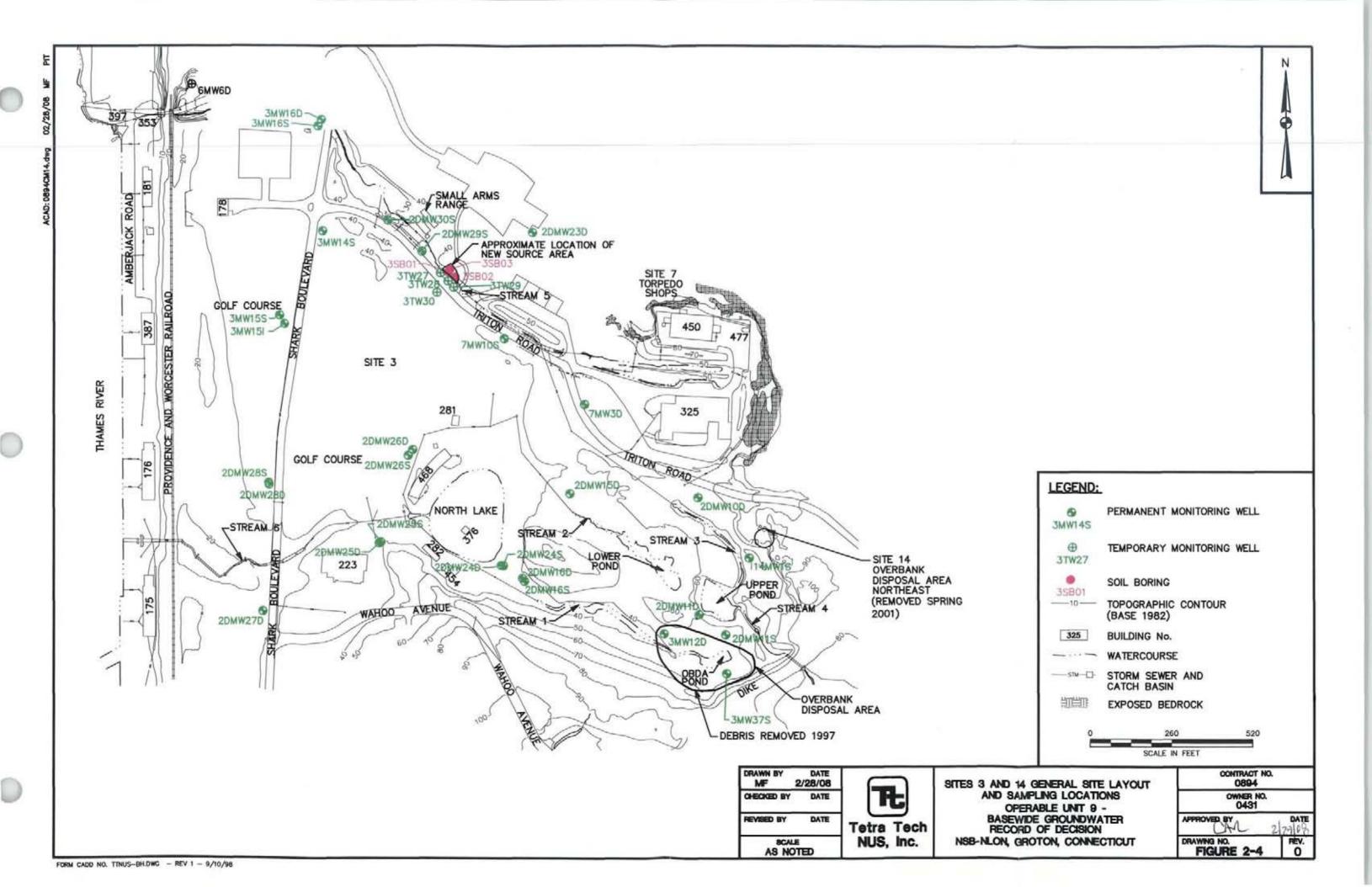
ASSESSMENT OF ACTION-SPECIFIC ARARS AND TBCS FOR GROUNDWATER ALTERNATIVE GW3-2 - SELECTED REMEDY OPERABLE UNIT 9 RECORD OF DECISION NAVAL, SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT PAGE 2 OF 2

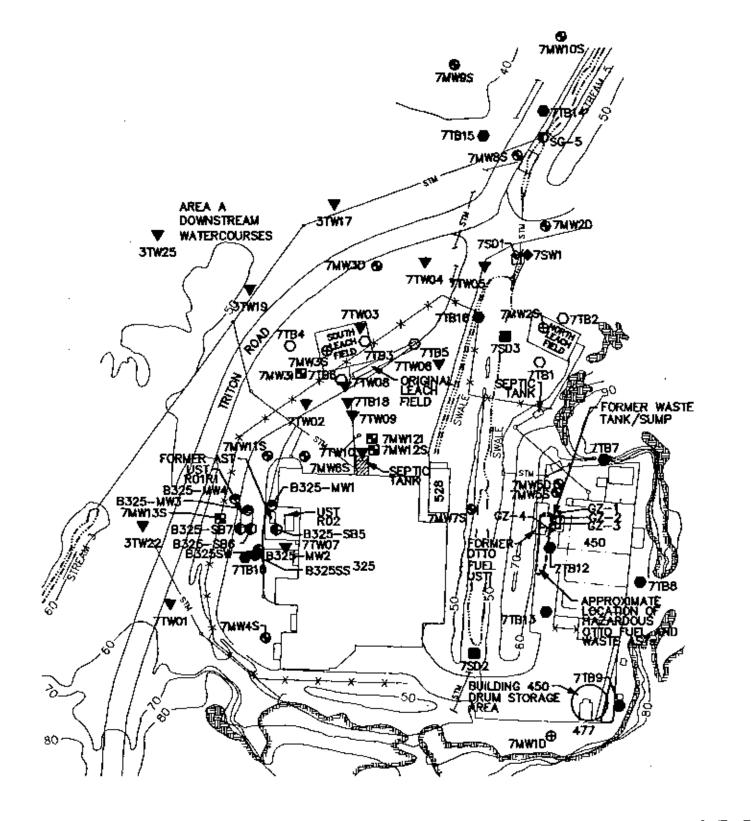
Requirement	Citation	Status	Synopsis of Requirement	Evaluation/Action to be Taken			
State of Connecticut (cor	State of Connecticut (continued)						
Connecticut Environmental Land Use Restriction Regulations	RCSA 22A- 133q-1	Applicable	Requirements to prevent disturbance of contaminated soil and to ensure that contaminated groundwater is not used for human consumption.	Implementation of environmental land use restrictions including deed restrictions.			
Connecticut Soil Vapor Remediation Standards Regulations	RCSA 22a-133k- 3(c)	Applicable	These standards establish volatilization criteria to address volatile organic substances in groundwater and soil vapor.	For areas where data show the potential for an unacceptable indoor inhalation risk, remedial actions (e.g., sub-slab depressurization systems) will be applied, as needed, to comply with the substantive provisions of these regulations.			











NOTES

- 1. UNDERGROUND UTILITY LOCATIONS ARE APPROXIMATE.
- 2. BASE MAP AND UTILITY INFORMATION FROM MAPS OF NSB-NLON AND PHASE II RI WORK PLAN.

<u>LEGEND</u>

GROUNDWATER MONITORING PROGRAM WELL

⊕7MW2S PHASE I MONITORING WELL

⊕7MW7S PHASE II MONITORING WELL

OB325—MWY SITE CHARACTERIZATION MONITORING WELL

O7TB1 PHASE I TEST BORING

•7TB12 PHASE II TEST BORING

©8325-S86 SITE CHARACTERIZATION SOIL BORING

\$\sqrt{75WI}\$ PHASE I EXISTING SURFACE WATER SAMPLE

#75D3 PHASE II SEDIMENT SAMPLE

CSG-5 PHASE II STAFF GAUGE

▼71B17 BGOURI TEST BORING LOCATION

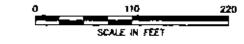
▼7TW17 BGOURI TEMPORARY WELL

TOPOGRAPHIC CONTOUR

123
BUILDING No.

CATCH BASIN EXPOSED BEDROCK

* * FENCE



DRAWN BY DATE
MF 2/29/08
CHECKED BY DATE
REVISED BY DATE
BOALE

BOALE

Totra Toch
NUS, Inc.

AS NOTED

SITE 7 GENERAL SITE LAYOUT AND SAMPLING LOCATIONS OPERABLE UNIT 9 -BASEWIDE GROUNDWATER RECORD OF DECISION NSB-NLON, GROTON, CONNECTICUT ORSA

COMEST NO.

O4ST

APPROVED BY

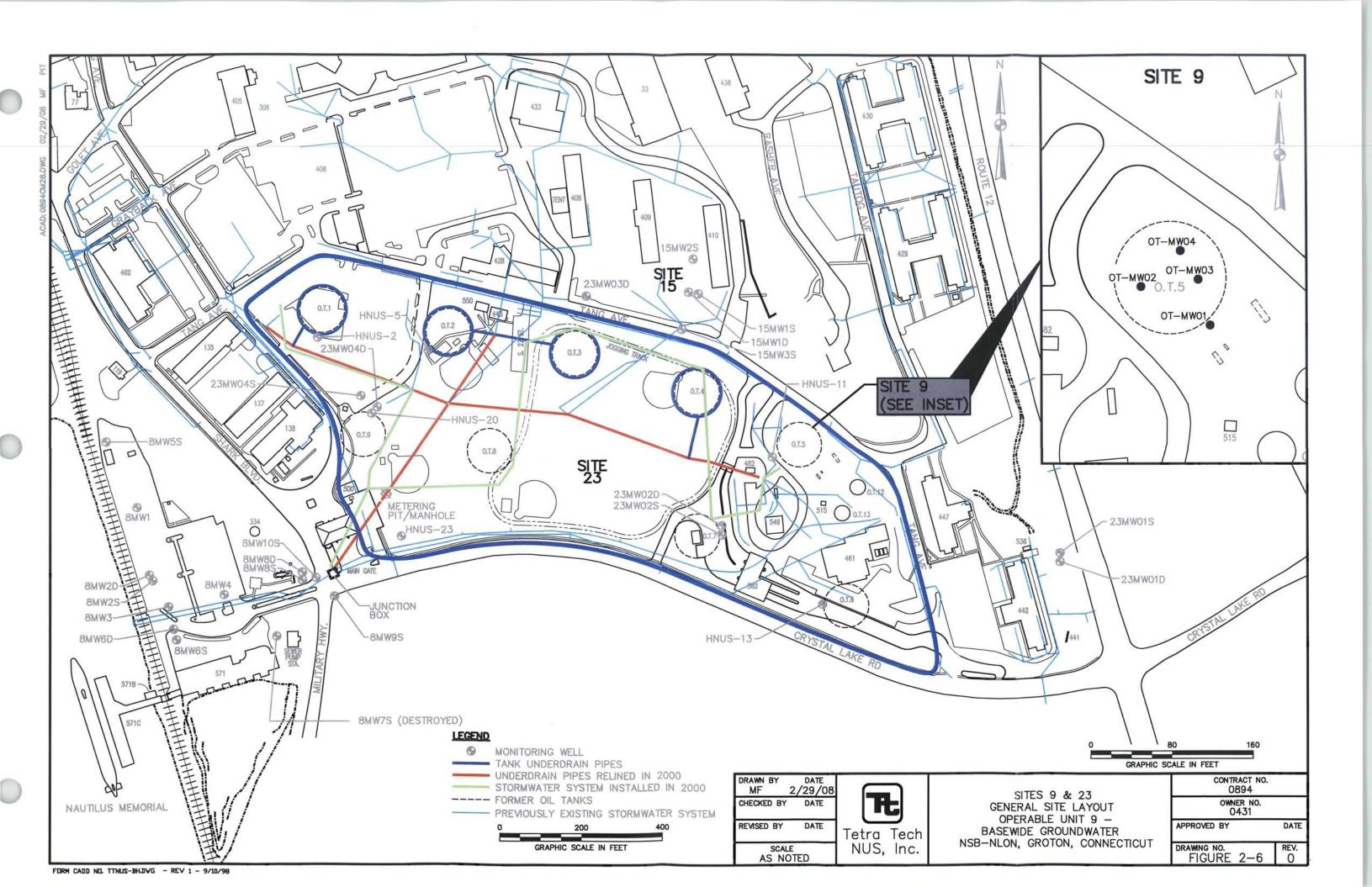
CA-0 2 2910

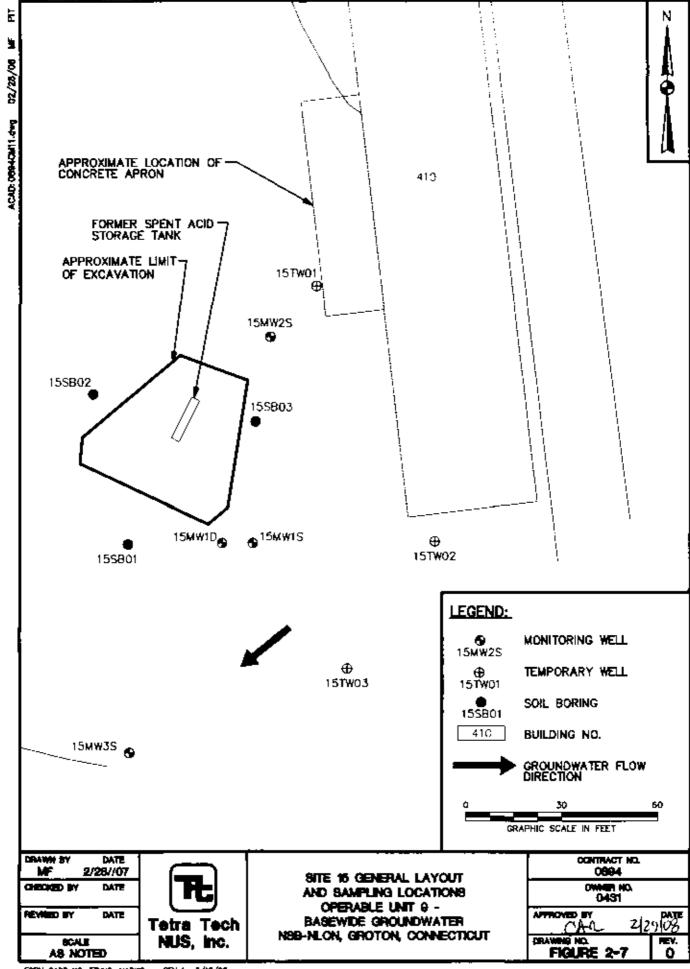
DRAWING NO.

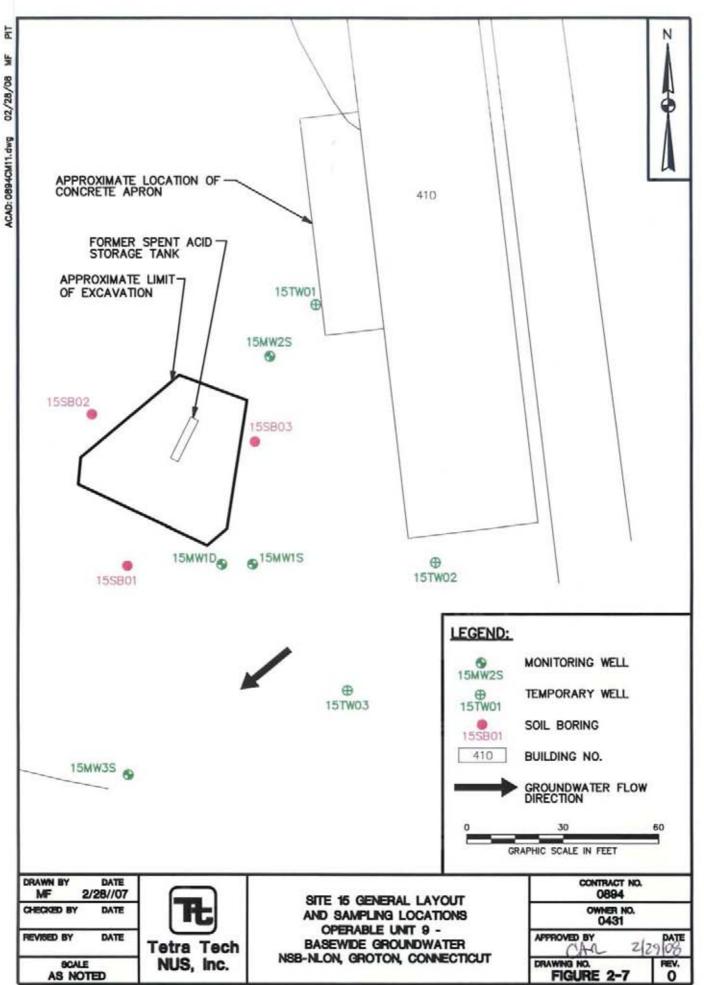
FIGURE 2-5

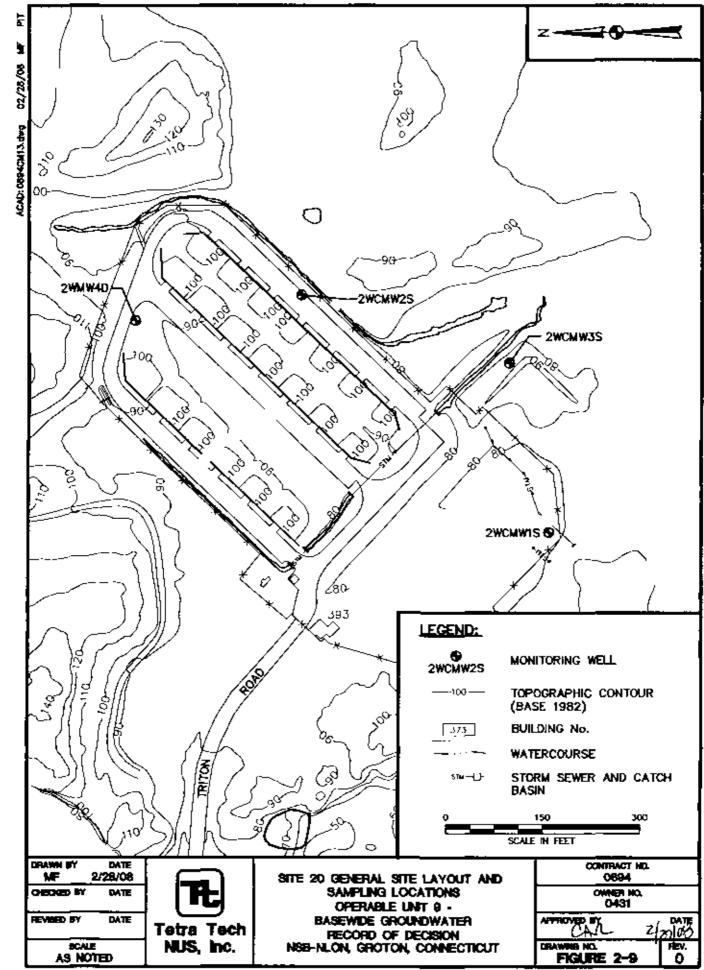
O

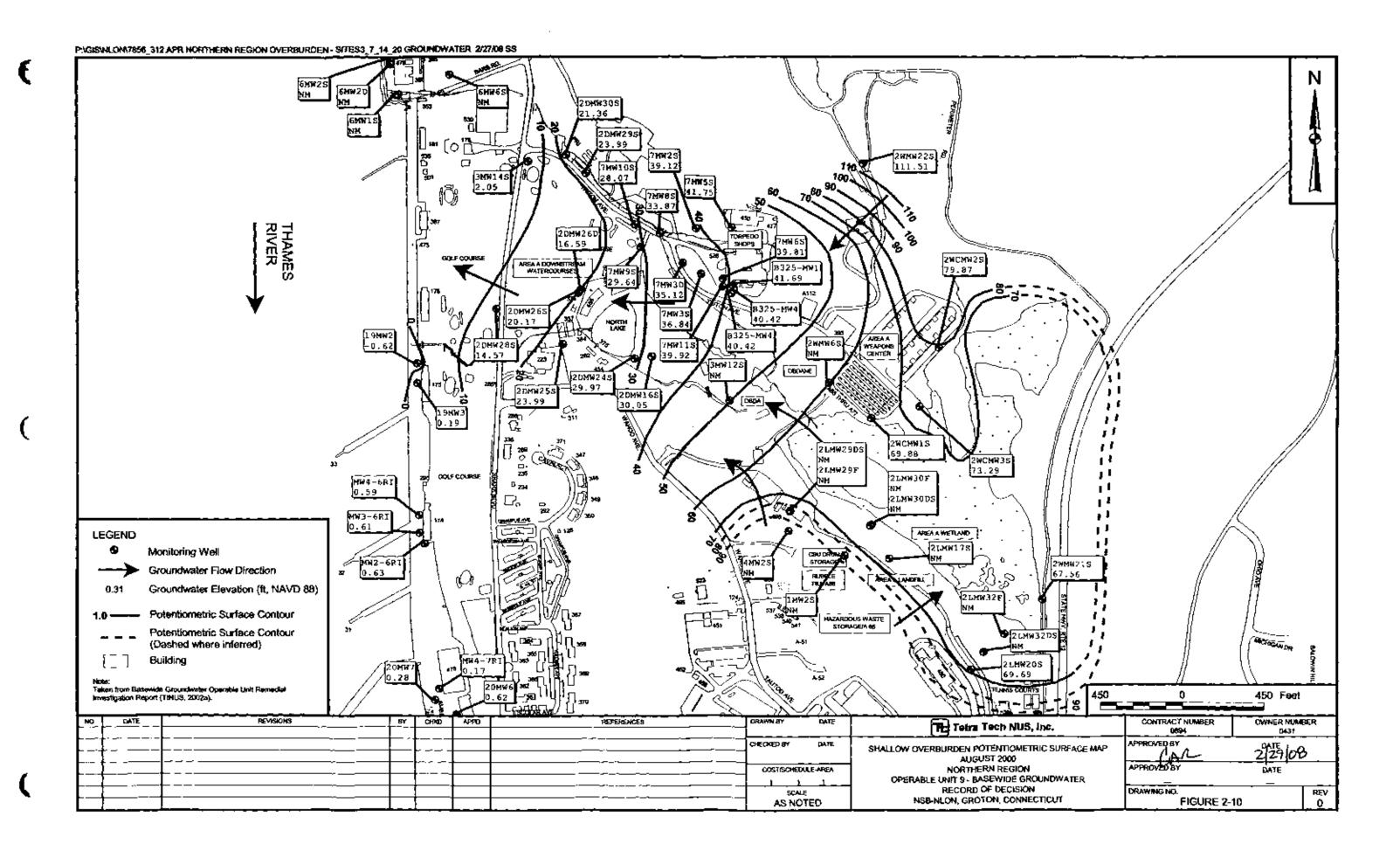
CONTRACT NO.

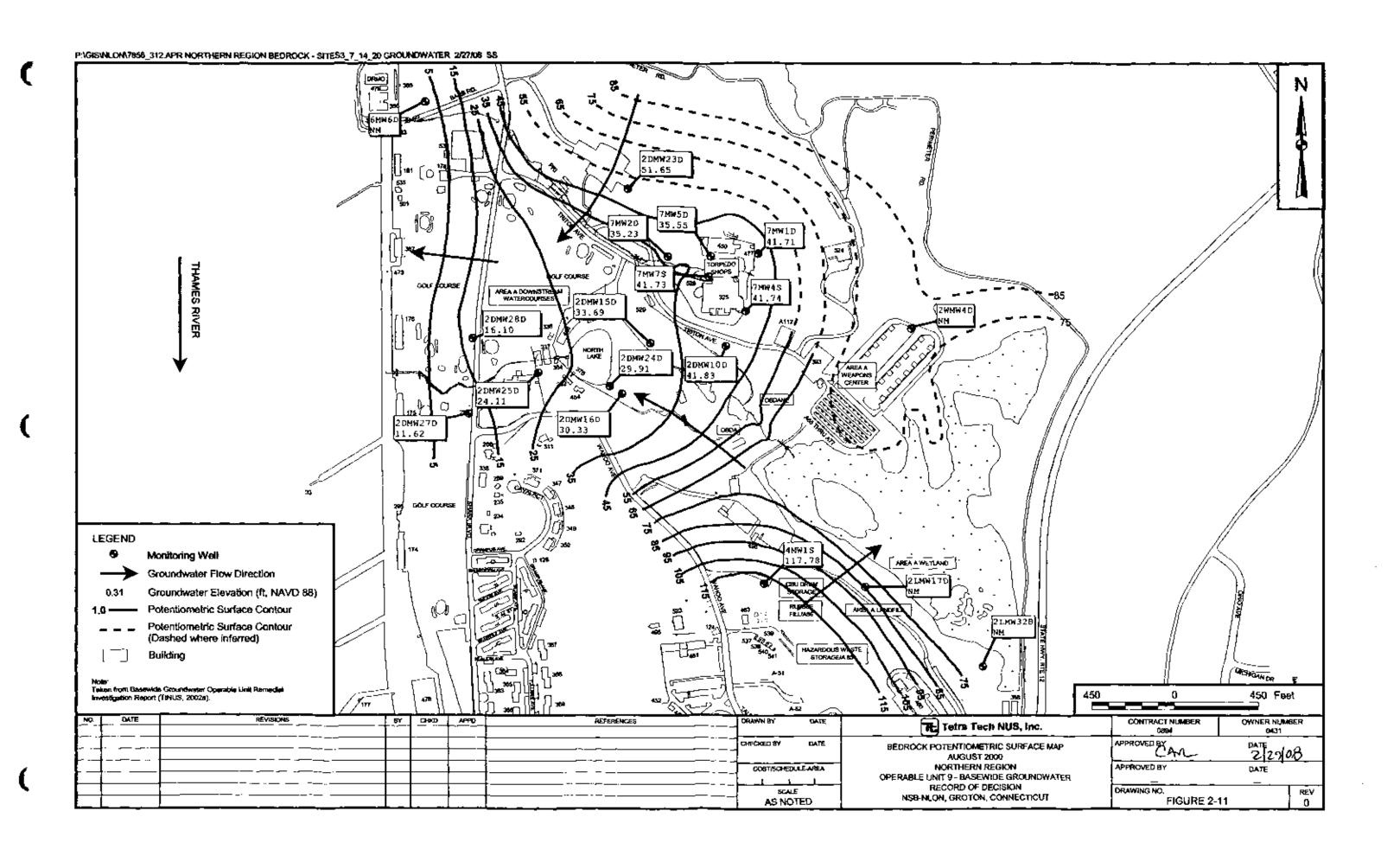


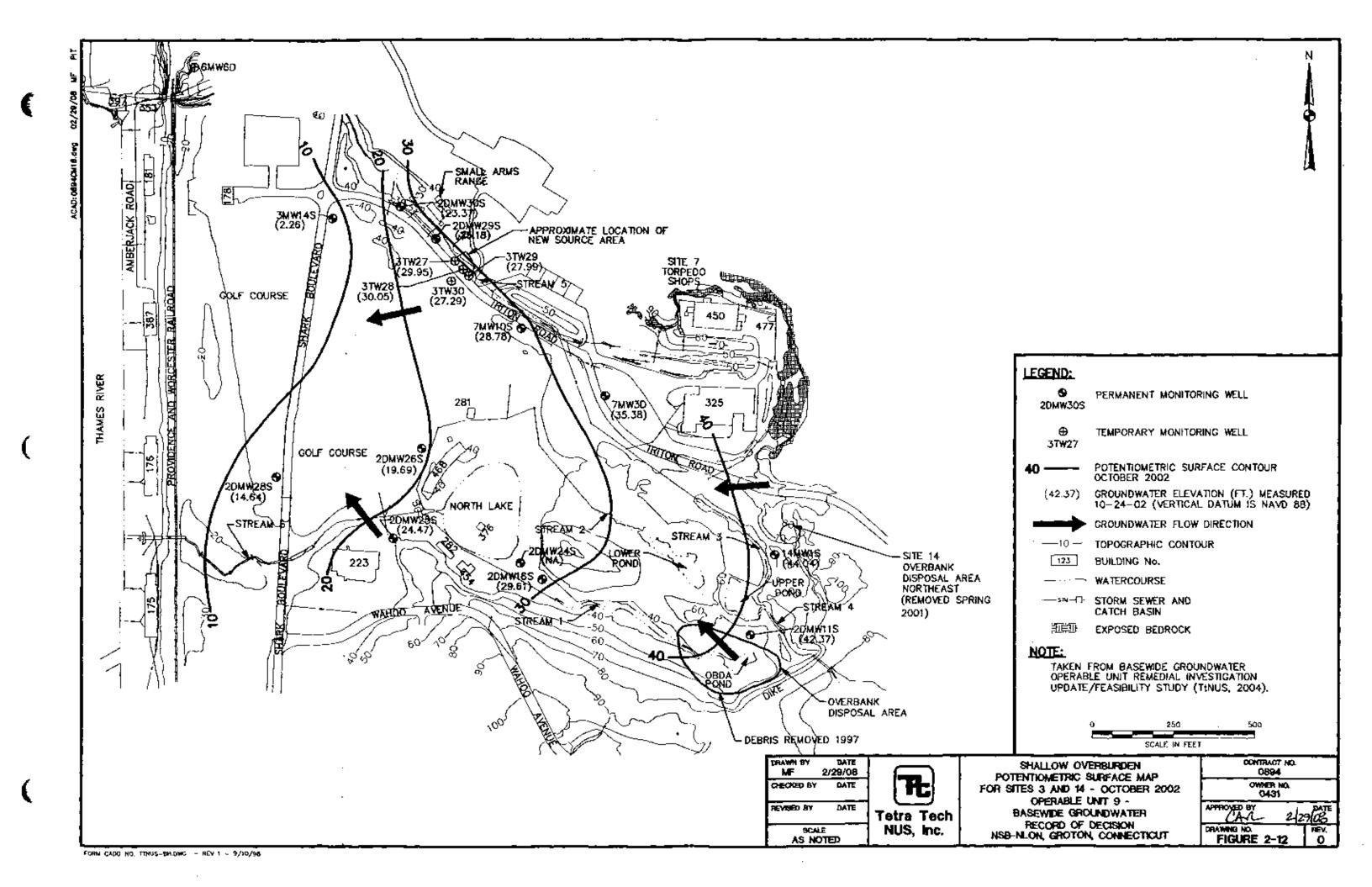


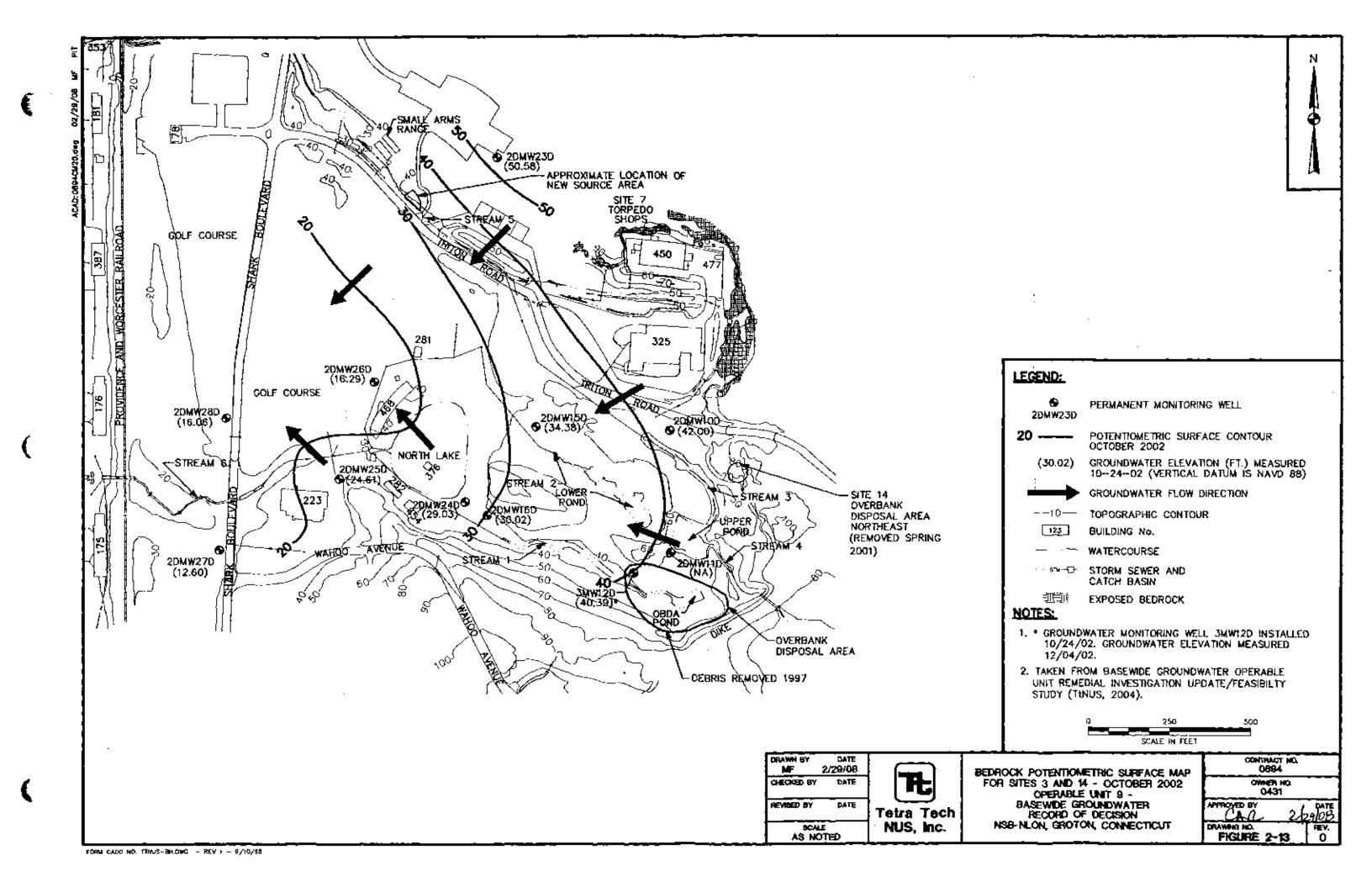


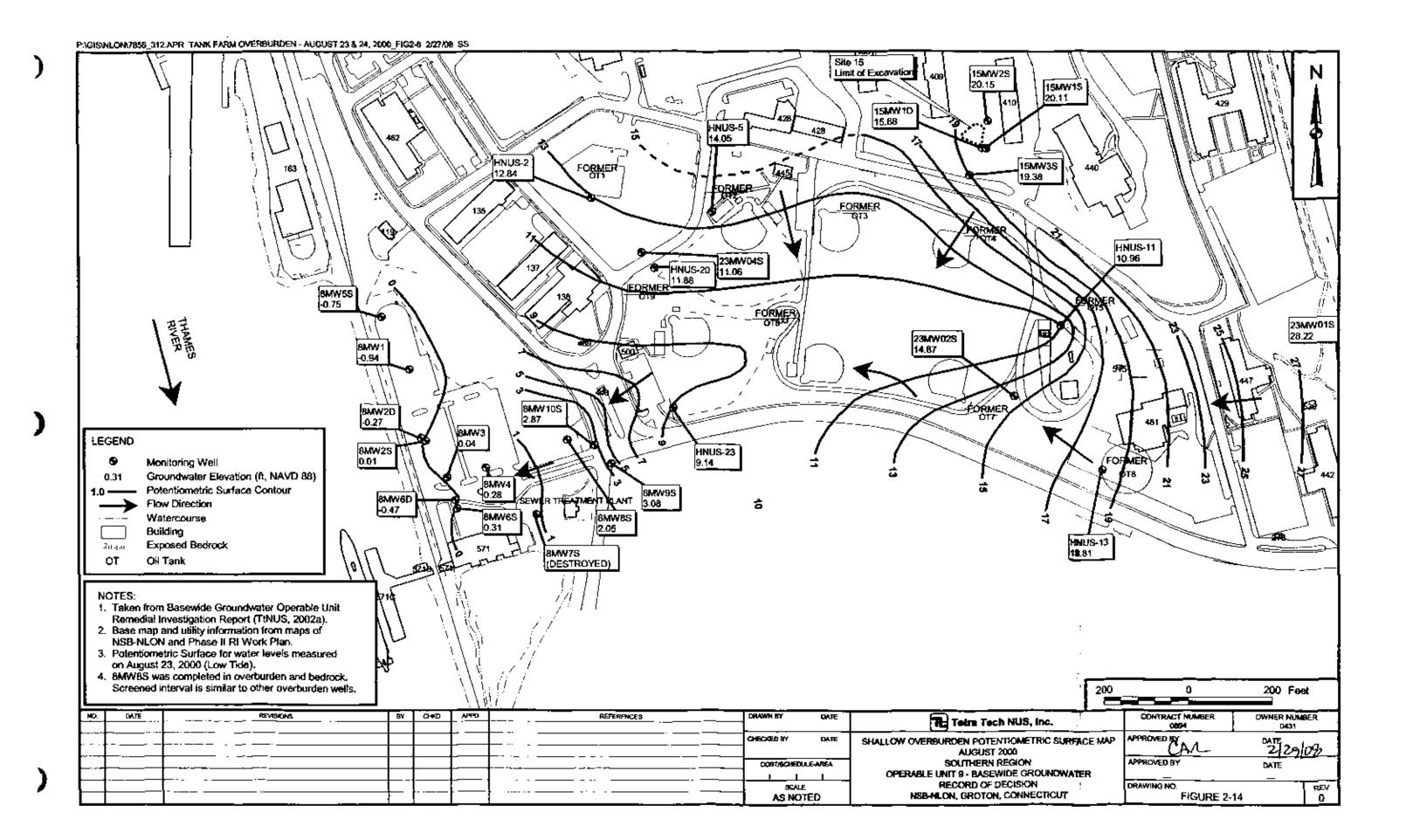


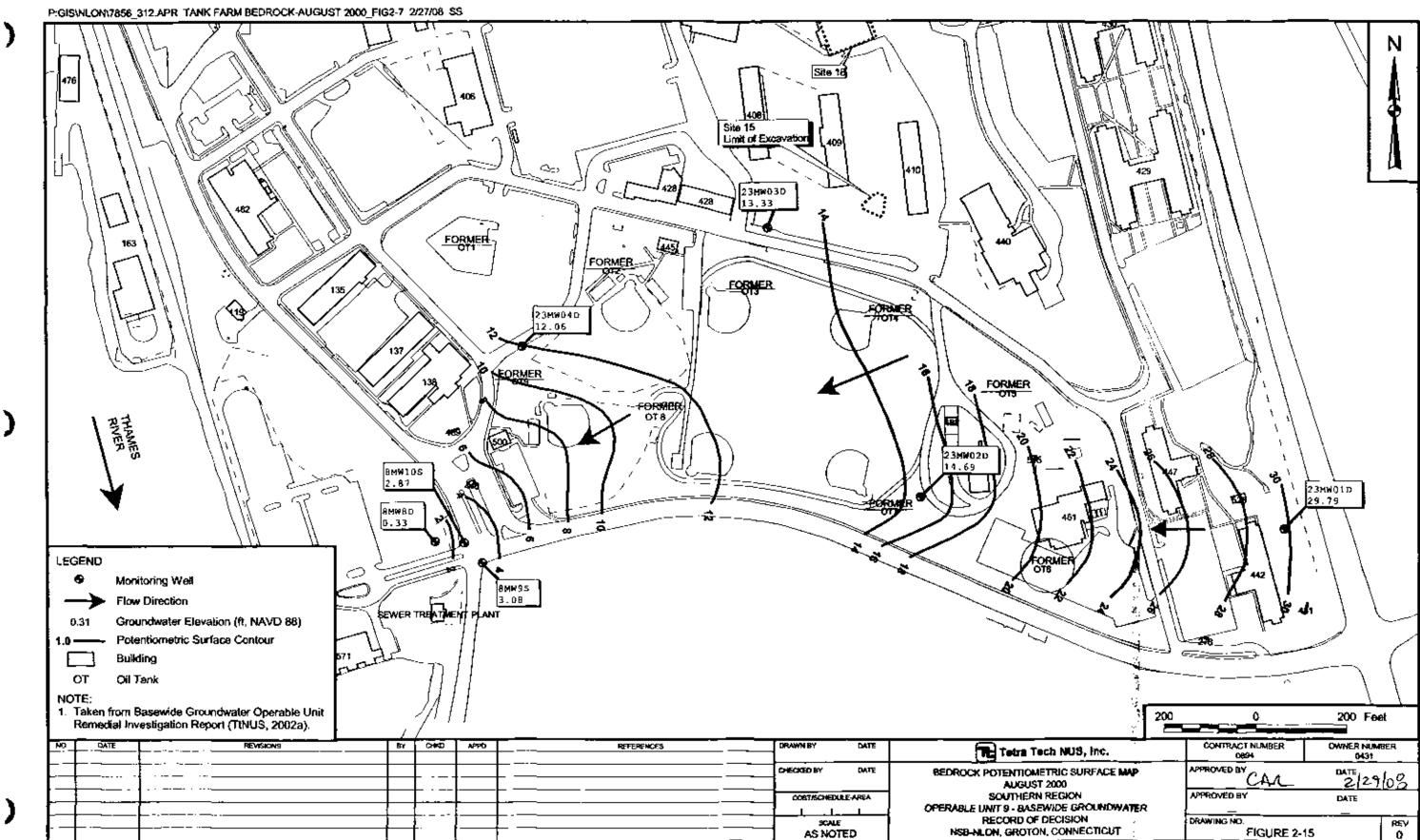




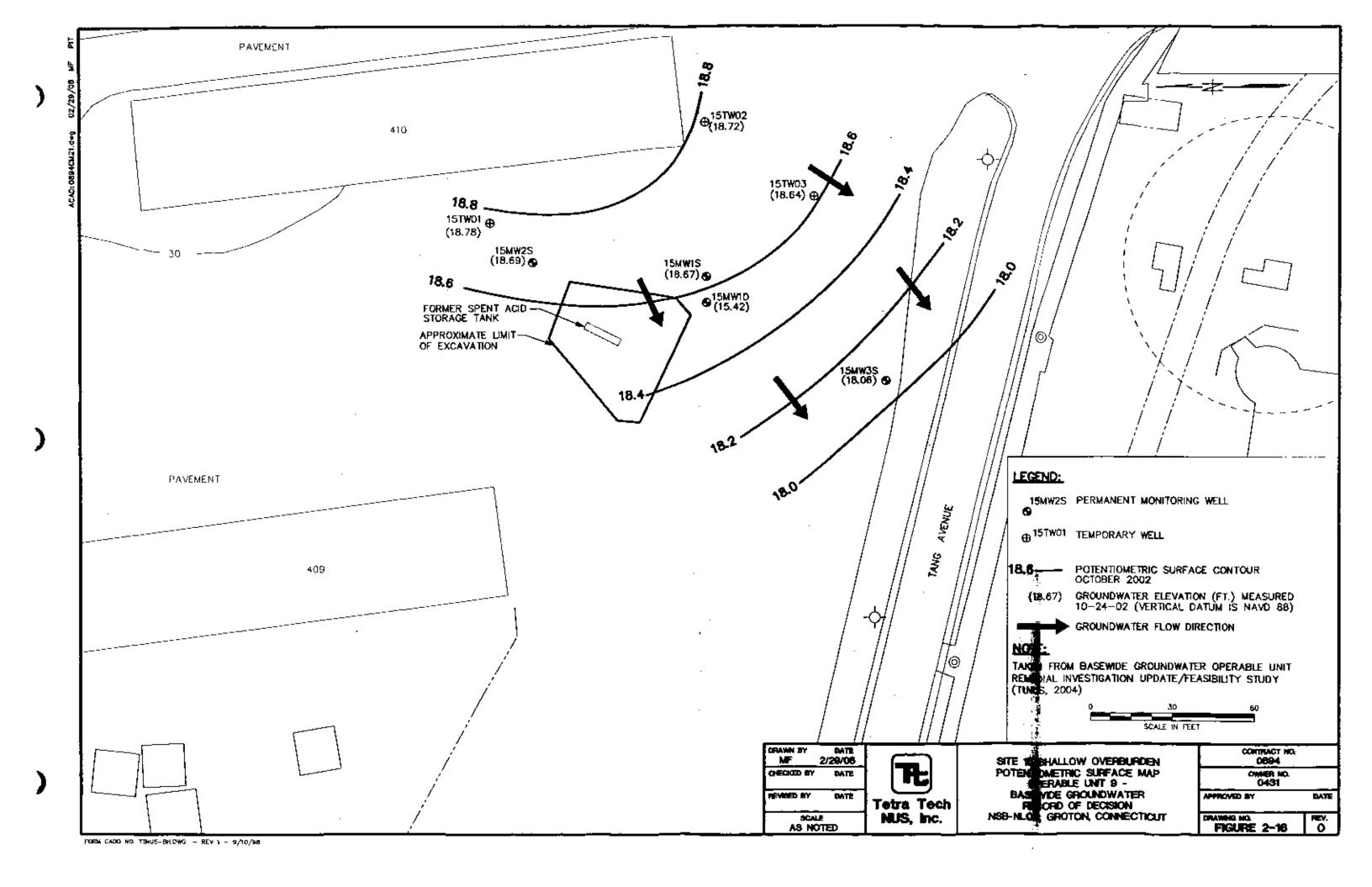


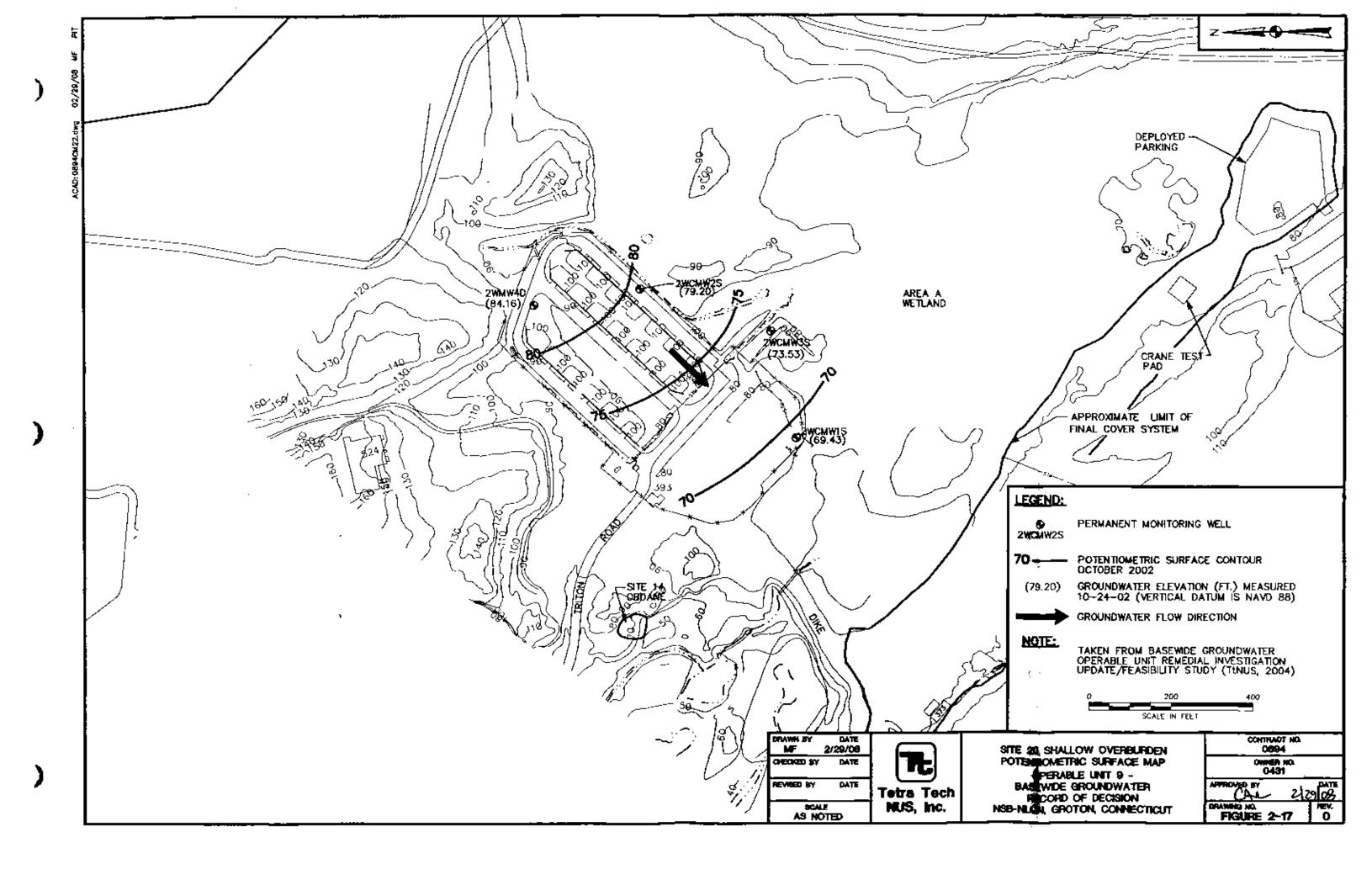


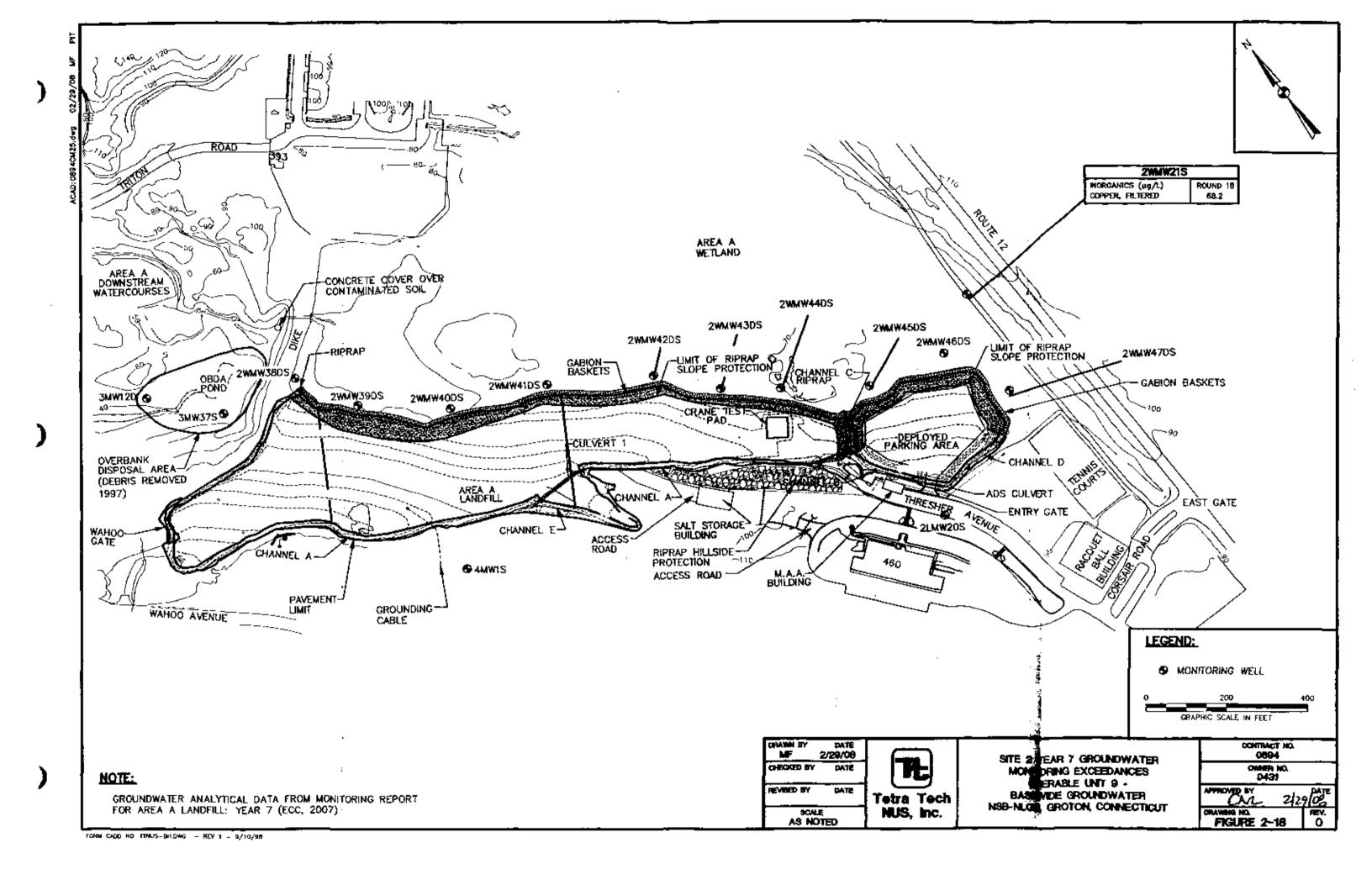




.







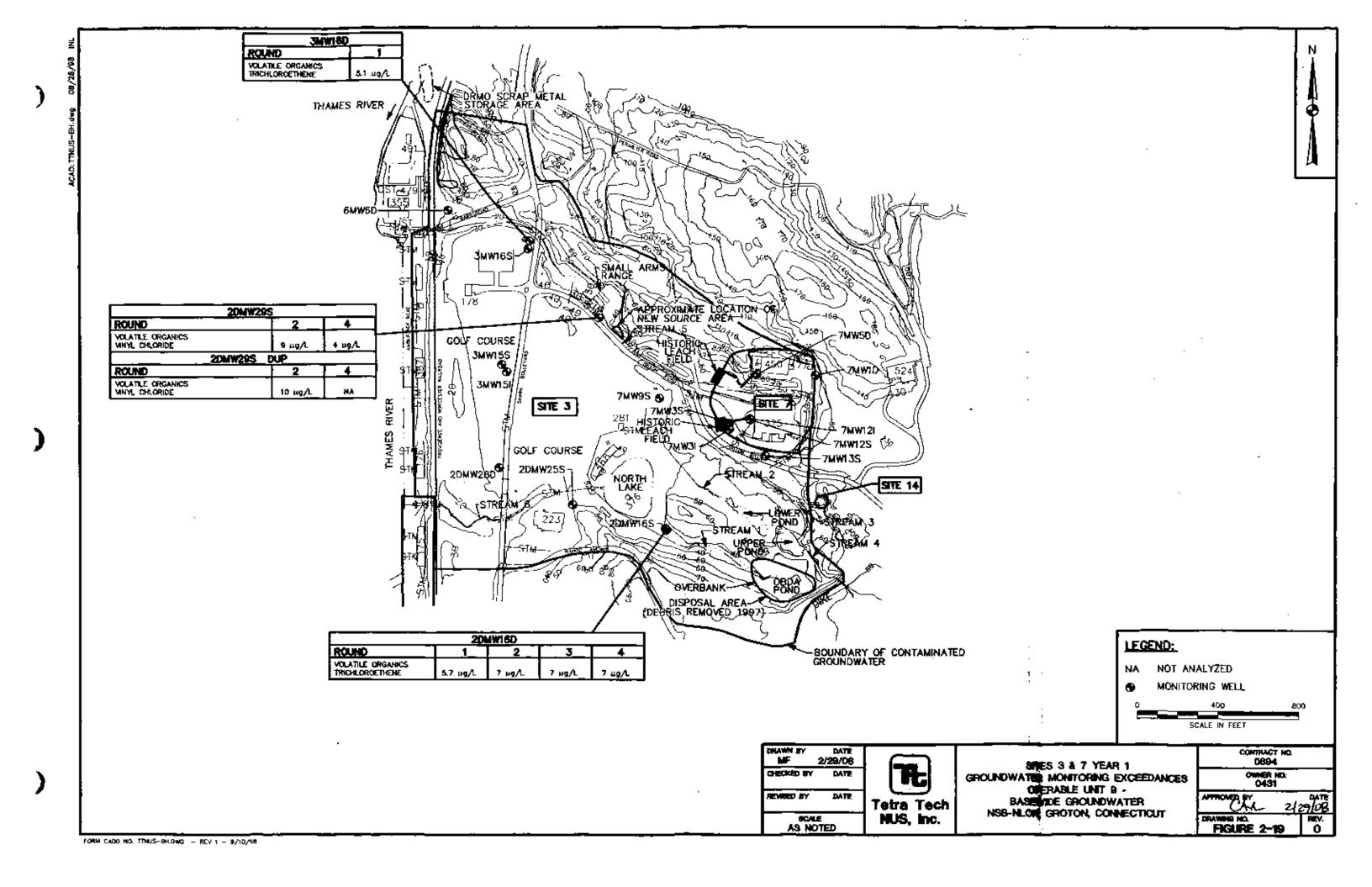
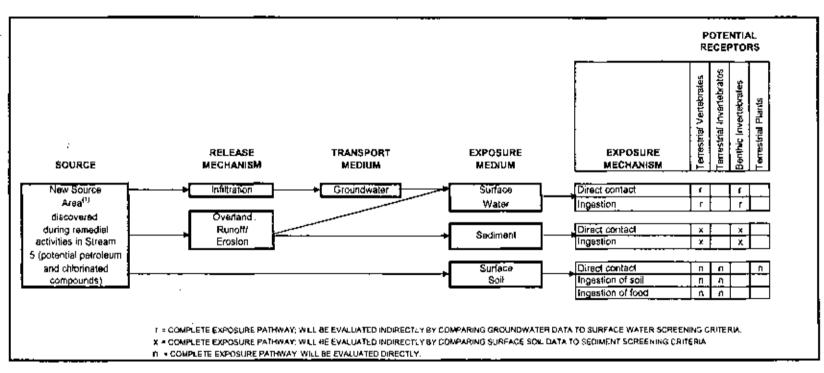


FIGURE 2-20

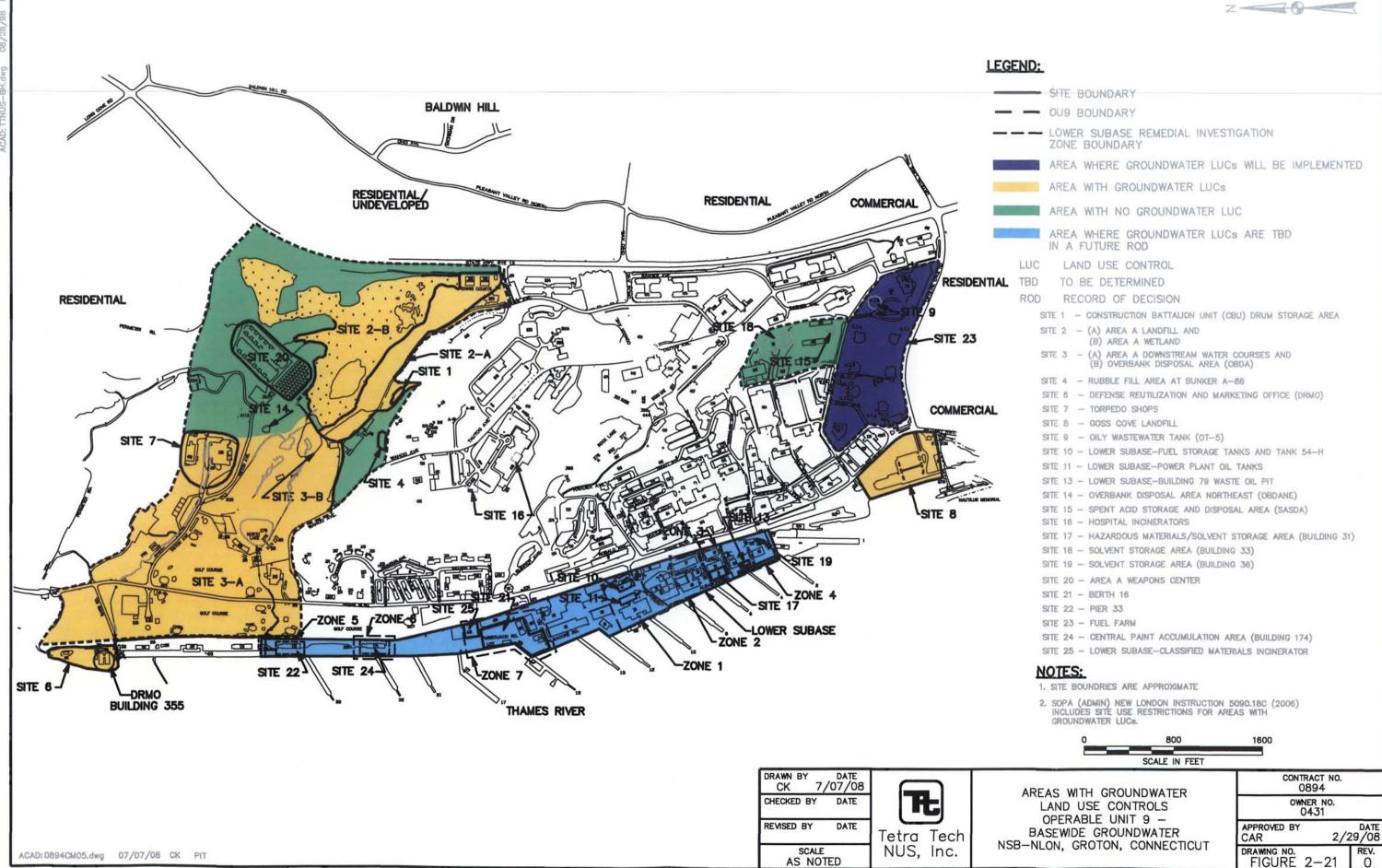
ECOLOGICAL CONCEPTUAL SITE MODEL FOR SITE 3 - NEW SOURCE AREA OPERABLE UNIT 9 RECORD OF DECISION NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT



Blank space indicates incomplete exposure pathway or relatively insignificant, or not applicable potential exposure.

1 New Source Area located adjacent to Stream 5 in Site 3 - Area A Downstream Watercourses.





3.0 RESPONSIVENESS SUMMARY

The Responsiveness Summary is a concise and complete summary of significant comments received from the public and includes responses to these comments. In addition, this summary provides decision makers with information about the views of the community. It also documents how the Navy, EPA, and CTDEP considered public comments during the decision-making process and provides answers to significant comments. In accordance with the guidance in Community Relations in Superfund: A Handbook (EPA, 1992), the Responsiveness Summary was prepared after the public comment period, which ended on July 14, 2008.

3.1 OVERVIEW

This ROD is for OU9, Basewide Groundwater, which includes the groundwater at Sites 2A, 2B, 3, 7, 9, 14, 15, 18, 20, and 23. The Proposed Plan, as presented to the public, identified Institutional Controls with Monitoring (Combination of Alternatives GW1-2 and GW2-2) as the Selected Remedy for Sites 3 and 7 groundwater, and Institutional Controls (Alternative GW3-2) as the Selected Remedy for Sites 9 and 23. The Selected Remedies are protective of human health and the environment, attain all ARARs, are considered by the Navy, EPA, and CTDEP as the alternatives that provided the best balance of the evaluation criteria. The Proposed Plan also identified NFA as the Selected Remedy for Sites 2, 14, 15, 18, and 20 groundwater. This remedy is appropriate because there are no unacceptable risks associated with exposure to groundwater at these sites. At Site 2, compliance monitoring of groundwater will continue to be conducted as part of the OU1 remedy.

3.2 BACKGROUND ON COMMUNITY INVOLVEMENT

The public comment period for the Proposed Plan for OU9 began on June 14, 2008, and ended on July 14, 2008. A public meeting was held on June 26, 2008, at the Best Western Olympic Inn on Route 12, Groton, Connecticut, to accept verbal comments on the proposed action. Comments on the proposed remedies were received during the public comment period, but none require revisions to be made to the Selected Remedies, as identified in the Proposed Plan.

3.3 SUMMARY OF COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD AND NAVY RESPONSES

Comments received during the June 26, 2008 Public Meeting are summarized below along with the Navy's responses. No other comments were received during the Public Comment Period which ended on July 14, 2008. None of the comments that were received impact the remedies selected by the Navy for

the groundwater in OU9; therefore, no changes to the remedies are required in response to public comments.

Public Comment No. 1 (Mark Oefinger, Groton):

- (a) Regarding Site 23, the old tank farm, were the sides and the bottom of the tanks left in place and filled with stone?
- (b) The perimeter drains are being used because there is high ground water there, would it have been better to actually remove the drains? Are the perimeter drains needed because there's still contamination in the cement or in the tanks?
- (c) Groundwater is being monitored because there is the potential for pollution, or was all pollution previously addressed?

Responses:

- (a) Yes. The sides and the bottom of the tanks were left in place and filled with stone.
- (b) The ring drains are primarily there because there is a continued need to dewater the site. Dewatering is required because it would flood out what used to be Crystal Lake approximately 50 to 60 years ago and because it may cause some of the tank carcasses to float to the surface. There is no contamination present in the cement of the tanks. All material was removed from the tanks prior to closure.
- There is some remnant oil contamination in the soil. The tanks were previously used to store Bunker Fuel (No. 6 Fuel Oil) and No. 2 Heating Oil. The one exception to that was one of the tanks was converted over to storing waste oils (OT-5). Removal actions were previously conducted by the Navy to address a majority of the oil contamination. Residual oil contamination is being addressed through natural attenuation (i.e., the breakdown/degradation of the oil over time). The monitoring provides the means to confirm that the oil is not migrating to the deep drain system which eventually discharges to the storm water system and the Thames River.

Public Comment No. 2 (Felix Prokopf, Ledge Light Health District):

(a) The Ledge Light Health District covers five towns including Ledyard, Town of Groton/City of Groton, Waterford, New London, and East Lyme and there are a lot of board members within those towns that would appreciate a two- or three-page summary of the Navy's activities. There is too much detail in the current documents for them to review. In addition, board members change every two or three years (e.g., there's new elections for the health district board) and this type of document would be useful for the new members. The document would provide a quick overview of what is going on and where they can get additional information such as at the library. Points-of-contact should also be included in the document. I could hand out this type of brochure if I get calls for information from another town.

(b) I have been coming to these meetings for many years and feel the Navy is doing a terrific job. Previously, the RAB Co-Chairman for the Public had a phone chain that was used to notify all RAB members prior to the meetings. Even after notification, very few officials showed up at the meetings. So there was a good system in place to communicate with members. I do not think the call system is being used anymore. Even though there was little interest in the past, maybe the Navy could improve its community outreach program to see if there is any new interest.

Responses:

- (a) The Navy will prepare and provide you with a brief brochure that gives a general snapshot of the entire Installation Restoration Program. The EPA also noted that their website for the base has a two page summary of the progress at all of the sites at Naval Submarine Base New London. The Navy will include the link to the EPA's website in the brochure.
- (b) There was more interest in the environmental program in the past. As the various programs have matured, public interest has faded. As the Navy gets towards the end of the Installation Restoration Program, it is appropriate to reinitiate its community outreach program to make sure that people are aware that the end of the program is coming and things will be closed out soon. The Navy has taken or will take the following steps to improve its community outreach program: (1) The Navy added the Town Managers for the Towns of Groton and Ledyard to its distribution list in addition to the Mayors of those towns, (2) The EPA's Community Outreach Coordinator will be notified to determine if additional efforts are needed to inform the public about the Installation Restoration Program, and (3) the brochure discussed above will be prepared and issued.

REFERENCES

Atlantic (Atlantic Environmental Services, Inc.), 1992. Phase I Remedial Investigation, Naval Submarine Base - New London, Groton, Connecticut. Colchester, Connecticut. August.

Atlantic, 1994a. Draft Focused Feasibility Study, Spent Acid Storage and Disposal Area Installation Restoration Program, Naval Submarine Base - New London, Groton, Connecticut. Colchester, Connecticut, March.

Atlantic, 1994b. Draft Focused Feasibility Study, Area A Downstream/OBDA Installation Restoration Program, Naval Submarine Base - New London, Groton, Connecticut. Colchester, Connecticut. April.

Atlantic, 1995a. Background Concentrations of Inorganics in Soil, Naval Submarine Base - New London, Groton, Connecticut. Colchester, Connecticut. April.

Atlantic, 1995b. Final Focused Feasibility Study, Area A Landfill, Installation Restoration Program, Naval Submarine Base – New London, Groton, Connecticut. Colchester, Connecticut. May.

B&RE (Brown & Root Environmental), 1996. Site Characterization Report for OT-10, Building 325, and Building 89, Naval Submarine Base - New London, Groton, Connecticut, Wayne, Pennsylvania.

B&RE, 1997. Phase If Remedial Investigation Report for Naval Submarine Base - New London, Groton, Connecticut. Wayne, Pennsylvania. March.

CTDEP (Connecticut Department of Environmental Protection), 1996. Remediation Standard Regulations. Bureau of Water Management, Permitting, Enforcement and Remediation Division, Hartford, Connecticut, January.

CTDEP, 1997. Supplemental Sampling at Spent Acid Storage and Disposal Area, June.

EA Engineering, 2000. Feasibility Study Site 20 - Area A Weapons Center, Naval Submarine Base - New London, Newburg, New York. June.

ECC, 2007. Year 7 Annual Groundwater Monitoring Report for Area A Landfill, Naval Submarine Base New London, Groton, Connecticut. Prepared for Naval Facilities Engineering Command Mid-Atlantic, Norfolk, Virginia. September.

Envirodyne (Envirodyne Engineers, Inc.) 1983. Final Initial Assessment Study of Naval Submarine Base - New London, Groton, Connecticut. Prepared for Navy Assessment and Control of Installation Pollutants (NACIP) Department, Navy Energy and Environmental Support Activity (NEESA) 13-025, Port Hueneme, California, St. Louis, Missouri, March.

EPA (United States Environmental Protection Agency), 1992. Community Relations in Superfund: A Handbook, EPA 540-R-92-009, Office of Solid Waste and Emergency Response, Washington, D.C., Directive 9230.0-03C. January.

EPA, 1995. Federal Facility Agreement Under CERCLA 120, In the Matter of The US Department of the Navy, Naval Submarine Base - New London, Groton, Connecticut. January.

EPA, 1997. Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Interim Final. Environmental Response Team. June.

EPA, 1998. Final Guidelines for Ecological Risk Assessment. Effective April 30.

EPA, 2000a, 2000 Edition of the Drinking Water Standards and Health Advisories, August. Office of Water. EPA 822-B-00-001.

EPA, 2000b. Preliminary Remediation Goals Table, Region IX, Solid and Hazardous Waste Programs, San Francisco, California. November,

EPA, 2001. Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment), Interim. September. Office of Emergency and Remedial Response. Washington, D.C. EPA/540/R/99/005.

EPA, 2002a. 2002 Edition of the Drinking Water Standards and Health Advisories, Summer 2002, Office of Water, EPA 822-R-02-038.

EPA, 2002b. Preliminary Remediation Goals Table, Region IX. Solid and Hazardous Waste Programs, San Francisco, California. October.

EPA, 2004. User's Guide for Evaluating Subsurface Vapor Intrusion Into Buildings. Office of Emergency and Remedial Response, Washington, DC, Revised February 22.

FWEC (Foster Wheeler Environmental Corporation), 2001. Final Closeout Report for Storm Sewer Rehabilitation, Navaí Submarine Base - New London, Groton, Connecticut. Langhorne, Pennsylvanias. May.

Navy, 1995. Record of Decision, Source Control Operable Unit, Area A Landfill, Naval Submarine Base New London, Groton, Connecticut. Northern Division, Lester, Pennsylvania. September.

Navy, 1997a. Action Memorandum for Overbank Disposal Area, Naval Submarine Base - New London, Northern Division, Lester, Pennsylvania. July.

Navy, 1997b. No Further Action Source Control Record of Decision for Spent Acid Storage and Disposal Area, Navai Submarine Base-New London, Northern Division, Lester, Pennsylvania, August.

Navy, 1998. Record of Decision for Area A Downstream Watercourses/OBDA Pond Soil and Sediment, Naval Submarine Base - New London, Northern Division, Lester, Pennsylvania. March.

Navy, 1999a. Action Memorandum for the Non-Time Critical Removal Action at Over Bank Disposal Area Northeast, Engineering Field Activity Northeast, Lester, Pennsylvania. September.

Navy, 1999b. Navy Policy for Conducting Ecological Risk Assessments. Memo from Chief of Naval Operations to Commander, Naval Facilities Engineering Command. Department of the Navy, Washington, D.C. April.

Navy, 2000. Record of Decision for the Area A Weapons Center, Naval Submarine Base - New London, Groton, Connecticut. Engineering Field Activity Northeast, Lester, Pennsylvania. June.

Navy, 2004a. Site 3, Site 7, Site 14, Site 15, Site 18, and Site 20 Groundwater Proposed Plan, Engineering Field Activity Northeast, Lester, Pennsylvania. September.

Navy, 2004b. Record of Decision for Site 7 Torpedo Shops and Site 14 OBDANE Soil (OU8), Naval Submarine Base - New London, Groton, Connecticut. Engineering Field Activity Northeast, Lester, Pennsylvania. September.

Navy, 2004c. Record of Decision for Sites 16 and 18 Soil (OU11), Naval Submarine Base - New London, Groton, Connecticut. Engineering Field Activity Northeast, Lester, Pennsylvania. September.

020806/P R-3 CTO 431

Navy, 2004d. Record of Decision for Site 3 - New Source Area Soil, Naval Submarine Base - New London, Groton, Connecticut. Engineering Field Activity Northeast, Lester, Pennsylvania. October.

Navy, 2004e. Interim Record of Decision for Sites 3, 7, 14, 15, 18, and 20 Groundwater, Naval Submarine Base, New London, Groton, Connecticut. Engineering Field Activity Northeast, Naval Facilities Engineering Command, Lester, Pennsylvania, December.

Navy, 2005. Remedial Design for Land Use Controls, Site 3 – Area A Downstream Watercourses and Overbank Disposal Area and Site 7 – Torpedo Shops Groundwater, Naval Submarine Base - New London, Groton, Connecticut, June.

Navy, 2008. Proposed Plan for Operable Unit 9, Basewide Groundwater, Navat Submarine Base New London, Groton, Connecticut. King of Prussia, Pennsylvania. TBD.

SCS (Soil Conservation Service), 1983. Soil Survey of New London County Connecticut. United States Department of Agriculture Soil Conservation Service.

TtNUS (Tetra Tech NUS, Inc.), 1999. Groundwater Monitoring Plan for Area A Landfill, Naval Submarine Base New London, Groton, Connecticut. King of Prussia, Pennsylvania. January.

TtNUS, 2002a. Basewide Groundwater Operable Unit Remedial Investigation Report for Naval Submarine Base New London, Groton, Connecticut. King of Prussia, Pennsylvania. January.

TtNUS, 2002b. Work Plan for Basewide Groundwater Operable Unit Data Gap Investigation, Naval Submarine Base New London, Groton, Connecticut. King of Prussia, Pennsylvania. October.

TtNUS, 2004. Basewide Groundwater Operable Unit Remedial Investigation Update/Feasibility Study Report for Naval Submarine Base New London, Groton, Connecticut. King of Prussia, Pennsylvania. July.

TtNUS, 2006a. Operations and Maintenance Manual for Installation Restoration Program Sites at Naval Submarine Base - New London, Groton, Connecticut. Volumes I, II, III, IV, and V. King of Prussia, Pennsylvania. January.

TtNUS, 2006b. Work Plan for Remedial Action at Sites 3 and 7, Naval Submarine Base - New London, Groton, Connecticut. King of Prussia, Pennsylvania. March

TtNUS, 2007a. Draft Letter Report for June 2007 Sampling Event, Site 23 Underdrain Metering Pit, Naval Submarine Base New London, Groton, Connecticut. King of Prussia, Pennsylvania. August.

TtNUS, 2007b. Year 1 Annual Groundwater Monitoring Report for Sites 3 and 7, Naval Submarine Base New London, Groton, Connecticut. King of Prussia, Pennsylvania. September.

TtNUS, 2007c. Letter Report for September 2007 Sampling Event, Site 23 Underdrain Metering Pit, Naval Submarine Base New London, Groton, Connecticut. King of Prussia, Pennsylvania. October.

TtNUS, 2008a. Letter Report for December 2007 Sampling Event, Site 23 Underdrain Metering Pit, Naval Submarine Base New London, Groton, Connecticut. King of Prussia, Pennsylvania. February.

TtNUS, 2008b. Letter Report for March 2008 Sampling Event, Site 23 Underdrain Metering Pit, Naval Submarine Base New London, Groton, Connecticut. King of Prussia, Pennsylvania. TBD.

TtNUS, 2008c. Draft Year 1 Annual Monitoring Report for Site 23 Underdrain Metering Pit, Naval Submarine Base New London, Groton, Connecticut, King of Prussia, Pennsylvania, June.

USGS (United States Geological Survey), 1960. Geologic Map of the Uncasville Quadrangle, New London County, Connecticut.

APPENDIX A

STATE OF CONNECTICUT CONCURRENCE LETTER



STATE OF CONNECTICUT

DEPARTMENT OF ENVIRONMENTAL PROTECTION

79 ELM STREET HARTFORD, CT 06106-5127

PHONE: 860-424-3001

September 30, 2008



James T. Owens, III, Director, U.S. Environmental Protection Agency Office of Site Remediation and Restoration 1 Congress St. Suite 1100 (HIO) Boston, MA 02114-2023

Mark S. Ginda
Captain, USN
Commanding Officer
Naval Submarine Base New London
Box 00, Building 86
Crystal Lake Road
Groton, CT 06349

Re: State Concurrence with Remedy for Operable Unit 9, Basewide Groundwater at Naval Submarine Base New London, Groton, Connecticut

Dear Mr. Owens and Captain Ginda:

The Connecticut Department of Environmental Protection (CTDEP) conditionally concurs with the final remedy selected by the EPA and the Navy for addressing basewide groundwater at the Naval Submarine Base New London, in Groton, Connecticut. The basewide groundwater is also known collectively as Operable Unit 9. This operable unit includes groundwater at 10 separate sites throughout the base.

The Navy proposes to address groundwater contaminants at the Area A Downstream Watercourses and Overbank Disposal Area (Site 3), and the Torpedo Shops (Site 7) by the continued use of institutional controls and groundwater monitoring. The institutional controls that were previously put in place include restrictions against the use of groundwater at all these sites and against residential use at Sites 2A, 2B, and 3. A new institutional control will be put in place at Site 3 to control potential exposure of future residents to soil vapor.

The Navy proposes to address groundwater at Waste Oil Tank 5 (Site 9) and the Tank Farm (Site 23) by implementing new institutional controls that would restrict the use of ground water.

The Navy will take no further action to address groundwater at the Area A Landfill (Site 2A), the Area A Wetland (Site 2B), Overbank Disposal Area Northeast (OBDANE, Site 14), the Spent Acid Storage and Disposal Area (Site 15), the Solvent Storage Area (Site 18, Building 33), and the Area A Weapons Center (Site 20). No groundwater contamination remains at these sites at concentrations in excess of Federal or state standards.

Groundwater at Sites 2, 3, 7, 14, 15, 18 and 20 was previously addressed in an interim remedy that the Navy implemented in 2004. The 2008 record of decision for Operable Unit 9 is the Navy's final selection of a remedy for groundwater at these sites.

The final remedies for groundwater at the Defense Reutilization and Marketing Office and the Goss Cove Landfill were included as part of source control remedies already selected for these sites. Groundwater at the Lower Base will be implemented as part of the source control remedy that will be selected for that site.

The remedy is described in detail in the proposed plan dated June 2008, and in the Record of Decision (ROD), dated July 2008.

The institutional controls will be memorialized in the base instruction document entitled "NSB-NLON Installation Restoration Site Use Restrictions Instruction document (5090.18C)". This document will remain in effect as long as the Navy continues to own the base. The ROD states that if the Navy sells or transfers the base, and contaminated groundwater remains at any of the sites, environmental land use restrictions (ELURs) will be recorded in accordance with state law.

The State's concurrence is conditioned upon the Navy making best efforts to comply with the requirements of the State's Remediation Standard Regulations regarding the recording of an environmental land use restriction to prohibit construction of a building at Site 3 on a schedule to be determined. The State expects that the Navy will propose a schedule to be agreed to by EPA, the Navy and the State.

State Concurrence- Final Remedy for Basewide Groundwater Naval Submarine Base New London, Groton, Connecticut Page 3 of 3

Thank you for your cooperation on this project. DEP looks forward to working with the Navy and the US Environmental Protection Agency toward continued remediation at the Navai Submarine Base.

Yours truly,

Gina McCarthy Commissioner

GM:MRL

C: Mr. Ron Pinkoski Naval Facilities Engineering Command, Mid- Atlantic 9742 Maryland Avenue Bidg N-26, Room 3208 (Code EV3) Norfolk, VA 23511-3095

> Ms. Kymberlee Keckler, Remedial Project Manager US Environmental Protection Agency- Region 1 1 Congress St. Suite 1100 (HBT) Boston, MA 02114-2023

Naval Submarine Base New London Attn: Richard Conant Building 439, Room 105, Box 39 Crystal Lake Road Groton, CT 06349

E

APPENDIX B

SOPA (ADMIN) NEW LONDON INSTRUCTION 5090.18D

DEPARTMENT OF THE NAVY



NAVAL SUBMARINE BASE NEW LONDON GROLON, CONNECTICUT 08349-5000

SOPA (ADMIN) NLONINST 5090.18D 9 Sep 08

SOPA (ADMIN) NEW LONDON INSTRUCTION 5090.18D

From: Commanding Officer, Naval Submarine Base New London

Subj: INSTALLATION RESTORATION SITE USE RESTRICTIONS AT NAVAL SUBMARINE BASE NEW LONDON, GROTON, CONNECTICUT

Ref: (a) Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA)

(b) Superfund Amendments and Reauthorization Act of 1986 (SARA)

- (c) Operational Naval Instruction (OPNAVINST) 5090.18. Current Version
- (d) Resource Conservation and Recovery Act (RCRA)
- (e) Connecticut Department of Environmental Protection Remediation Standard Regulations
- (f) Federal Facility Agreement under CERCLA 120, In the matter of the US Department of the Navy, Naval Submarine Base New London, Groton, Connecticut, January, 1995, and as amended.
- (g) Record of Decision, Source Control Operable Unit, Area A landfill, Naval Submarine Base New London, Groton, Connecticut, September, 1995
- (h) Record of Decision for Site 8 Goss Cove Landfill, Soil and Sediment, Naval Submarine Base New London, Groton, Connecticut, February, 1998
- (i) Record of Decision for Base-wide Groundwater Operable Unit 9, Naval Submarine Base, New London, Groton, Connecticut, September, 2008
- (j) Public Works Department Instruction 11000.1A
- (k) Record of Decision for Site 6 Defense Reutilization and Marketing Office - Operable Unit 2, Naval Submarine Base - New London, Connecticut, December, 2006
- (1) Operations and Maintenance Manual for Installation Restoration Program Sites at Naval Submarine Base New London, Groton, Connecticut, Volumes I, II, III, IV, and IV, January, 2006
- (m) Draft Lower Subase Feasibility Study, Naval Submarine Base - New London, Groton, Connecticut, March, 2008
- (n) Area A Landfill Allowable Loading Pressure, Naval Submarine Base New London, November, 2006
- Encl: (1) Defense Reutilization and Marketing Office (DRMO)
 Installation Restoration Site and Landfill Cap Site 6
 - (2) Area A Landfill Installation Restoration Site and Landfill Cap - Site 2A

- (3) Installation Restoration Site Map for Naval Submarine Base New London
- (4) Excavated Soil Management for Installation Restoration sites at Naval Submarine Base New London
- (5) Management of Dewatering Wastewaters for Installation Restoration Sites at Naval Submarine Base New London
- (6) Goss Cove Landfill Installation Restoration Site and Landfill Cap - Site 8
- (7) Monitoring Well Inventory Map
- 1. Purpose. This instruction defines the Naval Submarine Base New London (SUBASENLON) policy regarding ground surface disturbance of soils/sediments or any subsurface disturbance of soils/sediments and/or groundwater exposure or extraction in Installation Restoration (IR) sites and the disturbance of any remedial infrastructure, including monitoring wells and landfill waste caps. Disturbance is defined as any form of damage to remedial infrastructure, excavation, soil penetration, soil compaction, filling, or change of topography. The definition of disturbance also includes any proposed action to dewater excavations or extract/expose groundwater for discharge, consumption, or use in any way. This instruction is intended to enact institutional controls that are specified in references (a) through (n).
- Cancellation. SOPA(ADMIN)NLONINST 5090.18C.
- 3. <u>Applicability</u>. This instruction is applicable to all Navy departments, tenant commands, contractors, invitees, and personnel at SUBASENLON.
- Discussion. In accordance with references (a) through (n), the SUBASENLON IR Program manages the identification, characterization, and cleanup of contaminated soils, sediments and groundwater at specific SUBASENLON IR locations. The existing IR sites at SUBASENLON are in various stages of the IR investigation and cleanup process. Specialized landfill caps have been installed over the former landfill at the Defense Reutilization and Marketing Office (DRMO) site, see reference (k); the former landfill at the Area A site, see reference (q); the former Goss Cove landfill, see reference (h); and a small area of Area A Downstream, see enclosure (3) in order to isolate contaminated soils and sediments from the surrounding environment. These caps can be damaged by the operation or storage of heavy equipment on the cap surface or by unauthorized excavation or penetration through the cap surface. Enclosures (1), (2), (3), and (6) outline the extent of the former landfill sites, the current landfill caps, and the contamination at Area A Downstream. Enclosure (3) depicts the boundaries of all other identified IR sites at SUBASENLON and areas where groundwater use controls and restrictions are in effect. Groundwater and surface water shall not be extracted and used for any purpose at

SUBASENLON. Note that potential localized risk exists in Site 3 which could result from exposure to chemicals that could volatilize from groundwater and migrate through building foundations into indoor air. All proposed building projects in Site 3 must be coordinated through the SUBASENLON IR program manager to ensure that the building design process considers the potential issue of vapor intrusion and appropriate remedial strategies. All areas indicated in Enclosures (1), (2), (3) and (6) may contain contaminated soil, sediment or groundwater, which can potentially threaten human health or the environment if disturbed by unauthorized excavation or dewatering. Work can be safely conducted within the boundaries of identified IR sites, but proper planning, coordination, preparation, and safety measures must be implemented in accordance with federal and state IR site work requires strict adherence to a site-specific health and safety plan, proper training of site workers, correct use of personal protective equipment by site workers, and proper management of any generated waste. Enclosures (4) and (5) provide guidance for excavation and dewatering in IR sites at SUBASENLON. Reference (1) provides requirements and guidance for the protection and maintenance of all IR sites identified in enclosure (3) and their associated structures, e.g., landfill cap asphalt wearing surfaces, landfill cap toe-slope protection, diversion channels, gas management vents, stormwater conveyances, material handling and storage pads, monitoring wells, and site perimeter fencing. Note that monitoring wells are not exclusively situated within the boundaries of the IR sites depicted in enclosure (3). Enclosure (7) provides the map of all known active, inactive and abandoned monitoring wells at SUBASENLON. All such structures shall not be modified, disturbed, or in any way affected without coordination with the SUBASENLON Public Works Environmental Division. The periodic and routine maintenance of all IR sites, and their associated structures, will be accomplished in strict adherence to reference (1) by authorized Navy contractors. The operation of equipment and storage of materials within any IR site identified in enclosure (3) shall also be in compliance with references (1) and (n).

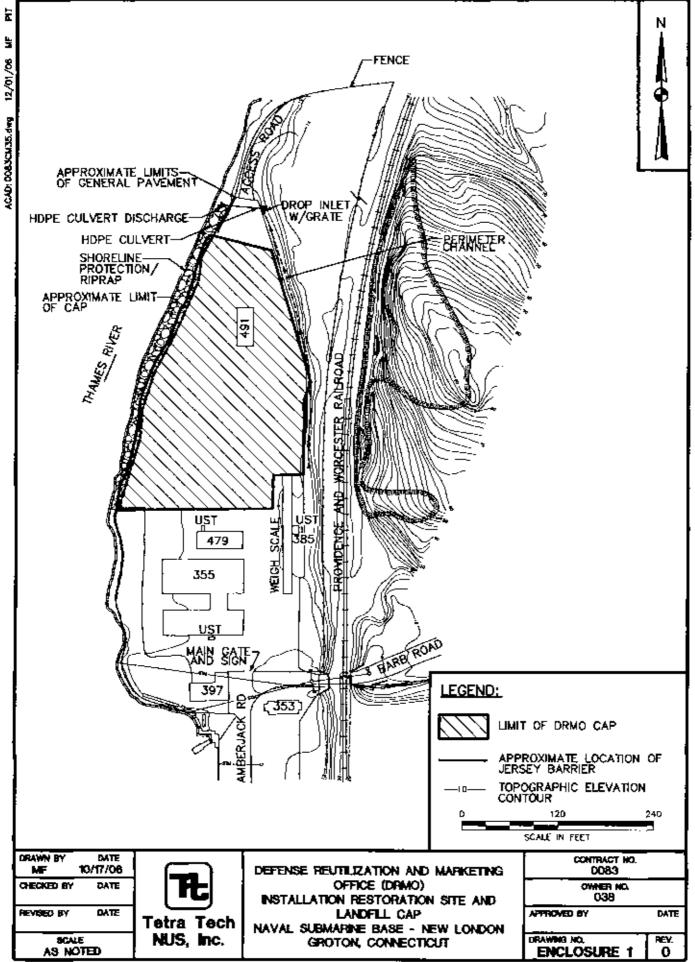
5. Action. Prior to the operation or storage of any heavy equipment at the sites depicted in enclosures (1) and (6), all SUBASENLON departments, tenant commands, Navy contractors, and personnel shall contact SUBASENLON Public Works Planning and Environmental Divisions, which will determine general landfill cap loading restrictions for all equipment/materials to be operated or stationed on these landfill caps. The Area A Landfill Installation Restoration Site and Landfill Cap - Site 2A depicted in enclosure (2) is a restricted area controlled by SUBASE Chief Master-at-Arms (CMAA). All requests for access to Area A and for the storage of any heavy equipment/materials

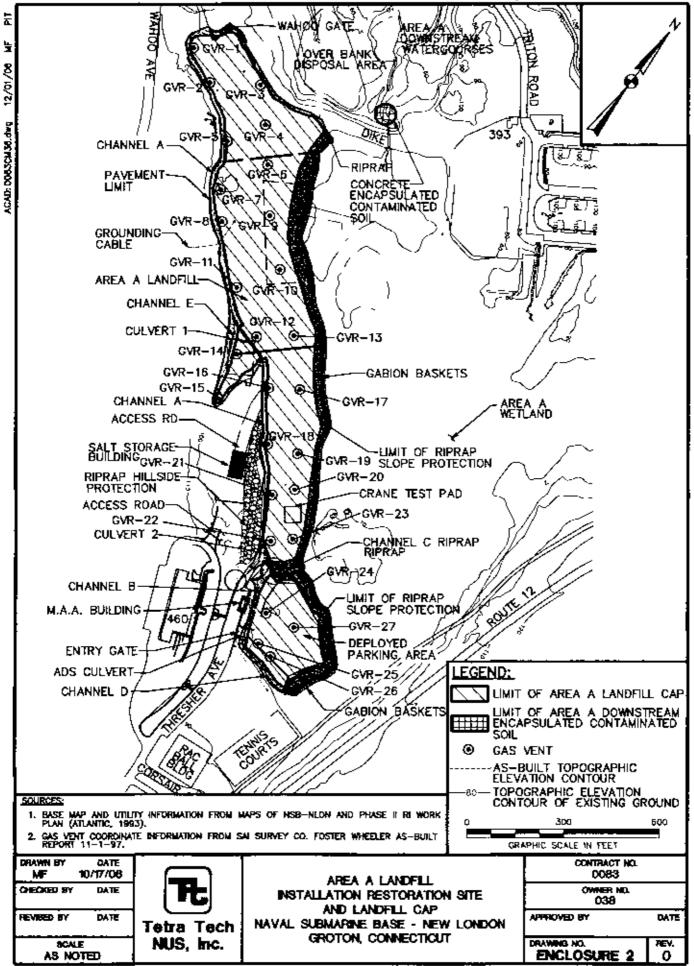
at Area A will be referred to the CMAA office. The CMAA office will coordinate all heavy equipment/materials storage requests with the SUBASENLON Public Works Planning and Environmental Divisions prior to authorizing any storage of heavy equipment/materials at the site. The loading guidance provided in enclosure (n) shall be utilized to assess storage of heavy equipment/material on the Area A landfill cap site. Precaution must be taken to ensure that any equipment operated and/or stationed on the three landfill caps will not damage the asphalt wearing surface to any appreciable degree. Damage to the asphalt wearing surfaces at the landfill caps must be reported immediately to the SUBASENLON Public Works Environmental Division. Any SUBASENLON department, tenant command or Navy contractor planning projects involving subsurface excavation, subsurface penetration of the soil, dewatering, or ground surface disturbance at the sites depicted in enclosures (1), (2), (3) and (6) shall notify the SUBASENLON IR Program Manager at 694-5649 at the earliest project planning phase and follow the dig permit directions contained in reference (j). The IR Program Manager will coordinate project review with the Naval Facilities Remedial Project Manager, the SUBASENLON Public Works Planning Division, the Public Safety Department, and the USEPA and the CTDEP, as applicable under references (a) through (n). the outcome of this coordination, the SUBASENLON IR Program Manager will provide guidance for projects proposing ground surface disruption, subsurface excavation, penetration, or dewatering work in accordance with enclosures (4) and (5). work shall commence in IR sites until an excavation permit, as required by reference (j), is completed and signed by the IR Program Manager and the Public Works Planning Division. excavation permit will specify requirements for the project, detail waste management procedures, and establish standards for protecting remedial infrastructure and restoration of the project site.

> D. M. ROSSLER By direction

Distribution: (SUBASENLONINST 5216.8N)

List D





LEGEND:

- SITE BOUNDARY

--- OU9 BOUNDARY LOWER SUBASE REMEDIAL INVESTIGATION ZONE BOUNDARY

AREA WITH LUCS ON SOIL AND/OR GROUNDWATER

LUC LAND USE CONTROL

SITE IDENTIFICATIONS:

SITE 1 - CONSTRUCTION BATTALION UNIT (CBU) DRUM STORAGE

(A) AREA A LANDFILL AND (B) AREA A WETLAND

(A) AREA A DOWNSTREAM WATER COURSES AND (B) OVERBANK DISPOSAL AREA (OBDA)

RUBBLE FILL AREA AT BUNKER A-86 DEFENSE REUTILIZATION AND MARKETING OFFICE

SITE 7 SITE 8 SITE 9 SITE 10

ORMO)
TORPEDO SHOPS
GOSS COVE LANDFILL
OILY WASTEWATER TANK (OT-5)
LOWER SUBASE-FUEL STORAGE TANKS AND TANK

54-H

LOWER SUBASE-POWER PLANT OIL TANKS
LOWER SUBASE-BUILDING 79 WASTE OIL PIT

OVERBANK DISPOSAL AREA NORTHEAST (OBDANE)
SPENT ACID STORAGE AND DISPOSAL AREA (SASDA)
HOSPITAL INCINERATORS
HAZARDOUS MATERIALS/SOLVENT STORAGE AREA
(BUILDING 31)
SOLVENT STORAGE AREA (BUILDING 33)
SOLVENT STORAGE AREA (BUILDING 36)
AREA A WEAPONS CENTER
BERTH 16
PIER 33
FUEL FARM
CENTRAL PAINT ACCUMULATION AREA (BUILDING 174)
LOWER SUBASE-CLASSIFIED MATERIALS INCINERATOR

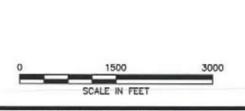
SITE 20 SITE 21 SITE 22 SITE 23 SITE 24 SITE 25

NOTES:

THIS FIGURE SHOULD BE IN COLOR, IF IT IS NOT, PLEASE CONTACT THE ENVIRONMENTAL DEPARTMENT.

2. SITE BOUNDRIES ARE APPROXIMATE

SOPA (ADMIN) NEW LONDON INSTRUCTION 5090.18D (2008) INCLUDES SITE USE RESTRICTIONS FOR AREAS WITH SOIL AND GROUNDWATER LUCS.



BUILDING 355

ILLE SITE 22 SITE 24

DRAWN BY CK 8	DATE /19/08
CHECKED BY NB 8	/12/08
REVISED BY	DATE
SCALE AS NO	TED

THAMES RIVER

BALDWIN HILL

RESIDENTIAL/ UNDEVELOPED



RESIDENTIAL

COMMERCIAL

WER SUBASE

RESIDENTIAL

SITE 9

SITE 23

OMMERCIAL

ACTIVE INSTALLATION RESTORATION SITES AND AREAS WITH LAND USE CONTROLS NAVAL SUBMARINE BASE - NEW LONDON GROTON, CONNECTICUT

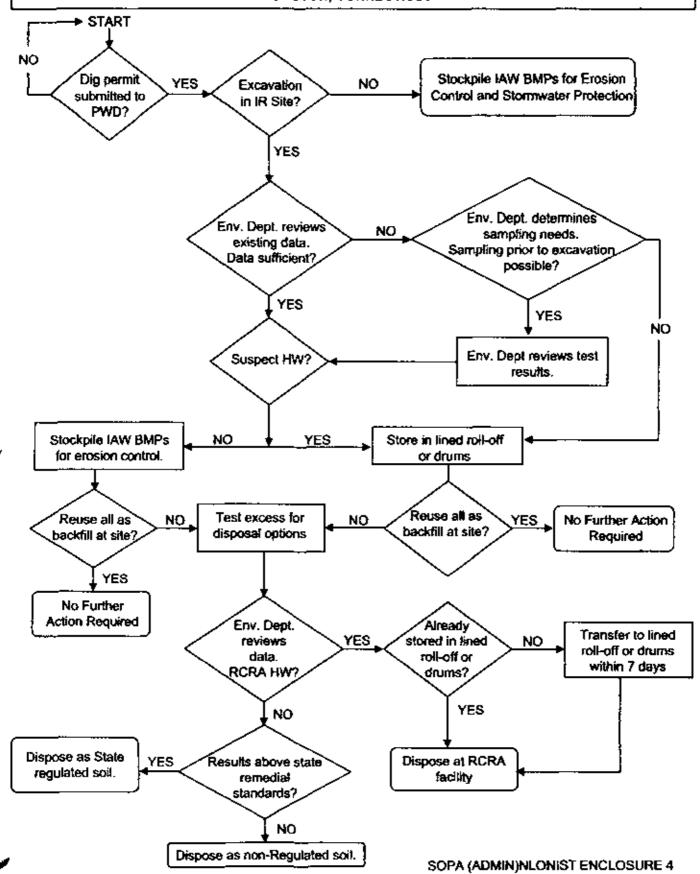
CONTRAI 077			
OWNER NO. 073			
PPROVED BY	8/1	DATE 9/08	
RAWING NO. ENCLOSUR	E 3	REV.	

SITE 6

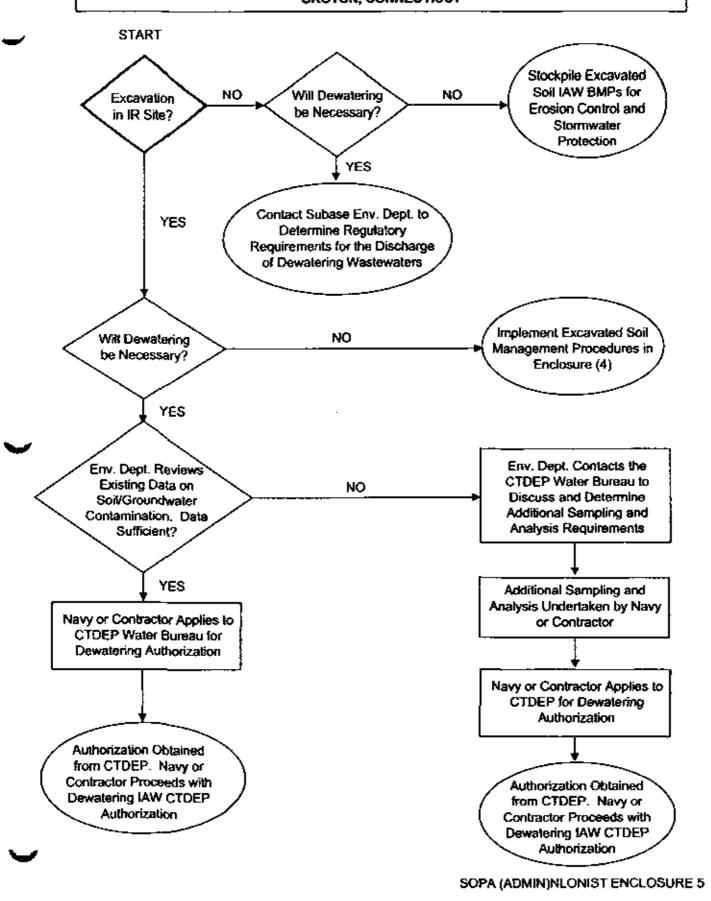
RESIDENTIAL

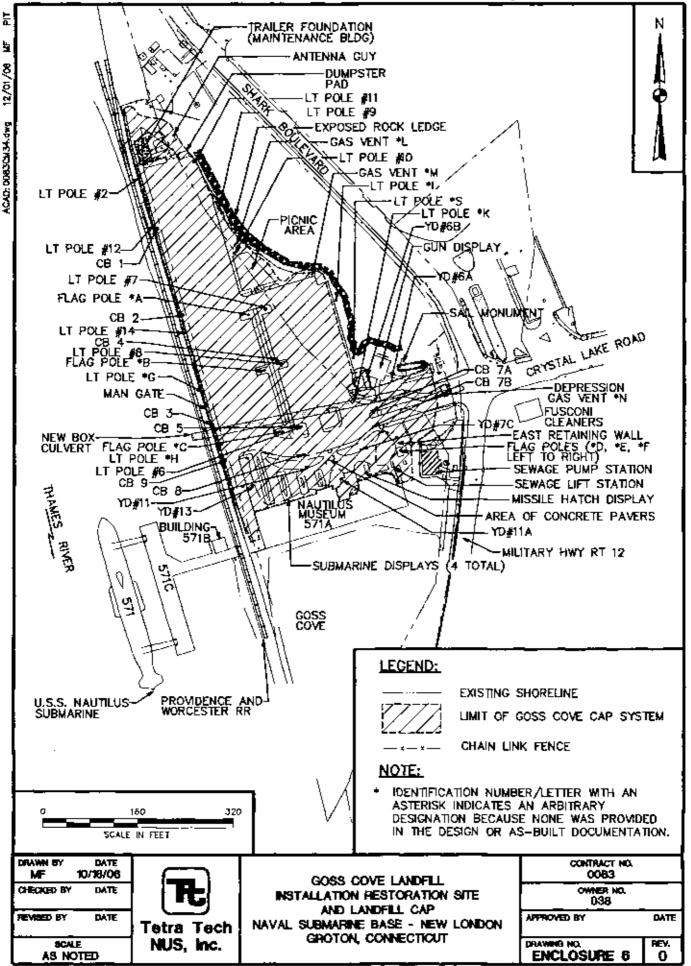
SITE

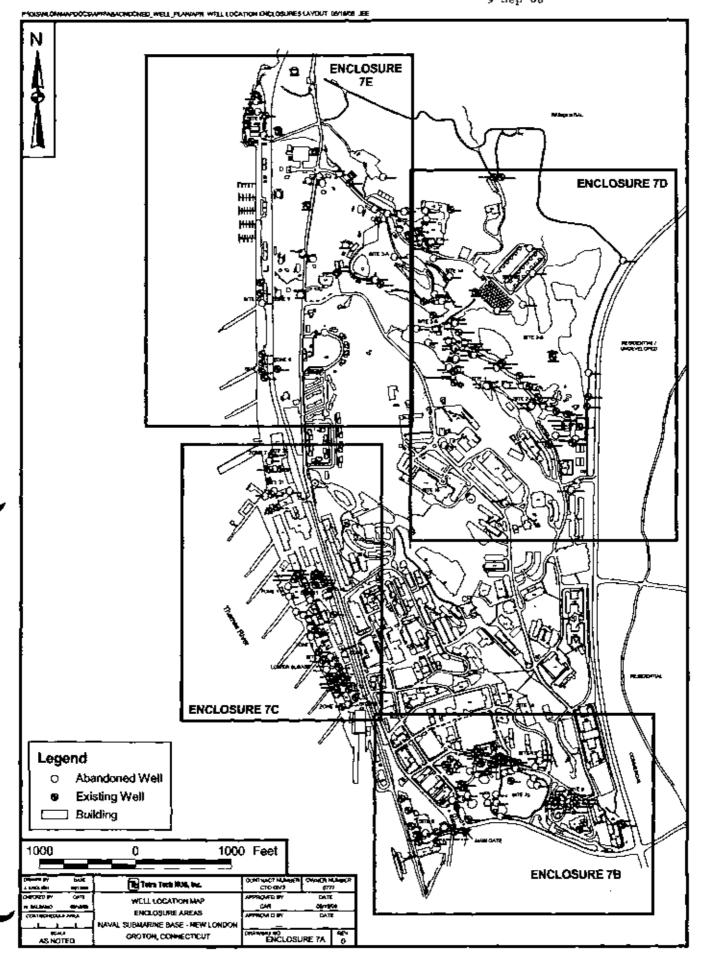
EXCAVATED SOIL MANAGEMENT FOR INSTALLATION RESTORATION SITES NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT

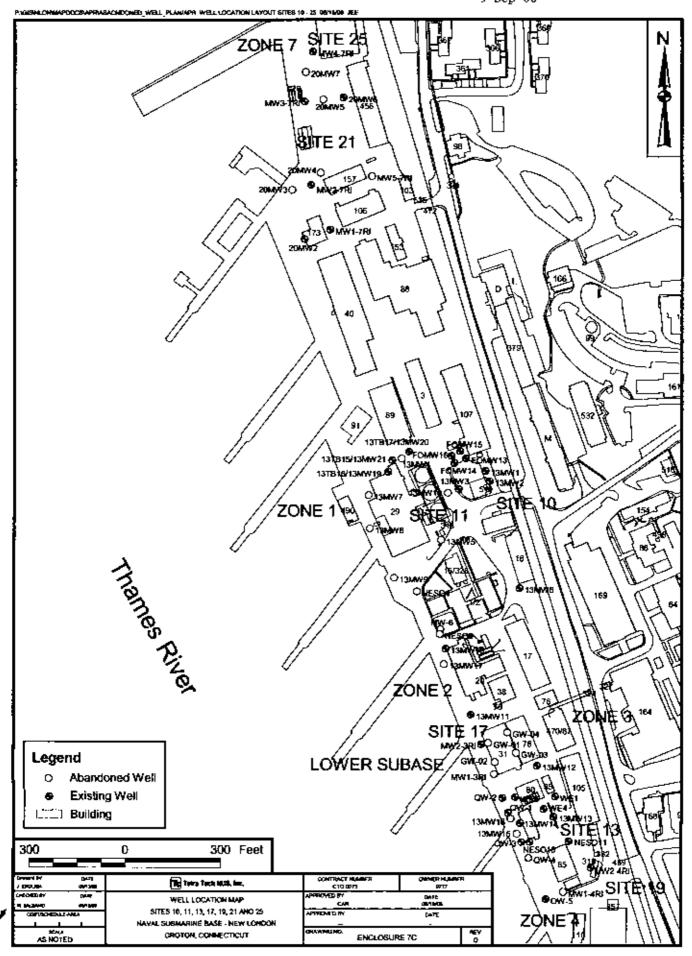


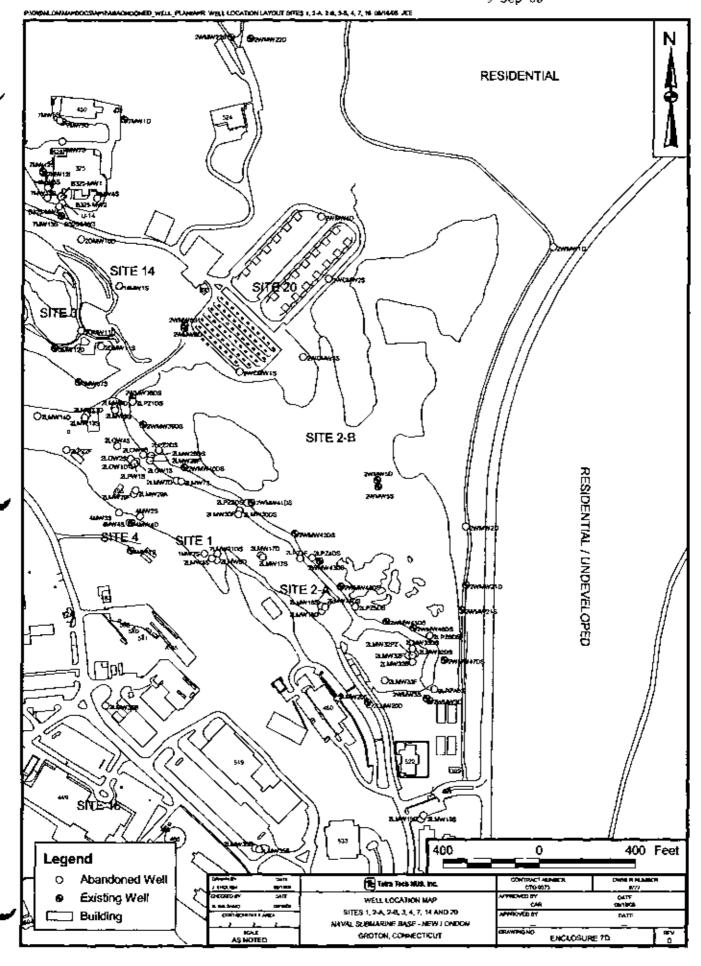
MANAGEMENT OF DEWATERING WASTEWATERS FOR INSTALLATION RESTORATION SITES NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT

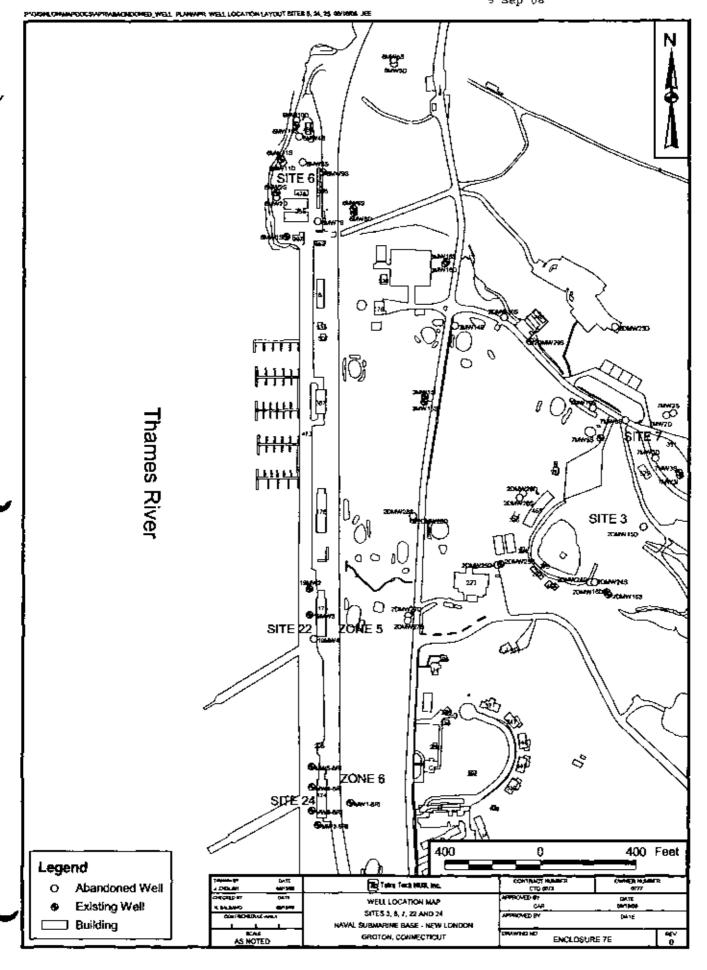














APPENDIX Ç

PROPOSED PLAN AND PUBLIC NOTICE



Naval Submarine Base -

New London, Groton, Connecticut

PROPOSED PLAN FOR BASEWIDE GROUNDWATER OPERABLE UNIT 9

Introduction

In accordance with Section 117 of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the law more commonly known as Superfund, this Proposed Plan summarizes the Navy's preferred final options for addressing groundwater at the Area A Landfill (Site 2A), Area A Welland (Site 2B), Area A Downstream Watercourses (Site 3), Torpedo Shops (Site 7), Waste OT-5 (Site 9), Overbank Disposal Area Northeast (Site 14), Spent Acid Storage and Disposal Area (Site 15), Solvent Storage Area (Site 18), Area A Weapons Center (Site 20), and Tank Farm (Site 23) at Naval Submarine Base - New London (NSB-NLON) (Figure 1). The groundwater at Sites 2A, 2B, 3, 7, 9, 14, 15, 18, 20, and 23 make up the basewide groundwater Operable Unit (OU) 9. The groundwater at Sites 2A, 2B, 3, 7, 14, and 20 is hydraulically connected. Similarly, groundwater at Sites 9, 15, 18, and 23 is also hydraulically connected. The proposed remedial actions for groundwater at Sites 3, 7, 14, 15, 18, and 20 were previously presented in a 2004 Proposed Plan and Interim Record of Decision (RQD). The proposed remedial actions for groundwater at those sites were considered interim actions in 2004 because the remaining portions of OU9 (Siles 2A, 2B, 9 and 23) were not addressed at that time. In this Proposed Plan, remedial actions are proposed for all portions of OU9 (Sites 2A, 2B, 3, 7, 9, 14, 15, 18, 20, and 23 groundwater) and this will be the final Proposed Plan for OU9. Site 9 is located within Site 23, and groundwater issues for the site will be addressed in the proposed remedial action for Site 23. The sites addressed herein are 9 of 23 sites being addressed by the Navy's Installation Restoration (IR) Program at NSB-NLON. The IR Program identifies and cleans up sites created by past operations that do not meet current environmental standards.

The Cleanup Proposal...

After careful study of groundwater at Sites 2A, 2B, 3, 7, 9, 14, 15, 18, 20, and 23, the Navy and EPA propose the following plan:

Groundwater at Sites 2A and 2B

Groundwater at Sites 2A and 2B is currently monitored under a groundwater monitoring program selected as part of the remedy for OU1. Post-closure groundwater monitoring is reguired by the September 2005 ROD. Volumes II and III of the Operation and Maintenance Manual for Installation Restoration Program Siles at Naval Submarine Base New London (Janu- Groundwater at Sites 9 and 23 ary 2006) describe the groundwater monitoring plan in detail. 1 This Proposed Plan proposes to continue the monitoring for Sites 2A and 2B as required by the OU1 ROD. Institutional controls will remain in place at Sites 2A and 28 and are described in the Site Use Restrictions document.

Groundwater at Sites 3 and 7

- Continue to implement institutional controls that identify the location and magnitude of groundwater contamination, restrict extraction and use of the groundwater, and control vapor intrusion. (Site 3 only) based on land use. (Based on the Interim ROD, the Institutional controls for Sites 3 and 7 were implemented in 2006.)
- Continue to monitor the groundwater contaminants until they decrease to levels at which unrestricted use of groundwater may be permitted. (Under the Interim ROD, a monitoring program for Sites 3 and 7 was initiated in 2006.1

Implement Institutional controls that identify the location and magnitude of groundwater contamination and restrict extraction and use of the groundwater.

Groundwater at Sites 14, 15, 18, and

No Further Action (NFA).

June 26

Public Meeting AND HEARING

Informational

Meeting: 6:30 pm

Formal Public Hearing:

Date:

Thursday, June 26,

2008

Location: Best Western Olympic

Inn, Route 12,

Groton, Connecticut

Learn More About the Proposed Plan

The Navy will describe this Proposed Plan and listen to your questions at an informational public meeting. Aformal public hearing will immediately follow this meeting.

For further information regarding the proposed remedy or upcoming meeting, call Mr. Richard Conant with the NSB-NLON Public Works Environmental Division at (860) 694-5649.

Technical terms shown in bold print are defined in the glossary on Pages 29 and 30.

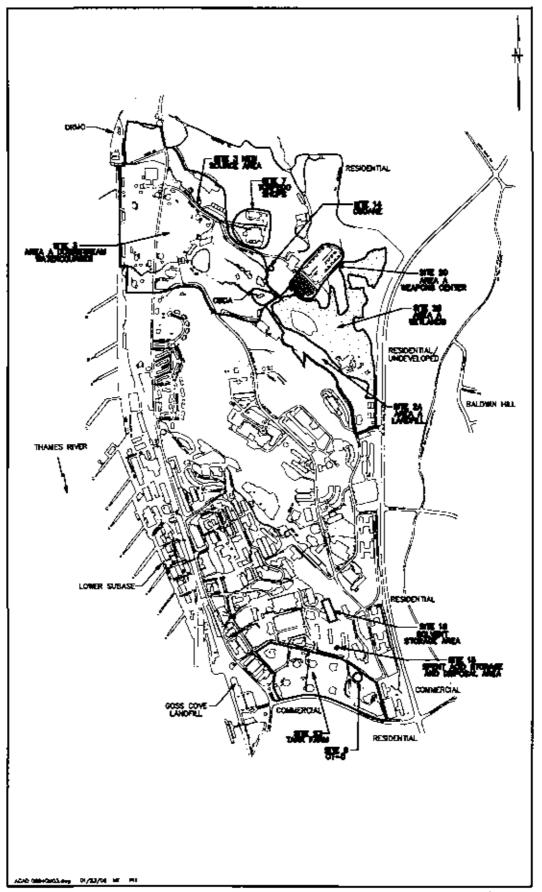


Figure 1. Site Location Map

What Do You Think?

The Navy and EPA are accepting public comments on the final Proposed Plan for OU9 from June 14, 2008 to July 14, 2008. You do not have to be a technical expert to comment. If you have a comment or concern, the Navy wants to hear from you before making a final decision.

There are two ways to formally register a comment:

- Offer oral comments during the June 26, 2008 public hearing, or
- Send written comments postmarked no later than July 14, 2008 following the instructions provided at the end of this Proposed Plan.

To the extent possible, the Navy will respond to your oral comments during the June 26, 2008 public meeting. In addition, regulations require the Navy to respond to all formal comments in writing. The Navy will review the transcript of the comments received at the meeting, and all written comments received during the formal comment period, before making a final decision and providing written responses to the comments in a document called a Responsiveness Summary. The Responsiveness Summary will be included in the ROD.

Introduction

The Navy conducted various field investigations at Sites 2A, 2B, 3, 7, 9, 14, 15, 18, 20, and 23 from 1990 to the present to assess the nature and extent of groundwater contamination. The investigations at Sites 2A, 2B, 3, 7, 20, and 23 focused on the groundwater present in the overburden and bedrock, and the investigations at Sites. 9, 14, 15, and 18 focused on the groundwater in the overburden. Overburden and bedrock groundwater potentiometric contours and flow directions at Sites 2A, 2B, 3, 7, 14, and 20 are presented in Figures 2 and 3, respectively. Sites 2A and 2B are located hydraulically upgradient of Site 3. Site 20 is located hydraulically upgradient of Sites 3 and 7. Overburden and bedrock groundwater potentiometric contours and flow directions at Sites 9, 15, and 23 are presented on Figures 4. and 5, respectively. Groundwater flow directions at Site 18 are shown on Figure 6. Risk assessments were also performed to evaluate the potential effects of the contamination found in the groundwater at Sites 2A, 2B, 3, 7, 14, 15, 18, 20, and 23 on human health and the environment.

Detailed descriptions of the sites are provided in the Phase II RI (March 1997), Basewide Groundwater Operable

Unit Remedial Investigation (BGOURI) Report (January 2002), BGOURI Update/Feasibility Study (FS) Report (July 2004), and Second Five-Year Review Report (December 2006), which are all available in the Information Repositories at the locations identified on page 19.

The remedial actions for groundwater at Sites 3, 7, 14, 15, 18, and 20 are described in the December 2004 Interim ROD. The selected remedy for Sites 14, 15, 18, and 20 was No Further Action (NFA). Based on the interim selected remedy of Institutional controls and groundwater monitoring for Sites 3 and 7, a groundwater monitoring program for Sites 3 and 7 was initiated in 2006. Also, a remedial design for land use controls was completed in 2005 and a Site Use Restrictions document that defines the Navy's policy regarding disturbance of groundwater at IR sites was updated in 2006 to include Sites 3 and 7 groundwater.

This Proposed Plan recommends final measures of institutional controls and monitoring for the groundwater at Sites 3 and 7. This recommendation is based on recent monitoring results in conjunction with the BGOURt Update report's conclusion that there were no significant risks to current human or ecological receptors, but there are potentially significant risks to hypothetical future human receptors from routine, long-term consumption of contaminated groundwater.

This Proposed Plan recommends implementation of institutional controls for the groundwater at Sites 9 and 23. This recommendation is based on recent monitoring results in conjunction with 2008 risk assessment memoranda for Sites 9 and 23 that indicated that there were no significant risks to current human or ecological receptors, but there are potentially significant risks to hypothetical future human receptors from routine, long-term consumption of contaminated groundwater.

This Proposed Plan also recommends NFA for the **ground-water** at Sites 14, 15, 18, and 20. The conclusion that there were no significant risks to human health or the environment from current or future exposure to **groundwater** was presented in the **BGOURI** report for Site 18; in the **BGOURI Update** report for Sites 14, 15, and 20; and in 2008 risk **assessment** memoranda for Sites 14, 15, 18, and 20. Sites 2A and 2B will continue to be monitored as required by the **OU1 ROD**.

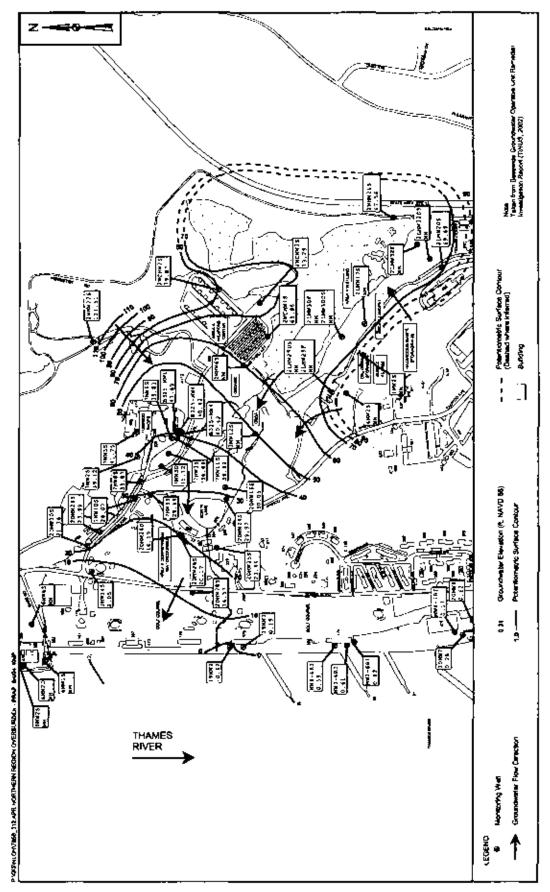


Figure 2. Shallow Overburden Potentiometric Surface Map, Sites 2A, 2B, 3, 7, 14, and 20, August 2000

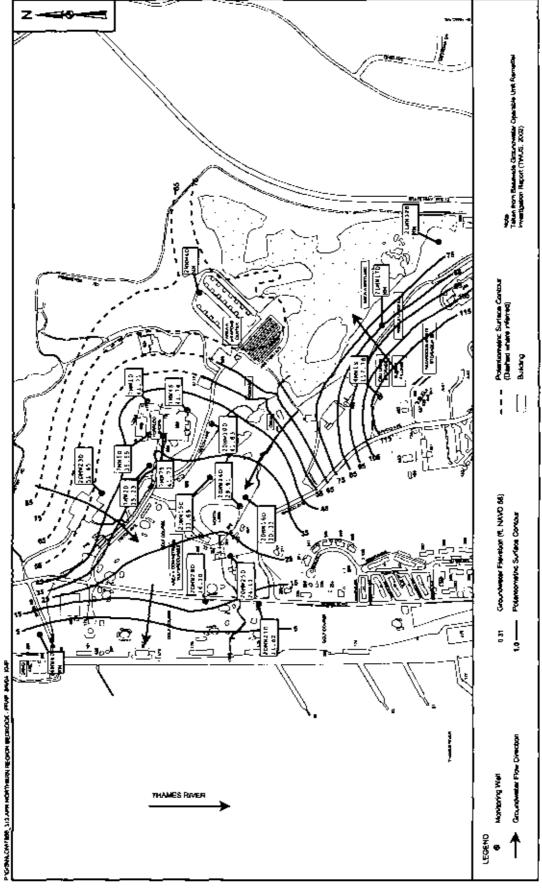


Figure 3. Bedrock Potentiometric Surface Map. Sites 2A, 2B, 3, 7, 14, and 20, August 2000

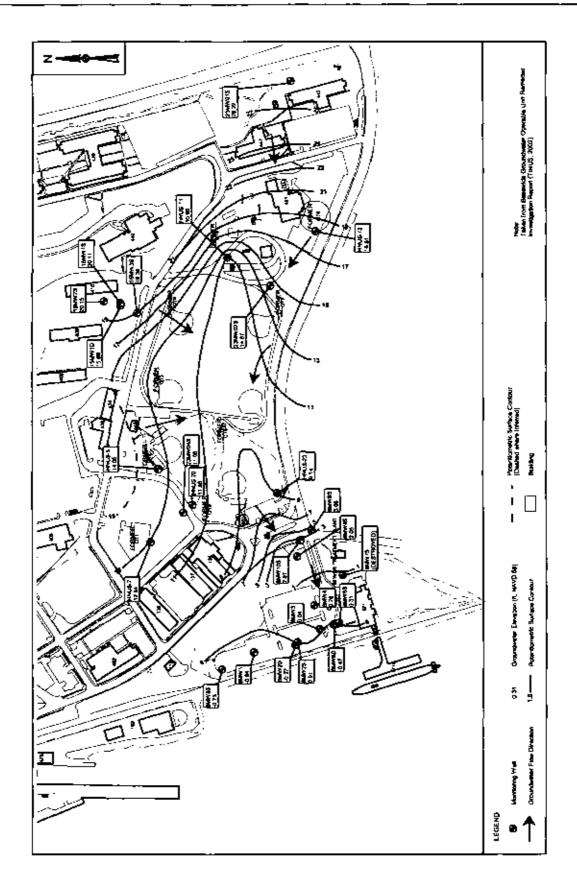


Figure 4. Shallow Overburden Potentiometric Surface Map, Sites 2A, 2B, 3, 7, 14, and 20, August 2000

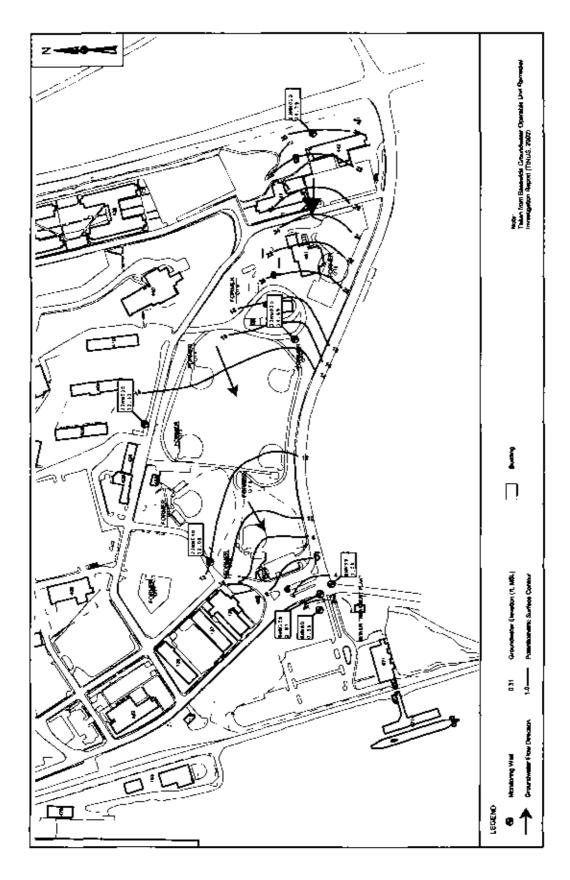


Figure 5. Bedrock Potentiometric Surface Map, Sites 9, 15, and 23, August 2000

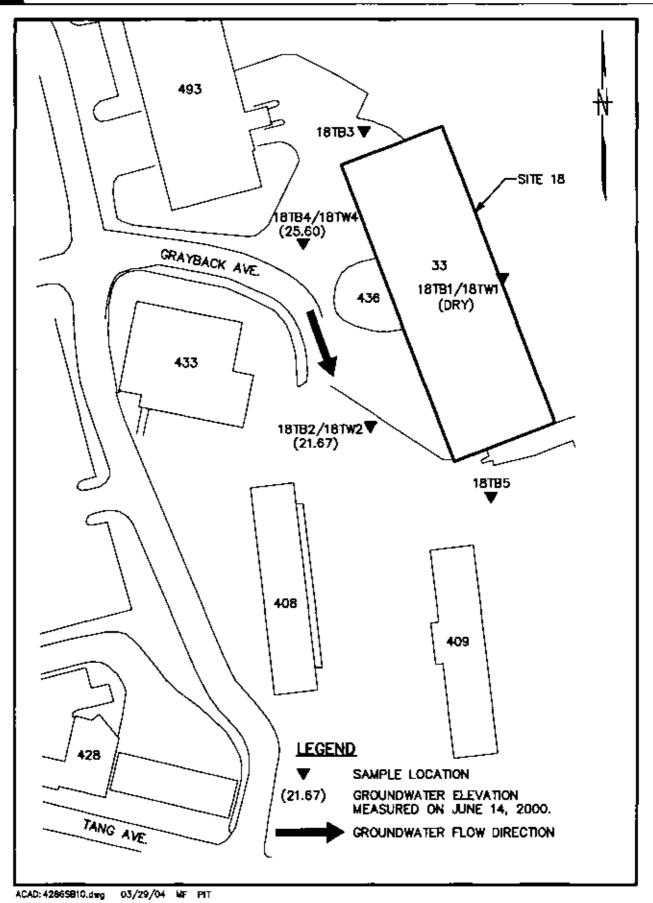


Figure 6. Site 18 Layout Map

Site Backgrounds, Characteristics, and Investigations

Site 2A

Site 2A includes the Area A Landfill, as shown in Figure 7. Area A Landfill opened around 1957. Incinerated combustible wastes were disposed at the Area A Landfill until 1963, followed by refuse and debris disposal until 1973, when landfilling operations ceased. The thickness of the landfill materials is estimated to range from 10 to 20 feet. After closure, a concrete pad was constructed on a portion of the landfill. In the early 1980s, transformers and electrical switches stored on the pad were reported to be leaking. Petroleum compounds were poured from containers at the landfill and flowed into the Area A Wetland. Spent sulfuric acid solution from batteries was poured into trenches dug in to Area A Landfill for disposal and subsequently covered with soil.

A Phase i Remedial Investigation (RI) (1992), Focused FS (1995) and Phase II RI (1997) were conducted for the Area A Landfill. The Phase II RI concluded that shallow groundwater contamination existed at the site, the landfill soil may pose a threat to human receptors from concentrations of PCBs, and chemicals in soil could adversely impact ecological receptors. To address Site 2A soil (OU1), a Remedial Action (RA), which involved the construction of a 13-acre low-permeability cover system over the landfill area, was performed in 1997. The groundwater at the Area A Landfill is currently monitored under a long-term. groundwater monitoring program. The groundwater at the site was also investigated as part of the BGOURI (2002). The BGOURI recommended that the monitoring program be continued to gather data to evaluate long-term trends in contaminant concentrations and the decision to proceed to an FS should be made after sufficient data have been collected and evaluated. Land use controls have been implemented at the landfill to meet the requirements in the soil ROD. A majority of the Area A Landfill is paved and is currently used for storage of equipment and vehicles.

The initial **Groundwater Monitoring** Plan (GMP) (1999) for Site 2 called for **monitoring groundwater** and surface water for semivolatile organic compounds (**SVOCs**), volatile organic compounds (**VOCs**), **PAHs**, **metals**, pesticides/PCBs, and various field parameters.

A geochemical investigation completed during Year 3 revealed that the slightly elevated arsenic concentrations detected in the downgradient **monitoring** wells in the Area

A Wetland, which were completed in dredged material, are related to the dredged material and not the landfill. It is also likely that the elevated zinc levels were related to the dredged material as well as background conditions.

The geochemical investigation also indicated that the pore water in the dredged material is not participating actively in the local groundwater flow system. This conclusion was based on measured hydraulic conductivities (vertical and horizontal) and the observation that the dredged material pore water retains strong signatures of seawater. Therefore, the monitoring results do not indicate that the Area A Landfill is acting as a significant source of contamination to groundwater or surface water.

After 4 years of monitoring, the revised GMP (2004) called for monitoring groundwater and surface water for SVOCs, PAHs, total and dissolved metals, and field parameters. A decision was made to eliminate VOCs and pesticides/PCBs from the Area A Landfill analytical program based on monitoring results with no exceedances of criteria for these compounds. The revised monitoring list for the Area A landfill is as follows:

- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Benzo(k)fluoranthene
- BEHP
- Phenanthrene
- Arsenic

- Beryllium
- Cadmium
- Chromium
- CopperLead
- Zinc

Compliance with CTDEP Remediation Standard Regulations (RSRs) for a given constituent in a **groundwater** plume can be shown by two different methods. Compliance is achieved when sampling locations are representative of the plume and:

- The average concentration of the compound in the plume is equal to or less than the applicable criteria for at least four consecutive quarterly sampling periods, or
- Statistical comparisons of upgradient and downgradient concentrations such that the concentration of the compound is not increasing over time.

Site 2 has been monitored for 8 years. Overall the results of seven years of monitoring indicate that the cap system is working properly and significant contaminant migration from the landfill is not occurring. The most recent results available, those from Year 7 (2006), determined that copper was the only contaminant detected in groundwater in excess of criteria (Figure 8) and this was in a



Figure 7. Sites 2A, 2B, 3, 7, 14, and 20 Layout Map

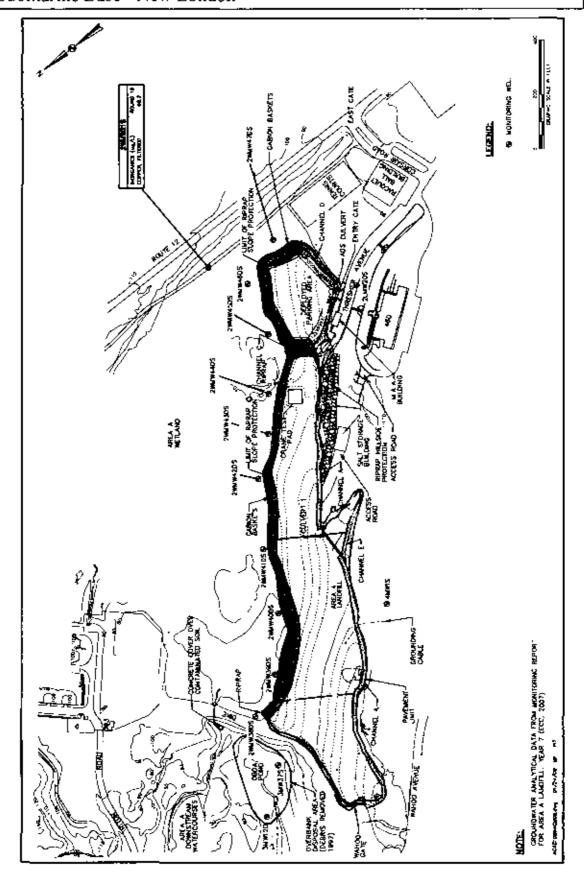


Figure 8. Significant Groundwater Contamination at Sites 2A and 2B

reference well, not a downgradient well. In addition, this well had elevated turbidity, which indicates a suspended sediment issue. The concentrations of copper in all monitored wells exhibited some spikes and appear to have a seasonal component but do not exhibit a clear trend.

The Site 2A human health risk assessment performed during the BGOURI evaluated potential risks from exposures to groundwater by construction workers. The risk assessment determined that risks for construction workers were within acceptable risk levels. The risk assessment was updated in a 2008 memorandum to account for current risk assessment guidance and Year 7 sampling results. The assessment confirmed that risks to construction workers exposed to groundwater would be acceptable; however, the assessment showed that there are potential risks to hypothetical residents that would exceed USEPA and CTDEP acceptable levels if groundwater is used as a drinking water supply. These risks are mitigated by the existing institutional controls that prohibit residential development of Site 2. Potential risks resulting from exposures to chemicals that have volatilized from groundwater and migrated through building foundations into indoor air were also evaluated by comparing concentrations of volatile chemicals detected in groundwater to USEPA and CTDEP screening criteria. for vapor intrusion. Concentrations of chloroform, tetrachloroethene, and trichloroethene exceeded the USEPA screening criteria and they were further evaluated using USEPA's Johnson and Ettinger Vapor Intrusion Model. Modeling results showed that cancer risks and hazard indices for residential and industrial scenarios were within USEPA and CTDEP acceptable levels and vapor intrusion is not an issue at Site 2A.

Site 2B

Site 2B, the Area A Wetland, is located north of the Area A Landfill (Figure 7). In the late 1950s, dredged material from the Thames River were pumped to this area and contained within an earthen dike that extends from the Area A Landfill to the southern side of the Area A Weapons Center. The thickness of dredged material ranges from 10 feet to 35 feet. A small pond is located at the southern portion of the wetland, where 1 to 3 feet of standing water is present year-round. Phragmites is the predominant type of vegetation. It was reported that formulated (watersoluble) 1,1,1-trichloro-2,2-bis(4chlorphenyl)ethane (ODT) was used in the 1960s before the 1972 ban. The Phase I and II RIs (1992 and 1997, respectively) and the BGOURI (2002) included investigations of the Area A Wetland. The Area A Wetland sediment was identified as OU12 and it is currently being investigated under CERCLA.

The Phase II RI found little, but some, evidence of ground-water contamination at Site 2B. The human health risk assessment concluded that carcinogenic risks were within the USEPA target risk range of 1 per 1,000,000 to 1 per 10,000. Non-carcinogenic risks were below the USEPA acceptable level of one. The cumulative hazard index exceeded one for the construction worker but the risk assessment assumed that the construction worker would come in direct contact with the soil and groundwater for 8 hours a day for 120 days a year. The cumulative non-carcinogenic risks for the construction worker scenario using assumptions of direct contact for 4 hours a day for one month a year are in the acceptable range.

The risk assessment was updated in a 2008 memorandum to account for current risk assessment guidance and Year 7 sampling results. The assessment confirmed that risks to construction workers exposed to groundwater would be acceptable; however, the assessment showed that there are potential risks to hypothetical residents that would exceed USEPA and CTDEP acceptable. levels if groundwater is used as a drinking water supply. These risks are mitigated by the existing institutional controls that prohibit residential development of Site 2. Potential risks resulting from exposures to chemicals that have volatilized from groundwater and migrated through building foundations into indoor air were also evaluated in a separate 2008 memorandum by comparing concentrations of volatile chemicals detected in groundwater to USEPA and CTDEP screening criteria for vapor intrusion. Concentrations of trichloroethene and tetrachloroethene exceeded the USEPA screening criteria and they were further evaluated using USEPA's Johnson and Ettinger Vapor Intrusion Model. Modeling results showed that cancer risks and hazard indices for residential and industrial scenarios were within USEPA and CTDEP acceptable levels and vapor intrusion is not an issue at Site 28.

Sites 3 and 7

Site 3 covers approximately 75 acres in the northern portion of NSB-NLON. The site contains mainly undeveloped wooded areas and recreational areas (golf course and lake for swimming (North Lake)). The Site 3 watercourses include several small ponds and interconnected streams (Figure 7) that convey surface water to the Thames River. Site 3 also includes the former Over Bank Disposal Area (OBDA). Site 3 was investigated during the Phase I RI (1992), Phase II RI (1997), Data Gap Investigation (2002), BGOURI (2002), and BGOURI Update/FS (2004). The major sources of contamination to Site 3 included historic application of pesticides, abandoned disposal areas, and the septic system leach fields at Site 7. In March 1997, accumulated debris in the OBDA (Figure 7), includ-

ing discarded wooden pallets, telephone poles, and empty tanks, was removed as part of a Time-Critical Removal Action (TCRA) and disposed off site. During 1999 and 2000, a remedial action was completed for a portion of Site 3 soil and sediment (OU3). Approximately 18,050 tons of soil and sediment contaminated with pesticides and metals were excavated and disposed at off-site disposal facilities. The Site 3-New Source Area (NSA), discovered during the RA for Site 3 OU3, contained petroleum-contaminated soil. The site was a small disposal area on the hillside adjacent to Stream 5, and debris, such as rusted drums and wire cable, was found intermingled with soil and boulders at the site. An RA for the debris and contaminated soil at the site was completed in October 2007.

Most of Site 3 is within designated Explosive Safety Quantity Distance (ESQD) arcs of Site 20; therefore, further development is not planned for this area. Navy regulations prohibit construction of inhabited buildings or structures within these arcs. Although existing buildings operate under a waiver of these regulations, no further construction is planned.

Site 7, the Torpedo Shops (Buildings 325, 450, 477, and 528), is located in the northern portion of NSB-NLON on the northern side of Triton Road (Figure 7). The Navy conducts maintenance activities on torpedoes at the site. Site 7 media were investigated during several phases from 1990 to 2000. Site 7 soil was addressed by the ROD for QU8 in 2004 and an RA (excavation and off-site disposal) in 2006. The major sources of contamination at Site 7 included possible historic disposal of solvents/chemicals into two on-site septic systems and leaks or spills associated with on-site underground storage tanks. Contaminated soil was found on the southern side of Building 325, and it appeared to be related to former underground storage tanks used to store fuel oil. Groundwater and suspected soil contamination on the western side of the building appeared to be related to the septic tank, sewer lines, or leach field associated with the former septic system. The underground storage tanks were closed in the 1990s, and the septic system was abandoned when sanitary sewers were installed in 1983. A soil RA was performed at Site 7 in 2006. Soil was excavated from two locations - south of Building 325, and the former septic tank area west of Building 325. Approximately 1,150 tons of PAH-, benzene-, chlorobenzene-, and dichlorobenzenecontaminated soil and 125 tons of asphalt were excavated and disposed off site. Excavations were backfilled with clean soil.

Chlorinated **volatile organic compounds** (**VOCs**) [e.g., cis-1,2-dichloroethene, trichloroethene (TCE), and vinyl chloride] and **PAHs** were the primary contaminants his-

torically detected in the groundwater at Site 3. Chlorinated VOCs were detected during all of the investigations. and it is likely that their detections are the result of solvents released to groundwater via the two septic systems and associated leach fields at Site 7 and migrating downgradient to Site 3. No other potential source of the contamination was found in the area. Use of the septic systems and leach fields at Site 7 was terminated in 1983. when sanitary sewers were installed. The concentrations of the VOCs detected during the 2002 investigation were lower than concentrations detected during previous investigations (1994), indicating that a continuing source of contamination is not present. The VOCs were found primarily along the length of Stream 5. The PAHs, which were detected infrequently, were found to be related to suspended solids in samples collected from recently installed and sampled temporary wells and not a site-specific groundwater concern. The results of the risk assessment showed that there are no unacceptable risks to current receptors from exposure to contaminants in Site 3 groundwater, but the maximum concentrations of TCE and vinyl chloride in Site 3 groundwater could result in unacceptable risks to hypothetical residents if groundwater is used as a drinking water supply.

Potential risks resulting from exposures to chemicals that have volatilized from groundwater and migrated through building foundations into indoor air were also evaluated in a 2008 memorandum by comparing concentrations of volatile chemicals detected in groundwater to USEPA and CTDEP screening criteria for vapor intrusion. Concentrations of chloroform, trichloroethene, and vinyl chloride exceeded the USEPA screening criteria and they were further evaluated using USEPA's Johnson and Ettinger Vapor Intrusion Model. Modeling results showed that carcer risks and hazard indices for residential and industrial scenarios were within USEPA acceptable levels, but cancer risks from chloroform and vinyl chloride for the residential scenario exceeded CTDEP acceptable levels. Because the concentration of chloroform did not exceed the CTDEP vapor intrusion criteria, it was concluded that there are no vapor intrusion issues associated with chloroform. Further evaluation of vinyl chloride concluded that it does present a potential risk for the residential scenario. A building could be built for industrial purposes in the area where elevated concentrations of vinyl chloride were detected in groundwater, however, there would be restrictions on construction of a building for residential purposes within 100 feet of the area unless steps are taken. to mitigate the vapor intrusion issue (subslab depressurizing system). As a result, the NSB-NLON IR Site Use Restrictions document for Site 3 will be expanded to include controls on vapor intrusion issues until groundwater concentrations reduce to levels at which vapor intrusion is no longer deemed an issue. Site 3 land use is currently industrial and no significant risks are expected from exposures resulting from the migration of vinyl chloride from groundwater into indoor air since there are no buildings in the area of the exceedance and vinyl chloride was detected infrequently in groundwater. As previously mentioned, most of Site 3 is within designated ESDQ arcs for Site 20 and further development is not planned within this area.

Investigations at Site 7 found benzene, chlorobenzenes (1,4-dichlorobenzene, chlorobenzene, and hexachlorobenzene), phenanthrene, and TCE in the groundwater. The contaminants were probably released to the groundwater via the two septic systems and associated leach fields historically used at the site. The results of the risk assessment showed that there are no unacceptable risks to current receptors from exposure to contaminants in Site 7 groundwater, but the maximum concentrations of benzene, chlorobenzenes, and TCE in Site 7 groundwater could result in unacceptable risks to hypothetical residents if groundwater is used as a drinking water supply.

Potential risks resulting from exposures to chemicals that have volatilized from **groundwater** and migrated through building foundations into indoor air were also evaluated in a 2008 memorandum by comparing concentrations of volatile chemicals detected in **groundwater** to USEPA and CTDEP screening criteria for vapor intrusion. Concentrations of trichloroethene exceeded the USEPA screening criterion and it was further evaluated using USEPA's Johnson and Ettinger Vapor Intrusion Model. Modeling results showed that cancer risks and hazard indices for residential and industrial scenarios were within USEPA and CTDEP acceptable levels and vapor intrusion is not an issue at Site 7.

The initial screening of the analytical data also indicated that the maximum concentrations of hexachlorobenzene and phenanthrene could migrate from **groundwater** to surface water. However, upon further evaluation of frequency of detection information, the potential migration was determined to be insignificant.

The **groundwater** chemicals of concern (COCs) for Sites 3 and 7, based on the investigations and **risk assessments** that were conducted, and the remedial goals selected for each of the COCs are as follows:

VOCs

- 1,4-Dichlorobenzene, 75 μg/L (Site 7)
- Benzene, 1 µg/L (Site 7)

- Chlorobenzene, 100 µg/L (Site 7)
- TCE, 5 µg/L (Sites 3 and 7)
- Vinyl chloride, 1.6 µg/L (Site 3).

SVOCs

Hexachlorobenzene, 1 µg/L (Sites 3 and 7)

In addition to these COCs, the following COCs were identified for the PAH-contaminated soil at Site 7. The groundwater is monitored for these COCs to evaluate the effectiveness of the soil remediation at Site 7. These COCs will only be analyzed in monitoring well 7MW13S.

PAHs

- Benzo(a)anthracene
- Benzo(a)pyrene
- Benzo(b)fluoranthene
- Indeno(1,2,3-cd)pyrene

Monitored **groundwater** wells and exceedances of remedial goals from the first year (four rounds in 2006-2007) of sampling at those wells are presented on Figure 9. No COCs were detected at several wells. At Site 3, TCE and vinyl chloride were detected in three wells at concentrations that slightly exceeded their remedial goals. It is expected that these contaminants will continue to trend downward and will shortly be below the remedial goals. All compounds at Site 7 were below their remedial goals.

Site 9

Site 9 included OT-5 (Figure 10), a former underground concrete storage tank, located within Site 23 (Figure 11). The soil at Site 9 was investigated and remediated under the CTDEP RCRA UST Program. No CERCLA decision. documents were prepared for the soil OU. The tank was constructed in the 1940s and was used to store fuel oil. The tank had a capacity of approximately 750,000 galions. In the late 1970s, the tank was converted to a storage tank for bilge water and other waste solutions. Use of OT-5 was stopped in 1993, and all tank contents were removed. A residual sludge layer of approximately 2 to 3 inches was left in the tank after purging. This sludge contained polychlorinated biphenyls (PCBs) at concentrations exceeding 500 mg/kg. After OT-5 was emptied, groundwater infiltrated through cracks in the concrete surface and partially refilled the tank. Residual materials were removed in 1994. After the contents of OT-5 were removed, the tank was cleaned and the top of the tank was crushed. The tank was closed in place by filling it with inert material. Further evaluation of Site 9 groundwater is included under Sites 23.

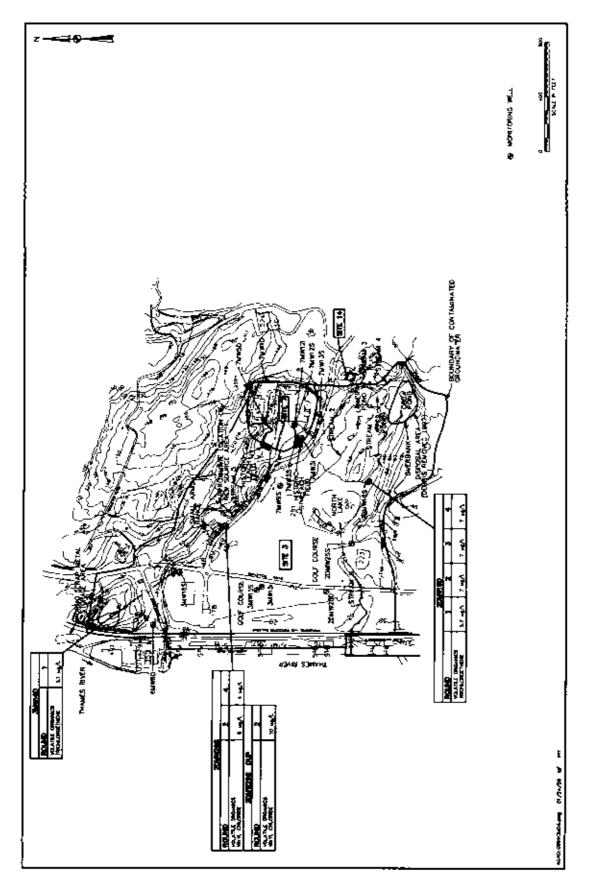


Figure 9. Significant Groundwater Contamination at Sites 3 and 7

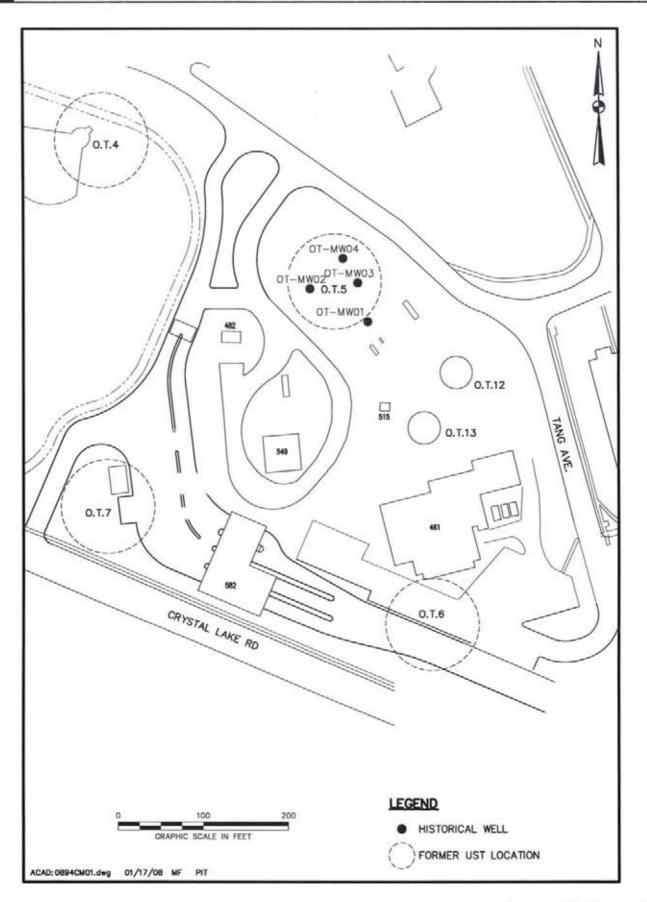


Figure 10. Site 9 Layout Map

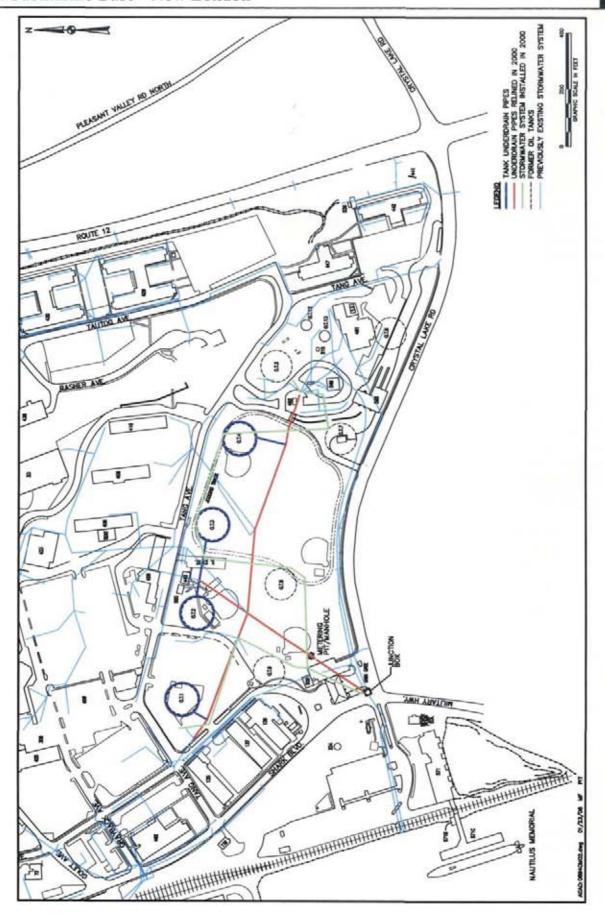


Figure 11. Sites 9 and 23 Layout Map

Site 14

Miscellaneous wastes were dumped at Site 14. It is located adjacent to Sites 3 and 7 in a wooded area on the edge of a ravine just north of Stream 3 (Figure 7). ANTCRA was completed at the site in 2001 to address the soil (OU8) and miscellaneous wastes dumped at the site. Approximately 270 tons of material were removed and disposed off site, and the site was subsequently restored.

One groundwater monitoring well was installed at Site 14. It was sampled in 1994 and 2000. Naturally occurring metals were the only chemicals detected in the groundwater. Evaluation of the Site 14 analytical data indicated that there are no adverse health effects anticipated from exposure to groundwater at the site.

Site 15

Site 15 is located in the southern portion of NSB-NLON (Figure 1). It is centrally located between the southern sides of Buildings 409 and 410 (Figure 12). This site was used before and after World War II for the temporary storage of waste battery acid in a rubber-lined underground tank. The tank was reportedly 12 feet long by 4 feet wide by 4 feet high. The batteries were placed on a concrete pad next to the tank onto which acids occasionally leaked. No major spills were recorded. A 1951 aerial photograph showed that the area around the tank was not paved. Acid from the batteries was stored in the tank and was subsequently pumped into a tank truck and disposed in the Area A Landfill (Site 2). Historical investigations completed at Site 15 include the Phase I RI (1992), Focused FS (1994), Phase II RI (1997), Supplemental Sampling Event (1997) and **BGOURI** (2002). Based on the results of the Phase I RI and Focused FS, it was determined that a TCRA was necessary for Site 15. The removal action was completed in 1995 and included removal of the tank, its contents, and 318 tons of lead-contaminated soil. Subsequent to the TCRA, completion of the Phase II RI, and confirmation sampling, an NFA Source Control ROD was signed for Site 15 soil (OU6) in 1997.

After the TCRA at Site 15, groundwater samples were collected in 2000 at the site during the BGOURI. The BGOURI identified TCE and metals as the groundwater chemicals of potential concern (COPCs). TCE had not been detected in previous sampling events. Additional soil and groundwater samples were collected during the data gap investigation (DGI) in 2002 to confirm the results of the BGOURI, to further define the nature and extent of contamination at the site, and to determine the risks to human receptors from exposure to Site 15 soil and

groundwater. The DGI results were presented in the BGOURI Update/FS. TCE was not detected in the DGI groundwater samples, which indicated that the detections of TCE found in groundwater samples during the BGOURI were anomalous and not indicative of a site or upgradient source issue. The metals cadmium, chromium, lead, nickel, silver, and zinc were identified as groundwater COPCs at Site 15 during the BGOURI. The results of the DGI showed that the chromium, lead, nickel, and silver concentrations were also anomalies and that the elevated concentrations may have been a result of the field sampling methodology and/or laboratory issues.

The risk assessment and data screening completed with the DGI results showed that there are no groundwater COCs for Site 15. The risk assessment was performed for construction workers and hypothetical adult residents. The results of the risk assessment indicated that the risks from direct exposure to groundwater were within USEPA and CTDEP acceptable risk levels. Potential risks resulting from exposures to chemicals that have volatilized from groundwater and migrated through building foundations into indoor air were also evaluated in a 2008 memorandum by comparing concentrations of volatile chemicals. detected in groundwater to USEPA and CTDEP screening criteria for vapor intrusion. Concentrations of chloroform exceeded the USEPA screening criterion and it was further evaluated using USEPA's Johnson and Ettinger Vapor Intrusion Model. Modeling results showed that cancer risks and hazard indices for residential and industrial scenarios were within USEPA and CTDEP acceptable levels and vapor intrusion is not an issue at Site 15.

Site 18

Site 18 consists of Building 33, the Solvent Storage Area. The location of Site 18 is shown on Figures 1 and 6. Building 33 has been used for the storage of gas cylinders and 55-gallon drums of solvents such as trichloroethene (TCE) and dichloroethene. The Solvent Storage Area at Building 33 was identified during the IAS. The site was identified as Study Area F in the FFA and is now identified as Site 18 for the IR Program. **Groundwater** samples were collected from the site during the **BGOURI** (2002).

At Site 18, no significant groundwater contamination was identified during the BGOURI. No groundwater COPCs were identified for Site 18 during the data screening portion of the risk assessment. The results of the RI did not indicate that subsequent rounds of investigation were necessary to further characterize the site or that an FS was necessary for the site.

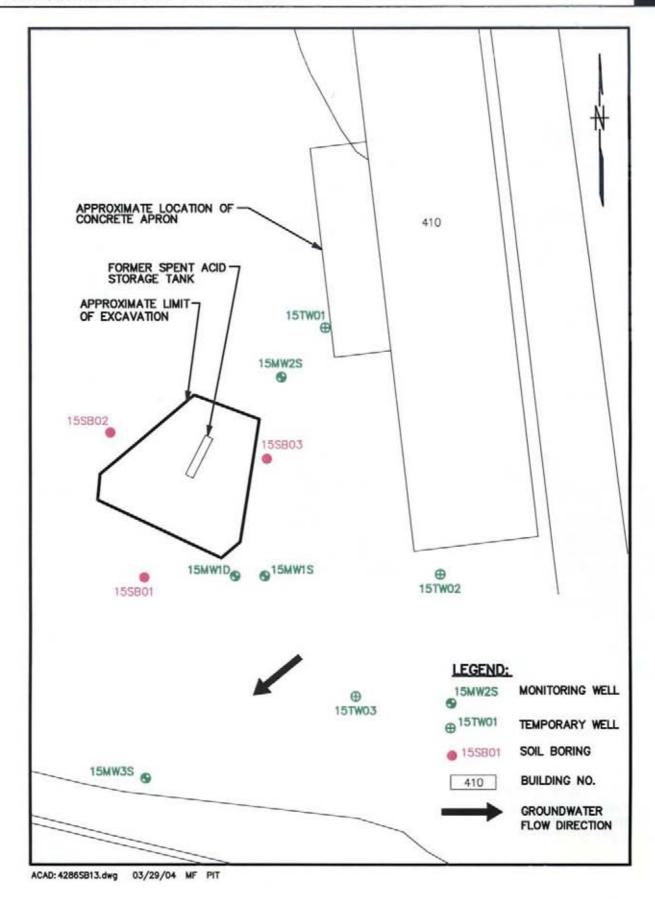


Figure 12. Site 15 Layout Map

The soil associated with Site 18 (OU11) was addressed in an NFA ROD in 2004.

Site 20

The Area A Weapons Center (Site 20) consists of Building 524 and the weapons storage bunkers. The site is located near the top of a local topographic and bedrock high (Figure 7). Building 524 is used for administration, minor torpedo assembly, and storage of simulator torpedoes. Small quantities of chemicals (cleaning and lubricating compounds, paints, and adhesives) and chemical waste generated by on-site activities are stored at the site. Liquid fuels present in the weapons storage bunkers include Otto fuel II, JP-10, and TH Dimer (jet rocket fuel). A small (less than 200 cubic yards) soil RA was conducted at the site in 2001 to address polynuclear aromatic hydrocarbon (PAH) and inorganic contamination in the soil and sediment (OU7). Site 20 soil is designated as OU7.

The overburden and bedrock groundwater at Site 20 was characterized during three separate investigations. VOCs and SVOCs were detected sporadically at low concentrations in the overburden and bedrock groundwater during the investigations. Naturally occurring metals were detected consistently in the groundwater. Evaluations of risks in the Phase II RI related to the site's groundwater indicated potentially unacceptable risks for construction workers and adult residents. The results from the BGOURI showed that risks to construction workers were within acceptable levels mainly as a result of lower concentrations of metals in groundwater. Risks for hypothetical adult residents exceeded acceptable levels in the BGOUR!. The latest results from the BGOUR! Update! FS showed that there are no adverse health effects anticipated from exposure to Site 20 groundwater for hypothetical adult residents.

Potential risks resulting from exposures to chemicals that have volatilized from **groundwater** and migrated through building foundations into indoor air were also evaluated in a 2008 memorandum by comparing concentrations of volatile chemicals detected in **groundwater** to USEPA and CTDEP screening criteria for vapor intrusion. Concentrations of trichloroethene exceeded the USEPA screening criterion and it was further evaluated using USEPA's Johnson and Ettinger Vapor Intrusion Model. Modeling results showed that cancer risks and hazard indices for residential and industrial scenarios were within USEPA and CTDEP acceptable levels and vapor intrusion is not an issue at Site 20.

Site 23

Site 23 (Tank Farm) is located in the southern portion of NSB-NLON (Figure 1). Site 23 features nine former USTs that were demolished and closed in place, a 30,000 galion, doublewalled UST (OT10), a 10,000-gallon waste oil tank, a fuel oil loading area, a tanker truck dumping pad and trough, associated UST piping systems, baseball/ softball fields, buildings that housed the former air sparging/ soil vapor extraction (AS/SVE) facility for the Naval Exchange service station, two 150,000-gallon diesel aboveground storage tank (ASTs), and other buildings. Five of the nine tanks (OT-1, OT-2, OT-3, OT-4, and OT-6) had perimeter underdrains installed around them during their construction to depress groundwater levels. In addition, the storm sewers, which the underdrains tie into, were constructed of perforated corrugated metal pipe to help dewater the area. The underdrain at OT-6 was subsequently abandoned around 1966 during completion of improvements to the storm sewer system. The soil at Site 23 was remediated in 1997 and 2000 under the CTDEP Resource Conservation and Recovery Act (RCRA) Underground Storage Tank (UST) Program.

The Site 23 USTs were properly closed in place; however, the tank underdrain systems were allowed to remain in place to help reduce groundwater levels in the area. Evidence of releases of petroleum products from the tanks, their associated piping, and possibly from other nearby sources was detected in soil during previous investigations. No significant groundwater contamination was detected; however, petroleum hydrocarbons were detected periodically at the outfall of the storm sewer system near Goss Cove. The stormwater drainage system was rehabilitated in 2000 such that the original combined groundwater and stormwater system was separated into a deep groundwater and a new shallow stormwater system. The groundwater underdrain system continues to collect groundwater from the old tank drains. In 2000, new storm drain was installed using solid wall HDPE piping and much of the underdrain was relined with perforated plastic pipe, at the locations shown on Figure 11. An existing manhole was modified to become a groundwater flow-metering and sampling pit. Beyond the metering pit, the groundwater underdrain pipe and stormwater collection pipes are recombined (Figure 11), such that groundwater then enters the storm sewer system.

The risk assessment performed during the **BGOURI** evaluated potential risks from exposures to Site 23 **ground-water** by construction workers and hypothetical adult residents, although, it is unlikely, that direct contact exposures to Site 23 **groundwater** would occur based on current and expected future site use. The results of the **risk**

assessment showed that there are no unacceptable risks to construction workers and hypothetical adult residents.

The Site 23 underdrain metering pit was sampled after construction and quarterly for one year starting in June 2007. The metering pit collects groundwater from the Site 23 area underdrains from four former tanks. All relevant concentrations were below established Connecticut criteria with the exception of arsenic and six SVOCs. Arsenic was detected in one unfiltered sample during the September 2007 sampling event at a concentration exceeding the Connecticut criteria, but the concentration of arsenic in the associated filtered sample was below the criteria. Because arsenic was not detected at similar concentrations during previous or subsequent sampling events, it was concluded that the single elevated detection of arsenic was related to suspended solid particles in the water and not a true issue. Six SVOCs were detected during the December 2007 sampling round at concentrations. that were greater than the Connecticut surface water protection criteria. These chemicals were not detected in the duplicate sample collected during that round and they were not detected in previous or subsequent sampling events. Therefore, it was concluded that these detections were anomalous.

The risk assessment was updated in a 2008 memorandum to account for current risk assessment guidance and the 2007/2008 underdrain metering pit quarterly sampling results. The assessment confirmed that risks to construction workers exposed to groundwater would be acceptable; however, the assessment showed that there are potential risks to hypothetical residents that would exceed USEPA and CTDEP acceptable levels if groundwater is used as a drinking water supply. These risks are mitigated by the fact that many of the major contributors to the carcinogenic and noncarcinogenic risks were only detected in one of four rounds of samples and Site 23 is not suitable for residential development.

Potential risks resulting from exposures to chemicals that have volatilized from **groundwater** and migrated through building foundations into indoor air were also evaluated in a 2008 memorandum by comparing concentrations of volatile chemicals detected in **groundwater** to USEPA and CTDEP screening criteria for vapor intrusion. Concentrations of chloroform and trichloroethene exceeded the USEPA screening criteria and they were further evaluated using USEPA's Johnson and Ettinger Vapor Intrusion Model. Modeling results showed that cancer risks and hazard indices for residential and industrial scenarios were within USEPA and CTDEP acceptable levels and vapor intrusion is not an issue at Site 23.

Based on these results, Site 23 groundwater (including Site 9 groundwater) collected and conveyed in the storm sewer system does not pose a significant current threat to human health or the environment, but it may pose a potential threat in the future to hypothetical future human receptors if they regularly consume the groundwater over a prolonged period of time. Institutional controls are required for Site 23 to restrict extraction and use of groundwater to minimize the potential risk to future human receptors.

What is Risk and How is it Calculated?

A human health risk assessment estimates "baseline risk." This is an estimate of the likelihood of health problems occurring if no cleanup action were taken at a site. To estimate baseline risk at a site, the Navy undertakes a four-step process in accordance with USEPA guidance:

Step 1: Analyze Contamination

Step 2: Estimate Exposure

Step 3: Assess Potential Health Dangers

Step 4: Characterize Site Risk

In Step 1, the Navy looks at the concentrations of contaminants found at a site as well as past scientific studies on the effects these contaminants have had on people (or animals, when human studies are unavailable). Comparisons between site-specific concentrations and concentrations reported in past studies help determine which contaminants are most likely to pose the greatest threat to human health.

In Step 2, the Navy considers the different ways that people might be exposed to the contaminants identified in Step 1, the concentrations that people might be exposed to, and the potential frequency and duration of exposure. Using this information, the Navy calculates a "reasonable maximum exposure" (RME) scenario, which portrays the highest level of human exposure that could reasonably be expected to occur.

In Step 3, the Navy uses the information from Step 2 combined with information on the toxicity of each chemical to assess potential health risks. The likelihood of any kind of cancer resulting from exposure to a site is generally expressed as an upper bound probability; for example, a "1 in 10,000 chance." In other words, for every 10,000 people that could be exposed, one extra cancer may occur as a result of exposure to site contaminants. An extra cancer case means that one more person could get cancer than would normally be expected from all other causes. For non-cancer health effects, the Navy calculated a "haz-

ard index," where a "threshold level" (measured usually as a hazard index of less than 1) exists below which non-cancer health effects are no longer predicted.

In Step 4, the Navy determines whether site risks are great enough to cause health problems for people at or near the site. The results of the three previous steps are combined, evaluated, and summarized. The Navy adds the potential risks from the individual contaminants to determine the total risk resulting from the site. The following table summarizes cancer and non-cancer risks for all OU9 Sites:

Table 1: Summary of Cancer Risks and Hazard Indices

	Site 2A	Site 2B	Site 3	Site 7
Construction W	orkers – Direct E	хроѕиге		·
	1.2 per	3.3 per	1.3 per	4.2 per
Cancer Risk	100,000,000	100,000,000	1,000,000	10,000,000
Hazard Index	0.006	0.2	0.001	0.09
Adult Residents	Adult Residents - Direct Exposure			
	3.3 per		1.4 per	6.4 per
_ Cancer Risk	10,000	NA	1000	10,000
Hazard Index	6.4	NA	2.4	5.6
Industrial Works	ers – Vapor Intru			
	1.1 per	1.4 per	2.3 per	6.2 per
Cancer Risk	1,000,000,000	100,000,000	1,000,000	1,000,000,000
Hazard Index	0.000003	0.00003	0.01	0.00001
Adult Residents	<u> – Vapor Intrusio</u>	on		
	7.8 per	9.8 per	1.6 per	4.2 per
Cancer Risk	1,000,000,000	100,000,000	100,000	100,000,000
Hazard Index	0.00002	0.0001	0.06	0.00008
	Site 15	Sites 14 & 18	Site 20	Sites 9 & 23
Construction W	orkers - Direct E	xposure		
			1.1 per	8.8 per
1	l .		i.i pei	0.0 00
Cancer Risk	No COPCs	No COPCs	10,000,000	100,000,000
Cancer Risk Hazard Index	No COPCs 0.002	No COPCs No COPCs		
Hazard Index		No COPCs	10,000,000	100,000,000 D.2
Hazard Index Adult Residents	0.002 - Direct Exposu	No COPCs ure	10,000,000 0.0002	100,000,000 0.2 2.6 per
Hazard Index Adult Residents Cancer Risk	0.002 - Direct Exposu	No COPCs Jre No COPCs	10,000,000 0.0002 5.6 per 100,000	100,000,000 0.2 2.6 per 10,000
Hazard Index Adult Residents	0.002 - Direct Exposu	No COPCs ure	10,000,000 0.0002	100,000,000 0.2 2.6 per
Hazard Index Adult Residents Cancer Risk Hazard Index	0.002 S - Direct Exposu No COPCs 0.3 ers - Vapor Intru	No COPCs ure No COPCs No COPCs	10,000,000 0.0002 5.6 per 100,000 0.3	2.6 per 10,000 13
Hazard Index Adult Residents Cancer Risk Hazard Index	0.002 - Direct Exposu No COPCs 0.3 ers - Vapor Intru 5.1 per	No COPCs No COPCs No COPCs Sion	10,000,000 0.0002 5.6 per 100,000 0.3	2.6 per 10,000 13 3.4 per
Hazard Index Adult Residents Cancer Risk Hazard Index Industrial Worke	0.002 - Direct Exposu No COPCs 0.3 ers - Vapor Intru 5.1 per 10,000,000	No COPCs No COPCs No COPCs sion No COPCs	10,000,000 0.0002 5.6 per 100,000 0.3 1.1 per 100,000,000	100,000,000 0.2 2.6 per 10,000 13 3.4 per 10,000,000
Hazard Index Adult Residents Cancer Risk Hazard Index Industrial Worke Cancer Risk Hazard Index	0.002 No COPCs 0.3 ers - Vapor Intru 5.1 per 10,000,000 0.001	No COPCs No COPCs No COPCs sion No COPCs No COPCs	10,000,000 0.0002 5.6 per 100,000 0.3	2.6 per 10,000 13 3.4 per
Hazard Index Adult Residents Cancer Risk Hazard Index Industrial Worke Cancer Risk Hazard Index	0.002 - Direct Exposu No COPCs 0.3 ers - Vapor Intru 5.1 per 10,000,000	No COPCs No COPCs No COPCs sion No COPCs No COPCs	10,000,000 0.0002 5.6 per 100,000 0.3 1.1 per 100,000,000	100,000,000 0.2 2.6 per 10,000 13 3.4 per 10,000,000
Hazard Index Adult Residents Cancer Risk Hazard Index Industrial Worke Cancer Risk Hazard Index Adult Residents	0.002 No COPCs 0.3 ers - Vapor Intru 5.1 per 10,000,000 0.001 - Vapor Intrusic 3.5 per	No COPCs No COPCs No COPCs sion No COPCs No COPCs	10,000,000 0.0002 5.6 per 100,000 0.3 1.1 per 100,000,000 0.00003 7.4 per	100,000,000 0.2 2.6 per 10,000 13 3.4 per 10,000,000 0.0008
Hazard Index Adult Residents Cancer Risk Hazard Index Industrial Worke Cancer Risk Hazard Index	0.002 - Direct Exposu No COPCs 0.3 ers - Vapor Intru 5.1 per 10,000,000 0.001 - Vapor Intrusio	No COPCs No COPCs No COPCs sion No COPCs No COPCs	10,000,000 0.0002 5.6 per 100,000 0.3 1.1 per 100,000,000 0.00003	100,000,000 0.2 2.6 per 10,000 13 3.4 per 10,000,000 0.0008

NA - Not applicable. A residential scenario was not evaluated since Site 2B is a wetland. No COPCs - Maximum concentrations of all chemicals were less than the screening criteria; therefore, no evaluation was required.

Summary of Alternatives Considered for OU9

The Navy prepared FSs to evaluate remedial alternatives for the groundwater at Sites 3 and 7 and risk evaluations and alternative evaluations were included in the ROD to evaluate groundwater at Sites 9 and 23. FSs were not prepared for Sites 14, 15, 18, or 20 because there were no actionable risks under CERCLA (see Table 1). Groundwater at Sites 2A and 2B is currently monitored under a groundwater monitoring program selected as part of the remedy for OU1.

Sites 3 and 7

For Sites 3 and 7, the Navy prepared an FS that involved development and evaluation of alternatives that would address the COCs detected exclusively at Site 3 (vinyl chloride) and the COCs detected at both Sites 3 and 7 (TCE and hexachlorobenzene). The Navy prepared a second FS that involved preparation and evaluation of alternatives that addressed the COCs detected exclusively at Site 7 (1,4-dichlorobenzene, benzene, and chlorobenzene). The alternatives evaluated in the two FSs are described separately below.

The two alternatives evaluated in the FS for combined Sites 3 and 7 groundwater included Alternative GW1-1 (No. Action) and Alternative GW1-2 (Institutional Controls with Monitoring). These alternatives were presented in the 2004 Proposed Plan. Active groundwater remedial technologies were evaluated but not retained for alternative development because of the absence of a contaminant plume. Alternative GW1-1 was evaluated for comparison purposes, and Alternative GW1-2 was evaluated because of site conditions (generally low concentrations of contaminants, groundwater not classified as a suitable potable water source, and the availability and use of a public water supply) and its ability to meet the Remedial Action Objectives (RAOs). The RAOs as defined in the FS and amended based on recent groundwater data are: to protect current receptors (construction workers) from incidental exposure to contaminated groundwater, (2) to protect potential future receptors from exposure to contaminated groundwater via ingestion (potable water supply and vapor intrusion), and (3) to protect aquatic ecological receptors. The following table summarizes the remedial alternatives considered in the FS. Estimated costs are presented including capital, operation and maintenance (O&M), and total present worth costs.

Table 2: Remedial Alternatives Considered for Sites 3 and 7, Area A Downstream Watercourses and the Torpedo Shops

Remedial Alternatives	Components	Comments
Alternative GW1-1: No Action	None, except mandatory five-year site reviews.	This alternative is not expected to be fully protective of human health and the environment because of unrestricted access to confaminated groundwater.
		Total Cost = \$69,600 (30 years)
Atternative	Continue to implement	Under this alternative,
GW1-2:	existing institutional	human health and the
	controls that identify	environment would be
Monitoring and	the location and	protected through
Institutional	magnitude of	institutional controls that
Controls	groundwater	identify the location and
	contamination and	magratude of groundwater
	restrict extraction and	contamination , address
	use of groundwater.	vapor intrusion, and resinct
	Amend existing	extraction and use of
	institutional controls	groundwater and through
	to address vapor	monitoring of the
	inbusion.	groundwater contaminants at the site
	Continue to monitor	ı
	groundwater	Total Cost = \$319,500 (30
	contaminents.	years)
	Conduct five-year site	1
	reviews	

The three alternatives evaluated in the FS for Site 7 groundwater included Alternative GW2-1 (No Action), Alternative GW2-2 (Institutional Controls with Monitoring), and Alternative GW2-3 (Extraction and Off-Site Discharge). Alternative GW2-1 was evaluated for comparison purposes, and Alternatives GW2-2 and GW2-3 were evaluated because of site conditions and their ability to meet the RAOs. The RAOs for this FS were (1) to protect current receptors (construction workers) from incidental ex-

posure to contaminated **groundwater**, (2) to protect potential future receptors from exposure to contaminated **groundwater** via ingestion (potable water supply), and (3) to protect aquatic ecological receptors. Table 3 summarizes the remedial alternatives considered in the Site 7 **groundwater FS**.

The proposed remedial actions for groundwater at Sites 3 and 7 were previously presented in the September 2004 Proposed Plan and December 2004 Interim ROD. Based on the interim selected remedy of institutional controls and groundwater monitoring for Sites 3 and 7, a groundwater monitoring program for Sites 3 and 7 was initiated in 2006. Also, a remedial design for land use controls was completed in 2005 and the Navy instruction document that defines the Navy's policy regarding disturbance of soil and groundwater at IR sites was updated in 2006 to include Sites 3 and 7 groundwater. The document will need to be updated to include the restrictions for vapor intrusion at Site 3.

The two alternatives evaluated for Sites 9 and 23 groundwater included Alternative GW3-1 (No Action) and Alternative GW3-2 (Institutional Controls). Active groundwater remedial technologies were not evaluated because of the absence of a contaminant plume and other site conditions (generally low concentrations of contaminants, groundwater not classified as a suitable potable water source, and the availability and use of a public water supply). Alternative GW1-1 was evaluated for comparison purposes and Alternative GW1-2 was evaluated because of site conditions and its ability to meet the Remedial Action Objectives (RAOs). The RAOs as defined in the ROD are: (1) to protect potential future receptors from exposure to contaminated groundwater via ingestion (potable water supply and vapor intrusion), and (2) to protect aquatic ecological receptors. Table 4 summarizes the remedial alternatives that were considered. Estimated costs are presented including capital, operation and maintenance (O&M), and total present worth costs.

Alternatives Evaluation Criteria

The following is a summary of the nine Superfund-mandated criteria used to balance the pros and cons of the remedial alternatives. The FS alternatives were evaluated using the first seven criteria. After comments from the State of Connecticut and public are received, the alternatives will be compared using the last two criteria to select the remedies for Sites 3 and 7 groundwater.

Table 3: Remedial Alternatives Considered for Site 7, the Torpedo Shops

Remedial Alternatives	Companents	Comments
Afternative GW2-1: No Action	None, except mandatory five-year site reviews.	This elternative is not expected to be fully protective of human health and the environment because of unrestricted access to contaminated groundwater. Total Cost = \$89,600 (30)
		yeers)
Alternative GW2-2: Menitoring and Institutional Controls	Continue to implement institutional controls that identify the location and magnitude of groundwater contamination and restrict extraction and use of groundwater. Continue to monitor the groundwater.	Under this afternative, human health and the environment would be protected through institutional controls that identify the location and magnitude of groundwater contamination and restrict extraction and use of groundwater and through monitoring groundwater contaminants at the site.
	Conduct Sve-year site rowews	Total Cost = \$303,800 (30
Alternative GW2-3: Extraction and Offsite Discharge	Install groundwater extraction and monitoring system. Extract approximately 1,250,000 gallons of groundwater over nearly 8 monits.	Under this afternative, human health and the environment would be protected since the confaminated groundwater would be extracted from the site, treated as necessary, and discharged.
	Pretreat extracted groundwater, if necessary, and discharge water to Publicly Owned Treatment Works	Total Costs = \$1,121.000 (1.5 years)
	Perform monitoring to confirm achievement of the remedial goals. Decommission the extraction system and	
	restors the site to its original conditions.	i

Table 4: Remedial Alternatives Considered for Sites 9 and 23, Tank Farm

Remedial Alternatives	Components	Comments
Alternative GW3- 1: No Action	None, except mandatory five-year site reviews.	This atternative is not expected to be fully protective of human health and the environment because of unrestricted access to contaminated groundwater.
		Total Cost = \$89,600 (30 years)
Allemative GW3- 2:	Implement institutional controls that	Under this alternative, human health and the environment would be
Institutional Controls	identify the location and magnitude of groundwater contamination and restrict extraction and use of	protected through institutional controls that identify the location and magnitude of groundwater contamination, and
	groundwater.	restrict extraction and use of groundwater
	Conduct five-year site reviews	Total Cost = \$119,000 (30 years)

- 1. Overall protection of human health and the environment: The alternative should protect human health as well as plant and animal life on and near the site.
- 2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs): The alternative should meet applicable and relevant and appropriate federal environmental statutes, regulations, and requirements and State environmental and facility siting statutes, regulations, and requirements.
- **3. Long-term effectiveness and permanence:** The alternative should maintain reliable protection of human health and the environment over time.
- 4. Reduction of toxicity, mobility, or volume through treatment: CERCLA prefers that the selected alternative use treatment to permanently reduce the level of toxicity of contaminants at the site, the spread of contaminants away from the source of contamination, or the amount of contamination at the site.
- **5. Short-term effectiveness:** The alternative should minimize short-term hazards to workers, residents, or the environment during implementation of the remedy.

- **6. Implementability:** The alternative should be technically feasible, and the materials and services needed to implement the remedy should be readily available.
- 7. Cost: Capital costs, annual operation and maintenance costs, and their associated net present values of all alternatives retained for detailed analysis shall be compared.
- **8. State acceptance:** The State environmental agencies should agree with the proposed remedy.
- Community acceptance: The community should agree with the proposed remedy. Community acceptance is based on comments received during the public comment period.

The Proposed Remedies

Sites 3 and 7

The Navy reviewed the results of the two FSs and decided. that it was appropriate to select one remedial alternative that could address groundwater contamination found in the portion of OU9 associated with Sites 3 and 7. The proposed alternative Institutional Controls with Monitoring. This alternative was selected in the 2004 Interim ROD. The alternative meets all of the RAOs by restricting access to and use of contaminated groundwater and monitoring the groundwater at the site. This remedial alternative has three major components: (1) implement institutional controls at the sites, (2) conduct a comprehensive monitoring program to ensure that the remedial goals are met and the resulting concentrations are shown to be protective of human health and the environment, and to verify that groundwater contaminants are not migrating. and impacting other resources, and (3) complete 5-year. reviews of the site until the remedial goals are consistently reached. The components of the alternative are discussed in more detail below.

 Implementation of institutional controls at the sites involved identifying the location, magnitude, and type of contamination and documenting it in a remedial design for land use controls and the NSB-NLON IR Site Use Restrictions document. These documents present the land use control objectives and include specific drawings and instructions for Navy personnel so that contaminated groundwater would not be extracted or used in a manner that would threaten human

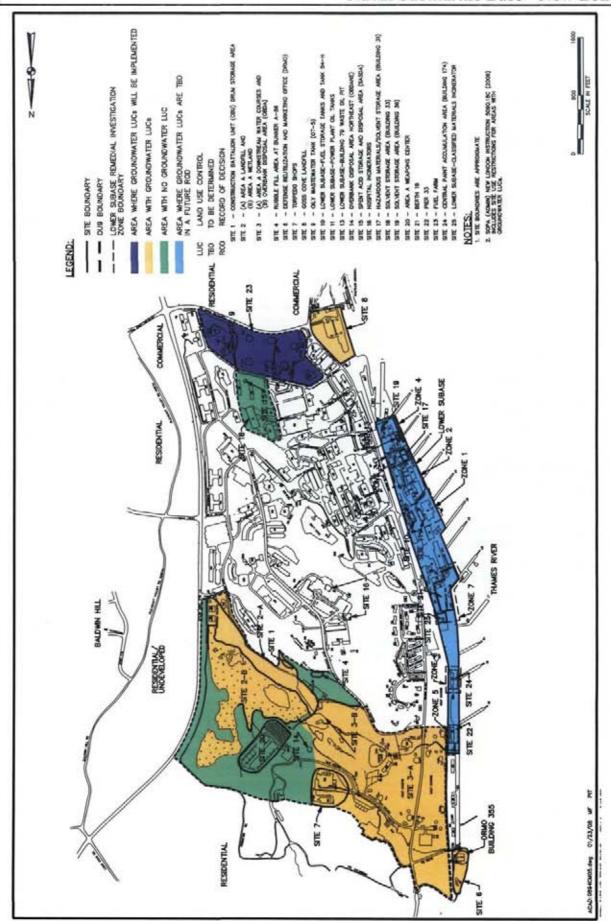


Figure 13. Location of Basewide Groundwater Operable Unit 9 and Areas with Groundwater Land Use Controls

health or the environment. Figure 13 shows the areas of Sites 3 and 7 that have **groundwater** land use controls. Areas of NSB-NLON with soil land use controls are shown on Figure 14. In the event of property transfer, and with confirmation that contaminated **groundwater** remains at the site, an environmental land use restriction pursuant to State law will be used to prohibit the use of **groundwater**. The institutional controls will also be amended to state that additional evaluation or the installation of mitigation measures relating to vapor intrusion will be implemented if future construction takes place.

- A groundwater monitoring plan has been developed to document the details of the monitoring program. Eight additional monitoring wells. were installed and used in conjunction with previously existing monitoring wells to create the monitoring well network required for the Sites 3 and 7 monitoring program. During each sampling event all wells within the monitoring network will be sampled. Initially, sampling events will occur quarterly. Sampling frequency could be reduced after sufficient data are acquired and contaminant concentrations have diminished. Based on the contaminants at the sites, it is possible that monitoring activities will be required for decades until the remedial goals are reached and the resulting concentrations are shown to be protective of human health and the environment. It is expected that contaminants present in groundwater will continue to trend downward and will shortly be below the remedial goals.
- Five-year reviews will be conducted for Sites 3 and 7 groundwater as required under CERCLA until the monitoring program shows that the remedial goals have been reached. The goal of conducting the site reviews is to verify that no changes have occurred that would impact the protectiveness of the selected remedy.

It is Navy's and EPA's current judgment that the Preferred Alternative for Sites 3 and 7 identified in this Proposed Plan is necessary to protect public health, welfare, and the environment from actual or threatened releases of pollutants or contaminants in the **groundwater** at Sites 3 and 7 because they may present an imminent and substantial endangerment to public health or welfare.

Sites 9 and 23

The Navy reviewed the results of the evaluations and decided that it was appropriate to select one remedial alternative that could address groundwater contamination found in the portion of OU9 associated with Sites 9 and 23. The proposed alternative is Alternative 3-2 Institutional Controls. The alternative meets all of the RAOs by restricting access to and use of contaminated groundwater. This remedial alternative has two major components: (1) implement institutional controls at the site and (2) complete 5-year reviews of the site. The components of the alternative are discussed in more detail below.

- Implementation of institutional controls at the site involves identifying the location, magnitude, and type of contamination and documenting it in a remedial design for land use controls and the NSB-NLON IR Site Use Restrictions document. These documents present the land use control objectives and include specific drawings and instructions for Navy personnel so that contaminated groundwater would not be extracted or used in a manner that would threaten human health or the environment. Figure 13 shows the areas of Sites 9 and 23 that have groundwater land use controls. Areas of NSB-NLON with soil land use controls are shown on Figure 14. In the event of property transfer, and with confirmation. that contaminated groundwater remains at the site, an environmental land use restriction pursuant to State law will be used to prohibit the use of groundwater.
- Five-year reviews will be conducted for Sites 9 and 23 groundwater as required under CERCLA.
 The goal of conducting the site reviews is to verify that no changes have occurred that would impact the protectiveness of the selected remedy.

It is the Navy's and EPA's current judgment that the Preferred Alternative for Sites 9 and 23 identified in this Proposed Plan is necessary to protect public health, welfare, and the environment from actual or threatened releases of pollutants or contaminants in the **groundwater** at Sites 9 and 23 because they may present an imminent and substantial endangerment to public health or welfare.

Sites 2A and 2B

Groundwater at Sites 2A and 2B is currently monitored under a groundwater monitoring program selected as part of the remedy for OU1. Post-closure groundwater monitoring is required by the September 2005 ROD. Volumes II and III of the Operation and Maintenance Manual for Installation Restoration Program Sites at Naval Submarine Base New London (January 2006) describe the groundwater monitoring plan in detail. This Plan proposes to continue that monitoring for Site 2A. Institu-

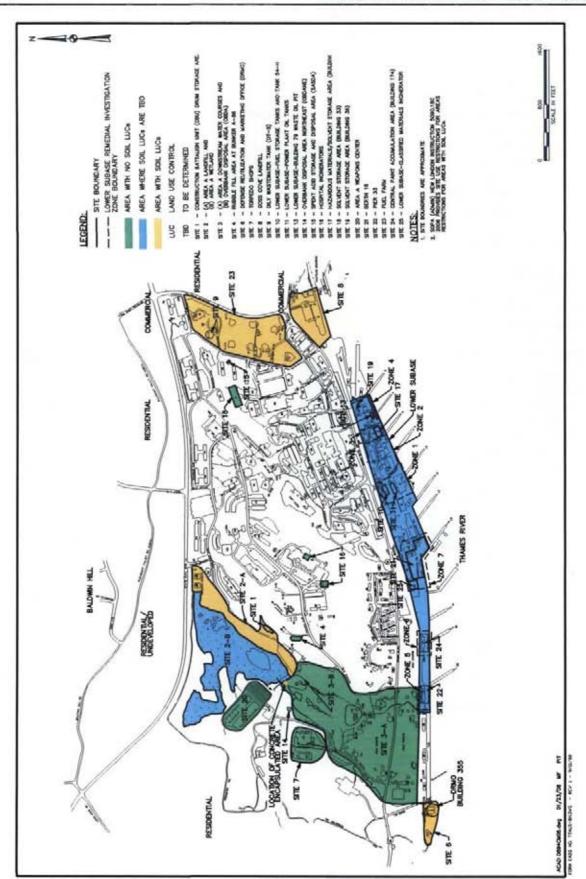


Figure 14. Location of Areas at NSB-NLON with Soil Land Use Controls

tional controls will remain in place at Site 2A and are described in the Site Use Restrictions document.

Sites 14, 15, 18, and 20

The Navy and EPA have determined that No Further Action is necessary for the **groundwater** at Sites 14, 15, 18, and 20 to protect public health or welfare or the environment.

Concluding Summary

Based on information currently available, the Navy believes the Preferred Alternatives meet the threshold criteria and provide the best balance of tradeoffs among the other alternatives with respect to balancing and modifying criteria. The Navy expects the Preferred Alternatives to satisfy the following statutory requirements of CERCLA §112(b): (a) be protective of human health and the environment; (b) comply with ARARs; (c) be cost-effective; (d) use permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (e) satisfy the preference for treatment as a principal element or explain why the preference for treatment will not be met.

The CTDEP concurs with the proposed remedies.

The Public's Role in Alternative Selection

Community input is integral to the selection process. The Navy and regulatory agencies will consider all comments in selecting the remedial actions before signing the ROD. The public is encouraged to participate in the decision-making process. This Proposed Plan for Basewide Groundwater OU9 is available for review, along with supplemental documentation, at the following Information Repositories:

Groton Public Library 52 Newtown Road Groton, CT 06340

(860) 441-8750

Hours: Mon.-Thurs.: 9:00 am-9:00 pm Fri.: 9:00 am - 5:30 pm Sat.: 9:00 am - 5:00 pm Sun.: Noon - 5:00 pm

Bill Library 718 Colonel Ledyard Highway Ledyard, CT 06339

(860) 464-9912

Hours: Mon.-Thur.; 9:00 am-9:00 pm Fri. & Sat.: 9:00 am - 5:00 pm Sun.: 1:00 pm - 5:00 pm For further information, please contact:

Ron Pinkoski, Remedial Project Manager NAVFAC MIDLANT OPNEEV Environmental Restoration Building Z-144 9742 Maryland Avenue Norfolk, VA 23511-3095 Tel (757) 444-0735 Email: ronald.pinkoski@navy.mil

Richard Conant, IR Program Manager Navai Submarine Base-New London Bldg, 439, Box 101, Room 104 Route 12

Groton, CT 06349 Tel: (860) 694-5649

Email: richard.conant@navy.mil

Kymberlee Keckler, Remedial Project Manager U. S. Environmental Protection Agency, Region 1 Federal Facilities Superfund Section 1 Congress Street (HBT) Boston, MA 02114-2023

Tel: (617) 918-1385

Email: keckler.kymberlee@epa.gov

Mark Lewis, Environmental Analyst 3 Connecticut Department of Environmental Protection Eastern District Remediation Program, Remediation Division

Bureau of Water Protection and Land Reuse 79 Elm Street Hartford, CT 06106-5127 Tel: (860) 424-3768

e-mail: mark.lewis@ct.gov

Glossary of Technical Terms

Applicable or Relevant and Appropriate Requirements (ARARs): The federal environmental rules, regulations, and criteria and State environmental and facility siting statutes, regulations, and requirements that must be met by the selected remedy under Superfund.

Basewide Groundwater Operable Unit Remedial Investigation (BGOURI) Update/Feasibility Study (FS): A Remedial Investigation report describes the site, documents the nature and extent of contaminants detected at the site, and presents the results of the risk assessment. An FS report presents the development, analysis, and comparison of remedial alternatives.

Contamination: Any physical, biological, or radiological substance or matter that, at a certain concentration, could have an adverse effect on human health and the environment

Groundwater: Water found beneath the earth's surface in the pores of the soil or the cracks in the bedrock. **Groundwater** may transport substances that have percolated downward from the ground surface as it flows towards its point of discharge.

Installation Restoration (IR) Program: The purpose of the program is to identify, investigate, assess, characterize, and clean up or control releases of hazardous substances, and to reduce the risk to human health and the environment from past waste disposal operations and hazardous material spills at Navy activities in a cost-effective manner.

Institutional Controls: Engineered or physical controls and/or administrative or legal mechanisms designated to protect public health and the environment from contamination.

JP-10: A popular missile fuel that is a single-component hydrocarbon (C10H16), rather than a mixture of many hydrocarbons. **JP-10** fuel is a storable liquid.

Metals: Metals are naturally occurring elements in the earth. Some metals, such as arsenic and mercury, can have toxic effects. Other metals, such as iron, are essential to the metabolism of humans and animals.

Micrograms per Liter (µg/L): One part of contaminant in a billion parts of water.

Monitoring: Collection of environmental information that helps to track changes in the magnitude and extent of **contamination** at a site or in the environment.

Operable Unit (OU): Contaminated media, site, or set of sites that are evaluated as a group.

Otto Fuel II: Otto Fuel II is a distinct-smelling, reddishorange, oily liquid that produces hydrogen cyanide when burned. The U.S. Navy uses Otto Fuel II as a fuel for torpedoes and other weapon systems. It is a mixture of three synthetic substances: propylene glycol dinitrate (the major component), 2-nitrodiphenylamine, and dibutyl sebacate.

Polynuclear Aromatic Hydrocarbons (PAHs): High molecular weight, relatively immobile, and moderately toxic organic chemicals featuring multiple benzenic (aromatic) rings in their chemical formula. Typical examples of PAHs are naphthalene and phenanthrene.

Potentiometric Contours: Contours that represent the height (usually above sea level) at which the water level stands in tightly cased wells that penetrate the aquifer. Potentiometric contours define a surface that is equivalent to the water table in an unconfined aquifer.

Record of Decision (ROD): An official document that describes the selected Superfund remedy for a site. The **ROD** documents the remedy selection process and is issued by the Navy and USEPA following the public comment period on the Proposed Plan.

Remedial Investigation (RI): A report that describes the site, documents the nature and extent of contaminants detected at the site, and presents the results of the risk assessment.

Responsiveness Summary: A summary of written and oral comments received during the public comment period, together with the Navy's and USEPA's responses to these comments.

Risk Assessment: Evaluation and estimation of the current and future potential for adverse human health or environmental effects from exposure to contaminants.

Sediment: Soil, sand, and minerals typically transported by erosion from soil to the bottom of surface water bodies such as streams, rivers, ponds, and lakes.

Site Use Restrictions Document: SOPA (ADMIN) New London Installation 5090.18C, Installation Restoration Site Use Restrictions at Naval Submarine Base New London defines Navy policy and procedures regarding disturbance of contaminated soils/sediments and/or extraction of contaminated groundwater. The locations of impacted media are also identified in figures provided in the Instruction.

Semi-Volatile Organic Compound (SVOC): Carbonbased chemical compounds that have low vapor pressures and only evaporate at elevated temperatures. PAHs are examples of SVOCs.

Source(s): Area(s) of a site where **contamination** originated.

TH Dimer: Tetrahydromethylcyclopentadiene, also called RJ-4, is a missile fuel which is used alone or as a component of JP-9 jet fuel.

Volatile Organic Compound (VOC): Carbon-based chemical compounds that have high vapor pressures and evaporate readily at normal temperatures. Examples of **VOCs** are the components of gasoline (*i.e.*, benzene, toluene, ethylbenzene, and xylenes) and solvents (*e.g.*, TCE).

USE THIS SPACE TO WRITE YOUR COMMENTS

Your input on the Proposed Plan for the Basewide **Groundwater OU9** at Naval Submarine Base – New London is important to the Navy and EPA. Comments provided by the public are valuable in helping to select the remedies for **groundwater** at these sites.

You may use the space below to write your comments, then fold and mail. Comments must be postmarked by July 14, 2008. Comments can be submitted via mail or e-mail and should be sent to either of the following addresses:

Ron Pinkoski, Remedial Project Manager NAVFAC MIDLANT OPNEEV Environmental Restoration Building Z-144 9742 Maryland Avenue Norfolk, VA 23511-3095 Tel (757) 444-0735

Email: ronald.pinkoski@navy.mil

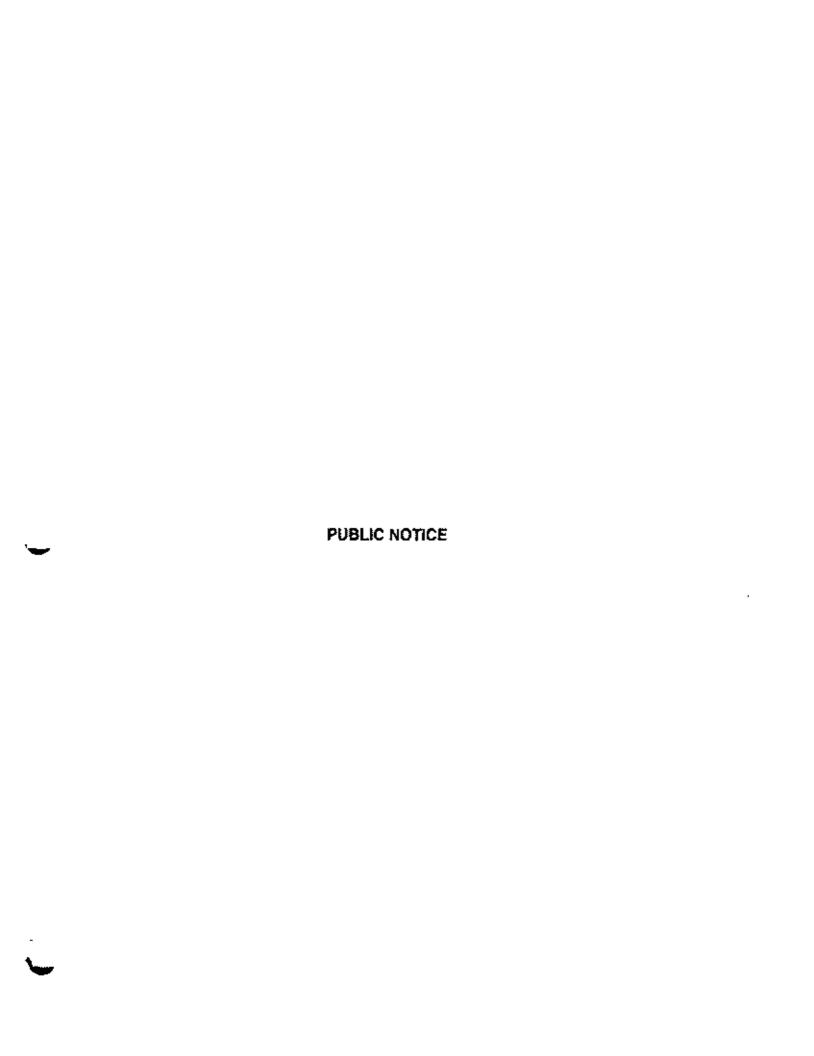
Richard Conant IR Program Manager Naval Submarine Base - New London Bldg, 439, Box 101, Room 104 Route 12

Groton, CT 06349-5039 Tel: (860) 694-5649

Email: richard.conant@navy.mit

you have any questions about the proposed remedies or the comment procedures please contact Mr. (757) 444-0735.	Ron Pinkoski
· · · · · · · · · · · · · · · · · · ·	,
	
ame	
ldress	
ty	
ateZip	
lephone	

Richard Conant IR Program Manager Naval Submarine Base - New London Bldg. 439, Box 101, Room 104 Route 12 Groton, CT 06349-5039



PUBLISHER'S CERTIFICATE

State of Connecticut County of New London, ss., New London

Personally appeared before the undersigned, a Nolary Public within and for said County and State. Melamo Foley, Legal Adversing Clark, of The Day Publishing Company Classifieds dept, a newspaper published at New London, County of New London, state of Connecticut who being duly sworn, states on data, that the Order of Notice in the case

6198 PUBLIC NOTICE The Department of Itte Navy, Naval Sub

A true copy of which is hereunto annexed, was published in said newspaper in its issue(s) of

06/14/2008

Cust: TETRA TECH NUS, INC.

Ad # | d00128017

Subscribed and sworn to be one mo-

melining

This Fada#, June 13, 2008

-Notary Public

My commission expues

PUBLIC NOTICE

PUBLIC NOTICE

The occompany of the News Noval Supervine Base New Leader, 1950-2004 Jr., at 15 a

this was being final proposed prigning story.

This Proposed Pronincomments (find proposed of instituting properties and their properties of institution of control of the properties of their properties of t

Begith gold by each register.

This Pressure Bijos accommends that measures of anviolational country, we are accommended to the Pressure of Th

tensionalists of contaminated propulstocks of the end o

Mg/m: 9, 20 and 6, 6, 97 mm.

Mgm - Thurs, 9, 20 and 6, 6, 97 mm.

1 m, 6, 50 h p m - 5, 27 p m.

1 m, 6, 70 p m - 5, 27 p m.

1 m, 6, 70 p m - 5, 27 p m.

Fig. 1, there is the resultant, planting our site one of the following individuals:

Rechard Council
Light for presidenting Properties (Alphager stands Southernorth Studies Mew London Robert Studies Robert London Robert London Council Council

Timber (2002, 1900, 1900, 1900)

Symbolish Nick Bler

19. S. Environmental Product Lea April V. Region I.
I. Commiss Street

2. July 100, 1903

Bordon, M.A. 197 14 200

Francis Accel. (1,00), 1903

Emplo Accel.

ntargulewasenestels.After

		I

APPENDIX D

PUBLIC MEETING TRANSCRIPT

PROPOSED PLAN FOR BASE-WIDE GROUNDWATER OPERABLE

UNIT 9

SITES 2, 3, 7, 9, 14, 15, 18, 20, AND 23

Public Meeting regarding the Naval Submarine Base - New London taken at the Best Western Olympic Inn, Route 12, Groton, Connecticut, before Clifford Edwards, LSR, Connecticut License No. SHR.407, a Professional Shorthand Reporter and Notary Public, in and for the State of Connecticut on June 26, 2008, at 6:35 p.m.

ORIGINAL

DEL VECCHIO REPORTING SERVICES, LLC PROFESSIONAL SHORTHAND REPORTERS 117 RANDI DRIVE MADISON, CT 06443

HARTFORD

NEW HAVEN

STAMFORD

APPEARANCES:

COREY RICH
TETRA TECH NUS, INC.
Foster Plaza 7
661 Andersen Drive
Pittsburgh, Pennsylvania 15220
412.921.4040, f: 412.921.8984
Corey.Rich@TetraTech.com

RICHARD CONANT
IR PROGRAM MANAGER
NAVAL SUBMARINE BASE - NEW LONDON
Building 439, Box 101, Room 104
Route 12
Groton, Connecticut 06349
860.694.5649
Richard.Conant@Navy.mil

KYMBERLEE KECKLER
REMEDIAL PROJECT MANAGER
U.S. ENVIRONMENTAL PROTECTION AGENCY, REGION 1
Federal Facilities Superfund Section
1 Congress Street
Boston, Massachusetts 02114
617.918.1385
Keckler.Kymberlee@EPA.gov

APPEARANCES (CONTINUED):

ALSO PRESENT:

Val Jurka

Noah Levine

Linda Levine

Mark Oefinger

Felix Prokopf

Ron Pinkoski

Mark Lewis

Chris Zendan

Larry Gibson

Harry Watson

Andrew Stackpole

1	RICHARD CONANT: Thank you,
2	everyone, for showing up. I think all of
3	you know me, Richard Conant. I'm with the
4	NAVFAC Public Works Environmental Division
5	now.
6	We are no longer a separate
7	compartment at the base, but we're still
8	on the base. Tonight, we're going to be
9	presenting our proposed plan for the base
10	water/ground water operable unit 9 or 10
11	sites.
12	Depending on how you want the
13	count, that's 9 up there. But sometimes
14	we break Site 2 and into 2-A and 2-B.
15	We will start off, Corey, our
16	contractor, Navy contractor, will be
17	presenting the proposed plan here during
18	the meeting and then immediately go into a
19	public hearing.
20	If anyone would like to make a
21	comment, have any questions, please
22	present those. You certainly can present
23	written comments to us during the public
24	notice period which started Corey,
25	July

1	COREY RICH: June 14.
2	RICHARD CONANT: June 14th and
3	closes down July
4	COREY RICH: 14.
5	RICHARD CONANT: 14th.
6	And after that we will incorporate
7	any comments into a ROD that will be out
8	and reviewed by the regulators, and
9	eventually we will finalize that
10	ROD
11	Hey, you are missing the best part
12	here.
13	Before ever we get into this, I'd
14	like to introduce our new RPM, remedial
15	program manager.
16	Ron, please stand up and introduce
17	yourself.
18	RON PINKOSKI: Ron Pinkoski, also
19	with NAVFAC, but I'm located at Naval
20	Station Norfolk.
21	But I'm the program manager for the
22	cleanup here at New London.
23	RICHARD CONANT: It's great to have
24	Ron here.
25	He brings a lot of experience over

1 from the army. 2 RON PINKOSKI: The army. 3 RICHARD CONANT: I've been saying the 4 air force for months now. 5 I finally got that right. But BRAC chased him out of the army. He's with the 6 7 Navy now. So it's great to have him on board. 8 9 And Val Jurka I think you know is our former RPM is still with us. He's gone 10 11 over to more technical capacity. 12 But I think we'll be seeing his face 13 here and his involvement with the program 14 here as I think we get into a very intense 15 and exciting period as we -- I hesitate to 16 say wrap things up. 17 But over the next two or three years I think we've made a lot of progress. 18 Hopefully Kymberlee and Mark will shake 19 20 their head, yes. KYMBERLEE KECKLER: 21 Yes. 22 RICHARD CONANT: We do have --23 certainly, this we're wrapping up the Area 24 A Wetland, I think is the next site that's 25

really in the barrel.

1 And then, we save the best for 2 last, lower base which is going to be a very complex, very complicated, very 3 exacting site to deal with. But we'll get 4 5 there. We are well into a FS/feasibility б 7 study on that. But not to get into that, our focus is with the ground 8 9 water, OU. Go ahead, Corey. 10 COREY RICH: All right. 11 Thanks. 12 Again, my name is Corey Rich with Tetra Tech NUS, consultant for the 13 14 Navy. Before I get started, there's three 15 handouts in the back if people didn't pick 16 17 them up. There's the proposed plan back 18 there. 19 There's also a copy of the 20 presentation if you want to get a closer 21 look at some of the slides. I know it's a 22 little difficult to read the screen if you 23 are towards the back. 24 So take a look at the slides. 25 There's also a copy of the public notice

that went out regarding the proposed plan being available for review. This ran in the New London Day back on June 14th.

So if you need those, go ahead and grab them. There's also a sign-in sheet back there to make sure we have a record who is attending the meeting.

Dick went through most of our agenda here. We've gone through our introductions. This presentation, we're going to review the regulatory process, describe operable unit 9, some of the details, characteristics of it and then also present our proposed plan for addressing the ground water and operable unit 9.

Once we wrap up the technical presentation, we'll open the floor for formal comments and try and provide all the responses that we can at this time.

If there's a comment raised we can't address, we'll get back to you in writing with additional information once we can get that information available. And

then, we'll close out the meeting.

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

24

25

Through the regulatory process to summarize CERCLA, the Comprehensive Environmental Response Compensation and Liability Act, there's multiple steps in the process under CERCLA from preliminary assessment site inspections and studies to determine what to do with the contamination you would find formally documenting the remedies that you're going to select through a proposed plan and ROD, then going through a remedial design to figure out how to address and implement that remedy than actually doing the remedy, the remedial action, and then qoing through operations and maintenance if that's necessary for that particular site.

As we talked about tonight, we are here to present the proposed plan.

Obviously, that's why it's highlighted in red.

So we are here to present the alternatives that we have decided are the best for the groundwater operable unit 9

best for the gr

and to get feedback from the public on it.

Slide: So this slide helps us to understand what the proposed plan is for. It facilitates the public involvement in the CERCLA process.

It presents the lead agency's -who, in this case, is the Navy -- their
preferred alternative to address the
contamination present, all the
alternatives that were evaluated, and the
reasons for selecting preferred
alternatives. And it's a requirement for
public participation under CERCLA and the
NCP.

The next step in the CERCLA process is to develop the record of decision, formalizing the selection process. It's a legal document that certifies that the remedy selection process was done in accordance with CERCLA.

It provides all the technical backup
for the alternatives that were
considered, all the engineering
components, the remedial action

objectives, the cleanup levels and so 1 2 forth. . And it is a tool to explain to the 3 public the problems the remedy seeks to 4 5 address and the rationale for its selection. 6 So with that introduction, we are 7 going to move in to operable unit 9, go 8 9 through some general introduction and then get into each of the specific sites and 10 the details of each of those sites. 11 So operable unit 9, it's New 12 London, includes sites at these 13 ten -- includes ground water at these ten 14 sites. We have broken out 2-A and 2-B in 15 this summary. 16 Ron, if we could go to figure 17 one. Just click on that. 18 Probably best to look at this in your 19 20 handouts. I'll give you some general 21 directions. North is at the top. 22 is at the bottom. 23 Route 12 is running right here. 24 Thames River is over here. There's 25 basically two portions of the sub

base, kind of the northern portion that we I have some groundwater concerns at. 2 Site 2 is the Area A landfill which 3 is up here, which has been 4 addressed -- the soils have been 5 addressed. Area A Wetland which is Site 6 7 2B is up here. Site 20 which is the weapons center 8 9 is right here. Site 14, over bank 10 disposal area northeast, is right 11 here. Site 7, the torpedo shops, is in 12 this vicinity. And Site 3 area downstream 13 is right here. 14 This is a east-to-west trending 15 valley, and most of the groundwater 16 migrates to the west obviously and 17 discharges into the Thames River. If we could head south then. 18 19 Southern part of the facility, Crystal 20 Lake Road, main gate right down here. 21 have four sites down in this area. 22 We have Site 15 which is the spent 23 acid storage and disposal area right here. Site 18 was the solvent storage 24 25 area building.

We have Site 9 which was OT-5 or 1 2 waste oil tank 5. And then we also had Site 23 which was the tank farm where they 3 4 previously had underground storage tanks 5 in that area. 6 So if you just minimize that. So for several of these sites, Site 7 8 3, 7, 14, 15, 18 and 20, the Navy felt we 9 had sufficient information to go to a ROD, and we developed an interim ROD and 10 signed that ROD back in December of 11 12 2004. So for those sites, we've implemented 13 14 remedies. And at that time, there was not 15 enough information for Sites 2A, 2B, 9 or 16 23 to go forward in the ROD process. 17 So some additional data has been 18 collected since 2004. There's been some 19 additional evaluations, risk assessments done with that data. 20 21 And then tonight we are combining all that information or we have combined all 22 23 that information into one proposed plan to 24 document all the final remedies for all

ten of these sites.

1 Next slide: So to get into the 2 detailed description of the sites, we have Area A landfill Site 2A and Area A Wetland 3 2B. 4 As we saw in the previous slide, the 5 sites are both located in the 6 7 northeastern-north central portion of New London. The land fill is about 13 8 9 acres. The wetland is approximately 26 10 acres. The landfill is relatively 11 flat, bordered with some steep wooded 12 hillsides to the south, wooded ravine to 13 the west and area wetland to the 14 north. 15 The major source of contamination in 16 this area for the landfill was disposal of 17 18 incinerated combustible waste, 19 refuse, debris, so forth was put in the 20 landfill. At one time there were some storage 21 22 pads on top of the landfill where some transformers and electric switches were 23 24 stored. There's also some petroleum 25

compounds were disposed up there, and

there's also some spent acid solutions that were poured into some trenches in landfill.

In the wetland itself historically

DDT was used as a pesticide to control

mosquitoes in that area. In the late '50s

the area -- wetland area was filled in

with some dredge spoils that were pumped

up from the Thames River. Dredge spoils

average about 10 to 35 feet in that

area.

This photo is a picture of Area A landfill looking south. The current surface is all paved and used for storage of equipment of materials for the Navy. You can see the rocky outcrop on the south side there.

Next slide: This is Site 2B Area A wetlands. It was a cold day. Everybody was doing our site inspections I think back then. But you can see the wetland area is predominantly covered by phragmites, grassy areas there to the north, looking north here.

Next slide: So the nature and extent

of contamination for 2-A and 2B, these 1 sites were included in several 2 investigations, Phase II RI, the base-wide 3 groundwater OU RI. 4 We completed the RI, and the 5 6 recommendations out of the RI were to continue monitoring the groundwater at 7 8 these sites under a previously signed ROD. 9 There was a cap installed at Area A 10 landfill back in '97, I believe it 11 And as part of that ROD there was a 12 groundwater monitoring component that was 13 part of it, and so the groundwater at that 14 site was being monitored. 15 16 To date there have been eight years of monitoring completed, and that 17 information helped us further evaluate the 18 issues at Sites 2A and 2B. The most 19 20 recent ground, they are on biannual sampling effort up there now was in 2006. 21 If we can go to figure 2 there, 22 23 Ron. Overall, we haven't seen any 24 25 significant issues with the groundwater

coming out of the landfill. Most of our 1 monitoring well networks are along this 2 side of the landfill. 3 Groundwater flows in this 4 direction. We have a series of wells 5 along this northern boundary. We've been 6 7 monitoring those as I said for eight years. There's also wells in the area 8 9 downstream to capture flows that moves in this direction. 10 But overall we haven't seen any 11 12 significant hits in these wells. The only 13 hit that we saw was actually on a side gradient well which was a reference well 14 15 we were using, and we saw some copper in 16 there in 2006. 17 But that appears to be related to a site unrelated to our Area A wetland/Area 18 19 A landfill. 20 So this information has told us that 21 our cap is working properly, and we don't 22 have significant migration from the landfill itself. 23 24 Next slide: We also updated our risk 25 assessment using this most recent

data. We went back using the data and some latest methodologies that are available. Those evaluations showed us that there were no unacceptable risk to current receptors.

The only possible current receptor would be a construction worker that would go in and excavate and expose the groundwater and come into contact with it.

But if somebody would hypothetically put a well in there and try to develop it for residential use, groundwater may present some unacceptable risk to those hypothetical receptors.

We also went back and looked at vapor intrusion issues, that is if there's any volatiles present in the groundwater that could migrate up through to the surface and any inhabited buildings or so forth would present any risks that evaluation showed that the volatiles that are there.

If there are any at low enough levels that they are not causing any risk to

ł

human health at this point. 1 2 At Site 2B there's some ecological 3 risks associated with the site. 4 Back -- the groundwater itself was 5 evaluated, and surface water was evaluated. 6 7 And the groundwater is not expected to present any risks -- wait. Go 8 9 back. Exposure of ecological receptors to groundwater or surface water affected by 10 11 groundwater are not expected and, 12 therefore, not evaluated. 13 Site 2A, groundwater at 2A discharges 14 to the surface water in the area 15 wetland. And the results of the Phase II 16 ecological risk assessment indicated that there were some chemicals in surface 17 18 water, sediment, and soil that could 19 adversely impact ecological 20 receptors. 21 We are currently still evaluating the sediments at Site 2B. There's an ongoing 22 23 remedial investigation for that site. 24 We are going to have some ongoing 25 discussions with the regulators on that

tomorrow as a matter of fact, and there l 2 will be final decision on that in probably 3 about a year. There will be a decision on how to address the risks associated with 4 5 the sediments there. 6 So overall, as far as groundwater is 7 concerned, there's a current monitoring 8 program under OU-1. 9 There's institutional controls in 10 place that prohibit use of the ground 11 water, and at this point because we have 12 these controls in place, the monitoring in 13 place, there's no FS required. 14 Feasibility study is what FS stands 15 for. 16 Going to move on to Site 3, trying to 17 cover and evaluate all these sites, and then we'll go through the alternatives we 18 19 developed for them and show our 20 recommended alternative at the end 21 here. Site 3 is area downstream water 22 23 courses and the over bank disposal 24 This site covers about 75 acres and

contains mainly undeveloped wooded areas

and recreational areas.

Historic major sources of contamination were past application of pesticides, abandoned disposal areas, and the Site 7 septic leach fields.

Site 7 is located just

upgradient -- side gradient of Site

3. And there were some leach fields in there and historically some materials may have been exposed in the leach field and migrated down through Site 3.

There was a large remedial action in that site for the soils and sediments back in '99 and 2000. About 18,000 tons of material was removed from that site and disposed of off site.

Another smaller area that was found during this remedial action, the Site 3 new source area was remediated back in October of 2007. So just about eight, nine months ago. That material was excavated and disposed of off site as well.

This is -- this picture is of Site

3. This is OBDA pond and site or stream

one. Area A landfill would be just upgradient of this. And this heads south towards the golf course. So give you a some landmarks as to where we are at.

As far as nature and extent of contamination, this site has also gone through several different phases of investigation. The main groundwater contaminants of concern were chlorinated solvents.

Trichloroethylene was the primary contaminant concern, and most of these TCE was detected primarily along stream five which is along the northern board of Site 3 and just downgradient of the leach fields that I talked about at Site 7.

So we feel that that was the primary source of the groundwater contamination we had seen there.

We can go to figure 3. Again, hopefully you can see these in the back of your packet. The picture or the figures are at the back of your packets. But this is historical information from 2000 -- the base-wide groundwater RI.

This is Triton Road, Shark 1 Boulevard. This is Site 7, the torpedo 2 shops. This area is area downstream. 3 4 Primarily we've seen contamination 5 right along this area. This was the leach field. There were two leach fields 6 7 here, a south one and a north one. 8 But you can see the concentrations 9 that have been detected there. TCE is the 10 primary contaminant. We've had some 11 degradation compound like vinyl chloride and cis-1, -2 dichloroethene as well in 12 13 the well. 14 If we can go to slide four or figure 15 four. Because we wrote an interim ROD 16 back in 2004 and selected a remedy, we've been implementing that remedy over the 17 18 past two years. And in Site 3 there was a 19 remedy selected. 20 So these results are the most recent 21 of the groundwater monitoring program that 22 we've had at the site. 23 There were three wells where we've 24 continued to see some contaminant levels

above our remedial goals that we've

selected, 3MW16D, 2DMW29S and 1 2 2DMW16D. And the levels that we're seeing are 3 marginally above our medial goals. 4 general we haven't seen significant 5 6 groundwater contamination. It's generally 7 been just marginally above our goals that we've selected. 8 9 Also historically, we had put in a few temporary wells near Site 3 new source 10 area when we were investigating that. 11 had some hits of PAHs. 12 But after we went back, reevaluated 13 the data and as is typical with temporary 14 wells, we found a lot of suspended 15 solids. 16 We had high turbidity in those 17 wells, and we picked up maybe some 18 19 material from the asphalt or maybe some 20 material from other places. 21 And we found that those detections 22 were not truly indicative of something in 23 the groundwater itself as much as the 24 suspended solids that were in there. 25 As far as the human Next slide:

health risk assessment for Site 3
goes, there's currently no unacceptable
risks to current receptors that would be
construction workers from exposure to the
groundwater.

However, if hypothetically in the
future, a residence was built on this site

However, if hypothetically in the future, a residence was built on this site and the groundwater was used as a drinking water source, there would be a potential for human health. The primary contaminants of concerns are TCE, trichloroethylene and vinyl chloride.

As far as ecological risks,
though, there's no significant risk
anticipated from migration of the
groundwater to surface water.

Next slide: Recently here in 2008 we went back and revisited vapor intrusion. There's been some new guidance, new information out. Went through that evaluation.

And again, we saw no unacceptable risks to current industrial land use which is what the Navy is using it for at this point.

But there is a concern at one
well, 2DMW29S. If the land use would be
changed to residential, there may be
some -- there are some restrictions that
would be required to make sure that no
residence would be built within a hundred
feet of that well or in areas where
contamination would be at similar
concentrations.

So because of those risks, because of those issues at Site 3, this site went through a feasibility study.

Before you start your feasibility study, you look at your risks and you determine what type of remedial action objectives you're going to have so you can develop your alternatives to meet these remedial action objectives.

And the three objectives that were developed and determined to be appropriate include a protection of current receptors from incidental exposure to groundwater with petroleum or chlorinated solvents at concentrations above PRGs, also protect any future potential receptors from

regular ingestion or exposure to groundwater via vapor intrusion, also protect any aquatic ecological receptors through migration of any petroleum contaminated groundwater into surface water.

After defining these, then we developed remedial alternatives to address the contaminant levels. Considering the dilute disperse contamination that we saw there, we just developed two alternatives, the first being a no-action alternative which was required under CERCLA, which we just consider ongoing five year reviews of the site.

And we also looked at an institutional controls and monitoring alternative which is a limited action scenario where we place restrictions, we formally identify the location and magnitude of the contamination and put restrictions on extraction of the groundwater.

We also put controls on vapor intrusion based on land use. We also

monitor migration and degradation until contaminants reduced to the remedial goals, and we continue to conduct five-year reviews.

So those were two alternatives to Site 3.

Moving on to Site 7 which is the torpedo shops also located in that northern area. The site includes four buildings, and it's on the northern side of Triton Road. It's used for maintenance for the torpedoes.

Solvents and petroleum products were used at the site during maintenance activities, some of which may have been disposed of in on-site septic systems until 1983.

There's also some underground storage tanks that were used to store petroleum products for use primarily for heating purposes, I believe, inside the facility and may have been some waste liquids and so forth stored there and possibly discharged.

There was remedial action on the

soils and septic system back in 2006. 1 Some contaminated soils on the western 2 side of building 325 and also the southern 3 side of building 325 that were 4 5 excavated, removed and disposed of off site. 6 7 This is a picture of building 325. One excavation as we mentioned for 8 soils was done on this side of the 9 10 building. The other was on the southern side of the building. 11 Next slide: Site 7 also investigated 12 during several remedial 13 14 investigations, several phases. Primary 15 contaminants also included solvents, some 16 benzene, chlorobenzene, trichloroethylene 17 detected here at building 325, 18 We can go and take a quick look at those -- look at five first. I kind of 19 have them in order there. 20 21 First slide shows -- or first 22 figure, figure five, shows some historic contamination detected in these 23 24 wells. 25 The data set provided includes

detections and non-detections to 1 understand the distribution of and 2 contamination. If you see a "U" after the 3 result, that means detect and 4 non-detect. That's a detection limit that 5 6 the laboratory was able to see down 7 to. A "J" is actually a detection, just 8 shows that there's a little bit of 9 10 uncertainty with that data, depending on 11 action limits, detection limits at the lab. 12 Primarily we saw contamination right 13 14 near the septic system, this cross-hatched 15 area identified where we saw the contamination historically. 16 Go to I think it's slide three or 17 figure three. 18 This is back to figure three where we 19 20 showed all Site 3 and Site 7 contaminants 21 of concern. There were several wells that 22 we saw in 2000 that had some detections of 23 trichloroethylene driving some of the 24 risks there.

And then, after the 2004 ROD, we

implemented a groundwater monitoring 1 program similar to Site 3. 2 You can go to figure four. 3 As part of that program, this is Site 4 5 we actually have not detected any contaminants above remedial goals in this 6 7 well at this point. So within the past eight years, 8 we -- concentrations have decreased below 9 10 our remedial goals and are no longer really a concern at this site. 11 So with that said, human health risk 12 13 assessment was recently revisited. unacceptable risks to current 14 15 receptors. There's still this potential 16 risk to hypothetical future 17 residents. This was primarily developed, defined 18 with some of the historic data. As we 19 said a lot of the risks are 20 21 reducing -- concentrations appear to be 22 reducing. 23 They are really -- risks are 24 decreasing as we speak. Ecological risk 25 assessments, no real significant risks

with ecological receptors. 2008 vapor 1 intrusion evaluation indicated no further 2 action is required for vapor 3 intrusion. 4 We still went through the process of 5 RAOs, alternative development for Site 7 6 7 as we did when we developed the 2004 Again, the RAOs were similar to 8 9 protect current receptors, future 10 receptors and the aquatic ecological receptors. 11 For this site we had actually looked 12 at three alternatives, a no-action and 13 institutional controls and 14 15 monitoring. And also because originally when we 16 17 were looking at this site, there was a 18 very defined, small contaminated source area right near building 325, we looked at 19 20 more aggressive approach and then pump and 21 treat or extraction on off-site discharge 22 so that we may be able to capture 23 that. 24 Because we have new data and new 25 information, this alternative is probably

1 too aggressive with the data we've seen 2 since then. Pump and treat, again as far as costs 3 4 go, is significantly higher than institutional controls and monitoring 5 6 which is more appropriate for the types of 7 contaminants and concentrations that we've 8 seen out there. 9 So move on to the next site, Site 10 9 --11 If there are any questions that you'd 12 like to ask during the presentation, just 13 let me know. Formally we'll try to 14 document those in the next public hearing 15 part of this presentation. 16 Site 9 is waste oil tank, waste oil 17 tank 5 -- sorry. It was a 750,000-gallon 18 underground concrete storage tank. 19 soil at the site was investigated and 20 addressed under corrective action under 21 the state's RCRA program. 22 Tank was used to store fuel oil, 23 bilge water and other waste oil solutions. The tank's use was 24

25

discontinued back in 1993. All of the

1 contents were removed. There were some PCBs or 2 polychlorinated biphenyls detected in the 3 4 residual sludge that was in there. was subsequently removed and disposed of 5 6 properly, and the tank was actually closed in place then. 7 This tank is located within the 8 boundaries of Site 23, the tank farm and 9 as a whole. Because it's all within that 10 11 one site, we were addressing the 12 groundwater within the Site 23 efforts. 13 Interesting picture, just a blank 14 15 field that's where the tank was. 16 very obvious there, but the tank was in this area. 17 18 Site 14, over bank disposal area 19 northeast located up in the same general vicinity as sites 3 and 7. Miscellaneous 20 21 wastes were dumped there over the edge of 22 ravine. The material covered about 80 feet in 23 24 diameter, really small area, disposal 25 Back in 2001 the entire waste area.

material was excavated and disposed of off 1 site. 2 It was about 270 tons of material 3 that were excavated and taken off site for 4 5 disposal. 6 This is a picture of the site after it was restored. 7 Next slide: As far as nature and 8 extent of contamination, this site was 9 investigated during several phases. The 10 only thing detected in the ground water 11 adjacent to this site were naturally 12 occurring metals. 13 14 Human health risk assessment did not indicate any unacceptable risks due to 15 exposure from groundwater. We didn't 16 17 detect any volatiles, so there were no vapor intrusion issues. Ecological risks 18 19 had no issues as well. 20 And, therefore, we did not proceed to 21 an FS or develop alternatives for this 22 site. 23 Spent acid storage and disposal 24 area, Site 15, is located in the southern

It's located

part of sub base New London.

1 between buildings 409 and 410. Historically there was a rubber-lined 2 underground storage tank at this site that 3 was used to store waste battery acid. 4 5 Batteries were a big part of submarine use historically. Since the 6 Navy has gone nuclear, batteries aren't 7 8 used like they were in the past. 9 But when those batteries ran their 10 life cycle or the acid in the batteries 11 ran their life cycle, it was a 12 placed -- temporarily stored that waste 13 acid. There was a removal action completed 14 15 back in '95 in which 318 tons of lead 16 contaminated soil were removed. And the 17 tank itself was removed, and this material 18 was disposed of off site. 19 This is a picture of the site. 20 can see the rather triangular-shape cut in 21 the asphalt there. That was where the tank was and the removal action that was 22 23 done there. 24 Nature and extent of 25 contamination, overall from the various

investigations that were done, some TCB 1 and metals were detected at elevated 2 concentrations in this area back in 2000 3 during the base-wide groundwater RI. 4 We -- these detections were somewhat 5 anomalous when we first saw them because 6 we had some historic data that didn't show 7 8 us these same issues. 9 Once we saw these contaminants of 10 concern, we conducted a data gap 11 investigation, went back, resampled these 12 wells again. And it appears that these results from the BGOURI base-wide 13 14 groundwater RI were anomalies. 15 Several factors that were considered 16 may have contributed to these 17 anomalies. The wells hadn't been sampled 18 in a long time. They weren't 19 redeveloped. 20 Maybe some particulates, other 21 materials settled in these wells. Some 22 different sampling techniques were 23 employed at that time, and there was also 24 some interferences. 25 So pre-BGOURI, post-BGOURI showed one

These other set of results showed 1 thing. 2 We based our determination off another. of the whole set of data that was 3 available to us. 4 So looking at that whole data 5 6 set, we did not determine any unacceptable 7 risk to human health from exposure to the 8 groundwater. 9 There's really no exposure pathway to 10 ecological receptors at this site where 11 the groundwater discharge and impact 12 them. We also reevaluated vapor intrusion 13 14 which showed no significant issues. And 15 again, without any true issues, we did not 16 proceed to an FS to develop 17 alternatives. 18 Site 18, solvent storage area, 19 building 33, that's located in the 20 southern portion of New London. 21 You can close that out. 22 Historically, that building was used 23 for storage of gas cylinders and some 24 drums and solvents. No expected or

documented spills, leaks, whatever at the

1 site. 2 Go to the next slide. This a picture 3 of the building as it was several years 4 ago. 5 Next slide: We did an investigation 6 at that site in the -- in around 2000, and 7 we found no significant groundwater 8 contamination around the perimeter of the 9 building. 10 We looked upgradient and downgradient of the building. We really didn't detect 11 12 any significant levels of 13 contamination. 14 We looked at what we did 15 detect -- in the human health risk 16 assessment identified, no unacceptable 17 risks during that evaluation, and we 18 detected no volatiles in that area. 19 So there were no vapor intrusion 20 issues. Also, no real exposure pathways 21 for ecological receptors and no reason 22 then to proceed to a feasibility 23 study. 24 Going down to the last two sites 25 here, Site 20, area weapons center, that's

1 back up in the northern portion of the facility up by Site 3 and Site 2, Site 2 3 7, in that same area. Historically -- or weapons center is 4 5 used for weapons storage. There's bunkers 6 there. There's also a small 7 building, building 524. There's some small quantities of 8 9 chemicals, solvents and wastes that are 10 generated at that site, maybe some fuels -- well, there's fuels and also 11 12 explosives that are stored in the bunkers 13 up there. 14 Soils were addressed through remedial 200 cubic yards of 15 action back in 2001. 16 PAHs and metals, contaminated soils were removed from the site, taken off site and 17 18 disposed of, as far as groundwater is 19 concerned. 20 Here's a picture of the 21 facility. Bunker storages or storage 22 bunkers on your right. There's some 23 access roads on your left. 24 Groundwater is investigated during 25 four different phases. There was some

low-level detections of volatiles and semi-volatile organic compounds, TCE and PAHs, detected in the groundwater. We also saw some naturally occurring metals.

Those contaminants were evaluated through our human health risk assessment. Through the various investigations, the most recent data showed no significant risks to human health.

There was also some changes to methodologies, sample analysis, sample collection that contributed to some changes over the years of different evaluations that were done at the site.

We took a fresh look in 2008 at vapor intrusion indicated there were no significant risks to human health from this site.

As far as ecological concerns, there were no unacceptable risks determined from this site from groundwater migration to surface water. And again, because no real

(203) 245-9583

risks associated with exposure to groundwater at the site, we didn't proceed to a feasibility study.

Last site, Site 23, tank farm,
located in the southern portion of New
London, there were 10, 11 USTs at Site 23
historically. Those have all been closed
out.

There were some evidences of releases of petroleum products from those tanks and piping. The soils associated with contaminated soils were addressed through several small removal actions that were done under the state's UST program.

And each of those tanks that were closed in place, obviously the product was removed from them, the tops were demolished and then they were backfilled. The tanks were filled with stone, crushed stone, and the area was backfilled.

But because of that area historically being a lake, Crystal Lake, there's groundwater issue in that area as far as groundwater level is elevated during rainy

parts of the year. There's some buildings that have had some flooding issues on the sub base.

So the ring drains that were in that area to depress the water table around USTs were left in place and continued to help collect groundwater and discharge that so that we can depress the water table in that area. So those ring drains are still in place, and they are collecting groundwater.

So we have -- if you move to the next slide, this just gives you a picture of the tank farm area. At the surface it's all the ball fields that you can see out at sub base and all the former tanks are underneath these ball fields.

So those drains were -- portions of the drains were rehabbed back in 2000 when the storm sewer system went under some renovations.

The deep groundwater system now connects downstream with the shallow surface water that's collected in the new system that was installed back in

1 2000, and then all that water, both 2 groundwater and surface water, eventually 3 discharge into the Thames River down in Goss Cove. 4 5 If we look at figure six, you can see the blue outline or the former tanks and 6 7 the drains. The ring drains are around 8 9 there, and the discharge pipes that go out 10 and tie in with this deep dewatering 11 system as well in the red that you can 12 see. 13 These were also historically storm 14 drains. But when the new system was installed, they were basically abandoned 15 16 as storm-water conveyance -- for 17 storm-water conveyance and now just 18 collect groundwater to help dewater the 19 system, So these are actually all 20 perforated pipes that allow collection of groundwater. 21 22 The greenish-yellowish system is the 23 most recent system that was 24 installed, and then the light blue system 25

is the existing system that's out

there.

But for this -- for this site,
because these areas were continuing to
collect groundwater and continuing to
discharge that groundwater to the Thames
River, there was a metering pit put in
here so that we could sample that, make
sure that contaminated groundwater wasn't
being discharged and wasn't posing a
potential threat to human health or the
environment.

So we've been studying that for the past year.

Go to the next slide.

Well, overall the groundwater was investigated back in 2000 in the BGOURI. We didn't see any real significant contamination back then.

We opted to postpone proceeding to the FS until we could evaluate the groundwater being collected by this drain system, under water drain system.

We did one year's worth of data collection out there from 2007 to 2008. We only saw some minor

exceedances, really I think from arsenic and a couple PAHs.

But we also had some suspended solid issues there especially from the arsenic. We looked at total undissolved results there, and the arsenic in the dissolved was much lower than the criteria in the concentration that we saw in the total sample that was unfiltered.

The PAHs, again, we had a stray hit during one of the three rounds or one of the four rounds, and we did not have similar results in our sample in duplicate. So again there's some likelihood of suspended solids contributing to that as well.

Next slide: We took that most recent data. We evaluated the risks back in the base-wide groundwater OURI and found that those risks were acceptable at that time.

We took our new data, also evaluated that in 2008 and showed that there were no unacceptable risks to the construction workers under the current industrial land

use scenario.

Conservatively, we estimated some potential risks to hypothetical residents in that area, but our data really shows minimal impacts to the groundwater.

It's more of a cautionary that these risks are being identified. We also looked at vapor intrusion exposure pathway and did not see any potential issues associated with that.

Because of those potential
hypothetical risks to future
receptors, we did go through evaluation of
alternatives, developed two remedial
action objectives to protect those future
receptors and also protect the ecological
receptors that may come in contact when
the groundwater discharges the surface
water.

Looked at two alternatives here, no action and institutional controls and monitoring.

As far as alternative two is concerned, we would locate the areas contaminated with groundwater

contamination and restrict extraction and use of that groundwater and then conduct five-year reviews as well.

So that concludes a summary of all the background information, the nature and extent of contamination, the alternatives we evaluated and basically a summary of all the information for those sites.

Now, as far as our proposed remedy, if you recall, we had -- we have remedies proposed for Site 3, Site 7 and Site 23. Those were the sites where we had risks.

As far as sites 3 and 7, because of their proximity, the similar contaminants of concern at those sites, we're lumping our proposed remedies together.

Alternatives GW1-2, GW2-2 which were institutional controls and monitoring, as part of those remedies as discussed previously, we would continue our institutional controls that were identified as part of the interim ROD or implemented as part of the interim ROD.

And those controls locate or identify 1 2 the location and magnitude of the groundwater contamination. They restrict 3 extraction and use of groundwater. 4 And for Site 3 because we had a 5 6 vapor, a potential vapor intrusion 7 issue, that will also identify that as a 8 potential concern. 9 If you want to go to figure 10 seven, this figure identifies areas at the sub base that have land use controls. 11 And sites 3 and 7 here are shown in 12 13 yellow. 14 They have land use controls on groundwater use, and they'll continue to 15 16 be implemented as long as groundwater 17 contaminants exceed remedial goals. 18 You can go back to that slide. Again, as we said, we'll continue to 19 monitor until those concentrations 20 21 decrease. We'll continue to do five-year 22 reviews, and the total present worth cost of this alternative as estimated 23 24 previously was \$623,000. 25 The contaminants of concern for sites

1 3 and 7 and the remedial goals selected 2 are summarized in this slide. We have six contaminants, all solvents for the most 3 part, dichlorobenzene, benzene, 4 5 chlorobenzene, hexachlorobenzene, trichloroethene and vinyl chloride. 6 Most of these levels that are 7 identified are based on Connecticut 8 9 RSRs. Mostly drinking water exposure 10 concerns, the only one that's not is the 11 vinyl chloride. That's based on a vapor 12 intrusion issue concern. For sites 9 and 23, the proposed 13 remedy is institutional alternative GW3-2 14 15 where we'll implement controls to identify 16 or to restrict extraction and use of the 17 groundwater. 18 Figure seven is that same land use 19 control figure we just saw. 20 As of right now, we are preparing to 21 put into action the land use controls that 22 will be a follow-on to the record of 23 decision that's signed for this site. 24 we'll implement those controls at Site 9

and 23 in the near future.

And we'll conduct five-year reviews, and the total present worth cost is estimated to be about \$120,000 for that remedy.

The remaining sites, sites 2A and 2B, because they were -- the groundwater in essence was addressed under OU1, we'll continue to implement those institutional controls and monitoring that were implemented under OU1 for those sites, continue to monitor any potential migration contaminant issues associated with the landfill.

For the remaining sites 14, 15, 18 and 20, the proposed remedy is no further action. Basically the data available indicates that groundwater doesn't pose any significant risks to human health or the environment.

So those are the proposed remedies. The public comment period, as we talked about at the beginning of the presentation, began back on June 14th, 2008. It will wrap up on July 14th.

We are having our public meeting this
evening. Once we finalize the public
comment period, we'll prepare our
responsiveness summary, a formal document
that summarizes all the comments received
and official responses to those comments.
That document will get incorporated
into the final record of decision, and we

That document will get incorporated into the final record of decision, and we hope to have that final record of decision in August or as late as September of this year.

As far as points of contact, if you feel you want to provide some additional comments after this evening or don't want to mail in comments, you can contact individuals up here on the screen from the Navy, Mr. Ron Pinkoski who is the remedial project manager with Midlant (phonetic) down in Norfolk, Mr. Richard Conant here at sub base and the regulators,
Ms. Kymberlee Keckler with EPA and
Mr. Mark Lewis from the DEP.

So that concludes my presentation. If there's any official comments, we'll move into the hearing

portion of the meeting. If there's any 1 2 unofficial, we can take those, too. Just off the record at this 3 4 point. Anybody have any comments? 5 MARK OEFINGER: Mark Oefinger from б 7 the Town of Groton, probably unofficial, just, maybe, for future 8 9 consideration. I got notice of this on Tuesday. 10 hadn't seen the ad in the paper, and I was 11 12 just -- I got it from Harry Watson who is 13 currently the town manager. 14 But I think he got it because he was a member of the committee that met for 15 16 years and years and years. And I would just suggest in the future -- and I 17 18 thought it was the practice. But at least, in the future, that 19 20 when we have these types of reports, I 21 think this -- you guys have done great 22 work as far as I can tell. I'm very 23 impressed at the thoroughness. But I would suggest that in the 24 25 future when we are going to kind of roll

1 out the final recommended plan, that 2 communities get notified formally, either the mayor who was notified but I think 3 4 inadvertently because you didn't know he 5 was a mayor. He was a member of the committee 6 because I don't -- the host communities 7 8 for the Town of Groton or Ledyard. I 9 don't know anybody from Ledyard is 10 here, but I doubt the Ledyard town council 11 is aware of this meeting. 12 I know I would have at least one 13 counselor who would be very interested in 14 being here. She couldn't be here because she's out of town. And it's just a 15 heads-up for the future. 16 I know you have -- receive comments to the 14th. 17 18 But we usually always get notified 19 about everything at the sub base. The sub 20 base does an excellent job at keeping the 21 host community informed. 22 So just for future consideration and 23 formal comment I want to pass on to 24 you. 25 COREY RICH: Yeah. Maybe, Dick, you

1 are best to speak to this. But I know the 2 Navy tries to inform the public as much as 3 they can. As far as the RAB distribution 4 5 list, I think they have б thirty-some --RICHARD CONANT: -- thirty-five. 7 Actually, Mark has got it in front of 8 9 them there. I think we can probably do 10 better as far as getting something 11 directly to the higher ups at Ledyard and 12 Groton. 13 Of course, we do have the 14 repositories out there, the Bill Library 15 and Town of Groton Library. 16 And all documents that will be 17 finalized are available over there, and 18 I'm fairly religious about getting those 19 over --20 MARK OEFINGER: I see that they are 21 on the list and in the legal notice. 22 RICHARD CONANT: We certainly -- we 23 are in an end game with this program. 24 think certainly aside from the legal that 25 was published on this, I can endeavor to

1	get maybe beef up that list a little
2	bit so it gets out to certainly you.
3	Mr. Watson has been involved for
4	many, many years.
5	MARK OEFINGER: Yes, he has.
6	RICHARD CONANT: We haven't had a lot
7	of contact with Town of Ledyard, and maybe
8	we can establish that.
9	MARK OEFINGER: I do know I do have
10	at least one counselor who will probably
11	make more of an issue that they weren't
12	aware of a hearing than the comments and
13	the recommendations and the protocols that
14	you've identified. So it's just
15	RICHARD CONANT: Well, certainly the
16	public comment period is open for another
17	couple weeks now.
18	So we'll entertain a call, e-mail to
19	either point of contact, written
20	response
21	MARK OEFINGER: I will follow up with
22	this one particular counselor.
23	We did scan this in and e-mail it out
24	to the entire council.
25	RICHARD CONANT: What would be the

1	most I mean, the Town of Groton is a
2	big place the most appropriate
3	POC?
4	MARK OFFINGER: Town manager's
5	office.
6	RICHARD CONANT: Okay, most
7	definitely.
8	MARK OEFINGER: At least, if the town
9	manager doesn't notify people, they know
10	who to hang.
11	RICHARD CONANT: For many, many years
12	we've been sending something out to Deb
13	Jones
14	MARK OEFINGER: Right.
15	RICHARD CONANT: our point of
16	contact. But maybe this should be bigger
17	than that.
18	When we were dealing with
19	resources, she seemed to be the planning
20	phase to this whole thing.
21	MARK OEFINGER: Yup. Yup.
22	RICHARD CONANT: I actually haven't
23	had contact with her for a number of years
24	on this.
25	MARK OEFINGER: I tried contacting

1	her today to see if she was coming, and I
2	didn't have any luck.
3	She may be off this week. It isn't a
4	criticism. It's just in the future.
5	RICHARD CONANT: No. We have that
6	reported and fair comment.
7	And I think we can do a little better
8	as far as trying to hit up high and if it
9	can trickle down as far as what
10	notifications you would like to make to
11	your people.
12	MARK OEFINGER: Great. Appreciate
1 3	it.
14	RICHARD CONANT: Certainly, we try to
15	get some attendance at these
16	meetings, and it's like pulling teeth
17	sometimes.
18	So it would be great, anything we can
19	do to especially as we get into lower
20	base which is going to be an exciting
21	site.
22	Why don't we segue right into the
23	public hearing here.
24	Thank you very much, Corey. Good
25	presentation, very complex. We were a

little worried about the number of slides here.

But groundwater covers a lot of sites out there. It's a complex situation. So we had to come think it through, and I thank everyone for bearing with us.

But certainly now this is the formal public hearing. If you have comments, if you have questions to direct anyone here, to direct to the Navy or to the EPA and the State that are represented here, please, you know, I would entertain anything at this time.

And certainly in the back of the proposed plan here points of contact Ron and myself. If you want to give us a call, send us an e-mail, smoke signal, whatever you care to do, we'd be glad to take your comments right up to the public when we close the public period in about two weeks.

COREY RICH: Dick, maybe also bring to their attention that they can provide comments, written comments.

You just fold it over. Your address

is on there. You can fold it together and 1 2 mail it in. 3 RICHARD CONANT: If you would like to 4 send it in snail mail to me, that's It's right on that sheet 5 6 there. 7 So any questions, comments. 8 Mark, again. 9 MARK OEFINGER: Again, Mark Oefinger 10 from Groton. And this is really a 11 question I'm curious: When we were 12 talking about Site 23 which is the old tank farm, and if I understood -- I 13 14 remember when that project was done quite 15 a few years ago, but the sides and the 16 bottom of the tanks were left in place and 17 filled with stone? 18 COREY RICH: Correct. 19 RICHARD CONANT: That's correct. And the perimeter 20 MARK OFFINGER: 21 drains we're using because there's high 22 ground water there, would it have been 23 better to actually remove -- I'm assuming 24 the perimeter drains are needed because 25 there's still contamination in the cement

or in the tanks or whatever is there 1 2 or --The ring drains are 3 RICHARD CONANT: 4 primarily there because we have to 5 continue dewater out there. We'd be concerned if ground water 6 7 comes up, not only would we flood out what 8 used to be Crystal Lake out there 50, 60 9 years ago, but also we might float some of the carcasses of the tanks. 10 11 Now, the tanks, I got a look at them 12 back in '94. We were cleaning them 13 out. They are so big you could play 14 tennis inside of it. 15 MARK OEFINGER: I remember. 16 RICHARD CONANT: And they were 17 reinforced concrete. They don't build 18 them like that anymore. 19 We actually had a huge amount of 20 trouble even stowing in the top of 21 them. We didn't think we could do 22 that. 23 MARK OEFINGER: We are monitoring the 24 groundwater, I suspect, because there's

potential for pollution, or did we get all

1	pollution at the time?
2	RICHARD CONANT: Exactly.
3	MARK OEFINGER: Okay.
4	RICHARD CONANT: There is some
5	remnant oil contamination in place and
6	primarily these tanks are used to store
7	bunker fuel and No. 2 heating oil.
8	The one exception to that was the one
9	we converted over to storing waste oils
10	there.
11	COREY RICH: Site 9.
12	RICHARD CONANT: Which is Site 9 that
13	Corey went over.
14	Yes, there is still some oil
15	contamination out there.
16	We are really pursuing natural
17	attenuation that was a breakdown over
18	time, but the concern is that there is a
19	pathway through the deep drain
20	system
21	MARK OEFINGER: Okay.
22	RICHARD CONANT: and the storm
23	water system to the river, and that's why
24	we are monitoring.
25	MARK OEFINGER: Thanks.

RICHARD CONANT: Anything else? 1 2 FELIX PROKOPF: Felix Prokopf, Ledge 3 Light Health District. 4 The Ledge Light Health District 5 covers five towns, Ledyard, Town of 6 Groton -- City of Groton, Waterford, New 7 London, and East Lyme. So I deal with a 8 lot of board members and things like 9 that. 10 Maybe something like what Mark is 11 saying, if I could have or we could 12 have -- I know, there's a lot of detail in 13 this -- maybe like a two- or three-page 14 statement of what you are doing --15 RICHARD CONANT: Okay. 16 FELIX PROKOPF: -- to contact 17 them. I saw something like that. 18 said, Jeez, I should have made a copy of 19 ít. 20 And I was going to call you up on it 21 where I can have two or three pages. 22 Because we deal with a lot of 23 board -- people change every two or three 24 years. There's new elections like health 25

1	district board. It would be nice if I
2	could give them something not so
3	detailed.
4	Something a quick overview of
5	what's going on and, then, where they can
6	get the information like at the
7	library. I think I saw Andy's number
8	on.
9	RICHARD CONANT: So you are looking
10	for something more general, a snapshot of
11	the entire program?
12	FELIX PROKOPF: A new member on
13	board, this is what is going on, that
14	maybe something like that. I have two or
15	three cars that I travel around with.
16	Maybe something like that, Mark, that
17	would be handy. Because you, like you
18	deal with members all the time. So here's
19	what going on at the base.
20	They may not know that would help
21	me so I can give them so I don't have to
22	explain what's going on.
23	RICHARD CONANT: I think we
24	have
25	FELIX PROKOPF: Maybe this is I'll

take a look at it. 1 RICHARD CONANT: I can think of a 2 number of things we might have. 3 FELIX PROKOPF: Not so much 4 detail, just here's what we're doing. 5 6 don't know if I'm explaining it right. 7 Something that explains what you are 8 9 doing here, what's going on in proof and then contact numbers. 10 RICHARD CONANT: Certainly. 11 Certainly. I certainly have something 12 13 like that, and I can provide it. Kimberly? 14 15 KYMBERLEE KECKLER: Yeah. I wanted to point out that EPA's 16 17 website for the base is about two 18 pages, and it summarizes the progress at 19 all of the sites. 20 RICHARD CONANT: Yeah. 21 FELIX PROKOPF: Again, that 22 information would be put on this little 23 simple handout, if I get called from 24 another town, I can quickly hand them 25 something on file.

RICHARD CONANT: 1 We can certainly 2 cobble something together I think would meet those needs there that as far as a 3 snapshot of where we are at this time with 4 5 the program and where we're going and certainly provide EPA's website as well 6 which is the official website for this 7 federal facility. 8 FELIX PROKOPF: If I could say 9 something to Mark: These guys have been 10 11 doing a terrific job. I have been going to the every 12 meeting for the last -- I don't know how 13 I don't even know how old I many years. 14 15 am. They tried and Sue Orrell, she used 16 to call. She used to call all these 17 officials, and nobody ever -- very few 18 19 people showed up. 20 So you did have a very good 21 system. I don't want to say it's lax but even 22 23 the last -- how many years have we been 24 coming? 25 Early '90s. RICHARD CONANT:

1	FELIX PROKOPF: Am I old?
2	But they had a call system. Sue had
3	a calling list and things like that. So
4	they have been doing it in the past.
5	RICHARD CONANT: I think we had a lot
6	more interest in the past. And as we've
7	gotten into various programs, the interest
8	has faded a bit.
9	And now maybe as we get to the end of
10	this, we need to make an attempt to
11	say, Hey, we are coming to the end of
12	this, and it's time to maybe close things
13	out.
14	And if you have comments or concerns
15	or want to catch up, now is the time to do
16	it.
17	FELIX PROKOPF: Only one free
18	dinner, 10 or 12 years, cheese and Ritz
19	crackers or something.
20	RICHARD CONANT: I'm sorry. We are
21	protective of your tax dollars.
22	Thank you, Felix.
23	FELIX PROKOPF: Yeah.
24	RICHARD CONANT: Any other
25	questions? comments?

Hearing none, we'll close the public hearing right now. Certainly comments can be submitted via the means that we outlined. Thank you all. COREY RICH: Thanks. (THEREUPON, THE DEPOSITION WAS CONCLUDED AT 7:43 P.M.)

CERTIFICATE

I hereby certify that I am a Notary Public, in and for the State of Connecticut, duly commissioned and qualified to administer oaths.

I further certify that said hearing was taken by me stenographically reduced to typewriting under my direction, and the foregoing is a true and accurate transcript of the hearing.

I further certify that I am neither of counsel nor attorney to any of the parties to said matter, nor am I an employee of any party to said matter, nor of any counsel in said matter, nor am I interested in the outcome of said cause.

Witness my hand and seal as Notary Public

Clifford Edwards

Notary Public

My commission expires: 9/30/2011

24

25

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

17

18

19

20

21

22

23

U.S. NAVY

SUBMARINE BASE NEW LONDON

PROPOSED PLAN FOR BASEWIDE GROUNDWATER OPERABLE UNIT 9 PUBLIC MEETING AND HEARING

June 26, 2008

Attendee Roster

NAME	ORGANIZATION	PHONE # / EASE#	E-MAIL
1. Noah Lev	ne BAB	S(C)-44D-5115	NEW JENNEY & SHET, NET
2 tros Jev	in Prosic	"	<u>''</u>
3. Coney Richt	TENUS	(412)921-8984	coreyrich@tetatech.c
4. Rehard Comot	Sch-se Env. Dev	860-694-5649 rich.	I connected many m. 1.
5-ROW PINKOS	KI US HAVY	757-444-0735 r	onald pinkoskienary mil
6. Jampenee Ja	eefler USGA_	6179181385	Keckler Kymbula @Pa
7. Val Jurka	NAVEAC	757-322-83/4	Valjurka @ navy mi)
8. (TITE Ed.	voids Court Repo	ster 860 604 .11	15 Cliftedwards
2. Mark Low	is cireb.	860-424-37	75 Cliftedwards & Comcast.
10. (FIRES ZET	some/non who	960-694-5980	CHES TENON DO LANY MIL
11. Larry Gibs	EDY KAB	860 - 464 - 828	1 thyiba gol. com
12 Felix PA	Rokepin Heplin 5	3.c 448-418	CHESTERON DOLLANY, MIL 1 / harba gol. com
13. Harry Watson	Mayor Town	4 Groton 7054551 h	watsons866@tvcconnect.nev
14. MAK R.O.	FINGER GROTON TO	DOWNAMER 441-6	watsons866@tucconnect.new.
			3976 andrewsterkpokaray.mi
16,			
17			
18			
19			
20,			

APPENDIX E

HUMAN HEALTH RISK ASSESSMENT 2008 MEMORANDA

- **E.1 HUMAN HEALTH RISKS ASSOCIATED WITH SITE 2 GROUNDWATER**
- E.2 HUMAN HEALTH RISK ASSOCIATED WITH SITE 23 GROUNDWATER
- **E.3 VAPOR INTRUSION EVALUATION FOR OU9**

,		
÷	£.1	HUMAN HEALTH RISKS ASSOCIATED WITH SITE 2 GROUNDWATER
		-

•

From: Bob Jupin, Tetra Tech Risk Assessment Specialist

To: Corey Rich, Tetra Tech Project Manager

Date: May 19, 2008

Regarding: Human Health Risks Associated with Site 2 Groundwater

Historical and current information pertaining to Site 2 groundwater were reviewed to determine if Site 2 groundwater poses a threat to human health and the environment. Historical information reviewed as part of this evaluation consisted of the Phase II Remedial Investigation (BRE, 1997) and the Basewide Groundwater Operable Unit Remedial Investigation Report (BGOURI) (Tetra Tech, 2002). Current data reviewed as part of this evaluation consisted of the data included in the Year 7 Annual Groundwater Monitoring Report for Area A Landfill (ECC, 2007). Groundwater data presented in the Year 3 Annual Groundwater Monitoring Report for Area A Landfill (Tetra Tech, 2003) was used to evaluate the potential for vapor intrusion at Site 2. This was the last year that VOCs were analyzed for in groundwater samples collected at Site 2. VOCs were eliminated as a concern at Site 2 after eleven rounds of groundwater monitoring.

There have been changes in United States Environmental Protection Agency (USEPA) and Connecticut Department of Environmental Protection (CTDEP) guidance since the BGOURI HHRA was prepared. The major changes in guidance include:

- USEPA Region 9 Preliminary Remedial Goals (2004).
- CTDEP Remediation Standard Regulations (RSRs) Volatilization Criteria (2003)
- Draft Guidance for Evaluating the Vapor Intrusion into Indoor Air (USEPA, 2002).
- Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment), Final Guidance (USEPA, 2004).
- Guidelines for Carcinogen Risk Assessment (USEPA, 2005a).
- Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005b).

The revised guidance was used in this evaluation.

Site Description

Figure 1-1 shows the general location of the Naval Submarine Base and Figure 1-2 shows the location of Site 2. Site 2 includes the Area A Landfill (Site 2A) and Area A Wetland (Site 2B). Area A Landfill opened around 1957. Incinerated combustible wastes were disposed at the Area A Landfill until 1963, followed by refuse and debris disposal until 1973, when landfilling operations ceased. The thickness of the landfill materials is estimated to range from 10 to 20 feet. After closure, a concrete pad was

constructed on a portion of the landfill. In the early 1980s, transformers and electrical switches stored on the pad were reported to be leaking. Spent sulfuric acid solution from batteries was poured into trenches dug into Area A Landfill for disposal and subsequently covered with soil. Petroleum compounds had been poured from containers at the landfill and had flowed into the Area A Wetland.

The Area A Wetland is located north of the Area A Landfill. In the late 1950s, dredge spoils from the Thames River were pumped to this area and contained within an earthen dike that extends from the Area A Landfill to the southern side of the Area A Weapons Center. The thickness of dredge spoils ranges from 35 feet to 10 feet. A small pond is located at the southern portion of the wetland, within which 1 to 3 feet of standing water is present during all seasons. Phragmites is the predominant type of vegetation. It was reported that formulated (water-soluble) 1,1,1-trichloro-2,2-bis(4-chlorphenyl)ethane (DDT) was used in the 1960s prior to the 1972 ban on DDT.

A two-phase Remedial Investigation (RI) was conducted for the Area A Landfill and Wetland from 1990 to 1995 and a Focused FS (FFS) was conducted for the Area A Landfill in 1995. An RA, which involved the construction of a low-permeability cover system over the landfill area, was performed in 1997. Operations and maintenance (O&M) of the landfill cover system and groundwater monitoring at the Area A Landfill and Wetland have been performed in accordance with the O&M Manual. Land use controls have been implemented at the landfill to meet the requirements in the ROD. The status of the Area A Landfill is considered RIP. A majority of the Area A Landfill is paved and is currently used for storage of equipment and vehicles.

Current and expected future site usage is industrial/commercial. Groundwater at Site 2 is classified GB. Groundwater at Site 2 is not used as a potable water source. Currently there are no direct contact exposures to groundwater. Potential receptors evaluated in the HHRA for Site 2A included construction workers and hypothetical future residents. Potential receptors evaluated in the HHRA for Site 2B included construction workers.

Phase II RI Report

Groundwater at Site 2B was evaluated in the Phase II RI (BRE, 1997). As part of the evaluation, concentrations of chemicals in groundwater were compared to USEPA and CTDEP screening criteria for direct contact (USEPA Region IX Preliminary Remedial Goals, USEPA Maximum Contaminant Levels, and CTDEP Maximum Contaminant Levels, and CTDEP RSRs). A copy of the comparisons is included in Attachment A.1. Maximum concentrations of bis(2-ethylhexyl)phthalate, antimony, arsenic, barium, beryllium, boron, cadmium, lead, manganese, nickel, thallium, and vanadium exceeded the direct contact criteria. Construction workers were identified as the only plausible receptor for exposures to groundwater

under current and expected future site use. The cancer risk of 4 x 10⁻⁷ was less than USEPA's and CTDEP's acceptable levels. The hazard index of 2.2 exceeded the USEPA and CTDEP acceptable level of 1. Manganese was the major contributor to the hazard index. The HHRA assumed that construction workers were exposed to groundwater 8 hours a day for 120 days a year or the entire length of the construction project. This is a very conservative assumption since it is unlikely that a construction worker would have contact with groundwater 100 percent of the time they are at the site. Assuming that a construction worker would have contact with groundwater 4 hours a day for one working month (30 days) results in a hazard index of 0.2, which is less than the USEPA and CTDEP acceptable level (Attachment A.2). The HHRA guidance has been updated since the Phase II RI was prepared, but the changes in the HHRA guidance would not change the conclusions of the HHRA.

Basewide Groundwater Operable Unit Remedial Investigation Report

Groundwater at Site 2A was evaluated in the BGOURI (Tetra Tech, 2002). As part of the evaluation, concentrations of chemicals in groundwater were compared to USEPA and CTDEP screening criteria for direct contact (USEPA Region IX Preliminary Remedial Goals, USEPA Maximum Contaminant Levels, CTDEP Maximum Contaminant Levels, and CTDEP RSRs) and migration (CTDEP volatilization and surface water protection criteria). A copy of the comparisons is included in Attachment A.3. Maximum concentrations of acetone, arsenic, barium, and mercury exceeded the direct contact criteria (Table 5-4). Arsenic and mercury were detected at concentrations exceeding the surface water protection criteria (Table 5-5). Construction workers were identified as the only plausible receptor under current and expected future site use. The HHRA determined that risks for construction workers were less than USEPA and CTDEP acceptable levels (Table 5-8). The HHRA guidance has been updated since the BGOURI was prepared, but the changes in the HHRA guidance would not change the conclusions of the HHRA.

Year 7 Annual Groundwater Monitoring Report for Area A Landfill

The analytical sampling results for the two latest rounds of groundwater samples collected from upgradient wells, downgradient wells in Area A Downstream, and downgradient wells in the Area A Wetland (Rounds 18 and 19) at Site 2 are presented in Table 3-2 in Attachment A.4. Groundwater samples were analyzed for only PAHs and metals. VOCs are not considered to be chemicals of concern at the Area A Landfill based on the conclusions of previous investigations. Cadmium, copper, lead, and zinc were detected at concentrations which exceeded the surface water protection criteria. Cadmium, copper, and lead were not detected in groundwater samples collected during the BGOURI. Concentrations of zinc in the latest two rounds of sampling were higher than those detected in groundwater samples collected during the BGOURI. Concentrations of the other chemicals detected in

the latest rounds of groundwater samples were comparable to or less than those detected during the BGOURI. While concentrations of cadmium, copper, lead, and zinc were higher in the latest round of groundwater samples, potential risks to construction workers would still be less than USEPA and CTDEP acceptable levels (Attachment A.5). Potential risks to residents using groundwater as a drinking water supply would exceed USEPA and CTDEP acceptable levels, although residential development of Site 2A is prohibited.

Vapor Intrusion Evaluation for Groundwater

Year 3 groundwater data from Site 2 were evaluated to determine if there were unacceptable risks associated with vapor intrusion into buildings (Tetra Tech, 2008). Concentrations of volatile organic compounds (VOCs) in groundwater were compared to screening criteria for vapor intrusion. The screening criteria were obtained from USEPA's OSWER Draft Guidance for Evaluating the Vapor Intrusion into Indoor Air from Groundwater and Soils (Subsurface Vapor Intrusion Guidance), November 2002, CTDEP's Proposed Revisions - Connecticut's Remediation Standard Regulations Volatilization Criteria, March 2003, and USEPA Region 1 (April 24, 2008). Concentrations of chloroform, tetrachloroethene, and trichloroethene at Site 2 exceeded the USEPA screening criterion. These chemicals were further evaluated using USEPA's Johnson and Ettinger Vapor Intrusion Model. Modeling results showed that cancer risks and hazard indices for residential and industrial scenarios were within USEPA and CTDEP acceptable levels at Site 2. Further evaluation against PRGs and ARARs showed that vapor intrusion is not an issue at Site 2. It was concluded that no further action was required for vapor intrusion issues at Site 2.

Conclusions

Historical and current information pertaining to Site 2 groundwater were reviewed to determine if Site 2 groundwater poses a threat to human health or the environment. The conclusions of this evaluation are the following:

- The HHRA for Site 2 Area A Landfill prepared during the BGOUR! evaluated potential risks from exposures to groundwater by construction workers. The HHRA determined that risks for construction workers were within USEPA and CTDEP acceptable levels.
- The HHRA guidance has been revised since the BGOURI HHRA was prepared, but the changes
 in the guidance would not change the conclusions of the HHRA.
- Polential risks for construction workers exposed to Site 2 Area A Landfill groundwater would still
 be acceptable using the analytical results from the most recent rounds of groundwater sampling.
 Potential risks to residents using groundwater as a drinking water supply would exceed USEPA
 and CTDEP acceptable levels, although residential development of Site 2A is prohibited.

- Waste remains at Site 2 Area A Landfill under the landfill cap. Additional monitoring is required to demonstrate compliance.
- Dredge spoils remain at the Site 2 Area A Wetlands. There are no issues with groundwater at the Site 2 Area A Wetlands.
- The vapor intrusion evaluation for groundwater determined that risks from vapor intrusion were
 within USEPA and CTDEP acceptable levels for residential and industrial scenarios. The
 evaluation concluded that no further action was required for vapor intrusion issues at Site 2.
- Based on existing information, under current and expected land use. Site 2 groundwater does not
 pose a significant threat to human health or the environment. Adverse health effects are possible
 under hypothetical residential land use.

References

BRE (Brown & Root Environmental), 1997. Phase II Remedial Investigation, Naval Submarine Base, New London, Groton, Connecticut. Wayne, Pennsylvania, March.

CTDEP (Connecticut Department of Environmental Protection), 2003. Proposed Revision, Connecticut's Remediation Standard Regulations, Volatilization Criteria. Bureau of Water Management, Permitting, Enforcement and Remediation Division, Hartford. Connecticut, March.

ECC, 2007. Year 7 Annual Monitoring Report for Area A Landfill, Naval Submarine Base, New London, Groton, Connecticut. Marlborough, Massachusetts, September.

Tetra Tech (Tetra Tech NUS, Inc.), 2002. Basewide Groundwater Operable Unit Remedial Investigation, Naval Submarine Base - New London, Groton, Connecticut. King of Prussia, Pennsylvania, January.

Tetra Tech, 2008. Vapor Intrusion Evaluation for Groundwater at Operable Unit (OU) 9, Naval Submarine Base – New London, Groton, Connecticut. Pittsburgh, Pennsylvania. May 14.

USEPA (United States Environmental Protection Agency), 2002. Oraft Guidance for Evaluating the Vapor Intrusion into Indoor Air. Office of Solid Waste and Emergency Response. EPA 530-F-02-052. November.

USEPA, 2004. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R/99/005, Office of Emergency and Remedial Response, Washington, D.C., July.

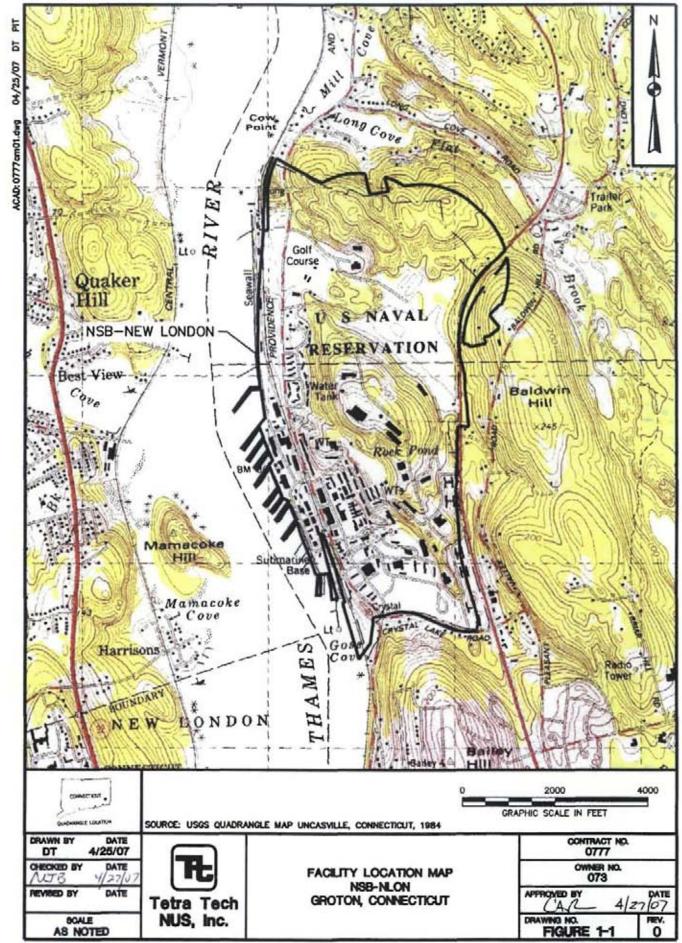
USEPA Region 9, 2004. Preliminary Remediation Goals, November.

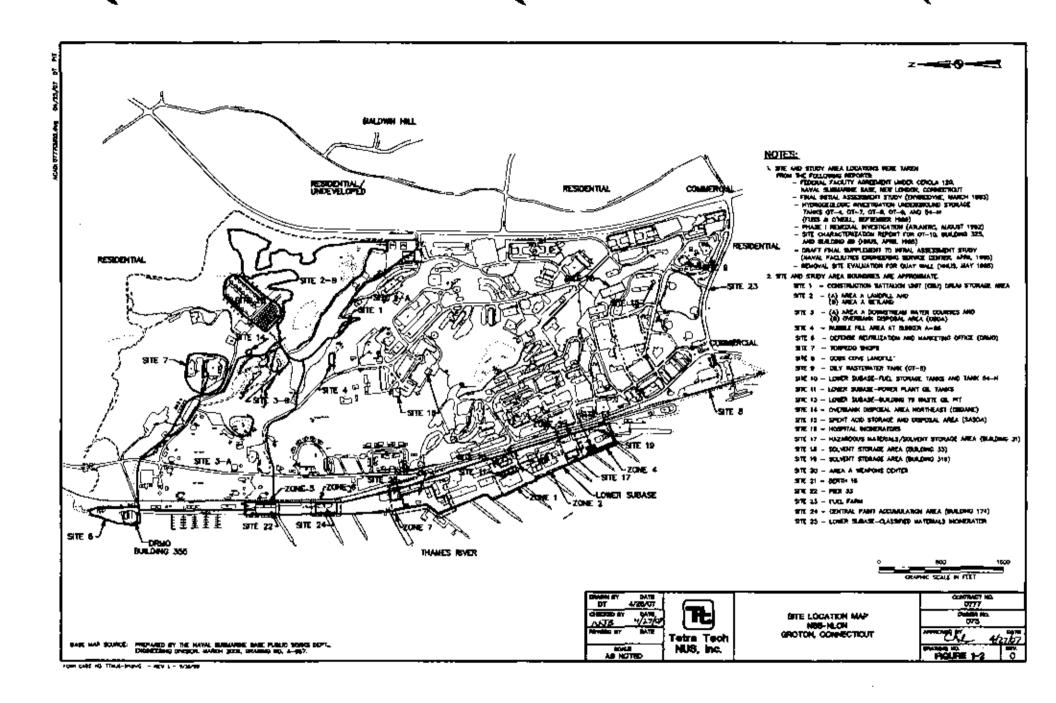
USEPA, 2005a. Guidelines for Carcinogen Risk Assessment. EPA/630/P-03/001B. Risk Assessment Forum, Washington, DC. March.

USEPA, 2005b. Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens. EPA/630/R-03/003F. Risk Assessment Forum, Washington, DC. March.

USEPA Region I, 2008. EPA Comments on the Basewide Groundwater Vapor Intrusion Analyses. Email from Kymberlee Kecker of USEPA Region I to Corey Rich of Tetra Tech NUS, Inc. April 24.

FIGURES





ATTACHMENT A.1
TABLES FROM PHASE IS RI REPORT

მსმი!3

SUMMARY OF COC SELECTION SITE 2 WETLAND - UNFILTERED GROUNDWATER (UG/L) (1) NSB-NLON, GROTON, CONNECTICUT

Chamlest	Frequency of Dejection (2)	Range of Detection (2)	Location of Maximum	Range of Nondetects (3)	Federal MCL (4)	State MCL (5)	Risk-based COC Screening Level (6)	Selected es COC?	Astionale
Carbon disulfide	1/27	2	2WGW215	5 - 10		·	100	N	2
Xylenes, total	1/27	1	2WGW55	5 - 10	10000	10000	1200	N	2 .
2-Methylphenol	1/27	2	2WGW220	10			180	2	2
4-Methylphanol	1/27	3	2WGW229	10	-		18	N I	2
Benzaid edid	5/27	05-12	2WGW3D	25 - 50	, <u>, </u>	·	15000	N	2
Bis(2-sthyihexyöchthalate	4/27	11 - 31	2WGW6D	10	- 5	6	4.8	Υ	3
Di-n-butyl phthelate	1/27	1	2WGW3\$	10	· · · _		370	, N	2
Di-n-octyl phthalate	2/27	0.6 - 3	2WGW3D	10	· -	'	73	N :	2
Diathyl phthalate	2/27	1	2WGW3D/2WGW3S	10	· 1		2900	N	Z
Phenoi	1/27	14	2WGW220	10	· ·		2200	. N	2
Alvm!num	17/27	39.6 - 9910	2WGW6D	30 - 305	50 - 200 71	•	3700	¥.V	45
Arsenic	12/26	1.9 - 109	2WGW21S	2 · 5	50	50	D.045	Υ	3
Barlum	27/27	15.5 - 904	2WGW30	· · · · ·	2000	2000	260	Y	3
Beryllium	4/27	1 - 3.6	2WGW6D	1	4	4	0.016	Υ	3
Baron	13/19	89.7 - 3260	2WGW21S	21.3 - 43	<u> </u>		330	Y	3
Cedmium	9/26	1.2 - 10.8	2WGW3D	1 - 4.8	5	6	1.8	Y	3
Cafelum	27/27	5920 296000	2WGW21\$	· · · · · · ·	<u> </u>	· · · · · · ·	,	N	1
Chromium (total)	5/27	2.9 13.8	2WGW21S	3 - 5	100	100	18 8	N ·	2
Cobalt	12/27	2.1 - 37.5	2WGW6D	3 - 19.9		٠,	220	N	2
Capper	14/27	2.B - 44.6	2WGW21\$	1.1 - 17.2	1300 (9)	,	150	N	2
Cyanide	1/7	5	2WGW5\$	5	200	200	73	N	2
Iron	26/27	85.1 - 131000	2WGW5S	105	300 (7)	·:	1:00	₩N	35
Lead	14/27	1.3 - 32.7	2WGW20	1 - 15.1	15 (9)	<u> </u>	-	Y	4
Magnesium	27/27	1340 - 1080000	2WGW21S	-	· · · · · · · · · · · · · · · · · · ·	-	· ·	N	1
Manganese	27/27	2.3 - 9270	2WG\V5S	· ·	50 (7)	·	48- 86	Υ	3
Nickel	8/27	9.3 - 116	2WGW60	7 - 25.6	100	100	73	Υ ""	3
Potessium	25/27	557 - 815000	2WGW219	1650 - 2290	· 1			N	1
Selenium	5/27	2.2 - 5.1	2WGW60	1 - 5	50	50	18	N	7
Sirver	1/27	1.5	2WGW3S	1 - 7.2	100 (7)	50	18	N	2



SUMMARY OF COC SELECTION (Continued) SITE 2 WETLAND - UNFILTERED GROUNDWATER (UG/L) (1) NSB-NLON, GROTON, CONNECTICUT

Chemical	Frequency of Detection (2)	Range of Detection (2)	mumixeM lo collecçu	Renge of Nondetects (3)	Federal MCL (4)	State MCL (5)	Risk-besed COC Screening Level (6)	Selected ex COC7	fisitorale
Sodium	27/27	7580 - 8500000	2WGW21S			-	, _	N	1
Thallium	5/22	4.6 - 15.2	2WGW21S	1 - 20	2	2	0.26 (10)	Y .	3
Vanadium	4/27	2.7 - 26	2WGW215	3 - 20		,	26	Y	3
Zinc	18/27	6.8 - 274	2WGW6D	2 - 26.7	5000 (7)	-	1100	N	2

Footnotes:

- 1 Results in up/L unless otherwise noted.
- 2 Sample and duplicate counted as separate samples. Non-validated and rejected results are not used in risk assessment.
- 3 Sample-specific.
- 4 Maximum contaminant level, (USEPA, May 1995).
- 5 Title 19, Health and Safety, the Public Health Code of the State of Connecticut, Chapter II Environmental Health.
- 6 For tap water, based on a target hazard quotient of 0.1 or an incremental concer risk of 16-6 (USEPA Region III, October 20, 1995).
- 7 Secondary MCL (SMCL) based on agethetic water qualities.
- 8 Revavalent chromium.
- 9 Action Level.
- 10 Thallic oxide.

Rationale Ossignations:

- f No toxicity criteria evallable; exposure to chemical will be addressed in uncertainty acction of risk assessment.
- 2. Maximum is less than the COC screening level.
- 3. Meximum is greater than or equal to the COC screening level.
- 4 No COC screening level available; maximum is greater than or agual to Federal Action Level.
- 5 USEPA Region I does not advocate quantitative evaluation of this chemical.



ATTACHMENT A.2

RE-EVALUATION OF PHASE II RI RISKS

TABLE 4 V B ME

VAÇUES USED FOR DAILY INTAKE CALCULATIONS ASSASONABLE MAXIMUM EXPOSURES - PHASE 1 RIPRE-EVALUATION ASSANJON GROTON CONNECTIOUT

Scenard Timetrame Future Mgc ym Croundwater Eisposore Medium Groundwater

									
Exposure Pouls	Retwater Publisher	Receptor Age	Exposure Point	Parumeter Çodn	Parameter Definition	Valle	Jeda	Hapana e. Pelerént e	rttaen Fquation Noder Name
Demail	Construction Workers	Adult	Sie 2	Dae vom	Dormally Apsorped Dose per Silent	Casuates	mg :m%.ever:	US EPA, (1004	Dermaly Adherited Dose (ing kgroay) a
				l sa	Skin Surface Available for Contact	3300	c-2	U.S. EPA 2004	
	1			≣v	Event Frequency	·	eventstuay	(1)	<u>DAC-ent - EV + E7 + E0 + SA</u>
				€7	Exposure Time		'koureday	11)	BW ≰AT
				55	Circosure Frequency	30	Cays yag	ļ1;	
				52	Exposure Ouration	:) 03'8	(1)	See less for conduction of DAssert
				844	Body Weight	76	10	US EPA 1969	
				1	Averaging Time (Cancer)	25550	days.	US EP4.1989	
	<u></u>			1 <u>#58</u>	Averaging Time (Mon-Clander)	365	days	U.S. EPA, 1989	<u> </u>

Spurces

- 1 Professionar Jacq nom-
- LUIS I SPA 1989 (Pisk Asseksmen) Guidance for Superfura (Vol.) Human Health Evaluation War Judi Park A. EPA 5(0.1-85 (A)
- LIS ISPA 19024 Pisk Assessment Cuidance for Superfund (Parl E, Suppremental Superior for Cormal Risk Assessment, Final ISPA 540 R.99 (p5)

Unit Intake Calculations

ingestien (make = 18.5% a EF a EO, BW a A1). Central (make th (SA a EV a EF a EO, BM a A1).

Cancer Engestion intake + 14A. Nancanzer Engestion Intake + 18A. Cariter Bortal interent 5,545,02. Nordancer Bortal intake n. 3,676,400.

TABLE 4.2 INTERMEDIATE VARIABLES FOR CALCULATING DA(EVENT) SITE 2 - PHASE II RI RE-EVALUATION NSB-NLON, GROTON, CONNECTICUT

Chemical of	Media	Dermal Absorption	FA	K	p	1(c	vent)		ıu —	Т Т	-	8
Potential Concorn	1	Fraction (soil)	Value	Value	Units	Value	Units	Value	Units	Value	Units,	Value
Semivolatile Organic Compo	unds											
Bis(2-ethylhexyl)phthalate	Groundwaler	NA	96	2 5E-C2	gryinn	4	h/	1.7E+C1	hr	4 05+01	'ar	195-01
Inorganics	·											
Antimony	Groundwaler	NA.	;	1.05-03	cm/pr		1	NA	NA.	NA.	NV	NA
Arsenic	Groundwaler	NA .	1	1 0E-03	umihr	4	li-	NA NA	NA.	NA	NA	NA
Bar um	Groundwaler] NA	1	1 0E-C3	<u> բա</u> լիլ։	4	hr	NA.	' Α	NA	NA	NA
Berylium	Groundwater	N.A	1	1.0E-03	om/nr	1	hy	NA	NA	NA /	NA	NA.
Boran	Groundwater	NΑ	ì	1 05-03	cm/hr	- 4		NA.	ŇA	NA.	NA.	NA_
Cadmum	Groundwater	NA	1	1 05-03	cm/hr	4	1117	NA	NΑ	NA NA	NA	NA NA
Manganese	Groundwaler	NA NA	1	1.05-03	ርግን/ከተ	4	hr	NA.	NΑ	NA	NA	NA
Nickel	Groundwaler	N,A	1	2 0E-Q4	ር ግን ነካ፣	-1	h/	NA.	NA	ŊĄ .	NA	NA.
I'no"ium	Groundwater	NA NA	1	1 CE-03_	em/hr	4		NA NA	NA_	NA	NA	NA.
Vanocium	Groundwater	NA NA	1	1 CE-03	cm/hr	4	F:	NA .	NA	NA	NA	NA.

Notes

All values from EPA's Risk Assessment Guidance for Superfund Volume 1: Human Health Evalual on Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Final, July 2004

FA = Fraction Absorbed Water

Kp = Definal Permeability Coefficient of Compound in Water.

T(event) = Event Duration

Tau = Lag Time

The Time to Reach Steady-State.

S = Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Fermeability Coefficient Across the Viable Epidermis

NA = Not applicable.

TABLE 5.1 NON-CANCER TOXICITY DATA -- ORAL/DERMAL SITE 2 - PHASE II RI RE-EVALUATION NSB-NLON, GROTON, CONNECTICUT

Chemica of Potential	Chronie Subchranic		ı RfD	Ora Absorption Absorbed RIO Efficiency		O for Derma. 1	Pr mary Target	Combined Uncertainly/Modifying	RtD Target Organ(s)		
Concern	l [Value	Units	tor Derma."	Value	Unis	Organis)	Factors	Saurce(s)	Date(s) (MM/DD/YYYY)	
Sem volatile Organic Compc	unda	_				·	···	- 			
Buy 12-ethy new, Highthotopia	Caronic	2.0∺.52	mg kg cay	<u> </u>	0.05-02	mg kg das	, te (t/	1500.5	'RIS	4 23 2048	
Inorgan es					_	•	_	•			
Antimony	Chrania	a 05.04	mg/kg day	0.5	6.05-05	mg kg day	9'000	1 (622)	iPIS	4/33/2008	
Arser:c	Chrania .	3 00 04	Enfeg day	:	3.05,04	mak; da,	Skin CVS	3:1	IRIS	4,23,2008	
Barum	Chronic	2.00401	mg/kg/day	0.27	: 45.32	mg kg iday	Kiche,	30011	IRIS	4/23/2008	
3+7/00	CMond	2.06-03	mg kg day	0.007	14E-05	mg kgrday	GS	3000	₹5	# 23 2009	
(Boreni	Chronic	2.05.01	mg/kg day	'	2.05/01	mg kgrtay	Dekle ортвоја:	56	₹5	ar23/2009	
Catenara	Chronic	5.05-04	mg Ng day	0.03	2.5É-25	mg ka tay	A Chey	16 :	₹5	4723 2008	
Mangacese	Chronis	2.48,00	mg/kg day	0.04	9.6∑-34	mg kg/day	CNS	5.3	₹.5	4-23 2009	
Nicke	Chronic	2 CE-62	mg kgʻday	0.04	9 CE-04	индиц бау	Body Weight	390 1	₹5	4 23 2008	
Part and a	Chronic	7 GE-05	mg/kg/gay		7.0É-05	mq kq dav	Liver	3630	USEPAI	10 11/2007	
/aradum	Chrenic	* CE-02	mg/kg/zay	0.225	2 6E-05	mg kipiday	Koney	150	USEPAIN	10 11 2007	

Notes

- 1- US EPA 2004 Risk Assessment Guidance for Superfurd (Part Si Supplemental Guidance for Quernal Risk Assessment) Interest EPA 540-R;99-005.
- 2 Applicad domini RIO x Oral RIO x Craf Absorption EMbland, for Derival
- 3. Weight adustment of the RIS value.

Delications

CNS = Central Nervous System

CVS = Cardiovascular system

EPA TRIUS EPA Region 3 RHC Table Oblober 11, 2007.

39 x Gantto plessing) system.

RIS a lating rated Risk Information System.

NA a Not Applicable.

TABLE 6.1 CANCER TOXICITY DATA -- ORAL/DERMAL SITE 2 - PHASE JI RI RE-EVALUATION NSB-NLON, GROTON, CONNECTICUT

Chemical of Potential	Oral Cancer	Slope Factor	Oral Absorption Efficiency		cer Slope Factor ermal ^{ist}	Weight of Evidence/ Cancer Guideline	Qra	AI CSF
Concern	Value	Units	for Dormal ^(*)	Value	Units	Description	Source(s)	Date(s) (MM/DD/YYYY)
Semivolatile Organic Compo	unds							· ·
Bis(2-ethylhexyl)phthalate	1 4E-02	(mg/kg/day)	T	1.4E G2	(mg-kg/day)	92	IRIŞ	4/23/2008
Inorganics			<u> </u>					
Antimony	ŊΑ	NA	NA [NA	NA NA	NA NA	NA.	J NA
Arsenic	1 5E+00	(mg/kg/day)	1	1.5E+00	(mg kg day)	A	IRIS	4-23/2008
Bazium	NA.	NA	NA NA	VA.	NA.	Ö	IRIS	4-23/200B
Beryllium	NA.	NA	NA NA	NA	NA.	81	IRIŞ.	4/23/2008
Beren	NA	NA.	NA	VA	NA	NA NA	NA.	NA.
Caemium	NA	NA	VA.	NA.	NA.	В:	IRI\$	4/23/2008
Manganese	NA.	N/A	NA "	NA	NA NA	U	IRIS	4/23/2008
Nicke ¹	NA	NA.	NA NA	NA	NA	NA NA	NA	NA
1իթ հետ	NA	NA.	NA NA	NA	NA	N.A	NA	NA.
Vanadium	NA.	NA	NA NA	VA	NA	NA NA	NA.	NA,

Notes.

- U.S. EPA, 2004, Risk Assessment Guidance for Superfund (Part E. Supplemental Guidance for Dermal Risk Assessment) (not in EPA/\$40-R099/005)
- Adjusted cancer slope focior for dermail to Oral cancer sidee factor? Oral Absorption Efficiency for Dermail

IRIS = Integrated Risk Information System NAIT Not Available

EPA Group:

- Al-Human card togen.
- Bit Probable human cardinogen indicates that rimited human data are available.
- B2 Probable human card nogen indicates sufficient evidence in animals and inadequate or no evidence in humans :
- Cil- Possible numan carcinegen.
- Di-Not classifable as a human card negen.
- Ell-Evidence of nuncarcinogenicity.

TABLE THRME CALCULATION OF CHIM CAL CONCERN AND NON CANCENCENDER HAVENON REASONABLE MARKETING REPOSCATOS FRANCE HERE (ALLICATION MORNION GROOM CONNECTION

bornus Pinerlaine Futur Pedietro Podustro I Colono, Illiano, Herr Registro Agel Mata

forestorm.	Elepaine Medicin	Substance Have	Exposure Audie		,	72		CAT	والحوز عادة بهرا	14001			Section 2	aje Habila (41.4003	
				Folence Continu	0.65.6	ر جار	Nath Elicani	e Comment carron	-54	are distributed	Carcer Rise	NIME I (DOL)	e Torrellord	"	र कर	Lugare Scotter
	<u>'</u>	<u></u>				_	Value	_0-19	Veste	25-26	<u>l</u>	Value	er a	(44)	Je ja	1
interes and	Securation	5-4:	Cain+	BAZATUTER, CTTSNATE	-63		■(E)2	75.364	148.52	my highways	65.58	7.48.00	Triage 1 0341	2006.02	79.60.00	6.00
	!			Anymore	157	193	1.400	=q -q dA ₁ :	1,4	100 kg 1867.1		138.51	,mg - 2 38+1	EG 75	or might dam.	0.002
	1			janteres	92.6	100	1.00	1,0004	1,544.78	mg kg (e) (275.79	1 % 76	region base	305.04	img vg der:	0.004
	'	ļ		Ber um	510	1 4.	146.71	make dept	1/2	00,000,000		155.36	, improper	194,00	maging dept	8,2007
	1		1	BANGER.	192	45	7 - 506.10	10,000,000	-44	impagas (i	l	205.05	they be 20%.	14E C	Jan 52 5 08 .	200
				!som	1.00	1 45	100.07	m = + = 211	' N±	angleg days.		Aur ds	,770,410 Aug	2.51.01	179.9641	1,7777
				Jane -	1 660	.9.	198.51	mary lay.	714	الاردو وهوجه	l	100.61	10 h 3 days	. 52 (6	mg/g/tax	7.704
		İ		Manganese	\$400	-95	98.00	mg kg gays	44	F1272444		, 11EG	1,613,349	9.66.04	.mg i g care	<
				Sichel .	411	1 41	20.00		44	a greater of		146.01	ing is also	N 25 (94	may right agric	0.000
			•	Trans-	8 %	3 492	202.09	1. 1. 1. 200	1.4	C252000		1,460	ing 14 045	108.00	- 10 A S 22 A	0.002
			:	Vanecym	37.4	-9%	519.74	75 14 61.1	1,4	mig Neg Saint		43.5	JE 212 0451	188.99	7034.40	507
		L	Exp. Route folia	I			T				3 . ē (3 6	Ĭ				1
		Laponyon Francisco									3.75.76					1.3
	Expresse Medium folg						}				2 90 (26)				•	
Merch 1000											5 % 1\$					1 :4
									Frie: :> 2444	Acits At Macia	3.32.28]	No Sec.	ru or near day	Access All Degra	::

TABLE 9 1 RMS

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR CORQUIRES SONABLE MANIFOLING EXPOSURES FRANCE IN PERCUALIZATION INSTRUMENT OF THE SONABLE CONTRACT.

Spongra Timphiche Future

Reseptor Population - Construction Workets

Receptor Age (Acur

\$1 ₀₀ toom	Exposure sted-um	Exposure Point	Chemica or Potentia			Cartinogena	: Pisk		Size-Çarşınışanış (Lager) Qabber)						
	ļ		Contern	Ingestion	רטינ פרחו	Décorat	Falyraai Baskailong	Fapasure Ragres Total	Primary Targe: Crgan(s)	* Şalahger	Printal ph	Den-şi	Fagurate Roules i dal		
iranogedier	Groundwater	Site 2	British Britis		· · ·	67-29	·	88,09	£ 3.€°	·		1,76%	0.00%		
		ļ	An' mone				- 1		€.250	Ι.		0.002	6,762		
	1	İ	Arson 2	'l	-	35.59	1 !	38.08] 5≠ + ¢vs			6,004	0.004		
		ļ	8 M 1 →	1		Ι.			Honey		<u>'</u> . '	0.0007	0.000		
	i		Beylver.						CS.			2,007	0.762		
			Baron .						Developments	ļ		0.3002	5 0002		
		:	Cadmium		i "				4004,	; .		0.054	6,004		
			Manganesa						CMS			2.1	3.1		
		i	Victe				ļ į		Book Warshi		•	0.0002	7,0002		
			The rate	i	-		- !		L/sm/	i		0.000	0.002		
			Vanadiom	1 .					Kichey			co: [0.72		
		L	Chemical Total	J	-	JE-CB	1	96- ce	1): 	2.2		
		Exposure Point Tola]				26.08					23.		
	Exposure	lregion folal						05-08					33		
edium Total				<u></u>				16-05					62		
ecoptor (ora							dai Risk Tara	26, D5			Rec	epior +1 Taral	0.7		

Total Glood Hi	0 302
Total despite Meight HII	0.7902
Folia DMS JH	31
Total CVS Pt	0.004
To a GS HI	Cenz
Total Alerey III	5.52
Total Liver Hi	0.000
Tal⊋t 5 c = Hr	2 3 3 ¥
Тогач Вече оспурмул. На	2,0002

ATTACHMENT A.3 TABLES FROM BASEWIDE GROUNDWATER OPERABLE UNIT REPORT

TABLE ! 4

DCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN FOR GROUNDWATCH AT SITE 2 DIRECT CONTACT EXPOSURE SCENARIOS BASEWIDE CHOUNDWATER OPERABLE UNIT REMEDIAL MYTESTICATION MSB-NLOY EMDET CONTECTION PAGE 1 OF 3

Scangillo Timetrume Fulkis | Wodium | Groundwater | Fapogy is Medium | Groundwater | Engologie Point | Area Alberddill and Wellands | Site 2]

CAS No-ther	Gritati.	Microsophi Consentration	Microspe Outlifier	Yesimpm Concentration P	Maximum Qualifar	มคศ	Location of Mazimum Concentration	Oslacjion Fraquency	A Brook of handelegte st	Concentre/ion Used Ig: Screening "	Background Value ¹⁶	Fish-Sased COPC Screening Seve	Pulanira: ARARIBO Value	Potential ARAR/TBG Source	C00C	Sprighted for Sprighted Balation or Spletnon
iyoland a Orga n d a 118 03 3	CBU YANGNE		· · · , —	[%		iat	2A/0A/)VUS 04		, ,	26		<u></u>	i ha	Cillepase FEDING	40	H.S.
ਲਗਾ (ACETONE	-	•	**-		179 1	(ASA)905 (a	3 //			5.A	61 7.	199 NA	Group Mr. Cross Asa Aug Mo.	YES	450
(, , , , , , , , , , , , , , , , , , , 	TOAPETNU NO MORO !	_ , _ ₂ _		7		-94	g and about the	3	├──;		***	- 166 N	132 N.A	CTORPIVOS CITORNIASA LINES MO CITORNIAS		PE'.
-53 att.a	eranjeratene	2 -	, —	:			2 A G A 39G 5-04	— . —	· ·			<u>·</u> 175 <u>···</u> 1	765	160 NO.	†:.	
108 88 3	TOLUFNE		1	77	· / - !	क्र	2A GAV J9DS (4		···· ,—	<u> 16</u>	<u></u>	- 14 N	1040	CTDEN VCC DICUP 45R FFD VCC	N.C.	050
डिकार :	TRICHTORDETHUNE	†	:	, i	-	-; t -; t	15 A 275-64			-	74	±€ C	, 100 , 5 , 5	<u>0100P (61</u> 2108P 959 4108P (400	60	551
Sem votat e Organ	164 184-22 THYLPHENO.	375	:	T -75	J	·3.	2404390554	 .	25			·-·	35 N-A N-A	CONTRACT PED-MCL CONTRACT	<u> </u>	36.
(5 85 3	BENZO-C ACID	2.3		2.1	-	26.1	ZAGA3605 (4	* 15	N 13	5.3	<u> </u>	(\$0.50 K	50000 5 A	21294 RSR 480 VOL 213823/CE	1/20	351
100-95 2		75	,	21	1	نه د. ا	21/G M39/29 C4	i	5.53	7.75		2200 S	NA.	CTDEPIRSH PED VOL 21089 MOL	12	93.
Pestigides 79:54 8	4.4.000	2 347	,	2 756	٠	⊒gi.	27/G/N4705-64	·	0.00-0.009	1 259		2 29		21052 PSR 140 VČL 27062 V <u>ČL</u>	Ι,	95L , L
70(a) Medala 7429.93 S	A, GXIZEUM	720		792		291	pacastos ja ji		69 ° - 198	292	35ec	9500 N	50-200	01082 RSR 1008000	15	EST BAC
T440)5 7	AKSENG	:6 -		 x+	,	ا وما	24/04/4/DS 24/0	4	27.401	- 754	1 92	0.045	7 (A 5) 5)	STDEP MÇL CIDLP RSR FED VOU (CIDEP MOL	YES	
व्यक्ति व्यक्ति	BARIUM	254	,	527	· ·	721	CAGATOS CA	-	W 4	780	227	N o s	25000	DIDEPRIN PED UCL DIDEP NO.	YFS	450
7440 77-2	**************************************	9,70		334 (8)	,	-% L	JACA 460S (4	·	-; 5	1345.uc	1650#3	74	,.275 1, 2, 4 1, 4, 4 1, 4, 4	CTDSP VCL	.	'sT
745) 27')	Children		<u> </u>	:-4	-	-:-	2,4-0,4-605 C#		'3	ा ह	49.9	11	7 - 32 194	CIDEP OCL FED I/C. CIDEP OC.		3-0
7446-48 4	COSALT	7 Feb -	1		 }	3.	7/4/03/47/05/54 7/4/6/4/2/55 (4-1)	3	<u> </u>	31	<u> </u>	4 - 220 - 8 I	100 . NA . NA	CTOEP ASA LIFEDING LICAR VOL	I NO	050 98%
7400 69 ú	IRCA			134000		١; -	24-0/14708-04	*C · ·	-17	234200	28740	1100 h	280 NA	CTDENHSR PENSOON CTDENHAL	F.C.	PP4

TABLE S.4

OCCURRENCE, DISTRIBUTION AND SELECTION OF EMEMICIALS OF POTENTIAL CONCERN FOR GROUNDWATER AT SITE 2 DIRECTICONTACT EXPOSURE SCENARIOS BASEMADE GROUNDWATER OPERABLE UNIT REMEDIAL INVESTIGATION ASBINLOW, GROTON, CONNECTICUT PAGE 2 OF 1

Scenario Timpframe Fulure Medium Groundwater Exposure Vedrum, Groundwater (Copsure Powr) Area Allandfill and Wellange (Sire 2)

ÇAŞ Nymher	Chemical	Carcenianar	Ymerum Cuahhar	Mes mum Concentration	Mazimum Qualifa-	G- 18	Location of Manimum Concentration	Detection Frequency	44.000.61	Consentiation Leed for Screening**	Background Value th	Risk-Based CGPC Scienting Asset ³¹	Poleniui ARARITHO Vi ui	Polental ARASTIBÇ Source	CGPC Fiag	Opicion e:
F454 254	¹m+ GKL SIÚM ' '''	. 5530		1020000		Pq.	2 mGm46DS-C4	5.71	Y'4 !	11,0000	191000	K-A	1.6 1.6 1.6	2106/43/46 450 905 2106/490		, Skeckori , Nu f
(45 a labelt	Maric Grie St	Jbb		8950		· i ·	2/16W4/DS C4			9960	11766	PP 14	5/4 50 5/3	CTOFFIGSR FED SMC. CTOFFICO	Ι.	m _s ;
1439 97.6	MERCURY			.,		15.		,11	ļ ,,		MD	0.36	2	CIDEP RSR *LO MOL CIDEP MOL		45.
7440 (72)	NICKEL :	** - 19795		- 11		ij .	2 A GWYSON-04	.,	, 13 V		97.5	7) ' Ñ	5/4 100	STOLE OUT SEC OCT CHOISE OUT		
7440 23-5	jedrassion 			291200		63.5	2WGW45D5 C4		. 4.9	35°5C1	76500	N-3	574 574 575	CTDEPIASE 450 UCC C19U4 VCC		NI,T
74683	Control Lacontrol Control C	6/68J	,	. 7533790		ug s	2WGW45D5 C4 2W3W45D5 C4	7.0	377.7	1930000	19,00001	NA.	1 4 0 4 1 7	CIDEPIASR FLC VOL CIDEPIASP CIDEPIASP	١.	NLT
7410 00 0		÷ ¿	, ·	!	, ,	· val	2A CA46(S 04	/ 	, "" ' }""J- 49 "	ļ _, ,		76 N	578 578	FFC VCL CTDEP UCL CTDEP USK	Ĺ.	93 . 64. 9ku
Dissolved Vetais		. `				انها.	711.111323 04	: '	" "	'	.,,	- "	5000	FED SMC.		
TAIC 38 2	ARSENIC, FELTERED	. es '	; 		,	i vali	,790)947,09,044	1.578	7 (17 (17) 3 (17)	293	197	0.045 C	50 507 50	CIDEPHSP FFC VCL CTDEF VCV	YES	4SL
<u>'बार छ।</u>	BARKIN, FILTERED	18.3		-e15		ا بهد ا	, VCQ VY4 106-04-F	77: 197) _{N'-}	1578	127	760 N	7000 7000 2000	हाका सम्बद्धाः १९७ ५८: १२:११:११ ५८:	भरङ	άN
landar i mili	TORUS ON FICHERES :	32003		327000		cyt	2WGW4605 (4:4	1 22.0	ו	307000	ζ.	V 7	1 A 1 A 1 A	CTDEP ASR FEG VOC FILLE VOC	80	<u></u>
*46475*** · **	CHECKION CUENCO	· e	-	30-		-41		. <u>5</u> -1	. 2	136	49.9	11 14	50 106 1.9)	CTDEP ASR FED PCU CTDUP PDU	'	980
Marcas 2	COURT LEGARGE	299	•	725		car.	I MGW 4 135 CA F	a · 6 :	354	14 5	486	220 N	5% 5.8 5.6	CIDER ASR FLO VOL CIDER VOL		P(k 550
735 89 5	ROAT CORED	1 779		1930,00		wal	[AGN4755 54 F	9. (·e?	203003	29290	\$100 t;	300 5.6	CTOEP ASR FOO SMOV CTOEP MOI	:	174
(1459) 95 A	WASKESOUM FLITERFO	Stic		ngerions i		va t	.766W4CD9 64 F	10.16	V 4	1387030	191000	" h-A	\	01067 RÓR 110 MO. 01057 MOL]	i,c, r
Taken See S	*NOT. JONESE EN 1586D	;)2				(3)	, #6w4706 044	1 10 10 1	44	Defici:	11700	88 P.	90 5 A	01004456 100840 2108870		9r.G
7410/59/7	MFRCURT, FR. TEXES	> 12		•		י הו י	27.54.4705 (4) C	- 25 5	9.	3	мр	0.36	2 2 2 2	CIDER RSR 750 VCU CIDER-NOL		45.
İ	POTASS UN PRICEED	5090		166360	,		/WGW850S (4 F	10.0		765 p.X	7000	N 4	4.4 4.3 5.6	CIÓLARSA ALC MOS CIORAMOS]	' ₁₀ T
/u025 3	SOC UN TICTORES	61/40	L	2940000	l	eş t	andwatos das "	····	h. 6	7915/00	1900000	N·A	6/3 4/8 5/8	01057 859 (00 90) 01057-901	1 10	407

TABLE 54

OCCURRENCE, OSTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN FOR GROUNDWATER AT SITE 2 DIRECT CONTAGT EXPOSURE SCENARIOS BASSWIDE GROUNDWATER OPERABLE UNIT REMEDIAL INVESTIGATION MSB-HUDM, GROTON, CONNECTICUT PAGE 1 OF 3

Scenera Irmetrata, Falure. Medium Stoungwille Exposure Yestum, Groundester Exposure Point Area & LandSt and Wetterde (5)(e.2)

CAS Yumber	Cramical	Metimen Contamition	Ninamum Qualifar	Mayimum Concentiation	Va. mom i Gualiñar	Ųniis	Location of Massimum Concertianor	Leading of A	Range of Nordatests ²	Concentration Used for Screening ⁽¹⁾	Baceground Valve ^M	Risk-Bused COMC Screening Eavel ¹	Polentas ARARTEC Value	Post-in ARARTBC Boulde	COPE Flag	Mations # (or Contaminant Desploy or Selection *
242 62 5	VAN-ACKLAN FILTERED		:	8,1		-;;	16 3W4208 64 F		177 45	33	·:.	2 ti	50 5/4 9/4	CTOSK KAR FROMEL CTOSE MOJ	1-3	B3. 340
7419 00 6	Tanà Rumpes	136		187	,	,,,	2V GV.4703-25 F D	'."	22.76	· • ·	17	1102 14	5050	OTOER WOR FFO SMOL CTOER WOL	[57]	<u> 195, 4√0</u>
Mitorlaneous Pari												· ——				
	ACK+CINITY	17,47,800		141,0000	: 	2r	7.04(0.04(D)) DA	i 1-	**	2420000	1950	3.8	1 9/4 1 9/4	CTDUP 459 TEDAVOL CTOPP VOL		ν1λ
	CHEMICAL CANDAM DEMAND	#1800		2416000	[·		7m 0.m480.8 04	- 15	20 (35	2410000	570	, n, 1	6 6 A	CTCCMIA),Q FFD MCL CTC6P MCL		75X
	C=1, O4 G5	-57000	,	15300000	· [-y1.	2W G A 2021 A		k.i	1,600,000	4540	`` NX		FFD MOL	'	N/
	MAMONÉ 9 SI SI SI SI SI SI SI SI SI SI SI SI SI	175000		50 (000.0	i	791	(ADM)+C5-8+	•	1. 4.	4 page 50	ND	N.A.	5 Q	CTOSPIASR FED WOL CIOCE VC.	NG 3	673
	SULFATE -			996500		<u> "7"</u>	NV (2014-2022-04	н.,	20,000	989300	45.7	N-a		CTD/P HSP FER VOL CTDF= NO.	NO.	V.
	*(514) 0 880, VH, \$3.05	126300		12940000	· ·- · -	72.	2/15/4/4635.04	-11-	17 A	29435009	626 0	N,-4	500	CTDEP RSP (LD PC. CTDEP VOL	73	— c
	TOTAL CHEAN C SARRON	400		652.5	<u> </u>	ا. دس	MUNITES A	1 1/2/17	N 4 ***	65200	37.7	\a	30.8	รู้กับเครื่อรัก ครว พวง อาชนทพจีน	2	· 1/4
	FOTAL SUSPICEDED SOCIOS	22530	-	181030	,	-vg.1	2.0 G 0470 \$-06	• • • • •	4000	T - TB1391	736	Fi .	10A	CTOFF RISP FLOUVOL CTUSE NO:	143	NIX

Ashletes value indicates that the concentration used for screening exceeds the unlarge or subanyound value A shade potential frame indicates that the chemical has been as extent as a CDPC in

- . Бы притым 1 дустрыки ине срыттер ва быр верхну в въстрава на в паскутото пуд тве тип туто уто тавитит detected on Limburght
- 2. That was presented are somble specific observation (impa-
- 3. The maximum date to derivation washed for screening outcodes.
- 4 SSN Code Ture by to Jim the Trivial's talk ground data.
- 5. The ray cases CGAC street options for tableating is prosented. The value is based so all target hazard quasters of 3.1 for monopromogenis (denoted with a 1911 agy or are ingrenhental cancer.) The Child Nitating and persistence aware of Child (DSEPA) Region in November 2000s.
- 6. The onem number extract as a COPC fore maximum detected concentration exceeds the new cases. COPU standing everyng that ARARCBOIS).
- 7. Purette is used as a su rogate for phe wich tene.
- 9 Valve is for neveral enforcemism.
- 9. The USIGA has accrosed a new VC. for arisend of 50 up 1. The new VCL guest more fleet in 2006. The reduction in the MCL titles not moved the number health risk assessment

Assigned Samples

TWGW38E5-C4	24/37/4203/04	(WCW450S-)4 (053.375-04
7W GA 79D8 C4	2AGA4203 34 F	7.9/Ç./\=605.64	30W J75 (9-F
7WGA-39D8-C4 F	2/4/GA43/05/04	2.4 CAV46DS Q4+4	
QAGA4005 04	2 775 774 30 S GA F	24/GA479S-04	
24/07/1005/04/5	73/03/44/03/94	QWGW47DS (N/g)	
27/10/21/02 C4	27/5Y/4405-94 F	2ACM47D8-34-F	
AMOMATOS CAR	2WS/74WSS-C4	AWGM47DS-(HIP C	

 $\frac{C_{BLD}}{4R}(\frac{1}{2}m)$ and $\frac{1}{2}$. For example, the property of the state

Cili Sara rogeni

CORD & Crenical of Parental Corpers

Jiv Eximates yawa

Nik Neroard regm

NIA 4 Not Applicable

FED-MCC A Paderal Main Ham Contaminant (AVE) (USBPA) August 7000

FELDSMOUR Federal Secondary Manifester Contain Familiana (USFPA: August 2000).

PFC AL siFederal Asiron Level (USEPA: August 2000).

COLSER ASR - Commercial DEP Remodation Standard Regulations, 1996.

ETOSPINGUI Connection May nom Contaminant Level

Par male Georgi

For Selection as a COPC

ASU A Accive COPD Screening Leve (APAR) 100

Fig. C in Nation at a CCPS.

BKG - Alinir Background Levels

BSUP Below COPE Sureering Level 4R45, 18C.

Audio Especial Schools

NTA • No Toward information

gPAL # USEPA Region one does not advocate evaluation of the siteman.

NV is fitnes compounds are not available to the HHRA and the pary presented.

for of small and pulposes.

TABLE 5-5

OCCURRENCE, DISTRIBUTION AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN FOR GROUNDWATER AT SITE 2 MICRATION PATHWAYS BASEWIDE CROUNDWATER OPERABLE UNIT REMEDIAL INVESTIGATION NSB-NLCM GROTON, CONNECTIONT PAGE 1 OF 2

Scenario Timelrame: Fuluie
Modum: Groundwater
Expensire Medium: Groundwater
Expensire Point: Area & Landfilland Welfands (Sire 2)

CAS Number	Gheroical :	Minimum. Concentration	Merimum Consider	Maximum Concentration	Manimum Oualifei	Unila	Location of Maximum Concentration	Delection Flequency	Range of Nondelesis 3.	Concentration Used for Screening ⁽⁾	Background Value ^H	Seriace Water Protection Chiteria ¹	Volatilization Criteria ¹	COPC F/ag	Rai onale for Contaminant Deletion or Selection ⁽⁸⁾
Volatile Biggar ca 78-93-0	V BUTANONE ACETONE		- 2	25 -		-3-[2WG-Y09D5-04 2A-G-7/09D5-04	1185-	. <u>.</u> -		4-A	A	30000	l NO	BSC
67-64-1 75-15-0	CARRON DISCUPIDE			230		91	7WG474503-04			120	10 A	5.4	50000 5/A	NO NO	- Ç-X
100-41-4	-E-WISENZENE			23 -	ا ر ا	-23 -23	24/GW25D5-04	 ()	:	- 63		58(300	50000	NO.	+ - 351
1.88.61	TOLUENE	[64	;	t: //e-:	! [-		2AGA3905-04	 		<u> </u>	N-A	#6/09930	275%	1.50	SST.
79,01.5	TRICHLOROSTHENS				[:		3647)75.04	<u> </u>	·. ·· -	1	N/A	2340	219	40.	551
Semivolatile Organi											<u>. </u>			X	
1.	284 METHY, PHENOL		_	3.5	l	لحدا	2A GV/3905-04	<u> </u>	5 62	15	N-A	9-A	N A	NO	uTx
69-85-2	[BEHZO-DÁCIO	_i		. 23	[<u> </u>	194	2WGW)909_J4	7.15	20 25	2.3	N-W	N/A	MA,	NO	418
08-95-2	PHENO.	2.5		1 7.8	انا	[-3.5 [24/G9/JSDS 04	192	5.67	25	4.4	920000CC	_ <u>N:A</u>	, NO	RSt
Pesticides_	•														
72.54 8	4=-000	cay	· · —	0.258	ئے۔ یہ سا		2WQW47 <u>05/04</u>		<u>, 1975 - 6 6 76 .</u>	75 ²⁵ 8	Y-A	\\A	N/A	, NO	4"X
Total Metals 7479-72-5		* 5 .					n r. Orr all for a a co	T- :::	T	111.11					
7420 3 <u>6-2</u>	AUC ¹ /MAGNI ARSISNIE	227			} ·.− →	uç	27/GW47BS (4/D 27/GW47BS-04/D	1 411	27 - 17 1	292 30 4	9565 1.92	47	94 av	NO	<u> </u>
14 A 2 59 D	Bee-OM	78	— ⊹—	920		ug: Ligh	27/GW4705-04	• 3.5.0	NA.	523	227	16		60	N75
74 ± G-10-2	CALCIUM	70°0c				0g L	2WOW4F08-04	•	——42 ·	334906	188990	9 a	N-A	NO.	N13
7440-47-3	C-Ace UNIV	·	·· <u>-</u>	0.0000 0.0000	· , —	1 6 5 U	2076/74305 04	v		9	29.9	110	<u> </u>	NG	35L 6-73 (
 	i	1		-		1 "" " †	2WEWW/DS-04	 -	i	·		· · · · ·	t		
7440,45,2	COBALT	3 95		.31		-9-	249CAV42DS-C4-D	i)	: 94	1).	49.0	. NA	42	1.40	E 43
7439-59-5	IACN	159		254000	ļ .,	<u> 25</u>	287 GW 47 DS 04		12	274000	78200	N-A	N-A	0.0	41-4
74,3 <u>9-</u> 25-4	MAGNES JY	735557		1020000	l	-5-	27/6/7/ <u>/€</u> 05/04		NA NA	1929000	191000	Y-A	N A	- 22 - 25 - 25 - 25	95X
74/09/96/5	FIANGANESE	35.5		9960		<u> </u>	2A GW 47 DS-04	: <u>:</u>		5960	11709	1,.4		NE.	<u> </u>
7439.57 0	MERCURY	9.12	J		<u></u>	. 05 k	2W GW47D <u>57940</u>	• (1) -			ND	0,4	. t, c	YES	45.
7440-32-3	N CKEL	579g		·	l—	المها	277CNV38DS-04		12.4	51600	32.7 20100	HeC NA	F4. E	NO 193	BBC BKC
7440/03/5	JACAASSIDD PSODIUM	67000	,	741600 7937600		! us : !	2WGW4608.04 2WGW4608.04	_ -	- <u>}</u> 2 −	7930300	1900000	N 6	NA	NO.	<u> </u>
7410 62-2	VANADUM	7 95		1+6	i	3	2WGW 4505-64		0.71 . 7	14.0	10.2	N.A.	N 2 -	NO.	트
74.20-66-5	ZINC	 67 		}- ;;;;	├ - '	ر ۱۹۵۰. زینوس	2 // G/Y = 605-04	400	11.6e	٠ ١٠٠٠ -	12.	727	44-	5.0	B50 540
Disselved Netals	k. 5.	<u> </u>				42 E >				٠	·	<u></u>	<u> </u>		
7440-39-7	ARSENIC, FILTERED	29.3	J ⁻ '	i 355		ug U	27/6W8/Q3.04.4	210	3 (14.17)	35.5	5.92	4	N.A	YES	45.
7440-39-3	BAROUN ZILTERED	78.2	J	1676	Ι ΄	. 15 ()	7WGW47D5-64-F	<u> </u>	42	1070	227	1, W	NA.	100	I.TA
7420.70.2	CALCULA SUTERED	32000		, M/839		1.0	2//GW4605-04-F	77 × 6		NAME OF	186000	5. A	5. A	NO.	NTs
7420/47/3	CHPCNIUM FILTERED	3 - 3 - 7	J	136	ز بيا	. ng4. j	2 AM LANGUE DELP	7 10] i j =	106	49.9	<u>' 1</u> 13	N.A.	140	98: 8KG
/430-46-4	COSALT, FLTÉREC	0.99	;·· · ·	14.5		այւ	2W GW 47D5-24-5			14.5	49 €	'li-A	NA	50	850
7435-89-5	AON FUIEHED	219		260000		րագլ	2MGW47D5-04-7	4 - 6	1 167	263300	28200	N/A	N-A	- 50	м*>
7439-95-4	MAGNES UM FILTERED	5540		1060000	[ugl	ZWG:Y460S.BL.4	16.10	APA	1963980	191000	<u>?q-■</u>	H-E	NO.	<u>678</u>
74 39-95-5	VANGANESE FILTERED	228		TTT Trongs	L	, mj.1	2WGW47D5-34-3		N-A	-3130	. 11700	N/A	N-A	. 50	75.
7405 97-5	MERCURY, FICTORED	0.7	J	,		7.09.5	2WGW47DS-04-F-D	2 16	9.1	, 1	NO	0.4	N-A	YES	A51.
7440-08-7	HERRASSIUM ENLIGERED	5592	'	266610	l , ,	1 ոՇ է 1	27/GW465S.q4.5	1 10 10	NA	250000	70500		N.A.	V2	F, 1 V
7440-23-5	SOCIUM PLIERED	. : 673 <u>70 ''</u>	 _	7.744000	l- · .	ug-L	2WGW46U5-04-5	1975	N/A	7940000	19100000	- <u>} </u>	N 5	NQ	966
7440-62-2	WANADILM FUTERED	93			 ' -	95 8	2 A/C A/420 \$ -04 - F P		971-58	93	10.7	V-A	974	1.0	
Miscellaneous Para	ZINC FILTERED	135	4	19 7	ا	มรูใ	24/GW47DS 04 F-D	200)2-76	18 7	10.	123	<u> </u>	, NO.	<u>DSL BKG</u>
MISCEPAPEUUS PAPA	ALKALPHIY	1 120000 11		7420000			20/GW4605-04	10,00	NA.	7423350	1950	5 <u>15</u>		10	
	CHEMICAL OXYGEN DEMAND	4,000		2475666	}	0.61	200000460844 2000045DS-64	:-::-	: 00.000	24 (0000)	570		N-A	NO	473
L	Truck was to A to Cally the WAND	1 4700 ,		C* 22**)		Trol.	218/11/4app0/54		- <u>111 - 40</u>	24 1.1.11	210		20.00	70	

TABLE 5-8

DOCUMBENCE, DISTRIBUTION, AND SELECTION OF CHEMICAL'S OF POTENTIAL CONCERN FOR OPCUMDINATER AT SITE 7 MIGRATION PATHWAYS

BASCWDE GROUNDWATCH OPERABLE ONT REMEDIAL WVESTIGATION MSB-MLON GROTON COMMECTICUT PAGE 7 OF 2

Scenario Timeframe: Future Medium Groundwater Expasore Medium Graundwater

Exposure Point - Area A Langfill and Westands (Site 2)

CAS Yumber	Chemical	Majimam Concentration	Minimum Scalifler	Was intern Conceptration	Mag.mum Ouatifie	Units	Lecation of Maximum Concentration	Detection Frequency).		Concentration Upod for Screening th	Background Value"	Surface Water Protect on Criteria	Vo altifization Criteria ⁹	GOPE Flag	Palionale for Contaminant Colorion of Splaction by
	01/40 2/00	107999	J.	_15800000		mg v	0W 0W4508-04	**.11	N A	1680/3000	4540	N-A	46	NO.	5TX
<u></u>	HAHÇ VESS as CaCO3	110000		5000000		TYL.	2 MGW4505.04	11.11	9.8	50000050	ND	NA	9.6	3.0	'yrx
	5.JLFATE	20000		859000		Tgl	7/1/G/W4005-C4	811	20 000	939900	45 2	4 A	9.5	70	
	TOTAL EISSOLVED SOUTS	336000		25400000	i	·*9 .	2W0W48B\$-04	7	44	29400000	6260	R _{ev} ,∆	N.A	, YC	*; "x
	TOTAL ORGANIC CARBON	4000		6\$760	· -	mg.	2%G%41DS-04	.1.1.	NA	55200	37.7	N/A	N.A	NO	N*>
	TOTAL SUSPENDED SOLIUS	22030	<u>J</u> .	181000	,	mg.	27/GW4705 C4	9711	4,000	-9°500	236	N.A	N.A	NO.	N-X

A shaded kink of indicares that the concentration used for sometring excends the chiefe his background value.

A shaded channel in time intitutes that the chemical has been selected as a COPC.

FG9/7G28

- . Sample in 4 dup care are your ed as two separare swriples when determining the movimum and maximum. detected concenhabans
- 2. Maides presented une sample apecific quantifation intifs.
- J. The right-run its establishment of the used for screening purposes.
- 4 95% lapper To erange u moja. Tot ar you buckground dard
- 5 Connecticus ESE Surface Water Projection of teams.
- 6 Connecticus DEF Loranization consila
- 7. The chemical is knowned as a COPC if the maximum detected horizontation escapes the CTDER surface water protection or solativest on other al-

Associated Samples

2/VGW08DS-04	2/40/44209.04	zwiGwiasbskoa.F	00M 37S 64
24/GW 3705-04	2.4/GW4208-04-F	2.MGW46DS-04	1644378-04-6
2AGA3905-04-F	2A/GA/43D5-04	2WGW46QS-04-F	
2775774005/M	2WSA43D5.04.F	2WGW4708 C4	
2A/GW400S-04-F	2.4.GWZaDS.8a	2WGW470\$-04 D	
27/10/8417(8-04	29160,4459 (4.5	2m3m47BS-04-7	
2MGW41BS 94.5	24/GW4505-04	29/09/42BS-04-E-0	

<u>Definions</u>
ARARTBO - Approprie or Remaint and Appropriate Regulation of Ballions general

Ciri Cardinogen

COC - Chambal of Contein

Jil- Estimated Value

N = Nonceion agen

NA F Not Applicable

Paristale Occasi

Far Selector as a COPC

ASU FIAbove COPG Screening take IARAR/TBC

Aur Et mingligh av A COPIC.

BAG # William Background Levels

BSL 4 Below COPC Screening Leve, ARAP/TBC

NEX 1 No for our information

TABLE 5-8

SUMMARY OF CANCER RISKS AND HAZARD INDICES FOR SITE 2 BASEWIDE GROUNDWATER OPERABLE UNIT REMEDIAL INVESTIGATION NSB-NLON, GROTON, CONNECTICUT

Receptor	Media	Exposure	Cancer	Chemicals with	Chemicals with	Chemicals with	Hazard	Chemicals with				
		Route	Risk	Cancer Risks	Cancer Risks	Cancer Risks	Index	H > 1				
				> 10⁴	> 10 ⁻⁵ and ≤ 10 ⁻⁶	> 10 ⁻⁶ and ≤ 10 ⁻⁵	l					
REASONABLE MAXIMUM EXPOSURES												
Construction Worker	Groundwater	Derma: Contact	0.9E+00				0.00008					
CENTRAL TENDENCY EXPOSURES												
Construction Worker	Groundwater	Dermal Contact	0.0E+00		T		0.00004					

ATTACHMENT A.4

TABLES FROM YEAR 7 ANNUAL GROUNDWATER MONITORING
REPORT FOR AREA A LANDFILL

TABLE 3-2 GROUNDWATER ANALYTICAL RESULTS SUMMARY, ROUNDS 18 AND 19 YEAR 7 ANNUAL GROUNDWATER MONITORING REPORT AREA A LANDFILL, NSB-NLON, GROTON, CONNECTICUT

Ghambal at	Primary Monitoring Criterion ⁽⁵⁾	NSB-NLON Background Concentration ⁽³⁾	2LMW20S Round 16 8/25/2008/93	2LMW205 Round 19 2/13/2006	2WMW21S Round 18 8/28/2006	2WMW215 Round 19 12/14/2006	2WMW46DDS Reund 18 8/30/2006	2WMW40DS Round 19 12/13/2008
SVOCs (pg/L)		_						
BENZO(A)ANCHRACENE	0.3				0.039]u	2.04 U	[0.04]U	0.04. 0
BENZO(A)PYRENE	0.3				0.041 0	0 042 L	0.042/2	0,043 U
BENZO(B)F: UORANTHENE	C3				D 052 U	0.053[U	0.052[5	(: 054 U
RENZCIKI FLUORANTHENE	03	· · · · ·			"0 037 U	C 935 U	0.038 U	\$ 039 U
BISIZ-ETHYCHEXYCPHTHALAIE	59			i	6 4 J	: B[U	680	· 6[U
PHEMANTHRENE	0.3			[0.11 J	0.061 J	0 035 J	0.053{U
Inorganics (Total) (upiL)								
ARSENIC	'50 _	1 92			5.3 J	12.8	5 t J	18.8
RFAYEGOV.	- 4	NA			C 5 U	53,0	0.5 0.1	035
CADMIUM	0.25	VA			0 034 U	0 1710	0.034 9	0.1740
CHROM:UM	11	49.9		!	7.7	7 3	3.8 J	7.3
correr	4.8	197	ეუ (ტე1665)	Dry @ 15 501 €	6.4 J	14	.5.1	7.5
LEAC	12	5 ā 3			0.58 1	1 17 J	0.07,07	07J
ZING	55	131			13.4	60.5	12 2	61
Inorganics (Dissolved) (ug/L)					·			
ARSENIC	150	Z 55		ļ	46 J	14	6 9 J	7]
BERYCCIOM	<u> </u>	٧.		i l	0.100	5 3 ju	0.10	035
CADM:UM	D 25 ')'	5A			0.634 U	0.034 U	0.034 U	0 C34 U
SHROMICM		'ē			64J	6	29 3	7
COPPER	a 8	39.4			68.2 J	9	14.t J	. 9
LEAD	' 2	2 52			0.11 0	2 · [J	ର ହେଲି ଦୁ	52.0
ZINC	65	109	L	l	27 J	24	16.5 J	\$\$

V- INE

- 11. Sweed on Federal Amelies (Notes Coal), "Chief after expected of wound of recommon federal environment (Federal Coal) in Section (Federal Coal) in Coal after Coal and prince of the member federal coarson or so to Chipaman (FCCSE) 1997.
- (p,δ_{0}) . Described subground concentrate in the other bases as G , undescribed as the algebra (Bases) (Bases) and (p,δ_{0})
- (2) The reporting that from the laboratory extremts the primary matrixing safetyon for this analyte.
- In November 92 ed for in Basis placed complets.
- DUP 4 Precious determine
- J = Pol malegivatio
- Jigfulle inknograms per Har
- NA a Not everable.
- 1659-bit Chile havar Submer to Base New London
- SVDQs 4 Sero voluble aligano compounds
- Lin Colesias value
- Bold type denotes and yie deletion

Bhasan Kamenaga and Sangapan & Sangapan and Sangapan and Sangapan and Sangapan and Sangapan and Sangapan Sangap

TABLE 3-2 GROUNDWATER ANALYTICAL RESULTS SUMMARY, ROUNDS 18 AND 19 YEAR 7 ANNUAL GROUNDWATER MONITORING REPORT AREA A LANDFILL, NSB-NLON, GROTON, CONNECTICUT

Chemicat	Primary Monitoring Critarion ⁽²⁾	NSB-NLON Background Concentration ⁽⁴⁾	2WMW42DS Round 1875 8/29/2006	2WMW42DS (DUP) 2Bg04fd 18 28292006	ZWMW42DS Royno1973 12/12/2008	2WWW.4208.(DUP) 12012/2006	2WMW43D3; 2R000k 18*1 8124/2006	2WMW4308 60 Round-19 12/12/2006
SVOCs (µg/L)							·· —· ·	
BENZOJAJANTHRACENE	0.3	-	0.19[N	00009jC	C 008 U	0.04%	0.038 U	0.073 J
BENZO(A)PYRENE	00.		: 7 U	2 041 U	0.04 D	0.04210	0040	0.04 U
BENZO(B)FLUORANT#ENE	0.3		5 25 jU	0 051 u	0.05 U	0 053 L	0 05 U	0.05,0
BENZO(K)FLUORANTHENE	0.3		0 1B(U	5 537 L	0 036 U	0.038,U	G 736 U	0.036}U
BIS(2-ETHYLHEXYL)PHT~ALATE	59	-	7.0	65 5	150	17]	68[U	16]~
PHÉNANTRRENE	C 3		0.16,0	0.032 U	D.D56 J	0.04 J	0.030[U	0.054]J
(rorganics (Total) (ug/L)								
ARSENIC	150	' 5 2	11.6jJ	8.3 J	25 3 J	4.4]J	7,1 3	17.3
6ERYLLIUM	4	NA	วรไบ	C 5 v	230	03]0	0.6 U	0.0003 U
CACMIUV	C 25 ³¹	NA	0 034 U	0.034 5	0.17	0 C5 U	C 034 U	0.00024 U
C-ROMIUM	1'	49 3	5.9 J	8 2 J	9.5	69	7,8'J	\$.5
COPPER	48	107	30.6 J	6.3 J	B_B	5.5	17.9:J	5.2
LEAD	. 2	6.63	· 1,5 J	0.45 J	14 J J	2.6 J	1.10	0.39 J
ZING	65	13	19.1	16.9	67.5	51.5	37.3	41.7
Inorganics (Dissolved) (µg/L)								
ARSEN C	.50	255	8.5 J	0.039 0	13.7 J	[2 J	13.2 J	10
BERYLLIUV	4	NA	ر., 01	0.100	2.3[0	03 U	0.1[27	030
CADMIUM	3.25 2	НA	0.034	0.034 (7	0.034 ()	0,034 ()	0.034 u	0.034 ()
очком им	11	'6	5 3 J	1 9 J	4,3,7	<u>5</u> J	\$.4 J	6
COPPER	48	39.4	5.9]J	2 E J	5.8 J	1 1	9 J	. 8
LEAD	17	2 52	0.04 U	0.04 0	0.06 J	6100	0.09[0	9.3 J
ZINC	65	109	158 J	8 2 1	17.3 /	6 UJ	29.8	\$9

To Based unifierte de Amoleso Alvier Quelly Çolgra for grants sun al aqual of for on the ci-The control of the property of the control of the property of the control of the

(2) Turk Dissolved Sackground concentral or taken from Bachante Scoundswich Remediations (gold) Record (frous Landary 1985)

(3) The reporting limit from the whorwary exceeds the at many medicating striction. for they what the

A Such payed for A Background samples.

CUF - Floor Sup-Care Nethodo

The Sylmological color

niù e micrograms per liter

NATIONAL AND ADDRESS OF

NSB MLGN # Navai Sudmarine Base New Jordon

SVDCs • Semive are organic compounds.

or undetected value.

Bold Type genores and yre detection.

Brisided bodies denote accessibles of pursuity or secondary monitoring over on end of

sackground groundwater concentratoris.

TABLE 3-2 GROUNDWATER ANALYTICAL RESULTS SUMMARY, ROUNDS 18 AND 19 YEAR 7 ANNUAL GROUNDWATER MONITORING REPORT AREA A LANDFILL, NSB-NLON, GROTON, CONNECTICUT

	Primery	NSB-NLON	EG44MMAZ	ZWMW44D3	2WMW4605		2WMW46DS (OUP)		;:: :2UOW1D
Chemical	Monitoring	Background	Round 18 -	1 Fround 1814	· Round 18	Round 19		Round 18	Round 19
 1 (87) またい またい (84) (87) (27) (27) (27) 	.Criterion **	Concentration;31	8/24/2006	12/12/2008	78/30/2008	12/12/2006	12/12/2006	8/30/2006	12/13/2006
SVOCs (µg/L)								•	
SENZO/AIANTHRACENE	0.3		0.039(U	0.009	0.008 0	2 G4 U	0 C41 U	0.038 0	0 16 J
BENZO(A)PYRENE	C3		C (41)U	า ของคำไป	24 00 00	C 042 U	0.043[U	0.04[0	0 16JJ
BENZO/B/FLUORAN*HENÉ	V.3.		0.052]U	0.051 U	0.75]0	0.052 U	0 054 U	0.05[0	0.18]J
BEN2O(K)FLUORANTHENE	03		0 037 JU	0.507 U	0.006]u	0.038 0	0 C38 U	0 036 U	0.14
BIS/2-FTHYLHEXY. PHTHALATE	59		6.5]0	170.	67] - 7 u	[\ \ 8[U \	150	17]
PHENANTHRENE	C 3		0.032 ju	0.032]J	0.021]	0.032 U	0 C33(U	2 03 ° U	0 073 J
Inorganics (Total) (µg/L)									
ARSEN C	150	1.97	6.3 J	6.7	4.1 J	21.7	22.6	0 03a ÚJ	16
BERYLLIUM	4	N4	0.5 U	030	Q 5 U	0.3[0	0.3{u	0.5 U	030
GAOMIUM	0.25.3	hA	\$ 004 Ju	0 74 U	0 034 U	0.4 J	0:7(0)	C 034 U	. 0.34 J
CHROM LM	11	49.5	4.6 J	3.84 J	9.5 J	10.1!	10.8	0.28 Uu	2.7
COPPER	48	107	4.9 J	3.64 J	10.5 J	111 2	5 11.1 CONT.	1 1	17.6
LEAD	12	953	0.28 J	0.49 J	G 23 J	0.65 J	0.32 J	0.53 J	16.3
ZINC	65	.3.	20.6	47.7	27.7	73.6	74.5	4.95 J	90.5
inorganics (Dissolved) (µg/L)									
ARSEN C	150	2,55	1.9]J	. 5	13 1 J	12 J	26 J	1.1 J	1
BERYLLIUM	4	NA	0,71	C 3 U	2.01	0.3 U	U3 J	: \U.	60 U
CADMICM	0.25	A4	0.034]u	0.034 U	G 034 U	0.034]U	0 034 J	0.05 J	0.034 0
SHROM UM	1*	'5	1.9 J	2	7 e	9	8	0.3[0	0.0
COPER	43	39 4	2 J	2	15.2 J	11	17	0.39]J	05]
:EAD	12	2 5 2	0.55 L	5 ° U	0 C5 U	0.3 J	0.5 71	210	01.7
ZNC	65	.05	88,J	7 U	30.3 J	69	. 13	5.8 J	11

Notes

Based on Regern Ambient Maret Qualty Diversation protection of abusing life ton one. eshalinen. USSIPA 1999) and Connection Wester Qualty Chienal for protection of internal The informative on aflangarisms (CTOEP 1991)

 $\chi_{\rm F}$ (b)). O can be discovered concentration (average on Bethe de Groundeaux Periodia) Hiesigolox Report 7:NUS January 1990

2) The recording into how the Medium recipieds the primary monitoring crieflon. 2) The recording into how the Medium recipieds the primary monitoring crieflon. 3) This weakly

in the landy sed for measing our assumpces

During Fleid buck care sample.

. ■ Estimated value

Light is recognitive per ster-

54 г Могаза жаје

NSB/N, ON IN Naval Submarine Base New London.

 $SVOCs \times Spinovolution or gains a simple sindar.$

2.1 Lincolnoised value

Bold type denotes any yle delection

both type refers any processor.

Shaded both is thore immediated of printing or secondary monitoring different and/or background groundwater concentrations.

TABLE 3-2 GROUNDWATER ANALYTICAL RESULTS SUMMARY, ROUNDS 18 AND 19 YEAR 7 AMNUAL GROUNDWATER MONITORING REPORT AREA A LANDFILL, NSB-NLON, GROTON, CONNECTICUT

Chemical	Primary Monitoring Criterion (*)	NŠB-NČON Background Concentration ^{is:}	87297000	24W120 41 Round 19 12/13/2006	3MW378-28 Roand 18 8/28/2006	Round 19 12/13/2006	Rauja 16 1 8/25/2008	4MW15H Round 19 12/13/2006
SVOCs (µp/L)				•				
BENZO(A;ANTHRAČENĖ	0.3	1.	€ 039 (7	Q 94 Q	0 00a V	0.061 1	0.038[0	0.04 U
BENZO(A)PYRENE	0.3		904, N	0 C42 U	5 24 Ū	0.542	0.04 U	0.042 U
BENZO(B)FLUORANTHENE	6.3		2 052 Ü	0.053 [17	0.05 0	0 253 4	0.05(0	5 053 U
BENZO(K)FLUORANTHENE	0.3	-	0 037 U	0.036,0	6 736 U	0 238 0	0 036 ¹ U	0.038 U
BIG(2-ETHYCHEXYC:PHTHALATE	. 59		: 7 U	17,0	' 5 U	17	- 6:0	15 U
PHENANTHRENE	0.3		0 032 U	0.033[U	0.037 0	0.039]7	0.031]U	0.033 M
Inorganics (Total) (µg/L)								
ARSENIC	150	1 92	0 034 U.	13	0.034 00	0.8]	0.004]00	0 18 J
BERYLLIUM	4		<u> </u>	030	3 S U	030	250	0.3[0
CACMIUN	0.75	74	0 034 U	3.04,0	9.08, 1	0°50	0.00415	0.07 U
CHROMIUM		499	D 22 U	0.34!)	0.28 DT	0.76 J	0.25 0.5	0.28 1
COPPER	4.8	107	0.94)	1.2	<u> </u>	4.5	0.97 ₁ J	D.72 J
JEAD ZINC	; z	6 63	0 0 28 U.	0 32 J	0 P28 UJ	0 52 J	0.05 77	0.67 J
ZINC	66	131	4.52 J	10.9	2 28 3	35.21	5.1	€[0
inorganics (Dissolved) (ugit.)								
ARSEN C	150	2.55	0 69 J	1;	D 28 J	0.9 J	0.06]3	0.2 U
SERYLLIUM	Ĺ	NΛ	5 · Ju.	: 03]1	0.1500	03 U	لر [01	230
CAOMIUM	0.25).	NΑ	0.04 J	210	0.034[0	02 🗗	0.034(0	0.1 J
CPROMILM		16	9 1€ U	0.3(0	6 19 U	03/2	0 19 ¹ U	C a D
COPPER	4.8	39.4	0.93 J	0.8 J	1.3 J	2	1.3 J	0.8 J
LCAD	12	2 52	0.24 J	0.1 J	2 (B U	0.1 J	0 17 0	G U
ZINC	£5	109	4 65 U.	. 7U	3 (9 (0)	10	4 #2 U	5 U

Vo!es

- 111 Besed on Rederat Ambend states Culatry Criteria to protection of a quality of inchronic Theoretical USEPA (1995) and Connection Marky Query Other a for protection of humans.
- nearth from ponsumption of arganisms (CFCs P. 1997).
- (2) for a Chap yet categround concentration taken from Batte- be Groundwicts. Remotively, by the Report (1995), while the 1996°
- (\tilde{a}) for reporting tiest four the laboratory or coefficities a many mentioning noticing from surfaces.
- He from any size of the in packages and sumpless.
- $\mathbb{C}(\mathbb{R}^{N}\times\mathbb{R})$ is a displaced complete.
- Jie Fallmated value
- ца Сигли сгодлять регінег
- ria e bor avalada
- INSB NADNIK Nava IS Jamai ne Basenwa Covasi-
- SyDCs a Servician elorganic consecurate
- Unit disdensited value.
- Bord type denotes any jie detriction.
- Shaded boxes dende excessiones of primary or secondary monitoring chance and/or hard-on-oid societies descended.
- back around ground eiter concentrations.

ATTACHMENT A.5 RISKS BASED ON LASTEST ROUND OF GROUNDWATER SAMPLING ANALYTICAL RESULTS

TABLE 4 1 BME

VALUES USED FOR DAILY INTAKE CALCULATIONS REASONABLE MAXIMUM EXPOSURES I QUARTERLY MONITORING **CONTRACTION**

Scenario Titrehatte Husure Mezaum Groundwassn

Excosure Medium, Groundwater

Eliptaure Roule	Revesion Population	Recestor Ag e	Espand Port	Parameter Conn	Paramater Detri litte	va Je	unns	Rakonalet Roletende	нцеку Еруанов Иссе! Name
Dorma	Constitution Workers	2001	See 2	Danvert	Dectrally Advantand Cosn per Event	Calk water	mytom Ziellent	US EPA 2004	Demany Acombee Dose (mg +g day) r
ir M				5A	5+ n Scriece Average For Compact	1900	c + 2	US SPA 2004	i
i				EV	Eirent Frequency	1	8 / @ 1181 @ AV	171	240.00: • FV x 55 • <u>610 • 514</u>
)				ĒΤ	Endastre Time	4	Foors day	(1)	BW + A7
þ				ĒĽ	Exactore Procuracy	30	da, siyear	175	
∦				50	Exposure Duration	1	,cars	142	Secretaria del cultura de la Description de la Contraction de la C
l				8%	Body Weight	70	,	UIS EFA. 1989	1
ļ.			į	AT-C	Averaging Time (Cancer)	25550	days	UIS EPA 1989	1
į			<u> </u>	Al-N	Averaging Time (Nati-Darcon)	355	days	US 59A 1999	<u> </u>

Sources

1 - Professional Judgment

U.S. EPA, 1959. Rost Assessment Godance for Superfund, Vol.1. Norwan Health Evalvation Nation. Part A. EPA 510 1-56 060.

U.S. EPA, 2004. Risk Assessment Suidance for Superfund (Part F, Supplemental Guidance for Commat Risk Assessment) 5 nat IEPA (40 HOP) 2007.

Unit Intake Calculations

ingestor Intake = (IA-GW x EF x ED (IBW x AT) Decraf Intake = (SA x EV x EF x ED) (BW x AT)

Carter Ingestion Intake + NA

Cancer Denny Intake - 9,545-02

Noncarberingester Intake n NA

Norcancer Benna, Intovein 0.875 r00

TABLÉ 4 2 HME

VALUES I, SED FOR DAILY INTAKE CALCULATIONS REASONABLE MAXASUM EXPOSURES - QUARTERLY MONITORING

NSBINLON, SROTON CONNECTIOUT

Scenario Timphane Future Medium Ground auter Exposure Medium Fan

e gosan Racio	Aeceptor Papy acon	Rindapiar Age	Exposure Poin	Parameter Code		Vae	Coss	Rut enate Reference	Plane Boyatyn Made Name
Implante	Construction Workers	Acu;	5 e 2	£A.	Enemon consentation if av	Calculated	~9 m3	₩DEG 2004	make lorging days -
	[SW.	Chemical concentration in water	Astriage	ઝ્કુદ		
	<u>!</u>			C7	Cronversion Factor	9.501	mgg		<u>CANIRAGT AFFAEO</u>
	ļ l			Fì	Inhalaton Rate	25	1 75 Year	U.S. EPA (99)	BW 4AT
				Ē٣	Еврозов Тітв	4	FOLKWOA,	V\$1	
				EF.	"Exposure Frequency	36	days year	450	CA - CVV x CF + v F
				EÐ	Exponent Duration	,	years	(3)	
				; BV+	Body Weight	70	* 5	O \$ 2₽% 1999	
ŀ				AT-C	Averaging fine (Camer)	25550	ca)s	US EAN 1966	
				AT N	Averaging Type (han-Cancer)	365	cass	UIS EPA (389	
				VΓ	Voluntzal en Factor	Calculated	angimb ing bi	VDEG 2004	

Notes

U.S. EFA, 1989, Risk Assessment Guidance for Superland, to it incomprise that callon Manual PaniA. EPA 640,1,86,050.

ill. S. EFA, 1993. Superficials Standard Output Espay the Pacific for the Contral Tendency and Reasonable Maxim in Exposure

VDEQ 2004 Vegina Department of Environments. Quarry (VDEQ Institution of pill was pequivalence as a spirit normal page for the

Unit Intake Catculations

for a discontinuose in Plan 2018, EE 4 ED 4, EW 4 A T (

Capter in a ance thiake a 1 69E-Qs.

Norcarket Attaiation (Nako - 1.126-02)

^{1 -} Frofras-poal suriginient

TABLE 4 3 AME

VALUES USED FOR DAILY INTAKE CALCULATIONS REASONABLE MAXIMUM EXPOSURES - QUARTERLY MONITORING MSBIALONI GROTONI CONNECTICUT

Stenard Throfyme Folgrei Medical Croundwister

i Exposure Neclum (Groundwaler)

Erposure Houre	Rechalar Robustan	Redeptor Age	Exposure Pom	Parameter Code	Paramore Ochrica	Tra se	Unis	Barona e Selvience	make bouation. Model Name
rgester	Feb dents	Chra	5 te 2	EGW	Conmical Concentration in Groundwater	Wax or 95% DCL	7529	J 5 EPA 2002a	Orione Daly ribre (CDI) mg/kg/tay in
	l i			¢:	Conversion Factor	5.101	73146	-	
		į		3-C4	ngestion Rain of Groundwater	1.5	Uday	U.S. EPA, 1914	<u> 54 + 55 + 3454 + 55 + 50</u>
		!		Fi	Exposure Frequency	350	days/year	US EFA 1994	E-0 x A [™]
			1	501	Exposure Eurapen (Age 8 - 2)	2	years	US EAM 1989	1
				505	Exposure Duration (Age 2 - 6)		Fe Si 2	UIS EPA 1980	
				844	Body Weight	15	Ng Ng	US EPA 1991	
				AT-C	Averaging Time (Carver	25552	cars	US EP4 (989	
				AT-N	Averaging Time (Non-Sancer)	2190	days	US EPA 1959	
Dermal	Hesidon's	C-14	5ite 2	Daevero	Dermally Abscrace Dose per Even:	Callulated	ing/cm2-event	UIS IEPA, 2004	Derorati _i Absorbed Dose (mg/kg day) ≥
				SA	Skin Surface Available for Confact	6 ÷22	Lm2	JS 6P4,2004	!
				CV	Event Frequency	1	evants/csy	US EPA 2004	QARREST RESPONDE SEE
				Ę™	Esposore Time	9.25	Nounality i	UIS EPA, 1997	647 × AT
				EF	Exposure Fraguesc _y	350	days-y≠a*	US 584,1994	i
				50.	Exposure Duration (Age 0 - 2)	2	years "	UIS EPA 1989	See text for calculation of CAevent
				502	Especialist Devalor (Age 2 - 5)	4	50-10-5	U.S. EPA 1939	:
				8.0	Booy Weight	15	19	US EPA 1991	
			ı	AT-C	Averaging Time (Canyer)	25590	dego	US EPA 1983	
				4K	Averaging Time (fort-Carter)	2190	Cayo	US 684 1959	

Sources

U.S. CPA 1989 Risk Assessment Guidance for Superfund, so 11, Human Hearth System on Marca, Part A. EMA SAC 1985 SAC

1916 - GPA 1991, Risk Avsessment Guidance for Superfund - Suppremental Guidance- Standard Cetau (Electrorie Factors Interim Final

U.S. SPA 1984 U.S. SPA Region (Revioupones, August 1994)

UIS CPA 1997 Exposure Factors Handback I EPA 800/P 55 002Pb

UIS IEPA 2012 Cur ou ming disper Confidence Limits for Exposure Point Concentrations at Hashidous Glaste Sites II 09/06/9 9785 6-10. Getermber

ILIS I FFAI 2004, Rick Assessment Guitarite for Superfund tPart Si Supplemental Guitarite for Dannial Rick Assessment Final I SPA 6401R 98 005.

Unit Intake Calculations

riger (nave vigiliary was not required to the same of

Demailintake hi SA x EV x SE x 50 /18W x AT,

 Cancer registion make (Age 0 - 2) × 7.216 / 9.
 Cancer Derma, make (Age 0 - 2) × 7.216 / 9.

 Cancer registion intake (Age 2 - 6) × 6.456 / 06.
 Cancer Derma (Man 1, Age 2 - 6) × 2.416 / 9.

Noncanderinges on Intake + 9 59E-05 Noncander Dermat Intake + 4 22E+02

TABLE 4 6 AME

VALUES USED FOR DAILY INTAKE CALCULATIONS REASONABLE MAXIMUM EXPOSURES - QUARTERLY MUMITORING

KSB-MUON GROTON CONNECTIOUS

Sugger Toroname Figure Messyn Groundwater

Exposure tradium. Groundwater.

spakore Route	Secretor Population	Чесеріог Ада	Екрозыче Ром	; Parameter Code	Parameter Oefin kan	Colse	Unis	Materiale: Heferance	hilake Equation" Model Name
1985107	Residents	Aggii	Sie?	Caw	Chemical Concentration in Groups water	55% OCL of Max	::9"	US FPA 2000	Chronic Bally, prove (CDI) projeky days
				GF.	Conversion Factor	3 (3)	7-3-39		
				IRIGW	Ingestion Hare of Groundwater	2	Lidar	UIS EPA 1994	CW + CF + R-GW + EF + ED
	!			ָ ני	Биразије Гладыелсу	350	days/year	U.S. EPA 1994	B N + A [™]
				FD1	Esposare Duraico (Agenta - 15)	10	95.615	U.S. EPA, 1989	
	l i			EC:	Exposure Daration (Age 15 - 30)	12	years	U.S. FPA, 1990	
	!			844	Body Weight	10	·9	⇒ S. FPA, 1989	
		.		AT-G	Averaging Time (Cancer)	25.550	z ₁ st	U.S. EPA 1989	
	ļ <u> </u>			AT N	Averaging Time (Non-Cancer)	3 650	Cays	UIS EPA 1989	
Dennal	First decision	Anui	51#2	Daevect	Cermally Absorbed Dose per Event	Calculated	mq % m2 revent	UIS EPA 2004	Chimally Accorded Dose (mg kg day)
				54	Skin Sufface Available for Contact	18 000	607	U.S. EPA 2004	
		.		EV	Everl Frequency	'	everis da,	U.S. EPA 2004	DA <u>evert # 50 # 6</u> 7 # <u>6</u> 0 # \$4
				ET	Englishing Type	0.25	nouts day	UIS EPA 2004	B n + A [™]
				Ę*	Expande Frequency	353	days year	U.S. EPA 1991	
				יםפ	Exposure Buration, (Age 10, 15)	19	,62%	U.S. EPA 1989	Sepiled for cell, various til 04even
				EDZ	Excasure Duration (fige 15 - 73)	-1	,es-s	U.S. EPA 1589	
				Bev	Body Weight	7.0	+a	J S EPA 1989	
		•		AT-C	Averaging Time (Career)	25 550	dept	UIS EPA, 1989	
				aT-N	Averaging Time (Non-Carryon)	3,650	3000	JIS EPA, 1939	ļ

Sources

- U.S. EPA 1995 Riya Assessment Guidalk eilor Superfund, von Hilderum Halart Europaion Marcus, Pari A. EPA 540/1/89 060
- LLS GPA 1591. Bisk Assessment Guidance for Supaduno Supplemental Quidance: Standard Default Exposure Factory, mentri Final
- U.S. EPA 1994 G.S. EPA Region I Risk Updates, August 1994.
- U.S. EPA 1597. Expressive Factors handbook, U.S. EPA 60019-95-002FA.
- U.S. ERA, 2002. Calculating upper Confedence Cines for Exposure Point Concerniations in Mazarecous Waster Sites in OSWEM 5285-5-10.
- U.S. EFA 7004 Risk Assessment Guidance for Sucerdard (Part E. Supplemental Culosance for Dermat Risk Assessment Final EPA 545-4-99 000

Unit Intake Caiçii alipna

ingestion make it (IR/GW + EF + ED, (BW x AT)).
Companies as A x EV x EV x EO + BW x AT).

Cancer dynation make Age 10 - 16(= 3.918-06) Concer Derma (make Age 10 - 16) = 3.028-01 Cancer operation hashe Age 10 - 30(= 5.498-05) Concer Dermat make (Age 15 - 30) = 4.938-03

Noncareeringoskon triake + 6,588-65 Noncareer Cermail Have + 5,928-62

TABLE 4.5 INTERMEDIATE VARIABLES FOR CALCULATING DA(EVENT) SITE 2 - QUARTERLY MONITORING NSB-NLON, GROTON, CONNECTICUT

Chemical of	Media	Dermal Absorption	FA	/ K	p	T(es	/ent}	T.	30		· -	В
Potential Concern		Fraction (soll)	Value	Value	Units	Value	Units	Value	Units	Value	Units	Value
Votatile Organic Compound	9											
Trichtgraeinene	Groundwater	NA .		1 28 02	ുന്ന/ന	(1)	!if	5.8E-01	hr	14E+00	hr	5 18-02
Semivolatile Organic Compo	ounds											
Benzo(a)arthracene ⁽¹⁾	Groundwater	NA	NA	ŊA	NA	NA	NA	NA	NA	NA	NA	NA
Benzo(b)Tugranthene''	Groundwate:	NA NA	NA	NA.	NA	NA	NA	NA	NA	NA.	NA	NA
Benzo(kiffuoranthene 2)	Groundwater	NA NA	NA	NA	NA .	NA.	NA NA	NA.	NA	NA NA	V.A	NA
Benzo(a)pyrene ⁽²⁾	Groundwaler	NA NA	NA	NA NA	NA	NA	NA	ÑΑ	NA	NA.	NA	NA
Phenanthrene''	Groundwatek	NA NA	NA	NA NA	NA	NA	NA.	N/A	NA	NA.	NA	NA.
Inorganics												
Arsenia	Groundwater	NA I	1	1.0E-03	Cm/br	(*)	hr hr	NA	NA	NA.	NA.	NA
Cadmium	Groundwater	NA,	1	1 0E-C3	೯-೧/೧೯	(1)	nr.	NA.	NA	NA .	NΑ	NA.
Chrom:um	Groundwater	NA NA	•	2.0E-03	gm/hr	(1)	hr					:
Copper	Groundwater	NA NA	1	106-03	cm/hr	(*)	ħr.	NA.	NA NA	NA !	NA	NA
Ziic	Groundwater	1 VA		6 0E -Q4	em/hr	(1)	ja e	NA	NA.	NA.	NA	i NA

Notes

All values from EPA's Risk Assessment Guidance for Superfund Volume 1: Human Health Svaluation Manual (Part E. Supplemental Guidance for Dermal Risk Assessment) Final, July 2004

- t $T_{\rm spec}$ is 4 hours for the construction worker and 0.25 hours for the child and adult resident.
- 2 RAGS Part E recommends that desiral exposures to PAHs in water should not be quantitatively evaluated in the risk assessment

FA = Fraction Absorbed Water

Kp = Dermal Permeability Coefficient of Compound in Water

Tjevent) = Event Ouration

Yac = Lag I me

T" = Time to Reach Steady-State

B=0 mensionless Ratio of the Permeati Ity Coefficient of a Compound Through the Straium Corneum Relative to its Permeability Coefficient Across the Viable Epidermis

NA = No; applicable

TABLE 5,1 NON-CANCER TOXICITY DATA -- ORAUDERMAL SITE 2 - PHASE II RI RE-EVALUATION NSB-NLON, GROTON, CONNECTICUT

Chomical of Potential	Chronic/ Subchronic		RID	Oral Absorption Efficiency		Difor Dermal ^{rr}	Primary Target	Combined Uncoreanty/Modifying	RIO:Targ	et Organ(s)
Concern		Value	Units	for Dermai "	Value	Druts	Drgen(s)	Factors	Source(s)	Date(s)
Semivolative Organic Compo	unats									
5ist2-effytherytij #chatate	Chronic	2.0E-02	т-д-к-дгодау	<u> </u>	2 OE-02	ing kg Jay	(live)	1000 1	₹5	4723/2023
.កុម្ភារ ខ្លួនការ ខ្ល	•					•		•		
Actingey.	Chrone	4 GE-04	mg+g/day	Q 15	E 02-05	ing vyday	B ped	1000-1	₹5	4/23/2008
A-serii:	Chronic	3 0=-04	та-кстоау	· 1	3.00-64	ing kgidar	SKYL CV5	3/1	:815	4:23 2009
Sanon	Chian :	2 CE-Q1	mg/kgrday	. 307	1 4E-02	m.p.•g/day	Kidney	30011	₹15	4 22:2008
Secyllum	Chronic	2 0E-00	ma warday	0.067	14≦-05	rii; ig day	GS	300%	52	4/23/2008
30.01	Chronic	265-01	mg.kgrday	1	2 0F-01	nig kşidav	Developmental	66'7	RIS	4/23-2068
Castrolm	Chranic	5.2E.04	int; +ctdaγ	0.05	2.56,-05	mg •g day	X¢rey	302	3.5	4.23 2008
Manganese	Chronic C	2.4E-02	mg-≥g'day	0.04	9.68-04	mg kgypay l	, CNS	1/3	:815	4.23 2008
Nekm	Chronis	7 CE-02	migikgida,	604	\$ CE.04	тркуюм	9pay Areigns	3000	. RIŞ	4/23/2008
The lam'	Chronis_	7 05-05	miş kşiday		7.05-05	mg korday	U 907	3005	JSEPA n	10111 2007
Varatium	Chapter.	1 05 03	This kip day	2 326	2 65,05	mg ng day	Kiongy	300	JSF PA I	10,11,7007

Notes

- 1. J.S. EPA, 2004, R.M. Assessment G., dance for Superfund (Part El Suppremental Guidance for Dormal Risk Assessment Interior, EPA,540-Ry98 005.
- 2 Adjusted corma, RfG = Ora-NfO a Oral Apsorption Efficiency for Derma-
- 3 Weight adjustment of the PLS value

Definoons

CNS a Central Nervous System.

CVS = Cardiavascular system

USEPA I = U.S. EPA Region 3 RBC Table Obligger 11, 2007.

GS - Gastrointestinal system

IFIS 5 megrated Risk ofermation System.

NA - Not Applicable

TABLE 5.2 NON-CANCER TOXICITY DATA -- INHALATION SITE 2 - PHASE II RI RE-EVALUATION NSB-NLON, GROTON, CONNECTICUT

Chemical of Potential	Chronici Subchronic	Inhalat	lon RÍC	Extrapol	ated RID ^{:11}	Primary Target	Combined Uncertainty/Modilying	RIC : Targ	ot Organ(s)
Concern		Value	Units	Value	Unil s	Organ(s)	Factors	Source(s)	Date(s) (MM/DD/YYYY)
Volatile Organic Compounds				•					
Trichlorgethene	Chronid	3.50 07	ოვოი3	1 0E-02	(mg/kg/day)	Liver, CNS	NA NA	USEPA(1)	8/2001
Spmivolatile Organic Compounds									
Benzola anthrucene	NA NA	AW	NA	NA	NA NA	NA.	NA.	NA	NA NA
Benzoja)pyrene	NA	NA.	NA .	NA	NA NA	NA	NA.	NA	NA.
Benzolt)Pugranth ene	NA	NA.	NA	NA	NA .	NA .	NA.	NA	NA
Benze(k)flueranihene	NA.	NA	NA	NA.	NA	AA	NA	NA	N/A
Phenanthrene	NA NA	NA	NA	NA.	NA	NA	NA.	NA	NA
Inorganies							<u>.</u>		
Arsenio	NA	NA.	NA) NA	NA	NA.	N-A	NA	NA
9anum	Chronid	5.0E-04	mg/m3	1.4E+04	(mg/kg/day)	Felolosicity	1000	HEAST	7/97
Cadmium	Chronis	2 0E-94		5 8E-05	(mg/kg/day)	Kidney	NA NA	USEPA III	10/11/2007
Chromon	Chrenic	1,0E-04	r:g·π′	2 95 - 05	(mg kq'đay)	Lungs	30011	.RIS	4/23/2005
Capper	, NA	NA	NA .	NA	NA NA	NA	NA	NA	ŊA
Zinc	NA .	NA	NA	NA.	NA	NA.	АИ	NA	NA.

Notes

1 - Extrapolated RID = RIC 120m³/day / 70 Ag

Definitions

CNS = Central Nervous System

USEPA III = U.S. EPA Region 3 RBC Table, Gateber 11, 2007.

GS = Gastrointestinal

HEAST= Health Effects Assessment Summary Tables

'RIS = Integraled Risk information System

NA = Not Applicable

TABLE 6.1 CANCER TOXICITY DATA -- ORAL/DERMAL SITE 2 - PHASE II RI RE-EVALUATION NSB-NLON, GROTON, CONNECTICUT

Chemical of Potential	Value Units for compounds	Oral Absorption Efficiency		cer Slope Factor ermal ^{ièr}	Weight of Evidence/ Cancer Guideline	Ora	II CSF	
Concorn	Value	Units	for Dermal ^{III}	Value	Units	Description	Source(s)	Date(s) (MM/DD/YYYY)
Semivolatile Organic Compo-	បុរាជន្							
Bis (2-ethy hexyl)phthalate	1.4E-02	(mg/kg/day)	1 1	1 48-02	(mg/kg/day) ¹	82	1818	4/23/2008
Inorganics								
Ar) mary	NA	NA	NA NA	NA	NA	NA I	NA	NA.
Arsenia	1 55+00	(mg/kg/day)	1	1.5E+00	(mg/kg/day)		!વાર્ડ	4-23/2008
Banum	NA	NA.	NA.	NA	NA	D	ારાડ	4/23/2008
Beyllum	NA NA	NA NA	NA	NA.	NA T	81	'R!S	4/23/2008
Вогоп	NA NA	NA.	NA NA	NA	NΛ	AV	NA	NA
Cadmum	NA NA	NA	NA T	NA	NA	B1	:રાડ	4/23/2008
Manganese	NΛ	NA	NA.	NA	NA NA	D	IRIS	4/23/2008
V.ckel	٧A	NA NA	NA NA	NA	NA.	NA NA	NA.	NA.
້າສໄທກາ	NΑ	NA	NA NA	NA	NA.	NA.	NA	NA.
Varadium	NA.	NA	NA I	NA	NA NA	NA NA	NA	NA.

Notes:

- 1 U.S. EPA, 2004; Risk Assessment Guidance for Superfund (Part E. Supplemental Guidance for Dermai Risk Assessment) Interim. EPA/540:Ri99/005.
- Adjusted cancer slope factor for dermal = Oral concer slope factor / Oral Absorption Efficiency for Dermal.

IRiS = Integrated Risk Information System. NA = Not Available.

EPA Group

- Al-Human carcinogen
- 81 Probable human carbinogen indicates that limited human data are available.
- 82 Probable human coronagen indicates sufficient evidence in an mals and inacequate or no evidence in humans.
- Ci- Possible human cardinogen
- O Not classifiable as a human card nogen
- El-Evidence of noncarcinogenicity.

TABLE 6.2 CANCER TOXICITY DATA -- INHALATION SITE 2 - PHASE II RI RE-EVALUATION NSB-NLON, GROTON, CONNECTICUT

Chemical of Potential	Unit	Risk		on Cancer Factor ⁽¹⁾	Weight of Evidence' Cancer Guideline	Unit Risk : I	nhalation CSF	
Concern	Value	Units	Value	Units	Description	Source(s)	Date(s) (MM/DD/YYYY)	
Volatile Organic Compound:	5					····		
Trichloraethene	1 1E-04	(ug/m3)-1	4 05-01	(mg/kg/day)-1	с с	USEPA(1)	8/2001	
Semivolatilo Organic Compo	ounds	_						
Benzo(a)anthracene	NA.	NA .	NA.	NA NA	NA	NA.	NA NA	
Benzo(a)byrene	8.9E-04	(ug/m³) ¹	3.1E+00	(mg/kg/day) ¹¹	NA.	USEPA III	10/11/2007	
Benzo(b)flußranthena	NA	NA.	NA NA	. NA	NA	NA.	NA.	
Benzo/killupranthene	NA	NA.	NA	NA NA	NA,	NA.	NA	
Phonomitriene	AV	NA	NA	NA.	NA	ŊĄ	NA.	
Inorganics	· ·							
Arşenic	4 3E 93	(ugʻm³) [*]	+5€+01	(mg'kg/day)	A	iң:S	4/23/2008	
Banum .	NA	ŅΑ	NA.	NA .	С	!R.S	4/23/2008	
Çadmum	1 8E-03	(ug/m²)°	6.35+00	(mg/kg/day)	e i	'R'S	4/23/2008	
Chronium	1 2E-C2	(ug/m ³) ²	4 ZE+0*	(mg/kg/day)	Α	R:5	4/23/2008	
Copper	NA.	NA .	NA	NA NA	D	IRIS	4:23:2008	
Zirc	NA.	NA NA	NA.	NA .	D	RIS	4/23/2008	

Notes:

1 - Inhalation CSF = Unit Risk * 70 kg / 20m³/day.

Definitions

(RIS = Integrated Risk Information System)

NA = Not Averable

USEPA III = U.S. EPA Region 3 RSC Table, Oblober 11, 2007.

EPA Group

All-Ruman cardinogen.

B1 - Probable human cardinogen - indicates that I mited human data are available.

82 . Probable human caternagen - indicates sufficient evidence in an mals and inadequate or no evidence in humans .

Ci- Possible human parcinogen.

Di- Not classifiable as a human parenogen.

El- Evidence of noncard nogenicity

USEPA(1) = Oraft Trichloroethylene Health Risk Assessment, Synthesis and Characterization, August 2001

SMRT(3)64"

CALCURATION OF CHOMAN, CAMBER PISAS AND NON-CARCER MAZARDS ALANDMAN, EMIKAMUM I OMOSYMES I OLIAMIE 71 A MOGNICH NO MSE NUON CROTON COMMESTICUT

Scenaro Timahana Pulina Nasacion Aspublion (Conth., For Wistons Nasacion Reg., Artis

Mark (com	Excitive Venium III	Exchange Food	Expansis 90/14	Enemica or	- E	<u>*</u>	l	Ça-	cer Pres Carry a	. 200			Non-Car	ger hebbig (Sec. We'll	
	, i		:	Perenta Concern	7.50.0	.7~g	Ігіда віј врем.	ie Sonceniranos	CSF -	, ca Pipe	Carco Ros	*##K\$400%	re Conçan Islando	. 71	o alc	Hazard Spotter
	_[_	<u>:</u>	<u> </u>	_[1950	35.09	-444	VE41		Varia	Jreis	Value	21-15	1
J-1.6	STATE OF THE STATE	2.43	Darma:	THE PROPERTY OF	1.29	141	2.7: 09	ing cylin.	4(0,01	img Ng/days	108.69	2.35.67	:-y>pday.	3 3E (4	-mg/kg 02,1	7,0908
				Bertotetti hasima	2.60	vi.	0.05400	imaka oto.	5.15.05	Amplityrough	٠ .	\$ 7E -5\$	(marage)	444	inglass.	
				Bendo(signere	:160	1197-	2,05+00	Img/great	135100	,-shedani		0.00 460	(mg kg ak);	Me	imphydej:	
			!	Benjo; of working re-	0.180	181	0.05490	mag kgydd c	7.26,00	reging days		005-00	:mg kçalivi	No.	ሟላር መተ፣	
	[biensojejškovenihene	0.145	-91	a.36.400	img tg (4)	1.76.02	mg kiprawa "		0.04 400	(mg hg any)	Ma	mg 1934an	
	'			Prengnissere	0.073	eg t	D-M-100	ing span	8.0	imp kydayt		0.08-00	; ***¥1>6491	0.76,02		
	١ ,			Jineryc	25.)	115 4	166.00	17724 (174)	1.554.33	Amplipment	840.99	297.77	1-9-30-6	3.0 (34)	mg/agray	5.35
	i !		I	Ladmon	j (1400	-52	4.95/11	7,13740	194	integrables		504.59	my by termina	256.43	- 2 kg 14r.	27/007
			1	Contract	950	-93	4 (€ 69	7,1200	1,4	10% (5.3%) 1		7.98.08	implegries:	7,55,75	11319 241.	(964
	'		;	Logper .	20.0	بالإد	6,48,04	smale cart	94	imple section		45: 61	1mg *g c+1.	4 (1) 72	100 kg 2441	5 (385)
			<u> </u>	i in	90.5	- 44	10.00	mg kgrae _i s	44	Three a day?		8,48,01	on progression	108.01	.m., 3g 58, .	1,00003
			्रिक् दिस्ता क्रिक्ट)			Ĺ				ब गहारक					. :::as
	L	Francis Port Ford									3.16 (%)					2,396
	Trough ver Degram Topa										416.79					0.006
	T	507.2	Inhabion	inch prosidents	321.5	··· +; -1	34645	.T5 kg 14r	406.01	17-57-510	2 24 2W	28: 25	ing Egite.	10: 02	mg/mg day.	5,75054
	' i		!	Benesiala "Porte interior	0.18-6	(-;-)	0.05400	-, kgroes:	44	109 × 10 × 1		3.0€-10	may no dest	*.4	myng 14.	
				Sections care	3.08 (3)	^-; ¬1	0.05 (0.0	TO ME CARE	3 18-30	.maks say:		2.54.400		44	imphyder	
				Bennab/waren Pere	j vireis	74,713	0.94 -90	-mq -sreet:	74∸	my highlay		958-09	may agalege	74	F-237540	i
				Beichtlie erweiten beide	0.0840		0.76170	10.5 (6.5)	744	75.45.746		2005-00	1775 FC 0277	N4	10.2425911	
	!			Page 10 control of the control of th	7,9176	~~m3	3.26 70	0319.441	Ar	my hymiger		7 JE C*	47.64211	Me	(-21604)	
			:	Ann c	265-6	-y3	0.09-50	1427 E-1444	7.50(0)	m; +12+/i		0.00-00	~ 0.553400	ME	ma1904.1	
	·			7#7 7# .00	0 (E40	1197 773	0.05400	on; *9.2*;	E 25-30	imphy cap. 1		1.06440	1-2+904/1	5.75.05	might car.	
				un tomour	2.00000	mg m3	0.06.00	1073150411	44	my kg cay.		20:10	PG 1000;	7.9 (*)	ing by days	
	1			Cupper	2 A 40	-g.m3	301-10	mang dass	40	Thy Pop Caryl 1		308-00	ing syllage	NA	~41¢ 02;;	
			1	<u> </u> 2= .	365-6	-g103	205+70	j rejesta	7/1	PART SALES	<u> </u>	4,06-35	, mgaysayi	No.	1 Tright 1877	
	; (Eld Rove for	Ĭ			L				224 M					0.00004
		Піредону Рэкі Голг									126.67		·			0.00004
	j Bypour # Medium Pora										2 28 (9					5.9004
Order Ind											96,35,4					0.5%
											1.25 %		"2.0141 Pere			

TABLE TO HAVE DAY DOLAR CHICK OF ANY ORAL CANCER RISKS AND NON CANCER MAZARON FEBSONABLE WAS MUDIESAROS, RESIDENAR CHICK NO WITCH NO 1971 NOW CHICK OF BUILDING CORE CORE.

Scenario Tinatarne Foliare Massagri Pagolaine - Religieris Jeografia Agai - Chila

Mac .T	Setund a Medicina	E1004*# 574	Exposure Royle	Chemitalist	ļ =	<u>.</u>	ļ.		ger Pink Carry a			 		<u>r Seri Filipa di</u> Çu		
		1		Parental Content	(Value	On a	- alter discovere	r Carero mor	758 3	IA: A se	Correct Back	омин Версы.	e Contentia (n	41	1810	MAZA TOUR
	- 6 21 144	<u> </u>		<u> </u>			200.0	(8:3	1,000	-0049		Value	UP 19	141.4		
2 3 3 6 7	Drowledge Breit	2-11-7	1488'47	Inchese there	10.00	ug i	: J6 J8	mq - g cayl	4 /E 01	rigitog day:	1.56.24	98: (5	many left	200,84	imphydes:	2.0
	i			Bergoralan Mademe	6.140	02 L	105.08	mg ng đểy l	7.39.01	molegicary	7.11.76	198.00	10 2 10 2 2 473	**	-mingon;	
	i	!		Henry and reserve	0 .50	- 91	7.5t Cb	770,457,7461	7.85 (00)	manage again	5.18-05	1 19875	mg hg day	54	TG NG CA,	
		!		Beach Shopper Feet	9.150	Oğ L	7.95.66	-gagday:	7 35 91	mangrass.	SIJE (G	1.45.04	10,39047	*.5	inging text	
		ī	1	Hango I gajo-anin ena	1 0.140	vs4	4.17-26	***Q \$ 2.74%	7 30-40	(mg kg day)	4.58.72	108.00	mg/kg tAy	-,4	make car	
		•		étrangent san a	0.7/7	ugl	£ 05 01	(mg h p dan	N.E.	-4-1-204		F 01 -06	Shurday	25: 22	rights deet	1 :07
		l		418 gr. a.;	25 100	va t	7 % M	ing ag payl	118100	impagga, i	1:5%	1410	100, 49,047	0.0000	100232041	j
				Section 1	3 455	ug t	1.46.06	/mg bg cays	- W.	mgagday.		14065	ing egicar:	5 01 404	-mg =g ce1	009
	!	Į.		OF OFFICE	9.950	vi.	7 56 05	1		75 16 241: 1		1 1 E 24	4, 49 (4)	157.0	n-, 20, 18, 1	3)
		1		Copper	10 400	wi -	2.54.04	(75,49,74)	1 44	-5 45 : 15.		372.07	mg kgymay.	4 GE (2	mg kg days	
				20%	#3533	4.	148 14	1000 1000		I ' . i		95.54	-; >; 20.	301.51	-142549	
	İ		Dia Roya Sara	<u> </u>	1772.					l management	198,00	 	1.4	241421	2.5.19.	, , , , , , , , , , , , , , , , , , ,
		i	Der-at			uş:	1-55 m	omges dage	4.8.25		4.5, 07	578.04		V/5 (m	grig ig asyr	1
			j	Billion a and receive	1160		0.06-00	•	7.96.01	· implement		200,000	,mg 15 4411	N4.	1	
					1 167	.g.c	0.001.00	11-y 15-20-11		11 g 45 941			'g'\şdayı		110 (0.4)	Ι.
				Renz: 4 oyeere		-9 k		w2 + 3 cs + +	- 105-70 	m (2.14) (34)		1.00+00	(mag Nig day)		and igner.	
				Benzo bilowanii ere	1 '01	. 46	F 25 (5)	174 - 3 Cali:	3: -2:	, mg 15 dan		100-30	img (pida))	**	ment & carry	"
				Brecok How at 7419	2.542	j 🐠	0.06439	med ad entit	108.00	35.70		708-00	and of this			! .
						-9.	0.000	10246311:	114	-05 49 EB (1		9.05-00	· ing ry car:	3.28.12	-3 -3 34.0	: "
			:	A-1806	. 5/202	-4-	7,62,68	102 98 0911	1 52 120	med whiters.	: 6-	0.18, 20	indicati.	2.76.73	i matedore	1 73
				Tabric -	1427	- 177	1.25.05	man program.		W. 20 CA		4.727.29	argeges.	7.50 75	in gray day)	270
		i		Spatial	75W.	v4 -	1,16,98	- 1 pg care	\ '	whyday.		\$ 55.00	Tig tig cap.	7.53.73	-mangazy	50
				Copper	30,800	V. 1	9 16 78	ny wy day.	7.6	P (P (24)		10.00	19,702,5443	40000	11,762,2447	/:::
	-			// ret	-0.800	νς.	1.86.21	Total cal.		my kg days	<u> </u>	575.76	marky says	2 (5.7)	mana say.	: (07
			Sec Route Total								1.16.07					()
		Entitle and sort foret					<u> </u>				7.4164					<u> </u>
	Ligardie Web en Falle					~					19: 5					
	1.	5.47	19900	"ALPs.rugVerie	(59)	98.	44,06	# 1 % 3 C # pr	1 74 Or	Albedger!	3)8 %	9 68 09	10) hg 147	3 de 04	70,700 Car. 1	7
		<u> </u>		Rengolalar bilagene	2 162	Lat	3.96 - 65	mg 1 g cap.	7 35 -00	mg/kg day.	· ·	0.054.00	mg/kg day.		Make car.	
	1			Brown a circle	2.146	121	208-90	14276 246	7.75-07	.mg wgrant	· ·	0.08-60	1940/1491	~,≜	-right 1441	
	:	l		Sengab/Loran bene	2 129	14.6	5 02-95	- 7 kg cay.	7.20-11	ingles cap.		000,000	-property	- 44	92;:4,	'
		}		Bernard & Contract Carrier	0,40	W. C	2.05430	**9*27**	7.78.02	(mg kgroup, "		2 CE+C0	T4 12 T451	1 44	7592 Ter	
		1	:	Parantere	0.077	Ug/L	00-300	115 A 2 5 8 5 1	F14	(my kightay)		0.000,000	mg eg dage	Berser	.make say	
				≜Mark.	25,350	19.	0.09400	mg + 2 cave	1,52,95	mg kg days		CE-D	70,49,544	108.74	75.664.	1
		i		Cagnum	5.400	151	368-80	manaday.	\ L	-529 2+n		2,0 (5)	my her day	5 91 -04	-phg der	:
	•			Charter	9559	1/2/	1058-00	703-9-34-3	h.	mg tigroups		1.25-56	7949746	30870	* \$42 Tex	
		ļ		Doppe	10,500	451	501-6	-gbg cas.	NE.	ingle see		201700	(mg kg day)	4.08/02	.753 : 147	
		1	,	Zare .	00,509	02.5	206-22	1-15-21-1	N.E.	-0219 Sec.		102.00	(746.65469)	305.0	2542.06	
		ļ	Exp. Robe Total	_		· · ·					1.5	1				^;
		Ext. His Post for	1.0 //	·							. 1: -	├──				7
	Nagracie Medica Torie	20 20 10 10	-								225.3	 				}
																,
Virginia fora						_					2 27 .4	?				1

Note: Introduction exposures are assumed to be equal to the espectives from ingestion of groundwater.

TABLE 7.3 RAS CALCUI AND UP CHEMICAL CANCILIFIE SALIKID NOW JANGER HAZAROS

REACONARIO MARMON ERPOSORES I QUARTERA NOMICA NO MADINION GRACCON CONNICTI CON

Stellun, "methame Filore Receptor Proute on Hascourt Receptor Age Hous

Upc.Jm	Enclose Wealth	: 4.05.26 7.44	Facetare Poc≇ I	Chemical //	:-	<u>.</u>			an Augustus					<u> </u>	aliciations	. —
	'	!	I	Power a Concern	7804	ياسو		e Concernation		na Orga Linna	Грг;яг⊃уы		re Concentration	⊢	06/2	11#A#A 047
	g . Geografikansi	5/47	en. (1.1.1	Property of Panel	1020		7.65.76	ye is i⇔g aş dak	4 75 (1		1.614	561-01	.T6/12/29/1	945 F	-mg kg dayi	
	3-12 11112 11		241.5	бал (станаленталента	1 : 160	1 464	754.06	unging day,	7.9 (4)	Traine See	1.91.18	-E 25	27 y 19 cm.	94	mg highester	`.*
		ļ		Parago Archarta	i 2:0	l	2 5 5 0 6	17.15.500	7.854.2	I —g kg day)	- 42.15	1.60	730444		Linguis Sant	
	•]		Sengah Yayorar, hene	2 127	v2.	2 0 8 - 30		711.7	-912/249)	25.0	,	1.000,000	×4	mg Ng days	Ι "
	1	1	ı	Bonggo Mooren hene	2143	ing.	2.5%	in a region	122.0		161.57	6.2E Ge	-99,500	د. مرد	1-222011	
				Drighty lagrage specific	1 (37)	_	17E31	1591939) 1591939	22.07	requireday.		4,81 %		5 C E 92		Ι.
	i			l .	71,300	-2/- -21	106.74	ing ag day.	138-30	2.00	77874	78 23	741,941	7 36 34	imgraphii imgraphay:	
			;	Angeles Sacres m	1426	Ι ΄	317.00		1,4-20	and the Class	7 6 14	7 65 75	mg +g 79,:	l	1 '	20
	1		i	•	1 1520	-÷L	148.65	marker tags	ı	[165 kg 52 kg]		, .	and and and	100.04	I may agree.	1
				Charles		10g k	1	Art and Child	2,4	Wights care.		N 15 34	military man	No. 32	mig NG Capt	:-
	1	I		Crocer	57.679	we's	248.04	1737961,	44	~11: 50p.		2 /L 71	(7) (0)	4.36.50	mg tic aqui	
			<u> </u>]	\$2.500 		7 15 434	Jones 15, 2851	- 14	molegisar "	*5- 1:	1 ectsu	AND A SERVICE	321 01	9 % (0 0 4 4)	<u> </u>
	· i	I	Dennal	<u> </u>	1,656	–	105.06		10.00		476 CF	7.25.76		1.00 (4		1 6
	Ì		CHANNE	Then growther the		انت		aging days	118.00	imp ka sa ji	2-6-0		mig tig dann		1112,49,041	
	-	i		Patrico/page (February) In	0.46	481	305160	mg agrasi)	9 20	103,45,644	l) 98 ×20 9 65-60	17-9-10-01/2	N4		
				Hangy, a gare	-	-	100,000	راجو قراد	,	- 1 PC 0311		· ·	make and	N4	mg Ng dav;	
				Bengo, between where	3.782	4.	0.000 (4.3)	, H ₂ No. 24.	1/2.54	and highli		0.08463	inna ka deyî. Li waxa xwa	q.	10 Mg 20g.	1 '
			1	Personalis andera	2.45	-31	702107	70.49741	100.00	Walangers,	i	6.01.100	ALCONOMY.	74	mg kg say.	
			:	P7 engr. repre	36.3	-31	0.58-93	P. 187 (4)	1/4	Ud juli deli		00142	(5) (4) (40)	215 V	70,000,746	! .:
				-	25.385	447	431 61	my ke day.	1.13.100	-343640	# NI 07	1 15 36	me-egicar.	166.74	-2,6:76	. 62
				Carre on	14C	4.	4 55 C)	774 × 3 GHz		Ting car.		5 91 74	20 9 2 4 2 4 L	7.50.35	7000	
	Į.		1	Charter	8.567		# 75 G1	mg signatur.	14.4	-995,039		2 nE-CA	7010740)	138.74	,741g ra	2.5
				Checal -); y; *:5	ا مح	1	mg ngréal)	; 44	" "we jil sam,		4.76.05	. judybern	4.75,72	mg hg day.	1 17
			·] 2*- -	45,860	J., 184	11879		I <u>~*</u>	Legislate.		<u> </u>	1 20,4 cent	3 06 61	The Arthur	2.39
			Ero Part Ser	!			 		_		10.00					
	i. arana	Capacita Paris Fala					ļ				3,816	·				`
	Freezona Medico Totali.		1.50.00	li	Linote	- :-	765%		4 (5-9)		1 1 1 1	N 60 25	1	100.54	i	; ;
	ļ	59.2	**********	There programmes	1		(16-00	imphy thy:	738.35	(mp eg car)		00(10)	l i mga gidayi. Li masansa	1/4	mg kg (a)	
	-		:	Stray/elemination	2.150	, .a.	7.00400	img ag rilly.		−¢ kg de₁.		6.75-92	79 kg 24 ₀		F C N 2 /44	
			i	Benja sopere		1 4			1 35,400 1 18 80	management	i	P 75-92	ing again.	34	mg kg da,	1
		l L		Bergo reformane	1.49		00100	TE \$2.09(1)		my haden		25.00	HTE NO CAP	4-	mg hg day.	
	1	ł –	1	Bernoria Public de commo	1 - 22		200-20	. ^3+696-	2 M. G	me sacer.			5 (g c#),		marker says	1
			•	Company Albert			0.78 + 00	m3 + 3 cm is	r,x	-945 tes) (\$ (\$ 0) . 	TQ 19 SAVE	3(6.2	(C) 25 C (A)	;
	i			Array v	75 300	٠4٠	0.06100	76 *5 641	15.100	-313 mg		105-00	Tigate (3 CE 04	1/2 mile	:
			İ	i ≜omom	3,430	35.	0.08-70	15.4958		CA) Sicary,		2.07 4.06	1 girls days	1 (1, 04	1 0-775 000	: '
		i	•	Che-er	1 323	12.	9.05400	CONTRACTOR	**	-4 kg 3 kg		200.00	77) 44 2kg.	102.23	79.42.74-	
		J		C:65**	10 800	ا مود	9.78400	make and	54	-Cadical		100-09	73.974	4 05 77	7318 24-	
			ļ	ļ ————	50.255	🛂 :	212-35	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	<u> </u>	ing value		2.91.405	ing isani:	171 21	imq vg day:	
			Em Sour Ca	<u></u>			ļ				111 6	├				
	:	Erepture Profit Total					}					} _				
	Ergoruse Veisur- Cole						ļ.				1/2/4					<u>, ,,</u>
Organia (Ma							i .				7.95 44	1				

Inhalation exposures are assumed to be equal to the exposures from logistion of groundwater.

TABLE 6 FING SURVIAMY OF RECERTOR RISAS AND HAZARDS FOR COMO REASONABLE MAIR DUD ERPOSCRES FOLKARPE FOR FORMO NSB NON ORDROY COMMECTION

sizenaro fo erame Euwe Menegior Escusión i Osnorisson Workins Sanagoro Agel Javan

Men ye	, Egypter Masser	(aprilipe Police	Cremical Di Economia	;		Terrorus i	. 10.16			Min David	rogen (Mesers	dourem.	
			Contern	ngelingn	entre en con	Germa	Contrar Joseph en	Signatura Rodes (par	Primar,	1945104	Acadesys.	(-m-m	(njadare Rober Tos
Sunday'er	310,000,000	5 te 2	Primoros rems	· · · · ·		1929	•	15.50	-			. 0108	: .056
	ļ		Strang of teacher						3,5	-		I	
	'		Berriora di Mene		-	1.	[· · ·			i .	i İ
			Decay to the second review	g	-				[54]			(··	
	<u> </u>		density to describe the	a	-			·-	: 47				
			Physical Progress				'		g <<				
			diggras,			6840		65.05	51-1 C/S			:::-	3000
			*C40 * 4*	1 .	! .		I · I		Pow.			0.0000	0.90%
			G v ; r oπ	K	-	:	.		Retorn to 93 Same			529	€ X4
			5467PF		-	i	!		61			5.00.01	0.0007.
			7 m	_l ··	L_ <u>-</u>	. ··) !leos!		l	j comeni	1,25360
		L	Cramos Ide	· · ·	-	19-06		1148	<u>'</u>			500	1004
		Exposure Point Total		_ }		/	`)	19-25)				in che
		e Marcom Islan						19.08	<u> </u>				::::>=
	Chause yes	54+2	Trophysical Agency	7	28.00	-		7E-409	·-		0.00024		: 134
			Berne a servicione	•	i	-	1		1/4		-		
			Security Control	. i		-) . <u>.</u>		-		
	!		Serson Autor chara			-			1		-		
			Service Representation	1	·	٠.	1		1 😘		-		
			Pherantonie		:				- NA 1				
	ļ		Argenic.	i -			! -		4.4				
	i		CREWE	1		-			Korey				
	J		Chromoto	1 .			- !	I	.00%				
			Coxer	1 .			1 - 1		W		-		
	i		z∝	_1 -	l:_		<u>!</u>		إ بد إل		-		<u> </u>
	1		Cremice Fore	<u> </u>	A-26	İ		28 - 29	Ji	<u> </u>	0.0004		0.00014
	L	bigogyna Print Total						78.59	.l				(62,204
							;r 59	7				0.000	
	b water Mastern For	■						11 24	A				0.000

Five Blood M	9000000
TU# C-5 F	0.555
151# 35 m k	. 50M
Total Kidney T	9.00.00
TOTAL CAPTURE	3,7076
Total 59 c Hi	0.351
To at Establish 19	0.004
"SWEDING H	7 004

MBLC 9.7 RME

SUMMAYOF RECEPTOR HISAS AND MAZARDS FOR COPCY REASONABLE WAS NUMERPOSURES - QUARTERLY MON TORING INSENSON GROTON CONNECTION!

Scar and TheStane Future Receptor Ecou which Residents Receptor Age I Chic

			d Poema Corken	!		Card regar			Non Data Angelin dimazano Outrieni							
COMBA.		j	Corkern	Species	-79 41 CC	Derva	Erikha Falai	Erodsule Routes fixe	Programy Target Organiss	19 6 6: 211	1009-21-20	Delma	Baccsure Routes Total			
	Service leader	5-te 2	Table to patient is	3E 70	<u> </u>	57 De.	· - · ·	te vin	. 18"	23		507	23			
			boliti myddia ere	Sear			!	·	NA.							
			Biological (pyrame)	55.05				50.05								
			Parkething up and the late	2544				VU.75	144			·	1			
	1	<u> </u>	Ben Sidney Politician	45.cm		١.	ì ì	46.01		ĺ		1	· ·			
	i	ŀ	Dispersion rese	ļ		; ·			Kichey	0.0009			0.0002			
	1	!	415477	6.4		16 gt		274	5.000	٠.		0.009				
		1	Cadmium	ı					K 2647	0.28		C DO2	: ce			
			CONCRETE OF	1		٠	.		FROM DO NY GIS BOOM	(1		(33	e a			
		:	Copper	H			.		CS.	:07		20,006	0.27			
	:	ł	2 %	<u> </u>	<u></u>				8 84	sca -		000000	2.21			
		L	Johan da Falar	45.05		2E-07		40.04	1.	'1		0.05	,			
	j	Lighture Paint (Mail						46.74	J							
	Exposure 1	Medium Color						25.74								
	Skillswares	5-10-2	The Street of March	1)E ())T (%)	'/*		. 00	· ¬	2.1			
		İ	Gargota gritinaçene			-			442			.				
			Вемори(ручете				! -		1 44	· · ·	٠ ا					
		•	Benatoub Alvoranimene	1			-		1 14		' . ·	1				
			Senzo.4: Fuorammene]					94			. !				
			Postparente	i			! .		NA.		i .	'	· .			
			Arsenic				} "		NA.)	ĺ					
		1	Caam . T	1			[·		< 3*e,							
		İ	STOPHEN				١		20763		٠					
			Соррег	1 .			;	-	144.	·	i					
		ļ	1 ~c		L] !		. 4A		j		i			
		i	Chartest that		JE X	- ·	- ,	35,03			0.3		63			
		Exposure Point false						28-0,6					5)			
	Expecure Medium Form			i				20.06	:				93			
um Tela	· "=							AF JA	1				, ,			

Philipson 4 (COS) (65 are used mad to be equal to the expansives from ingestion of grownswatur.

500 085 00	
15 at 65 45	24
िर्देश संस्तिस्य भा	į, r
Total Just H	6.7
Limitson —	**

T49_6 \$ 3 4 4 Z

SUNMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCS REASONABLE MAXIMUM EXPOSURES - QUARTER, 7 MON TOR NO INSERTION CONNECTION

Scannic foretaine force	
Peceptor Population Residence	
Receally Age: Agus	

Venum	Saplaufe Vedut	έαμ±η,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	ंकर-५# 51939-14			Card rugen.	×31		Nor Caronogeni, nedard Guelleri						
			Concern	ing#srigh	ाक्षर राज	. Ce-−a	Silipma/ .Saciation.	Çaposure Aquies fola	Primary Large! Organis	Ingestion	mayaşı	Çerma	Exacture Postes false		
Grandager	Country	5/62	in a premie	1.7	 	46.00		35.0	Lia" .	2.0		; 13	25		
	i		description race as	12-01	.			20.0	5/4,						
			Benzolaktyreno	79,65	! .			2± 05	tia.		. '				
			Struck took tien	79,66			i - I	28 28	HA.						
			Set gotalf agrandiene	20.67	.		i.	28,07	1 \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \						
		ļ	ERANDO CARA	'	ا - ا		1 .		K-27-67		. '				
	-	;	Acres -	E some	,	36.07		H W	75.6 . 25			ce.			
		1	Caq Hom		. i		-		N Street	1.65		0.0.2	3.65		
		ļ	244-4-	·	i - [Foultries (65 Bane	0.2		0.04			
		İ	D00341				l i		GS.	0.05		0.0000	0.05		
			Z %	k	,		.		Bose	1.69		0.00000	0.02		
		Į	Chercus 1954	9 ta		1.77	. [75.04 75.04	Ì	4	·	900			
	!	Caparitie Posta fotel	·				•	64.77d							
	Francis	Mediçin Tolal					- ``	20109							
	Consult Characters	, S'e)	Teath progings:		77.40		1	1E / 05	70		()		0.2		
		:	Ветору, в запітня вте				1		96				1		
		1	Service a comene				l · i		N4		ł .				
			Bengo o Austran Zene						NA.		¦ .				
			940yok 7uorentPene				.		5,4						
			. F. Minantwore	· ·					N#				1		
		1	Arsons	j .					۸/		;				
	i	1	Cad = 100	<u> </u>		-	'		Kitcher				1		
			Charles 4		(j		Lungs				1		
			Cosper						144						
		ļ	2 44	_ j) 44)						
			The Charles		75/te		1	NF-06)		C y		()		
		Eleposure Moiry Total						30-38					(2		
	Fractive Median Total							25.55	<u> </u>				67		
ded vitrious								25.54					,		

Vaxe

map at the properties one assumed 2009 follow to the exposures from ingestion of groundwater.

P
97
0.1
2.2
;

TABLE 9 NAME SUMMARY OF REIDEMFOR RISKS AND HAZAROS FOR COPONING ASCHALAROS FOR COPONING ASCHALAROS FOR COPONING ASCHALAROS FOR MARKETING MONITONING ASCHALAROS FOR MONITONING ASCHALAROS FOR MONITONING ASCHALAROS FOR MONITONING ASCHALAROS FOR MONITONING ASCHALAROS FOR MONITONING ASCHALAROS FOR MONITONING ASCHALAROS FOR MONITONING ASCHALAROS FOR MONITONING ASCHALAROS FOR MONITONING ASCHALAROS FOR MONITONING ASCHALAROS FOR COPONING ASCHA

Scenario Turaffama Futura Hecepio Population (Respents Receptor Again Ulabora, Child and Adult)

:		Exaceure Neglor	Chemilia of Rotentia			Carchojons	721		Nun CA circywno Maza o Querom						
: - E> 200	: 		Origin	17543:05	erhalyl gr	jerra	Barema Magailar	Lispopura Roures Total	Primary (arcel Organis)	Ingestors	emata de	Çerra	(aymkar∎ Noytes Tata		
<u> </u>	. 5mg/	turbungwigner	Постароднего с е	£00 .		5E 77		7 <u>5</u> -Y.			;	:	Ι		
<u> </u>	!		personal reservations	75.00	.			75.75	H		l i	i			
<u> </u>	;		Benzpalbyrene	18-05	i			78,05							
<u></u>	i		Benzout discountries,	58,06	.			42.1e							
<u></u>		•	Souto kifumenthere	55-07	-			#6-4 "	l						
<u></u>		•	Columnation and				-								
<u></u>	;		hrves-c	35,04		SE DT		1575	i						
<u> </u>	V		Cadhum						,		l				
<u> </u>			Charman	·	-										
<u> </u>			Conper						l		!				
<u></u>	į		ž no	: .	; ;				Ħ						
<u></u>	:		Disertical Folia	-E-04	- <u>-</u>	11.60	······································	7 to C#	1						
<u> </u>	Exposure Park Fo		·· · · · · · · · · · · · · · · · · · ·	1			<u> </u>	18.74	1						
Çosursi water	sue Vesim Tela	E7304246 1		1			~~~î	16,64	i						
	5.42	Control water	1 - Proposite plants	-	46.64			65.44	İ						
			Велима:импириель												
			Benzo:atoyrene						Ā						
	i	j	Sensors Publishmens]						
			Bringer's Cultivariation of												
			Processes				l i								
			Arsevo	[
			3A3~ LM	i	!	!			ļ	'	!				
			Chierun								.				
											;				
			Zirk.	l .											
		ļ	Transportage	<u></u>	4: X			35.50	1	<u> </u>	-				
				·				72.00		· · · · · · · ·		·			
facer on blotters	Facebook Point To	finance Nede+ *ola						:1.0							
Securitions	Falcone Point To	2 Contract and an artist of the		4				12.5							

4000

The at on exposures are assumed to be equal to the appropriate from logaritish of gravidowater $\bar{\rho}$

•		
•	E .2	HUMAN HEALTH RISK ASSOCIATED WITH SITE 23 GROUNDWATER

From: Bob Jupin, Tetra Tech Risk Assessment Specialist

To: Corey Rich, Tetra Tech Project Manager

Date: May 19, 2008

Regarding: Human Health Risks Associated with Site 23 Groundwater

Historical and current information pertaining to Site 23 groundwater were reviewed to determine if Site 23 groundwater poses a threat to human health and the environment. Historical information reviewed as part of this evaluation included the Basewide Groundwater Operable Unit Remedial Investigation Report (BGOURI) (Tetra Tech, 2002) and data collected as part of the storm sewer rehabilitation (FWEC, 2001). Current data reviewed as part of this evaluation included the first four quarters of the underdrain metering pit sampling collected through February, 2008.

There have been changes in United States Environmental Protection Agency (USEPA) and Connecticut Department of Environmental Protection (CTDEP) guidance since the BGOURI HHRA was prepared. The major changes in guidance include:

- USEPA Region 9 Preliminary Remedial Goals (2004)
- CTDEP Remediation Standard Regulations (RSRs) Volatilization Criteria (2003).
- Draft Guidance for Evaluating the Vapor Intrusion into Indoor Air (USEPA, 2002).
- Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment), Final Guidance (USEPA, 2004).
- Guidelines for Carcinogen Risk Assessment (USEPA, 2005a).
- Supplemental Guidance for Assessing Susceptibility from Early-Life Exposure to Carcinogens (USEPA, 2005b).

The revised guidance was used in this evaluation.

Site Description

Figure 1-1 shows the general location of the Naval Submarine Base and Figure 1-2 shows the location of Site 23. No. 2 and No. 6 fuel oil and waste oil were previously stored in underground storage tanks (USTs) at Site 23 and each tank had an underdrain system that collected groundwater to control water levels and associated hydraulic pressure. The USTs were properly closed in place and the underdrain systems were kept to reduce groundwater levels in the area. Evidence of releases of petroleum products from the tanks, their associated piping, and possibly from other nearby sources was detected during previous investigations. Hemedial actions were taken to address petroleum products detected in the soil. No significant groundwater contamination was detected; however, low-levels of petroleum hydrocarbons were infrequently detected at the outfall of the storm sewer system near Goss Cove. Subsequently, the

storm sewer at Site 23 was rehabilitated in 2000 such that the original combined groundwater and stormwater system was separated into a deep groundwater and a new shallow stormwater system (FWEC, 2001). Over 2,000 feet of the existing underdrain piping was relined with cured-in-place plastic pipe and a manhole was converted into a metering pit to measure groundwater flow volume.

Current and expected future site usage is industrial/commercial. Groundwater at Site 23 is classified GB. Groundwater at Site 23 is not used as a potable water source. Currently there are no direct contact exposures to groundwater. Potential receptors evaluated in the human health risk assessments for Site 23 included construction workers and hypothetical future residents.

Basewide Groundwater Operable Unit Remedial Investigation Report

Groundwater at Site 23 was evaluated in the BGOURI (Tetra Tech, 2002). As part of the evaluation concentrations of chemicals in groundwater were compare to USEPA and CTDEP screening criteria for direct contact (USEPA Region IX Preliminary Remedial Goals, USEPA Maximum Contaminant Levels, CTDEP Maximum Contaminant Levels, and CTDEP RSRs) and migration (CTDEP volatilization and surface water protection criteria). A copy of the comparisons is included in Attachment A.1. Maximum concentrations of tetrachloroethene, naphthalene, and lead exceeded the direct confact criteria (Table 13-4). Arsenic and lead were detected at concentrations exceeding the surface water protection criteria (Table 13-5). The human health risk assessment (HHRA) evaluated potential risks from exposures to groundwater by construction workers and hypothetical residents. The HHRA determined that risks for construction workers were less than USEPA and CTDEP acceptable levels (Table 13-6). Risk for future residents were within USEPA and CTDEP acceptable levels. However, the chemical specific cancer risk for tetrachloroethene exceeded the CTDEP target level of 1 x 10⁻⁶ for individual chemicals, although the maximum detected concentration of tetrachloroethene was less than its CTDEP RSR. The HHRA guidance has been updated since the BGOURI was prepared, but the changes in the HHRA guidance would not change the conclusions of the HHRA.

Storm Sewer Rehabilitation

The storm sewer system at Site 23 was rehabilitated in 2000 (FWEC, 2001). After completion of the storm sewer system, groundwater collected from the deep dewatering system around the closed underground storage tanks is conveyed to a metering pit within the Tank Farm. The metering pit is connected to the shallow stormwater system and the water is conveyed to the Thames River. Seven groundwater samples were collected from the metering pit between July 25, 2000 and May 23, 2001. A summary of the sample analytical results are included in Table 1 in Attachment A.2. It should be noted that this data was not validated. Table 1 includes a comparison of the data to CTDEP RSRs for surface

water protection and volatilization. Concentrations of all chemicals in all seven groundwater samples were less than the volatilization criteria. Concentrations of total zinc exceeded the surface water protection criteria in samples collected in August and October, 2000. Concentrations of total lead exceeded the surface water protection criteria in samples collected in August 2000, October 2000, January 2001, April 2001, and May 2001. Concentrations of total arsenic exceeded the surface water protection criteria in samples collected in August 2000, October 2000, March 2001, April 2001, and May 2001, although total arsenic was also detected in the blank samples collected in 2001, indicating a potential laboratory blank contamination issue. Concentrations of all inorganics in filtered samples were less than the surface water protection criteria in all samples, suggesting that the elevated total arsenic and lead results were related to suspended soils in the samples. In general, concentrations of inorganics were highest in samples collected in August and October of 2000 shortly after completion of construction of the new storm water system and decreased significantly in subsequent sampling rounds. Concentrations of phenanthrene exceeded the surface water protection criteria in the samples collected in January 2001 and May 2001. Concentrations of benzo(b)fluoranthene, and benzo(k)fluoranthene exceeded the surface water protection criteria in the sample collected in May 2001. Considering the new risk methodology risks for construction workers exposed to groundwater would be within USEPA and CTDEP acceptable levels using the last round of sampling results (May 2001) (Attachment A.3).

Quarterly Underdrain Metering Pit Sampling

Four quarters of water samples were collected from the metering pit (Tetra Tech, 2008), which began in June 2007. The results of the sampling are presented in Table 3-1 in Attachment A.4. Included in Table 3-1 is a comparison to CTDEP RSRs for surface water protection and volatilization. None of the detected concentrations in the samples exceeded CTDEP volatilization criteria. In the sample collected in September 2007, the concentration of total arsenic exceeded the surface water protection criteria. However, the concentration of arsenic in the filtered sample was below the surface water protection criteria. In general concentrations of inorganics in the filtered samples were significantly less than the concentrations detected in the unfiltered samples. Also the sample log sheet indicates that orange precipitate was observed in the sample. Therefore, it is likely that the arsenic detected in the unfiltered sample was a result of suspended solid particles in the water and is not indicative of groundwater quality. Arsenic was not detected in the sample collected in December 2007 and was detected at a concentration below the surface water protection criteria in the sample collected in February 2008. In December 2007. concentrations of acenaphthylene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, hexachlorobenzene, and phenanthrene exceeded the surface water protection criteria. These chemicals were not detected in the duplicate sample collected in December 2007 and these chemicals were not detected in the sample collected in February 2008.

Table 2.1 in Attachment A.5 presents a comparison of the sampling results to human health screening criteria consisting of USEPA Region IX Preliminary Remediation Goals (PRGs) for tap water, USEPA Maximum Contaminant Levels (MCLs), CTDEP RSRs, and Connecticut MCLs. Several VOCs, SVOCs, and inorganics were detected at concentrations exceeding the human health screening criteria. Attachment A.5 also presents the results of a human health risk assessment (HHRA) for construction workers and hypothetical residents exposed to groundwater from the underdrain metering pit. Risks for construction workers exposed to groundwater are within USEPA and CTDEP acceptable levels. Cancer risks and hazard indices for hypothetical residents exceed USEPA and CTDEP acceptable levels, although Site 23 is not suitable for residential development. Hexachlorobenzene, carcinogenic PAHs, and arsenic were the major contributors to the cancer risks. Arsenic, iron, and manganese are the major contributors to the hazard indices. As discussed above hexachlorobenzene and carcinogenic PAHs were only detected in the sample collected in December 2007. Concentrations of arsenic and iron were only elevated in the sample collected in September 2007. In addition, concentrations of arsenic and iron in the filtered sample were significantly lower than those in the unfiltered sample. Concentrations of manganese were within site background levels.

Vapor Intrusion Evaluation for Groundwater

Groundwater data from Site 23 were evaluated to determine if there were unacceptable risks associated with vapor intrusion into buildings (Tetra Tech, 2008). Concentrations of volatile organic compounds (VOCs) in groundwater were compared to screening criteria for vapor intrusion. The screening criteria were obtained from USEPA's OSWER Draft Guidance for Evaluating the Vapor Intrusion into Indoor Air from Groundwater and Soils (Subsurface Vapor Intrusion Guidance), November 2002, CTDEP's Proposed Revisions - Connecticut's Remediation Standard Regulations Volatilization Criteria, March 2003, and USEPA Region I (April 24, 2008). Concentrations of chloroform and trichloroethene at Site 23 exceeded the USEPA screening criterion. These chemicals were further evaluated using USEPA's Johnson and Ettinger Vapor Intrusion Model. Modeling results showed that cancer risks and hazard indices for residential and industrial scenarios were within USEPA and CTDEP acceptable levels at Site 23. Further evaluation against PRGs and ARARs showed that vapor intrusion is not an issue at Site 23. It was concluded that no further action was required for vapor intrusion issues at Site 23.

Conclusions

Historical and current information pertaining to Site 23 groundwater were reviewed to determine if Site 23 groundwater poses a threat to human health and the environment. The conclusions of this evaluation are the following:

- The HHRA performed during the BGOURI evaluated potential risks from exposures to groundwater by construction workers and hypothetical residents, although it is unlikely that direct contact exposures to Site 23 groundwater would occur based on current and expected future site use. Cumulative risks were less than or within USEPA and CTDEP acceptable levels. However, chemical-specific risks for tetrachloroethene exceeded the CTDEP target level for individual chemicals, although the maximum detected concentration of tetrachloroethene was less than its CTDEP RSR (5 μg/L). Concentrations of tetrachloroethene in Site 23 groundwater have decreased from 3 μg/L in the BGOURI to 0.4 J μg/L during the second quarter of the underdrain meter pit sampling. Chemical-specific risks associated with tetrachloroethene would now be less than the CTDEP target level for individual chemicals.
- The HHRA guidance has been revised since the BGOURI HHRA was prepared but the changes
 in the guidance would not change the conclusions of the HHRA.
- Concentrations of chemicals in groundwater samples collected after the storm sewer rehabilitation were highest in samples collected in August and October, 2000 right after completion of construction and decreased significantly in subsequent sampling rounds.
- Concentrations of all chemicals detected in groundwater collected during the four quarters of the underdrain metering pit sampling were less than that CTDEP surface water protection and volatilization criteria with the exception of arsenic and several SVOCs. The concentration of total arsenic in the sample collected in September 2007 exceeded the surface water protection criteria although the concentration of arsenic in the filtered sample was less than the surface water protection criteria. The arsenic detected in the unfiltered sample is believed to be a result of suspended solid particles in the water and the filtered sample is more indicative of groundwater quality. Concentrations of acenaphthylene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, hexachlorobenzene, and phenanthrene exceeded the surface water protection criteria. These chemicals were not detected in the duplicate sample collected in December 2007 and these chemicals were not detected in the sample collected in February 2008.
- In general, concentrations of chemicals in Site 23 groundwater have decreased over time except as noted above.
- Potential risks for construction workers exposed to Site 23 groundwater are still acceptable using
 the analytical results from the four rounds of groundwater sampling. Potential risks for
 hypothetical residents exposed to Site 23 groundwater exceed acceptable levels, although Site
 23 is not suitable for residential development.
- The vapor intrusion evaluation for groundwater determined that risks from vapor intrusion were with USEPA and CTDEP acceptable levels for residential and industrial scenarios. The evaluation concluded that no further action was required for vapor intrusion issues at Site 23.

Based on existing information, under current and expected land use, Site 23 groundwater does
not pose a significant threat to human health or the environment. Adverse health effects are
possible under hypothetical residential land use.

Committee to the second of the

References

CTDEP (Connecticut Department of Environmental Protection), 2003. Proposed Revision, Connecticut's Remediation Standard Regulations, Volatilization Criteria. Bureau of Water Management, Permitting, Enforcement and Remediation Division, Hartford, Connecticut, March.

FWEC (Foster Wheeler Environmental Corporation), 2001. Final Closeout Report for Storm Sewer Rehabilitation, Naval Submarine Base New London, Groton, Connecticut, Langhorne, Pennsylvania. May.

Tetra Tech (Tetra Tech NUS, Inc.), 2002. Basewide Groundwater Operable Unit Remedial Investigation, Naval Submarine Base - New London, Groton, Connecticut. King of Prussia, Pennsylvania, January.

Tetra Tech, 2007. Letter Report for September 2007 Sampling Event, Site 23 Underdrain Metering, Naval Submarine Base – New London, Groton, Connecticut. Pittsburgh, Pennsylvania, October.

Tetra Tech, 2008. Vapor Intrusion Evaluation for Groundwater at Operable Unit (OU) 9, Naval Submarine Base – New London, Groton, Connecticut. Pittsburgh, Pennsylvania. May 14.

USEPA (United States Environmental Protection Agency), 2002. Draft Guidance for Evaluating the Vapor Intrusion into Indoor Air. Office of Solid Waste and Emergency Response. EPA 530-F-02-052. November.

USEPA, 2004. Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual, (Part E, Supplemental Guidance for Dermal Risk Assessment). EPA/540/R/99/005, Office of Emergency and Remedial Response, Washington, D.C., July.

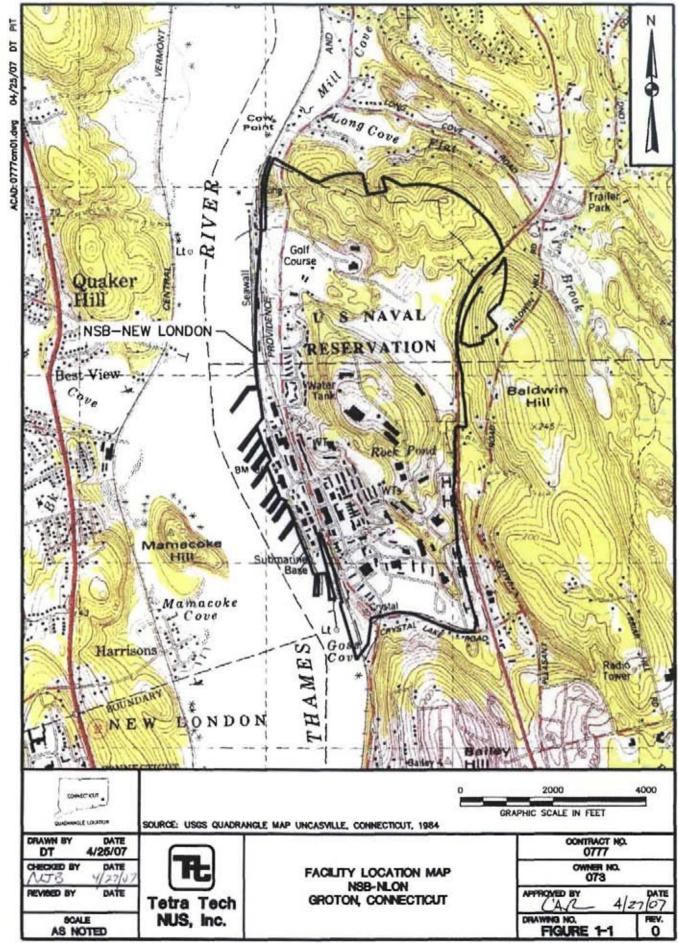
USEPA Region 9, 2004. Preliminary Remediation Goals, November.

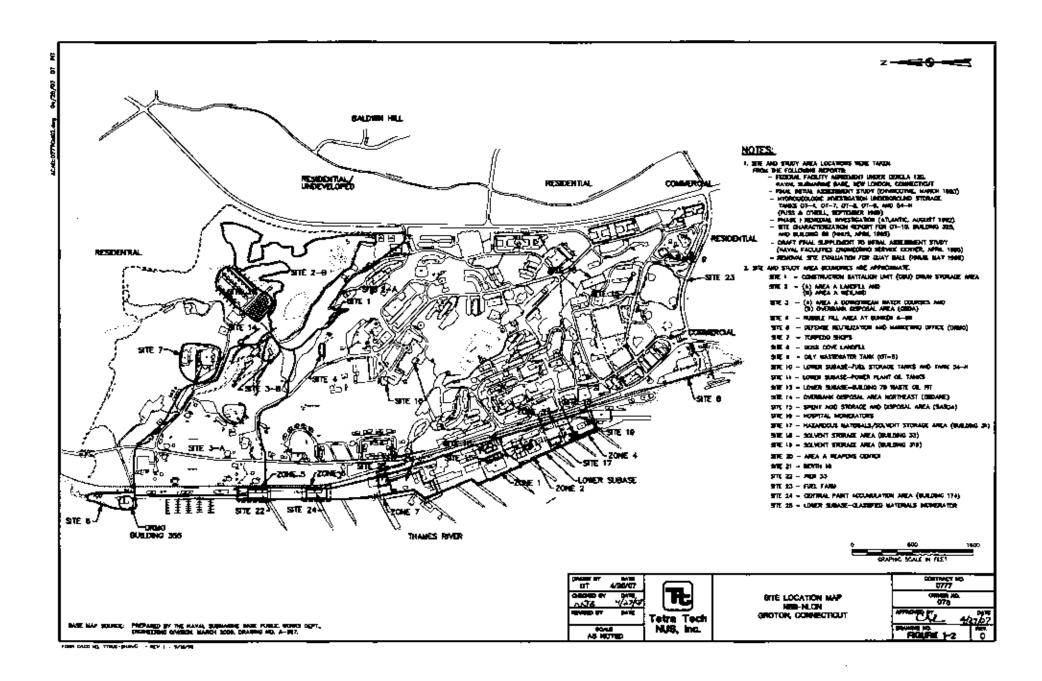
USEPA, 2005a. Guidelines for Carcinogen Risk Assessment. EPA/630/P-03/001B. Risk Assessment Forum, Washington, DC. March.

USEPA, 2005b. Supplemental Guidance of Assessing Susceptibility from Early-Life Exposure to Carcinogens. EPA/630/R-03/003F. Risk Assessment Forum, Washington, DC. March.

USEPA Region I, 2008. EPA Comments on the Basewide Groundwater Vapor Intrusion Analyses. Email from Kymberlee Kecker of USEPA Region I to Corey Rich of Tetra Tech NUS, Inc. April 24.

FIGURES





ATTACHMENT A.1 TABLES FROM BASEWIDE GROUNDWATER OPERABLE UNIT REPORT

TABLE 17-4

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCEAN FOR ORODINOWATER AT SITE 23 DIRECT CONTACT EXPOSURE SCENARIOS BASEWIDE CACUNDWATER OPERABLE UNIT REMEDIAL INVESTIGATION MOST-NUON, GROTON, CONFECTIOUT PAGE 1 OF 3

Speciang Yimstrame: Futura Medium Groundowser Exposure Medium: Groundowser Expusive Perm: Tank Farm (See 23)

CAS Number	Chemica:	#Inimum Concentration	Maranga Guilder	Maximum Concentration III	Maylmam Osalfier	lmw	Consentration	Cotaction Frequency	Range of Honderects ^a	Concentration Used for Screening ⁽²	Background Value ²¹	Rak-Based COPC Screening Lucal ^{ds}	Potentui ARAR/T BC Yalus	Potential ARAR/TBC Source	cord Fig.	Rabonale for Contaminant Deletion or Selection ¹⁹
VIDE CHESTON	V+P-XYIENES	2		2		JQ1	523WW02501	177	2	2	N/A	א יג	530	CTOEP 95R	MC -	8SL
													16000	FED.MCL CTDEP WOL		
\$3-¥7-6	(दाक्षताहरू)] ,]	··		T -	-5 ⁷	52 3 8462521	107	1	,	'NE'A	21 N.	10000 10000	GTDEP RSR FEO-MOL CTOEP-MOL	. WG	BSL
127 164	TETRACHLOROCTHENE	3		1		ugit	5294AG3DC+	*13	'	3	N/A	un G	3 5 5	FEC MOL	2 7]52	ASL
7775-2677	XVIEWES TOTAL	3		,	r .—	uşt	9230WG2801	17	'	3	N-W	21 - N	13000	CTOT MICHE FECHAL GTOEP MOL	NO.	est.
Donatorned General	METALE			970	,	_,	SZOWNOZSCI	· —		7 920		1 Ask		CTÓT É NSN		NEK
		1		4/		-9l	2520445901	0.0	,	940	N.A.		NA NA	CLD-NOT	· · ·	NIK
Samiyolate <u>i Organ</u> V1 70 3	MATERIAL ENI.	14		14	۲	ugit	523#W0/Sc1	1.7	05.5	- ₁ - ۲	N/A	013	N/A	CIDEPRIA FEO-DOL	·	Æ
Total Velan	<u>:</u>												N/A	CFOCHMA	<u> </u>	
1429-90-5	A. GATINGIA	890		2030		wy.	823MA0750*	1//	50 6 - 191	3038	3560	3605 H	N/A 50 in 700	CTDEP RSA FED-SMCL CTDEP-MCS	N#C	EPAJ, 9KG
7440 102	ARSEMC	4.7		17		up).	\$230 4 051101	1.77	27	1 47	1 97	N/A	50 10	CTOEP ASA FED MCL	N/J	B-SL
1349. jý. <u>s</u>	UARIUM	777		176	 	սայն	\$73M/M52561	iit	18 - 37	***	227	V)U N	50 1000 2000	CTDEP.MCL CTDEP.RSA FFD-MCL	MO	ASI WKG
7445.434	ZADM (W	+- ~~aa		567	•	იდან	5234NUS2001	477	0.26	062	ND	16 N	2000 5 5	CTOEP MCL CTOEP RSA FED-WCL CFDCP/MCL	MO.	BSL
7440.70 7	CALCE.M	b2/0		94100	1	uar	520W-03D01	. 7 0	44	94100	185000	44	IVA NA NA	STOCP ASA FED MCL CTDEP-NOL	WC	Hu⊺ B≒G
7445 a f 3	GHROV-UM	10 2	1	- 1 70 / "		• •	Solwwaysgn	470	62 -	407	- 49	11 N 3.	100 100	CTOEP RSR FFD-MCL C10EP-NCL	NO.	HSA, BAG
1400-MM-4	COBALT	4.5	-	6.4	,	-gri	52344402501	4110	42.63	6.	416	73 N	AA NA	CYDEP RSR FED-MCL CYDEP-WCL	40	9SL, RKG
TRIC SCIB	CONFR	÷n	,	VD 7	,	191	52344402501	2-10	68	101	101	1 1501 H	1300 1300 N/A	CTOLVIRGE FECHACI CTOEPIMOL		83/, 84G
1435 89.6	FACE	202		24/400		val	SZŽIMÁCYSEI	<u>\$1</u> 5		/4500	20200	7450 N.º		CT DEP RSR FFC-SUC(CTCEP MCL	įνα	FPAL HRG

OCCURRENCE DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN FOR ORDUNDWATER AT SITE 33 DIRECT CONTACT EXPOSURE SCENARIOS BASEWOIL CRICUIDWATER OPERABLE UNIT REMEDIAL INVESTIGATION NSB-NLOW, GROTON CONNECTIOUT PAGE 2 OF 3

Scenene Timeframe, Funce Medium: Groundweler Esparois Medium: Groundweler Espacine Point: Take Ferns [5 & 25]

ÇAŞ Humber	Ghamiçal	Minimum Consentration	Molmum Qualifier	Mesonum Gencentration	Man-vm Que Æer	Unds	Location of Maximum Concentration	Detection Frequency	Range of Mondelects ^o	Concentration Used for Screening*h	Beckground Value***	Rok-Based CDPG Schening Level ¹⁸	Founds ARARTEC Volum	Pote-tiel ARART BC Bource	ÇQ#C Fleg	Rationale for Contaminam Deletion or Selection ¹⁴
ऑ)प्रेंक्री 1	/CTD	iv.	,	317		Jpl.	SZJWW97Epp1	अग्र		3- 2	66)	N. A.	15 15 N/4	C10EP RSA PFD-AL C10LP PCL	YES	A5L
F4 201-95-4	O.O.SMF Stude	1610	<u> </u>	7646	Ì	nàr	\$23 \w \\025\ 1	— war - 	500	/8eQ	151000	N/A	N/A N/A N/A	CTDLP ASR FED WCL CTOF MMIL	•	NUT RKG
<mark>73</mark> 19.965 °	MANGANESE	414	,	.) Seig		u⊋L	523044025904	816	88.12.	31 <u>80</u>	11700	78 N	N/A 50	CTDEP HSA FED SMCL CTDFP-MCL	NG	BKG
AMCONO.	HCKEL	10	,	33.5		var.	573MAC7501	213	WZ-99	- 359	17 1	/2 N	150	CTOFF ILST FED-MGA CTOFF MGA	NO	8 8L
7440 (59)	PGTASSIUM'	1770		7/90		 (5.21 WW U2831	12.10	N-A	7790	75800	fs-A	N/A N/A N/A	CTDEP RSA FSD-WCL CTDEF-WCL	NO	96.7 BKG
7440-9765	SOCIUM	7192		80(30 ·	, ,	-W-	\$23HMU\$201	10.10	N:A	\$470 0	. 1 950 000	N'A	PAA PAA NAA	CTUMENTED IN FEO-MICA CTOEP MICA	340	NU", 9KG
7440 62 7	· ·	6.	,	64	,	مهد	52346/463061	1/15	63-87	1 84	10.2	36 10	50 NA NA	CTDEP RSR FED-MCU CTDEP-MCU	WO	BS4_B#C
7440 65·6	2-40	63.4		65.4		ւցւ	SOUNDER CO		109-421	684	171	1130 N	5000 5009 N/A	STOUP RSA FEO SMCL STOUP MOU	МО	BSL 8KG
Despised Metals (440 38 2	ARSENC, F CITERIO	7 37	.— , —		,	N/L	520WW02561 F	10	23	3.	2 55	n A	٥٠	TOTE ASA TOTAL TOTAL TOTAL		ikiq
7443-34-3	MANUA SELECT	32 6		150	•	ogt	SZYMAZYSET F	22' -	i N-A	150	. 124	763 N		CTOEP RSR FED MGL CTOEP-MGL	**	BSs.
7440 76%	CALCUIM FILTERED	79900		45 10 0	1	եցւ	[™] śża⊽wozśćT-r	7:2) N-Ā	মছারে 🗀	157000	NA -	NA NA NA	CTOFF RSN FLD-MCL CTOEF MCL	СМ	891.9KG
7479 896	HON THURKED	410		15408		uçıl	527MM 02501-F	5.5	**	15400	25300	3602 N		C1DEP RSR FED SACU ICTOCPIMO	NO.	FMAI, RIKS
7439.921	LLAD, FILTEPED		1	- 10 -		val	810AM3WQ.E	T "" -	7.	10	7 12	N/A		CTDEP AGA FED AL CTDEP VCI	NC	BSL
34 <u>39.95-4</u>	PAGNESIUM, F., TERED	37.7¢		5830		սայե	570VW0255#-F	2/2	N/A	5430	150000	N/A	NVA NVA NVA	TOTOLO NESS TOTOLOGY COLUMN PER	NAS :	ASI_AKG
7439 96-5	OURSANGSE TILTERCO			Asso		v9.	523 M (4025)1.6	277	Large	2650	\$490	55 N		CTDEP #89 FED-SMO. CTDFP-VCI	NO.	946
7440 09-T	POTASSIUM, FALTERED	9900		7340		tay.	5.73M/VUZSOT-#	7.77	NY	7540	*0000	N/A	NA MA NA	GTDLP 950 FED MCL UTDFP-NCL	1.0	NUT, BKG
7440-23-5	SOO UM FILTERED	49300		8260G	,	-97	523HNUSZÚT <i>A</i>	70	1 · · · · · · · · · · · · · · · · · · ·	45,000	1580000	N/A	NA NA NA	OTDEP MEA FED MEA OTDEP MICE	N/O	NUT, BKG

OCCURRENCE, DISTRIBUTION, AND SCLECTION OF CHÉMICALS OF POTENTIAL CONCERNIFOR GROUNDWATER AT SITE 23 DIRECT CONTACT EXPOSURE SCENARIOS BASEWIDE GROUNDWATER OPERABLE UNT REMEDIAL INVESTIGATION

HSB-NLON, GROTON, CONNECTICUT PAGE 1 OF 1

Scenario Timename Falure Madium Groundwater Exposure Medium, Gloverdustics Exposure Point: Tenk Farm (54-73)

CAS Number	Conserved	Minleype Concentration r:	Marimum Dualifler	Varioum Concentration	One special or a second or a s	Unite	Location of Medimum Concentration	Вической Егифурику «П	Range of Nondelects ^{ol}	Concentration Upon for Screening ^{TR}	background	Reik-Based COPC Screening Level ¹⁸	Potential ARAR/TEC Value	Potential ARAR/TBC Source		Concentram Concentram Coletion or Selection ¹⁸
Mincellaneous Para																
E-14506	SALKAL MITY	18	ĺ	348	[791	sysewender	(215	N/A	348	1960	' N'A	hea N.A.	CTOEP RSR FEC-MC. CTOEP-MCL		6KS
(RACET)	ANTIONIA	<u>916</u>	-	054	† '	mat.	\$25#HU52¢1	77	- FE	` -сы !	NO	NW	N/A N/A	OFFERMEN FECHAGE CTOLPHACE	i wo	NIX.
7664 41-7	ALABOMA AS NITROGEN	5'5	,	69	,	mg/L	S23MY02561	67 i	100	4.9	ND	N/A	No.4.	CTOEP ROH FEO MGL CTOEP MOU	₩0	MEX
:es-e}-o	CHLORIDF	b 25	<u> </u>	154		7-91	ระวมพ่าวรรษ์ร	13.15	NA	124	4540	Nu A	250 N/A	CTOPPASA TOPENOUS GODEPHACE	-	ชยเ
E. 11778	HAROVESS &L CACOU	22.3		257		mor.	8/3VW5J001	10/10	1474	25*	NB	HIA	>#A NA	CTOCP ASA FFD-MCL CTOEP-MCL	, MC	41%
14868-79-8	SILFATE	,,,		\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		179	<u>213Hz025acı</u>	16.10	N/A	472	45.2	 	NA 250 43	CIDEP ASA FUD-SMOL CIDEP-AGE	1	R%L
00 00 40 00 00 40	TOTAL 2 650, VED SOLIDS	66.2		519	,	. т <u>а</u> т 	503M402501	IG 10	M-v	519	6260	h-A	500 NA	CTDEP HSA FED-SMCL CTDEP-MCL	₩	BKG
: <u></u>	TOTAL OFFICAMIC CARSON	1) 			Ingi.	S7ukwar8cii	ושיוב	N/A	,-	377	h NA	NA MA MA	ETDEP ASA FER-MOU CTDEP-MOU		Net;
000-08-9	TOTAL SUSPENDED SOLUS	5	1	:69	,	""3"\ 	\$23M4/02901	610	5000	168	236	Ruik.	44A 44A	CTDEP ASA *ED-WCL CTDEP-WCL	"	B⊀G

A shaded value indicates that the concentration used for agreeming expends the orderior or beging own trades A shaded chemical name indicates this the chemical has been selected as a CDPC

00000000

- Symple and dyplicate are counted as two records samples when determining the minimum and maximum. Selected consuminations
- Values of warried are sample-specific quantitation limits.
- $\lambda=7 n_0$ maximum delected concentration is used for screening purposes.
- 4. 95% Upper To energy tire (UTL) of site background data .
- 5. The hist-based COPC screening level for Iso water use is presented. The value is beset on all larget Nazard Cuption of U. I for concavanogens (denoted with a TV fleg) or an incremental carden was of 10-bits caramogers (candidawith a "C" Regit USEPA, Region IX, Disposi 2004, Updale December 28, 7004).

33**7**266W04S01

- The them call is selected as a COPC if the maximum devected concentration exceeds the risk desect.
- CCPC screening laws under an ARARTRO(s)
- Value is for title legisters.
- 8 Valie of the Penderal Colonium

Association	lec:	524	245

\$23-10,51191 523MW97**0**91 532MW02001-D 523+**4**V-/\$1301 920HNJ52001 S23AW/02501 \$23446.57(1) 52]MN075314F \$20HM\u896\u8 \$23**47**(40300) \$201ML/\$501 \$23WWG4DC1

<u>Orindona</u> ARARTEG : Applicable or Relevant and Appropriate Requirement To Be Considered.

C • Gardinogen

CCC = Charaget of Concern

Jir Estimano Value

Nin Mondertvinogen

N/A + Nut Applicable

FED-MCL # Federal Maximum, Contaminant Level (USEPA, August 2000).

FLD-SACC * Federal Secondary Maximum Contaminant Level (USEPA, August 2000)

FED-AL IT Federal Action Level (USEPA, August 2000).

CFCEP-RSR in Connecticut CEP Remediation Standard Regulators, 1996

2"CCP-MCL = Connectical Massesser Contaminant Level

Rail Grade Copes

For Selection as a COC.

ASI - Above COC Screening Level-ARAR/16C

Lor Elimination as a COC

RKB • Within Background Levels

BSL 4 Beto- COC Science (Level/ARAP/TBC)

MUT = Essent at Nutriero

NTX - No Society interruption.

SPALN USEPA Region 1 does not advocable evaluation of this chemical.

NV + Avisce laneous parameters are not evaluated in numer health high assessments.

OCCURRENCE, INSTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN FOR GROUNDWATER AT SITE 23 MIGRATION PATHWAYS BASEWIDE GROUNDWATER OPERABLE UNIT REMEDIAL INVESTIGATION ASD NEON, GROTON, CONECTICUT PAGE 1 OF 2

Scenario Timeframe: Future |Medium: Groundwater |Exposure Medium: Groundwazer |Exposure Point: Tank Ferm (Site 23)

CAS Number		Minimum Concentration	Minimum	Maximum Concentration	Maximum Qualifer	unka	Location of Maximum Concentration	Detection Frequency	Range of Nondetects ⁽²⁾	Concentration Used for Screening ⁽¹⁾	Background Value ¹⁴	GTOÉP Surface Water Çesteriş ⁱⁿ	CTDEP Vol. Criteria*	COPE Flag	Rationele for Contaminant Deletion or Selection ¹⁴
Votatile Organics															
	M-P-XYLENES	<u> </u>	<u>.</u>	2 _	. – -	ug'L	523MW02501	100	<u> </u>	2	- NA	_ NA _	2:330	10	BSL ;
95-47-5	0-XYLENE	- 3 — I	ļ ·_	_ <u>i</u>	L	105	\$23MW07501	17:0	1			MA	21300	NO.	ES
177-18-4	TETRACHLOROETHENE	ا۔۔۔۔، ا	-	3	<u> </u>	ug'L	\$23 WW 03D01	1-10	1		NA.	. 86	1500	40	BSL
1430-70-7	XYLENES, TOTAL	/ 5	1	. 5	l	USI	SZRMWUZSON	1/10	1	<u> </u>	NA.	NA	21330	NO.	<u>05L</u> j
Distolved Gases									.——	. ——					
74.82.8	ME HANE	1	<u>. </u>	920		ug/L	523MW-02S01	7.79	<u> </u>	920	L_ NA	NA	N/A	NO [NTX
Semiyotatita Organi						<u> </u>					~ — -	-			
91-20-3	NAPHTHALENE	<u> </u>	<u> </u>		<u> </u>	U D'L	523MW02501	1:10	05-5	14	NA.	N/A	N.Y	40 [NIX(
Total Marely															
/479-90-5	AC LIMINUM	690	}	2030		اتوبا	\$23MW075811	2/10	50.5 - 591	2030	3560	N.I.A	NA	NG i	BKG
7440-38-2	ARSENIC	4.7	[4.7		ւցե	\$23MNUS1101	1010	23	_ 42	1 92	4	N/A	YES	45L -,
7440-39-3	BAR:UM	27.7]	176] սցե	\$23MW02581	4/10	18 - 37	176	227	N/A	N/A	NO [BKG
7440-43-9	CADMILIME	0.63	I	9.63		og/t	523HNU\$2001	1/10	0.75	0.63	ND.	6	NIA	<u>, NC </u>	_BSL
7440-70-2	CALCIUM	6270	I	94100	_] այբե	S23MWG3D01	10/10	N/A	94100	18-9000] N/A	!μA	NO	BKG
7443-47-2	CHROMIUN	10.2		43.7		ugt	S73MNV0Z5D1	4/10	6.2	43.7	49.9	N/A	N/A	NO.	BKG
7640.4B.4	CORALT	4.5	1	64	J	ug/L	SZ3MOVOZSO1.	4/:0	4.2 - 5 2	6.4	486	N/A	N/A	ND.	BKG
7440-50-8	COPPER	6.8	J	וסי		ug/L	523MW02901	2/10	0.6	10.7	107	48	N/A	[NG	est exa
7439.89-6	IHON	257		24800	_	JGL	523MAQ2S01	970	175	24600	28200	NiA	N/A	NO.	RKG
7439-92-1	LCAD	19	J	31 2	i ——	997	\$23MM/02501	5/50	. 18	31.7	66)	13	N/A	YCs	ASL
7439-95-4	MAGNESIUM	1610	 	7840	<u> </u>	Juga.	S23MW02SD1	9010	544	7840	191000	N/A	N/A	NO.	BKG
7439-96-5	MANGANESE	7 - 7 - 7	†· —— ·	3380	F	Jet	\$73MW07501	8/10	. H 6 12.1	33 8 0	11700	N/A	N/A	NЭ	BKG
7443-02-6	NVCKEL		<u> </u>	33.5		agil.	\$22MW07901	2/70	92-95	33.5	32.2	980	N/A	NO	B5L
7440-29-7	PCTASSIUM	1170		7790		ugl	\$23 MW 02 S 01	13-10	N/A	7790	70800	N/A	5/A	CN	RKG
7440-23-5	SCOIUM	/790	,	99200	<u> </u>	ugʻL	523HNUS201	10-10	N/A	. 99790	1900000	N/A	NA	NO	BKG
7440-67-7	YANADIUM	64	├ ;─	64	i —	Tuo'i	523MW03D01	1/10	5 3 - 8.2	li 4	10.7	N/A	N/A	NO	BKG
744D-06-6	ZINC	- 68	<u> </u>	694	 	yo't	\$73MW07501	1/10	109-431	66 4	1 131 _	123	N/A	NO	BSL, BKG
Dissolved Metals							<u> </u>								
7440-38-2	(AKSENIC, FILTERED	. 31	Г —	3.5	, . <u> </u>	[ug/L	1 \$29MW(2831-F	11.2	2.3	<u> </u>	7.55	T - 4	N/A	LNOT	#SL .
7440-39-3	BARIUM, FILTERED	23 B	<u></u>	150		jugit	\$23MWy02501-F	2/2	N/A	153	124	N/A	N/A	50	NTX
7440-70-2	CALCIUM FILTERED	33000	1 —	45100	1-	ogt	S73MW025D1-F	7/2	N/A	45100	152000	N/A	N/A	NG	BKG
7439-89-6	IRON, FILTEREO	4416	· ·	15400	+	ugit	\$23MW025D1-F	272	N/A	15430	25300	NA	N/A	40	BKG
7429.92 1	LEAD, FILTERED		 	'0	1	ugiL	523MW02S01-F	† — 1/2 :	1.8	15	2.52	13	N/A	1 NO 1	9.SL
7419 95-4	MAGNES/UM, FILTERED	3770	 	5830		UavL	523ANY/02S01-F	2/2	N/A	5830	150000	I N/A	N/A	NO.	BKG
7439-98-5	MANGANESE, FILTERED	977	1	2650	1	ug/L	523MNV02S01-F	2/7	N/A	2650	9400	N/A	N/A	NO.	BKG
7440-09-7	POTASSIUM, FILTERED	5500	—	7343	1	Tugic.	523MW02501-F	7/7	NJA	734C	E0000	NIA	NIA	NG	BKG
7440-23-5	SODOM, FILTERED	49300		82600	† `	T John	5234NUS201-F	7/2	NIA	82600	1560000	N/A	N/A	NC	BKG
Miscellaneous Para		-7200	<u></u>			1 239 6						• • • •	-		,
F-14506	TALKALINITY	18	т ——	348	Τ —-	mgd	\$73MVVU3D01	. 10/10	N-A	348	1950	N/A	N/A	MO	BKG
7664-41-7	AMMONIA	016	 	0.54		тел	\$73MNU5201	313	NA -	-054	ND	NIA	N/A	No.	NIX
7664-41-7	AMMONIA AS NITROGEN	+ - 6.53 -	 	69	- 	mgil	S73ANV0ZSD1	67	100	69	ND	N/A		NO :	NEX
000.02-3	CHLORIDE	+	┼ ¹	174	-	TICL	\$23MW02\$61	10010	 	- 12ª	454C	N/A		⊢ ‱́~	BKG
(MCO-OE-3	TOTALONIUE	1 4.55		174		THEL		<u>, 1010 </u>	1100	<u> </u>	1. 4.746	1,100	<u> </u>		L., 676

OCCURRENCE, DISTRIBUITON, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN FOR GROUNDWATER AT SITE 23 MIGRATION PATHWAYS BASEWIDE GROUNDWATER OPERABLE UNIT REMEDIAL INVESTIGATION NSB-NLON, GROTON, CONCENTCUT PAGE 2 DF 2

Scenario Timeframe Future
Medium Groundwafer
Exposure Medium Groundwater
Exposure Point Tank Farm (Site 23)

CAS Number	Chemical	I Concembration I	Michigaya Chundhar	Maximum Concentration	Maximum Qualifler	Uniba	Location of Maximum Concentration	Detection Frequency		Cancentystian Used for Screening III	Background Value ⁽⁴⁾	CTOEP Surface Water Criteria ¹⁹	Criteria th	COPC Flag	Rationals for Contaminant Deletion or Selection ^{ro}
<u>E-11778</u>	HARDNESS as CADD3	22.3		257	_	mg/L	923MW03001	18/10	N/A	257	NU	N/A	N/A	NO.	N-X
14608-79-8	SULFATE	_7 G		47,2		ጥሮሴ	523HNJ82001	10:0	N/A	472	45 2	NVA	10A	140	NTX
000-09-0	TOTAL DISSOLVED SOLIDS	66.2		519	J	TGL	523MW02S01	10/10	N/A	519	6260	N/A	VIA	NO	BKG
	TOTAL ORGANIC CARBON	1		9		mol	523MW34501	10/10	N/A	9	37.7	N/A	NIA	140	BKG.
000409-9	TOTAL SUSPENDED SOLIDS	6 .	Ţ	169	٦	ጠሷቤ	523WW82\$8*	6/10	5000	169	23ti	N/A	N/A	NO	BKG

A shadge unity indicates that the concentration used for screening exceeds the extension or background value. A shadge short call name indicates that the chemical has been selected as a COPC.

Feetroles

- Sample and duplicate we counted as two separate samples when determining the maintain and maximum
 agreeted concentrations.
- 2. Values presented are sample-specific quantitation striks.
- 3 The maximum detected concentration is used for screening purposes.
- 95% Upper Tolerance Lend (UTL) of sile bacaground data.
- 5 Connecticul DEP Sorface Water Protection ontena
- 6 Connectical DEP Veralization college for residential exposures.
- 7 The chervical is solected as a COPC films maximum detected concentration exceeds the CTOPP surjects water protection or violations or criteria.

Associated Samples:

\$294W04901 \$294W04901 \$294W04901 \$294W04901 \$294W04901 \$294W02901 \$294W02901 \$294W02901 \$294W040901 \$294W040001 \$294W040001 \$294W040001

Definitions

ARAR/TBC = Applicable or Relevant and Appropriate Requirement/To Be Considered.

C - Carcinggen.

COC - Charmte' of Concern.

Jir Estimated Value.

N - Nordardinggen

NA F Not Applicable.

Rationale Codes

For Selection as a COPC

ASU - Above COPC Screening LeverARAR/TBC

For Elmination as a COPC:

BKG = Within Background Levels.

BSL - Below COPC Screening Level/ARAR/TBC

NTX = No Taxoity Information.

SUMMARY OF CANCER RISKS AND HAZARD INDICES FOR SITE 23 REASONABLE MAXIMUM EXPOSURES

BASEWIDE GROUNDWATER OPÉRABLE UNIT REMEDIAL INVESTIGATION NSB-NLON, GROTON, CONNECTICUT

Receptor	Media	Media Exposure Route								Chemicals with Cancer Risks > 10 ⁻¹	Chemicals with Cancer Risks > 10 ⁻⁵ and ≤ 10 ⁻⁴	Chemicals with Cancer Risks > 10 ⁻⁵ and ≤ 10 ⁻⁵	Hazard Index	Chemicals with HI > 1
Construction Worker	Groundwater	Dermal Contact	1.3E-09				0.0002							
Adult Resident	Groundwater	Ingestion	1 8E-06			Tetrachioroethene	0.01							
	1	Dermal Contact	8.5E-07				0.005							
	Į.	Inhalation (1)	1 8E 06			Tetrachloroethene	0.008	- · -						
		Total	4.5E-06			Tetrachtoroethene	0.02							

Notes:

1 - Inhalation risk is assumed to be equal to risk from ingestion for volatiles.

ATTACHMENT A.2
TABLES FROM STORM SEWER REHABILITATION

TABLE 1 DROTON STORM SEWER ACHIERALITATION PROJECT UNDERDRAIN WATER SAMPLING FOR CALMATER SEPARATOR (CWS) DETERMINATION MONTHLY SAMPLING RESULTS

ſ										
	Sample #	CW5-072500	QWS-082300	(7mS-10040)	<u> </u>	QW5-C31505	QW2)-641901	ØN\$-052301	CTDSP RSR	G7CEP RSR
1	Dox замуже	7/25/2000	873/2000	10/4/7000		2**5-2001	4/19/2001	5/23/2001	Surface Water Protection	Groundeque: Voial system
وعدد ويوفرني ويرازي ويستوع					NA.	101-11	<u>2011</u>		Chena "	Cotton a 16
Fuel Type Furgerarini	5075	ND	MO .	MD	NA NA	MA.	, , , , , , , , , , , , , , , , , , ,		NA.	NA NA
PH	EPA 150 1	6.2 sid Unca	6 3 sec Unics	6 I sig Ung	NA	NA NA	623	5.64	NA	. NA
Total petromore										
rydrec areens	4181	1 1 mg/t	≺r û wgā	<u> </u>	MA	RA .	52 ngh	0.35 mgA	NA.	NA.
Oil and grease	FP4 41.11	5 E mg/l	; U mo1	5 U mor!	NA .	· 44Å	97 mg1	'6 ~g/l	N/A	NA
Total auspended solids	EPA 160 2	€2 mg/s	720 mg/l	1400 mg/	45 G mg*	73 mgs	160 mg1	273 (194)	NA	NA.
Metate:	60±08	NA.	. wa* .j			egs. Tight Chanolyed	- ·	- Total Control of	- ·	·
A Commune		NA	11300		1360 (Asymbod)	1670 AC	2:50 (happeload)	Total Desoleed	· — ·	
Antirechy	- 1	NA.	1 1 1 1 1	— <u>*</u> *** -		-ND NC	*ND*!*ND*!	1328 NC	88300	- HA
Arana	——	NA.	13.4	22.7	-ND -ND	45	aria zen	21B NC		MA
Banum		NA.	169	723	6459 5630 <u>1</u>	6'69 3348	877U 453E	96 78 34 DB	NA .	· •
Baytter _	. 1	NA	76	93	MD 17B	ND(NG	0158 NO]			NA
Caumon		NA	0.8	38 35800	ND NO		ND NO	HO NO		h4
_Catour		NA I	32500		1,100 39260	35430 3 300	33700	. 7820C 2860U	- NA - 113	
Choran Cobal	_	· - NA · ·	- 196	26.4	249 ND 1	- 168 HD	128 43 <u>9</u>	5 58 - MG - MG - MG	- Ki -	44
Copper	_	NA.	35	₃	No	618 - 1 - 816	228 - MD - MD		10	- NA
Irpr.		NA I	= 1 ₆₂₁₀₀ 1	116000	15/30	74100 766B	1,000 - 756 -	67900 129	NA -	
Lasu : : ·		NA	73.7	937	T.9	10.1	16.1	285 ND		HA.
Magnesom		NA	79 50	12000	7.150 E560	A350 6850	6460 F560	6520 1 6400	NA	NA.
Manganeso		N4 NA	(540)	2220	884 601	856 562	1190 515	1630 476 ND 073		NA.
Mercury		·		<u>6 2</u>	MO T NO T	NO NO 318	ND . ND	ND 073	6 # 866	NA —
Polassur		NA.	- 6 55 +		- 5405 · + 5130	7:00 477CB	Sign Sign	47700 - 4 3308 ·	- NA	·
Saleraum	٠ ١	NA .	72	775	ND ND		50 · · · · ND · · ·	54 193	50	NA 1
		NA	7.0	·		NG1:: ND	4: ND	98 ND	· · · · · · · · · · · · · · · · · · ·	. NY_
500-17		NA.		51 80 0	41800 37500	35700 35700	44°00	46400 45400	<u>n#</u>	MA.
:halive		. NA	17	17 52.7	AGR NO	- 40 578 ND	ND		6) 	NA .
Variation Einc	· i	- - 6	10.5	32	555 445	465 108	Si + Si + Si + Si	979 440	122	NA
Syende	:	· · · · · · · · · · · · · · · · · · ·	RN	5.4	No. 1 44	NA T	NA THAT	- NA - NA	NA.	NA I
VOA	<u>0000</u>		i		<u> </u>	l = 1				
elrachtorse Pérel					ND .		ND .	02	, ha	- MU
ADY (LICI	DLM2		ļ	,		₁₀ -	· - _{vo} -	W9		—
Memane un produktione Einage 11 2 Inchapper 2				———!	+31	- NO				
Kurna I	87/pc	 -	····· · -		*",		·*** ·		NA	" -
Ometokouphalane			· ·			_ w2.	ND	<u>-</u>	NA	
Onthylphthelete			<u>'</u>			ND:	ND	22	NA.	
Display of malane]	ND .	15		
Вац2-[Шулахуііртіі ў діе Ран					1 25	,, <u>%</u> >,	ND	20	54	- ^^
Napříkalena	80.5		· ·	<u> </u>	··— _{ND}	ND	ND	0.375	—	
Phanamione			<u> </u>		3 00	f No	Nn	0.56	G3	NA NA
l upranitigne].	; — —	J 00		NG NG	u 58	3700	NY
Pylithe	· <u></u>	<u>.</u>	i	<u>. </u>	NO .	F No	NO		110000	<u>NA</u>
Senzo Bientras eine			!	. —	. <u></u> - <u></u> -	<u>ND</u>	<u>NL</u>	¢ 25.	0.2	NA
Chryshrie			· · ·	ł· — —		NO -	MD —-	05,7	NA	NA NA
BenzojaMuoianavene BenzojaMuoianavene	.	-	1		NO		- · · - NC ·	200	- 	· NA
Benrojaloviene	· · -	·-·	 -		· NG · ·	} % −	<u></u>	0.62	<u> </u>	NA NA
Dibenggia Aparthracene			-	·-··	· — ND		, NO	0.50	9 9 A	N.E
Benzalgh jostylenn			<u>i-</u>	l	NC NC	NO -		662	NA	NA ···

Motes NC • Not Detected

NA # Not Analyzed

NH - Ngl reported

- NH NG reported

 I hindusca annest vice value

 II Hindusca annest vice value

 III Hindusca annest vice value

 III Hindusca annest vice Celebrate

 Fill Ng Coutanated Flue Type Celebrate

 Pessicial-PCB compluings with not detected (Method QuM2 1)

 1. CoppER connectiation Standard Regulations, Rouderday, 1996

 2. Connecticus & Proposed Heilings in Rouderday, 1996

 2. Connecticus & Proposed Heilings in Rouderday, 1996

 2. Connecticus & Proposed Heilings in Rouderday, 1996
- Strating and delos that concentration exceeds the screening orders

ATTACHMENT A.3 RISKS BASED ON STORM SEWER REHABILIATION GROUNDWATER ANALYTICAL SAMPLING RESULTS

FABLE 4.1.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS. REASONABLE MAXIMUM EXPOSURES - STORM SEWER REHABILITATION SAMPLING RESULTS.

NSB NUON, GROTON, CONNECTICUT

Scorano Timoframo Future Mediumi Groundwaler

ဦးသင့်ရုံမှုရုံ Nedium - G<u>roundwater</u>

Exposure Rouss	Raceptor Population	Receptor Aga	Exposure Point	Parámeter Code	Parameter Definition	Value	JMs	Retonale: Reference	Iniako Equal-on' Model Name
Dermail	Construction Workers	Adult	5 % Z3	Dasvers	Dermaty Absorbed Dose par Event	Calculated	mg/c/n2-event	U S EPA 2004	Dermaily Absorbed Dose (mg/kg/day) =
				SA	Skin Surface Available for Contact	3300	cm2	UIS EPA 2004	
H				€v	Event Frequency	1	events/day	(0)	<u>CAovert x €V x EF x ED x SA</u>
				ET	Exposure Time	4	Nours/cay	11}	BW ± 4⁻
į į	i I			EF .	Exposure Frequency	30	deys⊅yeser	(1)	
•	1 I	'	1	ED	Exposure Duration	1	years	11)	See last for calculation of DAevent
]				8W	Bod, Weight	74	kg	J.S. EPA_:989	
				AT-C	Averaging Time (Cancer)	7555D	days	U.S. EPA, 1989	
	1			AT-N	Averaging Time (Non-Cancer)	355	days	US EPA. 1969	

Sources

1 - Prolossional judgment

U.S. EPA, 1969. Risk Assessment Guidanou for Superfund, Vol.1; Homan Heath Evacuation Manual, Part A. EPA-540/1-65/050

U.S. EPA, 2004 Risk Assessment Guidanse for Superfund (Part E. Supplemental Guidance for Dermal Risk Assessment) Final, EPA/S40/R/99/005.

Und Intake Calculations

Ingostion Intake = (IR-GW ± 5F x EDV(BW x AT) Demna intake = (SA x EV x EF x ED)(BW x AT)

Cancer Ingestion Intake = NA

Gancer Demis Intake - 5 546-02

Noncancer Ingestion Intaka = NA

Noncancer Derma Intake 1 3 876 400

TABLE 4 2 RMS

VALUES USED FOR DAILY INTAKE CALCULATIONS.

REASONABLE MAXIMUM EXPOSURES - STORM SEWER REPABILITATION SAMPLING RESULTS

NS8-MJON, GROTON CONNECTIONT

Sconano Tinettamo Fulure Medum: Groundwain Euposein Medium, Air

Бурсяціп Roula	Receator Population	Receptor Age	Saposkije Poeit	Parameter Code	Parameter Dofn son	Value	Units	Astonalei Reference	higky Eco≱ion/ Model Name
irhalatan	Construction Womers	Adu:	Sile 23	CA	Снетяса" сонсентации и ве	Cakubled	m2,413	VDEQ. 7004	Intaka (mg/kg/day) =
] OW	Chemical concentration in wester	Average	Lgt		
1	† I			CF	Conversion Factor	6 691	mg/ug		CANCALL XES A ED
				ĮΗ	Inhalator Rate	75	m3/hour	U.S. EPA, 1993	64 x A**
	· I			בי	Exposure Time		houreday	11)	
	- I		1	EF	Expansion Fraguetry	ນ	Сауыўна»:	(1)	CA = CW = CF × VF
				ED	Engosum Curation	1	years	(1)	
	<u> </u>			BM	Body Weight	70	. kg	US EPA, 1989	1
				AT-C	Averaging Time (Cancer)	25550	cays	4) S EPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	415 EPA 1989	
				VF	Votastgalion Factor	Capulated	(mg/m3)(mg/L)	VDFO, 2004	

Notes

1 - Professional judgesem

U.S. EPA, 1989. Ptyl: Assessment Gustania for Superfund, Vol.1. Human Heeth Evaluation Nitriust, Part A. EPA/5401-86/360.

U.S. EPA, 1993: Superfund's Standard Default Exposure Factors for the Central Tendericy and Reasonable Maint um Filiposure

VDEQ, 2004. Veginial Department of Environmental Quality (VDEQ, orange http://www.dag.eliele.va.us/mons/s/hominpage.html)

Unit injeke Calculations

propieto locada e (PR x ET a EF x FD)/(RW x AT)

Cancer inhalation inlane = 1,68F-64

Noncentger Integration (make # 1 17E 02)

TASLE 4 3 RME

VALUES USED FOR DAILY INTAKE CALCULATIONS REASONABLE MAXIMUM EXPOSURES - STORM SEWER REHABILITATION SAMPLING RESULTS

ASSIMION GROTON, CONNECTICUT

Scenario Tyneliame Fulure Medium Granindwarer

Exposure Medium, Groundwarer

Exposure Route	Receptor Papulation	Receptor Age	Ехразите ^о сылі	Parameter Code	Parameter Definition	Veteo	Unes	Reispale/ Reference	make Courton/ Model Name
ingeston	Residents	Chai	S te 23	CGW	Chemical Concentration in Groundwater	Marior 95% U.C.	mghg	J S EPA 2002s	Chronic Desylintake (CDI) (mg/kg/day) =
				CF	Conversion Factor	3 00.	mg/bg	-	1
				IR GW	Ingestion Hare of Groundwater	1.5	Lidey	U S EPA, 1954	CWACHAIR GWAEFAED
				EF.	Exposure Frequency	350	daystycar	U.S. EPA, 1994	BA • AT
				ED1	Exposure Sureton (Age 3 - 2)	2	years	U.S. EPA 1969	}
				ED2	Exposure Duration (Age 7 - 6)		yeare	U.S. EPA, 1969	i
				RW	Весу Мации	\5	4 9	U.S. EPA, 1991	}
				ALC	Averaging Time (Cancer)	2555C	days	U.S. EPA, 1989	į
				AT-N	Averaging Time (Nun-Canter)	2190	deys	U.S. EPA, 1989	
Germal	Residents	Crise	Sele 25	Daevert	Dermally Absorbed Dose per Event	Calculated	mg/tm2-event	U S EPA, 2004	Denically Assorbed Dose (mg/kg/cay) =
				S.A.	Skin Surface Available for Contact	5,600	¢m2	U.S. CPA, 2004	
	1			₹	Event frequency	,	eventsida,	U S EPA 2004	DARVETT LEVILER LED LSA
				ΕT	Exposure Time	0.75	hoursiday	US EPA 1997	0γν ≈ Λ*
				EF	Exposure Frequency	350	doys-'year	US EPA 1994	
				521	Exposure Duration (Age 0 - 2)	3	years	US EPA 1989	See lest for calculation of Disevers
				207	Exposure Buration (Age 2 - 6)		years :	US EPA 1389	
				BW	Sody Weight	15	kg	JS EPA, 1991	
	ĺ	İ		P. C	Averaging filma (Cancer)	25557	days	JS EPA, 1989	
	1			AT-N	Averaging Time (Non-Cancer)	2190	Gavs	J S. EPA 1989	

Sources

U.S. EPA 1989 Rink Assessment Gustande for Supplifunc. Vol.1. Numer Health Eveluation Manual, Part A. EPA/343/1-35/060

U.S. EPA, 1991. Risk Assessment Guidance for Superfund - Supplemental Guidance- Standard Detail Expositive Factors Inter in Final

U.S. EPA 1994, U.S. FPA Region I Risk Updates, August 1994.

U.S. EPA, 1997 - Exposure Factors Mandbook - SPANGC P-95/002Fill

U.S. EPA, 2002 Calculating Upper Confidence Limits for Exposure Point Concernations at Nazardous Waste Sites. I OSWEM 9285.6-10. December

U.S. EPA, 2004. Risk Assessment Gueance for Superlund (Part E. Superlena) Gudance for Ceimar Risk Assessment: Final EPA:540R-99005.

Unit Imake Calcutations

ingested make = (R.GW s FF s ED)(BW s AT) Demai intake s (SA » EV s EF s ED)(BW s AT)

 Cancer logesion Indoka (Age 0 - 2) = 2.745-06
 Cancer Dermalititake (Age 0 - 2) = 1.7(E+01)

 Cancer logesion Inlake (Age 2 - 6) = 5.48E-06
 Concer Derma-Intake (Age 2 - 6) = 2.4(E+01)

Noncance: Ingestion Intake # 9 596 05 Noncancer Dermit Intake # 4 225+02

TABLE 4 4 RME

VALUES USSO FOR DALY 'NTAKE CALCULATIONS' REASONABLE MAXAGEM EXPOSURES - STORM SEWER REHABILITATION SAMPLING RESULTS

NSS-NUON GROTON COMMECTICUT

Scenario Timeframe Futuro

Medium Groundwater

Exposure Medicani Groundwater

Supazure Route	Recopius Population	Receptor Age	Еирозска Ролч	Para-melar Code	Parameter Definition	Vaun	Urals	Rafionale/ Reference	iniaks Equation Model Name
ingestion	Residents	Addi	Sile 23	EGW	Characa Concentration в Симориалия	95% UCL or Mex	ıçı	⊔ S EPA 2002	Chronic Daty Mare (CDI) (hg/kg/day) r
1	}			Ç€	Conversion Factor	0 001	mgalg	-	
	i I			.R-GW	Ingesion Rate of Groundwaler	?	Uday	U.S EPA 1994	CWACFARRIGWAEF • ED
				ני	Ciposure Frequency	350	days/year	U 5 EPA, 1994	8w x A*
				ED1	Exposure Duration (Age 10 - 16)	10	years.	U S EPA 1989	
					Fuporure Duration (Age 16 - 30)	14	years	U 5 EPA, 1989	
		;			Body Wingh:	70	143	U S EPA 1389	
				ı	Averaging Firms (Gancer)	25 593	days	US FPA 1989	
					Averaging Time (Non-Dencor)	9.650	Days	U.S. EPA 1989	
Dema	Reserves	Adult	Sel= 23		De maily Absorbed Cose per Event	Cakulated	ngkm2-even)	U.S. EPA, 2004	Bermally Absorbed Bose (mg/kg/day) -
				5A	Skin Surface Available for Contact	18 000	(m²	JS FPA 2304	
				ני	Event Frequency		aventa/day	J S [PA, 2004	DAMEN'S EVY SE - ID + SA
				FT	Espasure Time	3 25	1 SEPTIMENT OF THE PERSON OF T	JS EPA 2004	θγν = A*
		1		Ŀ⊦	Exposure Frequency	350	09/2/year	J S. EPA 1994	
ļ				ED1	Exposure Dereton (Age 10 - 16)	-0	years	U.S. EPA, 1989	See test for calculation of Different
Ĭ				E02	Exposure Duration (Age 16 - 30)	14	ye∎rs .	U.S. EPA 1989	
•				BW	Body WegM	76	*9	U.S. EPA, 1989	
				AT-C	Averaging Tatio (Center)	25,550	(Legy)	US EPA 1980	
<u> </u>	[<u>.</u>	AT-N	Averaging Time (Non-Cancer)	3.850	ವರ್ಷಕ	U S EPA 1989	<u> </u>

Sources

U.S. EPA, 1989, Hist, Assessment Guidence for Superland, Vol.1, Human Hearth Evaluation Mentur, Parl A. EPA/540/1-65/060

U.S. EPA, 1991, Risk Assessment Gudanon für Supperfung - Suppernentat Gudanos- Standard Delaufi Exposura Factors Intel im Ferak

U.S. EPA 1894 ILS EPA Region I Risk Updates, August 1894

U.S. EPA 1997 Exposure Factors Harragons III S. EPARKOUS BM002FA

U.S. EPA 2004 Risk Assessment Guidance for Superfund (Pan F. Supplemental Guidance for Dermal Risk Assessment) Final EPA/S4(VA/S9005

Unit Intaka Calculations

Ingestion misks = (IR-GW x EF x ED)(BW x AT)

Dental (misks = (SA x EV x EF x ED)(BW x AT)

 Cancer Ingestion Intake Age 10 - 167 : 0.918-06
 Cancer Deima, Intake Age 10 - 167 : 0.918-06
 Cancer Deimatintatio (Age 16 - 30) - 4.938-06

 Cancer Ingestion Intake Age 16 - 30) - 5.468-06
 Cancer Deimatintatio (Age 16 - 30) - 4.938-06

Nancariter Ingestion Indiae # 6 588 05

Mondancer Dermat Intaka × 5 92€ • 02

TABLE 4.5 INTERMEDIATE VARIABLES FOR CALCULATING DA(EVENT) SITE 23 - STORM SEWER NSB-NLON, GROTON, CONNECTICUT

Chemical of	Media	Dermal Absorption	FA	K	0	T(ev	rent)	Ta	iu	7	-	P
Potential Concern		Fraction (soil)	Value	Value	Units	Value	Units	Value	Units	Value	Units	Value
Volatile Organic Compounds	·				•							
Tetrachio pelhono	Groundwater	NA,	1	3 3 £ - 0 Z	cm/hr	4	hr	9.1€-01	hr	7.2E+00	hr	1.7E-01
Semivolatile Organic Compo	unds					_						•
Benzo(a)anthracene"	Groundwater	NA NA	NA	NA NA	NA	NA .	NA NA	NA NA	NA	NA	NA	NA
Benzo(a)pyrens ⁽¹⁾	Groundwater	AA	NA NA	NA .	NA	AN	NA NA	NA.	NA	NA NA	NΑ	NA.
Benzo(b)!luoranihene ⁽¹⁾	Groundwate/	NA NA	NA	NA	NA	NA	NA.	NA NA	NA.	NA NA	NΛ	NA .
Benzo(g,h,i)perylenc ⁽ⁱ⁾	Groundwater	AN	NA	NA	NA	NA.	NA.	NA	NA	NA.	NA	NA.
Benzo(x)fluoranthene'''	Groundwate/	NA NA	NA	. NA	NA	NA	NA.	NA I	NA	NA NA	NA	NA
Bis(2-Ethylhexyl)phthalate	Groundwater	NA NA	0.8	2 5E-02	em/hr	4	hr	1.7E+C:	hr	4.0E+01	the .	1.9E-01
Chrysene ^(*)	Groundwater	NA NA	NA	NA.	NA	NA.	NA	NA NA	NA	NA NA	NA.	NA.
Dibonzo(a.h)anthracene'1'	Groundwater	NA AN	NA NA	NA NA	NA	NA.	NA.	NA 1	NA NA	NA NA	NA.	NA.
Diothylphthalate	Groundwater	NA NA	1	3.9E-03	cm/hr	4	hr	1.9E+00	hr	4.5E+00	hr	2.2E-02
Denethylphinalate	Groundwater	AN AN	i	1.4E-03	cm/hr	4	- Thr	1.3E+00	hr	3.1E+00	חר	7.4E-03
Di-n-butylohthelate	Groundwater	NA.	0.9	2.4E-02	cm/hr		br	3.9E+00	- br	9.3E+00	br	1.5E-01
Fluoranthene ⁽¹⁾	Groundwater	NA NA	NA	NA.	NA	NA.	NA.	NA	NA.	NA NA	NA	NA
Naphina'eng	Groundwater	NA NA		4.7E-02	cm/hr	4	ħr	5.6E-01	hr	1.3E+00	hr	2.0E-01
Phenanthrene ⁽¹⁾	Groundwater	NA.	NA NA	NA T	NA.	NA.	NΑ	NA.	NA	NA NA	NA.	NA
Pyrene	Groundwater	T NA		1 9E-01	<u>բա/ի</u> բ	4	hr	1,4E+00	br	5 55+00	hr	1.1E+00
Inorganics		<u> </u>					•			,		
Aluminiahi	Groundwater	NA I	· 1	1.0E-03	cm/nr	4	h.r	AN	NA	NA I	NA.	NA.
Antimony	Groundwater	NA.	1	1.0E-03	çm/hr	4	hr	NA	NA	NA	NA	NA.
Arsenic	Groundwater	NA NA	1	1.0E-Q3	cm/hr	4	he	NA	NA	NA NA	NA	NA
Bar um	Groundwater	NA NA	•	1.0 E-0 3	cm/hr	4	h-	NA NA	NA.	NA	NA	NA.
Beryll:um:	Groundwater	T NA	:	1.0E-03	cm/hr	4	hz	NA	NA	, NA	NA	NA
Chromium	Groundwater	NA	<u> </u>	2.0E-03	cm/hr	4	hr_	NA.	NA	NA .	NA	NA
Cobalt	Groundwater	AN	:-	1 0E-03	covhr	_ 4	hr_	NA J	NA	NA	NA	NA
Copper	Groundwater	NA	_ 1]1.0E-D3	cm/hr	4	hr	NA	NA	NA	NA	NA
Iron	Groundwater	NA [1	1.0E-03	cm/hr	4	ħr	NA :	NA	NA NA	NA	NA
Manganese	Groundwater	NA.	1	1.0E-03	em/hr	4	hr	NA	NA	NA_	NA .	NA.
Selen um	Groundwater	NA NA	1	1.0E-03	çm/hr	4	ħr	NA	NA	NA NA	NA .	NA
Silver	Groundwater	NA.		6.0E-04	cm/hr	- 4	hr	NA	NA	NA	NA	NA
<u>Zinc</u>	Groun/Jwælet_	NA	1	6.0€-04	cm/hr	4	hr	NA.	NA	NA	NA	ŅΛ

Notes:

All values from EPA's Risk Assessment Guidance for Superfund Volume 1: Human Health Evaluation Manual (Part E. Suppliomental Guidance for Dermal Risk Assessment) Final, July 2004.

1 - RAGS Part E recommends that dermal exposures to PAHs in water should not be quantital vely evaluated in the risk assessment.

FA = Fraction Absorbed Water

Kp = Dermal Permeability Coefficient of Compound in Water

T(event) = Event Duration

Tau = Lag Time

T* = Time to Reach Steady-State

 $B= \hbox{Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis$

NA = Not applicable.

TABLE 5.1 NON-CANCER TOXICITY DATA -- ORAL/DERMAL SITE 23 -- STORM SEWER NSB-NLON, GROTON, CONNECTICUT

Chemical of Potential	Chronici Subchronic	Oral	R/D	Oral Absorption Efficiency		D for D+rmal [∞]	Primary Terget	Combined Uncertainty/Modifying	R/D:Targ	et Organ(9)
Concern	<u> </u> [Value	Unite	for Dermui ¹¹	Value	Unif	[6 r4210	Factors	Source(s)	Detele!
Valatila Organic Compounds										
Tetrachloroethore	Chronic	1 0E-02	mg/ag/day	1	7 QE-02	mg/kg/day	Live	1909/1	IRS	4/73/2008
Semivalatile Organic Compo-	unds					_				
Berso(n)anthracene	NA .	NA	NA_	NA I	NA.	NA NA	NA NA	NA NA	NA.	NA
Benzoja)gyrene	NA	NA.	MA	N/A	NA.	NA.	NA.	NA.	NA.	NA.
Bergojo)Nuoranthene	NA.	N.A.	NA.	NA.	NA.	NA NA	NA .	NA.	NA.	NA.
Berzaig.h.i)parylengii:	Chromic	3.0⊢-42	mg/kg/day	1	3.08-92	mg/k;;/day	Kidney	3000/1	IRIS	4/23/2068
Benzyjk)fluuranthene	NA NA	NA	NA	NA I	NA	NA.	NA.	NA	NA	AA.
Bix(2-othy/hexyl)ohthalale	Chronic	2 05-02	mg/kg/day	† - 1	2 CE-Q2	mg/kg/day	Liver	1000r1	IRIS	4/23/2008
Chryseire	NA NA	NA.	NA.	NA NA	NA.	NA	NA.	NA.	NA .	NA.
() bengs(a.l· janihracena	NA NA	NA.	NA -	NA I	NA	NA.	SA.	- NA	NA	. NA
Diethyolynaiale	Chronic	8 05-01	mg/kg/day	T 1	8 CE-01	mg/kg/day	Body Weight	1005.1	IRIS	4/23/2008
Dimethy shine alle	NA NA	NA	NA NA	NA NA	NA.	NA.	NΑ	NA.	NA.	NA.
Dinibuty physalate	Chronic	1 05-01	πg/kg/day	 1	1.05-01	mg/kg/day	Mortality	1000/1	IRIS	4/23/7008
Factorian thomas	Chronic	▲ 0E-02	mg/kg/day	 "	4 02-02	nigAg/day	Liver	3006/1	IRIS	4/23/2008
Nach!Na-9ne	Chronic	2 05-02	mg/kg/day		2 0E-02	myktyday	Body Weight	3000/1	.8.8.	4/73/2008
Pnorantiiene ⁽³⁾	Chronic	3 GE-02	mg/kg/day	 	3 0 E-0 2	molegiday	Kidney	3000/1	IR.S	4,23/2G0B
² yre∩e	CMpniš	3 CE-02	maykaday	1 1	3 0F-02	mg/kg/gay	Kidney	3300/1	IRIS	4/23/2008
Inorganica	· <u> </u>						<u></u> -			
Numnum	Chronic	1 0E+20	rhg/kg/tlay		1.05 -00	mg/kg/gay	CV\$	100	оρητγ	10/23/2006
Antinony	Chronic Chronic	4 0E-04	mg/kg/day	0 15	#: 0E-Q5	mg/kg/cay	Bloog	1000/1	iRS	4/23/2508
Arsenic	Chronic	3 GE-04	rep/sq/day	1 1	3.0E-04	mg/kg/day	SEm, CVS	3/1	IR (5	4/23/2008
Berom	Chronic	2 0E-01	mg/kg/day	0.07	14E-02	mg/kg/bay	Kidney	359/1	IRIS	4/2302008
Benyllut	Chronic	2 OE-03	mg/kg/day	0.507	14E-05	mg/kg/day	G8	300/4	IRIS	4/23/2008
Chremium	Caronic	3 0F-D3	mg/kg/day	0.025	7 5E-05	mg/kg/day	Fulcionatily, GS, Bone	300/3	IRIS	4/23/2008
Cobat	NA NA	NA .	NA	NA NA	NA.	NA	NA.	YA	٧٨	NA NA
Goaper	Chronic	4 0E-02	mg/kg/day	 	4 0E-02	mg/kg/day	65	NA NA	PEAST	7/1997
ron	Chronic	7.0E-01	mg/kg/day	 	7:0E-01	mg/kg/cay	GS	15	PPRTV	9/11/2006
Manganesa	Chronic	2 4E-02	mg/kg/day	0.04	9 6F-04	mpliquay	CNS	1/3	IR15	4/20/2008
Salowern	Chronic	5.06-03	mg/kg/day	1 1	5 0E-03	mg/kg/day	Skin	3/1	IRIS	4/73/2008
Siver	CMonic	5 GE-03	morkgiday	0.04	2 0E-04	mg/kg/day	Skon	3/1	IRIS	4/23/2008
Zinc	Chronic	3 0F-D1	mg/kg/day	 	3 0E-01	памакау	Blood	3/1	IRIS	4/23/2008

Notes.

1 - U.S. EPA, 2004. Risk Assessment Guidance for Superfund (Pen E, Supplementa Guidance for Demet Risk Assessment) Internm. EPA/S40/R/99/005.

2 - Agusted dermat RfD - Oral RfD x Crat Absorption Efficiency for Dermat

3 - Values are for pyrene.

Delimbons

CNS * Carroll Nervous System

CVS = Card 6-vascular system

USEPA(1) * Braft Thoriforbethyland Health Risk Assessmant, Synthesis and Characterization, August 2001.

USEPA 1 = U.S. EPA Region 3 RBC Table, October 11, 2007.

GS n Gastrointésimal system

IRIS - niegrated Risk information System.

NA - Noi Appitable

TABLE 5.2 NON-CANCER TOXICITY DATA -- INHALATION SITE 23 - STORM SEWER NSB-NLON, GROTON, CONNECTICUT

Chemical of Potential	Chronit/ Subchronic	inhai a i	ion Rt¢	Extrapol	ated RfD ⁽¹⁾	Primary Target	Combined Uncertainty/Modifying	RfC : Tan	get Organ(s)
Concern		Value	Units	Yakus	Units	Organ(s)	Factors	Source(s)	Date(s) (MA//DD/YYY)
Volatile Organic Compounds									
Teleschloroschene	Civanic	2 8E-01	ան,ա,	8.DF-C2	(mg/kg/day)	LIVer	NA	USEPA III	10/11/2007
Semivolatile Organic Compounds	1				_				
Renzo(aljanthracone	NA	NA.	NA.	NA	NA.	NA NA	NA NA	NΑ	MA
Benzo(4)pyrene	NA	NA	NA	NA.	NA.	NA.	NA NA	NA	NA
Benzo(b)fluoranihene	NA NA	NA.	NA NA	NA_	NA	NA	NA NA	NA	NA.
Bur zo(g.huperylene	NA.	NA	NA.	NA	NA.	NA	NA.	A:A	NA.
Benzo(k)fluoranthece	NA NA	NA	NA.	NA	NA .	NA .	NA	NA _	\A
9:s(2-Ethymexys)ph@alate	NA.	NA .	NA	NA.	NA	NA NA	NA,	NA	NA.
Chrysene	NA NA	NA .	NA.	NA	NA.	NA.	NA,	NA NA	
Desenzo(a htantriacene	NA NA	NA.	АИ	NA.	NA NA	NA	N/A	NA	NA NA
Destryighthatatu	NA 1	NA.	NA.	NA.	NA	NA	14A	NA _	NA .
Ovnethylphihalate	NA	NA	NA.	NA.	NΑ	NA	NA .	NA	5A
O∘c-butyliphihalate	NĀ.	NA.	NA	NA	NA.	NA	NA.	NA	NA.
Fluoracihene	NA	NΑ	NA.	NA NA	NA.	NA NA	NA NA	NA.	NA.
Nappe Brane	Chronic	3 08-03	mg/m³	8 6F-04	(mg/kg/cay)	Nasal	3000/1	JRI\$	4/23/200B
Phor atthree	NA .	NA.	NA.	NA	NA.	NA	NA NA	NA	NA.
Pyrens	NA NA	NΑ	KA.	NA.	NA NA	NA.	AN	NA.	NA
Inorganics									
Aluminum	Chronic	Q (005	mg/m3	1.4E.C3	(mg/kg/day)	CNS	300	PPRTV	10/23/2006
Anamony	NA NA	NA	NΛ	N.A.	NA .	NA.	NA NA	NA	NA
Arsenic	tea	NA	NA.	NA.	NA.	NA NA	NA NA	NA	NA
อีลค <u>่</u> ยสา	C≯ronic .	5 OE-04	mg/m3	1.4E-04	(mg/kg/day)	Fetalaxioty	-900	FEAS1	7/97
Beryllun:	Chronic	2 0E-05	mgim3	5 7E-06	(mg/kg/day)	GS	10/1	IRIŞ	4/23/2008
Chroman	Chronic	1.0E- 0 4	nvg/m³	2 9€-05	(mg/kg/day)	Lungs	300/1	IRIS	4/23/2009
Cobalt	AM	NA	NA	NA	NA .	NA.	NA	NA.	NA.
Copper	AM	NA	NΑ	NA	NA NA	NA.	NA .	NA	NA NA
Iron	NA NA	NA	NA.	NA	NA	NA,	NA NA	NA.	NA NA
Manganose	Chronic	5 DE-05	mg/m ²	1,4€-05	[mg/kg/day]	CNS	1000/1	IRus	4/23/2008
Selenium	NA I	NA .	NA.	NA.	NA.	NA NA	NA NA	NA	NA.
Silver	NA NA	NA .	NA NA	NA	NA.	NA .	NA NA	NA	NA.
Zinc	NA NA	NA.	NA.	NA	NA.	NA.	NA NA	NA.	NA.

Notes

1 - Skirapolated RIO = RfC *20m³/day / 70 kg

Defindens:

GNS = Central Nervices System

USEPA III n D S. EPA Region 3 RBC Table, Octobre 11, 2007.

GS = Castronlesteal

HEAST= Heath Effects Assessment Summary Tables

RIS = Integrated Risk Information System

NA v Not Applicable

TABLE 6.1 CANCER TOXICITY DATA -- ORAL/DERMAL SITE 23 - STORM SEWER NSB-NLON, GROTON, CONNECTICUT

Chemical of Potential	Oral Cancer	Slope Factor	Oral Absorption Efficiency		cer Slope Factor ermai ⁽²⁾	Weight of Evidencer Cancer Guideline	Ora	II C5F
Concern	Value	Units	for Dermei ⁽¹⁾	Value	Units	Description	Source(s)	Date(s) (MM/DD/YYYY)
Volatile Organic Compounds								
Terrachioroethene	5.4E-01	(mg/kg/dayl-1	1	5 4E-01	(mg/kg/day)-1	NA NA	.RIS	4/23/2008
Semivolatile Organic Compo	unds.							
Senzo(alanthracene	7 3E-01	(mg/kg/day)	Ť	7.38-01	(mg/kg/day)	B2	U\$EPA(1)	7/1993
Senzo(a)pyrene	7.3E+00	(Tig/kg/day)	· · · · · ·	7.3E+00	(mg/kg/day)	62	IRIS	7/20/2007
Henzo(t)/M.oranthene	7 3E-Q1	(Pig/kg/day)	1 · - -7	7 35-01	(mg/kg/cay)	92	USEPA(1)	7/1993
9enzalg.h.ilperylene	NA	NA	NA.	NA.	NA.	0	IRIS	
Senzo(k)fluoracthene	7.3F.42	(mg/kg/day)	f:	7 3E-02	(mg/kg/day)	62	USEPA(1)	7/1993
Sis(2-ethylhexyl)phthalate	1 4E-02	[mg/kg/day)	<u> </u>	1 45-02	[mg/kg/day)	92	IRIS	4/23/2006
Chryse-e	7 3E-G3	(mg/kg/cay)	1	7 3E-03	(mg/kg/day)	B2 ,	USEPA(1)	7/1993
Dibenzo(a,hjanlfiracene	7 3E+00	(mg/kg/day)	1	7 3E+00	(mg/kg/day)	B2	USFPA(1)	7/1993
Diethylphthalale	NA NA	NA	NA	NA	NA NA	U	RIS	4/23/7008
Omelnytphthalate	NA NA	NA.	NA.	NA	NA NA	U U	IRIS	4/23/2008
Di-r-butylphihalate	NA.	NA.	N/A	NA	NA NA	D	IRIŠ	4/23/2008
Fluoranthene	NA.	NA.	NA	AN	NA.	0	IR:S	4/23/2008
Naphtraiene	NA.	N.A.	NA	NA	NA.	C	IRIS	4/23/2008
Phenanihrena	NA .	NΑ	NA	NA	1.A	0	IRIS	4/23/2008
Pyrone	NA	NA.	NA	NĄ	NA.		IAIS	4/23/2008
Inorganics								
Aluminum	NA.	NA	NA :	NA.	NA.	NA I	NA.	NA NA
Anianocy	NA.	NA.	NA -	NA.	NA .	NA NA	NA.	NA NA
Arsenic	1 95+00	[mg/kg/day)	1	1 5E-00	(mg/kg/day)	A	IRIŞ	4/23/200B
Barum	NA.	NA.	NA NA	NA.	NA.		IRI\$	4/23/200B
Beryllsum	NA.	NA.	NA	NA	NA	B1	IRIS	4/23/2008
Ct romium	NA	NA	NA NA	NA.	NA NA	D	IRIS	4/23/2008
Собал	NA	. NA	NA NA	NA	NA NA	NA NA	NA.	NA.
Соррег	NA.	NA.	NA NA	NA.	NA NA	0	ikiS	4/23/200B
Iron	NA.	NA NA	NA.	NA,	NA	NA	NA.	NA NA
Manganese	NA.	NA.	NA .	NA	NA	מ	IRIS .	4/23/2008
Spiens m	NA NA	NA NA	NA.	NA,	NA		JRIS	4/23/2008
Silver	NA.	NA.	NA .	NA.	NA.	D	IRIS	4/23/2008
Zinc	NA.	NA.	NA NA	NA	NA.	NA T	NA	NA.

Notes

- 1 U.S. EPA, 2004. Risk Assessment Guidance for Superfund (Part E. Supplemental Guidance for Dermat Risk Assessment) Intunin. EPA/540/R/99/005.
- 2 Adjusted cancer slope factor for dermal =

Oral cancer slope factor / Oral Absorption Efficiency for Dermal.

USEPA III > U.S. EPA Region 3 RBC Table, October 11, 2007

"RIS = Integrated Risk Information System.

NA = Not Available

EPA Group

- A Human cardinogen
- B1 Probable human cardricgen indicates that knoted human data are available.
- 82 Probable human cardregen indicates sufficient evidence in animals and inadequate or no evidence without and ...
- C Possible human caramogen
- Di-Not classifiable as a human caronogen.
- Ell-Evidence of noncarcinogenicity

USEPA(1) = U.S. FPA, Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons, July 1993, EPA/600/R-93/099

TABLE 6.2 CANCER TOXICITY DATA — INHALATION SITE 23 · STORM SEWER NSB-NLON, GROTON, CONNECTICUT

Chemical of Polympsi	Unit i	Risk	1	n Gençer Fector ⁱⁿⁱ	Weight of Evidence/ Cancer Guldeline	Unit Risk . I	mhalelion CSF
Concern	Value	Units	Value	Unite	Description	Source(s)	Date(s) (MN/DD/YYYY)
Votațiile Organic Compounds							
Tetrachiarcettione	5.7E-05	(ug/m³) '	2.05-02	(mg/kg/day) ^{**}	.ea	USEPA II.	10/11/2007
Semivolatite Organic Compou	nds						
Benas(alanthré06ne	NA.	44	NA.	NA .	NA.	NA	NA_
Berup(a)py rene	8 9⋶-04	(Lg/m²) 1	3 1E-00	(me/kg/day)	NA	DSEPA III	10/11/2007
Benzo(b)Nyoramhene	^A	NA	NA.	NA NA	NA.	AA	NA NA
Benzolgih, Iperylene	NA NA	NA	NA.	NA.		IRI5	4/23/2008
Benzojk filogranihene	N/A	NA	NA	NA.	NA NA	NA.	NA
8x(2-Etrythexyl)phthafalo	NA	NEA	NA NA	NA.	82	RIS	4/23/2008
Chrysene	NA NA	NA	NA.	NA I	NA.	NA.	NA.
O benzo(a)nyanthracene	NA NA	5	NA.	NA	NA .	NA	NA
D-ethyphthafale	NΑ	NA	NA	NA	D	RI\$	4/23/2008
Omethylonicalate	NA .	NA.	NA.	NA NA	D	13:5	4/23/2008
Di-n-buty-phma-ale	NA.	NA	MA	NA NA	0	# \$	4/23/2008
Fivorantiens	NA I	VA.	. NA	NA.	D	RIS	473/2008
Naphthalene	NA .	NA	NA.	NA .	С	iRIS	4/23/2008
Phenanthrene	NA NA	NA	NA	NA .	Ð	IRIS	4//2/2008
Ругиле	NA	NA.	NA	NA	D	RS	4/23/2008
norganica							
Naminum	NA.	NA	8A	NA	NA .	NA	NA.
Antimory	NA NA	NA	NA	λA	.NA	NA.	NA_
A/seruc	4 3E 43	{u3/m²/	1 55+01	(mo/ks/day)	A	,२८5	4/23/2008
9anum.	NA NA	N/A	NEA	NA NA	D	श्रद	4/23/2008
Begdam	2 4E-03	(ug/m²) ¹	8.45+00	ime pangani	B1	R'.S	4.23.7008
Chromum	1.2E 492	υς'm²) '	4.25+01	(mg/kg/day)	А	15.0	4/23/2006
Dobalt	NA.	NA .	NA	NA.	NA.	NA	KA
Соррег	NA.	NA.	NA NA	NA .	. 0	àнı ş	4/21/2008
ron	NA NA	NA.	NEA	NA NA	MA	A.P	MA
Vangavese	AN	NA.	NA.	NA.	J	R.S	4/20/2006
jelenum	N/A	. NA	NA NA	N/A	0	(815	4/23/2008
Silver	NA NA	NA.	MA	N/A	5	IRIS	4/23/2008
Unc	NA.	NA.	NA.	NA NA	0	ลเร	4/23/2006

Notes

1 - Inhate; on CSF = Unit Risk 170 kg J 20m³iday.

Definitions

IR.5 = Imagrated Risk information System

NA = Not Available.

USEPA: I • U.S. EPA Region 3 RBC Table, October \$1, 2007.

EPA Groups

- All Human card nogen
- B1 Probable human cardwogen indicates that smiled human data are available
- 92 Probable human caromogen indicator sufficient evidence in animals and -hadequate or no evidence in humans.
- Ci- Possible human caronogen
- Di- Not classifiable as einuman carchoges.
- Fig. Evidence of noncarcinogenicity

ANG 71 RME

CAUGULAY ON OF CHUNKAL MANCER RINKS AND NON-MANCER HAZARGS.

REASONABLE WARROW EXPOSURES - STORM SEWER REHABL ITATION SAMPLING RESULTS

NSB NION GROTON, CONNECTIONS

PAGE 1 CF 2

Stateno Timelijano Filiada

Reventor Population - Construction Workers

Groups of Age (Adult)

Medium	Exposure Meanum	Exposure Power	Exposure Rouse	Commental	E	PC	l.,	<u> </u>	<u>معرسية</u> هناه و <u>م</u>	Mr.		<u> </u>	Her Ca	rcar Hazard (Modesom	
			1	folenias Çoncem	Value	U-4s	Market Expose	e Ctrue-Yellon	CSF/J	AT ROM	Carcertta	Імаце-Терова	e Concentration	4	TANK.	HEZAG GLOSEN
		<u> </u>		<u> </u>			value .	V/48	VBGB	Unny		VipA,mi	UV	YANA	3-46	1
	Control of the	549.73	04	Aumen	2,40	ugt	561-67	Img/sg sant	**	hudadeesh),		39045	(mg/sg/day)	106-00	(w3x0,042)	5 0000A
		I	1	Arbren	3.20	uot.	7 -E.13	Imphy Ser!	- 0.	(mg hgreass)	l ,	506-05	(mg/kg/Bey)	60(45	(mgrapHs4)	concer
		I	l	Appart of	9.3	- og %	3 ct - 58	Img bg cay;	1.50,700	(1750/16/01/05)	\$ 205-000	14E 07	imphip (tas)	3.02.04	,-grigina.)	0,0005
			1	Ban.m	96 r	195	2 16 G#	Imphoras.	NA.	- ~g^		1500	(mg/tig/ttag)	141.62	:mg&guarri	> 00001
			1	Barton	0.960	102	226.00	umphy dept	NA.	(mg/spds/r)		156.08	img sgrown	148.05	[mg/gdati	6 501
			ľ	Çhram-ym	6 39	-0-	7 97 39	implig day,	745	(Aug Sign Cary)		29€ €7	(mg/kgrawy)	196.00	(mg@grier)	6 003
			l	Cotes	4.40	-9 9%	9.78,13	Imaging Say:	No.	inghipasi)		4 15 46	(mg/kg/day)	44	(ng)gden	-
			i .	Copper	10.6	- PA	7 10-09	imatgas;	HA	- mg/kystenni'		146.07	img figlda _{1.1}	4.06.02	:mongrase;	0.000004
			1	'or	€7500	- 1974 - 1974	7.46 CS	,−g>yda,	ME	**************************************		97E-04	(mg/lighter)	7 DF -01	Imphysions	6.901
				March 444	1500	49%	368.07	Img/scay:	NA.	(mg/kgrásy)		2 5€ 05	Img/\graph_1) 46E (4	(1989/1997)	0.03
			L	Selector	5.40	19g*	1.26-09	img%p tay:	×.	ing hypesy."		147-08	(mg/kg/day)	507 43	(mg@gder)	0.000002
			1	50	150	ogt.	756.0	imphoses:	NA	/mg/ngdays*		145.08	ing hardens	2 0E-34	(mg/kg/day)	p uouos
			1	Zec	67.9	ug V	1 26 GB	,−g≯grts;	NA.	, sapaginani		LTTCT	Authorities (1	304-04	(Mg\$graer)	0.0000009
			[*etracPhone Prece	0.500	19%	5 °E 09	may by Capi	54E41	img Sg (tug)	2 65 29	3 SE-07	Inghip also	109.42	100 phase 1	0.00004
			i	Comediyabichalare	1.10	-43	ser-io	Imglig cay)	NA.	1-20-20-0371		3 3E DE	img Ng day)	¦ 44	- imaginari	-
			1	Conthylph Solution	70 0	w.	1.3E-08	rmg*g-bay)	ME	mg/kg/day i *		1 35 06	und yighter)	801-01	, ingagones	0.000003
	-		1	De la Companion Mariante	.50	99%	1.35 (21	(mg%g.asy)	NA	,mp/spdsyr	ŀ	F16-06	(Add of the State	10£-5:	[mg/gdm/l	0.00009
	<u> </u>		;	Ber 5 Ethalte verson zware	20.0	ug/.	\$17-07	(mgagas) i	1 45 462	PQ*Q*ani*	1 61-98	198.00	(mg/kg/qayr)	2.06.42	1-45-348-1	C 503
		\	1	Naphtheese	0.316	Og/L	1 SE 39	ing % dept	*	(mg/sg/day)*	1	3,41-97	Implement	7 707-02	(mgAgAsa)	9 30002
				Congression (eg	0.563	94	2.05+00	المجه والأرساد	444.	(mg/cg day)		6.35 +00	(mag/ag/mag)	**	(mg/kgrdas)	-
		ļ		Photo protection and the second	0,000	vgt.] :aC∗au	imples seri		Imgreposo "		> 26 - 20	img#g/bay,	4 00 02	inighy08))	-
				- Carrier	0.520	Ugst.	378.58	300g NS 1441	u	(mg/kg/day)	1	268.06	(my highland)	3 CE 07	(mg/kg-day)	9,00000
				Genzalan was en	0.250	work	¢ de ∙ou	Img/se sayl	£31-5°	img7 g day; "		6:55:00	Imd.r.Puth!	HAT	imp@ptusy	-
				Chrysone	0213	og/.	G 5E+20	language of	T)E-03	Imphacas."		206.00	(mg/sp-8ay)	NA NA	-mg/sp/pays	Ļ
			1	de-voib#ke/#mhene	0.450	495	2.0E+00	Indo Spicest	r 3F-51	[mg196ss)"		24€+00	(400,000,000)	- NA	(naMartan)	j -
				Berrojk Pluor malfigrag	2.00		0.0€-00	Impligitari	1 35-02	(mg/sgrasy)		course	(mg/cp/tay)	NA.	Implement	
			,	3comazorene	0.623	wa*.	0.05-30	(mg/span)	7.34 (20)	imph gréas: "		3-3E+50	img/sproses	MT	-mg Ng Ben)	Ļ _
			1	Эфекто(в) чести водин	2 500	10%	c os -au	Img@pdayl	7,067,00	(mg/speak)		0.00 +0.0	(mg/kg/ce ₂)	NA.	Wightpoory)	í
			Ĺ	Benooky No systematic	0.625	ugit.	0.0E+20	(mg/kg 14r)		(mg/tgrbsy)		6 #E+00	improver;	***	(mg/cg-day)	l -
		L	End Pourse Tour				1				13546	1				0.04
		Especiare Plane Total					1				13576	1				1004
	Espassive Madrum Foto	-									1.06:04	lacktriangledown				004

TABLE 7 S RVE

CALCULATION OF CHITUKUN CANCI IT IT SKS AND ROM-CANCIT HAZINDIS MEASCHARLE MAXIMUM ELPOSURES, STORM SEMER REMABUITATION SAMP, NO RESULTS RIBUMON CHARGO COMMICTICUT PAGE 107-3

Scenario Timelame, Autoré

Receptor Pobergion - Construction Morkets

Receive age Appr

Menum	Esposur Medium	Esponent Porti	Esponan Rova	Очеться о	92	×	Į	Can	ear Pole Calcula	4cm		l	Hon Car	ner research	NC (AND OFF	
				Potencial Gorcem	Yeke	John	Probat game	e Concentrator ,	CAFA	h· Ru	Canpar Rige	mater (Capenda	и Согсинацион	e.	D-RHC	Hayes Door
							View 1	(A = 1)	V playe	Larvan	<u> </u>	2844	ومدن	Velor	D-0	<u>l </u>
مولو سايس بريش	4.4	54e-23	or hadde been	Almour	0.06+0	9310	3.0E+00	troughgroup)	74	(mg*g=ay)		0.05+00	Img/spites;	146-03	[mg/kg/389]	·
	,	'		Scattering:	355 ra	വഴവർ	0.000.000	(mg/kg/cay)	4	(mg/\peas)	-	0.9€ +00	Implies cont	N.A.	(Mayba grade)	-
	i i	i	1 1	America	0.0040	my m3	0 UE+00	imphg/Seri	:94.01	(100401544)		5.56+00	[mg/kg-day]	HA.	(mg/kg/kl/) i	-
	į ,	ļ.	i '	Beton	CX-0	0000	0.76.90	imphotosy;	44	(mg to day)		0.05400	Inghamas;	1.4E-04	Imph@Sami	-
	[i	i	!	Berylman	0.0640	~~>	೯೯೯-∞	(mg/kgrésy)	84F+30	(mg/12/24/01)		0.5€+36	[mg/kgrday]	5.70-06	(mylegelay)	-
				CMM-	uc€+s	mgwaa	0.04-00	(mg/kg/ster)	135-01	ImpNo/Seri I	1	206+30	I-GRESSAVI	2 9E 05	(-920)2011	
	\ '		! '	Special	0.75-0	mpr-1	೯೦€-೨೦	impha day.	اسدا	Investigation (G OR FUE	(mg/racts ₁)	NA	:mg%gday)	-
				Contorn	C (47.40	eng/m3	2.36.400	(mg5-g-day)		img/agiday)"		0.05400	g^g (049)	NA.	image graphi	-
		1	i	P2	9.05-0	ngra i	:08+00	(mg/kg-day)	144	Imphysics)		0.04 +00	img*tg*da ₂ ;	NA.	(imgespheet	-
	i	I	i	l'étaphrape;	60E+0	க தோ)	\$66.00	Imglegatest	- AL	ing@giley)*		0.0€+00	(mg/kg/04)1	TARCS	(may 2 gard)	
			Į	September	9.05-0	നംസ	006+00	Img/spidey)	, w	(mg/kgrdes)		306-05	(mg/kg/day)	NA	(mg/c;-day)	-
	ļ	ļ		S4-#4	0.66+0	mg ma	# \$00 ± 100	(mg&g nay)	•	(mg/sptay)		0.06 -00	Imphares:	N.C	Industrial	
	Ι	I	i	Zes.	coreo	egin)	a::E-00	(mg/kg/day)	**	(AC 7001)		0.0E+00	mg/kg/day)	44	Img/\p74el	-
		l	i	Tapacrocomment	146-5	വളംബ	7 ≜€-09	(mg/kg/day)	3 OC 02	(monty Cay)	4.65.11	Trice	imphiprosy.	# 26 GS	(mgageas)	6 20200
	1			Densit Aphronale	17640	mg/mb	3 0E+50	(mythgreign)	94.	(Aug/Agress)		0.05+09	(mg/hystes)	NA.	(mg/kg/day)	-
	- i	i	! i	⊇ +7γ4 ¢-Onduk	corre	mgvaa	006-55	imgiligrass.	· ·	(mp \ tree;		0.05*90	(mg/kg/day)	ML	(mysigmar)	
				Constitution 4, ref.	09E+C	mgr-3	⊔೧೯≂ರ	Imging Ser;	••	impha seri		5.56+36	(mgAg-day)	REAL.	ImphaNeyr	-
				Sa(2-Etylhosy) and water	0.0016	mg/m1	0.06-00	emphigraps		(mg%pter)	ł	206:00	(mphg-day)	Nait.	:-upgday)	
				*********	1.7E/5	program 8	18844	(mg/kgreey)	••	Ind Speak		13:47	(mg/spetay)	8 65-04	(mg/kgc/ay)	2 0001
				Company of the Compan	137-5	mgw-3	266-09	(mg/kg/pay)	٠.	(material)		1 85 67	Index-seek	No.	(Mg/kg/Cay)	
	, ,	l	. '	European et	0 XE+5	mg/m3	e eE+co	(mg/grday)	144	(mg/sgroup)		206-00	(mg/ng/day)	HA	Implication.	-
	ţ	ı	i	Print	0.04.40	mg.m3	>46-30	ing kg (an)	5.0	(mg/guest)		0 CE+00	(mg/kgyasa)	44	(mg/ng/day)	
			1	Bencole jen z sposne	0.55-0	region)	3-3E+30	Imphadent	**	(mg Ng day) "		0.05-00	(mg/kg/ter)	N.A	impliate;	-
			i	Delate	7,0870	mgr-3	690.00	(mgAg-day)	•	(000/00/249)		0.07+00	manaka)	NA.	(mystyklar)	
			1	Byrto(b)/korar-hene	≎ 0 € • 0	mg.m3	246-30	(mg/kg/day)	N.	(mp to day)		\$ \$6.400	(**9* (9*09y)	44	(mg/kgrass)	-
				Barrioskiikova Millera	ં ≎લ્ટના	-rayma	o oE ∗ou	imphydday;	NA.	(m; 49.047)		a ar • Go	(mg/ng/de ₁)	24	imghaday)	-
			:	Servol agreement	200-0	~~~	236-40	(mgkgras)) 16+00	(mg/mg/day)		0.06-60	(**9**0**)	NA.	(respectator)	
			1	Deber anya handiriski erre	€ 0€ • G	remi	0:96-30	(mg/kg/day)	NA.	(mg/100571		c::r=00	(mp/tgMay)	· u	imghigiday)	-
			1	Berooky) z perylane	0.3E+0	eg/e)	346-30	Impho pays	. 44	(mg/tagday)		0.05400	programme .	**	Imphysias;	
			Rep. Route Total								4 (5 1)					0.0003
		Excusive Port 704					Ϊ				4.8E-11	L				6 5002
	Exposure Modeum Found										1 (6) 11					0.0063
Manager Total							$\overline{}$				13566	$\overline{}$				224
							<u> </u>		Чак врука 4 кал		108.36		Total of Sec.		Acres de Maga	0.04

TABLE 1 1 PAGE

CALLICATION OF CHEMICAL CANCER MISMS AND NON-CONCER HEAPOS BEASONNELL WANTER EUROSCHEST 15 TUNCH SEWER REMAINTANKE SAMMLING RESULTS WITH MORE PROFOS COMMERCICAL PAGE NOT?

Scenary Triphane Fours Recens Projector Resident Recensus Age (Nep

Liderija, re	Exposure Medium	Esperate Port	[4: 72 P.D. 46	Cremes of		_		- . .	car Rain Carras				har Fr	CA CAMPA	4.44.48	
} """	t que se mado-	10000	}	Population of	ا بين از	- Jeans	-	, Commercial		ne Rate	Carter Sam		- COACOT HOS		and	Name Of Street
			i .	1,	[" [100		Vene	344		YEA	Units Units	Value .	10-2	1 1000
	Gra-cr-way	5u ₂ 11	{	ALPERT	1545		2 16 62	(-2,000	ha ha			3 48 401	Impleyde.	100-00		02
	D. C. Promis	34,11	regulation.	MARIN	1 300	ugit usi	288-05	(Liney Burse)		Company and	'	1100	1-0-2000	400-04	Cardy Gardel	
			i .		***	ugit.	7 96-35		199.400	(mg/kg/dex)	1.1.4	1716		700.00		7.3
			1	41-4	5,7	w/L	7 96 64	(Pighyden)	hA.	(beach,	''"	N 26 405	(mg/som)		YTENGON!	3,00
			ſ	bar.m	r ' I	Og/L	# 1E-0A	my publication	,	indybeati.	Ι,		7 '	: mt-41	1949	
			į.	Develor Entreor	: #40 e %0	·9/	3 × 45	imphydes Imphydes	<u>.</u>	\$210h		5 Me 75 6 Ze 24	:-United	20E-G)	اجتماد رفسا داهه خوفساد	905
			ļ	Const.	144	ogt ogt	184.09	inghigan.	hà	The state of	ļ .	1 35 04	Implace.	+4	had pringer.	"
ì			1	I	0.6		1849	(TOROGEN	h.	This agriculture	ĺ	100.00	1779 to 500.	102-03	Authorities	
		!	ļ.	Coppe	Ma:	-all	: 'T-D'	(mythysian)	h.a	ILOS PARI	Ι΄.	504-00	ingepan.	10161	1	1
ľ		Ì	1	l		-41	. 35-63	1	144	terophy-terit		14701		Set on	(mg/ prise)	ļ ;;
			1	Maryaca-	16 kg	opt :	0.7.40	1 40 5 y Cay. 1405 y Cay.		:-u-gdm	"	127.04	indphase:	13(6)	/rg/qami	į.
		I	1	Capación	3.00	+445				1-dy-Said-1	:.	186.04	1	l .	(Pahades)	71
[1	See See	1960 	<i>^</i> 1 .	160 (4) 7 (5 (4)	Autography (Sec.)	<u>.</u> س	indubçei.	:		Imphir Jan	5.76.75	(-a) parami	8.24
			1	l	1 1 1	-sat		inspose.	1	: management	l	6.0540	Imphoten:	/04/01	7-019/5m1	209
ļ			1	14-E-Colemba	0.900	-sat	416.00	(manage)en	545-61	Target School	2.76.26	4 N(05	(moño an)	125 %	(mg/kg/Gm)	000
l		I	1	Эмес-ургания	i ''' (-91 I	00±-00	imygon:	\ <u>```</u>	, mgr. p-ray	ļ	1.15.00	Imphibites:		(myspecta)	
I		ļ	1	Our year and	202	-call	0 06-00 0 06-00	(mg/r grass)	N.	17010-001]	1840	inghig days	8.08.49	tabylate;	0.003
I	1	?	1	Designation	10:	-e/L	200-00	(mg/cycey)	1	-maky tapi		100.04	Contraction (Contraction)	100.01	1-shakara	:010
I	ļ	I	1	6-d13 p beloem Automotive	200	-04	168.04	-mg/kgca-	1 45 /0/ ha	IPON LINE	(°For	. 66 03	Implication	200.02	; mphodes.	0.4
l	ì	l	1	lugar-gara	2 240	ug/L	3 36 66	mgh graes	N.	(mg/kg/day)	ļ ··	198-05	ing hypotheria	2 3C 62	indigital.	:002
	-	i	1	-	3 1400	ug1.	4 85 700	(mg/spramy)	ı	Marchard		186.65	Configuration (Configuration)	l	(legthorn)	l
	. !		1	* LONG-Street	C 960	.et	t IV an	Luck Beerl	44.	(Agrata)		1 10 00	(authorities)	# 29 G7	1mg banks	2001
l	1		ţ		2370	196	4 16 404	1-05040-1	40.	√πp-1gmas:	l :.	\$140.00	(Fig high Cap)	10.00	- Charles	0.702
l		1	1	******	5230	ag/L	1.16 M	implydel	184	. mangapangan	1.4 %	51(10)	1,000,000,000,000,000,000,000,000,000,0	201	: THE CONTRACT	-
l	1		1	Chare	53%	ug/.	116.06	imphysian.	7.984.7	"Mary Property."	1446	205406	Lady Cont.	**	Audugen	! -
ì			1	Deviar Asserties	0.452	-at	2 00,-26	مجدورتس أ	I NE OI	(TORGORY)	1.00 (8)	4 38 475	(magapage)	45	Lashy Same;	- 1
l .			1	Part of the date France	100 l	- Marie	486.00	Indiana.	7,000	many man:	61976	198.04	;	. ~	(ue,east)	
l .				ber Dag verde	01%	-9º .	3 75-09	ingligan;	7.36.400	(attractional)	275.01	586.60	ing*pde:	**	hady droph!	
l .			(for any age to an income.	(****)	- PA	137-06	Imphases.	7.38 407	Laboratory .	140.04	4 MZ 05	indepose.	445	170734251;	i
l				Device property	66%	- თეზ	5 (0.00)	Indiana.	44	mphorderi i	۔۔ نیسل	1960	Imphane;	, vi	yestempt.	<u> </u>
			Tip Ram tos	.	,	. —					1.839					
l			Deme	4e-men-m	, sec. 1	الحدث	7.16-64	t in the department	į 😘	_danager ;		\$76.0r	(weighter)	106-00	:40,844#;	9 2002
ι		l.		American,	י מיו <u>ן</u>	- Jan	186 GH	imphydan:	445	(MENT SATISTIC	1 :	3.0(40)	II-ahades	100.00	Sept Sept.	0.000
ł	1			No service	9.40	aşt	27,499	Wildly Supply	156-00	10000101	4.5 (4)	808.67	(with the case)	132.04	Ladge Serie	2 003
l		ł		Auren.	96.7	ابد	246.01	-0,40m	, ha	Laboratory.		158.05	. معد جو السنا	141.07	independent	0.5067
	1	1		Regeue	C 1440	ugit	3 34 499	Subplication.	h.	Image Briefs		106,401	l-debow.	144.55	(magnitude)	0.001
	ľ	!		Carrent Contract	**	100	380.48	(Mg/Lpay)) +a	Industrial.		115-06	Last (Second)	138.05	(mg/spage)	022
	l	1	1	Cobes	4.86	NO.	1944	manage.	. •	(monoton)	i	165-01	Imphotosy.	**	Sadipident.	I
I	}	1		Capen	10.8	age.	9 2E 00	may again.	٧.	Lade Result,		1.16.00	IME TO MAKE	455.02	(Pakitan)	30000)
1		1		(van	67900	ارت	196.00	/mg/kgrate.	N4	(mark prose)		F 88 40		P 256 01	(Paneday)	: 009
		l		W4-14-44	1630	uget	(R-3	mg/cgcag -	"-	(Paying Serv		178.44	(Agingam)	9+[-04	1-mph giden -	:2
	1)	;) 140	-»t	0.00.400	1-dy-0-min		(**Opposed)	ነ ።	1.19.47	(-0+9-0e)	7.06-63	10.000	0.0001
	i	1	ļ	Sêrea	- 60	19%	145-00	Late gibbarks	hà.	improdesi.		25, 47	(Amby from A)	2 DE-0#	1-may 5 cash (0.0006
		1	1	les.	17.9	vgA.	1642	Indian Company.	~•	(CONTRACTOR)	Ī	167.56	(mphg-and	100.4%	1440 Gall	5 38907
	į	1	ł	Terrescondents	0.500	ugt	\$ 16.47	الججود والمراسا	14641	(mgragose)	140-07	174	1-20,50001	100.61	impAy rept	0.0009
		1	ì	D-тей-устания	3.00	ارسا	0.00€+000	hudy bapes	M.	Improvent"	Ļ	10646	Cath Grass	RA.	(mgNg-jay)	
I		1	1	Онитуров жин	j ×o	بسا	00.400	(PROPERTY)	N.L	(Magrati]	4.70	(100,000,000)	906.60	-meteconi	0.00008
	1		1	Diving (Williams)	(.ce	(49	900,400	(makeneri		Indepoted.	ł	7.97-04	(46,004)	108.61	- Transfer	E 202
		1	1	Brizinghardshare	3 50	Upl.) W 46	Industrial	146-22	Imphodesi	3 MG 427	194	1.000	206.07	IMS/49-CB-1	0.05
1		1	1	herman	9370	l val	\$ 16.47	المناق والمرا	MS.	imphotes	· ·	244.04	(mp/ growt)	709-03	(Party Sept.)	0 00004
		i	1	Premarenese	0.540	-pt	07£-94	(mg) gded	48.	(Appropried)		\$00 <u>6</u> -400	(mg/system)	[w	(MARCH)	1 -
1	Į.		1	Page 1994	0.580	ارسا	0.06.400	imphyda:	HA.	(Tenevani)		p oé ⊬as	(refrace)	405.02	(mg/mg/max)	i -
l	1	l	1	Press	0.530	است	704-08	Impliates.	44	(manager)		100.05	Indead Sero	908-00	(MANAGES)	6003
ነ	l.	1	1	Baron samentara	0.256	wit	0.50=02	1701-0001	7 31 -20	the hadden!		0.00*00	Impligition!	44	monatory	[-
1		1	1	Change	6210	ugi	0.06.400	(mahara)	124.60	(my hades)		a 5€+00	Imphibiday.	45	(mg)-gm-1	Ì -
r		4	I	Berano Aurertes	0.450	-54	0.06-00	(Mg/system)	7 90 00	(mphgma)	l	0.00400	: mg/gram	I 🖫	management	1

TABLE 7 2 MAC CALCIDENT ON CHEMICAL CENTER RUBBLE AND MONICEMENT PROCESSORS AND SOMERLE BEARBOOK PROCESSORS IS SOMERS WITH OF WELL OF TO MAKE MY MESTICES AND MODEL COMMENT CONTROL OF THE SOMERS OF TO PAGE 2017

Strains from one Tuess America Mountain Resident Democraty Cons

Linguis, eq.	Captain Makes	Equation	Lapse / 1 Acres	(Nerves of	1	ĸ		<u></u>	es Res (man	ton.		L _	40-34	ne mesic	#0.7900Y1	
	1	1	ł.	Population Concern	* California	l/nbi	remark grows	ra Concert stop.	6541	pro Oppo	Carrow Kee	PUPE LOSSO	- Courtes	- 4	246	P44 M3 (34.04 m
	1	l	[Video	(///	2000	7	1 !	7-849			3544	1
Simple.	Google	\$4±25	Oe-e	Special Contract Cont	320	vgt	1.00-46	(mg/kgrae _t)	7.22-22	(mpapeley)		(34-00	imphotos.	ME	:mphpetent	<u> </u>
]	· .	1	Service Service	0420	-9L	0.06-40	-regis primp)	19-60	.79140091		:00:40	Institution in	N/A	(magada)	_
				Description of the Parkets	0.500	-91	0.25-00	1000 plops	730-00	respigates 1		200-00	(myhydas)		(mg/kgidan)	١.
				Barron o h Transport	985	-01	2.2(40)	(marketter)	44	-mojorani		: 65.400	iruhada:	NA.	(mg/kgrdan)	l -
	1		Em Rose Ton	<u> </u>	1		 -	1.4 4			1654		1. 22		1-3-3-	0.3
	Ī	Employa Park Total					·—				7 16 N	i 			-	30
	Гаранд Чаран (24										Sona	- -				7.
r Charles	Tu-	540	14444cm	-	2543	- Japan	F-08-400	p1 3/24/1	- P.S.	919/061		706-00	150° 2001	-3(140)	Inches earl	
	[1	A-train.	1 130	w.	035400	-019041	h4	ABJANDAI,	Ϊ.	:01-00	I-objected:	105-04	Imple detail	1 .
				Armene	110		:4-00	management.	158.400	- '		:08+00	:-OADMan:	100.04	impyle-per i	1 :
	-			b.	70	- Japl	0%			E mohoraeni'i I — hannani	1 ' '	200.400	1 ' '		1	-
	}		Į.	Serv-	3 700	ابعا	504-X	Land Book	-	-10,00m;	'	30040	Indig Note:	206-01 206-01	may 2 cert	ļ
		j	1	Carpero Carpero		-4/-	200.000	Publisher.	I	Indige set			:-D-30#1		Impligation -	1
		: •]	CVOTON .	6.50	100		whatered.		Indudate.		9 0 9 -3 2	(mg/spane)	196.51	Imphy am	1 -
					- 45	491	0.0042	: - paper	•	(why diese)		0.95.400	and hydron	h.	(myby/000)	-
				*****	134	49.5	0.05+70	(mary brown)	•	:		0.26 400	inderes.	4.06.00	.mp/g/de-i	
	1	ŀ	5	·~	6,500	-c/L	0.06-90		,	: Labys Daged ! .		0.06100	India 8 cets	*00-01	:mg/-grawl	ነ -
			ì	tagamar I	1636	198	३ % -ऋ	indiana.		tuðaðesky,		0.50 +00	: Herath, Sa.:	740-07	leady 2-raw	
				S	5.40	up!	600,486	(mpagda)	- 44	:udybasis,		0.00		509-60	probatos.	į ·
		ŀ	1	Shar	1.00	ugil	696,00	(mily Byyan)		(adhiberto)	l · .	0.09 400	TE OF STREET	537-03	Sudyd-aw,	
	ſ			t ne	17.4	-01	0.22.400	-management	N.	TGTG-CAST		\$0F-06	Imdy Breek	300.61	1000	-
				Facinity or Assessment	4 4 500	الإس	41540	.mg+g=m+1	546.01	(20) (40)	180	4 65 05	1442 th 441.	100 00	IMPO Intl	6,009
				Company of the Compan	7:0	995	3 004-00	المجترة فيسرأ	h4	me harden; "	.	>%1-00	implepter.	-	(-9898m)	-
	ነ	ŀ	1	() mail of the state of the sta	30.0	198	0 0F =00	Imperior.	N	(magabase)	i	0.06 405	Transport I	8 DE-01	Imphysian.	ነ -
				in a budgeton the same	139	194	2.09-42	i-greati	48.	(emphysider)"		0.06.400	(mg/mg-day)	108.41	Imphysias:	-
				Day A Carpton of State of the	702	194	3.56,-60	img/sp/let-	149.02	(mg/getay)		a ce -oo	(100,000)	208.42	(mg/grae)	1
		ì	1	herman	53/0	upt	339.06	Imphysion"	**	imprasser"		230.46	(mphysian)	208-02	(mg/kgstar/)	2002
				Personal	4 760	ugt	3 0€-00	mon year	44	Impegdey."		0 0€ - 00	(mp1pmp)	NA.	(mg/kg/day)	
		ì		Carrier +	0.500	نيت	90€∹0	(mg/kg/day)		(mphases)		100,400	(Page grows)	101.03	(mgAg car.	l .
				Pyrene	0.000	ખા	:au+00	result groups	**	(767-966)		>00,-00	(Fight Street)	10F 02	protegraps	
				Bergeria grant to della	0.350	wil	₹ >0₹+00	mys granti	7.86.40	1010000		>05-00	(egitgram)	44	Office potent	
				Overe	4179	200	204.400	- MAGNETI	F 78-05	1979000		:01.400	Indiase.		(mg/kgulen)	l -
		1	1 .	the rest of the second	2450	994	200-00	(Imple str	120	Impley less 1	l	0.00400	India grams		(Imphodes)	l -
)	1	Berne Aventer	2.00	- 300	COT-40	mg#@##y1	130.63	a serior		:02+00	Implement	44	(mg/kg/day)	_
				Device spirit	0.649	-51	\$ 0.00 ×00	, mg 1 (reap)	100,600	ing agree;		074-00	Importer		.mphyshmi	
			ŀ	Orange & Williams	0.500	-01	0.35400	ing's prose;	7.86+78	menotion:	l .	0.84-00	imatadesi	HE	(mateurine)	1
				Serucción de pro-	0 600	191	235.00	. 173 1 9424		10 lates	1 .	202.00	my be day.	MT	(mphphan)	1 :
			Let Pouts Toe		1 ****		1	1	 _	4 . Armit	7.0036	<u>⁺~~</u> ~	1 4 .4 .4.		1	0.567
		Employed Party Folian	12, 42.01.02								200.00					9.007
	44	Entrates and 1979					┈				734			_		0.00
	Calendar Halland Con										3.77				_	 -
Marrier, 278											1 X1111		Total Ca Ru			- 7

Protes: " The company of the company

TABLE FORMUL

CALCULATION OF CHARGAL CONFLERANCES AND MONICARCES HAZAROS HE ASSOCIABLE MUNICIPAL EXPOSERS \$ 1000 SEASO REMAIN CATION SAMP, WE RESULTS

HER HIGH CHUTCH COMMESTIGHT

PAGE 1 04 3

Çeyenen Yerabyaya biniye Pacapio Populario Residenti Saturday Age: Acus

in the latest section in the latest section	Fagorine Mession	Equazoras	Comments.	Courses of		~;		ست	or has Calcan	eve		1	Non Co	ryan hazarê ke	e-saler i	
	1	ſ		Power Cover	-	-	******	B Concernmen	cses	OF Page	Comp Res	hard and	e Compressor	41	D-175.	Paylet (Append
						l i	Name of Street	0-40	Vege	(Julia	1	Vee	Ļ.	744	Uniq	1
72-MAT	Grandees	5(1.7)	494840F	Aumere	7540	41	7.06-82	;***********;	AA	Imphorami		100.00	(mg/kgraw)	107.400	(Politican)	6.7
				Annon r	920	أبأسأ	336.95	Professional		(mgngebed)		2.00-34	(makenae)	10/24	(Fig.) prior.	**
	Į			Asher.	9-0		7.10,46	(mg/spides)	158400	(mgagama)	11774	404.00	1-yeproni	10644	(mphgday)	1 27
]		Care and the same of the same	44.7	المعا	764.04	inghgda.	NA.			1 16 41	Imphation!	196.41	mg*-gcap1	009
		J		1			170.06			10140	"	8 42 45		408.00		ı
				Sept.	C MAC	-e/-		1.000000	44	(mga yakay)	l	4 2 34	(mg/gray)	•	(mg/kg/ami)	505
				K. tr. program	**	ugt	51145	(may the sail	44	- margaret			Implepries:	104-33	100 2 CBy1	0.
		ł		ade 	1 ***	~~`	1 = 1 + 0 + 0	المهادرتين أ	48	mg-spiker i	· ·	1 K (*	Impligrant	44	Authorities (Sept.)	
		I		K-que-e	108	***	135.00	Imphyden:	**	-mg todes.	l	7.00-04	(Indeplement I	40(4)	County Totals	407
		})-v	67500	-46V	a me a):	inghester	ME	,mangram -		# 1E+50	Im@%g/den.	100E41	participation (Sec.)	.,
		!	Ļ	jv.agett.	4100	المهدا	1260	1-gApdes	44	(very speed;)		10(4)	ا ;مجمدورتسر)	3443	(mghglasy)	-:
			1	Same of the Control o	5.00	յ ար	102,400	retges.	. •	(mg/gr/sar)		3 62 64	(mgégiány)	308-03	Lady System,	257
			ſ	(mer	100	(wy i	18165	Charles	H4	(repayable)	ł .	130.04	(CERGRAN)	>90.00	INDAPAS.) o==
			1	/mc	819	ا درسا	665-04	Contraction of	н.	(mg/gotier)		5 86 405	(ACC (COM))	100.01	(PS/Seas)) oo
			1	Inverse and an arrangement	N 500	/ www. i	190.00	Chapter States	1.000	(makedes)	2.500	320	Impharmy)	100.02	Imphysion;	Gass
			i	Ситетургония		4,4	: 06-60	ung/egiter:	**	(mg/sprim)	l	1 25 65	Inchesen	•	(Fig. by take)	į.
			1	Derrygramm	2: 0	, m	० छह-तर्द	(mg/kg/2m/		managem "	l	129.63	1-50000	4 DE 01	(Big/kg/de/)	9007
			\	Din beygerners	100	1 2	306-00	rg*gdm)	Hà	(mgagata)	l	48.01	(mgagaay)	137.00	1900 2 West	000
				D-11 Carlambikation	206	-51	18.04	(TO POST)	145.63	I .	128.00	182	(10 % g/0est	10[2]	industrial	0.00
	<u> </u>			1	2 190	Joh Joh	294.00	ı	ha.	(manager)	1	2400	1	70503	Imphodes:	č mo:
	1			- Caramera				:16/4 (Mark)	ш.	(mga gday)		166.66	Land of Printers	- 44		****
				CTop ch/ST4 grow	: 140	-54	4 98 69	Inghighted	l	(Medical)		1	(adjet)(tal)		I Labor Debi	
		1		Chica and American	C Hate	40/-	132.04	(makeda)	AL.	(adultant)		1000	Imphyllent	100.51	- undy dyget	n 0010
		ĺ		_C h-man	1 0585	ابهد	112.00	Implicati	44	Page 2 day		3.46465	Impapae.) De 4s	Lucky Systems	0.001
		1		Design of a right of the	0.794	- Marie	346.08	(mg/sgmm)	7 31 01	(Mary and and a	8.06.00	142.04	Imphades:	44	udy Seals	-
		1)	Craysene	0216	-94	146	Cartin Barrel.	780	Imperiorate.	1 20 406	141.05	ر لجيڪوڻي.		purity day.	-
		1	1	Berush Northean	0.000	\¢-	107-06	(Frameson)	יאניי	(mysychast)	59.96	100.00	(Indiabati	-	mg/rgmes;	ነ -
	1			Service Plane Service	2.00	-9%	1 (6-06	(Ample problem)	7.39 400	(mg/kg/da)	ነ <i>የ</i> የጽ	1.25.44	(mgAgaay)	144	(mg/kg/day)	-
				Вечедарувая	0.620	91	975.00	Propression .	7.97400	Indianasi.	(1746	4 (84%)	(mg/kg/sey)	- 44	1795-241.	-
	}			Commission	2 500	193	166.04	Proproperty.	7.36+00	الجهودوسا	5 15 485	38.49	-mg#gcm/I		Implement.	-
	Į.		1	Banking hispanyane	0.820	A).	****	2518641	~	Impligator!	ł	1100	(Make age)		10000000	
			Em Rode Total	<u> </u>			 	1			25.00	t				
	ſ		Same	Aleman	r) dead	21	246.00	mg haken	hd	imphp dayl	, 	245.04	(Pay Syrrey)	-01-00) imphoson.	à (c)qu
	1			Adjourn	7.5	-91	48204	mg/speleys	N.	(West grown)	i	4.78.07	imphysique I	400.05	lesy@geter 1	\$ 0000
		ŀ)	1	ugit	1967	Inothern	138.705	4	2 184-27	13/47	Imphatian!	lot or	umphordes!	0.004
				Andrew	919	I -			1	(all a house)	1	140	1	144-0	1	
		ļ		Barra.	1 70 ′	wet.	107.06	174,54 25;	**	April and		1	(adequate)	1	Implement:	0.60
				Seyle.	(2 900	wet.	3 - E con-		**	(methodogram)		14841	Luchbage,	146-35	- Andry & const.	Gai
		:		Ceromer-	1 490	- Agric	1,640	language;	46	" " " " " " " " " " " " " " " " " " "		100.00	(add g trans):	7 907-08	(F0*0 +++)	905
		(Cook	440	ugt	FX-0T	Impherim:	H.	(mpobale)	· ·	14600	Implighter:	j w	اشتون فيشدد	-
		1		Cooper Cooper	98	ug/L	3 14 40,	imphadas!	H4	(Tape and)		166.44	Imphadmi	100.44	(mbg-bgah)	7:5000#
		1	1	* -3*	62900	wet.	139.05	IngAges.		(mphgram)"		1 28 403	(mg/kgrdav)	104-01	/*************************************	501
		ነ	1	Ningmen	1640	44	34506	Chips proper	**	Inghpeler:		346-64	Implement	98.00	(marq/gar)	93
	i		1	Sauce	5 40	- pt	0.045-000	21972/201	MA.	Imph primit	Ļ	4.09-07	(made grower)	557.40	(MgAgroen)	0,222
				Save	110	401	746.00	mph pries	8.0	(mptg.tey)	ſ .	177-00	(****	35(6)	Mg/Lytom)	>9000
	}			2	er s	-pl	116.00	n sylvations	N.	179340-0011	. .	1 85 06	(Activity)	306-01	Implighter:	0.00005
			1	Telepoktorastera	0 500	-21	8.00	mg/(pray)	546.41	(MANDON)	· e :::	1 8 05	Img*pdm.	106.07	hand from	0.001
	1				135		000.400	The Control	N-12-0	1		1 42 400	(mg*gray)	1 144	(mg/sgrass)) "."
				Committee of the desiration	1 -		\$00,400	1 .	1	[mg/spcsys.]	1					J
	1			I_				.000 (May)	64	Indiability,		8.76-08	Landig Broad -	4.32.01	100000	(: ooo ·
	(Decryptoners	20-0	agl.		1		1			1		· - • · ·	4 4 -
	(3-4 CANGEO COMMISS	90	ugit	0.05-00	Inchipos	44	(mg/kg/mi)	\ ·	515,44	(-#40cm)	106.41	(maya-an)	2,001
				l			0.05-00 198.04	ing hydragi (ng hydragi	144.0	(mgraden)	74.00	175.00	(magnitude)	7 06 47	Imphysion.	0.72
		}		3-4 CANGEO COMMISS	90	ugit	0.05-00	,	1		710		1 . , ,	7 06 47 7 06 47	(maya-an)	
		 		galf (same are been galf)	-20 200	ugA ugA	0.05-00 198.04	(mg/sprday)	144.0	(mgrayter)		175.00	(Page (prior)	7 06 47	Imphysion.	0.72
				D-+ Cappediane Book England of Popular Regionalists	90.0 \$1.0 \$1.0	upt upt	0.05-00 1.95-04 1.55-06	(mg/kgrday) (mg/kgrday)	1 44 CI	(white)		1,500	(Anglespring) To Anglespring)	7 06 47 7 06 47	(makeran) (makeran)	0.72 0.0005
	(Direct Conferences direct Conference of the Product of the Conference of the Confer	700 200 204 7560	197. 494. 497. 497.	0.05-00 198-04 196-08 0.05-00	indydayl indydayl indydayl indydayl	1 44 (C) 144 44	(mg/g/m) (mg/g/m) (mg/g/g/m)		1 15 01 1 15 05 0 00 400	(mg/g/gap) mg/g/gap) (mg/g/gap)	7 (05-427 7 (06-427 864	(make ten) (make ten) (make ten) (make ten)	0.77 0.0005 -
				Directory (Constituted of Constituted 700 700 700 700 700 700 700 700 700	197. 497. 497. 497.	0 05 400 1 95 04 1 95 400 0 05 400 0 09 400 1 95 20	Individual individual Individual Individual individual	1 44 C) 44 45 46 46	imagidiyeti (mayakeeti (mayakeeti (mayakeeti	 	1 (E-00) 0 (E-00) 2 (E-00)	(mg/ng/ay) (mg/ng/ay) (mg/ng/ay) (mg/ng/ay)	7 (00 407 7 (00 407 MAI # (00 402	Implification Implif	0.72 0.0005 -	
				Direct Conferences direct Conference of the Product of the Conference of the Confer	120 300 200 1300 1300	197. 494. 497. 497.	0.05-00 198-04 1.55-05 0.05-00 0.09-00	indydayl indydayl indydayl indydayl	1 44 CI 144 44 44	(mg/g/m) (mg/g/m) (mg/g/g/m)		1 (E-0) 0 (E-0) 2 (E-0) 2 (E-0)	(Angleyster) (Angleyster) (Angleyster)	7 05 47 7 05 47 84 8 06 42 1 07 41	Implesters Implesters Implesters Implesters	0.72 0.0005 -

TABLE CARRY

CALCALATION OF CHEMON, CHACKE HAMS AND NON-CANCER MADARDS PENSONNING (MACHIMEN EMPOSIES & STOCKE STANDER MANDEL TATION SUMMY HIGH CREATS HAS MORE CHACKES CONTINUED TO THE CHARGEST OF THE CHA

Scandin Tereform Rubye Radigue Agenday - Rubyara Manazor Agentau

B.Baylon, err	Cupre on Masson	Employant Power	EARTHUR SHAFE	Crement		~ E		G#	ng Ras Carrie	Array .			New Co	roer hexaro D	ACATO:	
		ì		Powerus Cancern	V.Bank	Line	President.	e (apremiestan	CSF 1	and Regar	Carter Per	Market Server	ne Carcentreton		Drift.	HUMA SAFA
]	1	l	l.	1	L	Yes	.na	2804	UFHL	1	784		V	(Jerrin	1
, and the same	Sharringer	544.21		Managa Mayoraya Program	124	wyt	:04405	amphysical	7.85.02	Impapos.		:u€-co	(mg/kgráský	*	ymphysters.	-
					1870	200	0.00g-gg	1 Ampliance Court	2.640	(Para-sa)		900,400	1 make ten	44	10010001	1 -
	1			Other and the programme	2900	بحد	;6€-4s	1700000001	7.92-00	(mg/spran)		3 06 •00	(representant	44	To have you	1
	ì			Hercag r Inevers	: 620		9.06-00	(mg/kgaay)	h.a.	Industry.		9.00.400	Impha section	44	7616791	-
	Ī		tio Power New	F ' —— -	1	<u></u>	┼── ·		<u> </u>	1.72	100.0	ì——				04
	į	t spokes for Total							-		7747					•
	Esperator Version Years	•					<u> </u>				756.5-					<u></u>
	1 -2	Sec.21	(Friedlich	Marrie Married	(2940	ياوسا	0.09-00	Indepthent		. لعهاد وهدا		- 3 0€ -40	The Brain	· 第-5	1.000	
			1	Antreps	0.0	091	:00+00	- myselfice.	444	Implipace	l	\$10 5 +00	75.2004	4 (9) (94) Impligners:	1
			t	Ayeara,	7.10	098	200.00	(mg/kgrósn)	13(50)	V/GP SCRY1	l	2 CRE-UU	-1019441	5 00 404	(mysephanic	
				Beron.	₩-	ugit	nutiue .	Imphotory.	44	-make-same	!	3 01.400	- TEN Y SAFE	7.06.401	implythe:	ļ .
			i .	Sarylan .	0.990	Upt.	.07-40-	(mg/kgyter)		(makacay)		:200	,75°04#1	708-00	(mg/Lgates)	!
			f	(Jaconson	130	091	au€⊣s	impligates!	NI.	-makecey*		രമത	- mphysical	706-03	(mg/spides)	
				Colores Colores	840	up/L	: :06-we	I-phyteri	N.E.	(material)		0.24.400	(mg/spilety)	14,4	(mg/kgudes)	į .
			ł	Create Contract	128	ug/L	: U6-00	1-0,00041	N.	(Mg/Lg/Cay)		2004-000	- mg/mpdays	408.07	(mghgate)	1 .
			!	-ar	62500	اود	F CE HID	Imphysia-I	N.	17970491	!	DOE+00	- make page	F 50: 40 *	(mg/sgrdav)	
		!	1	ALCONOMIC SERVICES	1830	اجد ا	004-00	mg* prass	**	(-61969)		9.98 -00	(mg/mg/am);	34842	- make days	1 -
		:		Seeman	340	-at	006-00	prophysics:	14	.*9190=1	!	100 400	(mg/kgrás _t)	506-03	yeşkiş cayı	-
				See	190	اوسا	0.00	ymghgrawr	ų.		į	0.08 400	registrates:	\$ 00-02	(Page group)	-
		ŀ		200	119	برسا	0.00	managem;	ļ 44	.76794491	!	0.59 402	(**g**)	1000	Total Street	
				* PRINCIPAL OF THE PRIN	0.500	, mp4	192-36	matgram;	141.0	AND LOCK AND I	24.00	1370	;y-2/04;	100 42	I THE DIESE	1,000
				Demokratikasia	110	عوس أر	606-00	myteria:		(monomer)		0.56 +0G	(margage)	•	inchere.	
				Deflyptions	20.0	اوسا	:06-00	mphartes:	\ \L	1,0000000	i ·	0.56 +06	(mg/rgmap)	166-05	-	-
				Энт эмургания	100	ارس ا	1 :00:00	matalasi	L L	· hastonell.	! .	0.00 ×00	(mg/sprane)	100-01		
				Bulle-mayreness	22.6	j war	2.000.400	-motame;	141.00	(*************************************	j	0.001+00	1995	107-27	A CONTRACTOR	
	ì	1		Name and Address of the Parket	01'0	ارت (378.00	Inglights		(mylegides))	240.65	Incabqui.	2 or oz	protocopi.	FCC-
				Premiument	9.546	اند	0 OE -96	-matigmen	N ₁ ±	(mphysion)		30446	(eq agrant)	44	(Augustus)	· ·
				Parameters.	2566	-et	0.06.400	(mg/sgraw)	No.	(myNgrden:		eor-co	(Projection)	43644	(40,044)	
				eras	0.00	-64	0.01.400	(makean)	. 44	(mphysian)		ಿಗ್ -ಮಂ	(mg % grille)	10Eet	(mg/sptm)	
	1			ويجز وأمراه لمسطية الذالشمة	0:00	-51	005400	(Mg/rg/May)	23000	(mg/kg/day)		0.00€-000	ing hydro;	44,	prophysicani	-
	i			Companies.	0210	-54	946-10	(mylegelen	CHEAS	(manageday)		0.000-000	ing*pde>	44	.000 g 1000 l	-
				Centals Avairables	0.490	-spt	0.06 -00	:physides	740	,mg*gram;*		2 0t 400	(mg*pdas)	44	,manager	-
	ĺ	l		Devar place en en	7-30	اص	000(-00	.mphgrday	72.07	"mg-revisit;"		608-60	(right) det	44	(mg/town)	-
	Į	l .		Device to your	0.620	.pt	0.004.400	(mykante).	***-∞	(mg v prosen) *		608-00	Inghades -	44	270101001	l -
				Demograph of the second of the	C 500	ug's	10E+05	img/ipde.i	7.22+00	Indudate.		0.00:00	(mg/kg/cay)	hA.	(mg/system)	1 .
	i			Bennag rupanwas	:420	اود		(motigiday)	44	Impropries		0.00,400		**	Lanks Street!	
			Far Rose 134				<u> </u>				200					700.0
		Fagging a Page Total									20146					0 dys.
-	Consult Parkers Total	· · · · · · · · · · · · · · · · · · ·									7.44					0.008
Mather Trans	•										744 4					1

Pride at on expansings, give insuranged in the equal to the exposures from ingestors of growtheater

TABLE 9 1 RVE

SURVARY OF RECEPTOR RISKS AND HAZAROS FOR COPCI-

REASONABLE MAXIMUM EXPOSURES - STORM SEWER HEMABLINATION SAMPLING RESULTS. ASBINEDHI SROTON CONNECTION:

FAGE 1 OF 2

poenska I meheme i folgre

Receptur Population Constitution Workers

Receptor Ago | Agus

Modwin	E posure Meli an	Enpost-19	Cren-de			Carchagene	: R sk			Non-Carunto	genic Kuzans Q	luolani	
	Lean 3C	Port	al Polema Concern	ingestion .	intelator	Deireal	Faterna (Pacalion)	Espesive Routes Total	Primary Target Organia)	Ingestion	:rvasakon	Сугтай	Fejastura Rodes Tasa
Catalogue	Groundwater	S4# 23	Y *LMIN	f · - ::		· ·		.,	€×iS	-		0.00004	G D0604
			Animony		-	1	-		Bood	,		0 00009	C DOW
		1	Assence			3E-09	-	35.49	Stur, CVS	J -		0 0005	0.0005
	1		Benum	[-		(-		Makey	_	l Ì	0,000	3 0001
	!		Ban/#wm] -		ļ ₋		tis			2001	2 201
	1		Çh-brikum		-	}] -		Felotus (4y GS Bone	! -		0 003	0.203
			Cobat		-	ļ	.		NA NA			-	
			Copper] -		, GS	i -] !	40000004	C 000004
	· I		hón		-		-		GS	-	1 1	ə 3 01	0.201
			Vangenese		-	١	-		CNS	- ا	'	0.05	0.02
	Ļ		Serentum		-		. !	٠.	S.um	1 -		0.00007	0000002
			Salven	1	-		_		Sain	_		0.00004	0.00009
		1	Z∞c]	, -]	B ooc	-		0.000000	0.000003
			Terrach/croenhene	1		36-05	'	9E.ce] [~er	-		0.00064	000004
			Damethylphihalaid				_		₩.			_	_
	[1	Dethylphihelate		- 1		- !		Body Weight	- 1		6 000003	0.0000003
		1	D-n-busyphihalete		i -		- '		Morearty	-		Ороссу	000006
		ł	Sid(Z-Ethylnoxy/jp-kne/are		}	78-99	١	76.09	Liver	_		0.002	0002
	i	1	Naphih <u>air</u> :::	Į	- ا		\ _ '		Body Weight			0.00002	0.00007
			Physiothygne		_	ļ	-		Kidhej	_]	-	_
			Fruorenthena			l	-		London	i -			_
			Рупите	i	_	Į	.		Кертеу	-		0 20209	0.00000
			Bengo(a) politications		-	1	ļ _		. NA) -		ļ _	_
		1	Chrysene		-]] -		NA.	l -]	-	-
			Banzo(bytugranithene		l -		-		NA.	-		_	-
			Benze(kytuorenthene		_	1	-		. NA	-	i	ĺ	-
			Велиф(ф)ручело		_		_		NA.			-	_
	ŀ	1	(Dibanzo(a,h)anYrracene	}	-		-	}	NA	_		-	} -
			Benzolg, hilipen/ene				-	.,	KaSney	1 -			
		1	Chemical Total		 -	IE 68	- -	1E-08	1			C 04	0.04
		Exposure Point Total		1	•	- -	·	IF-0 0	1 -			•	0 64
	Exposito	Medium Total	1,10-1,10-1,10-1,10-1,10-1,10-1,10-1,10	}				IE.08	· · · · · · · · · · · · · · · · · · ·				C 64

TABLE 9 1 RVE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPOS

REASONABLE MAXIMUM EXPOSURES - STORM SERVER REHABILITATION SAMPLING RESULTS

N56-NUON, GMO FON, CONNECTICUT PAGE 7 OF 7

Stenario Timetramo Future

Recognor Population - Construction Workers

Receptor Age | Adult

				1				. <u></u>	1				
Med um	Exposize	Expediate	Chemical	l		Carchogene	FIS4			Non Sart reg	дел с Наза м а С	LONE TO	
	Medium	Paint	of Poternal Concern	hejesten	inhy glion	Cerna	Erlerna (Rader on)	Eroosure Houses Toral	Promary 1argel Organisi	,uGest,un	rNatarion	Demai	Espaças Rodes Tola
Supplies	Groundwete:	Sre 23	Numeron				-		CNS	<u> </u>	-		-
			Antomory				_	J	NA.	l	_		_
			Arsenc				_	!	VA.	l			-
			Banum	-		_	_]	Falcios 4 ty	.		'] -
	i		Berylkan	l -		_			GS				-
			Chromoum	-			_		Lungs				-
	ļ		Colui				-		NA.		-		-
			Сорож	Į .			-	1	NA.				-
			Iren	1 -			-		NA NA				
]	Mangarose	-		-	-		CNS CNS		-		
		1	Sale-v.m	1 -			-		NA.		-		-
	1		Sive	-		-	-		NA NA				-
			Δnc	-					54				-
	1		Tetrach proeiftene	ļ -	5E.'!	-	! -	5E-11	Lm#		0.000002		5 20000
			Demantiforcha ata	ļ -			-		NA NA				-
	1		Digenypronesia	i -		-	-		NA.		-		-
	Ì	Į	Dun-butytof-if-elete	-		-	-		NA NA		-		-
	ļ .	-	Bsi2-Ellythery/iphthalala	l ·			ţ -		N.		ļ -		-
			naportalene	l -		-	-		Nate		0.0001		0 0001
			Phaseotrero	-		-	∤ -		NA.	i			-
			Alugage:teme	l -			-		NA.		-		-
			Pyrene	l -		-	· ·		NA.				
			Benzoia)-aruhrecena	l -		- ا	-		NA.	٠- ا	-		Ι -
			Chingsane	l -		-	-		MA.		-		-
			Benyo bifuwanthana	l -		-	-		NA.		•	-	-
			Senzo(x)Ruoranihens	-		-	-		NA.		-		-
			Bartro, a) pyrania	- 1		-	-		NA.		-		-
			Obstacola Menth recene	ļ -					, va	· ·		٠٠.	-
			Benzo(gip)peryrene	<u> </u>			-		MA.		-		-
			Chertuçal Total		SL-01	<u> </u>	-	5E-11]		0.0002		3 0003
		Exposure Point Talai		<u> </u>		_		5E-11][]				0 0002
	Еврофия Мескул Токи							5E-11					2 0032
Sym Tolki								16-08					334
Roceptor Total					•	Rece	pior Poss Total	:E-C8			Rec	cealor HI Total	Г

TABLE 9.2 RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPICS.

READONABLE MAXIMUM EXPOSURES - STORM SEMER REHABLITATION SAMPLING RESULTS.

MSR-ALON GROTON CONNECTIONS PAGE 1 OF 3

Scanaro Terefrance Future Receptor Pubulation - Residents Receptor Age - Créd

Medium	Exposure Yeşalori	Exposure Part	Cromesi of Polynta	1		Eurogene	7-6×		j	Non-Carping	genig blårnig Q	(p)(w1)	
		ĺ	Concern	nganton	in## aliron	0erma	Extens:	Esposora	Primary	Mg#35 cm	::tweeeon	Dermai	e sportung
	_l	<u> </u>	<u> </u>	<u> </u>			(Radiation)	Routes Total	Tergel Organia)		L		Royles Total
/Dundware'	Groundwater	Se y 2 J	Alumnum.		[- [CNS	0.5		0 0 00 3	U 2
		,	Art mony		-		i - I		B cod	2.8		C 008	2.8
			o-servc	15.04	- !	AE-CS	[- [15.04	Sko CVS :	3		0 000	ذ
		!	6em		-]		, -		Kigney	9.95		0.0007	000
			Bery ven	f	- [-		G5 '	20%		0.007	00%
			Chioman		-]		, -		Facutorically GS Bone	53		0 02	3.3
		}	Const		- 1		i i		NA ·	-		-	- 1
	1	4	Coppe) -		J -		GS	C C3		0 000003	0.93
			lmjn.		-		i - I		135	٥		0.009	9
	1		Manganose	1 ··			ļ -		ENS	,		0.2	/
			Settlen:] -		- 1		Skr			0.0001	g:
	Í		Street		i - I		f - i		Ska	0.04		ათან	0.04
	1		z ×		-	· ·	- 1		Black	် တေ		3 200025	0.00
	1		Serias Progettiene	25.00	i - I	16-07	ļ - ;	Jē-⇔n	i noge	0.005		J 3009	0.006
			Comethylphiha ats		-		-]		N/A	ļ <u>-</u>		-	-
	1		Deshysprenavare		1	[·	1 - !		Body Weight	\$ pocs		300008	t OC2
	Į		Dire buoyanna yay	J	-	, ,] -]		Mortesty	0010		0 002	6.6.
	•		Binds-Etheric sylle/Albalage	25 oc	-	∔E- 3₹	! !	35.06	Liver	0.50	1 [005	0.1
	Į		Naching/grap] - i		-		Body Warge:	0002		20004	0.002
	1		Spelloulous		! - !	,	1 - i		Kecody	-	'	-	-
		<u> </u>	Flamenthere	į .	- :				Liver	10 001		-	0 001
			Fyrene	J	- !		-		Kejney	2 202		0.002	0004
		<u> </u>	Вклитога вистания	95-96			-	75.56	NA NA			-	1 -
			Chrysère	1E-00	- '	i	-	15-36	NA I	1 -		-	۱ -
		ľ	Beneaub)Fuoranihene	1E-05			-	1F-05	NA NA	-			-
	l	1	Bandolf Augmentend	UÉ 66	- '	1	-	5F 99	NA.	-			- 1
			Ветгонаручени	ZE-04	١.		- 1	21.68	} NA	-		-	-
	,		C 594976.0 € (unefeatoring	27-04	-		-	26.Ge] MA	-		-	-
			Bencolgit scantone	<u> </u>	l		l <u>-</u> i		Kitay	-		-	
			Chemical Fold	15.02		6E-07	-	95.04	1	20	· ·	0.5	. 20
		Exposure Point Teler		1				5L.04	ĭ				?3

TARLE 92 RME

SUMMARY OF RECEPTION A SKS AND HAZAROS FOR COPE»

REASONABLE MAXIMUM EXPOSURES - STORM SEWER REHABLIF ATION SAMPLING RESULTS

MSB-NLION GROTON, CONNECTICUT PAGE 2 OF J

Stenand Tritohame: Future Receptor Politi ahon - Residents Receptor Age - Chirl

Medium	Exposure Macum	Espoilure Port	Chemical of Pource			Caronogene	R 54		· ·	Non-Carono	gerik Harard ().	Jojani	
			Concern	Ingestran	Phasion	Овнача	Enternal (Receiver)	Exposule Royles Total	Pomary Target Organ(s)	logestion	Innalation	Dentral	Fizposure Movies Tata
i Dyridwalar	Groundester	5e= 25	Alymin, m	 		 	_		CNS				_
			Arthrony	_					NA .		_ :		_
			Areamo	_					NA.	l	l		_
	}		Ranigen	٠.		_	! _]		Featoughy		· - '		
		i	Вегун, <i>э</i> т				_		64		_		
			Chromain	-	.		_	٠.	Lungs		_		_
		[Gobali	-] _		ŅΔ		1 -		_
		1	Сорран)		_	1 - 1		NA.		1 - 1		- 1
		1	-200	-	i		-		NA.				-
		1	Manganesa	-		_			CVS		-		
			Seenur	l -			_		NA.	1			ļ .
		1	S-ver	h -			- '		N.A.	١	_		۱ -
		1	Zac	. ∤		·	- i		NA.	}	-		
			Tot/ac44/celbece	1 .	26.06			20:06	Lower		0.005		0.005
			Demailin/phihaisis				_		NA.				-
	1		Destryichtholain	- 1			_		NA.				-
	1		Den-dagly/phihalate	_			-		NA		-		-
			Bis(2-Elhythoxy johlhaiare	1	-,				NA.		-		-
			Naphitu'ere	l -		-] -		Nosai		0.002		0.002
	!		Phenantrene	١ -			1 - 1		NA.		- 1		-
			Flooranthène	ļ -					NA		_		-
]	Oyrene		.,		- 1		N/A				-
			Saruto(sismit-acens	_		! -	-		NA.		_		
			Chrysene	i -		-	_		, NA				-
			Bendnifflygrantflene	-			-		NA.				-
			Banco(*)fuorenthene	i -		-	-		NA.				-
			Banzolajpyrene	-		-	-		NA.		-		-
			Déan-coja (hjanitracena	-					NA.		ļ - :		-
			Benzoig hulparyere	-		-	j -		NA NA		-	-	
	1	}	Chemida: Total	1 -	26,06	-	-	26.06	i		3 007		0 007
	L.	Esposare Point Total		1				2E-06					0 607
	Esposure Wedulim Total	,		î				26.06					0.007
dum Tales		·· <u> </u>						5E-34	}			•••	70

None

introduces exposures are assumed to be equal to the exposures from ingestion of groundwater

TABLE 9 2 RME

SUMMARY OF RECEPTOR MISKS AND HAZARDS FOR COPUS

REASONABLE MAXIDUM EXPOSURES - STORM SEWER REHABILITATION SAMPLING RESULTS

NSB-ALON, GROTON CONNECTICUT PAGE 1 OF 1

Scenario Timultamé Future Receptor Population: Rosidents Reunator Age: Clind

Neg.um	Engosure Vegum	Espois _{are} Pisot	Chemics of Polanus		<u></u> .	Carchogenic	Ag.57			No.v-Ey z nos	≠ча на гре О	utteri	
}	}		Concein	Ingestion	lohalahan	Derma	Ceternal	Сърхония	Prompey	Policed	linus shon	Demogr	Exposing
	L	<u> </u>					(Radiation)	Rowas Total	Тапуы Опрагца)			i .	Rouses foto

Torial Body weight He	C 005
Total CNS No.	7_
109/09/59	3
7 m a 15 m H	9
Total Katoey M.	0.05
Four Liver Hi	0.2
Tota Sterie	<u> </u>
Tota Nasa Pi	0.002
Total Bore of	0.2
Total Felologicity AV	6.3
Total Mortality Mile	0.01

TABLE 9.3 RMF

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

4EASONABLE MAXIMUM EXPOSUACS - STORM SEVER REHABILITATION SAMPLING RESULTS. INSBINLONI GROTON CONNECTIONT

PAGE 1 OF 3

Scenano i metramo Fucure Receptor Population Residents Receptor Agel Adult

Medium	Exposure Vecum	Exposure Port	Chemical of Polential			Carcinogeno	Rak		Ī	Мос-Сальну	jeng Hazard O	uolașn!	
	ļ		Concern	Ingesium	Interation	Domai	£ rterne (Radiation)	Exposure Routes Total	Primary Target Organi(s)	Ingestion.	Chelmon	Darmai	Suposure Rouses Tola
oundwater	Groundwaler	Sr= 23	Alumerum	· ·		·	-		CNS	02		0.0004	9.7
		i	Antomony		-		-		Black	0.5		0.008	05
		!	4.58%c	1E-04	-	36 gr	.	10.04	94 v GVS	2		3 934	2
		1	Banum	1 ··	i - '		h -		Kioney	0 03	'	0.001	C 03
			Bary'sm		.		! -		cs	909		001	_ co+
	i		Chroment.		- ;		i - I	.,	Felotoricity, GS, Bone	01		0.03	62
		1	Cobst		i - i		l - I		NA -	-		-	-
			Copper		-		-		68	0.02		0.00004	0.62
			Pon		-		1 - 1		G\$	ь		cc.	6
			Малуатич		-		<u> </u>		ONS			63	5
	-		Selenam] -				Swn	6 07		0.0002	19.0
			Salver] -		ļ - ļ		Sen	6.92		0.02008	663
			Loc		-		-		€ood	0.02		000003	0.02
			Tell schlarge (Perse	20,06	-	16-06	-	JE 06	l her	0.003		0 001	0,005
			Dimethyphtha are				-		PLA.	-			-
			Dialhylphihaiaia	i .	-		_		Buty Weight	0.005		0.0003	3002
			D:-n-эшуірініншеіе		-				Mo/16-fy	0.007		0003	0.01
			8.s.2-60-) Heizyt (#17-auto	26.06	-	26.4%	- 1	5E 06	Lorer	0.07		007	21
			Naphtha and		-				Body Weight	0.001		0 00005	0.002
			Phenanthrene				- 1		Kidney	-		-	-
			Sluckarthena		-		- !		Limit	0.0010	1	-	0 00 10
			Pyroce		-		- '		Kathery	0.001	٠	0.003	0.004
		ļ	Benco(ajonthiacena	3E-06	-		-	35.06	NA.	l -			-
			Chrystere	VE-08	-		-	16-08	- №	-			-
		1	Banzojo:Nucrentinane	≾E-06	-		-	56.06	NA.	-		-	-
			Benzo, « Rustanthere	2E-06	-		-	25.06	NA.	<u> </u>		-	-
	1	ì	Веньфарующе	77-06) - 3		-	7F-05	·ux	ì -		1 -	} -
	1		Экрепсов и брановичения	60-06	- :	:	-	c€-05	NA.	! -		-	
			Benzo(g hijparyene	l	-			••	Kidney	i			-
	ı		Chenka Tota	28.04		45.0€	 - 1	36.04	1	13		0.4	
	ŧ	Exposure Point Total	-					<i>15-</i> 04	3				

TABLE 93 RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR CORCU

HEASONABLE MAXIMUM EXPOSURES - STORM SEWER REMARKITATION SAMPLANS RESULTS.

NSB ALON, GROTON EDANFETICUT PAGE 2 OF 0

Scenario l'impliante Futuro Raceptor Propriation - Residents Receptio Age - Adel

- Medium	Saposara Medium	Exposure Pour	Chamical of Polanica			Carcinogenio	R14			Non-Carcino	gend Havard Q	lyci- m	
			Concern	ngestion	transfero	Derros	External (Pacation)	Expensell floates Telak	Promary Target Copanie)	vigestion	Into March	Dema	Espésyag Routes Nota
Smandweller	S-out-owaler	544.23	A:um-cum	<u> </u>			<u> </u>		CNS				
			Альтю-у	- 1			- 1		74	ļ	-		-
		†	Areans;	-		۰] -]		NA.				-
		}	Barrym	-] - 1		Felclüse,Jy	1	i -		-
		,	Bery rum	-			1 - 1		ଦଃ		{ -		-
		1	Chromer	-			-		Lungs				-
			Cobell	-	1	-			NT.	-			-
		i	Сорреч	-			-		, NA				-
		1	lion		'	-	-		NA NA	1		'	
ļ	1	}	Manganese	-	'		-		CNS		-	· ·	-
]		1	Seanum	1 -			-		NA NA		-		-
1		1	ls ver	4 -			-		NA NA		-]	
:		1	Zna	ł -			.	٠] NA				-
			Part service course ha	-	7E-05			20,486	l-van	ļ	6 983		0 003
		l	Omethychthalate	_	1		i - 1		NA.	}	ł		
			Contryspictorate	_		' -	i - i		N/A	l	ļ		
			Over-thoday primavalia	-		l -			NA.]] -		_
			Bar 7-Ethy Sprylig Straigle	ļ _		-] - !		NA.	.	-		_
			NagNihalene				i - I		Nana!		0.001		C 001
			Pharantniana	_			[_ i		44	٠	l -		_
			Publishine	_		!	l - 1		NA.	J	, .		
			Pyrene			l -	i _		Na Na	¦			_
			Benzo(a)aniNacane	_	l .				44.	.	_	l	_
			Chrystag	_			_		NA.				<u> </u>
			Benzo(b) Tuoranihene	_	l	_	_		144	}			_
			Sensoje fluorantinina	_		l 	_		NA NA	j	j _		_
		1	Велго в(ругени				_		}	i			
			Onenzoja Ajanihracena	_	-		-	l ::	[",				
		1	Benzalg hillperyane] [i ::	l NA	(! <u>"</u>		[
			Chemica Trea		26.00	 - 	- -	25.36	ł ~~		0.000	 :-	C COS
		Exposure Point Total	C 40 - 50 - 50 -	ᠰ᠊ᢆ	1 10 41				}	- -	2003		0 005
	E. A Mark on 7 and	Cate State a den addr				 		26.06 26.06	}				0005
ec _n m Talai	Espaure Medium Total			├ ──		 -		3E-04	{ ── ─				14
Kapter Tetal							on Ropi°ota)\$ (A				egrar Hill Torul	14

Note

invariance exposures are assumed to be equal to the equivaries from regardisc of q continues.

TABLE 9 3 RVE

SUMMARRY OF MECEPTOR RISKS AND HAZAROS FOR COPCS.

REASONABLE MAXIMUM EXPOSURES - STORM SEWER REPARKINATION SAMPLING RESULTS.

MSS-NUDN, GROTON COMMECTICUT PAGE 3 GF 3

Summino Timerhamy Futury Receptor Population Headents Receptor Age Acci

١	Vedera	Execute Medium	Exposure Point	Chamical of Potential			Carcinogenia				Non-Cert not	er-c Hazard O	∡oleo⊓i]
ŀ				Consern	padeliciu	Inna alion	Сесты	Esterna	Esposara	Рэпцесу	Ingestion	'cheletor	Dam-4	Exposure
				<u> </u>	L			(Flackation)	Routes Total	Parget Organisi			i	Routes Total

Total Body Weight M	0.003
75th CNS →	5
1pig. (1/0) Pr	i
Total C/5 M	6
Taral Kidney M	0.04
Tate/ times 64	31
Total Sale let	2
Total Ness Iv	0.001
Tixa" Boto H	0.2
Tons Agronomoly M	0.5
Total Vortality MI	0.01

TABLE 9 4 FIME

SUMMARY OF RECEPTOR RISAS AND HAZARDS FOR COPCS.

REASONABLE MAXIMOM EXPOSORES - STORM SEMER REMARKINATION SAMPLING HESULTS

WSB-WIGN GROTON CONNECTICUT PAGE 1 OF 2

Speciario Timeli etta Patura Receptor Popularion - Revidents Receptor Aga - Lifekang (Chard and Adus)

Mactrum	Capesale Medium	Espéraro Pont	Chamber of Polent at	Ì		Carchogane	. R44	Ì		Non-Cardno	genic Hazara D	JOY BATE	
			Concarri	Species	!nha4oon	Dernar	Systema: (Radiation)	Expolure Routes Total	Premary Tergo: Organie:	Angestion	iona alson	Demai	Exposure Moules folsi
roundwaler	Groundwater	544 23	A Johnson	<u> </u>	 								
			Ant mony	i	[-		- 1			1) .		
]	Arpens.	20.44	l -	9E-07	- 1	aL ≎# -			Ι,		
		1	Baron		-)])	
		1	Seg*ium		-] -]		i]	['		
			Chapman		-] - ']	1		١		
			Севан				-				i		
			Copper		-		-				Ì		
			Imo		-		-				}		
	ļ		Manganese		-	-					١		
	(İ	Selection				!	[ļ			•
	1	†	Sever		-) -						[
]	}	200	}	-		-					[
		Į.	This wife decontribute	4E-06		-5.16	ļ ļ	5E 0×		1		ľ	
		1	Demokrykontrina a te	٠	-		1 - 1					•	{
		j	Destry phihalaise	(-		i - i			})	
		1	Dan-buryphrhafate	٠٠. I	! -] -]]		•	
		1	Designation of specimens	46.06	- 1	16.06		95.06				1	
		1	Napritha area		-					}		{	
		1	Lydraminatus	1	-		- '	1	1				
			Fluorentens] .	-		i - :	. 1	[1		ĺ	
			Pyrere	1	-			(Ī	1	ľ	}	
			Becaute (anthuarene	1F-65	-		- :	1F-95	ľ	1	į	Į	
			Chryslene	26.68	-			26-0e	ŀ	1	}]	
			Berumb)Coolaninana	2E-05				7E-05))	1	
			Ber ton Funtations	96,06			· '	VE LL			1	ĺ	l
			Эвгерова (ругани	aF-24	-		-	16-64					[
	}	}	Obenzola hightwark fie	28,34	-	j	-	20,04					1
	}	,	Benso(g hijperyere	<u>L -</u> _	<u> </u>		<u> </u>	<u> </u>	l		l <u> </u>		<u> </u>
	}		Chemical Tata	¥£ 47	-	55 De	-	8E-04					
		Exposure Point Total		l				85-04					
	Ezosura	Mede, 4. Total						85.04					

TABLE 94 RIVE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURES - STORM SEWER REMAINLITATION SAMPLING RESULTS NEG-NUOM GROTON CONNECTION PAGE 2 OF 2

Scenard Timeltome Future Receptor Population - Residents Receptor Age - L'Aging (Child and Adult)

Médiaié	Exposure Medium	Espanire Pont	Chemical al Potental			Carcavigenc	Пира			Non-Cardino	D Shasard Sweet	uDi ni ni:	
			Concein	higasion	Innealog	Oermai	Einemui (RAS Mign)	Esposure Routes Tota	Pomary Tanyol Organis:	Ingestaco	Inhgiglayo	Oe-ma-	Fagathore Roules Total
içe,relwate:	Groundwater	Seo 23	Atumin u m	· ·] '-		<u></u>	Τ,			
	ì		Antimony	ł -	i		-						}
			Arsens	1		-	-		1				!
			Struit				-		1				
	ì		Serytham	1 -	٠٠.	-	-						}
	ļ		Сподыл	-			-						1
			Cobell	- 1		-	-		i				1
	1		Соррег	j -			-						
			ron .	1 -			1 -						§
	1		Manganerut	1 -				•	ĺ				1
			Selenum	-			- !]				
			Silver	-			-					i	
		1	Zinc	_			i			1	}	1	
		1	"ecracinorphilibrine	-	45.06] -	-	46.06		1			
		}	Consideration	-		; -	1 -			Į	,)
		i	Deshyphihalate	_		-	-		i	1	}	i	
		1	Dem-bytyspitha wce	-			-						
			@s(Z-Ethythexyt)phthalate	-		' -	-			1			į.
		1	Naphilicane	-		í -	(-			\$!		}
		1	Phananihrede	l -		-	i -			ĺ			
			Fires per ret 16] -			-			1			i
		1	Pyrene	-						ļ	.		ļ
		1	Banusia) inscene			-	-			Í	1		
			Chrysene	1 -		-	- 1						ì
			Benzo(b)* coranibene	} -			, .			J]
			Benzok/fluoranthene			-	-			i			
			Bengmethyrene	ļ -		_	-						1
			Orbanzola Manthracone	-		i -]		l				
			Banarag,hiliperylana	1 -	i	' -	-						1
			Chemical Total	1	10.06	-	-	46.08				- 	-
	1	Exposure Point Total	· · · · · · · · · · · · · · · · · · ·	1	·			4F-36	<u> </u>	4.			
	Exposure Measum Total			├				45:06	1			•	
edium Tiskli		- <u></u> '—-—	<u></u>	⊹				85 D#	 _				
cepto: Fota							alm Rate Total	9F-34	1				₩-

Note

Inhalation expolutes 210 assumed to be equal to the exposures from ingestion of groundwater

ATTACHMENT A.4

TABLES FROM QUARTERLY UNDERDRAIN METERING PIT SAMPLING

TABLE 3-1

SUMMARY OF POSITIVE DETECTIONS FOR YEAR 1 MONITORING EVENTS SITE 23 UNDERDRAIN METERING PIT NSB-NLON, GROTON, CONNECTICUT PAGE 1 OF 3

PARAMETER	Surface Water Protection Crisina ¹¹	Residențiși Voletainelon Criterus ⁱⁿ	\$10mmater Disphares Parmit Cottesta	23MPd1 523CWWMD1 20070618 OPIQBNAL	25MPQ1 F03-041807 20070418 D4PLFC-4TE	23MP01 \$73GWMPM02 70970964 ORBGINAL	23MP01 533GWMP3403 20071214 ORIGINAL	Z3MP01 £D-:Z1MP1-04 20071318 DUPLICATE	33MP01 523GWMPM-64 20080221 GRIGHAL
Votatile Organica (up/L)			 1				·	<u> </u>	<u> </u>
BENZENC	7:0	130	j NA	650	050	350	050	656	027
BROMODICHEGROWETHANC		NI,	NA -1	— 637	1 050 -	T - 050	050	- 659 -	05V
CHUGAGEGRM	11.00	z ₀	NA i	ټ ز	3.7	05 (7	ÇSU	05 U	050
CYCLOHEXANE		NE NE	NA	£50	ij 5 Ų	0.1	750	55 C	050
CISH 7-D-CHUOROETHENS		850		.— [3] -—	02 J]01,	02.7	731	
SOPROPYCRENZENE		2800		C.1	ר פל: ם	0.1	0.5 ป	050.	1 - 05
METHYL TERT IN TYL FTHER	- · - · · · · · · · · · · · · · · · · ·	71900	'4A		<u>0</u> 9	04.	Ç B	0.6	Ç r
TETRACHLOROSTHENE	0.0	340	NA 1	037	<u>~</u> −	0.4	- 63	0 2 3	1 07
TRICALOROETH(NC	2340	27	NA.	34.1	((()	65;	04.7	0.37	C 4 .
PANG (ug/L)				<u></u>					
"METHYLNAMITHALENC	NE	NL.	NA I	070	[csn	07.3	G 96 J	0.3483	02' U
2-METHYLNAPHTHALENE	NF	45	NA.	0.17, 7	C'6.	02 U	11.7	0.244	0.21 (3)
4-NITROAN:LINE	NE_	NF.	NA.	02 (.	02 u	1 00	575.	10 VP	1000
#CEMAPH? HEME	NE.	NE	HA.	25 0	C2 U	C S D	6 63)	0.059.1	02· U
ACENAPHTHYLENE	1 03	NE NE	NA ·	<u>82</u> u	C2_U	07 J	1999	520 03	· 05. n
ANTHRACENE	1,100,000	NE	NA NA	0 i y	0.7 0	020	0.97.1	0 20 U.	02! U
BENZO <u>/AIANTHRACENE</u>	23	ħΕ	NA NA	<u> 3 37 </u> G	. <u>6</u> 67 U	004:0	1.7	2 842 07	3045 0
BENZO(A)PYRIENE		NE	i	62 0,	<u> </u>	0 0 0	18.1	3.2 0 U	0210
BENZO, DIP COOKAN THEME		NE	- MA	<u> 3.38</u> U	90 0 U	0.075 J	0.27	0 078 U.S	3 527 U
AFNZQXG HIGPERY, ENS		ME.	N.6	0.7		C2 U	0.31	0200	0.210
BENZO(K)FLUOMANTHENÉ		NE	NA.	0.7 (3)		020	0.512	0.20 0	1 32·U
CHRYSEAR	NLNL	NE	NA .	<u>0,2 U</u>	c2_u,	02 v	0.46.5	550.03	05, N
DIBLINZOJA HJANT-MACLINE	ME .	ME	<u>NA</u>	22 (4	024	026	6:43	0.20 J	9210
FLUORANINENE	3,700	HE.	HA.	92 U	(20	C2 U	33.0	2.50.00	3710
FLOORENE	140,000	NE	NA !	02 u	62.0	020	0.41.5	2800	0.21 70
HEXACHLOROSCATENE	5077	ME	- M	1.0		02 U	57,9	G 2C Liu	52° u
HEXACHLOROBUTAD (NE	NE.		NA.	<u> </u>	c2_u	046 U	0047	_ \$ 099 U	0.216
INDEND(1.2.3-CD)PYRENE	NE NE	<u>^</u> K	NA.	02.01	02 1	C2 U		920U	0.51 71
NAPHTHALENE	SL_	NE	NúA.	020	0.2 6	02 Li	10,1	0 088	# 25 J
PNENANTHROND	<u> </u>	,		92.0	68.0	<u> </u>	1997	Ø 20 GJ	0210
PYRENT	1:0,000	NE	44	32.6	<u> </u>		0847	0.70 (.)	0316
PAMp, Filtered (µg-L)									
-ANTTHYUNAPHTHALENE	NE.	₩ E	HA]	N4	i NA	NA	NA.		0.343.1
2 ALTHYLNADHINALENS	NE NE	N2:	NA .	NA NA	N^	NA.		NA NA	950"
4-NITROANS,INE	NC NC	HE	HA.	NA	N.A.	NA NA		NA NA	1000
ACEMAPHTHENI.	, ME	NE	NA NA	NA	NA.	N.	NA.	NA TO	0.0317
ACENAPHTHYLENE	2.3	NE NE	NA	NA.	NA.	NA.	NA.	*44	02 u
ANTHRACENE	1.100,000	NC NC	NA I		t ₁ A	NA.	NA.	N/A	92Ú
RENZOIAJAN PHRACENE	3,	NE	- · · - · · -	HA.	T ~~	N/A	NA NA	NA.	00420

TABLE 3-1

SUMMARY OF POSITIVE DETECTIONS FOR YEAR 1 MONITORING EVENTS SITE 23 UNDERDRAIN METERING PIT NSB-NLON, GROTON, CONNECTICUT PAGE 2 OF 3

PARAMETER	Surface Water Projection Citigate ¹¹	Residential Volentiasion Orbes is ^{en}	Scormwater Discharge Permis Creata th	23mP0ï 573GwiliPm01 20070618 ORIGINAL	29MPQ-1 FO-0418Q7 70070618 CMPLICATE	23MP01 \$73GWMPM02 20070906 ORIGINAL	234P01 \$23GWMPM-03 2007 1218 GRIG-FAL	23MP01 FD-121807-01 20071214 DUPLICATE	23MPB1 523GWMPM-64 299M0221 DRIGHAL
PAHs, Filtered (continued) [µg/L]			_' _ '-				. UNIO-IEL	1. DOPPERATE	GHOLDE
BENZO(A)PYRFNS	1 61	NE	NA T	HA	NA.	NA.	NA.	*4*	02u]
BENZO;0;FLOORANTHENE		NE.	- NA 1	_		4A	MA	NA.	. 0078 U
BFNZO(CH)_PFRYCEME		ME.	NA I		NA.	NA NA	NA NA	100	T - CE'O
BENZUKA LUCHANTHENE	1 03	NΕ	· ~		. NA	NA T	- NA	NA.	27 U
CHRYSENE	- NC -	NE.	NA NA	<u> </u>	NA NA	NA NA		N/A	020
DIBENZOJA NJANTHRACENE	, se	NC	NA	ALE	T TA -		- NA	MA	250
FLLORANTHENE	3.746	NE.	_ ~		NA.	- VA	NA NA	444	526
FLUORENE	140,000		_ _	NA -	MA	· NA		NA NA	2510
HEXACHLOROSENZENE	0.077	NE .	NA"	NA NA		NA .	NA.		021
HEXACHA GROUL/TADIEMI.	, _{ME}	:- ··	T 1	·- M	- AUA		NA	N/A	. 020
INDENOVILZ 3-CD/PYRENE	NE T	NE NE	NA .		NA	NA	NA.	5.5	U 22 J
NAPHTHALENE	. **= +	NC	· NA	_ NA _	T NA	-,,	NA	NA.	C 069 J
PHENANTHRENS	£ 03	NE	NA T	NA .	NA	NA	NA NA	1/4	7 020
PYNCKE	110 000	NC.	NA T		NA	HA	NA		020
Inorganics, Total (µg-1)	,								· '
ALUMINUM			NA I	473	117	322	181	218	29.4
ARSENIC	+	NA	NA.	270	. <u>1 n</u>	13.0	220	410	31
BARIUM	- 1 - ·	- Q A	· · · · · · ·	45.2	524	87	59.2	1 - - 53 4 ·	70.9
CALC-OM	_ нот	NA.	NA .	17800	15800	32900	35 500	34,790	34 1/10
CHRONIUM	110 ***	<u></u>	NA I	094 L	D#10	2	041	3.78.0	0.000
COBALT		hA.	_ N	Q84 U	\$64U	C26 J	088	0 53	- 06
CUPPER	48	NA .	60	30	30' -	į –,,, –	CALU	0770	COU
- KOM	108	NA.	NA !	9,190	*:,960	70,600	9,850	10,200	4.380
_FAD		NA		2.2	9 3	7.4	250	226	1 140
MAGNESIUM	MUY	NA -		7 260	7660	7 620	7,660	7,490	7,450
WAAGANESE	AG.	NA NA	NA	φ£∵	715	845	858	815	7B4
NICKEL	550	NA .	NA .	110	บลอน	04'U	0.51	C 46	0.64
POTASSIUM	NJT -	NA	NA I	5210	5490	5270	4,590	5.490	5,150
SECENIUM	50	NA.	T NA	15.0	2.)	:50	150	150	726
SILVER	_ ! 17	NA.	NA	0.60	0.480		046 U	0 46 0	0 SA U
SOOUN	MUT T	—- HA	j NA	48 900	49 600	25.00	53,600	52,300	±0,100
VANADILM	NE :	NA.	MA.	100	1.0	37	0340	02910	0.52 (4
ZNC	173	HA	200	21 3 J	22.3	47 6	22 8	20 C	26 5
Inorganica, Filtered (µg/L)									
ALUSINUM	NE	NA .		20 ≜ 3	36 7 3	2:31	:900	1500	35.4
ARSENIC				15u	220	124	1)1/2	1 '2	
(Анцэм	ME	NA.			45.4	50 \	48 9	136	36 f
CAUC UM	NU.T	- NA	HA .	3),600	¥.700	34,400	30 100	33,400	36,200
CHROWIUM	1:0 ***	NA.	- W.	121/	044 LI	63.	0 29	D #B	9.38 Li
COBALT	ME .	NA NA	NA NA	3 67 U	Odeu	C 47 ;	0.46	0.57	264
IRON	NUT	NA NA	NA .	2 473	3 830	3 690	4 196	4 743	3,750

TABLE 3-1

SUMMARY OF POSITIVE DETECTIONS FOR YEAR 1 MONITORING EVENTS SITE 23 UNDERDRAIN METERING PIT MSB-NLON, GROTON, CONNECTICUT PAGE 3 OF 3

RATAMARA	Surface Water Protection Orbertal**	Residential Volatilitation Cotaria [®]	Stormwater Drichunge Permit Criteria ¹⁹	23MP01 S73GWMPM01 30GF0618 ORIGINAL	23.6F01 FD-061267 20070618 DUPLICATE	73MPd1 923CWMPM02 2007M94 0RIGHAL	7]MP91 823GWMPM-03 2007121# URIGHAL	23M201 FD-121407-01 : 70071710 : DUPLICATE	73MP01 523GW#PM-64 20000321 ORIGHAL
inorganics, Filtered (continued) [µg/L]					•		· · · · <u> · · · · - · · · · · · · · </u>		
(EAD		A4A	30	134	18,	111,	210	786	144
MAGNESIUM	NUT .	NA .	44	7,200	7.460	6 980	F250	7,300	6.020
MANGANESE	NE :	NA	NA.	645	664	709	764	779	815
NICKEL	890	NA .			Oeeu	0.783	10	<u> </u>	0 to
POTASSIUM	NUT	444	NA ;	5 090	5,390	5 320	5 350	5 390	3.190
SCILINON	50	NA	NA NA	75.0	17.	74V	150	234	22 u
SOONY	hut	₩.		46 600	48,400	\$2,600	50 400	5',400	52,130
219K.	127	NA .	200	214.0	195.	'5	186	20.5	75
Patroleum Hydrocarbons (µg/L)	· · · -		·					·	•
ETPH (CCY-C30)	NE "	4€	2500 7	55 1		140.7	16C tr	1600 J	15.7
Petroleum Nydrocarbons, Fiftered (µg/L)								•	
ETPH (CCP-UUM)	- I ΝΕ	%€	2500	NA] NA .] 'NA	NA	1 - 	750

- Connects of Remarkation Standard Regulations (Languary 1996) and Comprehensive List of Approved Application Portland Substances Order aland Atlemative Chiena (October 2005)
 Proposed Revisions to Connected & Flamentation Standard Regulations, Violettapaton Chiena (Merch 2003)
 NSB-NLCNI General Permit for the Comprehend Stormwater Associated with industrial Activity (DEPLPERD-GP-014) Substance Date Condent 1, 2002 and Modified Date Livy 15, 2003)
 Chiena & Demonstrated Promition

- Criega is trace and greate
 Sample results inglige-ceed a primorare shown in Each for that Applicating
 Estantial Number
 Estantial Number
 Estantial Number
- 5 **80**CD NA NE NOT

ATTACHMENT A.5
RISKS BASED ON QUARTERLY UNDERDRAIN METERING PIT SAMPING RESULTS

TABLE 2.1

OCCURRENCE, DYSTRIBUTION, AND SELECTION OF CHEMICAL \$ OF POTENTIAL CONCERN SITE 23 - UNDERDRAIN METÉROPE PIT SAMPLING NSB-ALON, GROTON, CONNECTICUT

PAGE 1 OF 4

Scenitero Turbeframe Medium: Groundwater Esposure Medium: Groundwaler

sponule Paint	ÇAS Number	Gnemicel	Minimum Concentration ⁽¹⁾	Masimum Concentration ^{©1}	Ųnita	Sample of Meximum Conceptiation	Frequency of Detection	Range of Nondelects ^{is.}	Concentration Used for Screening th	Background Concentrations ^{is}	Screening Toxicity Value th	PoteMisi ARAR/TEC	Poleniul ARAR/TBC Source	COPC Flag	Retronals for Contestion of Contestion of Sciention [®]
STe 23	Volation Org 7143-2	anto Compounds Service	652	777	Jg/L	52)6WWPM@	- Fil	05.65	62		2350	: 5	CTDEP ASA FED-MOL CTDEP-MOL	%o {	B SL
	İ	Brumodic blazumerhane	9.2.2		υg/L	520GW9PW\$T	† <u></u> -	05.05	03	— — _{NA} —-	g. #ê c:	98 90 	CTDEP RSA 'ED-MOL CTOEP-MOL	}	ASL
1		Chloroform	27		ug/L		1/4	65-05	3	NA.	01/6	80 80	CTOEP RSA FED-MGL CTOEP NCL		AS.
		cs1,2-0-ahlorsethewe	07)	187	u g ∙L	5235WMPV02 5235WMPV02	4/4	C ≤ - O 5	0.3	NA.	8114	79 70 70	C DEP ASA FED-VCL JCTOFF-VCL		85L
		Cycleforene	ן 	810	n\$/r	\$23399MPM02	1/4	05-05	31		1005 N	MA MA AM	NA NA	No	N7 x
		·Δο;κφυγέρα (12 dine)	r 90.00	6:1	u-jy L	\$23GWMPM01 523GWMPM02	2/4	(0x-0x 	91	~	66 h	∺ ×	GIDEP RSR NA NA		RST
		Mothyl Tert-Bulyl Finer	211	' '	oğıl	923GWWPN01	44	 		NA.	11 C	70 NA NA	CTOEP RUR NA NA		BŠL
		Teleschiologihere	(2)	041	uģi	SZ3GYMPM32	6.4	<u> </u>			01 C	3 3 5	ETDEP ASA FED-MOL CTDEP-MOL	[-]	AŠL
		Tre hlorocizene	03-		va L	523G/4MPM32	- 24 	ļ	 	NA .	₫ <u>03</u> 8 C	5 5 5	CTDEP RSR FED-MGL C10EP-MCL	V2+4	ASL
	PAHs_, _	1-Merhylasohthalene	0.048.1	0 % ;	(ra/L	ระวงเพลานอั	1/4	03 031	т — гун т— і	- 4k	9 D2 M	45 NA NA	CTDEP RSR	Yps	151
	91 57-6	2.Methylnaphthalene	Ç 41 C		ugil	523GWVPV-23	Z/4	02-37	, , ,	······································	062 N	49 KA KA	CTDEP RGR	Yes	ASL
	100-01 6	4-Nuncianave	C 25		úşι	SZIGIYMP\$L03		02.5	2/5	N.A.	35.0	21 NA NA	CTOSP RSR NA NA	No	est
	83-32-9	#Et-wys/hene	(देंड)	3827	val	5235WMPM-08	- 54*	02 021		NA.	37 N	74. 74.	NA NA VA	<u>~</u>	8 80
	208 96-8	Ace: uphun/ena	64.7	091	uÿl.	S23GWMPM-03	1-14-	02-03	0.5	NA.	JI N"	42 2	C*DEPH\$A NA NA]	DSL.
	120412.7	Anny acares	0.85.1	602	· vg/L	\$23GWWPM-0\$	7/4	02-321	7 997 1	~	196 N	2908 NA NA	C10EPINSA NA NA		RŞL
	56-55-2	Benevijająmihracione	1,1		տրՂ	52.)(i.h/ii/21/-0)	1/4	\$ 2001.20		NA	9,035 C	7.7 7.7 0.00	CTOEP RSR NA NA	'	45.
	27.77-8	Benzolajpyreno	0.05.3	235 J	ogk.	5230WMPM-03	1:4	25.02:	0 25	NA NA	0 0003 €	0 2 0 2 0 2	CTOSP RSR CCD MCL CTDSP-MCL		A ŠL
	205-99-2	Benzejájí guranife ng	0.64.	3647	હ્ય		174	0 075 · B B#2	C 64	- -	0 033 €	NY 903	NA NA	Yen	ASL
	191.742	Велио(д h. Sperylene	- 07/	(2)	ψ g Λ.	\$23GWUPW.03	1/4	C 2 - Q 21	231	- NA		NA NA NA	NA NA NA	Me	BSL
	207-58 5	B4rreo(h)/Luorani hene	0 \$7.7	} 	og/t	\$23GWVPM-Q)	17/4	<u>₹2.02</u> •	053	NA.	5.97.5	05 NA NA	CT DEP RSA	Yes	

TABLE 2.1 OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL GONGERN SITE 23 - UNDERDRAIN METERING PT SAMPLING HSB-NEIGH, GROTON, CONNECTICUT PAGE 1 OF 4

Scenario Timeirame. Medium: Groundwater Expopure Medium: Groundwater

CAS Number	Chemical	Minimum Concentration'	Meskmurn Çencertration'''	Lin i t _e	Sample of Maximum Concentration	Frequency of Detaches	Range of Nondelette ⁽²⁾	Concentration Used for Scienning!h	Background Concentrations ^{NI}	Screening Toxicity Value ⁵⁴	Potevijei ARAR/TBC	Potential ARAR/TBC Source	CDPG Flag	Rationale for Comminant Outstion or Selection ^{Pc}
218 71.9	Сокумене	076]	076.1	⊌ y /L	S23GWWPM-Q3	7/4	32.021	0.76	*44.	93.0	4.8 NA	NA.	No	#SL
5,572.3	Винована, и <u>зантъгажене</u>	014.1	314.)	- ugrL	523GW449#403	14	62.029	0.4	NA -	0 0029 C	Q Z NA	CTDEP RSQ NA	Yes	~ <u>~</u> \$4
256-4+0	Flyorynihene		17,	nûr	SZJGWMPM II	194	9 2 - 0 21	,	- NA	150 4	280 NA	टाइस्ट इडस •••	No	P.2r
£6-73-7	FUorane		09/7	ng/L	52 JG WWPW-03	Trap	32 · C27			24 N	780 NA	CTUEP RSX		usi.
19-74-1	Mezachitarabenzene			∪g/L	SZZGIVVAN 03	114	<u> </u>	y-		0 042 G	1	CIDEP RSM FLO-MGL	Yes	≯ŠL
E7-68-3	Hexachiorobularinema	1		ug/L	.2232-mem-67	514	C 094 - C 48	∱ ~ _{ሞራ} ~~~ 			49 NA	CTO≜PASR NA	Na	B\$1
193-39-5	Indexa(1.2.3-cd invrene	C 22 ~	G 22	الم	\$2)00WMPVI-03	144	02.631	<u> </u>	·ii ·-	0 D92 G	ÚS NA	OTDEP RSR NA	Yes	AS.
91-23-3	Naghthaless	E 588 J	17.	uşt	SZ/OWMPM-03	- 134	- ह∑ ∙हरा	<u> </u>	NA	0 62 M	280 NA	UTOLV RER	Yes	ASL
85-01-8	Fheranitrese	0891	0991	·9'-	SZ3GWNPM-00	1/4	02-03-	- ୭୫ଟି	·N		730 TNA	CTOSP RSR NA	No	DSL.
:29.00-6	Pyr ene	0.84	084.1	-9°-	5230WWPW-00	1/4	02-021	684		∱-—- 18 N	200 NA	CFOCP RSH NA	NO.	Bs.
PANS. Filre	**-Methykraphthy/ane	- 6.660.0		}	533GWMPM04	1 "	· -	0 093	, NA	043 /2	49'13.	CTOEP RISA	7~	9 5t
63-32-9"	Azer agrifaria	_ 	- L G O	-	\$73GY/MPM04	10"		0.03:	NA.	O'N	NA.	NA NA NA	Nu	₿SL
191-24-2	Banzolg hylperyane	+ - 575	53,-	igi	523GWNPMM	''1		C . 3	NA	10 10 10	NA NA NA	NA NA	No	BSL
193 19-5	Indensi(1 2 3.co: myzene	<u> </u>	e 25 J	- ugyL	SYSCHMPMJE	Ti f		G 22		0 U97 C	95 NA	MA.	Yes	ASL
91-20-3	Naphthalene	0.069.1		- VOL	523GWMPM0A	111		0.069	·iù	3 K2 N	ZRC NA	CTUEP R54	No	- har
Inceganica 7429-90-5	Ale-fiction**	216	473	l wyl	S23GANPH401	414	·			[- NA	Yes.	ASL.
7840-35-2	Arsena	31	13.9	- vigit	CONDINATORS -	<u>_54</u>	22-47	\35	1 92	0 045 C	NA 50	ETGEP RSR	1	ASL
7440 3971	- (Jarum	-+ 457	}	- işı	SZECWINEWUZ	aid		87	227	260 50 -	1000	GTOEP-MGL	Na	A2F
7446-70-2	Ch Cum	32029	35800	0 3 /2	\$23GWMPM01-0	4/4	}	₃₅₈₆₅	185000	ša	NA NA	CTEP-MCL	ho	Nu-
15/23-26-1	 Curoenna	0.41	2	no	52)GWWPUC2	2/4	034-684	- · <u>-</u>		11 841	50 50	NA C*U€P FISH	No.	851,
	Mymber 218 71.9 53-73-3 206-44-0 66-73-7 118-74-1 118-74-1 118-74-1 193-93-3 85-01-8 193-93-3	Mymber 218-31-9 Chrysenc 63-73-3 Chrysenc 63-73-3 Chrysenc 63-73-7 Figurality of the second of t	Congarization Congarizatio	Congarization Congarizatio	Concentration Concentratio	Monther	Concentration	Chemical Consentration C	Chamical Concertation Concertain Concertation Concertation Concertain Concertation	Chemical Convertation Content allow Convertation Convertation Convertation Content allow Convertation Convert	Character Congentration Characteristics Congentration Congentrat	Chemical Concentration C	Chemical Chemical Congression Chemical Congression Congressi	Chemical Chemical

TABLE 2:1 OGGURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL COAGERN SITE 7.3 - UNDERDRAM METERNIG PIT SAMPLING NSB-MION, CROTON, COMMECTICAT PAGE 3 OF

Scenario Timetrame: Medium: Groundwater Exposure Medium: Groundwater

re Point	CAS Number	Chemical	Microsoft Concentration ⁽¹⁾	Maximum Concentration ⁽¹⁾	Unite	Sample of Maximum Concentration	Frequency of Detection	Range of Nondetects ⁽³⁾	Gencentration Used for Screening ⁽²⁾	(Euchground Concentrations ¹⁴	Screening Toxicity Yakus ^{rk}	Potential ARAR/TBG	Potermial ARAR/TBC Source	COPC Flag	Relignate N Contamina Defection o Solection
_ 1	7440-48-4	rjobak	0.53	0.55	99%	5236 MVPM-03	2/4	0.26-384	V 66	- AH 6	73 N	NA NA	NA NA	Na	BSL
	7440-50-8	Соррен	- 42	43	ug/L	\$7.1GWWPW02	ंख	C 22 - 3	42	:07	150 N	1300 1300	CTOEP RST	No.	ASL
	7474896	hou	4380	70000	PST	5230WMPMOZ	4:4		70837	28200	1100 N	- 1300 NA 500	CTOEP ASS CTOEP ASS FED-SMS1	Yen	ASL
	7434-92-1	Lapa			A3,1	5230WMP401 B	2,4	14-25	93	6.6)	<u> </u>	15	CTDSPINGL CTDEP ASR FAD-MCL	No i	B5.
	783¥-95-4	Dagrana Lam	7020	7660	-Si-	523CWMDM(1-0 523CWMDM(1-0	4:4		7660	191000	₩.	NA NA	CTDEP-VCL NA NA	hg	- YJY
	/#39-96-5	Manganese	661	879	nð,r	23.10A.Wbdv-97	4:4		892	11790	85 M	NA NA	NA.	Yas	ASL
	7440-02-0	Notel	045	C Ga	ug/L	\$230WMPW04	- 2:4	<u></u>		377	73 N	50 NA 100	NA CTOŁĖ RSA	j No	ési
	7445-09-7	Porass, m	. 5153	555C	ugil	\$23GWMPM-03		<u> </u>	55990	73830		NA 100 NA	STDEP-MCL NA	N ₀	Mu-
Ì		}]				L		_ %*	NA NA		
	1182-49-7				nihr	SZIGWYPNĆ O	1/4	15.21		y : y		50 50 50 _	- CTOEP RSR FED-MG1 CTDEP-MG1		RSL
	: #43-2 2-4		15	- 	ug/i	\$735WMPM37	174	- 2+ 5-€×4-	T,	NA.		36 100 50	FEG-SMCL NA] ~~	āŞt
	7FFQ-20-5	Sodium	4900		ag'.	\$23GWWPV-33	434 "			1900000		NA NA	NA NA NA	No.	NUT T
	7840-82 2	Varadium	37	3,	-9,F	\$23GWMP#3}***	174	329×13		102	14 N	35 NA	CTOEP RSR	Yes	ASL
	7 44 3 66-6	z~	50 1	<u> </u>	ug/L	S23GWNPM)2	-2-2	 	47 ((150 N		CTOCH RON	₩-	BSC
	inorganica, /a29-y0-5	Filtered	1 - 2243	L	100°F	L SZIGWUPWOLD	1 34	1 - 19 - 19	L		1 3600 N	NA NA	NA NA	Nı:	BS'L
	/ 240-33- 2	ì	12;	26	<u> </u>	S73GAAPWO4	224		20	2 25	0 045 E	50 9A 50	PED SMCA NA CEDEP RSR		ASL.
			1		i Manga I							10 18	CADENTOT		
	7440-3∓9	Bear.	446	58.8	ugs.	\$235YMPW04	4/4		56 A	122	350 N	2000 2000	CTDEP RSR FEO AVCL CTDFP-MCL	ho	BSL
i	7440-767	Celtarin	31400	76000	uş/.	\$23GWWPW04	4,4	<u> </u>	3600	15,8000	NA.	NA NA	NA NA	No	MUT
Ì	15723-26-1	Chromeun	-029.1		-9g*(S7XJWWPW-C3-D	2/4	038.12	Ç #A	16	11 N ^T	5¢ 100	CTOEP RSP FED-MOL CTOEP-MOL	ho.	9 8L
	7440-48-1	Coesh	-047 1	764	ug/L	\$23GWPM64	34	. 1357 - € 86 -	- 164	-453	73 N	100 NA NA	ALA NA	745	BSC
	7+39-64-6	ron	3473	- 4190	vg/L	SZ3GWMPM-CO	 -	 	4196	25350	1100 N	1/A 1/A 3500	VA VA PED SMCL	Yes	ASL

TABLE 2.1 OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN SITE 23 - UNDERDRAIN METERING PIT SAMPLING

NSB-NLON, GROTON, CONNECTICUT PAGE 4 DF 4

Scenario Temeliama: Medium: Groundwaler Exposure Medium: Capundwater

Esponare Point	CAS Number	Chemical	Minimum Concertration [©]	Maximum Concentration ²¹	Umita	Sample of Maximum Concentration	Frequency of Detection	Range of Nondatacta ^{ds}	Concentration Used for Screening ⁽²⁾	Background Concentrations ⁽¹⁾	Screening Foricity Velipp th	Potential ARARUTEC	Polamusi ARAR/TBC Source	GOPC Flag	Rationals for Contaminant Deletion or Selection ^{Re}
	7439-92-1	i.e.c	133	.8.	nā,r	\$233WWPW31.0	1/4	11.28	16	252	N.A	15 15 15	CIDEPIRSR FEO-MOL CIDEP-MOL	455	, BSL
ļ		Magnaphum	6980	8020	ugit	S23GWMPM34	4/4	-	8020	150500	KA.	4 4 4 4 2 2	na kia na	hių	N _U :
1	7439-95-5	Manganese	G45	815	ugit	523G/AINFMI)a			-B15	, Amili	20 N	NA SII NA	FFO-SLAGE NA	Yes	ASU
	7440-02-0	Nicket	D 64 J	, 	ogl	523GWMPNC00	4 بن	U 848-11	1	153	73 N	1400 NA 1400	NA NA NA	No	B\$L
	7440-09-7	Potenture	5090	5390	-9-	\$23GWWPM.03-0 \$23GWWPM.03-0 \$23GWWPM(#	4/4		5790	60000	NA.	***	NA ALA ANA	No.	NUT
1	778249-2	Se'erwi-	17.	17.1	- Cor	523GWVPW3:-D	li4	15-24	17	_ ~	18 hr	50 50 50	CROEPIRSR FEDAVOL CROEPINGL		BSL
	7440.23.5	ļ	36600	52600	99x	S23GWVPWQ2	4/4	-	52600	1580000	NA	NA NA NA	NA NA NA	K ₀	"AUT
	7440-66-6	Zenc	15.3	26 "	NA,r	รวงดีพพ ะกับดู้ ส	i		76	109	::00 K	5000 tea pea	CTGEFASA NA NA	No.	65.
	Patrofeum I	fydroderborts Tolas Pelvoleum Mydrocastions	55 7	7600 J	υ ρ 'ί	523GWMPM-03-D	24	75 - 160	'600	NA,	NA.	SSO NA SA	CTDEP RSS	Yes	ASI

Froingtes:

- 1 Sample and dypicate are considered as two separate schoulers when determining the investors and maximum concentrations
- Z Values presented ate sample specific quartitation limits.
- 3 The maximum detected concentration is used for screening purposes:
- 4 Values are from the Basewide Groundwater Operates Unit Remodule Involvigation Report (Talta Tech. January 2002).
- UbbPA Regum IX Protructury Retendation Goal (PRG). The noncarchogenic values (denoted with a "N" flag) are the PRG divided by 10 to correspond. to a larget hazaro quoi era ef 0.1. Carphogenic values represent an incuernerial cancer risk of 1.0F-46 (carchogens denoted with a "C" fact (USEPA Region IX, October 2004, Updated December 28, 2004)
- 5 The channel is selected as a COPC I are maximum detected concentration exceeds the institute of COPC screening level
- 7 Nephihatene is used as a surrogate for 1, and 2-mathy/haphthatene
- 8. Administrations is used as a surrogate for aconophilitylene.
- 9 Pyrene is used as a surrogate for beauting halperyears and phenerthrane
- 10 2-methylnephinalone is used as a surrogate for it methylnephthalene
- 11 Value a for hexavalent chromum.

Shaded chlerkin inspection that the management effected concentration exceeds one or more screening ordered. Shaded shemmel name indicates that the chancel was received as a COPE.

Associated Samples \$230WWPN01

523GWVPN01.D

S23GWPPNQ2

\$73GWWPM-00

S23GWWPM-03-0

SZEGWAPNOA

ARAR/TBC - Applicable of Relevant and Appropriate Requirements To Be Considered

C * Carchogen COPC • Chemical Of Potential Concern

i * Espinated value

Nia Noncaromogeni

NA - Not Applicable Not Available

FED-AKCE - Festinal Manager Contaminant Level (USEPA, 2006) NED-SWCL in Federal Max room Comaminant Level (USEPA 2006)

CTDEP RSR - Connect out DEP Remediation Standard Regulations 1996 CTDEP-MCL = Connect-out DEP May mum Contemmant Level

Assignate Codes:

For selection as a COPC

ASI, * Above Scienning Level/ARAR/78C

For elimination as a COPC

8St - Betwe COPC Scanning Lavel

NuT : Essential nutriera

NTX = No loacity criteria

EPA1 in USEPA Region 1 does not advocate eveluation of this chemical

TABLE 3.1.RME EXPOSURE POINT CONCENTRATION SUMMARY REASONABLE MAXIMUM EXPOSURES - UNDERDRAIN METERING PIT NSB-NLON, GROTON, CONNECTICUT

Scenario Timeframe: Current/Future

Medium: Groundwater

Exposure Medium: Groundwater

Exposure Point	Chemical of	Units	Arithmetic	95% UCL	Maximum Concentration		Ex	posure Point Concentration	
	Potential Concern		Меал	(Distribution)	(Qualifier)	Value	Units	Statistic	Rationale
Site 23	Bromodichloromethane	ug/L	0.26	(1)	0.3 J	0.3	UQ/L	Maximum Detected Concentration	(2)
	Chloraform	ug/L	0.81	(1)	3 J	25	ug/L	Maximum Detected Concentration	(2,3)
	Tetrachlorgethene	ug/L	0.31	(1)	0.4 J	04	ug/L	Maximum Detected Concentration	(2)
	Trichlaroethene	ug/L	0.40	(1)	0.5 J	0.5	ug/L	Maximum Detected Concentration	(2)
	1-Methylnaphthalene	ug/L	0.20	(1)	0.96J	0.492	ug/L	Maximum Detected Concentration	(2,3)
	2-Methylnaphthatene	ug/L	0.24	(1)	1.1 J	0.6	ug/L	Maximum Detected Concentration	(2,3)
	Benzo(a)anthracene	ug/L	0.15	(1)	1 J	Q.5t	UŞTL	Maximum Detected Concentration	(2.3)
	Benzō(a)pyrene	ug/L	0.13	(1)	0.35	0.225	ug/L	Maximum Detected Concentration	(2.3)
	Benzo(b)fluoranthene	ug/L	0.11	(1)	064J	0 3395	ug/L	Maximum Detected Concentration	(2.3)
	Benzo(k)fluoranthene	i/g/L	0.16	(1)	0.53 J	0.315	ug/L	Maximum Detected Concentration	(2.3)
	Dibenzo(a.h)anthracene	ug/L	0.11	(1)	0.14 J	0.12	ug/L	Maximum Detected Concentration	(2.3)
	Hexachlorobenzene	ug/L	0.34	(1)	1.2 J	0.65	Ug/L	Maximum Detected Concentration	(2,3)
	Indeno(1,2,3-cd)pyrene	ug/L	0.12	(1)	0.22	0.16	ug/L	Maximum Detected Concentration	(2,3)
	Naphthalene	ug/L	0.21	(1)	1 <u>J</u>	0.552	الوف	Maximum Detected Concentration	(2.3)
	Aluminum	ug/L	169	(1)	473	322	ug/L	Maximum Detected Concentration	(2,3)
	Arsenic	ug/L	5.1	{1}	13.9	13.9	υg/L	Maximum Detected Concentration	(2)
	Iron	ug/L	23939	(1)	70800	70800	ug/L	Maximum Detected Concentration	(2)
	Manganese	ug/L	788	(1)	858	845	ug/L	Maximum Detected Concentration	(2,3)
	Vanadium	ug/L	1.2	(1)	3.7	3.7	ug/L	Maximum Detected Concentration	(2)

For non-detects, 1/2 sample quantitation fimit was used as a proxy concentration.

- J Estimated value.
- 1 There were an insufficent number of samples to calculate distribution statistics.
- 2 There were only four rounds of results which is insufficient to calculate a temporal average, therefore the maximum detected concentration is used as the exposure point concentration

TABLE 4.1.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS REASONABLE MAXIMUM EXPOSURES - UNDERDRAIN METERING PIT NSE-NLON, GROYON, CONNECTICUT

Scenario Terreframo Fulure Medium Groundwater Sipasuro Mediury Graundwater

Exposure Roots	Receptor Population	Recestor Age	Ехрозин Ролі	Parameter Code	Parameter Ostinikai	Value	Unis	Rationale: Reference	letaka Squation∜ Made Natire
Ducusi	Construction Workers	Adııh	Sile 23		Cornally Absorbed Cose per Event	Calculated	mgronz-eveni	U.S. EPA, 200≇	Dormaly Absorbed Dose (mg/kg/day) =
				SA	Skiri Surface Available for Contact	3300	cm2	U.S. EPA, 2004	1
i i				CV	Event Frequency	,	events/day	ro -	DANNEY & EV & EF & ED & SA
				Εí	Supposure Time	4	hoursiday	(1)	BWXAT
]		Ę=	Fisposure Frequency	30	days/year	Ļ! I	
ł				ED	Exposure Duration		years	(1)	See that for calculation of CAevent
				BA.	Body Weight	70	kg	U.S. EPA, 1989	
i			[A1-C	Avikaging Time (Cancer)	25550	daya	J.S. EPA, 1989	<u>'</u>
l]	Į.	AT ₁ N	Averaging Time (Non-Cencer)	_ 365		U.S. EPA, 1989	[

Sources.

- 1 Professional, adgment
- U.S. EPA 1989. Risk Assessment Curdance for Suportand. Vol 1: Human Health Evaluation Manual, Part A. EPA/5401-86/060.
- U.S. EPA, 2004. Risk Assessment Guidance for Superfund (Part E. Supplemental Guidance for Dorma, Risk Assessment) Final. EPA/540/H/38/05.

Unit Intake Calculations

Ingestion Intake = (IR.GW • SF κ EDV(8W • A1) Demail Intake = (SA x EV • SF x EDV(8W • A1)

Carridor Ingestron Intako · NA

Cancer Domest Intake + 5 546-02

Noncancer Ingestion Intake # NA

Norwarder Dermat Intake - 3 87E - 00

TABLE 4.2 RMS

VALUES USED FOR DAILY INTAKE CALCULATIONS.

REASONABLE MAXIMUM EXPOSURES - UNDERDRAIN METERING PIT

NSB NEON, GROSON, CONNECTICUT

Scenaso Proekrame, Fylicro Medium: Groundwater Exposuro Medium: Ar

Expasors House	Receptor Population	Receptor Age	Exposure Paint	Parkmejor Code	Parameter Op ^e rvion	Value	Unis	Rationgrav Reference	iniakę Equation(Model Name
luhalation	Construction Workers	Agon	S 4: 23		Chemical concentration in av	Calculated	وسرعس	VDEO 2904	Intake (mg/kg/day) =
]				CW	Chemical concentration in water	Average	ugit		
1				CF	Conversion Factor	0.301	mg/cg :	-	<u>CANIRNSTREEAED</u>
1 '	i i		j	!R	Inhalation Rate	25	müdsour	US EPA, 1593	B'W' ⊭ AT
				1	Faposure Time	4	lacomition	115	l 1
]				EF	Exposure Frequency	30	Cays/year	177	CA = CW + CF x VF
i :	!		ļ	ED	Exposure Duration	,	years	ויו	l t
				BW	Body Meight	70	kg .	US EPA, 1989	i 1
	1			AT-C	Averaging Time (Cencer)	25653	Cays	J 5 FPA, 1999	1
H				AT-N	Averaging Titrle (Alum-Cance/)	365	days	U S. ÉPA, 1989	!!!
<u> </u>				VF	Volatilitation Factor	Calculated	;mg/m3//jmg/L1	VDEQ, 2004	

Notes.

1 - Professional judgment

U.S. EPA, 1989, Righ Assessment Custance for Superfund. Vol.1, Human Health Evelstation Manual, Part A, EPA/540/1-65/060.

U.S. EPA, 1993: Supertund's Standard Default Exposure Factors for the Central Tonderby and Reasonable Maintrus (Exposure,

VDEC, 2004. Very his Department of Environmental Quality (VDFD, county-http://www.degislateivalus/reproblementage.html)

Unit Intake Calculations

in haloloop in take $\sim |R|_A$ ET $_B$ EF $_A$ ED/(BW $_A$ AT).

Canopi Inhaalon Intake = 1 68E-04

Nonconcer Inhalation totalse # 1,176-02

TABLE 4 3 RME

VALUES USED FOR DALLY INTAKE CALICULATIONS REASONABLE MAXIMUM EXPOSURES - UNDERDRAIN METERING 911

NSS-MION GROTON CONNEUTICUS

Scenario Timefrane Future Medium Groundwater Entaturo Medium Groundwater

Еврозию Носле	Receptor Popularian	Receptor Age	Exposure Point	Parameter Code	Parameter Daleuwe	Væse	Urvis	Rakanalei Roferenca	Inlake Equations Model Marne
ingasian	Resperts	Chee	5Je 23	CGW	Chemical Concentration in Broundwitter	May or 95% UCL	mghq	U S EPA 2002#	Chronic Opey intake (COI) (insphisholary) =
	<u> </u>	'		C7	Conversion Factor	0901	פטפה		
	ĺ	'		⇒R SW	ingestion Rate of Groundwater	: 5	LIGHY	U.S. EPA, 1994	CW + CF + IR-GW + EF + ED
	i	•) EF	Exposure Frequency	356	days/year y	US FPA 1994	BN s AT
				ED1	Exposure Dyranon (Age 3 - 2)	,	years	US EPA 1989	
				EU2	Expassive Duration (Age 2 - 6)	4	yaars	US EPA 1989	
				l	Rody Weight	15	1 92	U.S. EPA 1991	
				AT-C	Avaraging Time (Cancer)	25550	09/5	U 5 FPA 1999	
	L			AT-N	Avoiliging Time (Non-Cancer)	2196	dayo	US EPA 1989	
Decrea	Residents	Ch4a	54c 23	i	Demoliy Absorbed Dose per Event	Carculated	mg.cin2-event	U.S. EPA, 2004	Dentially Absorbed Dose (Highlightay) -
	1		Ì	SA	Sem Surface Astellable for Contact	6.600	, cin2	U S CPA, 2004	1
	l i		}	EV	Event Frequency	' '	even's/say	U.S. SPA, 2004	<u>DAmenta EVA DE a ED a SA</u>
			ļ	ĹΤ	Esposure Time	0.25	hours/day	U.S. EPA, 1997	8W × A
				땨	Exposura Fredethoy	350	days/year	USEPA 1994	
	!			ED1	Exposure Duration (Age 0 - 2)	,)8+% (US EPA 1989	See test for calculation of DAevern
				ED7	Exposure Durelion (Age 2 - 5)	! 4	pears .	U.S. SPA, 1989	
	l i			₿₩	Body Weight	15	tog	U S EPA, 1991	
	l i			AT-C	Averaging Timb (Cariser)	25550	daya	U.S EPA. 1989	
	<u> </u>	<u> </u>	<u> </u>	AT-N	Averaging Time (Non-Cancol)	7190	18ys	U 5 EPA, 1989	1

Sporters

- U.S. EPA, 1989 Risk Assessment Gordance for Superfund, Vol.1. Human Health Evaluation Manual, Port A. EPA/54011-56/960
- 1) S. EPA, 1991. Pisk Attentioned Guidance for Superfund Supperfunds Guidance. Standard Defaul Exposure Factors Interm Final
- U.S. EPA, 1994, U.S. EPA Region I Risk dipeaks, August 1994.
- U.S. EPA, 1997. Exposure Factors Mandbook. CPA/600/P/95/002Fo.
- U.S. CP4, 2007 Calculating Usper Confidence Units for Exposure Pont Concentrations at Hazardous Waste Sites. IDSWER 9285 6-10, December
- U.S. EPA 2004 Risk Assessment Guidance for Suppetitivel (Part F. Supplemental Guidance for Dynnal Risk Assessment) Finix. (EPA)540/R199.005

Unit Intella Calculation

Regress. More \sim (.R-GW \approx EF \approx EDV(8W \approx A7). Decide, indice \sim (SA \approx EV \approx EF \approx EDV(8W \approx A1).

Center Ingestion Intake (Age 3 - 2) = 2.74E-06

Cancer Dermal Make: (Age 0 - 2) = 1 21E+01.

Cancer Ingestion hitake (Age 2 - 6) = 5.48F-06

Cancer Dermal (mass: (Age 7 - 6) = 7.41E+01.

Noncancel rigestion intake n. 9 59E-05

Noncercei Dermai Intere - 4 226-02

TABLE 4 4 RME

VALUES USED FOR DAILY INTAKÉ CALGULATIONS REASONABLE MAXIMUM EXPOSURES - UNDERDRAIN METERING PIT

NSB NEDN, BROTON CONNECTICUT

Seenavo Timelramo Fubile Massumi Groundwater

Exposisio Medium - Croundwater

Exposure Hawle	Receptor Population	Receptor Age	Exposure Pour:	Pårameter Code	Parameter Definition	value	실수님	Rationale/ Reference	Intake Equation: Model Variet
hgeston	Residents	시네네	See 7)	cow	Chemical Concentration in Stoungwater	95% UCV or Max	79 /L	US EPA 2007	Chronic Dally make (CD) (mg/kiyiday) =
	1 1			ÇF	Conversion Factor	0.001	mg/ug	_	
				R-GW	Ingestion Rate of Groundwater	2	Usay	JS EPA 1994	CW + CF x R:GW x EF x ER
				66	Ехровиче Frequency	350	daystycar	US EPA 1934	EW x AT
				ED1	Exposure Duration (Ago 10 - 16)	10	A24.8	U.S. EPA, 1989	ì
	1			ED2	Exposure Duration (Age 16 - 30)	14	years	US EPA 1989	1
	ŀ				Body Weight	70	kg l	U S EPA 1959	
				AT-C	Averaging Tyne (Cancer)	25 550	:1375	U.S. EPA 1989	
				AT-N	Averaging Time (Nun-Cancar)	3 1150	days	U S EPA, 1989	<u></u>
Derma	Rasidents	Ac.st	Sda 23		Dermaky Absorbed Dose per Event	Carcinated	mg/cm2-event	U S EPA, 2004	Deimety Absorbed Dase (nightg/day) =
				S.A.	Stan Sud ace Available for Contact	16 000	em2	U S CPA, 2004	
				5.4	Eveni Fraquency	1	encompany	L S EPA, 2004	DAMMAN EV EF . ED . SA
	!	·		ET	Exposure True	0 25	hours/day	U S EPA 2004	6W > A1
				1	Exposure Frequency	350	(Jays/year	US EFA 1994	
	!	j '		FD:	Exposure Duration (Age 10 - 16)	:0	pears :	U.S. EPA, 1989	See (ext for calculation of Different
				EO2	Exposure Duration (Age 16 - 20)	;*	hep.z	US CPA 1989	
	[SW	Body Weight	70	149	U.5 EPA 1989	
				A7-C	Averaging Time (Cancer)	75 550	days	US EPA 1989	
				AT-N	Averaging Time (Non-Cancer)	3,650	cepe	US EPA 1989	

Sources

- U.S. EPA, 1889. Risk Assessment Continue for Superford. Vol. 1. Human Health Evaluation Manual. Part A. EPA/340/1-88-060.
- U.S. EPA 1991 Risk Assessment Cuidance for Superfund Supplemental Guidance, Statistant Default Exposure Factors Memor Final
- U.S. EPA, 1994, U.S. EPA Region / Rea Updates, August 1994.
- ψ SI CPA 1997, Exposure Fyçices Handbook UIS EPA/600/9-95/002FA
- 13.3 CPA 2004 Risk Assessment Guidance for Superland (Part F. Supplemental Guidance for Emirral Risk Assessment) Final EPA-\$4019/98/005

Unit Intaka Calculations

Ingestion Imake + (IR-GW + EF + EO)(BW + AT) De/mail Intake + (SA + EV + EF + ED)(BW + AT)

Cancer Ingestion Irriake Age 10 - 16) = 3.918-66. Cancer Ingestion Prake Age 16 - 30) = 5.488-66. Cancer Dermal Inlate Age (E - 16) • 3 526 • 01 Cancer Dermal Inlate (Age 16 - 36) • 4 93E • 01

Nangarion Ingestion visite - 5,588-05

Noncancer Bermai Irdake = 5,926 x02

TABLE 4.5 INTERMEDIATE VARIABLES FOR CALCULATING DA(EVENT) SITE 23 - UNDERDRAIN METERING PIT NSB-NLON, GROTON, CONNECTICUT

Chemical of	Media	Dermal Absorption	FA		P	T(e\	rent)	Ta	NU .	Т	•	В
Potential Concern	ļ	Fraction (soil)	Value	Value	Units	Válue	Units	Value	Units	Value	Units	Value
Volatile Organic Compounds												
Bromodichloromethana	Groundwater	NA I	1,	4.6€-03	cm/hr	. (1)	hr	8.8E-01	hr	Z.1E+00	hr_	2.3E-02
Chloroform	Groundwater	NA NA	1	5.8€-03	cm/hr	_(i)	hr	5.0E-01	- hr	1.2E+00	þιτ	2.9E-02
Tetrachloroethene	Groundwater	NA	1	3.3E-02_	Qr:/ly	(1)	hr	9 1E-01	hr	2.2E+00	hr	1.7E-01
Trich/orgethens	Groundwater	NA NA	1	1.2E-02	cM/hr	(1)	þr	5.86-01	hr	1.4E+00	hr.	5 (E-02
Semivolatile Organic Compo	unds											
1-Methylnaphthalene	Groundwater	NA NA	1	9 1E-02	<u>cm</u> /hr	(1)	hr	Î 6.6E-01]	hr	165+00	hr	4.2E-01
2-Methylnaphthalene	Groundwater	NA	1	8.9E-02	Cott/frr	(1)	hr	6 6E-01	hr	1.6E+00	μ	4.1E-01
Benzo(a)aninracene ⁽²⁾	Groundwater	NA NA	NĄ	NΛ	NA	NA	NA .	AN	NA	NA	NA	NA_
Benzo(a)pytene ⁽²⁾	Groundwater	NA NA	NÁ	NIA	NA .	NA	NA	NA .	NA	NA .	NA	NA
წლიzo(ნ)fluoranthene ⁽²⁾	Groundwater	NA NA	NA	NA NA	ŊĄ	NA	NA	NA	NA	NA	NA	NA
Benżo(k)flutranihono ⁽²⁾	Groundwater	NA NA	NA	NA.	NA NA	NA NA	NA	NA NA	NA	NA	NA	NA.
Dibenzo(a.h)anthracene ⁽²⁾	Groundwater	NA	NA	NA.	NA	NA	NA	NA	NA	NA	NA	NA
Hexachlorobenzune	Groundwater	NA NA	0.9	1.3E-01	cm/hr	(1)	hr	4 2E+00	hr	1 6E+01	hr	8.7E-01
Indeno(1,2,3-od)pyrene ⁽²⁾	Groundwater	NA	NΛ	NA NA	NA	NA	NA	NA	NA	NA	NA	NA
Naphthalene	Groundwater	NA NA	1	4,7E-02	cm/hr	(1)	hr	5.6E-01	hr	1.3E+00	hr	2,0€-01
inorganics												
Aluminum	Groundwater	NA NA	1	1.0E-03	cm/hr	(1)	hr	NA]	N.A	NA_	NA	NA
Arsenic	Groundwater	NA	1	1.0E-03	cm/hr	(1)	hr	NA	NA	NA .	NA	NA
Iron	Groundwater	NA	1	1.0E-03	cmihr	_(1)	hr	NA	NA	NA	NA	NŁA.
Manganese	Groundwater	NΛ	- ;	1.0E-03	cm/hr	(1)	þr	NA .	NA	NA	NA	NA
Vanad.um.	Groundwater	NA .	1	: 0E-03	cm/tvr	(1)	, br	NA NA	NA	NA	NA	N/A

Notes.

Ail values from EPA's Rick Assessment Guidance for Superfund Volume 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Qermal Risk Assessment) Final, July 2004.

- 1 Terms is 4 hours for the construction worker and 0.25 hours for the child and adult resident.
- 2 RAGS Part E recommends that dermal exposures to PAHs in water should not be quantitalizely evaluated in the risk assessment

FA = Fraction Absorbed Water

Kp = Dermal Permeability Coefficient of Compound in Water

T(event) = Event Duration

Tau ≤ Lag Time

T' = Time to Reach Steady-State

B = Dimensionless Raiko of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis

NA = Not applicable.

TABLE 5.1 NON-CANCER TOXICITY DATA — ORAL/DERMAL SITE 23 - UNDERDRAIN METERING PIT SAMPLING NSB-NLON, GROTON, CONNECTICUT

Chemical of Potential	Chronic/ Subchronic	Ōri	N R1D	Oral Absorption Efficiency	Absorbed Rf	Ditor Dermailia	Primary Target	Combined Uncertainty/Modifyling	RID:Targ	H1 Organia)
Concern		Value	Unite	for Dermai ^N	Value	Units	Organ(s)	Factors	500=64(B)	Date(s) [MM/DD(YYYY)
(challe Organic Compound	•	,,		·			—			
Bromocichio/omethane	Chron-c	2 0E-01	mg/kg/day	;	2 0E-01	nig/kg/day	Kidney	1003/1	÷₹Ś	4/24/2008
Chioraform	Chronic	1 0E-37	mg/kg/day	1 1	1.0E-C2	ning/kg/day	. ver	100/1	7.5	4-24/20G8
etrachtoroethono	Сітонко	1 0E-07	mg*/g/day	1	1 0E-02	mg/kg/day	Lver	10001	īR\$	4/24/2008
Trichtoroeth ane	Chrone	3 DE 494	mg/kg/day	' '	3 0E-04	rno/ky/day	Erver, Kloney	NA NA	USÉPA(1)	8/2001
Samiyolarila Örganic Comp	ounds			·			•	•		
1-Methymaphthalore ¹²	Chronic	4 0E-63	mg/kg/day		4 QE-03	mgikgiday	Lyngs	1900/1	RS	4/24/2008
:Methylnaph?la/ene	Chronic	4 0E-03	mg/kg/day	1 1	4 0E-03	mg/kg/day	Lungs	1000/1	.88	4.74(2008
Benzo(a)ant/436eres	NA.	AM	AN	NA NA	NA.	AR	NA	NA.	NA	NA.
Вепдоја(ругеле	NÄ	NA NA	NA.	N/A	5A	NA T	NA .	NA NA	NA NA	NA.
Berzo(b)fuorante:ee	NA.	NA.	NA,	_ NA	4//	NA NA	NA.	NA NA	NA	NÁ
Benzo(k)Syoranihene	NA NA	AN	NA.	NA NA	NA.	NA,	NA	Ng.A.	NA	AP I
Ohenzoie hjanthacene	NA.	NA.	NA.	NA NA	hA	NA .	NA.	NA	NA	NA.
foxachicrobinizana	Chronic	8 0€ 404	mg/kgiday	1 1	8 3E-04	mig/hg/day	Uver	190/1		
aceno, 1,2,3-cd/pyrene	NA.	NΑ	NA.	NA NA	NA	NA NA	NĄ	6A	NA	NA.
Naphihalane	Chronic	2 0E-02	mg/kg/day	1 1	2 JE-02	ing/kg/day	Body Weight	3000/:	IRS	4/74/2008
norganics										
A OPPINITE	Chronic	1.0E • 00	mg/kgrday	: "	1 0E+00	mg/kg/day	CNS	100	PPRTV	10/2/9/2006
vseric	Shrenec	3 0E-04	mg/kg/day	, , , , ,	3 0F-04	πg/kg/day	Sun, CVS	3:	IRS	47(477008
ron	Chronic	7 QE-01	пирадіоду	1	7 dE-01	mg/kg/day	GS	1.5	PORTV	9/17/2006
Manganese	C'yone	7.4E-02	myka/day	0.04	9 6É-04	nrg/hg/day	CN5	10	IRI5	4/24/2008
/anadum	- Caronic	1 0E-D3	mg/kg/day	U 026	2 6E-05	ing/kg/day	≪dney	300	USEPATI	10/51/2007

Aoles

- 1 U.S. EPA, 2004. Risk Assessment Guidance for Superfund (Pan E. Supplemental Guidance for Dermal Risk Assessment) ligenm. EPA/S40/R/99/005.
- 2 Adjusted darms' RfD = Oral RfD x Oral Absorption Efficiency for Dermail.
- 3 Value is for 7-mejhylnaphihalene

Definitions.

CNS - Ceroal Nervous System.

CVS = Care:ovescular system

USEPA(1) = Draft Trichterbeithylene Habith Risk Assessmant, Synthasis and Characterization, August 2001.

USEPA III = J. S. EPA Region 3 980 Table, October 11, 2007.

GS = Gastrointestinal system

IRIS = Integrated Risk Information System.

NA « Not Applicable.

TABLE 5.2

NON-CANCER TOXICITY DATA -- INHALATION
SITE 23 - UNDERDRAIN METERING PIT SAMPLING
NSB-NLON, GROTON, CONNECTICUT

Chemical of Potential	Chronica Subchronic	inhalat	lon RíC	Extrapol	aled RfD ^(*)	Primary Target	Combined Uncertainty(Modifying	RfC : Ter	get Organ(s)
Concern		Value	Units	Value	Units ,	Organ(s)	Factors	Source(s)	Data(s) (MM/DD/YYYY)
Volatile Organic Compounds									.:=
Bromodichloromelhane	NA I	NA	NA	NA	NA NA	NA	NA NA	NA	NA NA
Chloroform	NA NA	NA	NA	NA	NA NA	NA.	NA NA	NA	NA
Tetrachlorpethene	Chronic	2.8E-01	mg/m ²	8.0E-02	(mg/kg/day)	Liver	NA .	USEPA III	10/11/2007
Trichleroethene	Chronic	3 5E-02	mg/m3	1.0E-02	(mg/kg/day)	Liver, CN5	NA,	USEPA(1)	8/2001
Samivolatile Organic Compounds									
t-Methylnaphthalene	NA NA	NA	AA	NA.	NA NA	NA.	NA NA	NA	NA
2-Methylnaphihelene	NiA	NA	NA.	NA_	AN	NA	NA NA	NA	NA.
Bonzo(a)anthracene	AN	NA	AN	NA	NA .	NA	NA.	NA	NA.
Benzo(a)pyrene	NA	NA.	NA NA	N.A.	NA	NA	NA	NA	NA
Genzo(b)[luprarithene	NA NA	NA	NA.	NA.	NA	AN	NA NA	NΛ	NA.
Benzo(k)fluoranthena	NA NA	NA	NA .	NA	NA .	NA.	NA.	NA	NA
Dibenzo(a,h)anthracene	NA NA	NA	NA.	ŅA	NA	NA .	NA .	NA	NA.
Mexachlorobenzene	NA NA	NA	NA	NA	NA NA	NA.	NA	NA	NA.
Indeno(1.2.3-cd)pyrene	NA I	NA	NA	NA_	NA NA	NΛ	NA NA	NA .	NA.
Naphthalens	Chron.c	3 0E-03	מחיםים '	8.6E-04	(mg/kg/day)	Nasal	3000/1	I 1 R15	4/74/2008
Inorganics									
Aluminum	Chronic	0.005	mg/m3	1.4E-03	(mg/kg/day)	CNS	300	PPRTV	10/23/2006
Arsenic	NA NA	NA	NA .	NA	NA NA	NA	NA.	NA	AA
Iron	NΛ	NV	NA NA	NA.	NA .	NA	NA I	NA	NA NA
Manganese	Chronic	5.0E-05	നള/ബ	1.4E-05	(mg/kg/day)	CNS	1000/1	IRIŞ	4/24/2008
Vanadium	NA NA	NA NA	NA.	NA	NA	NA_	NA.	NA,	NA

Notes:

1 - Extrapolated RID = RfC "20m"/day / 70 kg

Definitions:

CNS = Cestral Nervous System

FPA fil = U.S. EPA Region 3 RBC Table, October \$1, 2007.

MEAST= Health Effects Assessment Summary Tables

tRIS = Integrated Risk Information System

NA = Not Applicable

USEPA(1) = Draft Trichloroethylene Health Risk Assessment: Synthesis and Characterization, August 2001.

TABLE 6.1 CANCER TOXICITY DATA — ORAL/DERMAL SITE 23 - UNDERDRAIN METERING PIT SAMPLING NSB-NLON, GROTON, CONNECTICUT

Chemical of Polential	Oral Cancel	f Slope Factor	Oral Absorption Efficiency		cer Slope Factor ermal ^{ia}	Weight of Evidence/ Cancer Guideline	Ога	I CSF
Concern	Value	Units	for Dermal ^[1]	Value	Units	Description	Source(s)	Date(s) (MM/DD/YYYY)
Volatile Organic Compounds								
Bromod chloromethane	6.2E-02	(mg/kg/day⊁1	1 1	6.2E.02	(mg/kg/day)-1	BŽ	IRI\$	4/24/2008
Chloroform	NA NA	NA NA	NA NA	NA	NA NA	B2	IRIS	4/24/2008
Tetrachloroethene	5 4E-01	(mg/kg/day)-1	1	5.4E-Q1	(mg/kg/day)-1	NA.	RIS	4/24/2008
Trichloroethene	4.0E-01	(mg/kg/day)-1	1	4 0E-01	(mg/kg/dayH1	C	USEPA(1)	8/2001
Semivolatila Organic Compo	พาศร			<u> </u>				
1-Methylnaphthateae	NA NA	NA .	NA NA	NA	N/A	NA NA	NA.	NA NA
2-Methylnaphthalene	NA.	NA.	NA I	NA	NA.	NÁ	NA	NA NA
Benzo(a)anthrácene	7.3E-01	(mg/kg/day)-1	_ 1 -	7 3E-01	(mg/kg/day)-1	B2	USEPA(2)	7/1993
Вепло(а)ругеле	7.3E+00	(mg/kg/day)-1	1 _	7.3E+00	(mg/kg/day)-1	B2	IRIS	7/20/2007
Benzo(b)%uoranthone	7.3E-01	(mg/kg/day)-1	1	7 3E-01	{mg/kg/day}-1	B2	USEPA(2)	7/1993
Benzo(k)fluoranthens	7 3E-02	(mg/kg/day)-1	<u> </u>	7.3E-02	(mg/kg/day)-1	B2	USEPA(2)	7/1993
O-benzo(a.h)anihracene	7.3E+00	(mg/kg/day)-1	1	7.3E+00	(mg/kg/day)-1	82	USEPA(2)	7/1993
Héxach' Orobenzene	1.5E+00	(mg/kg/day)-1	1	166+00	{img/kg/day}-1	92	IRIS	4/24/2008
Indeno(1,2,3-cd)pyrene	7 3E-01	(mg/kg/day)-1	1	7.35-01	(mg/kg/day)-1	B2	USEPA(2)	7/1993
Naphthalene	NA.	NA	NA NA	NA NA	NA	C I	IRIS	4/24/2008
norganics			<u>-</u>					
Alomore	N,A	NA.	NA.	NA	N.A.	NA NA	NA	NA .
Arsenic	1 5E+00	(mg/kg/day)	1	1.5E+DO	(/ng/kg/day)	_ A 1	IRIS	4/24/2008
Iran	NA	N/A	NA I	NA	NA.	NA NA	NA	NA NA
Manganese	NA	NA,	NA.	NA	NA	O	IRIS	4/24/2008
Vanadium	NΑ	NA.	NA.	NA.	NA.	NA NA	NA.	NA NA

Notes

- 1 U.S. EPA, 2004, Risk Assessment Guidance for Superfund (Part E, Supplemental Guidance for Dermat Risk Assessment) Interim. EPA/540/R/99/005.
- Adjusted cancer slope factor for dermal = Oral cancer slope factor / Oral Absorption Efficiency for Dermat.

USEPA iti = U.S. EPA Region 3 RBC 7able, October 11, 2007.

IRIS = Integrated Risk Information System.

NA = Not Available.

USEPA(1) = Draft Trichloroethylene Health Risk Assessment: Synthesis and Characterization, August 2001.

OSCHA(1) - Drait inchidioexyylerie Reakti Alsk Assessment. Synthesis and Characterization, August 2001.

EPA Group.

- A Human carcinogen
- B1 Probable human carcinogen indicates that limited human data are available
- 82 Probable human carcinogen indicates sufficient evidence in animals and inadequate or no evidence in humans.
- C Possible human carcinogen.
- O Not classifiable as a human caronogen.
- E Evidence of noncarcinogenicity.

USEPA(Z) = U.S. EPA, Provisional Guidance for Quantitative Risk Assessment of Polycyclic Aromatic Hydrocarbons, July 1993, EPA/600/R-93/089,

TABLE 6.2 CANCER TOXICITY DATA -- INHALATION SITE 23 - UNDERDRAIN METERING PIT SAMPLING NSB-NLON, GROTON, CONNECTICUT

Chemical of Potential	Unit	Risk		on Cancer Factor ⁽¹⁾	Weight of Evidence/ Cancer Guideline	Unit Risk :	Inhalalion CSF
Concern	Value	Units	Value	Units	Description	Source(s)	Date(s) (MM/DD/YYYY)
Volatile Organic Compounds							<u> </u>
Bromodichlorome!hane	NA NA	NA NA	NA.	NA.	62	IRIS	4/24/2008
Chloroform	2.3E-05	(ug/m³) '	8.1E-02	(mg/kg/day)	B2	IRIS	4/24/2008
Tetrachtoroethene	5.7E-06	(ug/m³) ¹	2 OE-02	(mg/kg/day) 1	NA .	USEPA III:	10/11/2007
Trichloroether.s	1.1E-04	(ug/m3)-1	4 0E-01	(mg/kg/day)-1	С	USEPA(1)	8/2001
Semivolatile Organic Compos	ил о з						
f-Mejhyinaphthalene	, NA	NA	NA	NA NA	NA	AN	4/24/2008
2-Methylnaphthalene	NA NA	NA NA	NA	NA NA	NA NA	NA	4/24/2008
Benzo(a)anthracene	NA	NA	NA	NA	NA.	NA	NA.
Benzo(a)pyrene	8.9E-04	(ug/m ³) ¹	3.1E+00	(mg/kg/day) ⁻¹	NA.	ŲSEPA III	10/11/2007
Benzo(b)fluoranthene	NA	NA	NA	NΑ	NA NA	NA	NA NA
Benzo(k)fluoranthene	NA .	NA NA	NA.	NA.	NA NA	NA	NA.
Dibenzo(a.h)anthracene	NA NA	NΑ	ŅΑ	NA.	NA NA	NA	NA
Hexachlorobenzene	4.6E-04	(ug/m²) ⁻¹	1.6E+00	{mg/kg/day}	B2	IRIS	4/24/2008
Indeno(1.2,3-cd)pyrene	NA _	NA .	NΛ	NA	NA NA	NA	NA NA
Naph;halene	NA.	NA.	NA.	NA NA	c	IRIS	4/24/200B
Inorganics_							
Alumnum	NA NA	NA.	NA NA	NA NA	NA	NA.	NA.
Arsenic	4 3E-03	(ug/m³) ^{,1}	1.5E+01	(mg/kg/day)	A	IRIS	4/24/2008
lran	NA .	NA.	NA	NA NA	NA NA	NA	NA
Manganese	NA.	NA.	NA	NA.	D	IRIS	4/24/2008
Vanadium	NA.	NA.	NA .	NA NA	NA NA	NA NA	NA.

Notes:

1 - Inhafation CSF = Unit Risk * 70 kg / 20m²/day.

Definitions.

IRIS = Integrated Risk Information System

NA = Not Available.

USEPA III = U.S. EPA Region 3 RSC Table, October 11, 2007.

EPA Group:

- A Human carcinogen
- B1 Probable human carcinogen indicates that limited human data are available
- B2 Probable human carcinogen indicates sufficient evidence in animals and inadequate or no evidence in humans.
- C Possible human cardinogen.
- D Not classifiable as a human carcinogen
- E Evidence of noncarc nogenicity.

USEPA(1) = Draft Trichloroethylene Health Risk Assessment, Synthesis and Characterization, August 2001

TABLE F : NMC CALICULATION OF CHEVICAL CHINGER BYS MO MONCHALER HIZARDS REASONALLE MARKNUN FUNDSCHES (UNDERDAN MINETERNICE) MSB M, ON CROTON CONTITUENT PAGE 100-1

Scaleno Timetramo Pulsas Respiro Populada - Con publica Welfiell Reseator Roja - Mout

Mac u-	Electore Measure	Exposure Poert	Esparure House	Chambar of		ec i	1	Can	er Ru Greet	10004			Non-Ca	ос ен Ма тала Ст	et. deports	
				Potential Concern	Value	+Produ	Make Espoka	e Concerciaran	CSF :	urs: P, ya	Carry Rep	Depter Square.	e Concentration		DAMC .	HASSIN GARRIES
							Yelve	unda	6 STA	V-5		C SPARE	ولدول	Value	UAG	1
Groundwater	Groupromiter	5<+71	O+rNII	Виотористический	0.330	upt	1115.3	IMONO DEST	6.7E e)	Img*pays1*	115.11	316.68	(nghgday)	2 90-01	(yel/gree)	0.000002
				Charate	2 550	vot.	4.68-09	(mg/cycles)		Implicated)		3 28 407	Imphotograph	1 CE 02	(mg/kg/day)	V 00003
				Tetrachioconithere	0 400	ugt	4 15-09	Imphp case	548.01	[mg/Lprass]	2 26-09	290.07	(mg/sgray)	. CE-02	:mg/kgs/seri	0.00003
		1		Trichterpethene	< 500	ug/L	162-09	IMEA PERS	4.06.61	Imphament"	5 50:50	1.16.02	"Prophysicals	36€4⊭	(mg/ng/der)	0.000a
		!		1 Matylogisty gyrą	6 4 3 2	991.	1 ([-64	(mg/kgrcay)	3-46	Imphamel.		8 66 O7	(mphgday)	4 0403	(mphysist)	5 0002
				7-Mathyle agti masers	C 600	961	146-00	Img/12 caps	- <u>-</u> -	(mg/arter)		97647	(mg/sg/day)	4 07 -03	(mg/kg/dgy)	9,0002
				Berkonijane vetere	1	uş-L	0.0€-00	Ingles day;	1.85-01	Institute (Institute)		0.27 -000	(mg/kg/dari	NA.	(nglighter)	-
				Велога (мунича	0.2	ugt	0.0E-00	Impligates;	rar+00	(mg/kg/they)		0 08 × BO	(mg/kgytay)	NA.	(mg/kgr/eyr	-
				Bernan California materiale	0.3	ogst.	0 (€+US	lmgtçaı,	7.38-67	Imphydayi".		2.06+00	(Appropriate)	N/A	(mg/kgrane)	-
				Bervojs Pusanschere	0 17	ve1	0.05°+300	(mg/kgreas)	7 DE 00	Ing Special	-	905-00	(TONUMEN)	NA.	[mg/kg/day)	
				Эфекто в и изофинения	0.12	191	2.56 -00	(mg%grasy)	7 XE-00	Impligrates		0.05-05	(-ghgday)	HA	(mphyMby)	
				he actions as a serie	0.65	ugit	456.08	(mg4 group)	16E+50	(mg/kg sey)	7 56 08	346-06	(mg/tg/day)	8 07-84	[mg/g/deyl	0.004
		{		mileral 12 Traditionary		ug/L	0.05-00	(mgA g day)	756-01	(mg/ag/Gay)		007-00	(mg/system)	NJA.	[my/stay]	-
				Nept the state of		Ug2	665.59	(mphp(ley)	NA.	ing holdes/		+84 CT	(mg/kg/day)	2.06.62	(mg/kg/dey)	0.00002
				Alleren	927.70	vot.	7.6-36	(mg/kg/day)	NA.	(mg/kg/may) *		506.06	· Impliques)	1 0£-00	(mg%; day)	0.9600005
				Areer-c	1790	vgt.	3:1-09	(mphipday)	150-00	(mg/tigiday)	195.08	775 07	· (mg/kg-day)	3,06,64	(mg/cgray)	3 0007
				ևոր	70500 00	upt	186-05	(mg/sgloser)	l kja	(mg/kg/day)		**E49	(Imphysikes)	70640	(mg/sg-say)	2,002
				Kercene	645 D	ogt.	1.9E.3T	-20 Cabo	NA.	Img/tigrospi."		:36-05	(mg/kg-day)	≥8 ((34	mmy/kgr58ep)	20.
				Versideum	17	- Ogli	\$ 625.10	region days	NA.	(my hydday)		971-06	(mg/kg/da ₂)	2,88,05	Implement	0.002
			Emp Played Total								6.67.08	1				207
		Евровия Ром Тоуді					1				965-44					0.00
	Eleborrati Meurium Länk						<u></u>				6.65.08					9.07
	₩	5/6/22	I-faiater	Branch (Paul (Part)) grup	8456	rep-3	145%	,400 6 4 Ga.	N/A	(mg/yg-day)		99674	(mytopitas)	*	Impligation;	1
				L/Mary form	8455	mg/m3	1 45 50	"Ago Ago."	a re-uc	1440/40/0892	1 1 E Ø4	VBC-OF	imgtg-day)	146-02	implieses:	3 00007
				Terrechiomenhane	1 : [-5	md/s/2	1950	(mg/kg/dey)	2 OF 60	(mg/kg-day)	3.90.11	106-01	(mg/kg/ca)	# 0E-20	Impligate)	5 858567
				Technologicana	10€3	mg/m3	2.65.08	(mg/gday)	<0E-05	(Authorities)	1 18 29	195.07	(CQNQCSty)	105-00	ImOphdas;	> 20503
				Language Calend	1455	~9~3	3 45 79	ingles days	Na.	(mg/kg/day)		1021	(mg/geday)	44	Imp/sp/Ms/	-
			l	2 Adeb Anaphilhais na	1966	mg/m3	168.00	1 mily in gard	NA.	Imp/hp/day/		10-111	(mgtg-cu ₂)	, AA	(mg/kgWey)	-)
			1	Senzasjerdvacere	ner-c	mg m3	3-5€+50	1-640cml	**	(Authorities)		2.0E+00	IMG/Ag-0841	₩.	(mg/hgaday)	-
			1	gendebberg	0.0546	നുന്നു	907-30	(mg/gg/der)	215-00	(meagater)		2.95+00	(mg/kg/day)	HA.	(maphoday)	-
			1	Service Consentent	0.0640	~~ ~)	\$ OE +60	1=9896911	N4	(191019)		5.56 + 50	(անդենգան)	144	(ng)g(gr)	-
			1	der zijk fûstrandiene	0 0ۥ0	uu≎ L∩	3-26+00	(mylegiter)	~~	Commandated to		0.06 +00	ime physics	₩.	(mg/kg/day)	-
			1	Dibersora Handy scare	0.000.00	mg-m3	6-56+ 6 0	÷ra,9g/dayl	NA.	(mphoday)		626-00	Img/spice/i	HAR.	(mg/kg/day)	-
			1	His district specialisms	0.0540	~Gm)	0:06~00	ind place in	185-00	(mg/kg/sey) "		3 XE +00	(Lathy Bytel)	HA.	(mp9gd9y)	-
			1	inderect.2.3-calcyrene	0.05-9	وسرجب	34E (00	5m3g3cet1	~~	(10/0/09)		206400	(mg/tg/day)	₩.	(mg/kg/Vay)	-
			1	Programmo	1 ET-5	ածայ	2 /E-24	Sp3/SAM	NA	(Little gallet)	· ·	19807	1460 Sport	9 0E 0#	(mg/kg/day)	2000
			I	Assertion .	0.0646	~>~)	9:06:400	(mg@gider)	NA.	(mg/kg/asy) "	•	0.5E+00	(Matholical)	141-03	(~400 g/00y)	-
	ļ		1	Anere	0.6E+0	- magma	O-06 H00	rmg/tig Cayl	152-01	(*************************************		0.00.48	(mc/sp/dar)	NA.	(mg/kg/dey)	-
			1	=	0.36.0	es m)	o o€ ⊬ou	ine adulati	NA	(mphpiday)	· ·	0.06+00	1400 g Court	HA.	:mphgdart	
			I	entroduction .	0.0E+0	~6m3	3.06 - 30	17650301	NA.	(mg/kg/day) *		>>6×9¢	imit géquir	1.40-05	(mphy/08y)	-
				Veretorn	U 9E+0	i wani	9-06+00	1-0200441	, ~	(*GNUNHY)		C OF FDG	(mg/kg/day)	MA.	(ng/g/lay)	-
			Emp Rouse Total				<u> </u>				2.05-06					0.0001
		Exposure Point Total					<u> </u>				2.38-09					0.0001
	Exposure medium Total:										2 1E 5N					0 0003
Megaym Total											6 (6.0)	IF-SH			6.33	
								"pushol Ranaptor Histor Across All Mague			6.4E-06	Of Total of Receptor Mezanda Arroya Ali V			Arenne Mil Mecua	\$ 22

TABLE 7 Q HAVE

CALOUR ATION OF CHEMICAL CANCER RISKS AND KON CANCER REZARDS. REASONABLE MAXIMUM EXPORANCES - UNDERDRAM METER NO PIT

NGB AND WINDS OF STANDARD OF S

Scenero Terefrante Fullico Receptor Populación Heracotta Receptor Ago (mid

Madelon	Equation	Expusive Point	Eroanus Houte	Chamical of	r	PC .	i —	Car	on Ale Calcus	en i			Han Car	can regard C	etas de Oris	
				Роцеска Соловт	Várona	(And s	V-Mark galan	• Corompacar		~ Au	Carcar R to	India Espesal	и Сопоред ваде		D-R+C	Pared Duousel
							Ye've	Ues	Vere	Jn'i	1	Value	Lines	Value	Lords	1
Grounderlan	Councier	5 co 17	Ingestion	Semeschippmenages	0.500	val	71/100	(replicate)	475.00	(mchgiday)	158-20	298.99	Implegrant	258.02	(~p*g*0#y1	2 201
			_	(Կե ր-ժրու	7 530		2 -E-as	(mg/kg/den)		(mg/hgath)		भगव	:-@Pakeri	1.06-03	on Appleys	002
				Tera atthorogenena	6400	1994	200.06	ingagram j	546 G1	ingtoces)	1979	165-25	:00%g/G491	158.02)~g*grasgr	u 664
ł		1	l	Tachtoroethere	0.500	1497	4 16-De	icaye.=d	106-01	(mphates)	100.00	4.85.00	img@gadag;	1000	(Pgr@Gra)	0.2
Ī	(I	ľ	1 kang-finggar magasana	U 492	100	4 36.04	into the state of	س ا	ing today)]	4.75.495	Ingrance;	4 (4 - 2)] Imphakeyi	401
	ļ	l	Į.	2 Methyraphthalane	0400	194	416.00	Impha saci	٠	(mg/g/det)		5.88.65	(mg/kg/may)	◆ 36 G3	i-phyderi	961
	ſ			Benzha,aurwacane	0510	44	2 2E-05	ingly term	7.35 01	Ing Spoors	165.04	198.39	(mytoderi	94	(monarder)	-
	ŀ	!		Велицаїсцічня	0.225	ug/.	9.24-04	ILO/Saski	1.3E+30	(mg/ag/day)	7.71.05	2.25.05	. Impleques:	NA.	(Pakgraey)	- '
	ĺ	1	İ	Berting) was sell and	о н >	41	1.52.05	ings page	735.54	(mg/kydan)	11863	301-06	I prohibes;	44	(mghgrian)	
		l		Bencok Pustersheng	0.7%	wa't	140 05	Inghip carl	706.07	img/tg/de/f	197.08	20€ €5	ingag-met	N4	(-0°0'00')	
				College of the Prince Park and the	0.23	- AP.	5 JE-U6	inghorani ,	1 72.00	Inghaman.	1 miles	125-05	-raterial	NA.	modegasers	l '
	!	l		Messchizopgrupane	0.650	we's	3.75.00	15972541	1,604.79	imphade) i	3 15 26	0.2E 95	i Imphig Say)	8 56 64	(mg/kg/day)	0.06
	1	ነ		Indensit 2.3 udjugrans	6160	Light.	7.96.06	implies days	13631	- ngawaari	5 15 1m	* 10-91	img/tokkey:) Impagazas:	
b .	J		1	Haprimary	0.552	461	157.06	imphy (as)	**	(mg/kg/day)		5 5E 05	img sproas	400.02	mohs/deri	0.003
L			h	Alteria	322	- Age	266 es	(moles day)		r-splig dard		315-07	ings;dayi	1.06409	114000000	660
i			1	Auga-	13.60	1461	515.34	(mg/kg/cay)	155-00	(mg/kgrdar)	+ rg (≥	1.38-51	Ingraway:	108.64	(mg/kgrday)	
1			1	inc.	13 6 00	ogt.	56840:	(mg/mg.cay)	-	(replicate)		5.88+00	img>grdsy i	7.08-01	(mpagica);	47
J				Wangarasia	845	:وسا	696-01	,ngandas)	NA.	(mg/kg/GHz)		4-6 02	-managedays	248-02	(mg/k (r/Mg)	14
1			•	Versetum	3 10	160	306.05	inghoces:	NA.	(PSACON)		152.64	(mg Ng Yan)	:0001	(mg/ag-may)	
1			Elia Poure Tour			•	<u> </u>) (E:M				,	18
1			De-mail	Bronderkometune	650	T 601	235.44	.10 hg 6hg:	676-01	4795 (State)	1 3E-09	P 6C-07	(Mg/ligiday)	2 0F-02	(Physiq-say)	8.00004
]				Chlorn'om	2 100	-	20[-27	'me*eday;	744	(mg/kg/dig)*		7.76.64	mg/sg/fa ₂₁	1 05 52	Imphi say	0.0007
				² etrach#Oroentener	0.400	w.	2 °E-07	:mg%graeyb	1 1450:	(cophgates)	116.07	745.06	(hobgright)	*80.40	Amphahay)	3 000*
		i		1-ryticrosethene	0 500	146	F46 (H	(mgf-plane)	1000	(mphpday)	DOF CK	765.06	Ingagesyl	106-04	(mg/kg/day)	0.004
				1-Met yt apt Yudene	0.497	100	8 GE-07	(**************************************	' ·	(mg/kgrdas)*		≱ ir cs	(mg/kgrday)	# 0E-01	100000000	0.005
	!			2 stem-strategy-	0.609	- Agr.	7 % C"	(mefterday)	₩	img/tg/d#yl		235.05	IP-p%-G/G+y1	406.01	(webarget)	0.00%
				Rencomjanthrecere	0.513	-57	3-5€-50	,-age-group)	735.00	(mg/sgrdan)*		0 or -ac	(mg/kg/deyl	NA.	(50,000,000,1	
		<u> </u>		Barn 20 4 May Arms	0.225	ug/s	675-00	Imghgeneri	1.1E+30	(mg/kg/day)	l	0.05-00	(Agagea _r)	NA.	(mg/kg/der)	
		!		Benzolbÿkinnenthene	0 343	Lugar.	ბი€-თი	(matheway)	7.36-01	(mg/kg/day)		3 04 400	Ingligiters	Np.	(mg/kg/day)	-
)	J	•	Ber zo(k/kazami/here	0315	بارون	0.05+00	100976-2491	17847	Img/Sgrdani*		0.06-00	[*e-ko*est	NA.	ing@gden	
	!	I	l	Dependoja in santhyacene	0.120	19%	o>f•00	(mg/kg/day)	r36-00	(mg/tg/04g)	1	0.0E-00	(Pig/Sgreage	NA.	managrayi	
			· ·	Meast-criber sera	3890	ugt	3.16.06	· · · · · · · · · · · · · · · · · · ·	168106	(management)	± 50.6€	9.46-25	Impha day)	fig. cv	(regligida):	9.
1			i	inserting 3-capyard	0160	ogt.	0.06-30	(mg/kg-cay)	F 3E-01	(mg/kgrday)*		0.56+50	Ing/sposs		Improves;	-
i .			1	Naphtheliane	0.552	J 46%	9.2E-or	(**C*200)	**	(mga-g/94))		110.05	(mg/tigrdey)	2 0402	(mg/kg-da ₂)	0 gnos
1			1	Signature .	122	الوب	13316	implicati	NA	(mg/kgrdari)		3.4E-05	Inghousy)	10E-00	Improven;	C 300003
1				America	(190	- Sec.	4.2E-04	(mg/ng day)	190-00	(mg4-gross)*	6 1E-36	1 W 06	(hghghta)	30544	(mg/tg/day)	n oos
				रेक	700000	1001	216.64	ing to cap	NJ.	(metgray)*		7 58, 40	Imgragicays I	7050'	(0.920,000)	50%
				Opeganapy	845	-up/.	238-06	(mg*gides)	NA.	(mg/speak)		1 87 05	(mg/kg/day)	9 SC-6=	img/spiday)	0.09
				Variadium	3.75	-0	1 (6-54)	(Applied Color)	NA.	(mg/square)	L	3 56-07	109000000	266.00	(mgs pros)	0 02
			Ele Pour los				1				4.01.06					>2
1		Exposure From Total					ì				1.)E 0#	Ĭ				ıė
	Esposure Measure Total	•									3.07.24	ş				٠.

TABLE 12 APP CONTROL CANCER PASS AND NON CANCER MAZARDS PEASONABLE MAZARDS PEASONABLE MAZARDS PASSINES - UNDERSONABLE MAZARDS NOT CONTROL CONT

Scenario Fundigine F_elice Receptor Puporation - Horizonta Receptor Age - Child

Medium	Excosure Vegour	Exposure Point	Евравита Возия	Character or	ε	ric		Can	CALCAL CARCA	904			Nor-Ca	rear Haused S.	akurašo ni	
				Potential Concern	Value	Unry	Smalle Tapopa	a Connentation	C2F10	AND RIGHT	Carcon RnA	habite-Empowe	er Concentrator	IM	0.8%	Maratina Gardin
			Ш.	_		!	Village	0 ≪a	VAA	Jaco		Value	i owa	V#40	Urva	1
round-144	A.	Sr4 2)	Inflatation	Bromatic Narome Turne	0 300	va/.	2 58 -06	1-defidati	6.25.03	impligrass,	1 55 91	2 9E 45	(yeshyden)	2 0€-57	Impherant	0.001
				O-bookam	2 500	ugi.	2 16.65	i mp % dayri	400	(mg/kgrday)		74E 64	IPSN94941	10842	(Fg6g-6e))	202
				Teracreproemene	5.400	ug t	7 XE 08	1 Application	5.4E-01	(mg/kgreay)	1.50%	387-25	(mg/kgrday)	105 67	Imphydari	9,004
				Endecare there	0.500	99%	4 "F-DE	(mg/kg/day)	# (€.01	(mg/kg/say)	1 85 36	488.00	indyägaki	307.64	[mgligder]	0.2
				L. Mathy Traph Thelena	0.494	ug/.	456.06	I TOP TO THE T	NA.	(mg/tg-cay)		47840	(mg/kg/dey)	406.69	(regardent	591
				2-Mathymagh halons	2800	ogs.	4.0E-DE	17ghprost	44	Imphip capy		5 6 E 65	ing/spicers	4 007-03	Imphotoari	551
				Berusja seretra come	0.555	ug/L	8:56 viid	ingagasi "	7.38.91	ing to cap!		0.0E+30	[mg/kgkley)	*	Imphessal	
				Rent course programme	0.225	ug t	⊅ 3€ +00	Inghis degr	7.38700	inglepost;		0.00100	17937541	44	Impligatori	-
				Benzots (Namentiene	6 M:	wit	900.00	imphy days	7 JE 01	impharas;		0 0E-50	[mp3gKen]	ų.	Impagedent	-
				Berkolk fluorer Grene	03(6	ug/L	3-06-00	Interpolation	7 SE-07	(1793) (2005)		0.06+50	ITQN9/GR/I	44	Impligitari	-
				Пабытороди до частруждуване	3 17%	og ti	20ۥ36	Imphy deyl "	7.38+30	(mg/speak)		B o€∗co	(mg/kgrd.sy)	44	(mg/kg/day)	-
				Head Avidor same	desc	ug t	3-86-400	imphydeyr .	18.00	(mphgday)		0.06430	IPQNGM471	8.06.64	imgtig dayl	-
				Intero(171 copyeste	0.60	141	> 00 - 00	mg tigrasy;	736.01	(nekgomi)		5.56 + 20	img/kg-day)	-	Img/syr04yr	
				Nac' Peleve	0552	L/pt	# 5E 06	mengitari.	NA.	(mp/hyden)		\$ 36 45	(mg/cg-04y)	2 0E407	img/kg/day/	9 363
				Alternation	122	461	9.06 +09	#58green	NA.	imphiplosy (*)	· .	5 56 - 50	(mg/kg-dag)	100100	imphysis.	· .
				Amerika	-1130	ugl	0.05-05	ers by day:	192,400	Paydeyr	١	2,06,406	(mg/spray))0E 3#	inghydes.	.
				may.	F0620	160	0.99,400	Physics Cont.		(1959)	i .	5 56 - 90	(mg/cpdes)	101-0.	ImphpMas/] -
				Marquirer	845	ugl	99€-00	Army Registrary)	VA.	"mphyderi"		> 36 - 34	imghgasy;	7 #E-02	Impligates?	
			L	(Calcador)	1.0	491	9.00400	maka asy:	***	.mg#gideni*	·	> 5€ ∺00	(mg hg/day)	100.00	inig/kg/0251	<u> </u>
		L	Legislation Total				<u> </u>):					67-
	L	Empaye Point Total			_ /- 		<u> </u>) -2 (%					0.7
	Fee App Depart of	•									150 %					0.2
Marjourn "(righ							l) # (4					· ·
								Social of	Renerant Ricks	Actions At Market	: 46 114		Tricket of House	roke Hatarda I	ومورد ا	٠,

Nose

Inhalation exposures, are assumed to be equal to the exposures from ingostion of groundwater

TABLE / JAME

CALCULATION OF CHOMOAL CARGER RISKS AND NON-CARGER PAZAROS RCASONABLE MAYAMAM LIMPOSLATES - MICHIDRAM METÉRING PER

458-NLOH GROZON CONNECTIOUT PAGE 1 OF 2

Scenario Timeriame: Filtine
Receptor Population: Roudenin
Receptor Rige: Adult:

Megun	Exposure Wedness	Fagower Port	E spoule Have	Chemical of	E	PL:	$\overline{}$		on Paul Saloue	1001		1	Sign Car	Kai Page C	Picelines	
			}	Potenti Corcen	Verve	yre.	Probability groups	4 Concemberor		n-Ru	Cancer Rigg	hapt Figure	o Concertance		DRIC	Hitzert Owners
			i				79.00	Unes	Yahan	Urva		Value	Units.	Vace	Jirosa	1
Grow-Sento	Сту-д-41¢г	S4# 27	Pagester .	Bromotion unathers	2,960	·4:	2.75.06	angle groups	F2E40	Img/ag day,	1.5E 07	206.05	(mg/k/j/Cdy)	2 CE 02	(Asphakis)	: 3016
			1	Criteroform	2 500	ug-1	2 50-05	(mg/kgcmy)	*W.	Imphyson:		18/04	(mg/screen)	101-07	(mg/sg.de ₂)	202
			(Taracconomican	6400	925	3 NF-06	UNG REMARKS	546.61	Img*group!	1.77.96	2 65 05	Inter-Sector	1 CE 02	(Mg NgNa))	0 0003
			1	ingtitor cartigra	6500	ug t	3 26-06	Implement	40(-0)	U-S/FB GEVI	161.00	3.38-65	(mg/spices)	207.64	(mg/sgrawn)	٠,٠
	l i	İ	1	1-40-style-spiritualsys	0.492	vg/L	196.06	(Agito-dip)	NA.	implegroup)*		3.2E-05	(Angragions)	466.03	[Pg/lgKay)	C 208
]	İ	S meanthaigh dhaileag	0.690	Lgt	4 r6-06	(mg/kg/qs-)	NA.	imp/g/tayl*		3.98-35	(Pagnagnay)	4.70,03	2993920471	0.515
		i	1	Benchéjar/Hossere	טיפה	vol.	808.66	Img to chapt	F JE O:	impropries:	3.60 M	348-25	Img kg/04(c)	NA.	4-03043A	, .
		ļ		Ящ-ио(в фун о ст	0.225	ugt.	355.06	img*g/aspi	7.35 + 00	and publishing	20EG5	151-65	manadari	NA.	(79)89 48,1) -
			1	dence-b/kerser/term	0 240	491	5 16 06	Imples-day)	7.76.01	imphysion;	207.09	9.2E-05	(mg/googy)	N/A	ling highlant	ļ -
)		Ber JOA Yworanthene	9.713	ugl	4 9E-36	India Provid	L 1L-03	(mg-kg/tay)) eC-U/	2 47 405	img%gete _s }	NA.	(mg/kg/aar)	-
		i	!	Эвретичув Бултанаста	0 150	991	196.06	irreptic displ	7 3E-30	(mg/sgross)*	: +C 05	79546	n-graposti	NA.	(mg/mg/sys	! -
		ļ		Menachio-usorane	2,540	ագո	5.11-96	Img/spicest	1.85+00	(mo-hg/day)	# NO CE	6.78-05	(mg/sgr/sy)	9 36-04	(ng kg/ga/n	0.05
		[!	ingerol* 7,3 od pyrane	6.160	(var	256.06	[mg*pdept	f 16 or	ime Ng dan)	1.76.00	178-05	(mg+pr04))	NA	(mp)tgsdeys	
]		Naghtranna	5 552	- AP.	406-06	(mg/kg/sky)	4 JK	limpho/day)	ነ ።	141-05	, management I	154.63	1645.546 pt	3.963
		!		Allerman	1772	1974	25E-01	(mg hg/dfn)	*	:ngsgdart 1	,	5-6-05	(100.0000)	105-89	Implicated.	859
	· I			America :	1)90	wg/L	1,10,04	-mg/kgrass'	155-00	(myNg/day)	1.48.04	876.04	(right gitter)	1,91,04	(mgagraph) (
		ĺ	,	IGN	10801	uşA	5 SE-01	(mythysian)	- 4A	1 Implignment		418-00	(APPROVED	106.0	(mykyday)	67
			J	Cargoren J	M5	uşt	6 85-C3	(mg/spday)	→	(mdy.huni)		56549	(mg/k@stay)	7 4E-02	img/sqdas:	4.2
				Vanil 0x/5	7.10		796.05	Tours and the second	"	Imageoreasi		248.00	Impagasari .	: CE-01	(0.000000)	92
			Exp Rouse Your	! _ :				. — —		,	1.01.04	़	,			12
			Dermal	Brond-cHorometere	0.500	uşt	, 2E-0)	(maging Great to	42842	(may Acres)	946.09	1.16.06	(houghest)	2 DE-02	(mg/k;rday)	C 900001
	1		ļ	CHANGLOOM	2400	Les 1	1.46.06	, mg/kg/carri	VA.	Infolio day:		916.06	Img/spicery	1 MT-02	1000-2009)	0 6010
			1	(graditore fere	0.400	ugA.	9E-06	(mg#grt#r)	' 54E-0:	(Indeption)	10541	10005	(mg/t/dr/f/s)	105-03	in-Syt spik.	0.001
		ł])?rd=002 +8+*4	0.500	∽gt	5.25 37	(mg/Laces)	40€40	(Labybogski)	2 11 -07	2 (07 -OM	Ingliger:	76€ €	(440,846).	ייס ן
				1. iyaamiyin gorunadana 1	0.492	Lgt	4 #E 06	(mghg say)	NA.	Img/repass)		306.05	(mg s-day)	4 (1, 91	(m2 y b constru	0.207
	1	!	1	Z Methylmaphithalana	C 60C		5 1E-06	[with the state of	NA.	(make/day)		96865	Img ngroess	# 0E-03	indegtate.	0.565
				Secondary Secondary 	0.519	Ugs.	₽ 6€ • 00	(mg/kg/cm/)	1)1-01	(red feed day)		a af •0a	(mg/cp/de)	NA.	1003200171	1 -
		!	1	(files and a light server	C 225	100	0.05+30	[mSys@ost]	7 36 +00	(PQA9/08+1		0.60-30	Improves;	NA.	(hel/gram)	-
				Benzola Yayorandrane	0.343	\ '-91	0.06.400	Imghastari	13(4)	ind about		6 nr • co	Ing/attay!	k/L	100000001	
	ľ			Renan(s)/s-constraine	6375	j 😘	0.0E+30	(Meyabyyy)	7 36-01	(A.2-2-24)	· ·	0 007-000	img/spites)	NA.	(mg/kg/ma/)	-
	1	1		Diseasons have the core	é 12:	J. Opt.	0 0€+00 + 9€+05	(Pright price)	7.36+90 1.65+00	(LC/PB/gs ²)	. 10€.05	0.05×30 1.05×34	Indy Bonds	ışt.	1010/1948(1)	l
		ĺ		juggartismoetuere In anna hilland	3 650	المها	0 CE+50	Img hg/dayl	7 NE 01	070700011	, , , , , , ,	0.0E+30	(mg/tg/tay)	# 300-84 NA	. Typegray)	0.7
	1	ļ	l	Transit 12.3 cd gyamo	6 160	1	2 25 00	Prophy dept		(makipus)	Į.	10E-00	وفويون القرا	l .	manada)	D 000A
	ĺ	i	į	magnetizione	0 5 52 173	191	6 8E-06	(mg/kglasy)	1 NA	[mg/kg/cayl])	- 6E-0!	(mg/kg/dey)	106-00	Implement	u 50505
			1	Alament	123	uşt uşt	2 30, 02	(mgēgraky)	155400	(mg/kg darr)	; I ≄assor	2.40-06	Ang Angelon I (mg Angelon I	306-04	Ingle teri	0.0003
			ì	Aragenia; Ince	13 W	151	1 58,02	imghgdan) imghgdan	NA.		1 - ""	# GE 02	me-agraphic	75501	Impagnay: MgNg tari	6.5
			1	Variation	645	1001	1 16 03	(mg/gcar)	, Ta	imphgrassi	\	7 35 84	the parties	988.04	Img/s max	1 20
			1	Variation	1.10	Leg1	7 tE-06	img*cderi	. **	(mg/kg/say)	! !	5 SE 07	management to	266.35	Proping days	552
			Equi Route fotal	<u> </u>	L ,		1 112-20	- And Advantage	: -	[Jenspren	3 11 05	1 ~~~	" Andrew Company"		1 10 April 1984	6.0
		Exposure Prent Cour	1 - W 1455.1 1658								765 H	├	<u>-</u>			13
	Ésposure Meaum Pose	E-STORM PINE 132					├┈─ ─				2 67 74	 -				
	E-docers wascan rice						 , , .				,,					''

TABLE 1 SPARE CHICK, ATION OF CHEMICAL CANCER BISKS AND NON-CANCILL MAZZIDS REASONABLE MAZZIAN EAROSCHES HANDFILDHAIN METER HOTPY MSR NUON-GROTON, CONNECTICUT PAGE 2017 2

Statigue Timetrame Future Recopier Publisher - Pri General Recopier Age - Adail

سرمانيشا	CARCING MECHAN	Ецювив Рум	E4M-se Rouse	Chambar of		PC		Carro	ger films (1 44 000)	- Summer			Non-Ca	rem <u>Heart C</u>	es de la la la la la la la la la la la la la	
	}		1	Ponencia, Cjonnam	V 80.44	044	Line A Exposure	e Concentration	CSF	2-1 3-4	Carcon Rise	incute Expose,	na Concentration	R	OrRIC	Helizard Guoza
			<u> </u>	<u></u>		!	VEGE	outh.	Value	Lines	1 .	Value	Una	V albania	Unn	1_
i (nangwesser	į.	Sca 25	:respector	Broffice Novembrane	6 100	ug!	7.3F-64	(ceb ce cont	6.56.45	img*aca;	152.90	20€-04	Imphg-says	70€-02	(mg/b;rde);	0.00.0
		!	1	CNorston:	2,500	ugh.	2 0E 05	(mg13 04))	NA	(Aug 5 p Sept."		1 6E-04	(Amphibigated)	10E-02	[mghgst4pi	5.02
		!		Totals Normalities	0.400	1454	3 7F-06	Imphates I	54E 01	Improcer:	- 17 %	280-06	Impligation	1.08.00	imgagriest.	2 803
				Torropostere	0.500	ug/.	3 96.00	(M93204))	400-01	Imphysia:	189.06	338.05	Indigerati	⊋94-04	(muhoday)	יט
	i	i		: McTySnepr thateou	0.492	·9%	} >% દબ	(regis peas)	448	img@grass)*		3.75-25	, imphigrays	4 05 95	(-ghgday)	0.000
				7-Verhamageningsgrag	0.600	11/2	4 rE ion	(1797-204)	5.4	implic/Serl		34846	Impligation	10(-01	(mykskiár)	3010
	i '	ļ	ì	вечинштерущего	35.0	98	0.96+00] mgagasai [106401	ing hip days "		> 26 + 30	(Carry Carry)	No.	(mg/kg/tas)	
	Į	!	Į	Section 50 Action	9 775	0g/s	G oc ∗ae	(mg/sp/04)	7.36+00	respirates?"	L	2.56+00	img/sg-day)	NA.	Ime _s chaes,	l -
				Bernat (betware there	5,340	wy.	9.65-00	'mg*gm+ri	7.36.35	(mg/kgross) (9.05406	(mg/tg/day)	N/L	gray kydleri	-
	ļ		1	Receive the second second	0.315	ug's	20f+00	- mg/kg/days	7 16 47	(mg/sg/day)		0.00	(mg/kgrday)	NA.	img/kg/lkr/)	-
	i		1	Other social in sucretary general	6/20	96%	966-00	1-989961	7.08.405	ang ng payn"		9.05-00	(mg/kg/day)	NA.	/mg*y/M/I	
			:	PH GCP A Observance	: 659	1467	250.00	ing traders	165400	(mg/kg/ss ₁) [*]	:	> 20 × 400	ung/agicay.	8.06.04	ing to the co	-
	í		ļ	Protection 3 of subgraphs	0.140	99%	3.96 - 00	1 mg bigrabi.	7.56.01	.mgagaga)		306+00	(my/varday)	MT.	Imphy0811	-
				A SECURITY OF THE PARTY OF THE	0.557	⊸at	4.30.06	Jegaytayi	lek.	Page 4 in 1	l	38545	(mg/kg/qay)	300.53	:=-phgrday)	2 007
				Alternation (Control	155	uşt.	2,06-00	-2,50ceul	•	Implegraent		206-00	4-sphylleys	1.05-05	grageart	
			-	Arserv.	1190	આવ્≀	034.00	CONVENT	152400	(mphysiant)		29ۥ00	instigater.	30[04	,nebgdayı	-
			i	Name .	12400	1495	0.05-00	paparet	**	(mg/kgr(ay))	l	206-00	(-c, Agains)	7 08 G1	(-gagean	
				Danjer equ	545	Opt	ಂಚ-ಉ	1140 @ Cgr-,	44	(mg/kg/day)		00€-06	inglights)	24142	(mg/kg/day)	-
	ļ		<u> </u>	(Vanadom	3.70	_wii	0.0E+20	:yh@rasi	444	(mgag pays)		0.05+30	الإمادوة وسا	108-60	10-989 28pt	
	:	<u></u>	Exp. Route Total	<u></u>			L				140 - 65					U 1
	<u> </u>	Espone Point Tour					J				145.8					01
	Exposure Made in Total						1				2.87 (18)					υ.
Magazin Toria			_	_							2 FE 94	L —			_	

Note.

Inhalation exposures are assumed to be equal to the exposures from ingestion of groundwater

TABLE 9 TRVE

SUMMARY OF RECEPTOR RISKS AND MAZARDS FOR COPCS REASONABLE MAXIMUM EXPOSURES - UNDERDRAM METERISCIP." NSB.M.ON GROFON CONNECTACUT PAGE LIGHTZ

Scenanc Trackense Fallice

Recepto: Population Construction Workers

Receptor Age Adult

Medicin	Expôtura Medijan	Fapours Book	Chemeal of Potentia	!		Carrengene	Ru		ı	Non Carcino	genic Hazard O	ooreni	
			Concern	ingestion.	- NAW MON	Deimai	Extens (Retaion)	Fapot,en Routes Fals	Prompty Targel Organis)	-regesteen	Chalajion	Carry)	Exposure Routes Total
Ground and the	Groundwater	S1e 23	Bromedict tromechana	· · ·		3E-! 1	-	3€-11	Kioney	-	<u> </u>	3 0000002	0.000003
	Ĺ	{	CNWeller		- !		! -		Ļr.φr	-		0.00003	0 00003
	}	1	Tellachoras/here) ·] -	2E-09	-	27-99	Lm-er	-		360003	0.00003
	ł.	i	Tricromalhena	٠٠.	- :	6E-!C	-	6€-10	Liver Adhes			0.0004	0 0004
	(í	1-Methylesphinatore		-		! - [Lungs	-		00002	0.00037
	,]	2-Methyorasezeurung		1 -		ļ -		Lungs	-		0.0002	0.0002
	1	١	Benzo(a)anihracane	(1 - 1		' ·		NA			-	
	1	1	Вкилосијаулага	ļ	. !) .		NA.	-		-	-
	1		Bunaro(b)*utilian*/*eme]	-				NA	-			-
			Benco(#) flucture things		-] - '		NA.	-		-	-
		}	Dibenzola hjanihracene		-		-		NA.	-	.,	-	1 -
			Habachtorobenzene		-	65-06	-	eE-⊈e	CAN.	1 -		0.054	0.004
		i	Indone; (, 2.3-cd)pyrene		-	٠٠.			MA.	Į		-]
		•	Nashita xini				-		Body Waryer	-		0.00002	0,000035
			A. Jonepum		- 1		_		CN\$	-	١	0.000005	0.000000
		ł	Arsene		-	5F-29	-	5E-09	SIA CVS	1 -		0.0007	0.0007
		,	lvæ-						G5	1	[G 002	0002
			Mangane14		1 - 1		. '		CNS	-	!	0.01	6.61
		}	Venedom		-		_		Kalney	-		0.002	0002
			Chamical Toxia	î — ≔	-	9E-08	- 1	9E-00	1		[0.02	0.02
	(Exposure Point You	· · · · · · · · · · · · · · · · · · ·	ը		•	•	9€-08	i		·		3 32
	[72016/H]	Madium'i Total		} 		·		96.08	}			_	0.02
	Groundwater	See 23	Bromocch aramelhane				-		NA.	· · · ·			' -
	1		Crossetorm	-	16-09	i -		16.09	Liver		0.00007		0.00067
	1		Tellach groeinene	_	45.47	. .	i -	45-11	Lnar		0.0000002		0 200002
	1		1 nct/igroetheine		15-09] _		75.09	Liver, CNS		0.00002		3 33002
			1 Methyraphynelene	_					. NA			<u>'</u>	_
			2-Methymaphtica eco	_		!	-		NA.			[_
]		Benzo(a)er/Imprene	i -			1		NA.			}	
			Berurnes Kryfmiter			1 .	_) na	\		١	
		[Banzolof Assemblene				-		NA.	(! -
			Benzojk/Nuoran/hene		i .		ì . I		NA.	i	l .	l	} <u> </u>
			Diden zo(a.Plant/Witcone	_	l	_			NA.	.			_
		1	Hexachlorobanzene		1	_	1 . 1	1	NA.	1	_	1	1
		1	Indened 2 3-cdipyrene	ı -]	I -			1 ""	·		Ι .	Į.

TABLESTRUE

SUMMARY OF RECEPTOR RISKS AND MAŽAMOS FOR COPCS MEASONABLE MAX MUM EXPOSURES - UMOERDRAIN METERING FIT NISHMUON OROTON, CONMECTICUT PAGE 2 OF 2

Scenario Timetrame Futura

Receptor Population Construction Workins

Receptor Ago Augus

Ve cium	Esposure Medium	Exposure Posts	Cherryca of Polentie			Свтугодели	Pul			Non-Cartanop	регче нагана С	outer!	
		1	Concern	ingestion	Drhag!pr:	Deн этак	Enternal	Eroosum	Permany	ingestion	Inha:gripn	Dema	EQOSUM
	<u> </u>	1		<u> </u>			(Hadenor)	Routes Tole'	Target (Progence)				Houses Total
Groundwater	Groundwater	S4+ 20	Nephilisiene	-	:	-			NA		0.0007		E 0062
		1	Approxim	-		-	l - i	;	CNS		-		-
		1	Arsenc	-		-	- :		h _i ,L		-		-
		1	:mé	-		-	-		NA		-		-
		i	Manganese			-			CNS		-		-
			Verad-v~			-	-		. NA				-
		1	Chamea Jose	-	7F-09		- 1	2E-09	ļ		2 2003		0,0000
		Exposure Pour Total						7F-09					0.0001
	Exposure Medium Tutal							26.09					0 00003
Wedem Total				ï				9E-08					9 07
Keceptor Total			<u> </u>			44-44	NOT THE VIOLE	9E-08			300	eptor Hi Total	2 02

TABLE 9.2 FIME

SUBMARY OF RECEPTOR RISAS AND HAZAROS FOR COPCA REASONABLE MAXIMUM EXPOSORES - UNDERGRAN METERING PIT NSB-MICH EROTON CONNECTICUT PAGE 1 OF 2

Scenero Teneframo Futuro Reinpior Pigarleton Residents Recestor Age - Child

Med-un	Exposure Mesum	Espátura Porti	Combigar pt Potentia			Сансилороны	: 94k			Non-Cary e	rogenio Hecard	Goovers	
	-		Contem	'ogest ce	โกาลัสเซา	Darinal	Elerna (Rapitologi)	Esposure Flouies Total	Pama'y Targel Olganis)	Ingestion	inteleten	(Jerma)	Ecopyare Prodes Tolar
Ground-are:	Group and wanter	54e 21	Bromosich prometnane	7E 0'		12-09	Ţ -	26.07	Kidney	0.001	· · · ·	0.00004	0.001
]	j	Choician				!		Lower	607	٠٠ - ا	0.0007	0.05
	į)	Demailias perbene	20.06		1€ -07	! - }	26-0€	Liver	0.004	1	0.0007	0.005
	})	Therromethane	3E 59		3408	! - ;	24,406	Lives Kilmey	02) -	0.009	03
	1)	1-Memyraphyratens		'		ľ		Lunys	000		0.005	0.02
	}	ľ	2-Merry Aug/Arangico		- '		[-]		Lungs	001		0 006	0.02
	ì	ì	Senso(e)anthrecene	20,05	- '		-	08-65	NA	} .	}	-	
	(Benzo(alpyrena	7E 05	- '		-	7L-05	N4		}	-	-
	{	!	Benzujoji uotanibene	1E.29	- '		, - !	16 35	NA.	- }	}	-	-
			Bengo(k)fl.knáříbeny	1E-06	-		- 3	1E-06	NA NA	1 -			-
			Observate his alteracens	4E-05	-		-	45-26	**	1 -		-	-
			Heusen orgóenzene	94-06	-	4E 06	-	15 25	Love	0.08		01	0.7
			todeng(1,2,04,01 ₀);eve	56.06	-		-	15.76	144	-		-	-
			Naphthalene		-		j -		Body WeigN	0.003	٠.	00006	E DC3
			Aurenam	(i -		i - I		CNS	0.03		3 30303	0.03
			Anthe	36,04		6E 08	-	يون يور	SKECVS			0.005	4
			linge		-		(·		CS .	:0		001	.0
		İ	Мапралезе]	! -		1 -		CNS	,		0.09	1
		t	Vanadium	j .	<u> </u>	L :	<u>! </u>	L:-	Kidney	3.4	L	002	0.4
			Chame a Total	36-04		4E.06	J	25.54	l	15	_ ···	9 0	∵e _
	L	Exposure Montifeter		<u></u>				35-54	I <u> </u>				- '0
	Ergos Ae I	Medium Total		}				-L 34					•в
	Groundwater	Sale 23	Bromodic/Noromel*Are	-	7E-07	-		2E 37	NA.		0.00		0.001
		,	Coloratoria	i ·		[-	-		Liver	٠.	0.02		0.02
	ļ	ţ	Telvachiosofifes is	i -	2E 06	-		26.06	Lever .		0.004) -·	l coo₄
	4		Engh groethwise	-	25.36		1 - 1	25.26	LWM, CNS		02		0.2
	1		1-Aferryacechitistiens	٠.		-	_	·-	NA.	i	301		201
	1		2-Mcch/Machinarene	-	٠.		1		NA NA	٠٠ ١	001		0.01
1	1		Manzo(stanihracene	-		-	- 1		NA	(
			Bensy(a)gyrena	} -			-		₩.				-
			Benggio/ corantagos	l -		-			M]		٠.	-
		ŀ	Benzigk Tuoranihene	Į .	۱		- :		- NA	1	-		_
			Degrapija hjamenacene	! -			-	.	NA.		-		_
			, Maxach-probanzene	•		-	- 1		NA.				_
		1	Indençal: 2 3-cd)pyrane	(.			- 1	1 .	4,4		.		_

*ABLE 92 RME

Summary of receptor risks and hazards for copcables underlyably metoring pit arsonable har war you exposures . Underlyably metoring pit

NSBINLON GROTON CONNECTICUT FAGE 2 OF 2

Scenario Timeliame Fuiure Regigitiu Population - Residente Hecoplor Age - Chris

Меснит	E consume Medium	Exposure Pp or	Chemical of Potentia			Carcinogen	c Pasi		!	Non-Carde	rogenic Hazarō	Goolers	
			Corcen	udes; ou	Mina alien	Dermal	Estatus (Radiation)	Exposure Aputas Total	Pumpny Tanger (Ongarija)	ingeston	inhalecon	De-mai	Ezossure Roulas Tola
Ground≠#er	Groundwater	5 te 23	Naphihalana	<u> </u>			<u> </u>		NA.		0 203		0.003
			Alaman	-			- !		ENS			ا ا	- ا
			Asenc	F -	1		1 - 1		NA NA		-	ا ا	ļ -
			kan	<u> </u>			- 1		h.a			'	\ -
!			Monganese		٠, '	۱ -	-		CNS				
			Vanadium		.	_	1 . 1		NA.		-	1	-
1			Gnemica Total	<u> </u>	45-06	<u> </u>	†	#E-06	ĺ		0.2		0,
		Exposure Port Total					·	48 06	<u> </u>	•			C 2
	Espasore Medium Total		·-	Ī				4F-06					0.2
Medium Tota	_			1				3(-0+	Ī				עו
Repeptor Loss		················		<i>-</i>		Bh:e	gigi Risk Tolsk	\s ;u.	î			eglor Hi Tolal	

Nate

Inhalation exposures are assumed to be equal to the exposures from agestion of groundwater

oral Body Weight HI	0 003
foral CNS Hi	4
*Star Civil Mil	1
7990 05 HI	10
Total Kidney hit	35
Total Live HI	66
"va Ska H	1

TABLE 93 RVS

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPUS REASONABLE MAXIMUM EXPOSURES - UNDERDRAM ARTERING RIT NSERRICH GROTON CONNECTICE: PAGE 1 CF2

Summend Femelyame Hubbyo Placagoor Poppulation - Republishis Placagoor Page - Ashor

				γ		-							
Medwh	Exposure	Experiente	Charmes			Carrynogense	A3c		ĺ	Non-Carce	одинс нагага	Chalen	
	Medium	Pont	DI Polema	i									
		1	Сонкат	Propertion	nha-aron	De-mar	Esterno	Fagetages	P' TAY	სიეგასიეთ	inha'aign	Deimal	Exposure
	.1		<u> </u>	L		<u> </u>	(Radacon)	_Rouges Total	Target Erganis)	1			Raker*cca
Gruynd-ster	Groundwater	5:423	8romodicNotomeshalia	15.07	-	9E-49	-	28.07	Kathey	8 2010	· ·	9 30005	G DG1
			Chicrotomi		٠,		i - I		i ver	222	- !	0.0010	3 3Z
			Teleschorgethone	22.44	l - i	8E-07	! . I	22 (30	L well?	2003	!	0 201	0 004
]	inch propriete	26.06	_ '	78,07	1 - 1	25-06	Liver Xiddey	01	, '	0 01	01
			I-Mathykoptithe ene		-		l - i		เมาสูร	C 00#		0 007	C 62
			2-Methylnaph;halene		- '		i - 1		;-ոգո	5 9 10	,	0 009	C U2
			Велговајанопнисениј	65.06	- '		l - i	:₹÷	N/A	-	,	-	-
			Benchlalpyrene	38-06	- '			35-05	NA -		١ ٠٠ ١	-	-
			Denoist nuclearitiese	46.06	- '		[-	45.06	NA.	-		-	-
			Berzojkji Joranihera	45-01	- '		[- i	4⊆-07	NA .	-		-	-
		}	Dibenzola hisumbiacane	:6:05	-		- !	1E-05	YA.	-	'		-
	\	į.	Percetteratenzene	BF-CG	-	3E 05	i - 1	48 05	4.5 m	c es	ļ -:	0.2	42
		l	See Port Colors Support	25/96	-] -	2E-06	NA,	(-		- 1	-
		ì	Praphinalene	· · ·	~	· ·	1 -	'	Body Weight	0007		BOOD D	0.003
		ì	Alarmonia	į	-		-	'	CAS	C 67	(0.00000	302
		ì	Arsenc	20,04	-	40-07	-	20,04	SA 5 C / 3	,		0.007	,
		}	201		٠.		-		68	7		000	, ,
		4	Management	!	-		! -		CN9) ,		0,	
		{	Vanadom	┨ _ ::	<u></u>		<u> </u>		Kidnaty	[62	<u>. </u>	C 02	0.\$
			Спеліся Терр	22704	لـــــــــــــــــــــــــــــــــــــ	JE 45] = =]	38-54	1	'2		Ĉ4	13
		Espoqua Point Total		<u>L</u>		, ,		1F-04	[13
	Exposure	Medur '92						J6-04	(13
	Circumowater	Sile 21	Bromodick eromemene	-	15:07		-	15.01	NA.	ŗ	"D 2010"		3 3310
		1	Chicketorn	-			-		Logr	ļ	2.02		902
			"imach osso hene		25.06	-	} -	7E-04	Leer	,	0.003		0 000
			Test vicentime		(5.64			20.06	Lyar CNS	ļ	71	٠.	u i
			1-Metry capturation	ļ -		ł	-		NA.	}	0.008		0 008
			2-Methylmage4 nations	-			-		NA.	;	2010		0.010
	}	}	Benedatanthracene	-			-		NA.	¦			-
	1	1	Benzola)pyrena	-			-	· ·	NA.		-	, ·	
	1	•	Бегілірі бірінің және	-		-	-		NA.		-]	-
	1	•	Senzalkiňuoranihare	-		-	-	· ·-	•	1			
	1	1	Diberzoja harrimacene	l -			-		NA.		-	ļ ·	} -
	1)	Hesilpharopenyana	l -			-		NA.		-	j)
		<u> </u>	Indeno(1,2,3-cd/syrene	l		<u></u>	<u> </u>	<u></u>	NA	<u> 1 _ :</u>		<u> </u>	<u>-</u>

TABLE 9 3 RME

SUMMARY OF RECEPTOR MISKS AND HAZARDS FOR COPCI-REASONABLE MAXWUM EXPOSURES - UNDERDRAIN METERANG PIT

NSB-NJON GROTEN CONNECTICUT PAGE 2 OF 2

Scenara Timetrame Future Receptor Population - Residents Receptor Age - Adult

Nedym	Exposure Mecsam	Exposers	Chemical of Potentia			Сапслодени	:A11			Non-Carco	rogenic Hezeld	Quorien	
		 	Сожет	Ingustion	Inha avon	Derma	Esternar (Radiahon)	Esperature Rowaes Total	Photery Target Organis)	ingestion	Inhalaton	(Jeims)	Elicopum Routes Total
e consilwate/	Cronichader	Site 23	Saphihatene	Υ			- 1		NA .		0.002	'	0.002
			Alumynum						ENS			'	1 -
			ASSEC	-		-	} - }		. NA				-
		ì	l·1941	-			! - 1		NA.				-
	l	1	Manganese	1 -	Ì] -		CNS			l	
			Vanadkan				-	_	NA.		-		l
	ĺ	i	Cnames Tora	7	76-CC	· ·	- 1	3E-05	î		o.		01
	<u>t</u>	Exposure Powe Total	·					JE 06	i				31
	Faposoré Medium Tralai	<u> </u>						3E-06					0 1
Veder Total								3€-04					1.4
Receptor Total						Reco	der Bast Total	35.44	· <u>-</u> ·		Rec	exor Hi Tolal	

Note

Thread of exposures are assumed to being, at its the eappyways from ingestion of groundwater

TABLE 9 4 RME

SUMMARY OF RECENTOR RISKS AND HAZAROS FOR COPCH REASONABLE MAXAWAM EXPOSURES - UNDENDRAIM METERING PIT MS0-NLON GROTON, CONNECTICUT PAGE 1 OF 2

Scenaro Tringhamia Fulura Represtor Population - Hersdenis Reseata Age - Life any (Child and Adult)

Wedom	Esposure Wealum	Espasor Panj	Chemical of Potential		,	Caremagonic		·			rogenk havanj	Ousten:	
			Concern	Agestion	Inheleton	Derma	Chemai (4sosion)	Exposure Rouses Total	Pomety Target Digardal	ingestion	Inhavation	DestMall	Exposure Routes Tate:
Groundwarer	Crosnomater	Si:6 73	Bromsachorpilatinana	JE-67		15-08	<u> </u>	3E-Q7		`			
	}		Citiers!;pim		-		{ -		1			(
Ì	1	ŀ	Тики в окретеле	35,06	i - 1	90-07	-	41, 36	1) [] '	1
		•	Enchloricemente	37-06	· -	25.07		3606	ł		} ;		
	1	!	1-Metry-Maphibuteria		.		-]		
		!	2-Methydraphical and		ļ - I		-		i		'	ļ	
	1	<u> </u>	Benzo(a)anihvacene	26-05		Į	-	26.05	ļ		} .	-	
1		1	Benzo(n)gyrana	10-34	-		-	IE-D4	j				
1		1	Benyo(h)flooranifiere	15 35	-		-	1F-05)		1		
		1	Benzo(kifuoranineno	15-38	-		-	15 (06)		,		
ł			Dipenzoja nijarchiacene	5E-05	-			5E-05	h		١		
			Provachiorobenzane	2F-C5	~	JE-06	l - i	56.05	ļ	}			
			Modenton' 2 De disprese	76-06	-		i - 1	7E-06	ı	į			Į.
			Naphihaere		-		-		İ	ł			
!	,		Attroom) -]		i .)		ŀ]
]		≛-sr>4.	20:04	- 1	55.407) - }	25.04	ļ	Í		ł	l
)		lien		-) - ;			ĺ		ľ	{
	}		Mangenese				} - }			j		į	•
ì])	Vanadium	<u>}</u>		}] .]		ļ]	,	1	l
ţ		L	Creminal Inda	55.74	-	4E 05	-	7F-04	3			T	
1		Exposure Point Fora						66-04	1		<u> </u>		
1	Европи 4 (dedum Total						€E-3#					
1	Grounowater	5 (* 2)	Biomodytkingmet/woe		3E-07	-	<u> </u>	3E-Q7	Y			1	i
1		1	CNountorn.	-) -		1		[1	
l		1	Terrach proemane	-	12 0€	}	} ~	95.00]			1	
}]	Trishiplearnean	-	3E 06	i -	} -	36-36	1				
ł]	1-Methylnaphthalana			} -	} -				,		
ł			7-Methymaphthalone	-	1 .	į -	٠.		4		•		
Í		1	Ber Fo(e)ardFractione	-	j	!	l - 1		1)		
}	ļ		Белио(а)сутеле]	<u> </u>	' -		1		1		ļ.
	1		(Berso;b)fuor entrere	-	٠.] -] -		Ĭ				ŀ
ì	Ţ		Bertro(ki/Putrenthene	-]] -	١ ،	B				ŀ
H)	l	Ditterizoje hisraltyscene				-)				
I	}		Heyach orspenzens	-	٠.				•				
	}	1	Indono(1,2,3 cd)pyrene	_		ł			l		L		l

TABLE 94 RWE

SUMMARY OF RECEPTOR RISKS AND MAZARDS FOR COMOS REASCHABLE MAX NUM EXPOSURES - UNDERDRAIN METERAG PIT INSBINJON, GROTON - CONNECTICUT

SBINJON, GROTON CONNECTICUT PAGE 2 OF 2

Scenario I metrome i Future Receptor Pupulation - Randents Receptor Age - Lifutong (Chortane Adult)

Medium	Exposure Macum	Esposare Polit	Chamsuali of Molent-st Concern	Carc negative Fish				Non-Chrockigenic Hazard Cush and					
				ingesoon	Inha align	Den-sal	Erlema (Radanon)	Esposure Routes Total	Primary Target Cityan(s)	Ingestan	e/alguer	Derma	Exposure Routes Total
Ground+ater	Groundwater	See 23	Supricial dine	-			<u> </u>		Ĭ)			· · ·
	1	ļ	Alum num	-]] -	-		İ	ļ	'		Į.
	1		Arsenc	-			l - [ı	Ì	l i		[
			Iron				j -		1]		
	ľ		Mangénang	i -		-	} -		1	ŀ]		
	•		Vanadem	J		-	ļ -		}				L
	1	L _	Chervan Tota) —	75-96			75.06	1				
	[Exposure Point Total		<u>ו</u>				/5/06	•				
_ _	Exposure Medium Total					_		7E-06					
Medium Total								<u>6</u> ∈ 04					
Receptor "oral				Receptor Rails Total				6E-64	_				

Note

Inhalation exposures are assumed to be equal to the exposures from ingestion of groundwater

E.3 VAPOR INTRUSION EVALUATION FOR OU9

From: Bob Jupin, Tetra Tech Risk Assessment Specialist

To: Corey Rich, Tetra Tech Project Manager

Date: May 30, 2008

Regarding: Vapor Intrusion Evaluation for Groundwater at Operable Unit (OU) 9

Groundwater data from Sites 2, 3, 7, 14, 15, 18, 20, and 23 which are within OU 9 were evaluated to determine if there were unacceptable risks associated with vapor intrusion into buildings. The most recent groundwater data that was available for each site was used in the evaluation. Concentrations of volatile organic compounds (VOCs) in groundwater were compared to screening criteria for vapor intrusion. Screening criteria were obtained from USEPA's OSWER Draft Guidance for Evaluating the Vapor Intrusion into Indoor Air from Groundwater and Soils (Subsurface Vapor Intrusion Guidance), November 2002, CTDEP's Proposed Revisions - Connecticut's Remediation Standard Regulations Volatilization Criteria, March 2003, and USEPA Region I (April 24, 2008). The screening criteria are for residential exposures and are based on an incremental lifetime cancer risk (ILCR) of 1 x 10⁻⁶ or a hazard index (HI) of 1. If the risk-based screening criterion is less than the maximum contaminant level (MCL) the 2002 USEPA guidance recommends using the MCL as the screening level. However, USEPA Region I guidance does not allow for MCLs to be used as screening criteria. USEPA Region I provided risk-based screening levels for those cases where the USEPA draft guidance recommended MCLs as screening levels. If chemicals were detected at concentrations exceeding either screening criteria, then the chemicals were further evaluated using USEPA's Johnson and Ettinger Vapor Intrusion Model (USEPA, February 2004). The results of the screening and modeling evaluations are presented below.

COMPARISON TO SCREENING CRITERIA FOR VAPOR INTRUSION.

Site 2

Groundwater data presented in the Year 3 Annual Groundwater Monitoring Report for Area A Landlill (Tetra Tech, 2003) was used to evaluate the potential for vapor intrusion at Site 2. This was the last year that VOCs were analyzed for in groundwater samples collected at Site 2. VOCs were eliminated as a concern at Site 2 after eleven rounds of groundwater monitoring. A comparison of the detected concentrations of VOCs in groundwater samples from upgradient wells, downgradient wells in Area A Downstream, and downgradient wells in the Area A Welland to the screening criteria are presented in Tables 1 through 3, respectively. Concentrations of all chemicals were below the CTDEP RSRs for vapor intrusion. Concentrations of chloroform exceeded the USEPA screening criterion in samples from upgradient well 4MW01S. Concentrations of trichloroethene exceeded the USEPA screening criterion in samples from upgradient monitoring well 4MW01S; downstream monitoring well 3MW37S, and wetlands monitoring well 2WMW46DS. Concentrations of tetrachloroethene exceeded the USEPA screening

criterion in samples from wetlands monitoring well 2WMW39DS. Therefore, these chemicals were further evaluated using the Johnson and Ettinger Vapor Intrusion Model.

Site 3

Groundwater data presented in the Year 1 Annual Groundwater Monitoring Report for Sites 3 and 7 (Tetra Tech, 2007) was used to evaluate the potential for vapor intrusion at Site 3. A comparison of the detected concentrations of VOCs in groundwater samples to the screening criteria is presented in Table 4. Concentrations of chloroform exceeded the USEPA screening criterion in samples from monitoring wells 3MW15S, 3MW15D, 2MW16S, and 3MW16D. Concentrations of trichloroethene exceeded USEPA screening criterion in all four samples collected from monitoring well 2DMW16D. Concentrations of viryl chloride in monitoring well 2DMW29S exceeded the USEPA screening criterion and CTDEP RSRs in groundwater samples collected during the 1st, 2nd, and 4th quarters. Therefore, chloroform, trichloroethene, and vinyl chloride were further evaluated using the Johnson and Ettinger Vapor Intrusion Model.

Site 7

Groundwater data presented in the Year 1 Annual Groundwater Monitoring Report for Sites 3 and 7 (Tetra Tech, 2007) was used to evaluate the potential for vapor intrusion at Site 7. A comparison of the detected concentrations of VOCs in groundwater samples to the screening criterion is presented in Table 5. Concentrations of trichloroethene exceeded the USEPA screening criterion in all four samples collected from monitoring wells 7MW05D and 7MW12I. Therefore, trichloroethene was further evaluated using the Johnson and Ettinger Vapor Intrusion Model.

Site 14

No VOCs were detected in groundwater samples collected at Site 14 during the Basewide Groundwater Operable Unit Remedial Investigation (BGOURI) (Tetra Tech, 2002) indicating that vapor intrusion is not a concern at Site 14.

Site 15

Groundwater data presented in the Basewide Groundwater Operable Unit Remedial Investigation Update/Feasibility Study Report (Tetra Tech, 2004) was used to evaluate the potential for vapor intrusion at Site 15. A comparison of the detected concentrations of VOCs in groundwater samples to the screening criteria is presented in Table 6. Chloroform was the only VOC detected in groundwater samples collected at Site 15. Chloroform is a common laboratory contaminant and is frequently detected in potable water samples. Chloroform was only detected in one sample at one temporary monitoring well (15TW03) and the detected concentration exceeded the USEPA screening criterion. Therefore, chloroform was further evaluated using the Johnson and Ettinger Vapor Intrusion Model.

Site 18

No VOCs were detected in groundwater samples collected at Site 18 during the BGOURt (Tetra Tech, 2002) indicating that vapor intrusion is not a concern at Site 18.

Site 20

Groundwater data presented in the BGOURI (Tetra Tech, 2002) was used to evaluate the potential for vapor intrusion at Site 20. A comparison of the detected concentrations of VOCs in groundwater samples to the screening criteria is presented in Table 7. 4-Methyl-2-pentanone and trichloroethene were the only VOCs detected in groundwater samples collected at Site 20. Trichloroethene was detected in the groundwater sample from monitoring well 2WCMW2S at a concentration exceeding the USEPA screening criterion. Therefore, trichloroethene was further evaluated using the Johnson and Ettinger Vapor Intrusion Model.

Site 23

Groundwater data presented in Year 1 Annual Monitoring Report for Site 23 Underdrain Metering Pit (Tetra Tech, 2008) was used to evaluate the potential for vapor intrusion at Site 23. A comparison of the detected concentrations of VOCs in groundwater samples to the screening criteria are presented in Table 8. Concentrations of chloroform detected in one sample and trichloroethene detected in four samples exceeded the USEPA screening criterion. Therefore, chloroform and trichloroethene were further evaluated using the Johnson and Ettinger Vapor Intrusion Model.

VAPOR INTRUSION MODELING

The following chemicals were detected at concentrations exceeding the screening criteria for vapor intrusion:

- Site 2 Upgradient chloroform and trichloroethene.
- Site 2 Area A Downstream trichloroethene
- Site 2 Area A Wetlands tetrachloroethene and trichloroethene.
- Site 3 chloroform, trichloroethene, and vinyl chloride.
- Site 7 trichloroethene
- Site 15 chloroform
- Site 20 trichloroethene.
- Site 23 chloroform and trichloroethene

These chemicals were further evaluated using USEPA's Johnson and Ettinger Vapor Intrusion Model. There are currently no buildings at any of the sites that are used for residential purposes, although there

are some buildings that are used for industrial purposes. Therefore, the evaluation considered a hypothetical scenario where a residential building was constructed at the sites.

In accordance with USEPA Region I guidance (1999), there was not sufficient data available to calculate temporal averages at the monitoring wells; therefore, the maximum detected concentrations were used as the exposure point concentrations for the chemicals identified as exceeding the screening levels at each site. The boring logs for the monitoring wells where there were exceedances of the screening criteria were used to determine the Soil Conservation Services (SCS) soil type. Test results from the BGOURI were used to determine the bulk density and total porosity. The values used in the evaluation are presented in Table 9. Supporting information for Table 9 is included in Attachment A. Slab-on-grade construction was assumed for future residential construction due to the shallow groundwater depth at Site 3. At the Site 2 Wetlands the depth to groundwater was assumed to be 2 feet which represents the average depth to groundwater at monitoring wells 2WMW39DS and 2WMW46DS. At the other sites the shallowest depth to groundwater was used in the evaluation. Default parameters were used for the remaining model input parameters for the evaluation of residential exposures.

The USEPA vapor intrusion guidance does not provide any default parameters for evaluating industrial exposures. The USEPA default values of 250 days a year and 25 years were used for the exposure frequency and exposure duration, respectively (USEPA, December 2002) for industrial exposures. The CTDEP (March 2003) and ASTM (2004) default value of 0.83 hr⁻¹ was used as the air exchange rate and 300 cm was used as the building height. The same input parameters that were used to evaluate residential exposures were used for the remaining input parameters.

Toxicity criteria for trichloroethene are not currently published on the USEPA's IRIS database or in USEPA's Health Effects Assessment Summary Tables (HEAST). USEPA has published draft toxicity criteria for trichloroethene in the *External Review Draft for Trichloroethylene Health Risk Assessment: Synthesis and Characterization* (2001). The draft toxicity criteria are currently undergoing peer review. Alternatively, the California EPA (CA EPA) has developed toxicity criteria for trichloroethene (2002). Both sets of toxicity criteria were used to estimate risks for exposures to trichloroethene. The draft USEPA guidance recommends values of 1.1 x 10⁻⁴ (ug/m³)⁻¹ for the unit risk factor and 0.04 mg/m³ for the reference concentration. CA EPA recommends values of 2.0 x 10⁻⁶ (ug/m³)⁻¹ for the unit risk factor and 0.6 mg/m³ for the reference concentration. As recommended by USEPA Region I, the unit risk factor for adult exposures of 4.4 x 10⁻⁶ (ug/m³)⁻¹ was used for vinyl chloride. The toxicity criteria used in the evaluation are presented in Tables 10 and 11.

The results of the vapor intrusion modeling are summarized in Table 12. Outputs for the Johnson and Ettinger Vapor Intrusion Model are presented in Attachment B.

His for residential and industrial exposures to all chemicals at all sites were less than unity (1), indicating that adverse non-carcinogenic effects are not anticipated for these receptors under the defined exposure conditions.

Overall the ILCRs for residential and industrial exposures at all sites were less than or within the USEPA target risk range of 10⁻⁴ to 10⁻⁶. ILCRs for residential and industrial exposures were less than or equal to 1 x 10⁻⁶ at Site 2 indicating that there is no significant risk from vapor intrusion at this site.

At Site 3 the ILCR for trichloroethene of 3 x 10⁻⁵ for residential exposures and 5 x 10⁻⁶ for industrial exposures based on the draft USEPA toxicity criteria exceeds the CTDEP acceptable level for cumulative exposures and the ILCRs of 7 x 10⁻⁶ for chloroform and 8 x 10⁻⁶ for vinyl chloride exceed the CTDEP acceptable level of 1 x 10⁻⁶ for individual chemicals. The ILCR for trichloroethene for residential exposures based on the Cal EPA toxicity and ILCRs for industrial exposures for trichloroethene, chloroform, and vinyl chloride are all less than or equal to 1 x 10⁻⁶. Vinyl chloride was only detected at monitoring well 2DMW29S and trichloroethene and chloroform were not detected in groundwater samples from this monitoring well. Chloroform was detected in groundwater samples from monitoring wells 3MW15I, 3MW15S, 3MW16D, and 3MW16S. The maximum detected concentration of chloroform occurred at monitoring well 3MW16S. Trichloroethene and vinyl chloride were not detected at this monitoring well. Trichloroethene was detected in groundwater samples from monitoring wells 3MW16D and 2MW16D. At monitoring well 3MW16D, the only monitoring well where trichloroethene and chloroform were both detected, the cumulative ILCR for residential exposures is 2 x 10⁻⁵ based on the draft USEPA toxicity criteria, and 2 x 10⁻⁵ based on the Cal EPA toxicity criteria.

At Site 7 the ILCR for trichloroethene of 2 x 10⁻⁶ for residential exposures based on the draft USEPA toxicity criteria is less than the GTDEP acceptable level for cumulative exposures but exceeds the GTDEP acceptable level of 1 x 10⁻⁶ for individual chemicals. The ILCR for trichloroethene of 3 x 10⁻⁷ for industrial exposures based on draft USEPA toxicity criteria and ILCRs for of 2 x 10⁻⁷ and 3 x 10⁻⁸ for residential and industrial exposures, respectively, based on the Cal EPA toxicity criteria for trichloroethene are less than the CTDEP acceptable level for individual chemicals. Also the maximum detected concentration of trichloroethene in groundwater samples at Site 7 of 1 µg/L is less than the residential CTDEP RSR of 27 µg/L for vapor intrusion.

At Site 15 the ILCR of 4 x 10^{-6} for residential exposures is less than the CTDEP acceptable level for cumulative exposures but exceeds the CTDEP acceptable level of 1 x 10^{-6} for individual chemicals. The ILCR of 5 x 10^{-7} for industrial exposures is less than the CTDEP acceptable level for individual chemicals.

Also the maximum detected concentration of chloroform in groundwater samples at Site 15 of 3 μ g/L is less than the residential CTDEP RSR of 26 μ g/L for vapor intrusion.

At Site 20 the ILCR for trichloroethene of 4 x 10^{-8} for residential exposures based on the draft USEPA toxicity criteria is less than the CTDEP acceptable level for cumulative exposures but exceeds the CTDEP acceptable level of 1 x 10^{-6} for individual chemicals. The ILCR for trichloroethene of 6 x 10^{-7} for industrial exposures based on the draft USEPA toxicity criteria is less than the CTDEP acceptable level of 1 x 10^{-6} for individual chemicals. ILCRs for of 7 x 10^{-8} and 1 x 10^{-8} for residential and industrial exposures, respectively, based on the CaF EPA toxicity criteria for trichloroethene are less than the CTDEP acceptable level for individual chemicals. Also the maximum detected concentration of trichloroethene in groundwater samples at Site 20 of 5.02 μ g/L is less than the residential CTDEP RSR of 27 μ g/L for vapor intrusion.

At Site 23 for residential exposures the ILCR for chloroform of 2 x 10^{-6} and trichloroethene of 4 x 10^{-6} based on the draft USEPA toxicity criteria are less than the CTDEP acceptable level for cumulative exposures but exceeds the CTDEP acceptable level of 1 x 10^{-6} for individual chemicals. The ILCR for trichloroethene for residential exposures based on the Cal EPA toxicity and ILCRs for industrial exposures for trichloroethene and vinyl chloride are all less than 1 x 10^{-6} . Also the maximum detected concentration of chloroform in groundwater samples at Site 15 of 3 μ g/L is less than the residential CTDEP RSR of 26 μ g/L for vapor intrusion.

Preliminary Remediation Goals

The vapor intrusion model was also used to calculate site-specific, risk-based preliminary remediation goals (PRGs) for vapor intrusion at all the sites. The PRGs are presented in Table 13 and are based on a 1 x 10⁻⁶ risk level or a hazard index of 1. The model outputs for the PRGs are included in Attachment B. As recommended by USEPA Region I (April 2008), the PRGs for trichloroethene are based on the Cal EPA toxicity criteria. Also included in Table 13 are USEPA maximum contaminant levels (MCLs) and CTDEP RSRs. These criteria would be considered applicable or relevant and appropriate requirements (ARARs).

The CTDEP RSRs for vapor intrusion were also derived using the Johnson and Ettinger model, although CTDEP uses different input parameters than those recommended by USEPA. The most notable difference is that the CTDEP RSRs for trichtoroethene are not risk-based but based on a background air concentration of 1 ug/m³.

Uncertainty Analysis

The results of the vapor intrusion modeling are subject to the following sources of uncertainty:

- The model assumes an infinite source. The sources of VOCs at the sites have been removed and VOCs are no longer being released to groundwater. In addition, concentrations of VOCs in groundwater are decreasing with time.
- The model assumes that the areal extent of contamination is greater than that of the building floor in contact with the soil and that the contamination is homogeneously distributed within the zone of contamination. The groundwater concentrations from a single well were used as the exposure point concentrations for the model. It is not known if the extent of the groundwater plume is larger or smaller than the assumed building loot print.
- The model assumes that the contaminant exposure point concentration is present in groundwater at the soil/groundwater interface. The model does not consider the case when contaminated groundwater is present at depth and a relatively clean layer of groundwater is present at the aquifer surface. In this case, the clean layer of surficial groundwater may slow or restrict the migration of VOC vapors to the unsaturated zone. Modeling was done for several contaminants that were only detected in deep monitoring wells. It was conservatively assumed that these contaminants were present at the same concentrations at the soil/groundwater interface.
- The model does not take into account transformation processes.
- The default building area of 10 meters (32.8 feet) by 10 meters for residential exposures is based on a Michigan study and corresponds to the 10th percentile floor space area for residential single family dwellings. The slab on grade scenario assumes a single floor dwelling 2.44 meters (8 feet) high for residential exposures and 3.0 meters (10 feet) for industrial exposures. The modeling results may be different for a building with different dimensions.
- As discussed above, at present there are no USEPA-approved toxicity criteria for trichloroethene. Risks were calculated in this evaluation using draft toxicity criteria published by USEPA (2001) and toxicity criteria developed by Cal EPA (2002). At the Association of State and Territorial Solid Waste Management Officials (ASTSWMO) meeting in San Diego, California on March 13, 2008, Mary T. Cooke of the USEPA's Federal Facilities Restoration and Reuse Office (FFRRO) announced USEPA provisional guidance for trichloroethene. The provisional guidance is based on the Cal EPA toxicity criteria. According to Cooke's presentation, USEPA is recommending that regulators manage risk within a range of 1 to 10 μg/m³. The provisional guidance has not yet

been officially published. USEPA Region I recommended using the Cal EPA toxicity criteria to develop the PRGs in this evaluation. Risks from trichloroethene that were estimated in this evaluation using the Cal EPA toxicity criteria were within USEPA and CTDEP acceptable levels for both residential and industrial exposures.

SUMMARY AND CONCLUSIONS

Site 2

Concentrations of chloroform, tetrachloroethene, and trichloroethene exceeded the USEPA screening criterion at Site 2. These chemicals were further evaluated using the Johnson and Ettinger Vapor Intrusion Model. Modeling results showed that cancer risks and hazard indices for residential and industrial scenarios were within USEPA and CTDEP acceptable levels at Site 2. Further evaluation against PRGs and ARARs showed that vapor intrusion is not an issue at Site 2. No further action is required for vapor intrusion issues.

Site 3

Concentrations of chloroform, trichloroethene, and vinyl chloride exceeded USEPA screening criterion at Site 3. Concentrations of vinyl chloride also exceed the residential CTDEP RSR for vapor intrusion at Site 3. These chemicals were further evaluated using the Johnson and Ettinger Vapor Intrusion Model. Modeling results showed that cancer risks and hazard indices for residential and industrial scenarios were within USEPA acceptable levels. Cancer risks for chloroform and vinyl chloride for residential exposures exceeded the CTDEP acceptable risk levels. Cancer risks for trichloroethene based upon Cal EPA toxicity criteria were within CTDEP acceptable levels for residential and industrial scenarios but cancer risks based upon draft EPA toxicity criteria exceeded CTDEP acceptable levels.

The maximum detected concentration of chloroform exceeds the site-specific PRG for residential exposures but is less than the site-specific PRG for industrial exposures, USEPA MCL, and the CTDEP RSRs for vapor intrusion for chloroform. Because the modeling only showed potential cancer risks exceeding CTDEP acceptable levels and the maximum concentration did not exceed the CTDEP RSRs for vapor intrusion, it is concluded that there are no vapor intrusion issues associated with chloroform and no further action is required.

The maximum detected concentration of trichloroethene exceeds the USEPA MCL but is less than the site-specific PRGs and CTDEP RSRs for vapor intrusion. A groundwater monitoring program and land use controls are in place to address the exceedance of the USEPA MCL for trichloroethene. No further action is required for vapor intrusion issues.

The maximum detected concentration of vinyl chloride exceeds the USEPA MCL, site-specific PRGs, and residential CTDEP RSR for vapor intrusion. A groundwater monitoring program and land use controls are in place to address the exceedance of the USEPA MCL for vinyl chloride. Considering the CTDEP RSRs for vapor intrusion, the vinyl chloride concentration detected in groundwater at monitoring well 2DMW29S does not represent a vapor intrusion issue under the current industrial scenario, but may be an issue under a future residential scenario. A building could be constructed in the vicinity of monitoring well 2DMW29S for industrial purposes; however, there would be restrictions on construction of a building within 100 feet of the well for residential use unless steps were taken to mitigate the vapor intrusion issue. The current Site 3 land use control document should be amended to include controls to address vapor intrusion issues at well 2DMW29S until groundwater concentrations are reduced to levels where vapor intrusion is no longer deemed an issue.

Site 7

Concentrations of trichloroethene exceeded the USEPA screening criterion at Site 7. Trichloroethene was further evaluated using the Johnson and Ettinger Vapor Intrusion Model. Modeling results showed that cancer risks and hazard indices for residential and industrial scenarios were within USEPA acceptable levels. Cancer risks based upon Cal EPA toxicity criteria were within CTDEP acceptable levels for residential but cancer risks based upon draft USEPA toxicity criteria exceeded CTDEP acceptable levels. Further evaluation against PRGs and ARARs showed that vapor intrusion is not an issue at Site 7. No further action is required for vapor intrusion issues.

Site 15

Concentrations of chloroform in one sample exceeded the USEPA screening criterion at Site 15. Chloroform was further evaluated using the Johnson and Ettinger Vapor Intrusion Model. Modeling results showed that cancer risks under a residential scenario were within USEPA acceptable levels but exceeded CTDEP acceptable levels. Cancer risks for an industrial scenario were within USEPA and CTDEP acceptable levels. Further evaluation against ARARs showed that vapor intrusion is not an issue at Site 15. No further action is required for vapor intrusion issues.

Site 20

Concentrations of trichloroethene exceeded the USEPA screening criterion at Site 20. Trichloroethene was further evaluated using the Johnson and Ettinger Vapor Intrusion Model. Modeling results showed that cancer risks based upon Cal EPA toxicity criteria were within USEPA and CTDEP acceptable levels for residential and industrial scenarios but cancer risks for a residential scenario based upon draft USEPA toxicity criteria exceeded CTDEP acceptable fevels. Further evaluation against PRGs and ARARs showed that vapor intrusion is not an issue at Site 20. No further action is required for vapor intrusion issues.

Site 23

Concentrations of chloroform and trichloroethene exceeded the USEPA screening criterion at Site 23. Chloroform and trichloroethene were lurther evaluated using the Johnson and Ettinger Vapor Intrusion Model. Modeling results showed that cancer risks for chloroform under a residential scenario were within USEPA acceptable levels but exceeded CTDEP acceptable levels. Cancer risks for trichloroethene based upon Cal EPA toxicity criteria were within USEPA and CTDEP acceptable levels for residential and industrial scenarios but cancer risks for a residential scenario based upon draft USEPA toxicity criteria exceeded CTDEP acceptable levels. Further evaluation against ARARs showed that vapor intrusion is not an issue at Site 23. No further action is required for vapor intrusion issues.

References

ASTM (American Society for Testing and Materials), 2004. E 2081 Standard Guide for Risk-Based Corrective Action.

California Environmental Protection Agency (Cal EPA), 2002. Toxic Support Document for Describing Available Cancer Potency Factors. Air Toxics Hol Spots Program Risk Assessment Guidelines. Office of Environmental Health Hazard Assessment, December.

Connecticut Department of Environmental Protection (CTDEP), 2003. Proposed Revision, Connecticut's Remediation Standard Regulations, Volatilization Criteria. Bureau of Water Management, Permitting, Enforcement and Remediation Division, Hartford. Connecticut. March.

Tetra Tech (Tetra Tech NUS, Inc.), 2002. Basewide Groundwater Operable Unit Remediat Investigation, Naval Submarine Base - New London, Groton, Connecticut. King of Prussia, Pennsylvania, January.

Tetra Tech, 2003. Year 3 Annual Groundwater Monitoring Report for Area A Landfill, Naval Submarine Base - New London, Groton, Connecticut. King of Prussia, Pennsylvania. July.

Tetra Tech, 2004. Basewide Groundwater Operable Unit Remedial Investigation Report Update/Feasibility Study Report, Naval Submarine Base - New London, Groton, Connecticut. King of Prussia, Pennsylvania, July.

Tetra Tech, 2007. Year 1 Annual Groundwater Monitoring Report for Sites 3 and 7, Naval Submarine Base - New London, Groton, Connecticut. King of Prussia, Pennsylvania. September.

Tetra Tech, 2008. Letter Year 1 Annual Monitoring Report for Site 23 Underdrain Metering Pit, Naval Submarine Base New London, Groton, Connecticut. King of Prussia, Pennsylvania. May.

USEPA Region I, 1999. Risk Updates, Number 5. Waste Management Division, Boston, Massachusetts. September.

USEPA, 2002. Draft Guidance for Evaluating the Vapor Intrusion into Indoor Air. Office of Solid Waste and Emergency Response. EPA 530-F-02-052. November.

USEPA, 2002. Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites. OSWER 9355.4-24. Office of Solid Waste and Emergency Response, Washington, D.C., December.

USEPA, 2004. User's Guide for Evaluating Subsurface Vapor Intrusion Into Buildings. Office of Emergency and Remedial Response, Washington, DC, Revised February 22.

USEPA, 2008. EPA Comments on the Basewide Groundwater Vapor Intrusion Analyses. Email from Kymberlee Kecker of USEPA Region I to Corey Rich of Tetra Tech NUS, Inc. April 24.

TABLE L

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN AT SITE 2 - UPGRADIENT MONITORING WELLS VAPOR INTRUSION

NSB-NUON, GROTON, CONFECTICUT

Scenario limetrame Future Medium: Groundwaler

Exposure Medium: Oroundwater

Exposure Point: Upgradent Monitoring Walls (Sile 2)

CAS Number	Chemical	Munimum Concentration III	Minimum Qualiter	Maximum Concentration	Mgs imum Oveldter	Unite	Location of Mastroum Concentration		Plante of	Concentration Used for Screening th	Beckground Value ⁽⁴⁾	USEPA Growndwater Volatilization Criteria ^{ce}			
Volatile Organic Con	mpounde														
75/35/4	1,1-Окучаючае Вирии		-	1	1	υς:L	7LGW205-03	::ne		'	NA.	-SOH	190	No	esi
67-64-7	Azetore	'Ç	-	10	٦	ug/L	4000015-10	1/15	5		NA	270000 N	50000	No	est
75+15-C	Cerbon Quantide	09		3		by L	4GW01S-10	1/18	1.2	2	NA	560 N	NA.	[Pro	E21
67-66.3	CMaralorm	-		1		uşt	4GW015/02	1/15	1.3		NA NA	0.71 G 1	26	Yes	ASL
74-87-3	Chlorumethene	; 06		06	٦	ugi	4GW01S49	1/12	1 1	06	NA	6.7 G	390	No	BSL
127-18-4	Тавысіі:Кунсавчана	6	,	ð 11	٦	191	4GW015-05	1/18		011	T/A	055.0	340	No	BSL
79.01-€	Trichtaracthrine	09	7	0.0	٦	191	45W015-08-0	1/12	_	09	NA	0.05 € .	27	Yes	ASL

Data is from the Year 3 Annual Groundwarer Monitoring Report to: Aroa A Lanckill (Tatta Tech, 2009).

- Sample and duplicate are counted as two separate samples when determining the minimum and maximum detected concentrations.
- 2. Values presented are sample specific quantition leves.
- 3. The inax mum derected concentration is used for scheding purposes.
- 4. No background data is available for VDCs.
- 5. Draft Guidance for Executing the Vapor Intrusion to Indoor Air Pathway from Groundwarer and Soils. November 2002. EPA530 F 02 652 Values Anhillon Fable 20 and correspond to a tinger canger risk level of 16-5 or H1 11 and an exercision factor of 0.001
- 6 Connecticutis Proposed Revisions Remediation Standard Regulations, Volableation Criteria , Residential, March 2003
- 7 The chemical is anietzed as a COPC if the maximum (general concentration exceeds the risk-based GOPC screening evel and/or an AHAR/TBC(t)
- A USEPA Region I larget level
- A shader's value indicates that the concentration used to surgening escapes the cotenor or background value
- A sharted chemical name indicates that the chemical has been selected as a COPC.

Associated	Camples
A 90 GTG	: amove s

7LGW20S-01	2LCW205-11	4GW01S-07-D
21.530(295-92	4GW015-01	4GW01S-08
2LGW20S-02-U	4GW015:CI-D	4GW015468-0
PI GW20S 03	46W615 02	45W¢15-09
2UG4Y235-04	4/3/Y/01/S-03	46W018-09-D
2LGW705-05	45W0:5 04	45W019 10
2t GW205-06	43W015-95	#GWpt5-10-C
20GW268-07	45W01S-08	42W01S 11
21 GW205-08	4GW015-06-D	#GW015-11-D
2. GW205.10	4GW01S 37	

De trut one

APARATEC - Applicable or Halevant and Appropriate Requirement To Se Considered

G = Gardvogen GOPG = Chemical of Potential Concern.

J - Estimated Value

N - Noncarenegen NA - Not Appacable

MGL - Hederal Maximum Gonzaminant Leve

Returnale Codes

Fo: Selector as a COPC

ASL - Above COPO Screening Level/ARAR/TBC

For Elimination as a COPC

BSL - Beic+COPC Screening LevelARAP/18C.

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN AT SITE 2 - DOWNGRADIENT MONITORING WELLS IN AREA A DOWNSTREAM VAPOR INTRUSION

HSR-NLON, GROTON CONNECTICUT

Scenario Timetreme, Fuline Medium, Groundweter

Exposure Medium: Groundwates

Exposure Point: Downgradieni Monitoring Walls in Area A Downstream (Site 2)

GAS Number	Chemical	Minimum Dencantiation P	Matrimum Qualdier	Wasimum Concentration	Maximum Qualifier	Unita	Location of Massmum Consentration	Ortection Frequency Or	Range of Nondelects ⁽²⁾	Concentration Used for Screening ¹⁶	Rackground Value ⁽⁴⁾			COPC Flag	Retionale for Conteminant Delation or Selection ⁽²⁾
Volable Organic Cor	mpovnde														
75 15-0	Carbon Disuride	0.2	1	22		col	3GW37S-08	2/17		2.2	NA.	56û N	NA.	No	BSU
155 59 2	cis-1,2-De Norbethere	0.4	1	0.4	7	ugit	3GW37S-03	5/17		0.4	N.A	210 N	830	No	951,
138 68 3	lokere	0.	1	0.1		ugit	2GW37S403	1/17	_ ·	0.1	N.A	1500 N	7100	No	કડા
156-60-5	vans-1 2-D chlomethere	62	٦	6.2	7	ugi	3CW3/5403	1/17	· ·	C P	N.A	180 N	1000	Ho	3 5t
79.01.6	Trichloroeinene	0.58	٦	- 2		ugt	2GW37S403	9/17		2	NA.	U 05 C	27	75%	A5t,

Date is from the Yoar 3 Account Groundwater Moreoving Report for Area A Lanchtt (Tetra Tech, 2001).

- 1 Sample and duplicate are counted as two separate samples when calarmoung the minimum and maximum detected concentrations.
- 2 Values presented are eample-specific quantitation limits.
- 3 The missimum careciae concentiation is used for screening purposes.
- 4 No Background data is evasable for VCCs :
- 5 Craft Goddings for Explicating the Vapor Integror to lickon An Fethway from Congresses and Soile November 2002 IPAS00-F-02 0S2 Values are from "able 2c and correspond to a larget cancer risk level of 1E 6 or MIII and an afterwation factor of 0.001
- 6 Connoloculis Proposed Revisions Remadiation Standard Regulations, Volatilestion Criteria, Residental, Major 2003
- 7. The oherrical is solected as a COPC if the maximum detected concentration exceeds the risk based COPC screening level and or an APARTRIC(v).
- 9 USEPA Region I raigor level

A shaded value indicates that the concentration used for screening exceeds the onlying to background value.

A shaded chemical name indicates that the characterists bear selected as a GGPC

Associated Samples

oGW (2D o)	9GW 125-03	0GW075-02	30W37548
3GW-12D 31-D	0694-175-62	3GW37S-03	362W37S-09
3GW-12Q-02	9GW-12S-02-D	9GVY975-04	0500375-10
36W-12D-33	2GW-12S-03	3GW375 (S	30W37S-11
06W-12D 85 30	0GW-12S 03-D	3GW375406	3GW12D-11
3GW-12D-34	3GW375-01	3GW379-07	

<u>Deligibons</u> ARAP/TBC = Applicable or Fellovani and Appropriate Requirement/To Be Considered

S • Enterlogen

EUPC • Chemical of Potential Concern

2 = harasted Velue

N - Noncert-regen

NA e Noi Applicable

MCL - Federal Mannium Contamografiquel

Hahongle Codes

For Selection as a COPC.

AS, : Above COPG Scienning Level ARARVTBC

For Frenchanon as a COPS

BS. - Below COPC Screening Level/AHAR/180

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONGERN AT SITE 2 - DOWNGARDIENT MONITORING WELLS IN AREA A WETLAND VAPOR INTRUSION

NSB-NLON, GROTON, CONNECTICUT

Scenario Tomefranse, Fuldite

Medium: Groundwater Exposure Medium. Groundwater

Espacure Point Downgradient Manitoring Wells in Ares A Wattend (\$1) 2)

GAS Number	Chemical	Min-mum Concentration	Minimur Qualifet	Maximum Concentration (II	Masimum Guallher	Unite	Location of Meximum Concentration	Detection Frequency or	Ramge of Nondefecta ^{rn}		Background Value ⁶⁴ i	USEPA Groundwater Volktekuston Çrjierie ⁽¹⁾	CTDEP Groundhader Volabilization Calteria ^{TX}	1	Netronale for Contemporal Deletion or Selection ⁽¹⁾
Volshie Grasnic Car														• • •	
78 90 \$	2-Bulanone	1		26		اوي	2WGW36D5 04	20,61	1 - 25	[26	NA.	440000 N	N/A	No	854
67.54-1	Acetore	2	+	120		ugi	2WGW3905 04	26/70	5 - 31	120	NA.	220000 N	50000	54g	BSL
71-43-7	Bevere	0.2	J	0.9	-	ugt	2WGW4205-10	2/99	1.5	0.3	NA	136 C	139	No	RSL
75-15-0	Carbon Defulfide	. 02	J	7.6		υ ջ L	2WGW430S 07	36/99	1 13	7.6	ALM.	%0N	HA	No	RSI
74 87 3	Chloromethane	Dé	J	0.8	,	J. Ogl	2WGW440S 09	1/99	1 - 5	0.0	444	67.5	320	No	RS:
100 4 6-4	Elhyluenzena	0.3	[i]	0.3		ισί.	2WGW3908-04	1/99	1 - 5	C 3	NA.	601 N#	2750	No	. 85L .
75 09 7	Mottgrane Chlorde	0.5	,	1.9	7-1	UQL	2WGW3935-01	6.33	1 - 10	: 2	NA.	59.5	160	Nec	981
127 18-4	Feirechloroeihene	3.9	J;	14		Ug L	2WGW39D5-07	299	1-5	1.4	NA.	0 \$5 €	340	Yes	≢SL
100-88-3	Toluone	U 17	[,]			ugi.	2WGW39DS-00. 2WGW39DS-09	17:99	1 5	4	NA.	1500 N	7100	No	สรเ
1730 20-7	Fortal Xylanes	C 6		C 6	J. 222	Ugr.	2WGW42DS 09	1/89	1-5	0.6	NA.	22000 N	8700	Nes	331
75 01 45	Enchlorgethene	12	,) " a '		100	j zwgwied5-or	2'99	1-5	1.4	NA.	0 d5 C	27	Yus	ASL ,

Notes

Oata is from the Year 3 Arman Groundwater Monitoring Report for Area A Landiu (Tatra Tech. 2003).

- Sample and duplicate are pounted as two separate samples when determining the minimum and maximum detected concentrations.
- 2. Values presented are sample-specific quantitation hmits.
- 3 The maximum detected concentration is used for screening purposes.
- 4. No background date in available for VOCs.
- 5 Draft Studiesce for Eval: 23:05 the Mapor Indicator to Indige Air Pathway from Groundagies and Social Navience 2002 EPASSOF 42-059 Values are from Table 2d and concessiond to a larget concest est, lovet of 16,6 or PL v1 and an attornation factor of 0,001
- 6 Contraction's Proposes Playsians Remediation Standard Regulations, Variationation Citiena, Residential, March 2003
- 7 The chemical is selected as a CCPC if the maximum detected concentration exceeds the risk-based CCPC screening level mixtur an ARAR/TBC(n)
- 8 USEPA Pagor 19/get Hive
- A shaded value indicates that the concentration used for screening exceeds the crienor or background value
- A shaded chomical name indicates that the chemical has been selected as a COPG.

<u>Delinions</u>

ARAR-185 y Applicable of Relevant and Appropriate Requirement/16 Be Considered

C - Celonogen COPC - Chemicat of Potensial Concern

Jile Paumitted Value

N a Noncercongen

NA - Not Appacable.

MC, in Federal Maximum Consert nami Loyof

Hationale Codes

For Selection as a COPC

ASL + Above COPC Screening Level/ARAR/160.

For Elimination as a COPC

OCCURRENCE, DISTABBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN AT SITE 3 VAPOR INTRUSION

MSB NEON, GROTON, CONVECTION

Scanario Timatrame: Fytura Medium: Grountheater Exposura Medium: Groundwater Exposura Posti Sata 3

CAS Number	Chemical	Minanyan Gencentrason ///	Mirenum Qualified	Magimum Concentration (*)	Maximum Qualifies	Ur-19	Location of Maximum Concentration		Heroda of		Background Value ⁽⁴⁾	USEPA Groundwater Volatilization Crearuj ^{as}	GTDEP Groundwater Votetilization Criteria ⁽¹⁾	1	Retionals for Contaminant Oeletion or Selection ⁽²⁾
Volable Organic Co	mpounds				_				- - -						
79 34-5	1,1,2,7-Ferras nicroethana] 333)	0.33		ացլ	53GW2D4W16D01	195	05 1	0.33	NA.	10	16	No	HS.
75.27-4	Bromodchloromethane	0.5	J.	18		땅	SJEWSWWIEDO	4.36	05-1	. 8	N/A	210	44	No	AS.
124-48-1	Chlorocoromomenane	0.78	1	0.16		ug/L	SOGWOANWAGOOL	1.736	05-1	0.76	NA.	32C	^L LQ	Nu	H24
67.663	Chloroform	9.6]	15		⊔g-L	SOCKYOMWY6501	0.36	05 70	15	A:A	0.7 € €	26	Yes	ASL
156 59 2	os 1,2 Ochloroelhana	2	[6		dg'r	530W2DAW24502 530W2DAW29502-D	11/38	05.1	G	N/A	210 N	630	No.	95.
127 18-4	Telrachlorge!hane	0.33	j .	9.33	<u> </u>	Jg/L	\$36W3MM16501	136	05.1	0.33	NA.	0.55 C.*	346	No	BS.
100-86-3	Tylumia	9.90		\$ 1		vy/L	SGC-W2DMW28002	436	₽5÷1	5:	Pe4	1500 N	/190	No	BS.
1330 29-7	I dial Xylanes	0.6	J	06	9	ոֆւ	\$3GW2DMW28002, \$2GW2DMW28003	236	05-1	0.6	N/A	22000 N	8700	No	BSc
156 60-5	hang-1,2-Dichlordethene	Q 000	Ĵ	0.5		սայե	535W2DWW16504	2.36	05-1	04	A:A	186 N	1009	No	864
7y-q1-e	Tarchitureetinne	2		7		ışt	530W2DMW16D03, 530W2DMW16D03, 530W2DWW46S04	a-36	05-1	,	24	0 c>C -	27	Yea	ASI
75 01 4	Vinyl Chlorice	1.7		10	1	ogt.	\$36WZDMWZ9802-D	3/36	05 T	19	144	656	16	Yes	ASL

Voles

Data is high the Year I Annual Groundwater Monkering Preparation State 3 and 7 (Tayle Fach, 2007).

- 1 Sample yest duplicate are unusted as two separate symptes whos determining the minimum and may may describe conclusions.
- 2 Values presented are sample-specific quantitation times
- 3 The maximum detected concentration is used for energy purposes.
- 4 No hackground data or evaluate for VOCs
- 5 Chaff Couldance for Evaluating the Vapor Induser as Indoor Air Pathway from Circumdwater and Sols Nevember 2002 Is PASSO FIG2 052 Values are from Table 25 and correspond to a target pancy may level of 15-5 or HI in 1 and an amendation factor of 0.001
- 6. Connecticut's Procesed Revisions Remediation Standard Regulations, Votal Ization Chiera, Residential March 2003.
- 7. The changed is secured as a COPC if the manifest detected concentration arceeds the risk based COPC screening are and or an ARAR/180(9).
- 8 USEPA Appoint larges level
- A shadod value indicates that the concentration used for screening exceeds the circaron or background value
- A shaded chamical name indicates that the chamical has been selected as a COPC.

Associated Surregies	
\$3GW2DWW16D01	\$3GW2049925\$00
53GW2C44W16DC2	50GW20MW29504
SSGW20MW16DC3	SEGMENTATION
53CW2D46V16D64	50GW0MW151 62
\$3GW204W16S01	\$3GW3WW1503
53GW2DMW16502	\$3@W3 MW 15#04
S3GW2DMW168CD	\$3GW3VW15S0\
\$35W20MW16\$64	\$3GW3MM15502
\$30W2DMW25\$01	\$3GW0 AW 115S03
536W20MW29507	\$3GW3#W15504
53GW2DMW25503	\$3\$W3 W 16 00 :
53GW2QMW255Q4	\$35W3VW1600F
53GWzww28D01	\$3GW3WW\6D03
S3GW2DMA28D02	5.40W3MW16D04
53GWzDWw28903	\$36W3WW16S01
53GW2CWW2\$D04	53GW3MW16539
50GW2DMW29S01	\$35W3WW16S03
S3GW2D 4W 29S02	S0GW0MW18504

Debutions.

AHAHTIBC - Applicable or Relevant and Appropriate Requirement To Be Considered

D • Carcinogen

COPC - Chemical of Potential Concern

3 - Estimated Value

N - Noncarguegen

NA - Not Applicable

MCL - Federal Maximum Contaminant Level

Paponaia Codos

For Selection as a COPC

ASL + Aseva COPC Screening Level ARAR/TBC

For €: instantion as a COPC

- BSL + 84tow 0020 Screening Lave2ARAR/180

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN AT SITE 7. VAPOR INTRUSION

HSB-NUON, GROTON, CONNECTICUT

Scanage Timetrame: Future Medium: Geoundwater Exposure Nedium: Groundwater Exposure Point; Site 7

CAS Number	Chemical	4 "	Minimum Guslifer	Mer-num Concentration :4	Makimum Qualifier	Units	Location of Maximum Concentration	Detection Frequency	Plange of Nondelects ⁽²⁾	Concentration Used for Screening ⁽²⁾	Background Value ⁽⁴⁾	USEPA Groundwater Volationation Critery ⁽¹⁾	CTGEP Crowndwater Volatelaterer Criteria	corc Flag	Retionals for Contaminant Deletion or Salection ⁽¹⁾
Votatile Organic Co	mpounds														
76 3	1.1.2 Frichloiosifluoicethane] psa]	Γ—	0.58		IGC	S7GW/MW120i	[0.5	958	NA	1500 N	NA .	No	BSL
75-04-2	1, î-De naroamana	0.32] j	0.77	T :	191	\$76 W7MW \2.0;	528	05-1	077	144	2200 N	3600	No	BSL
108 90-7	Chkyubantana	י	1	2 -	[uşt	2/3mmm12504	4/28	05-1	2	NA.	090 N	1600	No	BSL
	e n- 1 2 Dichtoroetherre	0.72	L., .	- a a -	٦	Jul	\$75W7MW12S03, \$75W7MW12S01	3458	05-1	36	44.	2:0N	830	No	BSL
156.805	Irana-1 2-Dictionathana	1	J			Jan L	\$7GW7MW12I03	1/28	05-1	1	NA.	180 N	1000	No	est
7501-6	Tuchlarychaepe	0.7	1	'		ag'.	\$75W7MW5002. \$75W7MW5000. \$75W7MW12803	8/28	05-1	1	NA.	0095	27	Yes	ASL

Notes

- Date is from the Year 1 Annual Groundwater Monacene Report for Size 3 and 7 (Tetra Tech, 2007).
- 1 Sample and deplicate are counted as two separate samples when colormoning the minimum and maximum network concentrations.
- 2 Values proserved are sample specific quanctation limits
- 3 The missimum detected concentration is used for screening purposes.
- 4 No packground data is evallable for VOCs.
- 5 Diatr Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathwey from Groundwelor and Soils November 2002 EPAS30-F-02 0S2 Values are from Table 20 and correspond to a larget cancer risk level of 10.6 or H =1 and an affirmation latter of 0.001
- 6 Connecticura Proposed Hevisiona Remediation Standard Regulations, Volatilization Criteria, Hesidenoal March 2003
- 7 The charmost at extended as a COPC riths maximum detected concentration exceeds the rink-based COPC acrossing level and/or an ARAPYTEC(s)
- 8 USEPA Region I target evel
- A shado; value introdes that the concentration used for ecreening excepts the orderor or background value
- A shocod chemical name indicates that the chemical has been selected as a CCPC.

Associated Sumples

576W7MNY1001	\$70W7 MW50t 0
S7CW/MW1000	57GYY7MYY5DfH
87GW7MW1003	SAGYMANNIPS01
876W7MW1004	575W7MW9802
\$7GW7MW3991	S7GW/MW9S03
570W7MW3 Q2	570W7MW9504
\$7GW7MW3.03	57GW7MW19i01
S7GW7MW374	570W7MW12I02
\$76W7MW3501	S70997M9912800
S76W7#W3502	576W7MW12I04
57GW7#W3503	\$7\$W7WW(250)
\$7GW7MW3504	57GW7MW12S02
S7C/M7M/M5DQ1	S/GW/WW-2503
S7GYY7WWSD62	\$70W7MA\2804

<u>Qeforitors</u>

ARAPYTEC = Applicable or Figliorant and Appropriate FederalmentoTo Be Considered

C = Carcinogen COPC = Chemica, or Potential Concern.

I - Estimated Value

N Noncalchogen NA - Not Applicable

MCL - Federat Mayimum Contaminant Level

Rationale Godes

For Selection as a DOPC

AS. - Above COPO Screening Level ARATVTBC

For Formación es a COPO.

BSu - Below COPC Screening Level ARAR/15C

DCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN AT SITE 15 VAPOR INTRUSION

NSB-NLON, CADTON, CONNECTICUT

Scenario Timeliame: Future Medium: Groundweter

Exposure Medium: Groundwater Exposure Pomt: Sile 15

CAS Number	Chemical	Minimum Concentration	Manimum Qualifier	Meximum Concentration	Méximum Dualidier	Units	Legation of Maximum Concentration	Detection Frequency	Range of frondetects ⁽²⁾		Background Value ⁽⁴⁾	USEPA Groundwater Volution Criteria(5)	CTOEP Groundwarer Volublization Criteria(8)	GOPC Flag	Partionale for Comaminant Delation or Selection ⁽⁷⁾
Valente Organi	Compounds														
67 66 3	Chloroform	3		9	L	USAC	S15GW15TW301	1/16	1	3	N/A	671 N	26	Yes	ASL

Notes:

Quis is from the Basine de Groundwater Operable Unit Remediat Investigation Report Update Featubility Study Report (Lette Tech, 2004).

- 1. Sample and duplicate are counted as two separate samples when determining the minimum and maximum detected concentrations.
- 2 Values presented are sample-specific quantitation (in its
- 3 The maximum detected concentration is used for screening purposes.
- 4. No background data is available for VCCs.
- 5 Diaft Guidance for Evaluating the Vapor Intrusion to Indoor Air Partiway from Groundwater and Soils November 2002 EPAS30-F-02-052 Volums are from Table 2d and correspondite a target denoted risk level of 15-6 or Ht. all and an attenuation factor of 0.001.
- 6 Contrecticut's Proposed Revisions Remediation Standard Regulations, Volatilization Cirtera, March 2003,
- 7 The chemical is selected as a COPC if the maximum generorg concentration exceeds the risk pased COPC screening level anglor on ARAIVTBC(s).
- 8 USEPA Region Hargan ever

A shaded value indicates that the concentration used for screaring exceeds the differior or background value

A snagog chemical name indicates that the chemical has been selected as a COPC

Associated Semples:

515GW15MW1502

\$15GW154W2S02

S15GW15MW2SQ2-D

515GW15MW3502 SISCWISTWIDE

\$15GW:5TW201

8:5GW:51W301

Qsf_mlyong. APARVISC = Apphicacyle or Right-and and Appropriate Requirement/Te Re Considered.

Ciri Caronogeni,

CCFG - Chemical of Potential Concern.

J - Estimated Value N - Noncardinogen.

AIA - Not Applicable

NCI - Federal Maximum Corcaminant Lovel

Rajionale Copes

For Selection as a COPS.

ASU - Above COPC Screening Leve/ARAIVTBC.

For Elemination as a COPC:

#SV = Below COPC Screening Level ARAPYTBC.

TABLE 7 OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN AT SITE 20 VAPOR INTRUSION NSS-NLON, GROTON, CONNECTICUT

Scenario Timeheme: Futbre Megium: Groundwater Exposure Medium: Groundwater

(Exposure Point, Area A Weapont Conter (Site 20)

CAS Number	Chemical	I COCCOCICATION I "	jualifiat (Instruction	Maximum (Concentration)	Maximum Qualifier	Unida	Location of Mitrahum Concentration	Detection Fraquency I'l	Pange of Nondelects ⁽²⁾	Concentration Used for Screening ^{CC}	Background Yelus ⁽⁴⁾	USEPA Groundwater Votabilgation Criteria ¹⁴	CTDEP Groundwater Volatilisation Coderia**	ÇOPC Fin g	Pationale for Conteminant Datellon or Selection ⁽⁷⁾
Votate Organic Con	pouride														
[10e-16-1]	4 Methyl 2 Pentanone	129]	129	د	o ց վ	9202WCMW2S01	1/4	[<u> </u>	1.29	N/A	14000 N	13090	No	MTX
79 51 6	Trichlaidatheng	38	. 1]	5.02	ا ر	սֆե	5207WCMW2901	24	[']	5 02	N/A	0 05 C	27	Yes	ASL

Notes:

Data is from the Basewide Crownowaler Operable Unit Periodial Investigation Report (Tetra Tech. 2001).

- 1 Sample and Bublicate are counted as two separate samples whon determining the minimum and maximum detected concernations
- 2 Values presented are sample specific quantitation units
- 3 The maximum délected concentration is used for screening purposes
- a No packground date is available for VOCs.
- 6 Draft Guidance for Evaluating the Vapor Intrusion to Indoor Ar Pathway from Groundwater and Soils November 2002 CPAS30-F-02-052 Values are from Table 20 and correspond to a larget career risk level of TE Glor HI +1 and an attenuation factor of 0.001
- 6 Connecticut's Proposed Revisions Remediation Standard Regulations, Volativation Circuit, March 2003
- 7 The chemical is selected as a COPC if the maximum defected concentration exceeds merick-based COPC screening (yes) and/or an ARASY/IBC(s)
- 8 USEPA Region I tanget level

A shaped value indicates that the congociation used for someting exceptor major renor or tackground value.

A shaded chemical name indicates that the chemical has been selected as a COPC.

Associated Samples:

S232WCMW1501

5202WCMW7501

S202W0WW3S01

S202WMW4001

Definitions

ARIAR/TBC - Applicable or Pelevent and Appropriate Requirement to Se Considered.

S = Carcinogen

COPC : Chemical of Potential Contoin

J ≈ Eshmared Value.

Nill Noncaramogen,

NA - Nor Approactio

Rationale Copes

For Shiector as a COPC:

ASL - Above CCPC Screening Level/ARAF/TRC

For Elemination as a COPC:

BS: = Balow COPC Schedung Love (ARANTSC).

NEX - No Texicily Information

OCCUPACING DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN AT SITE 23 - UNDERDRAIN METERING PIT VAPOR INTRUSION

NSB-NLON, GROTON, CONNECTICUT

Scenario Timeframe; Future Medium: Groundwater

Exposure Medium: Croundwater

Exposure Point: Underdrein Metering Pri (Site 23)

CAS Number	Chemical	Minimum Concentration	Minimum Queldjer	Meximum Concentration	Mastmum Qualifier	Unite	Location of ¥aximum Concentration	Overetion Frequency	Penge of Nondebous th	Concentration Used for Screening ⁽³⁾	Background Yake ^{vii}	USEPA Groundwater Volatification Criteria ^{CR}	CTDEP Droundwater Voletilization Cutaria ⁽¹⁾		Rationals for Contaminant Deletion or Selection ⁽²⁾
Volable Organic Con	thyeuhda														
71-43-2	Mercana .	28	יַ נ [95	J	Lgst.	SZOUWMPHADA	1/4	. 05	02	NA	1400	130	No.	HSL
75.27-4	Brymodetkolomethene	93			[— <u>7</u> .—	LOL	S23GM/WPW01	1/4	03	93	NA.	2 · C	2.0	Ν'n	BS _k
100 82-7	Сускучения	91	J . [01		ugit	S23GMUFN92	1/4	03	01	N4	N/A	NA	No	NTX
57 66-3	Chlorolares	[?]		1	1	UQ1	SSEGWAPPAOL	1/4	85	3	NA	0.11 C.	26	Yes	A9.
146 59-2	os 1.2 Ochlorselhene	0.5		0.9	[]	uşt	S20GWAPNO) S20GWAPNO2	44	05	93	NA.	2'0N	sae	No.	8 SU
¥8 62-8	scpropyibarzene	0.09	٦ ,	01		ogl	S23GWMPMC1, S23GWMPMC2	24	05	01	NA.	54 N	NA.	No	B5.
1634-04-4	Metryl Test-Bulyl Cities	0.4	III J		i	UJL	S23GWMPWei	C4		1	NA.	120000 N	21000	\$	R5L
127-18-4	Tetrachiorpathene	0.2		04	1	UQL	SSIGMANAGS	4/4	-	94	NA.	0556"	340	No	DS:
78-01-6	Trichlorocibene	09	7 17	Q.5	<u>,</u> -	USL	SZOGWYPIACZ	44		25	N/A	0.05 €	27	Yes	ASC.

Notes

Data is from the Year 1 Arrival Montoning Report for 5 to 23 Understrain Metering P4 (Tetra Tech. 2008).

- 1. Sample and publicate at a counted 45 two separate eamples when determining the minimum and managing detected concentrations.
- 2. Values presented an aample-specific quantitation limits.
- 3. The maximum detected concentration is used for accoming purposes
- 4. No background data is available for VCCs.
- S. Craft Guidance for Evaluating the Vapor Interior to Indoor Air Partiesy from Groundwater and Soils. November 2002. [PAS10 5-42-052 Values are from Table 2d and correspond to a target cancer has level of 16.6 or HI =: and an attenuation factor of 0.001.
- 6 Connecticut's Proposed Revetous Remerkation Standard Regulations, Voluntization Citiese, Residential, March 2003
- 7. The chemical is solected as a COPC 4 the maximum patertial concentration exceeds the risk-based COPC acrossing level and within AFARVTSC(s).
- 8 USEPA Region Harget eval.

A shaded value indicates that the concontranch used for screening exceeds the chance or background value

A shades charmost name indicates that the chemical has been selected as a COPC

Associated Supplys

SPROMARMAN

520GWMPMq1-III

993GWWPW02 520GWWPM-00

SEGGWMPMO2 D

S20GWMPMo4

<u>Centuriors</u>
ARARTEC • Applicable or Relevant and Appropriate Requirement/16 Be Considered

C - Carculagen

COPC - Chemical of Potential Cork em

Jia Estationed Value N - Noncentroppen

NA n Not Applicable

MCL - Federa Maximum Contaminant Level

Figherral & Codes:

For Selection as a COPC

ASL - Above COPC Screening Leve/APAR/TBC

For Elimination as a CCPC:

BSL = Refew COPC Scienting Level/AHAH/IBC

NTX = No toxicity criteria available.

TABLE 9 INPUT PARAMETERS FOR THE VAPOR INTRUSION MODEL NSB-NLON, GROTON, CONNECTICUT

Site and Well	Depth to Groundwater (feet bgs)	Depth to Groundwater Daed in Model	Sail Type	Soil Type Used in Model	Dry Bulk Density (gm/cm²)	Total Porosity	Screened Interval (feet bgs)	Reference
2				_			_	
<u>Utxpradient</u>				· . –				
4MW01\$	6.31099	6.3 feet (190 cm)	Bedrock w/ gravel and s.fry gand above	Sandy Loam (\$1)	I.B	0.33	8 to 18	Year 3 GMH for Area A Landfill, Hounds 9 through 11, 12/2002 to 9/2002
<u>Downstream</u>	T a = 1 = 2 = 2	In Allert 1440 emil	O. Frank About and Assessment	0				
3MW37S	<u> </u>	3.6 feet (110 cm),	Sity Sand w/ trace rock fragments	Sandy Loam (SL)	1.8	C.33	4.510.5.5	Year 3 GMR for Area A Landfill, Rounds 9 through 11, 12/2002 to 9/2002
Wellands								
2WMW39DS	2.4 10 3 4	, ,	Org. Clayey Sti		Defauti	Default	4 to 14	Year 3 GMR for Area A Landini, Pounds 9 (mough 11, 12/2002 to 9/2002
2WMW46DS	1.55 to 2.28	2 1 feet (65 cm)	Org. Clayov Sri	Clay Loam (CL)	Defaut	Defaut	4 to 14	Year 3 GMR for Area A Landfil, Rounds 9 through 11, 12/2002 to 9/2002
		<u>. </u>	<u>g.g. qe.juj on</u>		CC-EL-I	Develor	4,014	Tear or client to three it can city, thou to a situation it, the sour to seem
3								
3MW1\$I	309	. ─ ─ ─	Sand and Gravel	1	1.8	0.33	55 ro 65	Rod 4, Year 1 GMR for Sites 3 and 7
3MW16S	29.4	1 i	Sand and Gravel	┪	1.8	0.33	28 to 38	Find 4, Year 1 GMR for Sites 3 and 7
3MW16D	22 1	1	Bedrack w/ sand and cobbles above	B	1.8	0.33	59 to 69	And 4, Year 1 GMR for Sites 3 and 7
3MW165	14.4	3.6 feet (110 cm)	Bedrock will sand and pobbles above	Şand (Ş)	1 B	0.30	17 to 27	Rod 4, Year 1 GMR fox Sites 3 and 7
2DMW16D	37	1 1	Bedrock w/ sand, sit, and cobbles above	1	1.8	033	16 to 60	And 4, Year 1 GMR for Sites 3 and 7
20MW295	8.6	1 1	Sand	1	1#	0.33	å to 16	And 4. Year 1 GMR for Sites 3 and 7
							-	
77								
7MW05D	12.4	5 feet (150 cm)	Bodrock w/ sity sand w/ trace grave: above	Loamy Sand (LS)	1.6	0.37	32 to 42	Rnd 4. Year 1 GMR for Stes 3 and 7
/MW121	. 5	3166(130(011)	Sandy sift	LOBSIN SAIN (CS)	1.6	0.37	20 to 30	And 4, Year 1 GMR for Siles 3 and 7
								-
15								
15TW¢3	6.5	[6.5 feet (200 cm)	Sandy sit	Loamy Sand (LS)	1.5	0.45	510 15	BGQUHI Update:FS
20		-						· · · · · · · · · · · · · · · · · · ·
2WCMW2S	4.6	4.6 feet (140 cm)	5-ity sand w/ grante tragments	Sandy Loam (SL)	1.6	0.37	4 10 14	BGQURI Update/FS
2WC M W4D	6.1		Bedrack		1.6	0.37	13 to 119	BCQUHI Update/FS
23				Laión				
23MP01	7 to 9	7 feet (210 cm)	S≥ty sand	Sandy Loam (SL)	1.5	0.45	HNUS 23 (7 to 17)	BGOURI

Other Information

Sile	But Consity (lb/cl)	Bulk Density (g/cm²)	Porosity	Reference
3	1,5 55	1,8	0.3306	BGOURI
7	348 77	1.6	0.374	BGOURI
23	90.8	1.5	D,445	BGOURI

TABLE 10 NON-CANCER TOXICITY DATA -- INHALATION NSB-NLON, GROTON, CONNECTICUT

Chemical of Potential	Chronic/ Subchronic		lan RfC		ated RfD ⁽¹⁾	Primary Target	Combined Uncertainty/Modifying	RIC : Targ	et Organ(s)
Concern		Value	Units	Value	Unite	Organ(e)	Factors	Source(e)	Date(s) (MXVDD/YYY)
Volatile Organic Compounds									
Ch proform	Стиолис	4.9E+02	mg/m³	1 4E-02	(mg/kg/day)	Liver	NA NA	USEPA III	19/11/2007
Tetrachloroethens	Chranic	2.8E-01	mg/m³	8.0E-02	(mg/kg/day)	Liver	NA NA	USEPA III	19/11/2007
Trichloroethens - Oraft EPA	Chronic	3.5E-02	m∂/m,	1.0E-02	(mg/kg/day)	Liver, CNS	NA NA	USEPA(1)	8/2001
Trichloroethane - Cal EPA	Chranic	6.0E-01	mg/m3	1.7E-01	(mg/kg/day)	Liver, CNS	NA NA	CA EPA	12/2002
Vinyl Chlorida	Chronic	1.0E-01	m∂,w₂	2.9E-02	(mg/kg/day)	Live/	30/1	IRIS	5/02/2008

Notes:

1 - Extrapolated RfO = RIC *20m³/day / 70 kg

Delimilions:

CNS = Contral Nervous System

EPA Itl = U.S. EPA Region 3 RBC Table, October 11, 2007.

IRIS = Integrated Risk Information System

NA = Not available.

USEPA(1) - Oraft Trichloroethylene Health Risk Assessment: Synthesis and Characterization, August 2001.

CallEPA - California EPA, Technical Support Occurrent for Describing Available Cancer Potency Factors, December 2002.

TABLE 11 CANCER TOXICITY DATA -- INHALATION NSB-NLON, GROTON, CONNECTICUT

Chemical of Potential	Unit	t Hisk		on Cancer Factor ⁽¹⁾	Weight of Evidence/ Cancer Guideline	Unit Risk : Inhelation CSF			
Concern	Value	Units	Value	Units	Description	Source(s)	Date(s) (MM/DD/YYYY)		
Volatile Organic Compounds				••					
Chloroform	2.3E-05	(ug/m ³) ⁻¹	8.1E-02	(mg/kg/day) ⁻¹	B2	IRIS	5/02/2008		
Tetrachloroethene	5.9E-06	(ug/m³) ⁻¹	2.1E-02	(mg/kg/day) ⁻¹	NA NA	USEPA(1)	6/12/2003		
Trichlorgethene - Draft EPA	1.1E-04	(ug/m³) ¹	4.0E-01	(mg/kg/day)	С	USEPA(2)	8/2001		
Trichlorgethene - Cal EPA	2.0E-06	(ug/m3)-1	7.0E-03	(mg/kg/day)-1	С	CA EPA	12/2002		
Vinyl Chloride (adult)	4.4E-06	(ug/m ^{-/}) ⁻¹	1.5E-02	(mg/kg/day)	А	IRIS	5/02/2008		

Notes:

1 - lobalation CSF = Unit Risk * 70 kg / 20m³/day.

Definitions:

IRIS = Integrated Risk Information System.

NA = Not Available.

USEPA(1) = OSWER Directive No.9285.7-75.

USEPA(2) = Oraft Trichtoroethylene Health Risk Assessment: Synthesis and Characterization, August 2001.

EPA Group:

- A Human cardinogen.
- B2 Probable human carcinogen indicates sufficient evidence in animals and inadequate or no evidence in humans .
- C Possible human cardinogen.

TABLE 12 SUMMARY OF VAPOR INTRUSION MODELING RESULTS NSB-NLON, GROTON, CONNECTICUT PAGE 1 OF 3

	Site 2 -	Area A - Up	gradient	Site 2 - A	Area A - Dov	nstream	Site 2	- Area A - We	tlands
Chemical	EPC	Çancer	Hazard	EPC	Cancer	Hazard	EPC	Cancer	Hazard
	(ug/L)	Risk	Index	(ug/L)	filsk	Index	(ug/L)	Risk	Index
		Residential			Residential			Residential	
Chloroform	1	5E-08	1E-04	NA	NA	NA	NA	NA	NA
Tetrachloroethene	NA	NA	NA	NA	NA	NA	1.4	8E-08	1E-04
Trichloroethene - EPA Toxicity Criteria	0.9	2E-07	1E-04	2	4E-07	3E-04	1,4	1E-06	6E-04
Trichloroethene - Cal EPA Toxicity Criteria	0.9	3E-09	7E-06	2	8E-09	2E-05	1.4	2E-08	4E-05
Vinyl Chloride	NA	NA	NΑ	NA	NA	NA	NA	NA	NA
		Industrial		Industrial			Industrial		
Chloroform	1	7E-09	2E-05	NA	NA	NA	NA	NA :	NA
Tetrachloroethene	NA	NA	NA	NA	NA	ŇA	1.4	1E-08	2E-05
Trichloroethene - EPA Toxicity Criteria	0.9	2E-08	1E-05	2	6E-08	5E-05	1.4	2E-07	1E-04
Trichloroethene - Cal EPA Toxicity Criteria	0.9	5E-10	1E-06	2	1E-09	3E-06	1.4	3E-09	6E-06
Vinyl Chloride	NA	NA	NA	NA	NA	NA	NA	NA	NA

Notes:

NA - Not a COPC at this site.

EPC = Exposure point concentration, maximum detected concentration of a chemical at a site.

Shading indicates an exceedance of USEPA and/or CTDEP acceptable risk levels.

TABLE 12 SUMMARY OF VAPOR INTRUSION MODELING RESULTS NSB-NLON, GROTON, CONNECTICUT PAGE 2 OF 3

		Site 3	_		Site 7		Site 15			
Chemical	EPC	Cancer	Hazard	EPC	Cancer	Hazard	EPC	Cancer	Hazard	
	(ug/L)	Risk	Index	(ug/L)	Risk	Index	(ug/L)	Risk	Index	
		Residential			Residential	1		Residential		
Chloroform	15		1E-02	NA	NA	NA I	3	. 1,8	7E-03	
Tetrachloroethene	NA	NA NA	NA	NA	NA	NA	NA	NA	NA	
Trichloroethene - EPA Toxicity Criteria	7		2E-02	1		1E-03	NA	NA	NA	
Trichloroethene - Cal EPA Toxicity Criteria	7	6E-07	1E-03	1	4E-08	8E-05	NA	NA	NA	
Vinyl Chloride	10		4E-02	NA	NA	NA	NA	NA .	NA	
	'	Industrial		Industrial			Industrial			
Chloroform	15	1E-06	3E-03	NA	NA	NA	3	5E-07	1E-03	
Tetrachloroethene	NA	NA.	NA	NA	NA.	NA	NA	NA .	NA	
Trichloroethene - EPA Toxicity Criteria	7		3E-03	1	3E-07	2E-04	NA	NA	NA	
Trichloroethene - Cal EPA Toxicity Criteria	7	8E-08	2E-04	1	6E-09	1 E -05	NA	NA NA	NÄ	
Vinyl Chloride	10	1E-06	7E-03	NA	NA	NA	NA	NA	NA	

Notes:

NA - Not a COPC at this site,

EPC = Exposure point concentration, maximum detected concentration of a chemical at a site.

Shading indicates an exceedance of USEPA and/or CTDEP acceptable risk levels.

TABLE 12 SUMMARY OF VAPOR INTRUSION MODELING RESULTS NSB-NLON, GROTON, CONNECTICUT PAGE 3 OF 3

		Site 20			Site 23	
Chemical	EPC	Cancer	Hazard	EPC	Cancer	Hazard
	(ug/L)	Risk	Index	(ug/L)	Risk	Index
_		Residential			Residential	
Chloroform	NA	NA	NA	3	7 12	5E-03
Tetrachioroethene	NΑ	NA	NΑ	NA	NA	NA
Trichloroethene - EPA Toxicity Criteria	5.02	17 17	2E-03	0.5	4 11	2E-03
Trichloroethene - Cal EPA Toxicity Criteria	5.02	7E-08	1E-04	0.5	7E-08	1E-04
Vinyl Chloride	NA	NA	NA	· NA	NA .	NA
		Industrial			Industrial	
Chloroform	NA	NA	NA	Э	3E-07	8E-04
Tetrachloroethene	NA	NA	ÑA	ÑA	NA.	NA
Trichloroethene - EPA Toxicity Criteria	5.02	6E-07	4E-04	0.5	5E-07	4E-04
Trichloroethene - Cal EPA Toxicity Criteria	5.02	1E-08	3E-05	0.5	1E-08	2E-05
Vinyl Chloride	NΑ	NÁ	NA	NA	NA	NA

Notes:

NA - Not a COPC at this site.

EPC = Exposure point concentration, maximum detected concentration of a chemical at a site.

Shading indicates an exceedance of USEPA and/or CTDEP acceptable risk levels.

TABLE 13 PRELIMINARY REMEDIATION GOALS AND OTHER ARARS FOR VAPOR INTRUSION NSB-NLON, GROTON, CONNECTICUT

<u> </u>	EPC ⁽¹⁾	PR	G ⁽²⁾	USEPA	CTDEP	RSA ⁽⁴⁾	
Chemical	(ug/L)	Residential	Industrial	MCL ⁽⁰⁾	Residential	Industrial	
Site 2 - Area A - Upgradient							
Chlorolom	1	21	144	80 ^{:51}	26	62	
Frichloroethene ⁽⁶⁾	0.9	258	1769	5	27	67	
Site 2 - Area A - Downgradient	•						
richloroethene	2	257	1760	. 5	27	67	
Site 2 · Area A · Wetlands		•					
Tetrachloroethene	1.4	18	122	5	340	810	
Trichloroethene ¹⁶⁾	1.4	74	508	5	27	67	
Site 3							
Chlorotom	15		15	80 _[3]	26	62	
Frichloroethene ⁽⁶⁾	7	12	85		27	67	
Vinyl Chloride	10		; ;			52	
Site 7							
Trichloroethene ¹⁶⁾	1	24	163	5	27	57	
Site 15							
Chloroform	3		5.9	80(3)	26	62	
Site 20				•			
Trichloroethene ⁽⁶⁾	5.02	68	467	5	27	67	
Site 23	•						
Chloroform	3	:	9.1	BO ⁽²⁾	26	62	
Frichloreethene ¹⁶¹	0.5	7.5	52	5	27	67	

Acronyms:

ARARs = Applicable or Relevant and Appropriate Regulations

EPC = Exposure Point Concentration.

MC1 = Maximum contaminant level.

PRG = Pretiminary Remediation Goal

RSR = Remediation Standard Regulations.

Notes:

All concentrations are in ug/L.

- 1 EPC is the maximum detected concentration at a site.
- 2 PRGs are based on a cancer risk of 1 x 10⁻⁶ or an hazard index of 1.
- 3 USEPA Drinking Water Standards and Health Advisories, August 2006. -
- 4 Proposed Revisions Connecticut's Remediation Standard Regulations, Volatilization Criteria, March 2003.
- 5 · Value is for total tribalomethanes.
- 6 PRG for trichloroethene is calculated using the Cal EPA toxicity criteria.

Shading indicates an exceedance of a PRG or ARAR.

ATTACHMENT A BORING LOGS AND DEPTH TO GROUNDWATER INFORMATION

	1			A:	· · ·	FI	ELD GE	DLOGIST: Tem Eng	4 75		<u> </u>
	(Oate	, Time	& Cond	livom) ,						Si.	· · · · · · · · · · · · · · · · · · ·
	\vdash	Ī	Ī			i_ ·	MAT	ERIAL DESCRIPTION			
•	o tree Of Rego	RUEL MED.	edb 4, dg	TOTAL TOTAL TOTAL TOTAL TOTAL	P-0.007	TOTAL COMMISSION CO COMMISSION CO COMMISSION CO COMMISSION CO COMMISSION CO COMMISSION CO COMMISSION CO COMMISSION CO COMMISSION CO COMMISSION CO COMMISSION CO COMMISSION CO CO CO CO CO CO CO CO CO CO CO CO CO C	: ca.c=	MATERIAL CLASSIRCATION		ed vici	RÉMARKS
- •	Ç-1 @ 1+3¥	0.0	15 15	1.5%.0		Dense	Shek	Graves when		49	Ser- + M. ++ C C -
	ie.	2.0	72	11.1 ³ 1.1 ⁸	A-63-2	Y-Device		Children Carrell 11-	_ ci	SC:/	Wet Debte from
, : . ·	1452- 4-7	e :		, I	K E DE	3-0,-4		Glin Shall witte	- /1		Sound - 4- To I Gar Grown 1 - Greens House !
./.	34%.	(D)	27.	4.5/50	~	Hard	4 5 5 X	Greeks	7 G 24	BA.	SS Refused - More
2 3	7.0			•			'	w/ send years	2.T/ 1.3'	1 T	1' SW.
	.71/4.5 8-5	Ġ		101/1.5		Hard	دروه. مين	Corns w/cow so	a m<	Br	114 FAC & 7.17 . 7.0
•	.,	*			j)	· · · · · ·		· <u>-</u> ·····		_	to 4 Free @ 12.4%
		┿┪		+-1	~#}						Core Burge Speak (2)
	₫ % o	0	<u>199</u> .	5.6%	~#[C-47	Circ 05		56	lo.** 13.3*
44	13.5	╁						· · · · · · · · · · · · · · · · · · ·		-	Powe Hid on to 13.5'
²17										_	B, O revel p 211
	1.1/5.0	<u>ලා</u>	<u> </u>	د.و/۹۵	果	Hard	LUC.R	Cheise	: 1	5 K	18.77
t	一十	++	\dashv					· · · · · · · · · · · · · · · · · · ·		1	H. & JAT & 15.2
	8.5	*	=								16.5" 16.4" (Bre \$nore Browle
ŀ	+			_	-		\dashv	Total Depth 1	B.⊊''- }	+	17.4
				二	Į			Jerein 85'-11	8 2 1	=	2" PVC Ololo Shirt.
-	-		=	\dashv	- }			Sand 6'-1		+	- just on Sand
ŀ	\dashv	- [\exists	\dashv	 			Pelletz 3'- 6	· 	-	- 58 to Bay Egystell
. 1	REMARI	cs_C	iemer	, GT	35v	HSA	Rio	<u>ATV</u>			BORING 4MWIS

PRO DRIL	PROJECT NAME: NSB-NLON PROJECT NUMBER: 5082 DRILLING COMPANY: EDI, Inc. DRILLING RIG: Triped			BORING N DATE: GEOLOG:	<u></u>	3MW37\$ -5-19-99 T. Evans							
DRIL	LING	i HIG:		7.5			DRILLER:	_	, <u>_</u>	a orl		_	_
Sample No. und Type or MGD	Depth (PL) or Run No.	Sloves/ 6" or RGO (54)	Sample Recovery / Europia Langth	Lithology Change (Depth/FL) or Screened (rparce)	Soil Density/ Constitutionary or Rock Hardwess	Color		ນ ຮ ເ ຮ	Her	narks	Sample 6	Sampler 82	Horehofe**
2-1	<u> </u>	3/3	1/23			OK 60k	HULLUS	P+	1330	wet	0	0	
	ე.მ	5/		~20					_			_	
ኑኢ		15	1.3/00		V Oewse	724	Silty F SAND	SΡ	1352		0	0	
	4.0	376					Tr Roch Frags	L	actos.	<u>le4'</u> -	7		
	·						J	G	Sca de	<u> </u>			
	٥. ي			5.5	<u>.</u>			<u> </u>	5/20 @				
		\leq		2.7		<u> </u>	·-·	<u> </u>	Drive ,		<u> </u>		_
		_				<u> </u>		ļ		to 5 6	ما إ	لما	-
						<u> </u>	Set 1'screen (10			2.2	~	7	1
		_				<u> </u>	When #1 San	12	3.2-		-	ļ	_
_ !						ļ	Bentonik	 	2.5-	- 3.5	<u> </u>	_	Ļ
				į		<u> </u>		-	-			_	_
		$\overline{}$				ļ		-	 -				
					·		<u> </u>	\vdash	1		\vdash	_	
		\leftarrow				 		+	<u> </u>				┝
		$\overline{}$				-		\vdash	 		\vdash	\vdash	\vdash
		$\overline{}$						┼─┈	 . —		╁		-
		$\overline{}$				├		╀	 	· •	\vdash	-	┝
$\vdash \dashv$		\leftarrow				\vdash		\vdash	 		├ -		-
					<u> </u>			┼	-		\vdash		├
		\prec			-	-			 		╀	\vdash	
		\leftarrow				├		 	 		╄	-	-
						<u> </u>			_		╄-	<u> </u>	<u> </u>

TŁ.	Te
l •L	••

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

			NAM				<u>NLON</u>			UMBE	R: <u>SMMW</u>	30	ે દ	<u> </u>	
				BEN: PANY:	508 EDI,				DATE: GEOLOGIS	ST-	<u> </u>	7			
	_		RIG:	, cuit,				ابد	Cartract DRILLER:	J F.	A - O - C	ر لا			
				1	_	Ť			RIAL DESCRIPTION			7	ID Re	dho ic	oom!
	Semple No. und Type or ROD	Carpet Ers Hus Hus Corp Hus Hus Hus Hus Hus Hus Hus Hus Hus Hus	Blowe/ 6" or ROD (%)	Serupte Flacovery: / Bumpte Langth	Littlebogg Change (Depth/FL or Screened interval	, ,	Soil Oursity Consistency or Rock Hardnese	Color		> 00 0 0 ·	Remarks	Вапріе	Sampler B2	Sorehole**	Collie 92**
9	5-1		23	15	9.1	-	Look	Вm	Silt Some = 5 and M-C Sound	M L γ	1340 Photo#	0	0		3
		20	2 / q	[·	ļ						Saturaled				
	5-Z		3.4	0.3/.5	[Look	D ውሎ	F-C Saul	ડખ	(345)	D	c		0
		4,0	3/3			_ _		<u> </u>							_
	S-3	٠	4	0.0	-	╢		ļ	No Kecover		1348	0	٥		0
	<u> </u>	د	_	las/] -	. d. el.af	 	0						
	54	-	77	0 /2 °		-	<u>##2 M</u>	11-0	four necessary		12/20	-			_
	_	8.5	77	1.1/		Ħ.,	THE M	UM.	1	o H-	1445	7.	H		_
	5-5		32	1.0	1 -	∦	196 344	<u> </u>	Clayen Silt	0 +	1 1 1 2	37.8		-	┝
	5-6	0-0		18/5	1		CAL	H	1. 3.00	┡╌┼╌	1505 722	3 0 m	Ð	_	2
	3-6	(2»	3	1	1 }	╢	*V(X	H			13	Œ		·	
	<u>5-7</u>	-	17	2.7/2.3		╢	Solt	17			1513	H	٥	-	δ
		(4.)	3		-	1									
	5-8		5/4	2%.0] ~	1	WS +iff				1250	25-9			
		6-3	43					$\downarrow \downarrow$	1	V		<u> </u>			L
		_	\leq	<u> </u>	190G I	-		ļ		ļ	Orive 4"	<u> </u>	_	_	
		i	4			ļ		<u> </u>			temp carry	<u> </u>	<u> </u>		-
					[ŀ		 	<u> </u>	 	<u>4</u> → 15	 	H	_	 .
			\leftarrow	-		ŀ			a it as a second			┼			-
	\vdash				ł	+		┝	2" PVC 4-14		Let wal	\vdash			╁╌
	<u> </u>			-	-	ŀ			#U Jand 3-15	├	321 3.04	╆┈	┝	┝	-
	 -			\vdash	1	F		 	Benent 2-3	 	 	├	_		┢
					1	F	-		<u> </u>	\vdash		+-	一	┢	
				el tock be		_		L	<u>.</u>			l Ber		_	1
	" Indu Rem		olor reaction 31	ng in 6 100	d intervats	91	barehale. Ir	ncr oas	o reading troquency if elevated reponse	read,	ยก Backgroui	lling . nd (p			8
			<u>X</u> -		471.	۷.	2w.	<u>.</u>	4-9905-00-9	9				_	
	Conv	erte	to We	ell:	Yes				No Well	I.D. #:					

ŦŁ	Tetra
•	

Tetra Tech NUS, Inc.

BORING LOG

Page ___ of ___

		r Nami r Num		NSB-	NLON		BORING N	NUMBE	R: <u>2 WMW</u> 5-17-9		, 5	5_	_3
			PANY:			``.	GEOLOGI	ST:	T. Evans	7		_	
DAil	LING	RIG:			ipod	w/ (Cat head DRILLER:		A-orlic	<u>k.</u> ,			=
				· ·	М	ÄTE.	RIAL DESCRIPTION	i		70	RD Re	dleg (r	(era)
Semple Mo. and Type o AGD	Oued (PC) and (PA)	Blown/ F or PIGO CG	Bampia (Recovery) Semple Length	Uthology Change (Depth/FL) or Screened Interval	Soil Denaity/ Cormintency or Rock Handhads	Color	Material Classification	n 20 20 .	Remarks	#mple	Sampler 82	Borehale™	Driller BZ**
2-1		13/8	0.5			βı∽	Koot malker	OT.	0949	2.5			0-à
<u> </u>	ညှစ	ا ماسط						<u>† </u>	wet				
5.5		47	0.%0	!	_		No Recovery		رونې	-			· .
	4.0	63	L	:					l]
\$ ·}		4	1/2	·	V Soft	olun ben-	Organic Clases	OH	(020	<i>3</i> .5	0-°		د.ه
	60	4				رسة	Silf?			<u> </u>			
5-4		3/1	2.0		MStiff	اراند مارد	Organic Clayer	он	(03.0)	123	0.0		1-2
	80	Z3,					Si lif	<u> </u>		<u> </u>			_
3-5	_	2/2	1/20		Sof f	9(cr) 4**1	Organic acuses	04	1040 Hzsaw		L.		I
	(0-0	3/2					Tr Roots (remain	4)	Orive 4"temp Cosin	<u> </u>			_4
5-60		<u>34</u>	2/3		No. SHIPE	dim bm	Organic Clayer	σu	1100 HZS odor	99.4	m		5-5
	120	23					S:1+ 0 /	<u> </u>			L.		
5-7		7	13,0		mustiff	Mest 500	Orinnic Clargey	014	1152	124	6.3		0:3
\perp	(4.2	2,					Sift To-shall	<u> </u>					
5-6		5/3	27/20		202+		<u> </u>		1/30	132	Ø.>		م.م
<u>L</u>	60					<u>. L</u>		_ ₩					
									4" Teng Casing	_			
		\angle	:	1					to 151	<u> </u>			
		\angle									L		\square
					<u>_</u>		2" puc 6-56-+	L.	1+1				
							Valve #c Sand	3'-	151				
							Bertoule 2	3	†			•	
							protective ass	بنہ	2.5 Strely	b_			
		$\overline{}$						7	T				
				L					1240 Dends				
** Inclu	de mosi	_			borehole, s	ncreas:	e reading frequency il signated reports	read	Dril Backgrour	ling /		Δ.	.5
1 15 11		<u></u> ¥	San	Q(C	,2 ~	5	4- 46 DS- BY-SS			~ u/	y-		<u> </u>
Cam	an et o d	to We	.thr	Yes	-/		No Well	ID #	H W Mh	1 U	61	56	

PROJECT NAME:	NSB New London, CT Site 3 BORING No.:	3MW15I
PROJECT NUMBER:	CTO 038, G00083 DATE:	4/27/06-
DRILLING COMPANY:	New England Boring Contractors GEOLOGIST:	Colin Doolan
ORILLING RIG:	Mobile BS9 Drill DAILLER:	S Rangdell
1 1 1 1	MATERIAL DESCRIPTION	moved Beerfee

DHIL	LING	HIG:			obile	<u>627</u>	DAM DHILLER:		> Ramsd	<u> </u>			
		Γ΄	_		_ N	ME	RIAL DESCRIPTION			0770	Anne	ing (open)
Sample No. and Type or ROG	DEF SEE	Slowe/ e'or ROD (%)	Sample Recovery / Sample Langth	(Depth/Ft.) Oil Screened internel	Soll Density Consistency of Rock Hardnass		Material Classification	∪ 00 C 00 +	Hemarks	Semple	ZB/(F)dG/FB	大大 大大 大大 大大 大大 大大 大大 大大 大大 大 大 大 大 大 大	Diller 62**
ና - ι 0905		3 3	1/2		loose	brown		SM	2 st. sil	0			
	2	6 7					fire cand . come med . cand . (Jill)	ŞΜ	данр	0			<u> </u>
	_						(J:11)				Ц		
L			 						<u> </u>		Ц		
<u>ζ-λ</u>	5	26						_ :	rao a la Blaca		H		
0200		4.5 8.3	53	& & & & & & & & & & & & & & & & & & &	Loose	1:30+ 40	gravel, pebbles, coubles	CP	refusal after 1st form	0	Н	\vdash	
├	7.					avey	2.mci , be may , (2004)	<u> </u>	damp to dry	-	Н	\vdash	
-			<u> </u>	1		-	<u> </u>		1		\vdash	┝┥	- -
<u> </u>	10			i		-		-		-	H	i-	
5-3 0944		41 83	1	9.35 3.55	louse	bra	copples peliples and	GP	dame	D	<u>.</u>	H	
77.	12	3344		~ <u>@</u> ~\$*-		Liena and	cobbles, pelibles, grant and coard fine sand , the	Gρ		0		П	
						9.47]			
				'								Ц	
	15									<u> </u>	; - 1	Ц	
6000 2- 4-		15/5	1/2	000	luose	tan to	gravel and sand	42	· moist	Ø.		L	
	17	23	ļ			1447.4	camp petities	હ		Ø		Ц	
						brown				\vdash		Н	<u> </u>
-												H	
3:5	70	8 7	36	· Parties	inner	ljajek	can l	5n		7	H	H	Н
1012	ક્રસ્	9 %				6100-1	med sand	ζμ 3π	wet	0		H	H
			 	47 M . 4.2				\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \		<u>بس</u>	H	Ħ	H
										+	H	"	
	λ5							1			П		:
		-							· · · · · · · · · · · · · · · · · · ·		_	_	_

	,,,,										
* When it ** Include Hemai	e monite	•	ց և 6				kicrease 2 '	s reading In	couchey it clavated reponse re-	ad. Drilling: Aires Background (p p://k	<u> </u>
Conve	rted 1	to We	Iİ:	Ye	S	х		No	Well I.O.	#: 3MW15I	



		NAM		NSE			n, CT Site 3	BORING N	o.:	3MW1:				
		NUM			CTO 0			DATE:	- T-	4/27/06-	5,	<u>/2.</u> _	10	6
		COM	PANY:				g Contractors	GEOLOGIS	5()	Colin Doc				
OHIL	SMIT.	RIG:		1\0			Or ill	DRILLER:		S. Romsa	<u>e !!</u>	_	=	
Semple No. and Type or HOD	Depth (FL) or Hun Ma.	Blows/ B* or ROO (%)	Sample Recovery f Sample Langth	Lithology Change (DepthY-t.) or Screened Interval			RIAL DESCRIPT		3000.	Remarks		ない。	300 S	ु राज्याक हर
5-6 1025		5/7	35	270	لههجو	ligat brown		<u>ئ.</u>	SM	mořst	٥	П	·	
102.7	27	9/	~ ~		(BV 3C	0.00.1	well see	14 th	SΜ	10121	6	┌╼┧		一
	- -	7/13	 	3 1 10	 -		<u>-</u>		711	···-	.~		-	H
)					·	ļ			_			$\vdash \mid$		\sqcup
		<u>/,</u>												Ŀ
	30			ا م د ا		j								
S- 7 1035		47	3/2	30.5	loose	brown	coarse can	of Breit	S۲	saturated	٥			П
	32	7/9	<u> </u>		wer your	t	Fine sound		SM	1/	0			Г
_					, , , , , , , , , , , , , , , , , , ,				_	water table: 305		П	7	į i
-							 -	•			—	-1		Н
	70			.					_		_	H	-	
<u> २- ४</u>	<u> 35</u>	67	2/2		1 -(2							—ļ		_
5-8 1160		Z,	/2		Looke net door	100000	very fine	sand	۶Ħ	saturated	0	├ {		
	<u>37</u>	12/13	L	8.73		₩.			24	•	O]	Ш
	_		<u> </u>	j :			<u> </u>			l.				
					i	1					.—			
	40]			· · · · · ·	··						
3-9	-	4	3~		ned	brewn	Jim to u	fine cand	ςn		0		一	
1110	<u>ት</u> ጌ	73 /	<u> </u>		Atrict	Ţ	fine to v.	1	5 m		0	┝	\dashv	\vdash
	1 %	16				١Ť			<u>, u</u>		Ě	\vdash	\dashv	
_		/	<u> </u>			<u> </u>			_			\sqcup		Ш
		_	<u> </u>				· · · · · · · · · · · · · · ·		_		_	\Box	i	Ш
	45]	
5-10 U30		1/3	3/3	· , · - 1	med . deuse	معودم	read fine con	ad with	3		0			Ė
	47	13/17				£	3000C C11+		5 _M		0	\Box		П
												口	_	\vdash
-							· -		_			H	\dashv	\vdash
	_										_ !	\dashv	\dashv	Н
	<u>56</u>		<u></u>	لـــــا								i		Ш
		-	er noedk bero ka in fa taar) boyehola. +	nC/0:r:-	reading frequency it el	evaled reconse o	cad.	Drillin	a Ai	rea		
Rem.		.,,								Background	•		_ ¢)
Conv	erted	to We	네 .	Yes	Х		No	Well I.C), #:	3MW19	5 I			

			NAM		NSi			n, CT Site 3		lo.:	3MW		==:		_
			F NUMI COM		New	CTO 0		g Contractors	DATE: GEOLOGI	SŤ:	나/37/0 (Colin Do	olar.	<u>>/2</u>	<u> 10</u>	<u>-</u>
			RIG:	7.11		obite		Dritt	DHILLER:		S. Rames			· ·	
			1	Γ -				RIAL DESCR	IPTION	Τ.		PHOFE	_	deng [J	ppm)
	Sample No. and Type or AGO	Depth (Fig. 8)	Blows/ Er or AGD (%)	Sample Recovery Sample Langth	Lithology Change (Depth/Fi.) or Screened Interval	Soil Germity/ Consistency or Rock, Hardross	· -		Clossification	u s c s ·	Remarks	Sample	Sempletia2	(Bovenole	
	5-11 1151		8 9	1.5/5	2.50	med dense	brom	Fine s.	nd	KH.	saturated	0	П		
		5 ર	13/14	~~				ν έ ξε ζε	n eed	ςħ	 	0			
		55								-		-			
	ร-เฉ เมเอ		7/6	1.5/5	4(17)	med	biont	fine to v	fine sand	ςn	1	0			\vdash
4/27/06		_	10/11			1743-11		w/ 5000	. 54.14	۶h		0	П		
5/2/06					}										
:				<u> </u>					- · · · ·						
	5-13	ಟ	11-	\ <u></u> -		ļ		·		╙	<u> </u>				<u> </u>
	4		29	1.5/2	C1-5	D <u>E%#</u>	o _K ₩	SILTY F S		SM		ما		-	
	1030	62	233	-		V. DENSE	e5™	FINE IME	GEANEL	SW	WET - SUB ANG GRAVEL 3/14	10			_
	\vdash				1					-	MAX SIZE	╁╾	Н	\dashv	
	5~H	65								-	· · · · · ·	† -	H		
	1125	660	24 2000	8/1		DENSE	PE _{3,3}	SHITY FINE	IMEO SAND	δW	WET-COULD	0	П		
					ETM				l and K frags			0			
					66	<u> </u>			· 	<u> </u>	AUGER REFUSA C. SOS I	1			
										-	<u></u>	igaplus	\square	\dashv	
						 _				-		╀	\vdash		
				·- ·					<u>55.5-65.5</u>	1	1 742 6	╁╌	\vdash		
						<u> </u>		SAND CHIPS	5466 52-54		YZ BAG CHIPS	╁╌	Н	\dashv	
									<u></u>		6 BAGS TOTAL	十			
				_											
			oring, ento ilos readin			o bosetola. V	ncrease	reading frequency	il elevaled reponsu	road,	Drilli	ng A	rea		
		arks:	0	SED SED		42 20					Background			Ğ	<u>. </u>
	Conv	rerted	to We		Yes	Х		No	Well I.	D. #:	3 <u>MW</u> 1	5 			

Page 1 of 2

PROJECT NAME: PROJECT NUMBER: DRILLING COMPANY New England Boring Contractors New England Bo
DRILLING COMPANY: DRILLING RIG: New England Boring Contractors GEOLOGIST: DRILLER: S. Rows&1 New England Boring Contractors DRILLER: S. Rows&1 New England Boring Contr
DRILLING RIG: Mobile 859 Drill DRILLER: S. Agessald Sample (PL) 6' or RCD (N) Sample (Depth I) Soil Benishing (Depth I)
Sample (N.) Blows / Sample (N.) Brows / Sample (Deployer) Soil Benship of Screening (
Sample (R.) (R.) (R.) (R.) (R.) (R.) (R.) (R.)
Manual Charge and Property of the Control of the Co
Type of Run (N) Sample (Constraint) Sology (Co
Sce boring log 3MW IS I S For lithology Description
Sce boring log 3MW IS I S For lithology Description
Sce boring log 3MW IS I S For lithology Description
See boring log 3MW ISI S Abr (ithology Acscriptson
S for lithology descriptson
descriptson 10
15
15
15
▎▐▗▐▗ ▎ ┠ ╸╵┃╽ ╸ ╸╶┈┤╏╸╶┈┼╏
20
┠ ╶╏╶┝ ╱┩╸ ┝╍╸┧╶╏ ╌╌ ╸╸┤═╏╸╸┄╼╌╢╸ ╂┼┼╂
*When mot engine and reck brokens
* When rack coring, enter rock brokeness.
* When rock coring, enter rock brokeness. "Include monitor reading in 6 tool intervals to borehole. Increase reading frequency it devated reponse read. Drilling Area.



		NAME		NS			n, CT Site 3	BORING N	lo.:		MW15S			
		NUM		- Marie	CTOO		g Contractors	DATE: GEOLOGIS	эт	<u> </u>	7/06 n Doolan	<u>.</u>		
		COMI RIG:	PANT:			859		DRILLER:	··· —		lamsde			
DAIL	LING	nio.		1 1 4 1 5						2. 1			=	<u> </u>
Sample No. and Type of ROD	(Ft.) Or	Blows / 6" or RDO (%)	Sample Recovery I Sample Length	Lithology Change (OsphyFL). or Screened Interval	Soil Density Constitution Constitution Social Hardress	Color	RIAL DESCRII	FION	U S C S ·	Remarks			1	20 mm
L						ļ	<u></u>					Ц		
	L.,		<u> </u>		L		see b	or ina						
							loq					П	٦	
				1 1		-	see b log 3NW	īsī				П	\neg	_
\vdash	30		<u> </u>										T	_
							desi	ithology cription	\vdash			П	\sqcap	
—	-		 	1 18		Ι "			<u> </u>			Ħ	7	
	-			1 11								П	H	
	 	[~		1 12		<u> </u>			 		~ 	Н	H	
	35					 - -						Ħ	叶	
	1			1 13					Ħ		- -	H	M	<u> </u>
_				1 12		-			1 1	- ···		H	H	
<u> </u>	-		 								 -	H	[+	_
	39		 				4 1 1	1	╆			H	┝┥	_
\vdash	-27		 -	<u> </u>	 		70191	depth:			-+	Н	Н	\dashv
\vdash	\vdash	1	 	{		├┈			╀			Н	Н	ᆔ
<u> </u>				ł				6 - 29 1	╂┄╂╾			Н	H	
<u> </u>				ł		├-	Screen: 2	6'-39'	╁			┨┤	-	\dashv
}—	 			ł		 	Screen .	.0 - 30	}_			┼╌┇	+	-
			ļ	{	<u> </u>	├ ─			╁╾╁╶	 -	 -	┼┦	H	<u></u>
<u> </u>	_	4	 	ł	<u> </u>	 -			₩			╀┦	lacksquare	
<u> </u>	<u> </u>		 	.	ļ)	<u> </u>		- -			1.		
<u> </u>	<u> </u>		<u> </u>	ļ	<u></u>	ļ <u>-</u>		 	 	· · · · · · · · · · · · · · · · · · ·		 _ 		i
<u> </u>	ļ	/	ļ	1		<u> </u>			$\perp \perp$			<u> </u>		
		\angle	<u> </u>		<u> </u>	<u> </u>	 		<u> </u>		!_		Ц	
<u></u>	<u></u>		<u>1</u>	<u> </u>	ļ		<u> </u>	<u> </u>		<u>. </u>	<u> </u>		Ц	
** Inca					Ø borehole.	Increase	a reading hequency i	f elevated reponse	read.	Backg	Orilling A round (pp			
Con	verte	to We	=11:	Yes	X		No	Well I.	D. #:	3	MW15S			



Sample Depth Blows / Sample Cithology Change and or 900 / Sample Cansistency Consistency C	Reading ((ppm)
DRILLING RIG: Mobile BS9 DY:\\ DRILLER: Cancele\	- (A)	
Sample Depth Blows / Sample Change (FL) 6" or Recovery Change (Depth/FL) or Consistency Or Run (X) Sample Length or Consistency Or Run (X) Sample Length Rock Hardness (Depth/FL) Or Consistency Or Consi	- (A)	
Sample Depth Blows / Sample Cithology Change and or Roo / Sample (Depth/FL) or Consistency	- (A)	
THE TELL TO SEE THE POOR PROPERTY CLASSICALISM 2 PL FILL D	-	1
1410 to 2 1 looke brown organic clayer silt. SM 2 ft. fill 0 some sand, a few SM material 0		, ,
(Pill material)		\Box
	-	\square
5 arillar naticed arillar naticed arillar naticed		$ \cdot $
134 of James 134 quartz and fell-spar at the opening dense 134 quartz and fell-spar at the opening dense 134 dense 134 quartz and fell-spar at the opening dense 134 d	-	\Box
7 18 10 and cobbles weathered grante of	- -	1-1
used eally augers		\Box
Cefusal at 9 C' to 10' to avoid		
19/06 10 Competent bedrock dammagny augusts		
	\top	Ħ
1/21/06 Course grabed cosing granite greats to 14'	•	
	Ţ	
/ai/06 *x		
/24/06 15		
core × Pint Coarse arained		
1300 × x granter graits Salta		
x such some bands of few fractures		
* The grained	_ 	
a few monor fractions		
core X Course apained		
1345 X X granitic gness		
X		
Some tonds of		
as × ^		
"When rock cosing, enter rock brokeness. "Include monitor reading in 5 tool intervals & burehole. Increase reading frequency if elevated reponse read. Bernarks: 4 4 10 augers 2 split spee is 5 Eackground (pp.)		5
Converted to Well: Yes X No Well I.D. #; 3MW16D		_



_	_	NAM		NSE	3 New Lo	ondo	n, CT Site 3	_BORING N	o.:	3MW16				_
		NUMI		NI	CTO			¯DATE: −GEQLOGIS	ъ.	4 / 19 / 06 — Catin Doc	<u>4.</u>	<u>Z3</u>	47	0
	LING LING	COMP RIG:	PAINT;				g Contractors Orith	_GEOLOGIS _DRILLEA:		S Roms	nan 1 Ju			_
, m		-			<u> </u>		RIAL DESCRIP			 	ያን ይደ የውፑዚ			<u> </u>
Semple No. end Type or Rigo	(fc)	Blows / ST or HOO (%)	Sample Recovery / Sample Length	Limology Change (Dephnoit) or Screened Interval	Soil Density Consistency or Rock Haidness	Color			0000.	Remarks		Sample: 62	آ	Ë
Core	3.7					KAK	geanitic qu	41.5	· - ·	C A .	" 		-	-
1430	- -		<u> </u>			to grey	coorse to	1		few fractures		}	}	
		_				and black	bunded) dimd			\vdash	_}	_{	
_		/	<u> </u>			9146A					Ш			
									<u> </u>		Ш			_
<u>L</u>	30:											Щ	_{	1
، بو با						Luck,	COACSE SE	ined					\neg	-
1525							livie during	c gresss	_	few Fractures	П			
						grey	fine assist	4 0141			П	寸		_
						1	fine quaine	re 1=		from box hale			Ť	
	35				• • •	فادراح	granitic	greis		recovered 1 A		7	┪	_
Cot e						0.4	120.1	1.4-		Static water	\vdash	1		_
0930	├─┤	-			· · · · ·	4,-1	light and			level at wist		╌╁	-	-
-	 	-				() lack		an/fix		Gas	┟┈┥			-
-		ر	 -				greits		_			\dashv	\dashv	_
 								<u>-</u>	·	two minus		\dashv	\dashv	_
ļ,	40									J**********	Ш	\dashv	_	_
6						Heck	light and	dart						
юю	_ 1			·		950)	banded	grawhiz		multiple				
						يها شاهد	See See	5		procheres				
						_			<u> </u>		j	П	コ	_
ļ	45			1							П	寸		_
(018 7.	14			i :					_	<u> </u>		_	ᆐ	
1100					- -	Pint.		n	<u> </u>					Γ
		ر				<u></u>	grained .	me.		no flortures	\vdash	-		
<u> </u>			<u> </u>	'		to orey	J. W. Call	grandfic _	_		$\vdash \vdash$	 -}		_
\vdash		/				' /	guti	·	_		$\vdash \vdash$			_
L	50		Ĺ			L				<u> </u>	Ш	Щ		_
" kidu		tor roadir	er rock bro		borehole, I	nciease	reading frequency if	ulevated reponse n	ead.	Drillin Background			_ <u>.</u>	÷-
Cons	rorted	to We	.II·	Yes	x		No	Well I.C	ff.	3MW16	<u></u>			_



			NAMI		NSE			n, CT Site 3 BORING N	o.: ˌ	3MW16				
				BER: PANY:	Now	CTO 0	38, G	00083 DATE: g Contractors GEOLOGIS	т. Т	4/19/06 - Colin Doe	<u>바 /</u>	26	1	26
			RIG:	, AH+.	1164	Mobile	G	S9 D. (I DRILLER:	'' .	S. Ramed				_
		Γ-					l	RIAL DESCRIPTION	<u> </u>		OVE	Res) وطار	ppm,
. :	Sample No. and Type or ROO	(FL)	Blows / 6" or RGD (%)	Sample Recovery Sample Length	Labology Change (Depth/Ft.) or Screened Interval	Soil Density Consistency or Rock Hardness	Color		⊃ ∞ ∪ ∞ ⋅	Remarks	Sample	Management of the second	Borehole"	Driller BZ*
	<u> </u>	50		<u> </u>				<u> </u>			. 🖑			
	8		_				P + N	J		some				· -
'	1340	<u> </u>	\angle				يدينر صبط	and fine graphed		fractures				_
i		<u> </u>				:	37	Growing ANTIZE				_		
i				l		<u> </u>								į
15/d		55					,							
4/0i	(ort					_	()k	coarse grained						Γ
	c&4c						75	coarse grained granitic grafss		Fractured		\sqcap		
:	-						وسوي	dark fre graned.		- //		\Box		
								bunding						
	\vdash	60			ħ							\Box		_
	E) (P					-	رد ان محم			 		一	一	
	10 09 49	 -		-	a creation	 -	and black	coarse grained		for Eachier		\vdash		_
	ļ				B	 -	<u>come</u> pink			few fractures		┍╌╂	<u> </u>	-
	├	 -			1		_					\vdash	\dashv	\vdash
	ļ	15			1	<u> </u>	١				-			<u> </u> -
i	Соте	65		 	1	 -	-1.2-		\dashv	<u> </u>		 		<u></u>
i	ម្រ	<u> </u>	/		Й	<u> </u>	4-0-1	coarse to Ane grained grantic	_	···		\dashv	\dashv	-
i	יירטו	<u> </u>	_	<u> </u>		ļ	~~	grained gravitic		some fractures		_		_
		<u> </u>	_		l II	<u> </u>	binck:	gretss]	Ш	L
	<u>'</u>	69						total depth: 69	_			╚	Ш	
	[į	:					<u> </u>		Ш		
					•			sand: 57'-69'			[]			
								sand: 57'-69' screen: 99'-69'				П		
								<u> </u>		-		П		
		-								<u> </u>		口		Γ
. !	\vdash	-	17			 -	_				H	\sqcap		_
;			_	er rock bro og in 6 Joo		boretvola. 1	noreașo	reading frequency if elevated reponse in		Drillin	لينا اg A	rea		
		arks:		· -	· · · · · ·		<u></u>			Background			C)
	Con	renten	to We	di.	Yes	×		No Well I	#.	3MW16	in .			—-

T	Fetra Tech NUS, Inc.
---	----------------------

			NAME		NS	88			n, CT Sile 3	BORING N	lo.:	3MW16	is />	• 7		
			NUMI COM		Men	_e F	CTO 0		g Contractors	DATE: GEOLOGI	ST.	4/21/06 - 4 Colin Doc	olan	4/(<u> </u>	
			RIG:	A111.		_			- POW	DRILLER:	٠	S. Rang				_
	3		1			7			RIAL DESCRIP		ı i		HOVETIC		tiner to	esen'i
	Sample No. and Type or ROO	(F(.)	Skyws.) 6" or RQD (%)	Sample Recovery / Sample Langeh	Change Change (DeplayFt or Screened Interval	1 54 4	oir Densityi onalstaniy	Color			ນ ຮ ເຮ	Remarks	Semple	, t	Borihate	.: *
	Щ	0		<u> </u>	ļ.,.,.	4-		<u> </u>			Щ		ं		_4	်ျ
				<u> </u>		. []	oose	Drown	organic Maye	H12 4	SM	2 F4 P.11		Ш		
'						L			Fill mas	<u>cial</u>	5٣	maierial			1	
					$ \cdot $				a pew c							
								_						\Box	\neg	
		ζ			D D	ğΓ						· <u> </u>		\Box	コ	
		· ′				įξ	lense	light	greats and	feidepar		weathered			一	
	~ - -			I		∵) I		40 4.ex	and copples	wy sand		granite	1	1		
					138	∮		tan_		· · · · · · · · · · · · · · · · · · ·	\vdash					
				├		<u>5</u> -			refusal at	8.5	╌┨		H	 - 	[
			-		↓ k	\vdash			competent	Pegrack.	 	- · - ·				
		10	-		[] }	┝			<u> </u>		 		\vdash	╢		-
			4	-		-					-	cosing to	H		{	
			4		_×	<u>ا</u> ۔					-	13'		<u> </u>	\dashv	
4/21/06			\angle	<u> </u>	[k	L									_	
4/26/06		14			×						L				\Box	
	<u> 31</u>					L		posts great	granitic co	neiss Imenanini] _					
ı	1350				У	Γ		black	·	 	,	large verticle	П	П	乛	
					×	7					1	fracture w/				
					× A	\perp		_			\Box	Pare divini	H	_		
					*	+				<u> </u>			H	一	1	
	₹ore.	19	<i>,</i>		×	+		black			-		\square	┌╼╏	ᅱ	$\overline{}$
	2. 400		$\overline{}$		ιи.	ŀ		to	Ane gras					! - {	-	긤
	1100		<u>/</u> _,	<u> </u>	×	┡		grey/ white	granitic		 	few fractures				
			رک		×	L		بـــر بينز		se grained					ļ	_
			,		,	χL			biolise vic	ь 		 .	Ш			
	_	24			×Ω			_	<u> </u>							
						•			-				-	1		
. '				er rock bro								D .100				
			itor reaction		10	au,	gers	X2005F	reading frequency it a	Spoars.	ead.	Drillin Background			O	
				0-5-0	95	(0)		<u></u>	(8,19:)	<u> </u>						_
	Conv	rerted	to We	ell:	Yes	_	_X		No	Well I.E). #:	3MW16	;S			



Converted to Well:

Yes

Χ

No

_	_	,															
PROJECT NAME:				NSB New London, CT Site 3 BORING No.:							3 MW165						
PROJECT NUMBER:			CTO 038, G00083 DATE:							4/21/08 - 4/26/06							
DRILLING COMPANY:										Colin Doolan							
DRILLING RIG:			Mobile 859 Drill DRILLER:							S. Ramidell							
		1 1 1		1									_		=		
F	Depth	B101		h:-h	<u> </u>	MATE	HIAL DESCRIPTION	ÜN	١ ا			PHOAFIC	PANEL CONTRACTOR	ing (p	~~		
Sample No.	(Ft.)	Blows /	Sample Recovery	Lithology Changa	ļ. · ¨				ũ			9	[:.5]	. 1			
und .	~	ADO	. /		Soil Density/ Consistency	l .			S	_		4:	监	•	ŧΙ		
RQD	Run No.	(74)	Sample Length	5cmened		Colo	Material Classif	cation	s	Re	marks	Semple		2	7		
,				Interval	Rock	4 ,,,	[·		•			8	Baseldme's	Borehole	ŧ.		
	_ኢ ኍ				Handrate	l	The state of			i		, **	8		•		
	^4						25 50 50 5	<u> </u>			·····		-20	_{1}	4		
Core	.		,	ly∦i	!		V .CO 44 10.	marca	!	Few	fractures		1 1	- {	- 1		
1550				1 2	<u> </u>		i e	· 1			,		1		コ		
				× N	├─-	├	gravitic o	3145127				Н		-+	\dashv		
		\leq		* 18*	<u> </u>	<u> </u>	with some	, !		<u> </u>	<u> </u>		LL	_1			
	28			×	{	}	Sinc grama	a	_					l	1		
				 							1 11 2 2 6 1	-	 		ᅥ		
		4		· .	<u> </u>	ļ				Total	dopth: 28'	Щ.	Ш	4	_[
					!										}		
				1		}	sand: 15	- 28 1				I^-	П	7			
				ĺ	 		Screen: 17	- 37				┢		_	ᅦ		
			 	ł		-	Screen. "			. —		-	┝╾┤		\dashv		
			<u> </u>	ļ	ļ <u> </u>				_			_	$ _ $	_}	4		
			!]	<u> </u>					<u>. </u>			·		╝		
				ł	[l			_						- 1		
				1		-				•	·		П	\exists	П		
			-	(· ·						-	Н	-+	ᅥ		
		ر۔۔			ļ <u>.</u>	 							- 1	<u> </u>	닉		
 _		۷,		·						_					_		
	l i				ı								}		1		
		7											H	コ	乛		
- -					 	 							 	+	1		
		۷_,			 -	<u> </u>							$\vdash \dashv$		[
<u> </u>					_								_	_]	_]		
											·			T	_]		
	H			,	-				\dashv					寸	一		
												┝╌┤	$\vdash \dashv$	\dashv	긕		
		_		į		<u> </u>						<u> </u>					
1	,				}								1	1			
		$\overline{}$!			{								\neg	\neg		
			-									H		十	ᅦ		
		\hookrightarrow			-								┝╼	\dashv	一		
						Ĺ		<u></u> j				Ĺ	Ш		Ш		
	de moni		v rock bro g in 6 look		# borebole. I	ncrease	reading frequency if elev	aled reponse re	ad.	Ę	Drillin Background	ig Ai (pin	rea m):[ō			
											•		_		_		

Well I.D. #: 3 MV-165

BORING LOG 2D MW 165

PROJECT: IR STUDY NSS - M.ON
PROJECT NO: 1758-10
LOCATION: AREA A DOWNSTREAM
DATE STARTED: 09/18/80
OATA COMPLETED: 09/18/90
DRILLING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC
ORTLLER: JOE RAAB
ORTLLING METHOD: HOLLOW STEM AUGER
SAMPLING METHOD: SPLIT SPOON

Ċ.

 \leftarrow

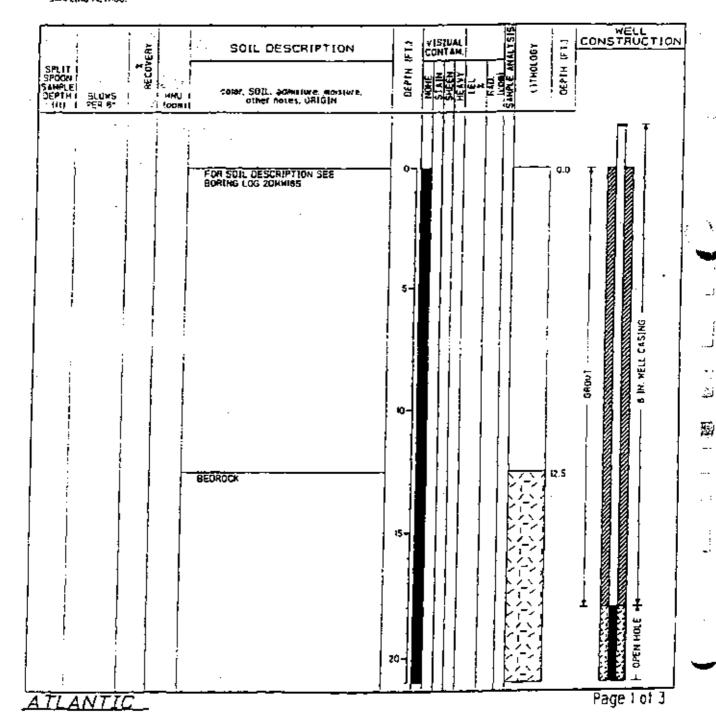
GROUND ELEVATION: 35.6
PROTECTIVE CASING ELEVATION: 38.08
MELL ELEVATION: 77.85
MATER LEVEL: 34.30 (03/21/91)
DATUM: SUBASE
WEATHER: 80", CLEAR SKIES, VERT WINDY
INSPECTOR: LITHN METCALF AND ERIK NESS
CNECKED 67: ERIK NESS

SPLIT I SPOON I SAMPLEI DEPTH I	BLOW5	RECOVERY	MNU (DDM)	SOIL DESCRIPTION color, SOIL admitture, worsture, other noies, 08[GIN	DEPTH JFT.1	AONE STATE	NO NO NO NO NO NO NO NO NO NO NO NO NO N	1 <u>1</u> 1	KATU.	SAMPLE ANALYSIS	DEPTH IFT.)	CON	VSTR	L UCT (O)
0-2 2-4 6-8 6-8 12-14	57 10 d 6 9 10 ll 100/5 26 30 13 7 6 20 31 45	50 30 50 60	0.2 0.4 0.2 0.2	Dark brown, hine SAND and SILT, trace roots, moist. TOP SOIL Brown, medium to coarse SAND and GRAYEL, trace set, moist. Brown, time to medium SAND and GRAYEL, trace set, well. AUGER REFUSAL AT 13,5 teet.	S-			0	40 50 60		6.0	F 001 St011E0 PVC		BENTONITE CAOUT
 TLA	NTI				20-					<u>-</u> .	<u> </u>	P	age i	 of 1

BORING LOG 2D MW 16D

PROJECT: IN STUDY NSB - MEON
PROJECT NOT 1215-10
COCATION: AREA & COMNSTREAM
CATE STARTED: 09/13/80
DATA COMPLETED: 09/13/80
CAILLING CONTRACTOR: ENVIRE SOILS INVESTIGATIONS. INC
CRILLER: CRAID CORNER
CRILLING METMOD: "AIR ADTART
SAMPLING METMOD:

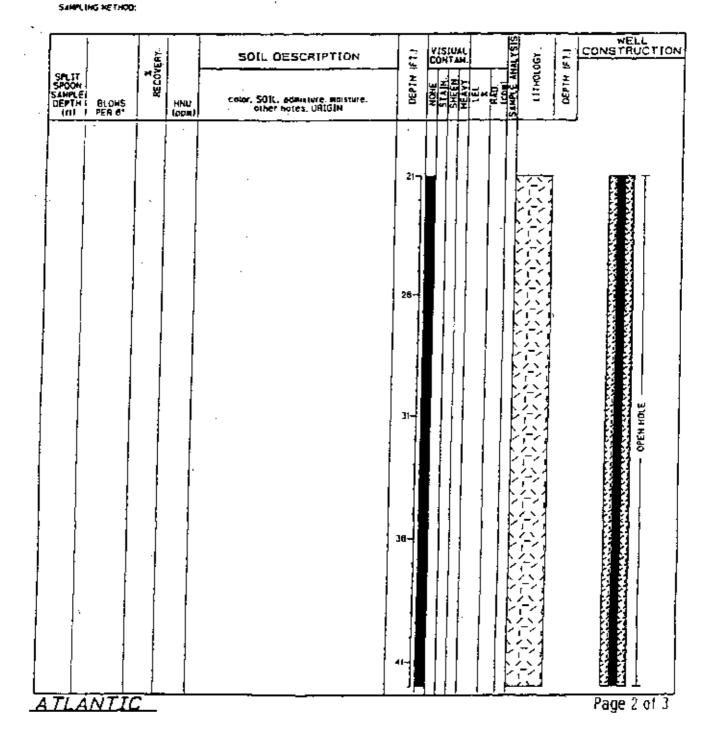
SROUND ELEVATION 35.9
PROTECTIVE CASING ELEVATION: 17.69
WELL ELEVATION: 37.69
WATER LEVEL: 374 (03/20/90
OATING SUBASE
MEATHER: 50-60', CLEAR SKIES
INSPECTOR: ARMIER MOSSAIN AND LYNN METCALF
CHECKEO 87: ERIN MESS



BORING LOG 2D MW 16D

PROJECT: IR STUDY NSB — NION
PROJECT NO: 1256-10
LOCATION: AREA A COMMISTREAM
DATE STARTED: OBVISION
DATA COMPLETED: OBVISION
DRILLING CONTRACTOR: EMPTRE SOILS INVESTIGATIONS. INC
ORILLING HETHOD: ARR ROTARY

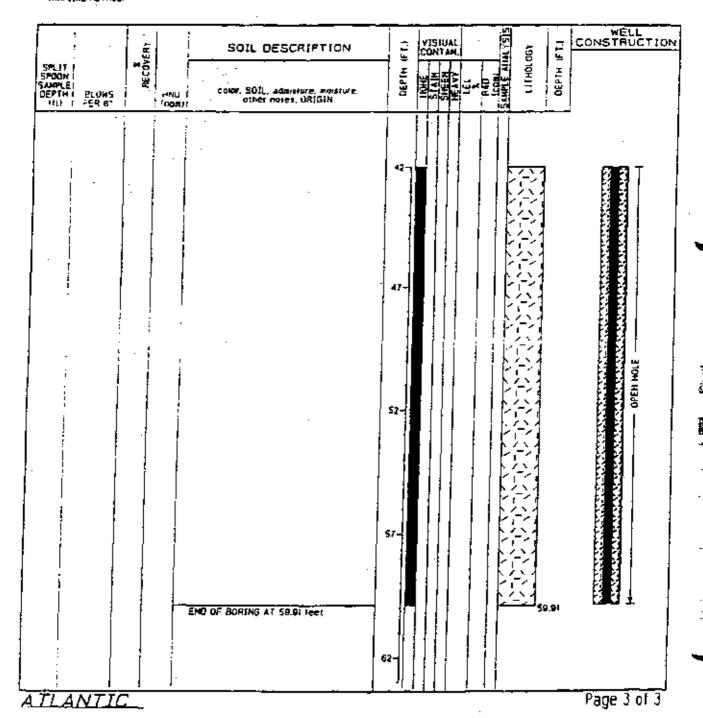
DADUND ELEVATION: J5.9
PROTECTIVE CASING ELEVATION: 37.69
WELL ELEVATION: J7.69
WATER LEYEL: 3.74 (G3/ZI/9)
DATUN: SUBASE
MEATHER: 50-60°, CLEAR SKIESINSPECTOR: AKMIER HOSSAIN AND LYNN METCALF
CHEDKED BT: ERIK NESS



BORING LOG 2D MW 16D

PROJECT: IR STUDY NS8-ALON
PROJECT NO: 1256-IG
JUGATION: 4256-IG
JUGATION: 4264-A COMMSTREAM
DATE STARTED: 08/13/90
DATA COMPLETED: 08/13/90
DRILLING CONTRACTOR: EMPTRE SOILS INVESTIGATIONS, INC
DRILLER: CRAID COMPA
DRILLING METHOD: 4/8 ROTARY
SAMPLING METHOD:

SROUND ELEVATION: 15.8
PROTECTIVE CASING ELEVATION: 17.69
MELL ELEVATION: 37.89
MATER LEVEL: 174 103/20911
DATON: SUBASE
MEATHER: 50-80". CLEAR SKIES
INSPECTOR: AKMIER MOSSAIN AND LYMN METCALF
CHECKED BY: ERIK NESS



80	ORING	LOG	: 	· 						HA	LLIBURTON NUS
PRO:	ECT NO	<u> </u>	8- NL 959	4)1-30-43 OLOG/ST: _		DRILLER	E.	25MW 295 ST COAST THOMAS/ REETT SWIATER
4			litions)								
		maws.	1			MATERIAL DESCRIPTION*				ROKK SA	
IAMELI III. A Presi O.R. RQO	PLI BUT RUM MCL	400 154	Cheelin Sympton Cheelin Sympton	Ignisary) Crimies	OPPLY	. 604.04		MATERIAL SSIFICATIO)N	est vici	REMARKS (HASIL)
5 E	0.0 2.0	M N	2.0/2.0	1	N. Deuto	Ben	SANO		GRAVEL	5~2	May \$ 6.15" (\$ pp.)
5-2	2.0	7	°7.	1	A.Derse	BRN	Sirah ?	M-0 m/	GRAVEL	2M	MOIST (Oppn)
5-3	4.0		14/2.0	├	غاصل	TAN	Samo		Fire-	50	MOIST COPEN
	[تموا	- 5	ľ								Fine, for the Gruded
P-2	8.0		113/10	6.0° CH	೯೬೪ಕ	2V27	<u> </u>	H) TR	COUSTS	SP.	WET (OPPA)
5-5		3	١٠٠٠)		Maries	PAST"	SAND			92	SATURATED (OPPM)
ي- ي	10.0	_4	13.0		M. brosc	Tay	OHAZ			50	Fine, Avorty Commed
	12.0	┈┶┥						<u> </u>			Five, Poorly Graded
S-7	14.0		2.0	· [4] [DENTE	56.2	· · · · · · · · · · · · · · · · · · ·	ļ. 		20	
S- &		8	1.3		M. Resc					26	
1445[60	<u></u>		<u> Fi6.4</u>				<u> </u>			
$\overline{-}$				-			la real			_	500500 (111
				ţ			45A to	16 '			SCREEN 6'-16'
			·	F		-	8 Sam				PELLETS 3'-5'
	_			E			TOTAL DE	1 HT9:	٠,	1	
			=	F							
REMARI	<u>—</u> Г	CME	75	HSA	Ric I						
		474"	10	AUGE	f	(140	# w+ _	70" Do	06)	-	BORING 20 MW 29 S
* See to	rgena or	8002	- 10	24 W	1 F L-46	. 13º	~ ,~ ,	30. Dic	<u>~_</u> ₹ _^	_	PAGE_1_OF_1

PROJ	ECT:	NS	8- NL	<u>.0N</u>					714W55
							3-8-94 DAI OLOGIST: Tim Evan		ST COAST THOMAS
			A :		FI	ELD GE	OLOGIST:	``	1144 0840
			litrons) _			<u> </u>			
	 -		_			150	TERIAL DESCRIPTION*	Acce	
	04774	BOWL	STATE OF	LITHOLOGY	ļ	1 111	ENAC DESCRIPTION]
⊶•	#kJ	47 det	elcovies.	Ometi	0000	}	MATERIAL	~	BEN 4 . 4 . 5 -
OK.	RUN	154	- CHARTON	Property .	OF HOLD	COLOR	CLASSIRCATION	uncs	
RQD	0.2 0.0 NO			77777	-	├─	Aspt 1 t		4D45 "5 Qer"
5-1		22	1.07	_ y 。	De NSP	Te-	Silly Sand with Co	<u> </u>	MATO C G F
17.0 17.0	2.0	22 /3-	V.5/0.8	- 6	Vernic		1	"	Mout 2' Cus
1348		3 ≰ t0	1.4/2.0	1	Milleric			_11	
	0.7 2.2	- 11				+	+	1	
SaH	34W -	1	1.7/2.0	1-	M.Denje	Tan	Silly Sand w/ Tr Goo	- 1 C.	56.
1415		73	12.0	•	CALLE FOR	1	Of 11th Devices (MILLIA, CARE	-E 1 3M	Fer Esmin Israelised
5-5	لعك	7 14	10/	* ±				 	-
85.			1.9/		<u>Dense</u>			!	
_ [] {	6.0	<u>Z1</u>				•	→	1 \$ 1	<u> </u>
5-6	}	13 26	17/2		V. Dense	D. Gra	Silly Sand & Garrel Co	رودا واماه	Maise
441	0.0	• •		e			1	1	4.341#£
S-2	0.0	<u> </u>	0.67	0 -			· · · · · · · · · · · · · · · · · · ·	- []	
400	11.0	100	71.0	o	V Devoe	D. Kra	_	 * 	tedy Wicarrows
12	2,3		0.1/0.0	ine ju			· · · · · · · · · · · · · · · · · · ·	1 1	Anger Return to 12
506									Т
- 1	 		I F	14 = [į		a-	CATE BOOK blocked in
5/ 31	0	-7-	1.5/5.0	ַן <u> </u>	Harrid (3	Gneiss	\top	HI & AMP (TISE.
			1	<u> </u>					Lubs. Karandad
\neg	╁	_	1	- F -			 ·		Blaking Eractured
7.0	┷┰	-	-^	티					
		#		Ĺ			-Total Depte 17"	-	3/14 Spin Casing tom?
	<u> </u>			L			·	_] .]	4,00 moch 4.35 as
	-		ì					7 1	3/15 @ 0622 2. 1 GS Rollerbit to 191
						$\neg \neg$			SAN CACINGHORS
─†-	- 			┢			S		Schooler
-+		- -		⊢			Screec 7'- 17'	-	10' - 3 "PYE (Schoolder
╌╂				⊢			Saud 6-17'	-}-}	- 100" Sam Same
				L			Pelletz 25-6		1 58 " Kine
- 1	_ -			ĺ		ļ			
	. 1); a al .	-1-1.	7 5	. 1411	, o	A I B I Section		
:MARK	·	7/1 V	74"	46.± 0-26	<u>۱۳۵۳ - ۲</u>	Davi L	.g (Bumbadier M.	7 / জন্ম ে (BORING THWSS
		4% "	10 8	<u>۱۳۰۳</u>	Aun	<u>4</u>	* 140mm-1 (Fr. 1979)	<u></u>	·
* See Le	dava ou	4404	•			• •		_	PAGEOF
		1" 5	in Cesi	-					

RQIE	ECT NO).: <u> </u>		4			01.05/57: <u>Tarce R. Freed</u>	LER: <u>E</u> s	
			4:			i ETTI AS	000061; <u>7.228 R. 74209</u>	<u> </u>	
					5 OVER	1455	RAIN 45° 3-16-43	cient 4	9
		_						Flores.	1 ""
unu Ma Ma Ma Ma Ma Ma Ma Ma Ma Ma Ma Ma Ma	opper ext ext Rust u.o.	2 8 2 2 8 2	CAMPLE SAMPLE CAMPLE CAMPLE	angige Grandi Stant/U	STATE OF THE STATE	Π	MATERIAL CLASSIFICATION	est est lysics	REMARKS
							ALL ROCING LOG TOW	25	
						<u> </u>	FOR LITHOLOGY METANS		Act 64 6 4111 6
						<u> </u>	FROM 6.5 TO 15.0'	\bot	From 6.5. To 16.0'
						<u> </u>			
1	1-15					<u> </u>	<u> </u>		
						Posts.	Gerald Berrit Owett		while them molecus
							1 Star		n giga briant grambib
I									of water telyon a
\Box				N MEN					25
\prod_{i}	9.20					Bull-Side Side	Samuela Biorist Overs +		
						!	KSom		
·			· .						
						١			
⊥.				引開					
ار.	4.25	_				BLAC	626.69		
T									
\Box	-		1			_ :		[[
		\exists		6 T = 1	·				
	}	<u> </u>	1	1 #					
2	<u> ري</u> د ۽		1 S			Eldel.	Galliss		
		\dashv	1						
	F	\dashv	Ī	1 1					
	F	\dashv	1						
Т	Ŧ						V	77	
1	کو،		B	1 1		diles	GNEISS	$\neg \neg$	· · · · · · · · · · · · · · · · · · ·

LOR	ECT NO)	8- NI 959	<u> </u>			2-14-54 BORING 2-14-54 DRILLE OLOGIST: TP SEPAUSON	i NO.; L: <u>E</u> J	TMWSD AST COAST THOMAS
VAΠ	ER LEV	EL DAT	A:						
Oate	, Time	& Cond	izioni) ,	3-14-9	5 Out	11,045	Pord 450 2-16-55 CL	rep fi	450
щ.		NOM.	- September 1	L/T=0L0EY	508	MA	TERIAL DESCRIPTION*	Macyc Bal	
₩ K 60	28.24	490 (%)	SAMPLE UNISTR	(Primit (Breen, Ar.)	COMPLETENCY OR SOCI UNIVERSELL	. cause	MATERIAL CLASSIFICATION	440	REMARKS
						Γ]	T	
\neg							1 1	7	
								1	· · · · ·
\dashv	-			A TAILE TO THE THE TAIL THE THE TAIL THE TAIL THE TAIL THE TAIL THE TAIL THE TAIL THE TAIL TH				1	Ab smallered wife
7	75- 17					GRAN. Beaut	648195	1	·
┪						Press	642/33	1	braries tones were
1								•	sobred during dulle
-1	41.97						*	-	17:00
				<u> </u>	-		SOMOR OF BUPPARIYED	╂╌╏	
-	[· · · · · · · · · · · · · · · · · · ·	┨	
╌┼	→ — {			<u> </u>			Instruct to per properties	┨═┩	<u>→ 3-16-95</u>
\dashv	{			` ⊦			well screen 32-42	┝╌┤	
+	╌╼			-			Saplock 28.5-47.0 Bombont		
{-				-			rolled and 145-28.5 Grat	┦┈╌┥	
┿		-		1-			14.5-75	╏╾╌┤	
+		#		-				! !	
-1	‡			- -			·		
4	‡			<u> </u>	ļ			┞╌┦	
	‡			Ļ			· · · · · · · · · · · · · · · · · · ·	 	
				L			<i>,</i>	Ш	
	ŀ					[
	-								
Т	-	\dashv		Γ					
1	7	=		Γ		$\neg \neg$			
7	7	ightharpoons	$\neg \uparrow$		1				
十	十			-	\neg	$\overline{}$			
ــــــــــــــــــــــــــــــــــــــ									
ARK	5 <u></u>	u_l	71 3 7 8 CC	17 60	er der	T F	123 of Mahasak 2270	-	BORING JMW5A

BORING LOG

PROJECT NAME: PROJECT NUMBER:				NS			n, CT Site 7	_BORING N	o.: ˌ	<u>7MW1:</u>				
							00083	DATE:	_	5/17/				
			PANY:	New			g Contractors	GEOLOGIS	5T;	Colin Doc				
DRI	LLING	RiG:					9 Dill	_DRILLER:		S. Rams.	_			_
Sample No. and Type of AlQO	(FL)	Blows*/ 6" or AQD (%)	Semple Recovery / Sample Langth	Lithology Change (Depth/Ft.) or Screened interval	Soil Despite	Color	Material Ca	. Salarian	0000	Remarks	داد		Bornhote"	Driller 82:
\vdash			_	in the			organic cop	561	ōυ	Do anterd	0		О	
 				100000 100000 1000000 1000000000000000	J	\$round	Sondy CIH		दस	fill material_	ŏ		Ť	\vdash
 -		/->			}- ٽ	-					14	-		-
<u> </u>	<u> </u>	/_		3	<u> </u>		<u> </u>			water table	ļ			
				j			<u> </u>		<u>L</u>	a+ 3'		i _l		
1	5		,	ļ		-					-			\Box
5-17		X	3/5	005 m 5	10050	A-10	0.5 pt course	sand	ćΜ	caturated (Fill)	0			_
V 6.77		3/16		[# .] . F	 	9124	1.014 2.14	roots	_	v wet	0	\vdash	<u> </u>	\vdash
 —					med decix	b∗ Desm	0.5 # 1:11			moist.	Ψ.	┼╌		
!		4			ļ. —	-			_			\vdash		1
 	L	/	<u> </u>											
	10		Ĺ	j		<u> 1</u>	<u>i. </u>						Ĺ	L.,
5-5 0856		75	15/2	7. 7. 7.	deuse	4.500 3.4004	site		SM	Met	١٥			
•		3/2		===	dense	blue			一 	moisa	0			П
\vdash		-				3,		· · · · · · · · · · · · · · · · · · ·	 		۳	┞┈		H-
<u> </u>	-				 	 	 				 	 -		\vdash
-	<u> </u>			i		<u> </u>			ļ		<u> </u>	\vdash	<u></u>	<u> </u>
	١S	<u>/</u>				<u> </u>						$oxed{oxed}$		
5-3 0915		7/2	<u>≯</u> ∢	2000年 日本宝	way god	arey	And count !	w 53 lt	ŚΜ	caturated	Q		0	0
					dense	1	sandy city	'		wet.	Ь			
	-1			_	-		700 400		-	-00-61	1	┞┈┤		H
					 	-	 		\vdash			┟╌		
<u> </u>		$\overline{}$			 -		· · · · · · · · · · · · · · · · · · ·	· · · ·	_		 	┞╌	Ш	
لبا	<u>کڻ</u>	۷.,			<u> </u>					. 	匚			
69.0 69.0		13/4	13	= P	dense	brown	silt	!	SM	salmruted	Q.	O		
		18/2				blue g-y	silt w/ trac	e clay			0			
						-		· - ·			┢	\vdash		
\vdash	 -{			19	 	¦	 -	·	 -		├-	┞╌	ļ	 -
 			 		[<u> </u>	<u></u>		 		▙			\vdash
لــــا	25		L	<u>L 12</u>	<u> </u>	L	<u> </u>							<u></u>
			er rock bro en im 6 tool		B h orebole 1	0018207	reading frequency if a	dungland recover -	034	Drillin	ın A	resi		
	arks;		<i>,</i> –.		(25°			のいと MASIBO IBDOUSS N	- 4.	Background			ΓC	5
														_
Conv	erted	lo We		Yes	Х		No	Well LD), #:	7MW1	2I	_		_



BORING LOG

		NAM		NS	SE				BORING N	o.:	7 M W1				
		NUM			_			00083	DATE:		5/17/				_
		COM	PANY:	Ne	W	England	Borin	g Contractors		51:	Colin Do	_	_		
DRAL	LING	RIĢ:			<u></u>	lobite		9 Dall	DRILLER:		S. Ramso	_	=_		
Sample No. and I ppe or ROOD	(FL) 01	Blows # 6" or ROD (%)	Sample Recovery Sample Length	Elijholog Chang (Daptiv)- or Scraene Interna	. I	Soil Danelty Consistency Rock History Co	Color		assilication	3000.	Remarks	Plores	A STATE OF	A POUR TOP	DAIL BZ
5 - 5 0950		7/12	1.8		1! }	stiff	blue	1 Pt. silt	w/ clay	ΚC	damp	О			
3.70		14/	~ ~	- 1	-	dense	3.4	1 pt 5.14	.,	ςN	t'	0	-		_
		20	_	1- 14	F	V X		271 3111		-	· · · · · · · · · · · · · · · · · · ·	 ``	-		_
	,	-			1		ļ.,								
		\angle			ļļ					\square					
	30				11	1	•] ;					
9.5		100	6.54 <u>7</u>	 	-	عامه (در	1	₹:1¥		114	bedrock refusal	٥.			
				* ×	١		ļ				at 30.5°		}	- }	
				××	.						_ 	Γ			_
				\ \ \ \ \ \ \ \	۱ ا			total de	pt: 30'						
	Ī]				Sand	18'-30' 18'-30.5' 20'-30'		- ·				
					·	<u>.</u>		Setten	30"-30"		:		П	\neg	
					Ì			200		М		\top			
_	_			•	ı							-	\Box	\neg	
T			-	ĺ	Į	-			•					_	
					Ì										
					Į									Į	
				Ì										_ [_
					Ì							\top			
					1		_	<u> </u>					\Box		
				1	Ì						<u> </u>	1		\exists	
			-		Ì			· ·				\sqcap	\sqcap	╅	
_	_		_	j	Ì									T	
				Ì	İ		_	· - ·					_		
					ļ							┤┤		_	
	_				Ì	<u> </u>	-				<u> </u>	\top	7	_	
		inng, ente for reader			. 0	borehola, i	ncrease	reading frequency i	l elevated reponse 4	ead.	Dáltia	ng Ai	ea		
	arks:	4-5		10		ખ્યુંલડ	,		Spears		Background			0	
~	. :	: 514			_										

TŁ.

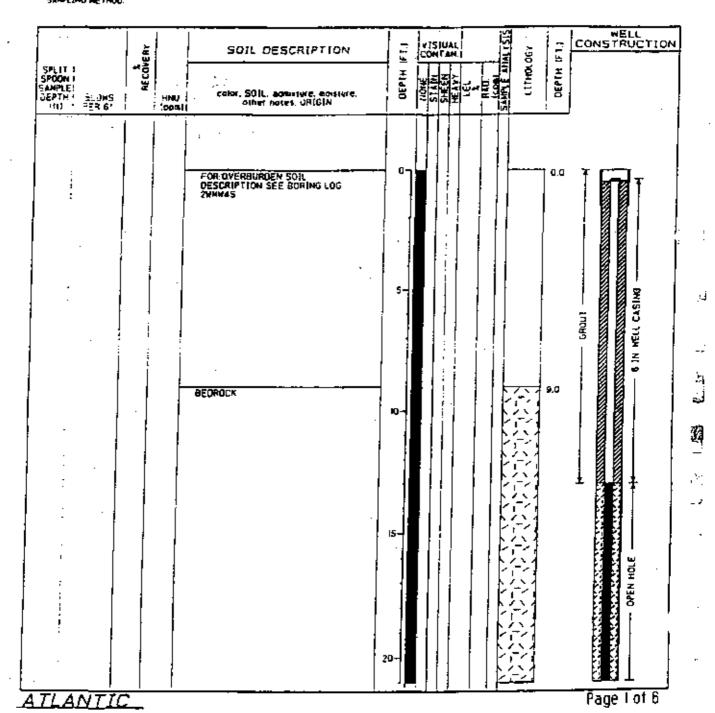
BORING LOG

	PRO	JECT	NAM	E:		NLON -			ap		BORING	NUM	BER:	157					
						841 # 4 ngland l					DATE: GEOLOG	ICT.	Koith	10 · λ.		7.1	<u></u>		
			i RIG:	PANT.		PT	JOIN .	<u> </u>			ORILLER:		JEFI		5AV	 	7		
						 :	/AT	ERIA	L DES	CRIP	•	7	_ 				10 fb	ومقد	(ppn
	Sample No. and Type of ROD	20年 日本日本	Blows / 61 or 800 (14)	Sample Recovery / Sengin Langth	Lithology Change (Depth/Ft I or Screened Interval					1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		3000.	R	emarks	· •		化		
1100	П	1					BRN	À	5# -₽ # 6-/(1	1			01	۲Ÿ		0	0	0	
	\square	2				MGD STLEE	l i	2.	31111111111111111111111111111111111111	2 1 24	= 5l	SW	7	MOIST		1.	ī	ī	7
	!	3			ļ	1	П	<u> </u>	1	1		11	\Box	†				1	Π
		4		34			¥	1		_		11			_				Π
		5					G-Y-	E	SANO	4 \$1	ILI- FRAN		G-RAY	J 25.	OR		\prod		\prod
		6			•] 1		:		.1	ΔM	+ ite	<u></u>					
		7				<u> </u>	BA	12	×/\S€	54	ND	П					Ш		1
	Ш	a	\angle	4/4		<u> </u>	L	Ł	NE S	ΑΝΔ	<u> </u>	╁	131	2 N/97	₹ ∧ γ			Ц	
		g	\angle			SOFT	_	1_	 		<u> </u>	11_		L		1			1
		10	/				Щ	<u> </u>	<u> </u>		 	Ц.				1	1	Ш	1
	 	11					Ц.	<u> </u>	<u> </u>		<u> </u>	Щ				1	Ш	Ш	
]{	12				$\sqcup \!\! \perp$	<u> </u>	Ľ	ER.	Rus	<u>7- co(0)</u>	<u> </u>				1	1		Ţ
	\sqcup	13	4		,	<u>- —</u>	<u> </u> _	ļ.,	Mo _T -	([1]	N9 746	44-	υμτ			1	Ш]]	1
	╚	14				_	_	Ц			ļ. <u>. </u>				:		Ш	\prod	1
1140	┝╌┩	15			·	1	Ł	1			¥	1	<u> </u>	<u>/ </u>		V	₩.	<u>V</u>	4
	\square	16			+-0						<u> </u>	ļ	·						
	$\vdash \vdash$	17					ļ		<u>3'-0</u>		ET_]		•			ᆜ	_	
ı	L	16	\leq		ļ		ļ	-	- <u>, 14</u>	Ę		<u> </u>			\dashv			_	
	\vdash	19	4		-			-			_	_					\dashv	-	
		26			}										_	_		-+	
	-+	┵			}			716	1 AC	<u>ئ</u>	O'OF D			4			\dashv	\dashv	_
		∤	\hookrightarrow		}		-	-			15° T	~	CAYS	Mua	אַטז	긕		-	\dashv
		∤	\leftarrow		- }	·	-	TD	<u>=.i5</u>		<u> </u>					_		\dashv	\dashv
		ᅪ	\prec		ļ			┡				Н				-4	4	-	-
	* When i	Mak ex	Ong sola	r rock byol	Anasa														
	" Includ	a monit	or readers	g in 6 kool	marvais (borehoie.	nore DE	BSA (B	DEIL	Hericy #	elevated repon:	se reac		(Backgro	Orilling bund (<u> </u>
	Conve	bene	to Wel	lt:	Yes			No			We#1.0), #;	··· -			_			<u> </u>

B	ORIN	G TO	<u> </u>					H/	LLIBURTON NUS.
			959			DATE:	80RI	NG NO.:	AWAWAS AST COAST THOMAS
		N:			-		OLOGIST: J. R. Kerausan		
WAT	ren Lei	VEL DA	₹A :	(= 3/	-94-	K 0			
(Sar	6, I III		atoroms)	/-~	,-,,,-,				
	ŀ	0.045		1	 	· MA	TERIAL DESCRIPTION"		` }
T TENE	~	(2) e00 4.06	TENTE LENGTH	(him)t	Depriery Combiletonic Car make Turklandis		MATERIAL CLASSIFICATION		REMARKS
	0-1			C SEA		Γ-	distilt and grand Set - bose	_ _	
<u>۔</u> ا - ک	3-4	12	1.0		M.Dress	T	d = 5) 0 4 d 1		4AU-0 15:27
<u> </u>			20		P3.D7*46	1	Short, Fine to Control Sand	1	HMU- 0 15:27 HeloT
≤ -8	4-4	5 3	١.٢	, ,	Loose	Seame		sw	HHD-0 11:39
		7			4	Bearing		<u>-</u> ₩	HET LERONE 2 THOUS
5-3	<u>6-8</u>	1	· 6		Y. L003€		 	لى <u>ن</u> بىد	1/10-0 15:5Z
J- 4	8-10	<u>۔</u> د	.3.0 .5		Loose	Beows.		34	447 16:00
		3				BROWN		54	wer
s-5	10-tz		.5		rt. Desar	Brown		24	
		20	مذ	· .]	·	البحة	- 1	5√	У П
5 · la	12-14	3,	1.0		Locat :	BROWN	<u> </u>	J≾₩	NHU-C) N:34
						Beaut.		<i>5</i> √.	NEC
<u>5-7 </u>	N-14	5	1,6	~ -	10058	BLACE	· · · · · · · · · · · · · · · · · · ·	5-	HNU-0 16:43
		- 1	1.0	<u>~~</u> ≅	M.SRF	Busca	DECEMBLE CLERKY SILVE TO OR	- m I	Wet/kast
5-B	lu 1B	₩ 6	2.0	32	x:स्र्रा	GEEN- GEET	material wood ctc.		HHU- O 14:56
			ە.د	22	 	GRAY	\\	+ 1	7610/1
7		==	$\neg \neg$				BOTTOM OF BARTHLE 18-0	17	
\neg				ſ				\Box	
\neg				Ī		\neg		\Box	
				- 1					
\neg	\neg			ſ		\Box			
	\neg			ı				77	
EMAR		36 <u>/</u> M	<u> </u>	F1010	CROSS			-	BORING JW/Mb/35

PROJECT: 19 STUDY MSB - NEON
PROJECT 70: 1258-10
LOCATION: AREA A WETLAND
DATE STANTED: 09/18/80
DATA COMPLETED: 09/18/90
DRILLING CONTRACTOR: ENFIRE SOILS INVESTIGATIONS, INC.
ORILLING CONDO: AIR ROTARY
SAMPLING METHOD: AIR ROTARY

GROUND ELEVATION 93 GT
PROTECTIVE CASING ELEVATION: 92.89
MELL ELEVATION: 92.89
MATER LEVEL: 7.43 LOS/21/80
OATON: SUBASE
MEATHER: 65°, CLEAR, SURNY
INSPECTOR: AKHIER HOSSAIN AND LYNN METCALF
CHECKED 67° ERIK MESS



FROJECT: (R STUDY NSS - NLON
FROJECT NO: C56-NO
JOATE STARTED OBJUSTOD
DATE STARTED OBJUSTOD
DATE STARTED OBJUSTOD
DATELING CONTRACTOR: EMPIRE SOLIS INVESTIGATIONS, INC
DRILLING CONTRACTOR: EMPIRE SOLIS INVESTIGATIONS, INC
DRILLING METHOD AIR ROTARY
CAMPLING METHOD:

ATLANTIC

SROUND ELEVATION: 93.07
PROTECTIVE CASING ELEVATION: 92.59
MELL ELEVATION: 92.69
MATER CEVEL: 7.43 103/28/90
DATUM: SUBASE
MEATHER: 85'. CLEAR SUMMY
INSPECTOR: ARMTER MOSSAIN AND LYNN METCALF
CHECKED BY: ERIK MESS

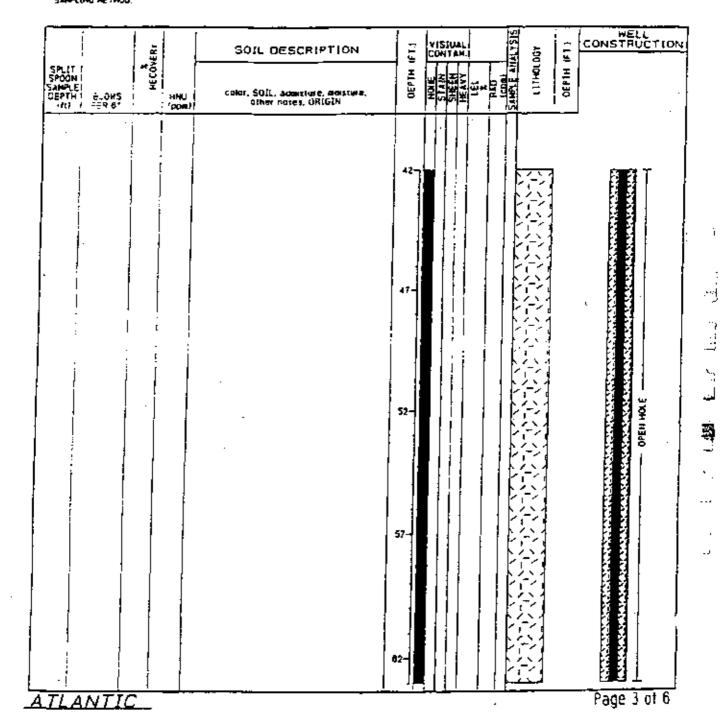
Page 2 of 6

CONSTRUCTION VISIUAL CONTAM 1 5 SOL DESCRIPTION _ 111101.061 SPLIT I SPOOM I LAMPLET SEPTH I DEPTH DEPTH color, SOIL, consistere, mosture, other noses, ORIGIN 리바이 글: OMS 4 글: 4 구등목 67 년 HNU ! 21. 28 36

PROJECT: IA STUDY MSB - MICH PROJECT NO: 1258-10 LOCATION AREA A WETLAND DATE STARTED: 09/10/00 DATA COMPLETED: 09/27/90 SAILLING CONTRACTOR: ENVIRE SOILS INVESTIGATIONS, INC. DRILLER: CHAIG CONNER DRILLING METHOD: AIR MOTARY SAMPLING HETHOO:

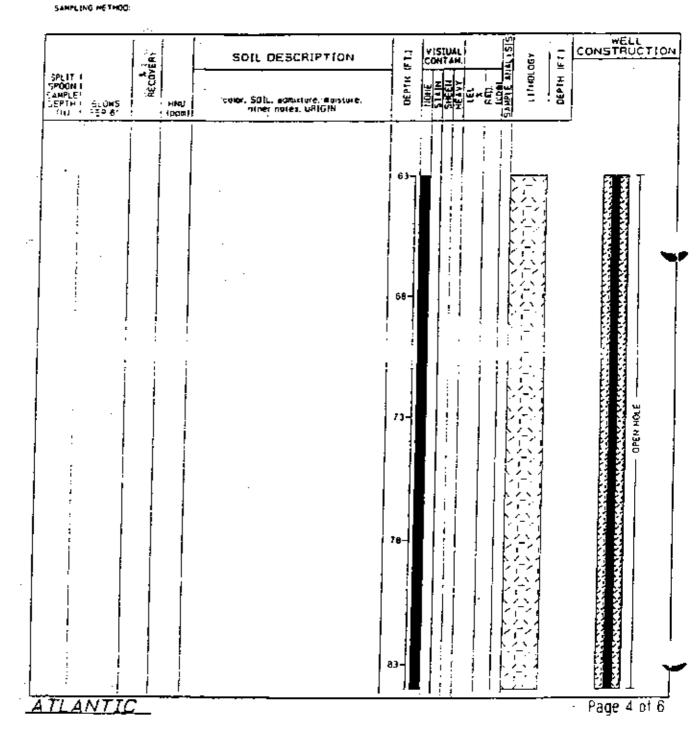
GROUNG ELEVATION: 93.07 PROTECTIVE CASING ELEVATION: 92.69 WELL ELEVATION: 92.69 WATER LEVEL: 7.43 103/21/9/1 DATUM: SUBASE WEATHER: 65", DLEAR, SUNNY INSPECTOR: AAHTER HOSSALN AND LYNN HETCALF

CHECKED BY: ERIK MESS



PROJECT: IR STUDY NSB — HEON
PROJECT NO: 1256-10
DATE OF 1256-10
DATE STARFED: 09/16/80
DATA COMPLETED: 09/27/80
DATELING CONTRACTOR: EMPIRE SOILS INVESTIGATIONS, INC
DRILLING CRAFG CONNER
DRILLING METHOD: AIR ROTARY

GROUND ELEVATION 93.07
PROTECTIVE CASING ELEVATION: 92.69
HELL ELEVATION: 92.69
HATER LEVEL: 1.43 (03/21/91)
DATUM: SUBASE
MEATHER: .55', CLEAR SUMMY
MESTERO AMNIER MOSSAIN AND LINN HETCALF
CHECKED 81 SRIK MESS.



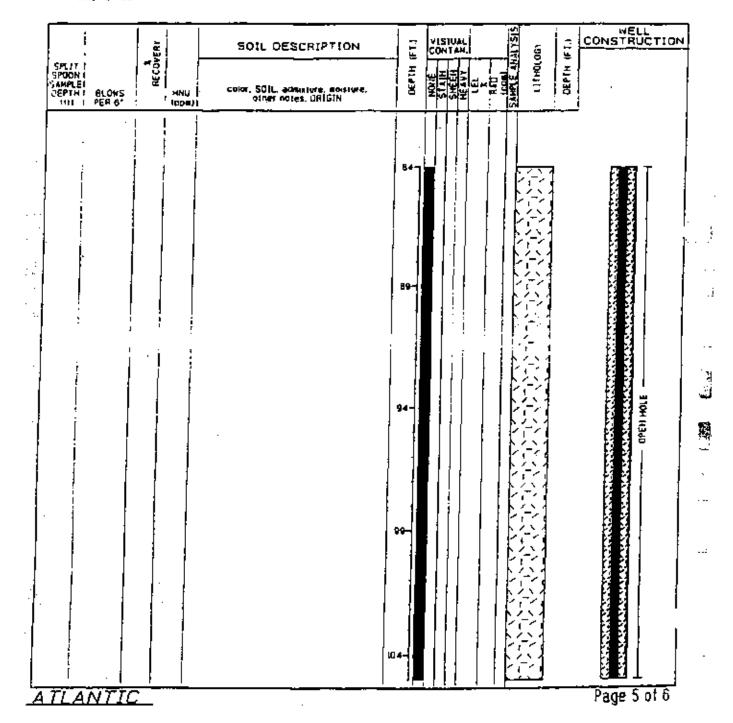
PROJECT: IR STUDY WSS - NOM
PROJECT NO: 1256-10
LOCATION AREA A METLAND
DATE STARTED: 09/19/90
DATA COMPLETED: 09/27/90
JAILLING CONFRACTOR: EMPIRE SOLLS INVESTIGATIONS, INC
DRILLER: CRAIG COMMER
DRILLER: CRAIG COMMER
DRILLING METHOD: AIR ROTARY
SAMPLING NETHOD:

SROUND ELEVATION: 93.07

*ROTECTIVE CASING ELEVATION: 92.69

*ATER LEVEL: F 43 (03/21/91)

DATON: SUBASE
*RATHER: 65", CLEAR SUNWT
CSPECTOR ANMIER MOSSAIN AND LYNN METCALF
CMECKED BY ERIK MESS



PROJECT: TRISTUDY HISE - NUON

**OJECT NO: 1256-10

CATION AREA & METLAND 341E STARTED: 09/19/90

1314 COMPLETED: 09/27/90

"FILLING CONTRACTOR" EMPIRE SOILS INVESTIGATIONS, INC

TRILLER CRAIG CONNER

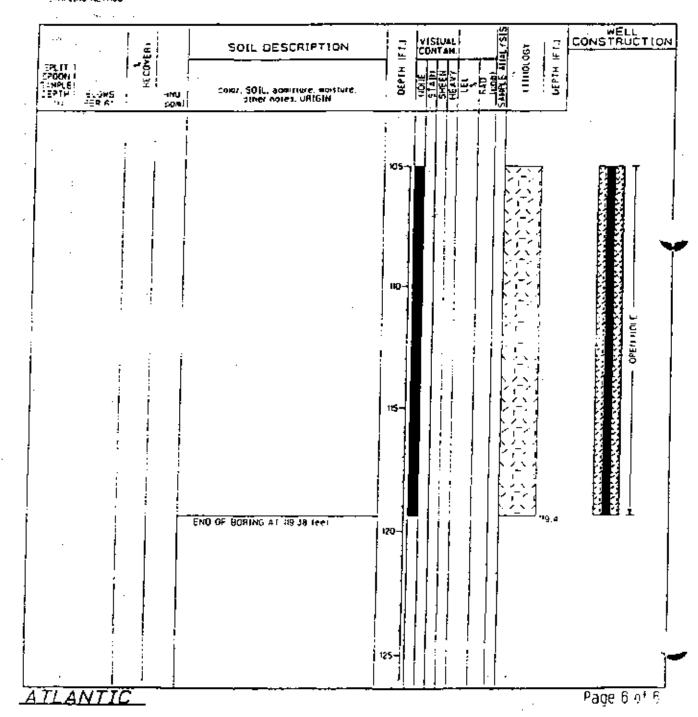
IRILLING METHOD: AIR ROTARY

EAMPLING HETHOO!

GROUND ELEVATION: 93 07 PROTECTIVE CASING ELEVATION: 92.69 WELL ELEVATION: 92/69 WATER LEVEL: 7 43 103/21/911 DATUM: SUBASE

MEATHER 65", CLEAR, SUMMY INSPECTOR: ARMYER MOSSAIN AND LYMM METCALF

CHECKED BY: ERIK NESS





BORING LOG

Page___of__

_														-	
PROJ	ECT	NAM	E: N:	<u> 58-</u>	Ν	Cor	1							NUS 23	
PROJ	ECT	NUM	BER:_	CTO	Ä	AL		<u>[6]</u>	ļί	,		10-4-95		<u> </u>	
			ANY:		7	E\$7	<i>,,,</i>	<u> </u>			GEOLOG	IST: <u>577</u> 4	Υ	CONTI	
AAVLE	: R LE	VELI	DATA:				_		_	11.0		<u> </u>	, _		
1		1		ļ	<u>.</u> .		_	M	AA'	TERIAL DE	SCRIPTIO	N	١.		1
Server No. and	-		Server.	0-4	_	98 (8.3)		1/2		4.7	2+0# 3 .	e Law Sella	. U	·	PRD or
Type or	PL #	A02	Seman Large	ID-reside or d-corre	-	1 (a) (a) (b) (b) (c) (c) (c) (c) (c) (c) (c) (c) (c) (c	eggy) makki		orsid Orași		alim (Spein	capos	S	Remarks	****
1 ~~] '**			•			10					ε		-
 	-	57	1-97		_						10.40-1111111111				10%
<u>S-1</u>	αo	71	1-9/20	ļ		MP	ENTE	Ben.	니	<u> </u>		200TS/	퇀	MOIST	1%
1350	2.0	213		:		<u></u>		<u> </u>			, Roca	FRAG	L	<u> </u>	<u> </u>
5-2		96	17/20	ļ		MSE	Æ		监	Story St	MD-8	ME COCE	ţu.	MOIST	0/2
1352	4.0	3/3					 {	1				FRAG	ļ		Γ
5-3		8/6	15/2.0			MŒ	1		┪	FINE TO			ы	DAMP + MOIST	9/4
_		72				-	<u> ۸۵۲.</u> ۱		7	1-1N/E. 10	14/547/2	CICAR	مې	Carting & MO131	 /- 7
1405	<u>0,0</u>	75	131			—	-	TAN	1		-	 	-	<u> </u>	1
S-4		<u>/2</u>	1.3/2.0	7	_	WIE	ΚE	Cea	4	SUTY F.	MED S	<u> 1</u>		MOIST	9/2
1467	8.0	3∕{			N		<u> </u>	. ↓					80		
5-5	-	9/[1.5/2.0	م و	l			GPA	4		,			MOIST >> WET	19/4
1415	7 7	9		HUL	1.1		_	4	_	SIGTY F	2440		SM	t 9'WET SENT \	
5-6	.0.0		1.1% ₀	μ ₂ ο 29	47	MM		PPLY					7		
\vdash		8	' <u>7'</u> 0	-1	H	WIE	10E		1	<u>γ</u>		·	┞┤	5W50Z3-08	g '
1418	13.0	إوع			N			ptty	4	SIGY VE	241312	 .	27	wer	17.
		<u> </u>			N			\sqcup	4				_	MIN'DEL SYNDA ZICH	1
		\angle			U				⅃						
	1021	\nearrow]]	7	,	l ↓	.						
5-7		75	1.8%		N	MŒ	ЖE	TAN	<u>:</u> †	SICTY E	SAUA	CULINY	SW	WET	9.2
		圂			ľŊ			LEEN.	+	2101 T I	ZW/ID-		7		ا۔ ۔۔ ا
1430	10	<u>~</u>		17.0	Ц	'	Z		4			Sict	ML	? MOTILED W LAYERING	
<u> </u>									4				ļ. ———	oy CAT DO NO.	\vdash
					l								ļ		<u> </u>
		7]		I		·			or AZH	17				
		$\overline{}$			İ				- 1	SPOONS					
	∤	- 1			1				ı			-			
}}		\hookrightarrow			ł	<u></u> -			•	<u>SCREEN</u>					
 		$\angle \downarrow$			ŀ			<u> </u>	4	<u> </u>	<u>5-1</u>	1		· · · · · · · · · · · · · · · · · · ·	
<u> </u>		4			1				1	<u>Peusis</u>	3-5				Ш
L (/			╻┃					FWSH	MT (61	ROUT TO S	UU		
-When e	ock co	ring en	ter rack (brokene	*\$5							_			
CONVE	RTF	o to	WELL	٠ ١٨	Ýο	5	No			14	/E) D #	: Huus	42-	ς.	
REMAR	≀ks:					_				·					
			5P7	UP	_[340	<u> </u>	بوح	_			G.	LA	B (SWLDK)	<u> </u>
Signatu	_ (غ(s):				_									 	
-			_			_									

TABLE 4-4

GROUNDWATER ELEVATIONS - ROUNDS 9 THROUGH 11

YEAR 3 GROUNDWATER MONITORING REPORT FOR AREA A LANDFILL

NSB-NLON, GROTON, CONNECTICUT

WELL	Reference Elevation ⁽²⁾		nd 9 nber-01		nd 10 ch-02		mber-02
ID	(feet)	Depth to Water	Groundwater Elevation ⁽²⁾ (feet)	Depth to Water	Groundwater Elevation ⁽²⁾ (feet)	Depth to Water	Groundwater Elevation ⁽²⁾ (feet)
4MW1S	129.55	9.9 卷	119,65	6.29 🗯	123.26	8.15	121.40
2LMW20\$	B6.83	18.02	68,81	15.81	71.02	_16.53	70,30
2WMW21S	76.31	4.98	71.33	4.33	71.98	4.77	71.54
3MW37S	47.26	3.79 🗱	43.47	3.61*	43.65	3.65	43.61
3MW120 ⁽¹⁾	47.22		1			4.44(3)	42.78
2WMW38DS	74.06	7.61	66.45	5.B1	68.25	7.93	66.13
2WMW39DS	73.53	3.4 *	70.13	2.40 🖈	71.13	3,31	70.22
2WMW40D5	73.21	3.81	69.40	3.15	70.06	3.79	69.42
2WMW41DS	73.39	3 24	70.15	2.42	70.97	2.89	70.50
2WMW42DS	73.65	2.5	71,15	2.05	71.60	2.64	71.01
2WMW43 <u>D</u> \$	74.36	3.28	71,08	2.44	71.92	2.90	71.46
2WMW44DS	73.72	2.29	71.43	1.62	72.10	2.00	71,72
2WMW45DS	74.24	2.95	71.29	2.12	72.12	2.60	71,64
2WMW46DS	73.53	2.28	71.25	1.55 🗲	71.98	1.97	71. <u>56</u>
2WMW47DS	73,39	2.37	71.02	1.3B	72.01	1.75	71.64
2LMW29A ⁽¹⁾	91.37		[8.91	82.46
2LMW29F ⁽¹⁾	91.50			<u>-</u>	ļ	10.56	80.94
2LMW75 ^[1]	84.87					11.85	73.02
2LMW7D ⁽¹⁾	85.74					6.65	79.09
2LMW32F ^{L11}	84,52					13.18	71.34
2LMW32D5 ⁽¹⁾	84,17			<u></u>		12.57	71.60
2LMW32B ⁽¹⁾	84.81			-		12,21	72.60

^{1.} No water levels were taken in these wells during Rounds 9 and 10.

² Elevations based on Base 1982 Vertical Datum.

³ Water level measured in December 2002.

TABLE 3-1

MONITORING WELL CONSTRUCTION AND ROUND 4 WATER LEVEL INFORMATION YEAR 1 ANNUAL GROUNDWATER MONITORING REPORT FOR SITES 3 AND 7

.NSB-NLON, GROTON, CONNECTICUT

Monitoring	Northing (H	Easting (1)	Ground Surface	Top of Casing	Top of Riser	Screened Aquiter	Screen Top	Screen Bottom	Screen Top	Screen Bottom	Depth to	Groundwater
Well	MOLYMENS	Easting .	Elev (ft) 🔼	Elev (ft) ^{Ch}	_Elev (ft) ⁽²⁾	acitélies Minuel	Depth (ft)	Dep(h (ft)	Elev (ft) (3)	Etev ((t) (7)	. Water (ti) ^{(⊅l}	Elevation (11) ⁽⁷⁾
Site 3												
20MW16S	708522.1	1181411,1	33.21	35.69	35.45	Overburden (Alluvium)	1.69	11.59	31.52	21 52	3.37	31.59
20MW16D	708531,9	_1181404.8	33.51	35.30	NA.	Badrock	16.00	59.91	15.51	-26.40	3.72	31.58
20MW25S	708649.4	1180952.5	31.09	33.02	32.59	Overburder: (Fill)	5.50	10.50	25.59	20.69	5.30	25.79
20MW28D	708835.6	1180594.4	33.22	33,22	33.01	Bedrock	26.00	136.00	7.22	102.76	16.11	16.90
20MW29S	709579.0	1181082,1	32,59	34.47	34,29	Overburden (Alkuvium)	6.00	16.00	26,59	16.59	8,57 🎏	25.72
34W15\$	709329.6	1180538.3	33,20	33.24	32.86	Overbuiden (Albiyium)	28.00	38,00	5.20	-4.60	29.38 🕊	3.48
34W15	709351.2	1180640.8	\$3.50	33.53	33.10	(Mulyuth) astructed	55.50	65 50	-22.60	-32.00	30.85	2.25
3MW16S	709908.8	1180730.0	36.10	36,10	35.78	Bedrock	17.00	27.00	(9.10	9,10	14.36 34	21.42
3MW160	709899.8	1180723.2	36.20	38,19	35.80	Bedrock	59.00	89.00	-22.80	-32.80	22 12 3	13.68
Site 7												
7MW1D	709281.1	1182145,B	52.28	NA	51.69	Bedrock	14.20	25.20	38.08	27.08	8.98	42.71
7MW3S	709033.9	1181704.2	43.59	43.59	43.32	Overburden (Fill/Alluvium)	6.90	18. 9 0	36.69	26.69	5.60	37.72
7MWSI	709021.8	1181707.0	43,40	45.38 ·	45.21	Overourden (Alluvium)	22.50	32.50	20.90	10.90	7,35	37.86
7MW5D	709280.3	1181887.3	54.43	54.43	54.18	Bedrock	32.00	42.00	22.43	12,43	12,40-	41.78
7MW98	709177.6	1181377.0	35.80	35,77	35.40	Overburden (Alluvium)	4.00	14,00	31.81	21.81	3.86	31.54
(7MW128]	709075.9	1181805.7	44.10	44,13	43.62	Overborden (Fil/Alluvium)	3.50	53,50	40.€0	30.60	3.28	40,36
7MW120	709070.3	1161808.6	44 20	44,22	43.90	Overburden (A9. vrum)	20.00	\$0.00	24.20	14.20	4.97	36.93
7MW 13\$	708891.7	1161882.7	48.60	50.79	50.58	Overburden (FIIVAlluvium)	6.50	16.50	42.10	32,10	8.91	41.67

¹ North American Datum (NAD) 83, Connecticut State Plane Coordinate System

NA - Not evallable

Elev - Elevation

ft - Feet

² North American Vertical Datum (NAVD) 88 (NAVD 88 = 1982 Base Vertical Datum - 2 39 feet^(b)). Vertical datum conversion factor of 2.39 feet was provided by NSB-NLON Public Works Department.

³ Water revels were measured on March 17th and 18th, 2007.

TABLE 2-2

WATER CEVEL MEASUREMENTS AND ELEVATIONS

OCTOBER 2002 DGI

BASEWIDE GROUNDWATER OU RI UPDATE/FS NSB-NLON, GROTON, CONNECTICUT

ļ	Depth to	Cepth to	Reference	Relarence	Well		October 2002	October
Well Name	Monitored	Monitored	Point	Point	Diameter	Aguiler Monitored	Depth to	2002 Water
	Interval	Interval	Elevation ⁽¹⁾	Elevelion ⁽²⁾	(inches)	· ·	Water	Elevation 14
	(feet bgs)	(foot bgs)	(leet)	(lest)	,	1 -	(loct)	(feet)
SITES 3/14	1 1.001 0302			·	•	<u> </u>	1000	
20MW10D	10.00	26.09	54.52	52.13	6	8EDROCK	10.13	42.00
2DMW11D	19.50	25.50	53.20	50,61	6	8EDROCK	NM ^[3]	NA.
20MW11S	2.50	12.50	46.85	44.45	2	OVERBURDEN (ALLUVIUM)	2.09	42.37
2DMW15D	10.00	19.51	44.09	41.70	6	BEDROCK	7 3.2	34.38
2DMW160	18.00	59.91	37.69	35.30	6	BEOROCK	5,26	30.02
2DMW 16S	1.69	11.69	37.85	35.46	5	OVERBURDEN (ALLUVIUM)	5.85	29.61
20MW230	7.50	55.00	83.38	80.99	- 5	BEDROCK	30.41	50.58
20MW240	25.00	45.00	3 6.D7	33.88	6	BEDROCK	4.65	29.03
2DMW24S	4.00	14.00	35.29	33.90	2	OVĘRBUROEN (ALLUVIUM)	NW ₍₆₎	NA
2DMW25D	18.00	40.00	35.48	33.09	6	BEDROCK	B.48	24.61
2DMW25S	5.50	10.50	34.98	32.59	2	OVERBURDEN (FILL.)	8.12	24.47
2DMW26D	30.00	40.00	29.19	26.80	2	OVERBURDEN (ALLUVIUM))	10.51	16.29
2DMW26S	8.00	18.00	28.71	26.32	5	OVERBURDEN (ALLUVIUM)	6.63	19.69
2DMW27D	20.00	205.00	27.95	25.56	6	BEDROCK	12.96	12.60
20MW28D	26.00	136.00	35.40	33.01	Ġ	BEDROCK	18.95	16.06
20MW285	17.00	22.00	35.26	32.67	2	OVERBURGEN (ALLUVIUM)	18.23	14.64
2DMW29S	6.00	16.00	36.68	34.29		OVERBURDEN (ALLUVIUM)	9.11	25.10
2DMw30\$	4.00	9.00	_33,11	30.72	2	OVERBURDEN (ALLUVIUM)	7.35	23.37
3MW12D	20.00	25.00	47.22	44.63	. 2	BEDROCK	4.44	40.39 ⁽⁵⁾
3MW14S	28.00	38.00	36.81	34,42	2	OVERBURDEN (ALLUVIUM)	32.16	2.26
14MW15	4.00	14.00	51.54	49.05	2	OVERBURDEN (ALLUVILIA)	5.01	44.04
3TW27	1.00	600	_38.20	35.81	ļ ·	OVERBURDEN [ALLUV <u>IUM]</u>	5.86	29,95
3TW28	1.70	6.70	39.56	37.17		OVERBURDEN (ALLUVIUM)	7.12	30.05
3TW29	3.00	7.50	38.96	36.57	!	OVERBURDEN (ALLUVIUM)	6.78	27.79
3TW30	6.00	18.00	37.81	35.42	<u> 1</u>	OVERBURDEN (ALLUVIUM)	8.13	27.29
SITE 7	, 						*****	
7MW10S	4.00	14.00	43.42	41.03	2	OVERBURDEN (ALLUVIUM)	12.25	28.78
7MW3D	23.80	33.80	46.67	44.28	2	OVERBURDEN (ALLUVIUM)	8 90	35.38
SITE 20 2WCMW1S	9.00	10.00	na an 1	9.60		CARRIADI IDINCAL/TE LANDARAST	90 90 1	50.40
2WCMW15	8,00 4,00	18.00	83.92	81.53	2	OVERBURDEN (FILUDREDGE)	12.10 4.57×4	59.43 79.20
2WCMW3S	5.75		96.16	83.77	3	OVERBUADEN (FILL)	_	
2WMW4D		15.75 119.40	95.95	83.56	2	OVERBURDEN (* II L/OREDGE)	10.03	73.53
SITE 15	13.00	113.40	92,69	90 30		BEOROCK	6.14	84.16
SITE 15 15MW1D	36.60	46.00	28.05	25.66	2	OVERBURDEN (ALLUVIUM)	10.24	15.42
15MW15	5.00	15.00		25.69	2	OVERBURDEN (ALLUVIUM)	7.02	18.67
15MW15	5.00	15.00	28,08	25.69 26.51	- 2 -	OVERBURDEN (ALLUVIUM)	7.82	
15MW25	5.00	15.00	28.90 25.26	23.87	2		7.02 5.81	18.69 18.06
15FW01			29.62	27.23	1	OVERBURDEN (ALLUVIUM)	8.45	
15TW02	5.00 5.00	15.00 15.00	29.62	26.70	1	OVERBURGEN (ALLUVIUM) OVERBURGEN (ALLUVIUM)	7.98	18.78 18.72
151W02	5.00	15.00	27.52			OVERBURDEN (ALLUVIUM)	8 49 -3 -	18 64
1917703	5.00	15.00	77.52	25.13	1	CAEURDHOEM (VEDOAIOM)	0.43	10 04

Notes:

- 1 Elevation based on Base 1982 Vertical Oatum.
- 2 Elevation based on NAVD 1986.
- 3 A water level measurement could not be taken at monitoring well 2DMW24S because it could not be located. It was assumed to have been destroyed.
- 4. A water level measurement could not be taken at monitoring well 20MW11D because it was destroyed
- 5 Measured on 12/04/02.

bgs = Below ground surface.

NA - Not applicable.

NM - No Measurement,

TABLE 2-2

WATER TABLE ELEVATION SUMMARY - JUNE 2000 BASEWIDE GROUNDWATER OU RI NSB-NEON, GROTON, CONNECTICUT PAGE 2 OF 3

Welf Name	Depth to Top of Screen (Feet)	Depth to Bottom of Screen (Feet)	Top of Casing Elevation 1982 Datum	Top of Casing Elevation 1968 Datum	Well Diameter	Aquiter Monitored	Depth to Water (feet) June 2000	Water Efevation (ft-mai)* June 2000
7MW4S	4.00	14.00	45.84	44,45	- 2	BEDROCK	2.08	42.37
7MW50	32.00	42.00	56.57	54.18	2	BEDROCK	11,84	42.34
7MW5S	7.00	17.00	56.62	54.23	2	OVERBURDEN (ALLUVIUM)/ BEDROCK	11.9	42.33
7MW6S	4.00	14,00	46.65	44.26	2	OVERBURDEN (ALLUVIUM)	3.97	40.29
7MW78	5.50	15.50	46.57	44.18	2	BEDROCK	1.87	42.31
7MW8S	3.00	13,00	42.10	39.71	2	OVERBURDEN (ALLUVIUM)	_ 3.81	35.90
7MW9S	4.00	14.00	37.91	35,52	5	OVERBURDEN (ALLUVIUM)	4.4B	31.04
B325-MW1	3.00	13,00	47.23	44.B4	2	OVERBURDEN/BEDROCK	2.53	42.31
B325-MW3	2.50	12.50	46.05	43.66	2	OVERBURDEN	1.24	42,42
B325-MW4	4.00	14,09	46.88	44.49	2	OVERBURDEN	3.42	41.07
SOUTHERN RE	GION WEL	LS						
8MW1	6.40	16.40	10.15	7.76	2	OVERBURDEN (FILL)	8.37	-0.61
8MW2D	54.00	64.00	9.77	7.38	2	OVERBURDEN (ALLUVIUM)	7.18	0.20
8MW2S	5.90	15.90	9.43	7.04	2	OVERBURDEN (FILL)	6.52	0.52
8MW3	5.80	15.80	8.96	6.57	2	OVERBURDEN (FILL)	6.09	0.48
8MW4	5.40	14.40	9.34	6.95	2	OVERBURDEN (FILL)	6,14	0.81
8MWSS	6.00	16.00	10.94	6.55	2	OVERBURDEN (FILL)	9.03	-0.48
8MYV6D	60.00	70.00	9.62	7.23	2	OVERBURDEN (ALLUVIUM)	7.15	0.08
8MW6S	4,00	14.00	9.66	7.27	2	OVERBURDEN (FILL)	6.43	0.84
8MYV8D	48.00	78.00	19.53	17.14	2	BEDROCK	16.58	0.56
SSWMB	7.00	17.00	19.68	17,29	2	OVERBURDEN (ALLUVIUMY BEDROCK	14,67	2.62
15MW1D	36.00	46.00	28.05	25.66	2	OVERBURDEN (ALLUVIUM)	9.22	16,44
15MW1S	5.00	15.00	28.08	25.69	2	OVERBURDEN (ALLUVIUM)	3.67	21.82
15MW2S	5.00	15.00	28.90	26.51	2	OVERBURDEN (ALLUVIUM)	4,61	21.90
15MW3S	5.00	15.00	26.26	23.07	2	OVERBURDEN (ALLUVIUM)	4.38	19.49
23MW01D	50.00	56.50	36.83	34,44	2	BEDROCK	3.65	30.59
23MW02D	18.60	28.50	23,19	20.80	ë	BEDROCK	9,72	17.08
23MW03D	39.00	55.00	22.91	20.52	В	BEOROCK	1.1	19.42
ERM-1	3.54	13.04	22.49	20.10	2	OVERBURDEN (FILL)	4.25	15.65
ERM-13	5.50	14,55	25.52	23.13	5	OVERBURDEN (FILL)	6.02	17.11
ERM-14	5.50	14.28	25.21	22.82	2	OVERBUADEN (FILL)	5.69	17,13
ERM-15	2.25	11.25	22.63	20.24	2	OVERBURDEN (FILL)	3.46	16.78
ERM-17	2.72	11,72	22,15	19,76	2	OVERBURDEN (FILL)	4.09	15.67
ERM-19	2.81	11.81	22.03	19.64	2	OVERBURDEN (FILL)	4.13	15.51
ERM-2	3.71	13.21	21.46	19.07	2	OVERBURDEN (FILL)	3.81	15.26
HNUS-10	5.00	15.00	23.25	20.86	2	OVERBURDEN (FILL)	8.81	12.05
HNUS-11	5.00	15.00	72.23	19.84	2 1	OVERBURDEN (FILL)	8.63	11.21
HNUS-12	5.00	15.00	26.47	24.08	2	OVERBURDEN (FILL)	2.68	21.40
HNUS-13	5.00	15.00	25.71	23.32		OVERBURDEN (FILL)	1.22	22.10
HNUS-15	5.00	15.00	23.13	20.74	<u>5</u>	OVERBURDEN (FILL)	4.94	15.60
HNUS-2	4.00	14.00	20.70	16.31	2	OVERBUADEN (FILL)	4.82	13.49
HNUS-21	5.00	15.00	22.35	19.96	2	OVERBURDEN (FILL)	7	12.96
HNU5-22	10.00	20.00	27.70	25.31	2	OYERBURDEN (FILL)	9.78	15.53
HNUS-23	7.00	17.00	20.42	18.03	2	OVERBURDEN (FILL)	6.93	11.10
HNÜS-24	5.00	15.00	27.11	24.72	2	OVERBURDEN (FILL)	10.71	14.01
HNUS-4	4.00	14,00	21.24	18.65	2	OVERBURDEN (FILL)	4,32	14.53
HNUS-5	4.00	14.00	21.35	16.96	2	OVERBURDEN (FILL)	4.22	
LOWER SUBAS		14.00	21.00	10.30	<u>-]</u>	CACHED INCH (FIEL)	7.22	14.74
		14.00	0 62 1	- <u></u> - T		OVERBURDEN (FILL)	60	0.24
MW1S	4.00	14.00	8.63	6.24			5.9	0.34
MW2D	77.00	87.00	7.65	5.46	2	OVERBURDEN (ALLUVIUM)	4.51	0.95
MW2S	3.20	13.20	7.30	4.91	2	OVERBURDEN (FILUDREDGE)	4.5	0.41
MW6D	28.00	42.00	12.50	10.11	6	BEDAOCK	8.99	1.12
MW65	6.00	16.00	12.16	9.77	2	OVERBURDEN (FLL)	8.65	1.12
3MW12	5.30	15.30	9.21	6.62	2	OVERBURDEN (FILL)	6.34	0.48
I3MW14 (4.80	14.80	7.98	5.59	2	OVERBUÄDEN (FILL)	5.02	0.57

TABLE 2-3

SUMMARY OF WATER ELEVATIONS - AUGUST 2000 BASEWIDE GROWNDWATER OU RI NSB-NLON, GROTON, CONNECTICUT PAGE 2 OF 3

Well Name	Depth to Top of Screen (Feet)	Depth to Bottom of Screen (Feet)	Top of Casing Elevation 1982 Datum	Top of Casing Elevation 1988 Oatum	Well Diameter	Aquiter Monitored	Depth to Water (leet) August 2000	Water Elevation (ft-mai)* August 2000
7MW7\$	5.50	15.50	46.57	44.18	- 2	BEDROCK	2.45	41.73
7MW8S	3.00	13.00	42.10	39.71	2	OVERBURDEN (ALLUVIUM)	5,84	33.87
TMW9S	4.00	14.00	37.91	35.52	2	OVERBURDEN (ALLUVIUM)	5.89	29.64
B325-MW1	3.00	13.00	47.23	44.84	2	OVERBURDEN/BEDROCK	3.15	41.69
B325-MW3	2.50	12.50	46.05	43.66	2	OVERBURDEN	1.87	41.79
B325-MW4 ·	4.00	14.00	45.66	44.49	2	OVERBURDEN	4.07	40.42
14MWTS	4.00	14.00	51,44	49.05	2	OVERBURDEN (ALLUVIUM)	5,32	43.73
SOUTHERN REG	ON WELLS					· · · · · · · · · · · · · · · · · · ·		
8MWT	6.40	16.40	10.15	7,76	2	OVERBURDEN (FILL)	8.70	-0.94
8MW10S	14.50	21.50	21.61	19.22	2	BEDROCK	16.35	2.87
BMW2D	54.00	64.00	9.77	7.38	2	OVERBURDEN (ALLUVIUM)	7.65	-0.27
BMW2S	5.90	15.90	9,43	7,04	2	OVERBURDEN (FRLL)	7,03	0.01
SWW3	5.80	15.80	9.96	6.57	2	OVERBURDEN (FILL)	6.53	0.04
BMW4	5.40	14.40	9.34	6.95	2	OVERBURDEN (FILL)	6.67	0.28
BMW5S	6.00	16.00	10.94	8.55	2	OVERBURDEN (FILL)	9.30	-0.75
CONWA	60.00	70.00	9.62	7.23	2	OVERBURDEN (ALLUVIUM)	7.70	-0,47
MW6S	4.00	14.00	9.66	7.27	2	OVERBURDEN (FILL)	6.96	0.31
BANYBD	48.00	78.00	19.53	17.14	2	9EDROČK	16.81	0.33
BMWes	7.00	17.00	19.68	17.29	2	OVERBURDEN (ALLUVIUM)/ BEDROCK	t5.24	2.06
WW9S	14.00	19.00	21.40	19.01	2	BEDROCK	15.93	3.08
15MW1D	36.00	46.00	28.05	25.66	2	OVERBURDEN (ALLUVIUM)	9.98	15.68
15MW1S	5.00	15.00	28.08	25.69	2	OVERBURDEN (ALLUVIUM)	5.58	20.11
15MW2S	5.00	15.00	28.90	26.51	2	OVERBURDEN (ALLUVIUM)	5,36	20.15
15MW38	5.00	15.00	26.26	23.87	2	OVERBURDEN (ALLUVIUM)	4.49	19.38
23MW01D	50.00	58.50	36.83	34.44	2	BEDROCK	4.65	29.79
23MW01S	6.00	16.00	37.25	34.86	2	OVERBURDEN (ALLUVIUM)	6.64	28.22
23MW020	16.60	28.50	23.19	20,80	8	BEDROCK	6.11	t4.69
23MW02S	4.00	14.00	23.35	20.96	2	OVERBURDEN (ALLUVIUM)	6.09	14.87
23MW03D	39.00	55.00	22.91	20.52		BEDBOCK	7.19	13.33
23MW04D	65.50	95.50	21.89	19.50	2	BEDRÖCK	7.44	12.06
23MW04S	45.00	55.00	21.56	19.17	2	OVERBURDEN (ALLUVIUM)	8.11	11.06
1NUS-11	5.00	15.00	22.23	19.84	2	OVERBURDEN (FILL)	8.88	10.96
HNUS-13	5.00	15.00	25.71	23.32	. 2	OVERBURDEN (FILL)	4.51	18.81
4NUS-2	4.00	14.00	20.70	18.31	2	OVERBURDEN (FILL)	5.47	12.84
INUS-20	5.00	15.00	22.51	20.12	2	OVERBURDEN (FILL)	8.24	11.88
NUS-23	7,00	17,00	20.42	18.03	2	OVERBURDEN (FILL)	8.89.	9.14
OWER SUBASE								
OMW14	3.20	10.20	12.69	10.29	2	OVERBURDEN(FILL/ALLUVIUM)	9.35	0.94
MW1-7RI	5.00	9.00	<u>0.11</u>	5.72	. 2	OVERBURDEN(FILL)	5.50	0.22
#W2-3RI	3.00	8.00	7.7B	5.39	2	OVERBURDEN(FILL)	5.94	0.55
/W2-6RI	3.00	6.00	6.02	3.63	2	OVERBURDEN(FILL)	3.00	0.63
/W3-6RI	300	8.00	6.31	3.92	2	OVERBURDEN(FILL)	3.31	0.61
/W3-7RI	3.00	8.00	6.66	4.27	2	OVERBURDEN(FILL)	3.89	0.39
⁄ ₩4-6FI	3.00	8.00	6.90	4.51	2	OVERBURDEN(FILL)	3.92	0.59
MY4-7R1	3.00	8.00	8.06	5.67	2	OVERBURDEN(FILL)	5.50	D.17
45 010	4.30	9.30	8.10	5.71	2	OVERBURDEN (ALLUVIUM)	6.02	-0.31
3 <u>4</u> 4441	7.49	17.49	13.36	10.97	5	OVERBURĎĚŇ (ALLUVIUM)	10.11	0.86
3MW10	5.00	15.00	8.44	6.05	2	OVERBURDEN (ALLUYIUM)	6.12	-0.07
3MW12	5.30	15.30	9.21	6.82	2	OVERBURDEN (FILL)	6.38	0.44
34/W14	4.80	14.80	7.98	5,59	2	OVERBURDEN (FILL)	6.60	-1.01
3MW 19	5.00	15.00	8.05	5.66	2	OVERBURDEN (FILL)	4.58	1.08
3MW2	7.67	17.67	12.80	10.41	2	OVERBURDEN (ALLUVIUM)	9.49	0.92
3MW20	3.00	13.00	10.45	9.06	2	OVERBURDEN (FILL)	7.12	0.94
3MW21	5.00	15.00	8.70	6.31	2	OVERBURDEN (FILL)	5.33	0.98
3MW3	7.36	17.36	12.89	10.50	2	OVERBURDEN (ALLUVIUM)	9.65	0.65

APPENDIX B.6 SITE 7 - TORPEDO SHOPS SOIL DATA

SUMMARY OF SITE 3 SOIL DATA -AREA A DOWNSTREAM BASEWIDE GROUDWATER OPERABLE UNIT REMEDIAL INVESTIGATION NSB-NLON, GRORON, CONNECTICUT

PAGE 1 OF 1

			r
focation	3SB14S3	[35829D0	3582901
matrix	SB	\$B	SØ
sample	S3SB14S3234	53\$82900911	53\$82901012
depth	32-34	09-11	10-12
sample_date	6/22/00	6/13/00	6/23/00
velidated	TRUE	TRUE	TRUE
cto_proj	312	312	312
proj_manager	CERCONE, O.	CERCONE, D.	CERCONE, D.
Grain Size (%)	· ·		
SIEVE # 10		100	·
SIEVE # 100		94.44	
SIEVE # 200		66.05	
SIEVE # 4		100	
SIEVE ₱ 40		99.07]
SIEVE # 50		38 61	
SIEVE 1-172*		100	
SIEVE W2"		100	
SIEVE 3"		100	
SIEVE 3/4"		100	
S)EVE 3/8*		100	
Miscellaneous Parameters			
BULK DENSITY (LB/CU F1)		112,22	·
PH		6.96	
POROSITY (N)		0.3306	
SPECIFIC GRAVITY		2.59	Ī
TOTAL ORGANIC CARBON (MG/KG)	109_U		123 U

$$112.22 \frac{16}{4^3} \Rightarrow 1.89 \frac{3}{cm^3}$$

$$Conv. = 0.016$$
HACTOIL = 0.016

APPENDIX B.2 SITE 3 - AREA A DOWNSTREAM SOIL DATA

SUMMARY OF SITE 7 SOIL DATA - TORPEDO SHOPS BASEWIDE GROUNDWATER OPERABLE UNIT REMEDIAL INVESTIGATION NSB-NLON, GROTON, CONNECTICUT

PAGE 1 OF 1

location	7\$801
matrix	\$8
utmple	57SB010912
\$\$ 0000	NORMAL
depih	09-12
sample_date	6/13/00
validated	TRUE
cto_proj	312
proj_manager	CERCONE, D.
Grain Stue (%)	
SIEVE # 10	35.38
SIEVE # 100	27 44
SIÈVE 4 200	19.49
SIEVE #4	45.71
ŜIEVE # 40	30.59
SIEVE • 50	29.62
SIEVE 1-1/2	100
SIEVE 1/2"	63,77
SIEVE 3"	100
SIEVE 3/4"	100
SIEVE 38"	58.69
Miscellanapus Parameters	
BULK DENSITY (LBAFT)	98.17
PH	8.33
FOROS/TY[N]	0 3735
SPECIFIC GRAVITY	2 53

$$98.77 \frac{16}{4.3} \Rightarrow 1.58 = 1.60 \frac{9}{cm^3}$$

$$\begin{bmatrix} conv. & = 0.016 \\ FACTOR & = 0.016 \end{bmatrix}$$

APPENDIX B.17
SITE 23 - TANK FARM SOIL DATA

SUMMARY OF SITE 23 SOIL DATA TANK FARM

BASEWIDE GROUNDWATER OPERABLE UNIT REMEDIAL INVESTIGATION NSB-NLON, GROTON, CONNECTICUT

PAGE 1 OF 1

sile	23	23
location	23\$8025	2358045
matrix	SB	SB
sample .	\$23\$802\$0810	\$23\$804\$1012
depth	08-10	10-12
sample_date	6/13/00	6/13/00
validated	TRUE	TRUE
cto_proj	312	312
proj_manager	CERCONE, D.	CERCONE, D.
Grain Size (%)		
SIEVE # 10	87.69	97.51
SIEVE # 100	40.62	39.98
SIEVE # 200	25.12	17,01
SIEVE # 4	92.55	98.70
SIEVE # 40	65.74	87.00
SIEVE # 50	57.20	79.31
SIEVE 1-1/2	100	100
SIEVE 1/2"	98.41	100
SIEVE 3"	100	100
SIEVE 3/4*	100	100
SIEVE 3/8°	97.22	99.57
Miscellaneous Parameters		
BULK DENSITY (LB/CU FT)	90.83	90.75
PH	5.96	7.46
SPECIFIC GRAVITY	2.54	2.68
TOTAL ORGANIC CARBON (MG/KG)	125 U	126 U
POROSITY (N)	0.4263	0.4567

ATTACHMENT B
VAPOR INTRUSION MODELING PRINTOUTS

SITE 2
AREA A UPGRADIENT

RESIDENTIAL

GW-ADV Version 3-1; 02/04	CALCULATE RIS		NOWATER CONC	5 N 1924 *10 N (en	ile: "X" n "YES" bo	x:						
Reset to		YES	L]								
Defaults	CAUCULATE INC	REMENIA, RISK	OR IS EROMACIOAU	GROUNDWAT	ER CONCENTRACE	ON (enter 1x) with YE	5 Box and Amaligrou	i dwaler (ord De :	un)			
		YES		1								
	ENTER	ENTER		•								
		20:03										
	Chemica	groundwaler										
	CASNO	COLG.										
	(Aurobots Only,	ς,										
	na dushes)	<u> </u>	-		_Cremital		•					
	6/663	1 005+00]		C/Hardfarm							
	FNTER	enter Gesin	ENTER	ENTER locals rou	ENTER SCACOLOTO SA SA C	ENTER	ENTER	ENTER	ENTER Sol		FNTER]
MORE	Average	Delow grade			Phickness	Thickness	1		stratum A		disertae" ned	l
•	204.	regularing	Dopin	Trickness	also.	of soil	55		505		5" alum A	
	groundwater	of who osed	below grade	5" 504	SITALUM B	strate + C	siralum	508	So lyde		sc I vago:	1
	iemberature	space foot.	to water table.	51'Ab. ⊤ A	remarkative or 3)	(Entervalue or 0)	directly above	North Lippe	sused is estimate	05	permeability.	
	T ₅	i.e	اما	1 n	~ w	h.	water lable,	directly above	50 vapor		S	i
	i,cı	<u>(ξΨ)</u>	(05)	(on)	1000)	<u> (27)</u>	(Splen A B or C)	www.labie	permeatinity		(cm) ² :	1
	11	15	195	190	3	ι ε	A	st	5.			1
			•			· · · · · · · · · · · · · · · · · · ·					•	•
	ENIER	ENTER	ENTER	ENTER	ENTER	ENIER	ENTER	FMLEK	ENTER	ENTER	GNIER	ENTER
MCRE	Stratum A	Stratom A	Stratum A	Stratum A	Stratum B	Stratum H	Stratum H	Shale # B	Stratom C	Shallon C	Stratum C	Shalon C
_ +_ !	202	solidly	so lotal	softwater-lifed		se! dry	spolicia	son water filled	SCS	Soft Cry	sen lotal	No water/filed
	sor (vae	or, • density	porosity	pares ly	so lyge	bulk density	20105 12	corosity	so Type	pulsidensity	porce ly	porosity.
	. 00 MAD 50-	o _t *	7.	e_*	compare.	P.,*	n ^y	9,3	Cophie Sa	F1 ⁼	r'	9_6
	Parameters ,	(g/am ⁻¹)	(unitless)	$p_0 = 2 c + 2$	Parameters	(5'27' ¹)	<u> pandlessi</u>	Jember 1	Parameters .	(glorn ²)	(40.985)	comband)
						145						
	St	1.60	2 430	2.103	<u> </u>	1.68	0.975	0.054	\$.	108	0.375	0.054
	ENTER	ENTER	CNTER	ENTER	Chten	ENTER	ENTER		ENTER-			
MaR€	Fratakes		Encloses	Freesea		Lieuwari	la dese		Average value			
	space Noor	Smilbldg cressura	space Noor	space Noor	£nclosed space	Floor-walf snam prack	Indoor Sinebahanga		liew rate into clog OR			
	thickness.	differential	ength	4000	Neight	wisth	74:0	Li	ense blank ru dales n	' <u>+</u>		
	Longe	₩.	L ₀	We		₩.	ĖH		C _{io} i			
	(m)	(g/cm/sf)	(cm)	(00)	(57)	[gm1	158		(t.t <u>⊡1</u>			
	15	40	1 1000	1030	744	Gi-		- 1	5			
							7.25	_				
MORE	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER						
<u>i</u>	Awaraging Time for	Averaging Jime lar	Exposure	E promoa	Target risk for	larger hazard						
	carcinogens	noncars-nagers	doration,	Exposore Pequency	sarc-rogens	qualigni for concerprogens						
	Alc	Alag	50 S	Fr.	ra considera	CHT						
	(y*4)	(af5)	(915)	(days/yr)	(40.0458)	(n :'ess)						
							• 1					
	70	32	T_ 20_	<u> </u>	1 05.06	11	l					
							l					

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D _a (cm²/s)	Diffusivity in water, D _w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T _R (°C)	Enthalpy of vaporization at the normal boiling point, \(\Delta H_{\text{o}} \) boiling point, \(\Delta H_{\text{o}} \) (cal/mol)	Normat boiling point. T _B (°K)	Critical temperature, T _C (⁵ K)	Organic carbon partition coefficient. K _{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (ug/m³)	Reference cond , RfC (mg/m³)
1.04E-01	1.00E-05	3.66€-03	2 5	6,988	334.32	536.40	3.98E+01	7.92E+03	2.3E-05	4.9E-02

INTERMEDIATE CALCULATIONS SHEET

Ekposure duration, t	Source- building separation Ur	Stratum A soil air-filled perestly θ_a^A	Stratum B soil a referred perosity 8,8	Stratum C sor- air filled perosity, 82 ⁵	Stratum A leffective lotal fluid saturatium S ₈	Stratum A son intrinsic permeability, k	Siratom A Sor relative an permeability	Stratum A soil effective vapor permeability k	Thickness of cabiliary zone.	Total porusity n capinary zone n _{er}	Air-filled parasity in cap: ary zone 8 _{4.11}	Wafer-Lied poresity in captilary cone. 82-5	Figgra Wor seam perimeter Xi.,
(sec;	(cm)	(cm²:¢m²)	$(am^3(am^3)$	(cm²;çm²)	(cm²/cm²)	(cm ¹)	(am²)	(am^2)	(0.07)	(sm²sam²)	(sm²/cm²)	(cm ³ /cm ³)	(cm)
9.46E+08	175	6 227	032	u 371	C.220	5 94E- <u>09</u>	: Ç &7 <u>9</u>	5 228,09	25.00	I 033	0.010	C_32C	4.000
Oldg. ventration rate. O _{C Assort} (cm ³ .s.)	Area of enclosed space ce ow grade. A ₀ Icm ²)	Crack- lo-tola: grea ratio. 'T (un Less)	Crack depth below grade Z _{con} (cm)	Entharpy of waper zation at ake, groundwaler lemperature AH, 15 (gal/mg/l)	Henry's law constant at avelight condwitter temperature this tarm-m ³ (mot)	identy's law constant at swit groupswater temperature, Tiflis (unit ess)	Vacor viscosity at lave iso: lemperature pris (gitmis)	Stratum A effective diffusion coefficient D'" (com''s)	Stratum 8 effectine diffusion coefficient Cff s (cmf/s)	Stratum C effective diffusion coefficient D**** (0m***5)	Capillary zone effective diffusion coefficient D*** [com**s)	foral overall effective diffusion coefficient Offic (om²/s)	Diffusion path ength, L ₄ (cm)
_1 59€+ <u>94</u>	_1,06E <u>+06</u>	3 77E-04	15	7.544		B 38E-02	1 /6E-04	6 85E-03	D COE∓OC	0 00E • 00	2 <u>48</u> E-05	1_/QE-04	
Convection path rength L ₂ (cm)	Source vapor cond G ₁₉₈₈ (ag/m ¹)	Orack radius foss (cm)	Average valpor flow rate into blog. Chair (cm*15)	Crack effective diffusion cuefficient D ^{ecen} (cm ² (s)	Area of crack, Area (cm*)	Exponent of equivarient foundation. Peuilot rumber, cap(Fe ¹) (and exs)	Infinite squrCe recoor attenuation coefficient u (univess)	of sile sporce bidg consis Chartes (ug-m²)	Unit risk factor URF (pg.m²) f	Relemence cond RfO Img/m³1			
15	8 38E+01	0.10	<u>8 33E-</u> €	6 85E-03	4 C0E+02) 29€+132	6 02F-05	5 035-03	2 3F-05	4 95/02			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater cond (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., {µg/L}	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncardinogen (unitless)
NA NA	NA NA	NA NA	7.92E+06	NA NA	4.8E-08	9.8E-05

MESSAGE AND ERROR SUMMARY BELOW. (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

PRG SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater cond., cardinogen (mg/L)	Indoor exposure groundwater cond., noncardinogen (mg/L)	Risk-based indoor exposure groundwater cond., (mg/L)	Pure component water solubility, S (mg/L)	Final indoor exposure groundwater conc	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
2.10E+01	1.02E+04	2.10E+01	7.92E+06	2.10E+01	NA	NA NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE; The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"

GW-ADV ersion 3 1, 02/04	CALCULATE RIS	KIBASED GROUI	NOWATER CONC	ENTRATION 16	nter x1 - YES bay	el .						
Reset to		YES	OR)								
Defaults —: ——	CALCULATE INC	REVENTAL RISK		AWGZJORO.	ER CONCENTRATI	ON (enter*x1 / 19≣	ST box and in hall group	ruwater condition	DA:			
		ME S	Х]								
	ENTER	ENTER Politic										
	Cremica	groundwale:										
	CAS No	. שרטש										
	(numbers only	C.										
	oc dasnes)	(Jigit)	-		Chemical							
	790±6	9 (05-01			Inch orgethyle	ine.]					
	ENTER	ENTER Depit	ENTER	ENTER Totals m.	ENTER ast add ∪p to yp u• g	ENTER / Lances G28:	FNTER	ENTER	ENTER Soil		ยพายพ]
MORE	Average	se aw grade			îh (kh e ss	Packness	1		stratum A		User-defined	
	70.1	lo pollore	Depth	Thickness	o* sq1	01.50	50	l	SCS		kliajum A	l .
	graundwaler	ul enclosed	below grade	of soil	şiralum B	Shaton C.	\$7:330m	\$05	50 TYCH		\$20 MROOF	l
	ten:perature. T	space Лаон	to water lable	Shatam A		id ried with a set \$1.	2 Wally (20w)	KENTYPP .	a. sed to estimate	3A	permeability.	ļ
	r _s rc	L,	L _{A-1}	h ₁	*s	he	water (able (Catalon Black)	cired: y above	SOL MIDO		4. 'Em'i	}
	101	KA*}	(00)	1 1001	15.44	(SP)	(Enter A_B_or C)	wa <u>t</u> er tabla	permeabody)		2001	1
	'1	15	[.êa	980	0	<u> </u>		5L	s]
	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENIER	ENTEH
MORE	Stratum A	Ѕилъл А	Skarum A	A molece	Stration &	5:ratum B	Stratum &	Sikalom B	Stratum C	Stratum C	Stratum C	Stratom C
	ses	50 BO	sol cala	soul male of the		201 C.A	90 Loxal	sp. w/incfiled	SCS	seldy.	sto (chal	so valentide:
	soliyed	bulk densily.	persect	because	20 (200	Du • densky	301557/ US	porosey.		auth density	ptrosity	porosity
	Cook za Soli Pere natera	c.*	-*	 ٠ .	paurio Sali Perameran	:5 ⁸ .		5-1	Eddend So Foremers	0.5	า์	9,0
		13 (4.5)	(un tiess)	jemíramí)	w	(g.cm).	_> lless.	(Cm/Sm)		1975 m 15	-umiless:	profession in
		1.90) 330	L -03	5	66	<u> </u>	2054	5	'AŞ	2 376	0.054
. MORE	ENTER Endicked	ENTER	ENTER Sholosed	ENTER Encased	ENTER	ENTER	SNTER		ENTER Average vapor			
	spac●	Soil-bldg	space	space	Enclosed	Clookwall	Indzor		Few rate into pida			
—	Rogr	pressure	Поре	100	50808	Searc prack	a / exchange		Ç ₹			
	Phokoess.	o ferental	មកជួប។.	wight.	Feighl,	w 42%	r∂'₹.	L.	Cunne Lianu TO da Gola	i e		
	L., .	5P	La	We	H6	W	ER		O ^D			
	jamı	Ig·cm-s²)	(cm)	(cm)	(CT)	(ser)	(11)		(L.n)			
	13	40	1000	<u> </u>	244	L - 51	0.25] .	<u>-</u>			
MORE	ENTER	CNTER	ENTER	ENTER	EMTER	ENTER						
	Averaging Sing for	Averaging time for	Expasure	Exposure	"arger osk for	Tange (Hadard						
	ancorogens,	. THE 191		frequency	osk far card nogens	qualient for rengare regars.						
	AT _C	AT _{rec}	FD	F:	TH	THQ						
	(45)	(5.22)	(315)	(days yr)	(unitess)	(an DesS)						
	Ti:	30	J 3D	350	1 05.05	1]					
					: Used to calcu	la e r skibasec						
END						cencerivation						

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D _a (cm²/s)	Diffusivity in water, D _w {cm ² /s}	Henry's faw constant at reference temperature, H (atm-m³/mol)	Henry's law constant reference temperature, T _R (°C)	Enthalpy of vaponzation at the normal boiling point, \(\Delta H_{c,b} \) (cal/mol)	Normal boiling point. T ₃ (°K)	Chlical temperature, T _C (°K)	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m³) ⁻¹	Reference cond., RfC (mg/m³)
7.90E-02	9,10E-06	1.03E-02	25	7,505	360.36	544.20	1.665+02	1.47E+03	1.1E-04	3.5E-02

INTERMEDIATE CALCULATIONS SHEET

Exposure duration 7 (Sec)	Source- building separation Un (ont)	Stratum A so archited porosity, θ_a^{-1} (cmf/cmf)	Stratum B soli arr-fined porosity R _s ⁵ (cm ³ /cm ³)	Stratum C soil air-filed porosity, e _a - fomforn?)	Stratum A officiole total fluid saturation Su tomilioni'i	Strature A soil infrinsic permeasility K (cm²)	Stratum A sort relative air permeability, %s tom ² :	Stratum A soil effective valoor permeability k ₁ .cm ²)	Thickness of cabillary zone U ₁₂ [cm]	Total poresity in capillary zone n _G (cm ³ ,cm ³)	Archived porosity or capitally zone by,, (aminomit)	Water-filled povesity in capillary zone #4.4 [cm/] cm/);	Floor- wall seam per meler, X _{ores} (cm)
['946£-08]	175	G 227	0 321	Ü 32*	0 270	1594 <u>5-09</u>	<u>0.879</u>	<u>5_22E-05</u>	25 50	6 33	0.910	0.520	4 000
Eldg. wentilation rate, O _{nergy} (cm ² /s)	Area of enclosed space defow grade A ₉ (cm²)	Crack- to-lotal area ratio tq (uro(2852)	Crack depin de ow grade. Z _{ree} (cm)	Enthalpy of Vaporization at avel groundwater lemograture, URL 15 (colimp!)	Henry's aw constant at ave groundwater temperature Pris (atm-milime.)	Herby's law constant at ave, groundwater temperature, M1-5 (unit ess)	Vapor viscosity at ave. soli temperature visc (grunis)	Stratum A effective diffusion coefficient Officient (cm ² (s)	Stratum g effective d.#Us on coefficient, Offis (cm²/s)	Stratum C effective cliffusion coefficient Dff(c) (omf s)	Capillary 20ne effective diffusion coefficient, D ^{eff} ec (cmf/s)	Total overall effective diffusion coefficient, DT+ (coeffs)	Orfusion cain rength the (cm)
: 69E+04	1.06€+06	3.77€-04		8.544	9 05E-03	2.17E-01	175E-04	5 20E-03	<u>0.00€ •00</u>	, 0 cc5+pp	5 83E-06	Γ 6 12E-05	175
Convection path ength L _v	Source vapor condi, Cour, (ug/m²)	Grack radius, Frake (cm)	Average vapor sow rate role side Q ₄₇ (cm ² /s)	Crack effective diffusion coefficient, Diffin (cm ² /s)	Area of crauk A _{con} (con ⁶)	Expensed of organization foundation Peolet number; exc(Peri) (unit exis)	Infinite source indoor alternation coefficient 9 continees)	ictinde source yildg cenc., C., (yg/m²)	Unic 1955 (actor URF (ug/m²)	Reference condi- RIG stopholic			
15	<u>1.</u> 95 <u>E+02</u>	L. <u>91</u> 0_	<u>8 33</u> E+ <u>01</u>	5 20E-03	4 90E+02	8.41E+1/3	2 T8F 05	4 24E 02	TIEGO	3 5E-02	j		

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor	Indoor	Risk-based	Pure	Final	Incremental Hazard risk from quotient	
exposure	exposure	indoor	component	indoor	vapor from vapor	
groundwater	groundwater	exposure	water	exposure	intrusion to intrusion to	
conc.,	conc.,	groundwater	solubility.	groundwater	indoor air, indoor air,	
carcinogen	noncarcinogen	conc.,	S	conc.,	carciлogen noncarcinoger	1
(μg/L)	(μg/L)	(µg/L)	(µg/L)	(µg/L)	(unitless) (unitless)	_
					<u></u>	_
NA NA	NA	, ŅA	1.47E+06	NA NA	1.9E-07 1.2E-04	_}

MESSAGE AND ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

PRG SHEET

INCREMENTAL RISK CALCULATIONS:

Indoor	Indoor	Risk-based	Pure	Final	Incremental risk from	Hazard quotient
exposure	exposure	indoor	component	indoor	vapor	from vapor
groundwater	groundwater	exposure	water	exposure	intrusion to	intrusion to
conc.,	conc.,	groundwater	solubility.	groundwater	indoor air.	indoor air.
carcinogen	noncarcinogen	conc.	\$	conc.,	carcinogen	noncarcinogen
(mg/L)	(<u>mg/</u> L)	(mg/L)	(mg/L)	(mg/L)	(unit <u>less)</u>	(unitless)
4 69E+00	7.74E+03	4.69E+00	1.47E+06	4.69E+00	NA	NA .

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: The values of Csource and Chuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

DATA ENTRY SHEET

GW-ADV Version 3 1; 02/04	CALCULATE RISI	K-BASED GROUN	OWOD RETAINED	ENTRATION fen	erikin YESibak)						
·		Y∈S]								
Resel to			OR									
Defaults	CALCULATE INC	REDENIAL RISK	S FROM ACTUAL	TAMEROSPO	FRICONCENTRATIO	DN tentar 1X1 in 1YES	Si bokana nia groun	dwaler condite	341			
		YES	X]								
	ENTER	ENTER In tal										
	Chem-cal	groundwater in tal										
	CAS No	care										
	(numbers arriy	C.A										
	no pacres)	(0.5(4)	•		Chemical							
	79016	9 008-01			Trich proethyle	ne						
	ENTER	ENTER Depth	ЕНТЕЯ	ENTER Totals mus	ENTER stacticationalon	ENTER	ENIER	ENTER	ENTER So:	_	ENTER	
MORE	Average	pe ow grade			Prokriess	Trickness			shatun: A		User-defined	
	50 7	rollop o:	Dapih	Thekness	of soil	0" 50	Sal		scs		strature A	
	dionucwa, e.	of gricles an	below grade	0,20	stratum H	stratum Q.	90180.55	508	so Lype		5017800°	
	temparature,	space floor	it water lable	stratum #	(Entervalue or 0)		с часну афрука	softype	(USEC LOWS: TOWN)	CH.	регладобу	
	T <u>.</u> (°C)	la 	LAI	F.	٠.	h ₌ '	water lathe.	олесну жоске			K, uzada	
	(0)	(OT.)	_ +977	<u> </u>	a- , je <u>rol</u>	(cm)	(5nler A 8 or C)	waigritable	perment ty)		(6)5)*1	
	11	15	190	190	0	3		Su	St			j
	ERTER	ENTEH.	ENTER	ENTER	ENTER	ENTCH	ENILR	ENTER	ENTER	ENTER	ENTER	ENTER
MORE	Seaton A	Scratum A	Strature A	Single T A	Stratum B	Stratum B	Statum 9	Skatum 6	Stratum C	Sinstam C	Stratum C	Stratum C
	908	so:dy	59110141	sod water-filled	505	sel dry	sə 79 1a l	Soliwater-fried	5C5	BOIL CTY	sor total	so worker-filled
	so lype	bulk dansily.	роковиу.	corps (y.	Sol Type	buildensity	porosity	porewity.	So Type	train departy	perosity.	porosity.
	(9)4-0 501	P E	'n.	v _e *	. some Ka-	2,6	۲,	9.*	Coords Not	r.c	-'	9,5
	Parameters :	- 19:0 m ³)	(unit res)	(Cm ² cm ²)	Paremeters :	(5 % ± ¹)	(undloss)	(cinferni)	Parameters 1	՝գլտ ² յ	(undess)	remistral)
	st I	1 80	0,330	<u>T0.01</u>	<u> </u>	1 66	0.7%	2,054		1.66	2 375	<u>0</u> 05a
	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER		EKTER			
MORE	Endises		Encrosed	Enclosed					Average vapor			
L_ +	space	Sedualdg	space	\$05° e	Englosed	Figorwall	i-dacr		Cow rare into blog			
	'gor	gressura	100/	100	space	Seam Eleck	arenhanye					
	th akpass	d fierential NP	engir	w Gin	74 Ap.	A 275	rule GA	U	ease toons to (atol. s A	.:q		
	1.01601		-A	N.E.	H _H	. *			O.,.			
	(pm) - Noeloge — v	- <u>1989/95</u> 1	<u></u>	1021		(0.7)		•	<u> </u>	1		
	0I		1200	" מפסי	744	5.1	0.29			,		
MORE	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER						
<u> </u>	Averaging	Averas 19	_	_	Tarçe:	large: Fazard						
	lime 'or	:ma'or	E sposare	Eroosare	ing # for	qualent for						
	paromagens A1-,	noncard regens. ATio	Curation ED	heddency EF	CarOmoryens. Tig	nondar: nogens (MQ						
	1975)	(y/S)	_0/5!	_(tays yr)	<u>.</u> uniless	gun Bess)						
	[30	<u>: [35</u>]	1350	- 0E 06	1						
					Used to carbo	ате нак-базеб						
<u></u> END				l	igroandwaler (i					
							•					

Diffusivity in air, D _a (cm²/s)	Diffusivity in water, D _w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m³/mol)	Henry's law constant reference temperature. T _R _ (°C)	Enthalpy of vaporization at the normal boiling point, \(\Delta H_{v,b} \) (cal/mol)	Normal boiling point, T _B (³ K)	Critical temperature. T _C (°K)	Organic carbon partition coefficient, K _{oc} (cm³/g)	Pure component water solubility, S (mg/L)	Unit risk factor. URF (µg/m³)*	Reference cond RfC (mg/m³)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1,47 É +03	2.0∈-06	6.0E-01

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, ; (sec) .	Source- building separation -1 (om)	Stratum A so air Fled porosity Θ_a^A (cm ² /cm ²)	Stratum 8 soft air filled softsity, e _a ⁿ (cm ²)cm ³)	Stratum C soil air filled peresity, e, ⁿ (cm ³ (cm ³)	Stratum A effective total thuid saturation S _* (om ² (cm ²)	Stratum A soi! intrinsic permeability, X (cmf)	Stratum A Ser refailive air permeability, Kig (conf)	Stratum A soil effective vapor berinead ily, k, (cm²)	Thickness of capillary zone, L _c , (cm)	Total perosity in capitary zone, n _{or} (em ³ (cm ³)	Art-filed perosity in capillary zone θ_{ext} (em^2/cm^2)	Water-Cited peroxity in cap Kary yone $\theta_{a,b}$ (cm^2/cm^4)	Floor- wall seam perimeter X ₁₉₁₃ (cm)
9 46É+C3	176	jC_227	0 321	0.321	0 220	5.948-09	T 5879 T	5 22E-03	25.00	7 633	0010	a 320	4 000
Blog ventration rate G_{police} (orn ¹ /s)	Area of enclosed spage below grade A ₁ icm ²)	Crack- te-total areu rabo ri (unitless)	Chack depth below grade, Z _{obil} (cm)	Enimarpy of supportablication at aveligroundwater temperature AH, 15 (cal/mol)	Henry's aw constant at ave groundwater temperature, (4sy (atm-mil-mol)	Henry's law constant at avergroundwater frequenture. Miss (Lowess)	Vapor Niscosny at avel so Iomouratus (1) (glont-6)	Stratum A offective diffusion coefficient D"cm*is;	Stratum B effective diffusion coefficient O"" 4 (cm" s)	Stratum C effective diffusion coefficient Offic tom ¹ /sy	Capitary some effective outsion could uni D ^M some	Total overall effective diffusion cuefficient, policy icom ² /s)	Offusion path ength, ibs (cnt)
1.695-04	T 1.06€+06	3 776-04	T 15	8,544	5 0 <u>3E-03</u>	2 - 7E-01	76E-34	5 20E-03	G 00E+00	0.00E+6C	8 836 05	6 12E-05	175
Convection path langth, La (cm)	Source vapor cond., C _{rapor} (µg/m³)	Chack radius. Fores (cm)	Average vapor flow rate into bidgi, Great (cm ³ /s)	Chack effective diffusion coefficient, D ^{one} (cm ² /s)	Area of crack A _{rea} (cm ²)	Exponent of equivalent foundation Pecial number, exp.(Per) junifloss)	Infinite source moder afterwall on coefficient) o (unifiess)	icfin.te source 5-dg curic , G ₀₋₂₄₋₄ (pg/m ³)	Unit risk lactor, urer (ug/m²) *	Reference cond . R1C (mg/m ¹]			
15	1, <u>95</u> E•02	I _ <u>0.0</u> _	6 33E+0	5.20E-03	_4.00E+02	8 41E+ 73	2.18E-06	4.24E-03	2 0E-06	5.0E-01]		

___END___

RESULTS SHEET

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen	Indoor exposure groundwater cond, noncarcinogen	Risk-based indoor exposure groundwater conc.,	Pure component water solubility, S	Final indoor exposure groundwater conc.	Incremental risk from vapor intrusion to indoor air, carollogen	Hazard quotient from vapor intrusion to indoor air, noncarcinogen
carcinogen (μg/L)	noncarciπogen (μg/L)	conς., (μg/L)	ς (μ g /L)	conc., (µg/L)	(unitless)	noncarcinogen (unitless)
NA .	NA NA	NA	1.47E+06	NA	3.5E-09	6.8 E -06

MESSAGE AND ERROR SUMMARY BELOW. (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

PRG SHEET

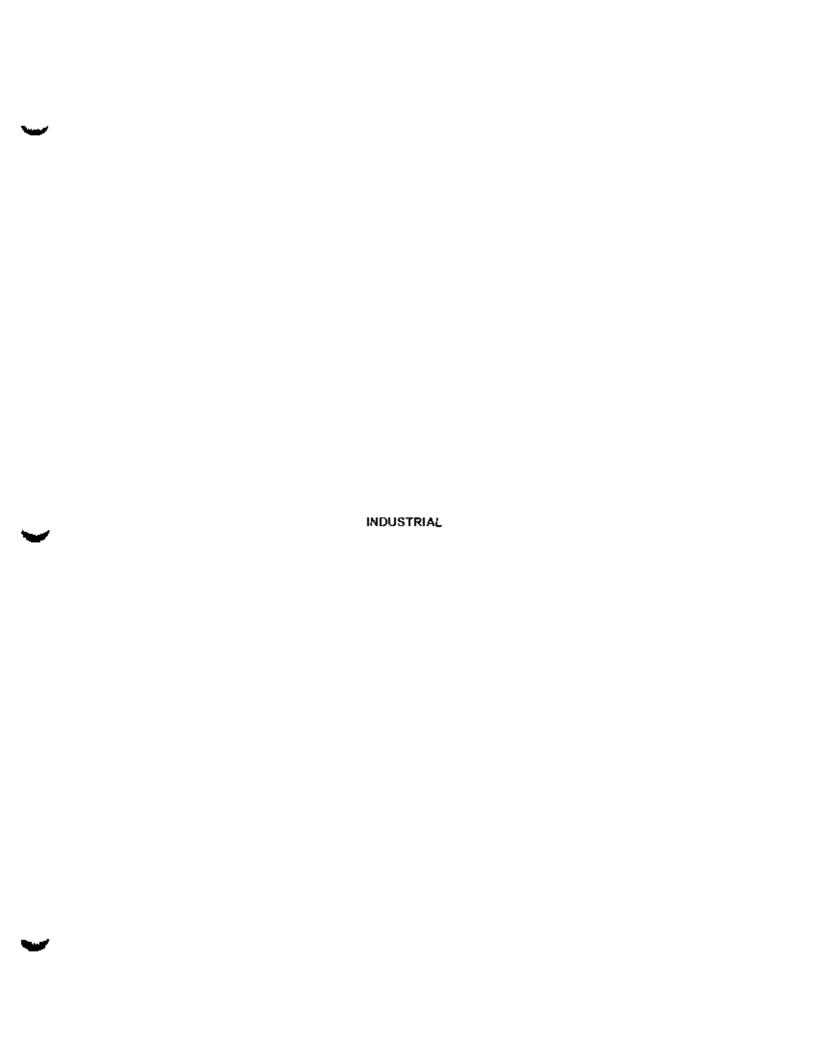
INCREMENTAL RISK CALCULATIONS:

					Incremental	Hazard
Indoor	Indoor	Risk-based	Pure	Final	risk from	quotient
exposure	exposure	indoor	component	indoor	vapor	from vapor
groundwater	groundwater	exposure	water	exposure	intresion to	intrusion to
conc.,	conc.,	groundwater	solubility,	groundwater	indoor air,	indoor air,
carcinogen	noncarcinogen	conc.	S	conc	carcinogen	noncarcinogen
(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(unittess)	(un:tless)
						
2.58E+02	1.33E+05	2.58E+02	1,47E+06	2.58E+02	NA NA	NA

MESSAGE AND ERROR SUMMARY BELOW. (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: The values of Csource and Chuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"



GW-ADV Version 3.1, 02/04	GALCULATE RIS	K-BASED GROUN	IDWATER CONCI	ENTRATION: OF	ror "X" in "YES" box	ı						
77.7		YES.)								
' Reset to j Defaults			OR	CBO: www.tr.z.T	C., 00h/CE+/T0++		S1 Sowand Initial gyour					
	CACCULA E 40	MEMERIA DE MISSE		- GMDE4D1-3(1)	ER CONCENTRALIA	Dalgaler A. a. 16:	a pakang mila gabu	Laweler pout bits	DW)			
		YF S	X	J								
	ENTER	ENTER										
	Charp call	in tal groupswaler										
	CAS No	SENC.										
	inumbers only.	C.										
	no deshes)	(agd,)			Chamica							
	67663	1 COE + 02			Chtereform							
	ENTER	ENTER Dogin	ENTER	ENTER Totals = 1	ENTER sliacă co to vaice o	ÉNTÉR 11 745 G29	ENTER	ENTER	FNTÉR 55.	-	ENIER	
MORE	Average	be ow grade			Thickness	Trickness			Stratum A		User-betined	
¥ _	sor/	io bairam	(2eptn	Thickness	0' 504	al soil	50		\$08		şiralom A	
	G.Dnucowitja.	gt enclased	balon grade	ar sa-1	shalom B.	stratem C.	siratem	SCS	აიი სედი	_	\$5.1 (\$30)	1
	lemperature	space floor	to waler rathe	Shaton A	(Entorivatue or 0)	(Solet value or 0)	directly above	so: type	(used to est mate	02	permeat (v	
	Ϊ <u>ς</u>	L,	-61	٠,	P1.	"c	water table	a really above	se i vapor		*	ľ
	<u></u>	lawj	(cm)	(cm)	icm;	((m)	[Erter A. B. or C]	water table	penne85 (ify)		(cm²)	l .
	11	15	190	195	E .	с	A	SL	Si,			1
		-							. — .			
	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	EN7ER	ENTER	ENTER	ENTER	ENTER	ENTER
MORE	Stratum A	Spalum A	Stratum A	Stratum A	Stratum 6	Stratum B	Stratum 6	Stratoin B	Strature C	Stratum C	Stratum C	Streture C
<u> </u>	805	sol dry	Scali totali	soil water-fried	SCS	sel dry	Soll (Coa)	suri water4, ed	SC5	sor dry	5011014	sociwater-filled
	sad type	bula dens (y	perosity.	oprosity.	50 ly⊅ e	bulk Gens (y.	paros (y.	93105 fy.	501 \y0e	baik Sensily	pores ty	ეცი ინ მე,
	.70000 500	>₀^	۰,*	6	:00*Up \$71	Fo [®]	۰,	6"p	Lookup Sol	70	4,	e,=
	FMarrelets	(g/cm²)	(art !:055)	Kim yipmay	Parameters	(5'em²)	(unitess)	iom ³ (am ³)	Pean#ell	(glami)	(on Fess)	tombers"
	5L	185	3 530	2.10 (ŝ	' 66	0.375	3 054	· s	: 66	0.375	0.054
								1 000-	•	. 40	~ ~ ~ / /	V 41.24
MORE	ENTER Fragsed	ENTER	ENTER Englased	ENTER Enclosed	ENTER	ENTER	ENTER		ENTER Avolige vapor			
, mone	514. Jage:	Sc -c-dg	5D3C6	space	Enclosed.	Fipgr-wa	nsoar		Now rate into bidg.			
	Cook	pressuro	Scor	Neor	500.8	seam crack	a revolution		CR			
	mickness.	g Berential	ergih	W-d-17	heigh!	44200	race.	· ·	coverbrank to carculat	'n		
	No. of the last	Vb.		W _E	٦,	¥n.	Ef		G ₂₀			
	(cm)	jgamsi)	;cm;	(0.77)	<u> </u>	(cm)	(1, 2)	_	$\{1, \pm i\}$			
	[40]		. <u> </u>	<u> </u>	283]	<u> </u>			
MORE	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER						
<u> </u>	Averaging	Averaging			Target	Tange: Nazard						
	time for	time to-	E •posu••	Exposite	-sk for	guar ≠ra lar						
	Carcino yen a	noncard abgless	duration.	requercy Es	Jaro nogens TO	noncaronegers 140						
	AT,	AT _{uc} (_e rs)	50 275	(days yr)	(UF 1 6 55)	140 (5.54685)						
	1975 (14,2)		f-nla isi	ia senaj	'e-senasi						
	70	25	25	250	<u>10⊑</u> 0€	<u>-</u>]					
					Joen to carry	lale hak-bäsed	I					
END						pgnganhal (h	I					

Diffusivity in air. D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m³/moi)	Henry's law constant reference temperature, T _R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,\varepsilon} = \{cal/mol\}$	Normal boiling point, T _B (°K)	Critical temperature, T _C (^S K)	Organic carbon partition coefficient, K _{co} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit nsk factor, URF (µg/m³)*	Reference cond., RfC (mg/m ³)
1.04E-01	1.00E-05	3.66E-03	25	6,988	334.32	536.40	3.98E+01	7.92E+03	2.3E-05	4.9E-02

INTERMEDIATE CALCULATIONS SHEET

Exposure duration ; (sec)	Source- building separation, L- (cm)	Stratum A son air-filled porosity, θ_a^A (pm²/cm²)	Stratum B socil air-filled porosity, g _s ⁸ (um²/um²)	Stratum C soil air-98ed porosity $\theta_{\rm s}^{(2)}$ (om ³ /cm ³)	Stratum A effective toral fluid seluration, S _a (cm ² (sm ²)	Stratum A spil intriosic parmeachity, k tom*1	Stratum A so I relative an permeability, k _a (cm ²)	Straturi A soil offective vapor permeability.	Thickness of capillary zone +cr (cm)	Total perosity in copiliary zone, n _{is} tem ³ /em ³ ;	Air-filled serosity in capitary zone (cm ² /cm ²)	Water-filled porosity in chollary zone. 0, _, 10m²/cm²;	Fluor- wall seam per meter: X _{out} s tom)
7 88 <u>8</u> •08	-75 -	U 277		3 321	c <u>zz</u> o	5 94E-09	0 879	_5,22E-09	<u>2</u> 5 <u>cc</u>]0 <u>33</u>	<u>010</u>	0 320	4 000
Bidg went fatter rate Geogra (cm²(s)	Area of goodsect space be ow grade A ₉ (cm²)	Crack- tektotal area ratro (unitless)	Crack cepth below grade. Z _{cras} (con)	Enthalpy of vaporization at avel groundwater temperature. 2H. 1s. (cal/met)	hienry's aw constant at awe groundwater temperature Mis (atm-m ³ /me)	Henry's law constant of ave: groundwater temperature His (unitless)	Vapor viscosily al ave, so: lemperature .41s (g/cm-s)	Stratum A effective diffusion coefficien; Offic (Confrs)	Stratum Butterive diffusion coefficient O*** (cm*/s)	Stratum C eNective diffusion coefficient, D'" (centis)	Capillary zone officialist deficient, officialist com ² (s)	Total overal effective diffusion coefficient D*** \(\text{(cm*/s)} \)	Officeron path length (cm)
6.92 <u>E+</u> 04	065-06	3 77E-04	<u> </u>	7 544	i1.96E-03	8 28E-02	[1,766 o 4	6.856-03	0.005+00	0 00E+00	2 49E-05	70E-04	175
Convection pain ength L _a (cm)	Source vapor cenc . C _{texts} (µg/m²)	Grauk radius, Secre (em)	Average vacor flow rate into bidg : Q _{not} Iom ³ /s)	Grack effective diffusion coefficient, D ^{coeff} (cim ² /s)	Area of creak A _{crea} (cm²)	Exponent of equivalent foundation Peulel number exp(Pef) (unifluss)	Infinite source indoor alrenualish doefficien) in ini Pessi	Infinite squirte sidg condit Graden (ug/m ³)	Unil risk factor, URF (ug/m²)	Reference loans : RfC (ng/m²)			
15	8 385+01	5.2	5 33E+01	6.85E-03	7 d CCE+02	1 29€+132	1.475-05	1.83E-03	7 3E-05	4 9E-02)		

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater cond., cardinogen (ug/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncardinagen (unitless)
NA	NA NA	NA	7.92E+06	NA	6.98-09	1.7E-05

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

PRG SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

!ndoor	Indoor	Risk-based	Pure	Final	ingremental risk from	Hazard quotient
exposure	exposure	indoor	component	indoor	vapor	from vapor
groundwater	groundwater	exposure	water	exposure	intrusion to	intrusion to
canc.,	cond.,	groundwater	solubility.	groundwater	indoor air,	indoor air,
carcinogen	noncarcinogen	conc.,	\$	conc.,	carcinogen	noncardinogen
(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(unitless)	(unitless)
1.44E+02	5.81E+04	1.44E+02	7.92E+06	1.44E+02	NA	NA

MESSAGE AND ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Coource and Chailding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"

GW-ADV	CALCULATE RIS	K-BASED GROUN	OVATER CONC.	NTWAT CHIE	oter IXT in IYE STippi	•1						
Version 3.1, 02/04				1								
		452	L	l								
Resel to			OR									
Defaults	CALCULATE INC	REVIENTAL RISK	S FROM ACTUAL	GROUNDMAT	ER CONCENTRAT	CN (photos IXI) in 1YE.	Silborand nila glovi	namales cosa iba-)w.			
		YES	(×	1								
				,								
	ENTER	ENTER										
	Green cal	indigt groundwater										
	CAS No	cons.										
	(numbers of y	€,,										
	no dashesi	(594.)	•		Chemica	 						
	79016	5/005/01	1		Thichlorouthy (ne	1					
			J	<u></u>								_
	ENIER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER		ENTER	1
MORE		Geşin		12(3.5 M)	o au aviole de obalita. Unickness				501			
MORE	Average so//	balow grada Ibibottom	Depth	Thekness	of soil	The-ress of sol	Sz:		stratum A SCS		Janaophrea straium A	
	graundwater	of englosed	pelow grade	0F80.4	stratum B	stratum G.	scator.	ses	son lyoe		SO VERPOR	
	Ne≏ peretore.	Strade foo:	(0 wa\0114040.	stratum A.	(Enter value of C)	Entervalue or 0)	directly above	so/ type	iused to estimate	56	permeat 45.	
	T _K	Le	L _A 1	- %	l:n	E,	water lable	piredity above	so! vapor		4,	ł
	(fC)	(cm)	(em)	(cm)	romj	$ \mathbf{g}(\mathbf{r}) $	(Enter All Billor C)	water lab e	permeativity)		(am²)	1
	-1	*5	190			e	A	S,	27	1	-	1
			_								•	•
	ENTER	ENTEA	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	CNTER
MORE	Stratum A	Statum A	Shakum A	Stratum A	Stratum B	5):atom B	Stratum B	Stratom B	Sharem C	Shaturi C	Stratum C	Shatom C
4	505	50 Cdry	50 (0:0)	sod water-bloc		salan	sor total	softwater-filled	SCS	SOUCH	80% IO!#	Sud waters' ind
	Section 6	Bully density	perosity.	acrosiny	501.006	brills density.	perceity.	page 15 dig	30 1/00	bull density	60105/fy	1-002505
	Cookse Su	Pro.		e,*	.S# 30 Sc1	ం_*	-,	6.2	Lookup 501 C	8 a 5	٦.	a _e -
	- Cartamatern	(g-cox²)	(undless)	ichtent)	Parameters 1		unifess)	$\kappa(m^2 \langle m^2 \rangle)$	- Parameters		(Indess)	.cm?(c <u>m</u> .)
	Su	* 60	2 230	2 123	S	: 65	0 375	0.054	5	1 F.=	0.375	0.054
			£	ENTER	5	h						
MORE	ENTER Ensisted	ENTER	ENTER Enclosed	Enriched Enriched	ENTER	ENTER	ENTER		ENTEÄ Average vapor			
, work	20306	Santrag	3,28C÷	ar-wre	Enclosed	Floor-wall	Indoor		few rate into bidg			
	Noor	pressure	Roor	Reer	40800	seam cráck	air eachange		GS			
	Pockness.	differential	teng".	width.	be-gru,	A diff.	a'e.	L	eave orang to calcula	le .		
	L.,,	ĄP.	L _e	V-B	¬n	Va	문제		G.,			
	(em)	iq cm-s/)	;c=;	(cm)	:s=1	(cm)	(1.5)	-	3.7)			
	-0	43	1000	1000	<u>[</u>	121 <u></u> 2	0.03]	5			
	FUZER	5.220	er.zen	ENTER								
MORE +	ENTER Averaging	ENTER Averaging	£MTER	ENIEK	ENTER Taige:	ENTER Target pazant						
·- ·- ·	Long for	Time for	Exposure	Exposure	L14 (0)	deal evi tat						
	paromogens,	noncarumogens	furation	irequency	card regard	nancare regens,						
	4-5	AT _K	€5	Ēč	14	Ç∺1						
	(y/S)	<u>(575)</u>	19751	(days-yr)	Limitess)	(unit #55)						
	79	25	75	<u>j</u> 250	105,04]					
]					
					! Used lo calcu	, aleiriskibased	I					

ENG

croundwater concentration

Diffusivity in air, D _a (cm²/s)	Diffusivity in water, D _w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m³/mol)	Henry's law constant reference temperature, T _R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,z}$ (cal/mol)	Normal boiling point, T _B (°K)	Critical temperature, T _C (^E K)	Organic carbon partition coefficient, K _{oc} (cm³/g)	Pure component water solubility. S (mg/L)	Unit risk factor, URF (µg/m³) ⁻¹	Reference cond RfC (mg/m ³)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	1.1E-04	3.5E-02

NTERMEDIATE CALCULATIONS SHEET

Exposure duration t (sec)	Source- building separation, L- (em)	Stratum A soil an filled perosity $\theta_{q}^{(2)}$ $(cm^{2}(cm^{2})$	Stratum B soil a refided porcycly e _i ⁸ (cm ³ cm ³)	Stratum C soil an-filted porosity e ^C (om ² /cm ²)	Stratum A offective local fluid saturation, S _a (cm ³ /cm ³)	Siratum A soil minisic permeability.	Stratum A sol relative ar- permeability. Signorial	Stratum A soli effective vapor cermeability. k (cm²)	Thicknessic* Capitary Zone Light (cm)	Total porosity in capillary tune turn (cm/sem/s	Air-filled porosity in capillary zone A _{iso} (on-from ²)	Water-filled porosity in capitary agents A _{A cont} to miles and the contract of the contract o	Floor- wart seam per meter, X _{CCD} (cm)
7.886+08	175	5 227	0.321	0.321	0 220	5,945-09	0.872	5 22E-09	25 00	<u> 533</u>	0 010	. D 320	4 000
Bidg. Went after rate. O _{coloo} (cm ² /s)	Area of enclosed space below grade. Ag (cm²)	Crack- to-tolat area ratio () (unless)	Crack depih helow grade, Z ₂₈₈ (571)	Enthaloy of vaponization at aveigroundwater temperature,	Henry's law constant at ave, groundwater temperature, Mrs. (atm-m²/mol.)	Hemy's law constant at avel groundwaler femberature, Mrs (unit ess)	Vapor wscosity at ave soil temperature, urs (g/on-s)	Stratum A effective ciliusion coefficient, D*" 4 (cm*/s)	Stratum B effective diffusion coefficient D*"n (com²/s)	Stratum C effective diffusion coefficient D*** (cm**/s)	Capillary zone effective diffusion coefficient, D ^{**} is (cm ² /s)	Total overali effective diffusion coefficient, D*"- (cm²/s)	Offusion pain length, C ₄ (cm)
6 92E+04	<u>1065+06</u>	3.775.04	15	8.544	5 05E-03	Z 175-01	1.766.04	5.70E-03	, d 00E+00	C 008.+50	8 830-06	6 12E 05	175
Convection path rength, L _y (cm)	Source vapor conc. C _{source} (µg/m²)	Crack radius, fow (cm)	Average vapor flow rate into a dg . (cm²/s)	Crack effective diffusion coefficient, Dress (cm²/s)	Area ol orack, A _{rea} (cmr)	Exponent of equivalent foundation. Peciel number: exp(Peri) (unit ess)	Infinite source indeer altenuation coefficient u (unidess)	Infinite source oldg, cond , Country (ug(m1)	Unitinsk factor URF (µg/m²)	Reference condi- RIC Ingini'i			
15	1 C8E+02	0.10	8.335+01	5 2 0E-03	4.00E+02	841E+173	5.34E-06	5.785-04	1 1E-04	3 5E-C2			

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS

Indoor	Indoor	Risk-based	Pure	Final	Incremental risk from	Hazard quotient
expo s ur o	exposure	ındoor	component	indoor	vapor	from vapor
groundwater	groundwater	exposure	water	exposure	intrusion to	intrusion to
conc.,	conc.,	groundwater	solubility,	groundwater	indoor air,	indoor air,
carcinogen	noncarcinogen	conc.,	S	conc.,	carcinogen	noncardinogen
(μ g /L)	(μg/L)	(µg/L)	(μg/ L)	(µg/L)	(unitless)	(unitless)
						•
NA	NA	NA	1.47E+06	NA	1.6E-08	1.1E-05

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT).

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

PRG SHEET

INCREMENTAL RISK CALCULATIONS:

Indoor	Indoor	Risk-based	Pure	Final	incremental risk from	Hazard quotient
exposure	exposure	indoor	component	indoor	vapor	from vapor
groundwater	groundwater	exposure	water	exposure	intrusion to	intrusion to
сопс.,	conc.,	groundwater	solubility.	groundwater	indoor air,	indoor air,
carcinogen	noncarcinogen	cond.,	S	cond.,	carcinogen	noncarcinogen
(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(unitless)	(unitless)
3.22E+01	4.42E+04	3.22E+01	1.47E+06	3.22E+01	NA	NA

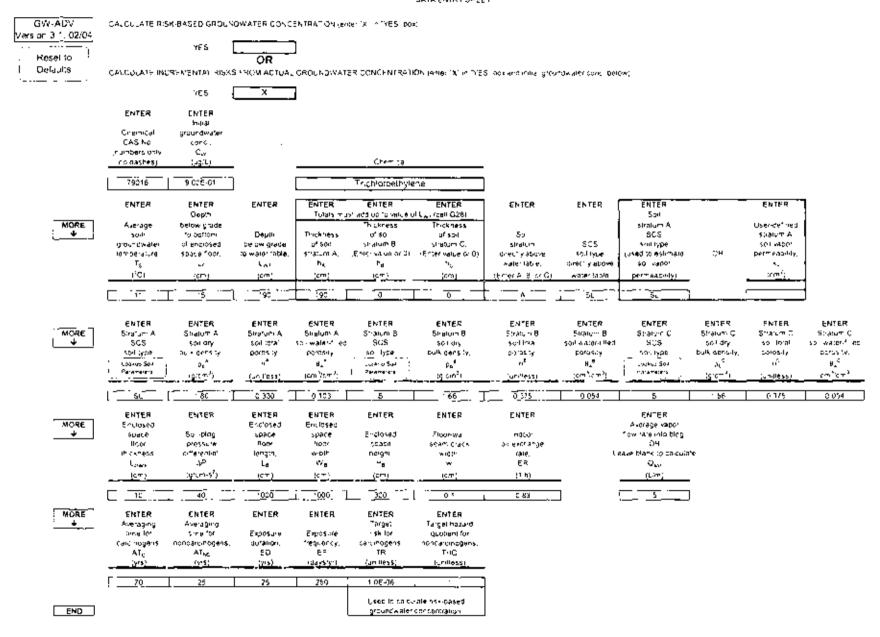
MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: The values of Csource and Chailding on the INTERCALCS worksheet are based on unity and do not represent actual values.

MESSAGE: Risk/HO or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

CATA ENTRY SHEET



Diffusivity in air. D _a (cm²/s)	Diffusivity in water, O,, (cm²/s)	Henry's law constant at reference temperature, H (atm-m³/mol)	Henry's law constant reference temperature, T _R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{ab} = \frac{(cal/mol)}{(cal/mol)}$	Normat boiling point, T _s (°K)	Criticaî temperature, T _C (°K)	Organic carbon partition coefficient, K _{cc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m³)	Reference cond RfC (mg/m³)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1,47E+03	2.0E-06	6.0E-01

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, ; (sec)	Source- building separation (cm)	Stratum A sof arr-filled percenty, e.m./cm/1	Stratum B so: am-filled perosity 8,3 (cm²/cm²)	Stratum C soil airdilled sprosity. Bi ^C (cm ² /sm ²)	Stratum A effective hotal III. d saturation Su tomf/cm²t	Stratum A soil intrinsic permeability, ([cm²]	Stratum A sor relative air conneability k _{in} (cm²)	Stratum A soil effective vapor permeability, K (cm ²)	Thickness of capillary zone kee (orn)	Total porosity in capitary dane, n _e (conform ³)	Air-fided polipsity in capillary cone 8, (um ³ /cm ³)	Water-filled portusity in capillary zione θ_{min} [cm ³]	Floori wal seam conneter X _{eas} , (cm)
7.98€ ∙08	175	0 227	อ วัยี1	0.321	0 220	5 94 6-09	5 879	5.222.09	25 gc	9 33	0 0.0	<u> </u>	<u>4 500</u>
Bidg went 'atron rate, O _{n Lang} (cm ³ -s)	Area of end osed space below grade. A _B (cm ²)	Crack- to-tola- area ratio. n (unit ess)	Crack depth defow grade Zone (cm)	Epiha pylof epportation at avaligroundwater temperature. 2H, 15 (galime)	Henry's law considert all avel groundwater temperature His (alm-m ³ /mol)	Henry's law constant at avel groundwater temperature Hing (unitless)	Vapor viscosily al avel sor remograture urs (glom-s)	Stratum A effective of flusion coefficient Offic (om ² /s)	Stratum 8 effective diffusion coefficient D ¹⁷ 6 (confis)	Stratum C effective c flusion coefficient Offic (ent/s)	Capi lary zono effective diffusion speriorent D**[(cm*/s)	Total overal effective outlinent coefficient, (cm²/s)	Diffusion path length: -e (cm)
€ 92E+04	106E+06	3 77E-04	15	6 544	5-05E-03	2 17E-01	176E-04	5 70E-03	5 C5E-00	0.0cz +50	8 83E-06	6.12E-05	·/5
Convection path length L _u (cm)	Source vapo: cond , C _{souce} (µg'm ³)	Crack radius, Grack (cm)	Average vator flow rate ordgic $O_{\rm rec}$ (cm ² /s)	Chack effective diffusion coefficient, birding [cm²/s]	Arga of crack Asso I cm² I	Exponent of equivalent foundation Poclet number, exp(Pe) junitiess)	infinite source indoor alternation coefficient in (unitiess)	interity source bidg cons. Course (.g/m²)	Uml risk factor, URF (ug/m³)*	Reference cond., R(C (mg/m²)			
15	1 95 € • 02	<u> </u>	<u> 8 3</u> 3E <u>+0</u> t	5 20E-03] 4 90€+02	8.44€+173	1 5 34E C6	1 045-03	3 0E-38	6.02.01	j		

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater cond., (µg/L)	Pure component water solubility, S (yg/L)	Final indoor exposure groundwater conc., (µg/L)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncardinogen (unitless)
NA	NA NA	. NA	1.47E+06	NA	5 1E-10	1.2E-06

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT).

SCROLL DOWN TO "END"

PRG SHEET

INCREMENTAL RISK CALCULATIONS:

					Incremental	Hazard
Indoor	Indoor	Risk-based	Pure	Final	risk from	quotient
exposure	exposure	indoor	component	roobni	vapor	from vapor
groundwater	groundwater	exposure	water	exposure	intrusion to	intrusion to
conc.,	conc.	groundwater	solubility,	groundwater	indoor air.	indoor air,
carcinogen	noncarcinogen	cond.,	S	ропо	carcinogen	noncardinogen
(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(unitless)	(unitless)
1.77E+03	7.58E+05	1.77E+03_	1,47E+06	1.77E+03	NA .	NA NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Coource and Chuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"

SITE 2 AREA A DOWNSTREAM

GW-ADV Version 3.1; 02/04	CALCULATE RIS	K-BASED GROUS	OWATER CONCI	EN" RATION (en	:e47X1 n 1YE5 bay	d:						
Reset to		YES	OR	1								
Defaults :	CALCULATE IND	REMENTAL RISK		GRCUNDW AT	R CONCENTRATI	DN renter IXI to IY85	ii be s and in hall groun	owaler conc. sa	эм)			
		YES	(x									
	FNTER	ENTER Fall #3										
	Chemica' CAS No	groundwater Gene										
	(numbers 0°°).	c*										
	nc dashes	191:	• 1		Chemican							
	79016	2/05/50	J		Trichloroethyle	пе						
	ENTER	ENTER Depth	ENTER	ENTER Potais mus	ENTER Glado ao to value o	ENTER (Lat., cell 528)	ENTER	ENTER	ENTER Sc		FNTER	
MORE ↓	Average spil	perowi grade to notice	Depth	Thickness	Proceess of Son	Thickness of SQ1	Sout		stratum A SGS		User-delined 6%arum A	
	groundwater	of enclosed	te aw grade	of 50-1	51600 B.	straturii C	Straturn	scs	so' lype		\$0 1 vageor	1
	tem gerature 1 ₅	space "gar U	to water table	5"2.LT A		-Entervolue or 0: }	oreofi, above water lable	521',pe	inise©isi eslim∂ie	CR	Sermead ().	1
	.°¢)	(cm)		:c->	Га ;ст:	n _t (sm)	Errer A.B. (r.C.)	divestly altrove water (ability	So vapor permeas by)]
			- '10	10	0	2		•				1
	11	15	-1;	-10		ü	A .	<u> </u>] 84		!	,
	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
MORE	Stratum A	Stratum A	Simple A	Seature A	Strature B	Shalon B	Stratoin 6	Stratum B	Stratum C	Str≢turn C	Strature 5	Shalon C
	SCS sortype	So : Gry bulk density.	so trys. perosity	sod wetard) po- poresdy,	5G5 #0 lype:	suil dry buik censity	solitotal purosty.	Soft water \$1.00 Corosity	5C5 90-1900	SOMETY DO A DECKNY	so librali edinos ly,	spalwater-1+pp pgrase _w
	1.00 FG4	ρ.*	7.	e_^	.00+JG 50+	26	76	a, *	Jun-4: 504	6.6	4c	4.5
	Parameters	(grom ¹)	(or ress)	$(c\sigma^2c\sigma^4)$	Parameters	(g/s/r ³)	:un (655)	,cm²cm²l	Para melana	ig/cm*)	Across	(pm ² /cm ²)
											(unitiess)	
	5L	183	0 330	j" ciās T	s	. 66	D 975	0.54	L5	1 66	<u>(375</u>	0.054
	ENTER		\$ 330 ENTER) T (153 T) ENTER	S	evrer	<u>6 375</u> ENTER	0.54	5 ENTER		_	0.054
MORE	EMFER Enclosed	1 ED ENTER	ENTER Enclosed	ENTER Fociosed	ENTER	ENTER	ENTER] <u> 0.54</u>	ENTER Avaraça vapar		_	<u> </u>
MORE	ENTER	1 83 ENTER Serverag	ENTER	ENTER		·	<i>-</i>	0.54	ENTER		_	0 054
MORE	EMFER Enclosed space	ENTER Scribbig pressure ciferental	ENTER Enclosed Koace Noar 'eng'n	ENTER Enclosed space Hoor width	ENTER Frelasco space reight	ENTER Figor-wall spam crack A diff.	ENTER Incoor a rieschange		ENTER Averaço vapor COR COR COR COR COR COR COR CO	: 66	_	<u> </u>
MORE	ENFER Enclosed space figer (oldeness ence	1 BD ENTER Schlodig pressure cifetenial	ENTER Enclosed space Apar length Le	ENTER Freibred space fleet width Will	ENTER Freibsco space reight	ENTER Floor-wall soam crack A tilt.	ENTER Incoor a revolvange rate. gg		ENTER Average vapor CA enter blank to be cold CC CC CC CC CC CC CC CC CC	: 66	_	6 054
#PONE	ENFER Enclosed space figer (o-puness	ENTER Scribbig pressure ciferental	ENTER Enclosed Koace Noar 'eng'n	ENTER Fociosed space Hoor width Mill (27)	ENTER Frolusco space reigh! if- tomy	ENTER Floor-wall soam crack A diff. (cm)	ENTER Liggor ar exchange role, ER		ENTER Average vagar Lawrate into aldg GR eave thank to be votal GC (Jm)	: 66	_	5 054
₩ONE WONE	ENFER Enclosed space figer (oldeness ence	1 BD ENTER Scholdg pressure cifetenial	ENTER Enclosed space Apar length Le	ENTER Freibred space fleet width Will	ENTER Frolusco space reigh! if- tomy	ENTER Floor-wall soam crack A tilt.	ENTER Incoor a revolvange rate. gg		ENTER Average vapor CA enter blank to be cold) CC CC CC CC CC CC CC CC CC	: 66	_	5 054
· MORE	ENFER Enclosed space figer (necessarial figer) 100 ENFER	1 83 EINTER Schledig pressure cifetenial AP Igicm-sft 40 EINTER	ENTER Enclosed space floor length Le tomy	ENTER Fociosed space Hoor width Mill (27)	ENTER Frelasco space reight in jorn 244 FATER	ENTER Floor-wall soam crack Alth w camp	ENTER Liggor ar exchange role, ER		ENTER Average vagar Lawrate into aldg GR eave thank to be votal GC (Jm)	: 66	_	5 054
	ENFER Enclosed space floor provides for: for: fig ENFER Avening ng	1 BD ENTER Sort-brag pressure cifetential AP ligicm-sft 40 ENTER Alexaging	ENTER Enclosed Food Food Food Food Food Food Food Fo	ENTER Findinged space floor width Viri (27) 1000	ENTER Findasco space reight the complete comple	ENTER Floor-wall soam crack A din. % (cm) Chief Chief Targe: hazard	ENTER Liggor ar exchange role, ER		ENTER Average vagar Lawrate into aldg GR eave thank to be votal GC (Jm)	: 66	_	5 054
· MORE	ENFER Enclosed space figor (blooms service) 100 ENFER Awaging benefits for care aggers	1 80 ENTER Schlotag pressure cifecterial AP Igionsfil 40 ENTER Aleraging mellor concator ogens	ENTER Enclosed sonce floor length Le ISTN TUDO ENTER Expassive dutation	ENTER Forcised space floor with Will 1000 TOSC ENTER Extensive Inspects	ENTER Finclasco space reight right space 1000 FATER Target risk for card indigens,	ENTER Floor-wall soam prack A dift, w (cm) CNTER Target hazard quaters for	ENTER Liggor ar exchange role, ER		ENTER Average vagar Lawrate into aldg GR eave thank to be votal GC (Jm)	: 66	_	5 054
· MORE	ENFER Endosed space figor (hoponess figor) 1 10 ENSER Averaging benefits for care sogens ATE	1 80 ENTER Schlodg pressur cifecterial AP ig chisfi 40 ENTER Aleraging the for	ENTER Enclosed sonce Approximation Le ISTN TODO ENTER Expassive duration SD	ENTER Facioned space Boor With Via (CT) 1000 I ENTER Excessive Inspective EF	ENTER Finclasco space reight id- (0m) 284 FAITER Target risk for cartingens, INC	ENTER Floor-wall soam crack A din. w (cm) CNTER Target hazard quotent for noncores THU	ENTER Liggor ar exchange role, ER		ENTER Average vagar Lawrate into aldg GR eave thank to be votal GC (Jm)	: 66	_	5 054
· MORE	ENFER Enclosed space figor (blooms) forth ENFER Avenue for the for	1 80 ENTER Schlotag pressure cifecterial AP Igionsfil 40 ENTER Aleraging mellor concator ogens	ENTER Enclosed sonce floor length Le ISTN TUDO ENTER Expassive dutation	ENTER Find space floor width Will 1000 TODO ENTER Expective Frequency E7 (page yr)	ENTER Findaseo space neight in the community of the comm	ENTER Floor-wall spam prack A diff, w (cm) CHTER Target hazard guozent for noncaro negens field unitless:	ENTER Liggor ar exchange role, ER		ENTER Average vagar Lawrate into aldg GR eave thank to be votal GC (Jm)	: 66	_	5 054
· MORE	ENFER Endosed space figor (hoponess figor) 1 10 ENSER Averaging benefits for care sogens ATE	1 80 ENTER Schlodg pressur cifecterial AP ig chisfi 40 ENTER Aleraging the for	ENTER Enclosed sonce Approximation Le ISTN TODO ENTER Expassive duration SD	ENTER Facioned space Boor With Via (CT) 1000 I ENTER Excessive Inspective EF	ENTER Finclasco space reight id- (0m) 284 FAITER Target risk for cartingens, INC	ENTER Floor-wall soam crack A din. w (cm) CNTER Target hazard quotent for noncores THU	ENTER Liggor ar exchange role, ER		ENTER Average vagar Lawrate into aldg GR eave thank to be votal GC (Jm)	: 66	_	5 054
· MORE	ENFER Enclosed space figor (blooms) forth ENFER Avenue for the for	ENTER Scribbidg pressure of research at AP (19 cm-sf) (19 cm-sf) (19 cm-sf) (19 cm-sf) (19 cm-sf) (19 cm-sf) (19 cm-sf) (19 cm-sf) (19 cm-sf) (19 cm-sf) (19 cm-sf) (19 cm-sf) (19 cm-sf) (19 cm-sf) (19 cm-sf) (19 cm-sf)	ENTER Enclosed soace floor length Le istry 1000 ENTER Exposure duration FO (yes)	ENTER Find space floor width Will 1000 TODO ENTER Expective Frequency E7 (page yr)	ENTER Findasco space reight reight reight factor 244 FAITER Target risk for cardingless THE (united September) THE (united September)	ENTER Floor-wall spam prack A diff, w (cm) CHTER Target hazard guozent for noncaro negens field unitless:	ENTER Liggor ar exchange role, ER		ENTER Average vagar Lawrate into aldg GR eave thank to be votal GC (Jm)	: 66	_	5 054

Diffusivity in air. D _a (cm²/s)	Diffusivity in water, D _w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m³/mol)	Henry's law constant reference temperature. T _R (°C)	Enthalpy of vaporization at the normal boiling point,	Normal boiling point, T ₉ (°K)	Critical temperature, T _C (^a K)	Organic carbon partition coefficient, Koc (cm³/g)	Pure component water solubility, S (mg/L)	Unit risk factor. URF (µg/m³) ⁻¹	Reference conc RfC (mg/m ³)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.475+03	1.1E-04	3.5E-02

INTERMEDIATE CALCULATIONS SHEET

Exposure duration : (sec)	Source- building separation. Un (cm)	Stratum A soil and ed potosity, 9,* (cm ³ /cm ³)	Swalum B soil emfiled perosity, e _s ^a (cm ³ (cm ³)	Stratum C soi: a r-firled perestry, u _s c (cm ³ /cm ³)	Strutum A effective tolal fluid saturation, Su (om ³ cm ³)	Stratum A soil introsic sermeability. K (cm²)	Stratum A ser religion air permeability kilo (cm²)	Stratum A soil elfective vapor permeablity, k, (cm²)	Thickness of capitary Zune.	Tota prinosity in capitary zone, for compression	A reflect percently in captillarly zone. $\theta_{t/r}$	Water filled parcs by in capillary come. ###################################	Floor- wall seam perimeter, X _{max} (s=)
9.46E+68		0 227	0.321	0.32:	0.220	5 94E-CŞ	D 879	5.226-09	25 00	0.33		0.320	4.000
Blog. ventiation rate. Orugia 	Area of enclosed space below grade. A ₈ (cm ²)	Crack- toktola area ratio, "I (Lint ess)	Grack depth below grade. Z _{erana} (um)	Enthalpy of vaporization at awe, groundwater temperature that is [tellmot)]	Herry's aw constant at avel groundwaler tomperature this tomorrhimals	Menry's aw constant at avel groundwater temperature. Hirs quortless)	Vapor viscos ly al avel goli temperature, ans (y'emis)	Stratum A effective diffusion coefficient D*"4 toem*(s)	Siretom 9 effective diffusion coefficient 0""; (cm²-s)	Stratum C effective of ffusion coefficient, D ^{eff} e (cm ² /s)	Capitary zone effective diffusion coefficient, D*1; (cmf.s)	Total uverall effective diffusion does on the control of the contr	Offusion path engit: -J (cm)
69E+ <u>C4</u>	I 06E+08	3 77E-04	15	8 544	\$ 058-03	2 17E-01	1.7€€- <u>04</u>	5 20F-Q3	5 CDE+00	000000	8 83E-0\$ ₹.	3 346-65	95
Convestion path ength. L _a (cm)	Source vapor cone , Couve (µg/m²)	Grack radius r _{ode} (cm)	Average vapor Fow rate into pldg . Q _{1,0} (cm ³ /s)	Crack effective diffusion coefficient Diffus (corf ² (s)	Area or crack Acas (cm²)	Exponent of equivalent foundation Pociet number, exp(Per) (unitless)	lof inte source ndoor attenual or coefficient & (un l'ess)	intraile source leidig condit. Georgia (ug/m²)	Unit hisk factor URF (ugm²) '	Refurence cont . RIC (mg/m²)			
15	4.33E+02	0.10	B 33E+01	5 20E-00	4 CCE+02	8 41E+173	2 19E-05	9.48E-03	1_1E-04	3 5 E - 32]		

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)	Incremental risk from vapor intrusion to indoor air, carcinogen (Unitless)	Hazard quotient from vapor intresion to indoor air, noncarcinogen (unitless)
NA	NA NA	NA	1 47E+06	NA .	4.3E-07	2.6E-04

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT).

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

PRG SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor	Indoor	Risk-based	Pure	Final	Incremental Hazard risk from quotient
exposure	exposure	indoor	component	indoor	vapor from vapor
groundwater	groundwater	exposure	water	exposure	intrusion to intrusion to
ÇONC.,	conc.,	groundwater	solubility,	groundwater	indoor air. indoor air,
carcinogen	noncarcinogen	conc.,	S	canc.,	carcinagen noncarcinagen
(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(unitless) (unitless)
4.67E+00	7.70E+03	4.67E+00	1.47E+06	4.67E+00	NA NA

MESSAGE AND ERROR SUMMARY BELOW. (OO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Capurce and Chailding on the INTERCALCS worksheet are based on unity and do not represent actual values.

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

GW-ADV	CALCULATE RIS	K-BASEO GROUN	DWATER CONC	ne: MCI (ASTM	ler ixtor MESt bo)=1						
Version 3.1, 02/94		YES		1								
Reset to		'E3	OR	1								
Defaults	CAUCULATE INC	REMENTAL RISKS	•	GROUNDWATS	S CONCENTRAT	ON (enter X) in ME	5° borrandin hat grou	ngwaler condiden	DW1			
-· ——- —·		i	, ,.	1								
		νE5	X	J								
	ENTER	ENTER										
	Chemical	n (la) gmunewaler										
	CAS No	conq.										
	(numbers (hily, no dashes)	ნ <u>"</u> (ლენ;			Chamica							
			I									
	79318	7.005+00		i	Trichloroethyl	en e						
	FNTER	ENTER	ENTER	EMTER	EN7ER	ENTER	ENTER	ENTER	ENTER	 -	ENTER	ו
MORE	Average	Depir		Total 5 imp	Stadd up to value : Thickness	of two (cell G28) Thickness	ı		So shalum 4		Usor-da ^a had	1
₩.	50 /	belőw grade To bollom	Jeath	Thickness	of Soil	ol sor	Seil		503ICT 4 509		Straitur A	
	groondwater	of enclosed	below grade	a[30	stratura B.	sirat∟ ± C,	ישר.פיונג	SCS	so lype		50137201	1
	remporalure.	space Boor	io warer lable.		(Enter value or 0)		∂ гес⊓у аво∨о	50 type	Jused to estimate	OR.	permaubility.	
	T ₆	li .	L-w-	٠,	^•	r _c	water table.	a restly above	sof valuer			1
	(°C)	(CT)	(5.05)	(siñ)	(cm)	<u> </u>	(Eyler A. B. or C)	wale table	germeability)		[Em.]	1
	- 11	15	110	100	. 0		A	<u> 5.</u>	S.	<u> </u>		1
	ENTER	ENTER	ENTER	ENTER	SHISH	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
MDRE	Stratum A	Smaller A	Stratum, A	Straig# A	Stratum B	Зивыт В	Straton R	Seation B	Stratum C	Sharem C	Sharum C	Straight C
	808	ናው! ር ጥ	soliola	softwater/ en	SCS	sou dry	50-100	45 water-hild	SC\$	10 dm	so Intal	No water/ led
	- salipe	bulk density.	peras/y	9_f parestly	50- (y30-	bu k gensky ve ^s	oprosite T	notos (γ 6_ ^m		20. A pensity	pares ly, n [©]	norosky e _s tr
	Joseph SC4 Polymeriers	ი, " (ე აო ⁽)	iuri"essi	'em' em';	. Council State			'ടത്തേ'ട	Personalism	04 (g/am ³)	(unitess)	ismijomiji
		10001	13.1 6331		 -		16.70°ESS1			<u></u>		
	SL	1 90	0.032	0.00	5	: 66	5,375	0.054	<u> </u>	1.66	0.375	2.754
	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER		ENTSA			
MORE	Fr(a s ⊕a		Enclased	Enclosed	_	a			Average valuer			
لىپ	space floor	Sol-5/dg pressure	space foor	#501	Enulosed space	Ficar-wall seart crack	Indecr on exchange		flaw rafe into bidg. CR			
	'h chness	d Ferential.	le rgit	w 10).	heigh).	width.	ra'e	L ₄	eave blank to calcula	s:e		
	۱ _{۲۰} ۰۰۰	4P	-8	₩A	-1 _B	Vm	Ea		Q.,			
	(cr)1	(तु'दक्तरी	/cm)	(cm)	(sm)	(cm)	i 1/m]	_	(J./m)			
	15	40	1500	1500	244	I 01	0.78])		
MORE	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER						
. 4	Averaging	Averaging	CHILI	Livies	Target	Targel Hazard						
<u> </u>	tern a for	prone for	Exposité	Esposure	risk for	quotient for						
	Card ribgens.	noncarchagens.	duration.	Programa	carcinogens.	rondaruniogens						
	AT ₀ (5/3)	AT _{eC} Graf	ED (visit	EF (0ays/yr)	TR 1057-6991	TMQ (Unillass)						
							,					
	[7 <u>0</u>	30	30	350	108-05	1	!					
END				I		ulaid hsk-based richtoerolgaden						
					and a series	Car Switzenson						

Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m³/mof)	Henry's haw constant reference temperature, T ₄	Enthalpy of vaporization at the normal boiling point. ΔH _{v.5} (cal/mot)	Normal boiling point, T _a (°K)	Critical temperature, T _C (^e K)	Organic carbon partition coefficient, K _{3c} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m³) ⁻¹	Reference conc., RfC (mg/m ³)
7.90 E -02	9.10E-06	1.03E-02	25	7.505	360.36	544.20	1.66E+02	1.47E+03	2.0E-06	6.0E-01

NTERMEDIATE CALCUI ATIONS SHEET.

Exposure duration, I	Source- building separation, U ₁	Stratum A soil an filled percenty, a (cm//cm/)	soil artified parasity, p. 8	Stratum C so a.r.fulled porosity, e _s C remitemin	Stratum A effectiver total fluid talluration, Sa tomition it	Stratum A soli ntrinsic permeability k, (cm²)	Shatom A 501 relative air pormeability, Mo- tom ² ;	Stratum A so effective vapor permeating, k, (cm²)	Thickness of capitary zone. Ly, (Cm)	Total poresity in capillary zerio [13]	Air-1 led porosity in capit ary zone, Barz (cm ³ /cm ³)	Water-I fed porcestly in capit any cone. Security in cone. Security in cone.	Floor- wall seam perimpter X _{met} (cm)
9 46E · C8	95	0 22/	[c.321]	0 321	0.220	5 94E-09	0.879	5 328-09	25 00	0.33	0.010	C 320	4 500
Bidg ventration rate, O _{bsess} (om ⁵ /s)	Area of enclosed space below grade, A _B (cr1 ²)	Crack to-tola- area ratio. n (unilless)	Crack depth befow grade, Zown (cm)	Enthalpy of vaporization at avel groundwater temperature, LtH _{end} (calmot)	Hearry's (aw constant a) aveligroundwater temperature, http: (atm-m ² /moi)	Henry's law constant at avergroundwater temperature. H'rs (see Pess)	Vapor vistos (y at avel so ternograture Pra (grom-s)	Stratum A effective diffusion coefficient D*** [cm*/s)	Stratum B offective diffusion coefficient D*"s (cm*'s)	Stratum C effective diffusion coefficient D''' (cm'/s)	Capillary zone effective oiffusion coefficient, D***; (cm*2(s))	Total overall effective diffusion coefficient, $\mathcal{D}^{\bullet,+}$, $(\mathbb{R}^{n-2})^*$ s)	Drius on path ength, t _{et} (cm)
1.695+04	1.06E+06	3.77 E- 04	[[5]	8 544	5 C5E-C3	2 t7E-01	1.76E-04	5.25E-03	0.00E+20	<u>0.00</u> E+00	8 835- <u>26</u>	0.34E-05	95
Convection path length, L _p (cm)	Source vapor conditions (ug/m²)	Orack radius folse (cm)	Average vapor flow rate into blog. Qual (cm ² /s)	Crack effective diffusion upefficient, Cores (confist	Area of crack, Averaged	Exponent of insured entition delication Peo'el number, exp(Pe') (unitiess)	In(p.ta source indoor attendation coefficient (coefficient)	Infinite source bidg, cordin Crussa [pg/m²]	Unit risk factor URF (ug/m²)	Reference cond . RfC (mg/m ³)			
15	4 33E+02	<u>0 10</u>	8 33E+01	5.20E-03	4 006+02	8416+173	2 19E-05	9 488-03	2 0E-DB	6 02-01			

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater cond., noncardinagen (µg/L)	Risk-based indoor exposure groundwater cond (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to Indoor air, noncarcinogen (unitless)
NA.	NA	NA	1.47E+06	NA	7.8E-09	1.5E-05

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

PRG SHEET

INCREMENTAL RISK CALCULATIONS:

					incremental	Hazard
Indeor	Indoor	Risk-based	Pure	Fingl	risk from	quotient
exposure	exposure	indoor	component	indoor	vapor	from vapor
groundwater	groundwater	exposure	water	expasite	intrusion to	intrusion to
cone.,	conc.,	groundwater	solubility,	groundwater	indoor air,	indoor air,
carcinogen	noncarcinogen	conc	5	conc.	carcinogen	noncardinogen
(mg/L)	(mg/L)	(mg/L)	(mg/E)	(mg/ <u>L)</u>	(unitless)	(unitless)
2.57E+02	1.32E+05	2.57E+02	1.47E+06	2.57E+02	NA	NA NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: The values of Csource and Obuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"



GW-ADV	CALCULATE RISE	K-BASED GROUN	DAATER CONCL	ENTRATION (e)	i¢r 'X" n 'YE5' tor	r;						
Version 3.1, 02/04 Reset to Defaults	CALGULATE INCI	YES REVENTAL RISK:	OR S FROY ACTUAL	GROUNDWATE	ER GONCENTRATI	ON jerter (X) in 1YES	S coverd nite gra.:	nwalarcond bel	ow)			
		158	Х]								
	CNTER Chemical CASING (numbers 05kg, no dashes)	ENTER Inical ground water cond. CA (ug.t.)			Chom.ca:							
	79016	2 00E+00	1		Trichioroethyte							
MORÊ	ENTER Average	ENTER Depin De ow grade	ENTER	ENTÉR Torais mu	ENTER stadd up to your : The camess	ENTER	ENTER	ENTER	ENTER Sol Solet A		ENTER]
<u> </u>	56 / groundwater temperature T _S /FC:	io ballom of enclosed space floor. Ur (cm)	Depth bolow grape to water lable, but (cm)	Thickness of soil stratum A, n _d (cm)	of soil stratum B.	of so: stratum C (Sider value or C) Pg (cm)	Soli sitetara Orectiy above water table, (Eller Al Billor Co	SCS so Hybe directly above waterragia	SCS so lyde rused to estimate soll vapor parmeability!	GR	Strature A Soft values permeability A, (Cot ²)	
	<u> </u>	15		1:0	o ···		j.	i St	5			}
MORE,	ENTER Shallon A SC5 504 Iyu0 .conp Sol	ENTER Stratum A s> dry bulk density 0, typesity	ENTER Shelom A solitoral parasity, f	ENTER Statum A so water/led cordsty enter/lemicemic	ENTER Stratum B SCS Scall (gan Connection	ENTER Spaller B Spaller B Spaller Spaller Spaller Spaller Spaller	ENTER Shotum B so total consists *** *** *** *** *** *** *** *** ***	ENTER Shelten B so I water-filled parosty, op ^b fom ¹ cm ³ [ENTER Sharper II SCS softype toxio SA Perantus	SMIFR Shappy C solicity sulk density of chemistry	ENTER Stratum C solitotal portosity, n ² unilessi	ENTER Shallon C so warenfiled porosity. e_f _cm_lcm_h
		189	0.330	0.63	2	165	· 6 378	0.054	. 5	: 86	2.375	0.054
MÖRE	ENTER Entrosed Space Food In oktays Upp. (cm)	ENTER Soll-blog pressure criterale. 3P ligromisi	ENTER Endicased space floor length Us (cm)	ENTER Proloted space floor elight, Why (cm)	FATER Endicated space naight, hy	ENTER Floor-wall seath 6/204 width # (4/25)	ENTER Indoor all exchange rate ER (1.1)	į.	ENTER Average vacci Toward encoping OR Read Norwing calquer Co. (Um)	~e		
	[45	1000	100g	300	<u> </u>	0.82	2	5			
MORE	ENTER Awaraging time for cardinogens AT _C (98)	ENTER Averaging Historia noncaronogens Afric (yts)	ENTER Exposure curation EC tyrs)	ENTER Exposure frequency, EH (caysh):	ENTER Larget nosk for cardinagens LER [United St	ENTER Taight hazard quotish for hondard hogers, THO junifessi						
	70	75	25	253	: 0E-26	•						
END				Į		rata riyk-qaşeç Coricentfátrofi						

Diffusivity in air, D _a (cm²/s)	Diffusivity in water, D _w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T _R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,z}$ (cal/mol)	Normal boiling point, T _g (°K)	Critical temperature, T _C (°K)	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor. URF (ug/m³)	Reference cond RfC (mg/m²)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	1,1E-04	3.5E-02

INTERMEDIATE CALCULATIONS SHEET

Exposure dural-on t [sec]	Source- building separation, Ex (craf	Seasum A se air to led peresity. the com ² cm ² cm ² cm ²	Stratum 8 soil air-loied perosity, θ_{\bullet}^{-1} (cm^2/cm^2)	Stratum C spil arr4/led perosity, A _s ^C (cm ² /cm ²)	Stratum A effective total fluid saturation, Su (cm//cm²)	Stratum A scir intrinsic permeability k (cm²)	Stratum A sold relative air permeats ily k _{in} (cm ⁴)	Stratum A soil effective vapor permeability. k, (cm²)	Thickness of Cap: Pary zone, Herricans	Toral parosity in Capitary zone n _{ct} (cm²/cm²)	Antilited porosity in capitary zone, (cm²/cm²)	Vrater-filled perosity in papiliary zone e _{= 14} rein/cm ²)	Floor- wa seam cerimeter, X. ₁₆ ,4 (cm)
7 88E+08	95	0 227	G 321	0.321	<u>C</u> 2 <u>2C</u>	5 94 E-09	0 879	5 225-09	25 CO	0 33	300	0 320	4.000
5 dg. ventration rate Og. _{sens} (cm ^o is)	Area of enclosed space below grade A_2 (cm²)	Crack- to-total area ratio, ft (unitiess)	Crack depth below grade, Z. ps (cm)	Enthaipy of vaporization at ave. groundwater temperature. ΔH _{ATS} (cal/mol)	Herry's low constant at ave groundwater temperature, His tatim-m ³ (mol)	Henry's law commant at overgroupswater temperature, Hins typ11ess)	Vapor viscos ly al avel soil temperature. Prs (grom-s)	Stratum A offective diffusion coefficient D''' (omit(s)	Stratum B effective d Musich coefficient Offic (coefficient)	Shatum C offectival diffusion spefficient B ^{MI} ₅ (cm ² /s)	Capulary zone effective diffusion coefficient D**: [pm*/s]	Total overal coloring diffusion coefficient D ^{eff} (Com ² /s)	Diffusion path ength, L ₂ (cm)
6.92E+04		<u>] 3 77E-04</u>	15	8 544	1 <u>5</u> .05 <u>E-0</u> 3	2.1/E-01	1 75E Q4	5 20E-Q3	0 <u>956</u> +60	0.0028-00	8 836-95	3 34E-05	55
Convection path 'ength Lo	Source vapor condi, C _{hiling} , (Ipg/m ²)	Crack radius. ************************************	Average vapor Low rate into bidg , Q_{404} (cm ³ /s)	Crack effective diffusion coelficient D ^{crac} (cm ² /s)	Area of crack, A _{cons}	Exconent of equivalent foundation Peo et number, exp(Po ¹)	infinite source indoor altenuation coefficient u (unitless)	nfinite source bidg conc., Couve (ug/m³)	Uart risk factor URF (ug/m²) ¹	Ruferenue conc RfQ (mg/m²)			
15 END	4.33E+C2	<u>, 0 10</u>	8.33E+01	5,20E-03	4 00E+02	841E+173	S 38E-06	2.32E-G3	1 (E-04	3 55-02]		

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor	Indoor	Risk-based	Pure	Final	Incremental risk from	Hazard quotient
exposure groundwater	exposure groundwater	indoor exposure	component water	indoor exposure	vapor infrusion to	from vapor intrusion to indoor air.
сопс., carcinogen (µg/L)	conc noncarcinogen (µg/L)	groundwater conc., (μg/L)	solubility, S (µg/L)	groundwater conc., (μg/L)	indoor air, carcinogen (unitless)	nencarc:nogen (unitless)
NA	NA NA	NA NA	1.47E+06	NA NA	6.3E-08	4.5E-05

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

PRG SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

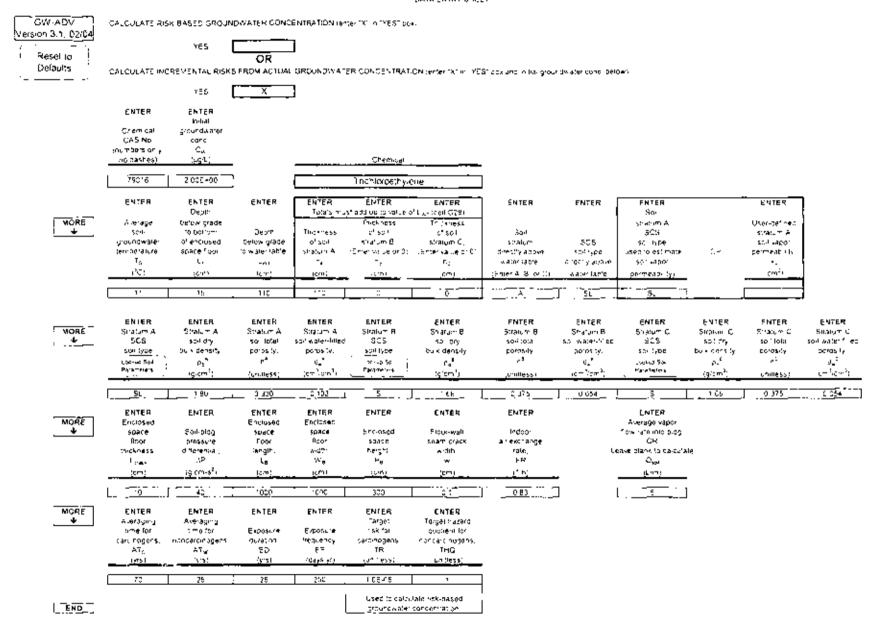
Indoor exposure	Indoor exposure	Risk-based indoor	Pure component	Final indoor	ingremenja) risk from vapor	Hazard quotient from vapor
groundwater	groundwater	exposure	water	exposure	intrusion to	intrusion to
conc	conc	groundwater	solubility	groundwater	indoor air.	indoor air.
carcinogen	noncarcinogen	cond	S	conc	carcinogen	noncarcinogen
(μg/L)	(ug/L)	(µg/L)	(μg/L)	(µg/L)	(unitless)	(unitless)
3.20E+01	4.40E+04	3.20E+01	1.47E+06	3.20E+01	NA NA	NA "

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT).

MESSAGE: The values of Csource and Coulding on the INTERCALCS worksheet are based on unity and do not represent actual values.

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"



Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Henry's law constant at reference lemperature, H (atm-m³/mol)	Henry's law constant reference temperature, T_R	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling paint, T _B (°K)	Critical temperature, T _C (³ K)	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (ug/m³)*	Reference cond., RfC (mg/m³)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	2.0E-06	6 0E-01

INTERMEDIATE CALCULATIONS SHEET

Exposure duration 7 (sec)	Source- booking separation, L _T (cm)	Stratum A soil air till ed porosity, θ_a^A (sm^3/sm^3)	Stratum B soil air-tiffed porosity. $\theta_s^{(a)}$ (am^3/am^3)	Stratum C soil art-fined pxrosity, 8,0 (cm ³ (cm ⁴)	Strailin A effective total fund saturation, 5., (om*/cm*)	Swatum A soil entroses permeability, k (orr ²)	Stratum A sor helotive a ri permeability k _m (cm ⁴)	Shatum A sod effective vapor permeability, k, (cm²)	Thickness of Caphary zone. La (cm)	Tola porosity in capillary zone. "(cm ³ /cm ³)	Air-f-lod porosity in cabbary zone 0 _{atr} (cm ⁻¹ /cm ³)	Water-filled concestly in daprilary cone. θ _{max} (cm Yom ³)	Floor- wall seam purimeter, X _{obs} (cm)
7 88 €+C 8 "	95	0.727	0.32	0 321	0.220	5.94E-09	0.879	5 22E-09	25 00	0 33	0.010	0.320	4 900
Bidg vent fation rate. Geogra (om ² 's)	Area of enclosed space be ow grade. As [cm²]	Greck- to-tola area ratio, n (unil ess)	Crauk deplin below grade, Z _{owe} (cm)	Entitle pylof vaporization at ave. groundwater temperature. AH ₋₁₁₅ (cal/mot)	Henry's aw constant at avel groundwater temperature Hrs (atm-m²-mol)	Hearty's law constant at avel groundwaler temperature, Mily (unit ess)	Vacor maccisity at avel soil temperature this (grunts)	Stratum A effective diffusion coefficient DFT2 (com ² (c))	Stratum B effective diffusion coefficient Diffs (amf/s)	Stratum C effective diffusion coefficient Dffe (cmf/s)	Capillary zone effectival diffusion coefficient, Danis Lomi/s)	Total overall effective diffusion coefficient Officers	Diffusion pain ength Ly (cm)
€ 92E+04	1 <u>0</u> 6E-06	3.77E-04	15	B 544	5 05E-03	2.17E-01	1.75E-04	5 205-03	0.005+00	i 0.00E+00	8 636.05	3 34E-05	95
Convection bath forgith U _p (ent)	Source Major cond , C _{ross} (Jgm²)	Grack radius, foat (cm)	Average vapor Powirate into bidg. Q ₁₅₆ (om ³ /s)	Crack effective diffusion coefficient, Other (cm ² /s)	Area of grook A _{cea} , (om ²)	Exponent of equivalent foundation Pediet our beful exp(Pet) (unitless)	Infinite source indoor alterisation coefficient, co ton tiess)	ntinte source bidg cond , George log(m²)	Unit Hisk Heaton URF (µg/m³)	Reference cond RIC (mg/m ³)			
45	4.33E+02	0.0	8.33E+01	5 20E-03	4.00E+C2	8.41E+173	5 36E-66	2 32E-03	2 0E-06	6.0E-C1]		

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS.

INCRÉMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater cond (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (un:tless)
NA	NA NA	NA	1.47E+06	NA NA	1.1E-09	2.7E-06

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

ÉND

PRG SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

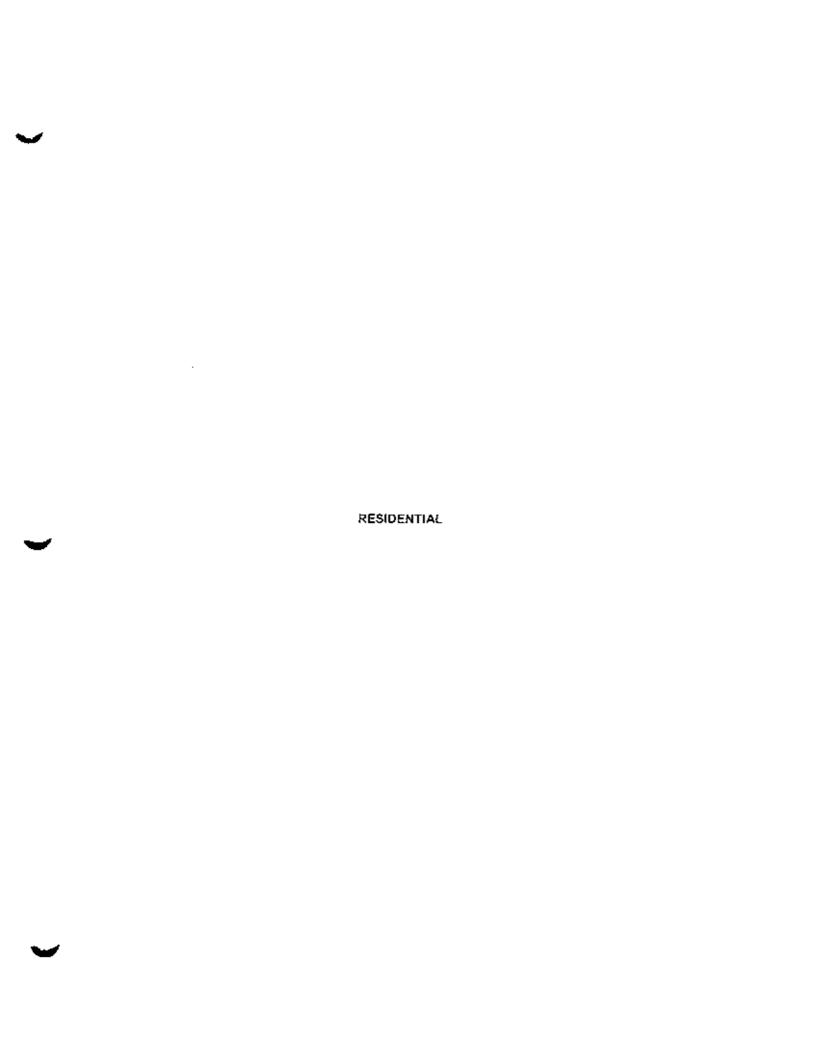
INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (mg/L)	Indoor exposure groundwater cond., noncarcinogen (mg/L)	Risk-based indoor exposure groundwater conc., (mg/L)	Pure component water solubility. S (mg/L)	Final indoor exposure groundwater cond., (mg/L)	Incremental risk from vapor intrusion to indoor air, cardinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncardinogen (unitless)
1.76E+03	7.54E+05	1.76E+03	1.47E+06	1.76E+03	(unuess)	NA NA

MESSAGE AND SRROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE; The values of Csource and Chuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"

SITE 2
AREA A WETLANDS



DATA ENTRY SHEET

GW-AQV Version 3 1: 02/04	CALCULATE RISK	K-BAŞŞD ÇRÖLE	NOWATER CONC	ENTRATION (en	der TXT in TYE Silbox	d						
		YES										
Resel to			OR									
Sefaults !	CALCULATE INC!	REMENTAL RISK	S FROM ACTUAL	GROUNDMAT	ER CONCENTRATI	ON (enter X in 196)	51 Beckland in his grou	ndwater conclube k	0 - *			
		YES	ГХ	1								
				,								
	FUTER	ENTER										
	Canana	haig an against										
	Chérica CAS No	groundwater eanst										
	(numbers only,	ς,										
	nc dashes i	(c/g/L)			Chemical							
	127184	1409+00	1		Tetrachiloroethy	gne						
			_									_
	ENTER	ENTER Geom	ENTER	ENTER Totals ma	ENTER Shand up to value o	ENTER	ENTER	ENTER	ENTER Soil		ENTER	
MORE	Average	below guade		10304 113	Puckress	Thickness			stratum A		Jser-Selined	1
,	50th	to Esticia	Dap(h	ff ckness	of sec	of Sp.I	So		SGS		stratum A	L
	groundwaler	of end osed	be over graces	E5 80 1	stratum B	atratum C.	Picalita	SCS	Soll(spe		Soll vápov	Į.
	lemperature,	space floor	lo waler lab'e	stratom A		(Foret value of 0)	Greetly andve	an lype	iusec lo estmale	QR	permeability	1
	T ₄	ι,	1.41	, ha	¬в	"c	water table.	Checily above	50" vapov		k, 	
	(°C)	(cm)	I(An)	1547	<u></u>	[cm]	(Frank A & ov C)	water table	permeat fily;		(grow ²)	1
		15] 85	-55	9		<u> </u>		<u> </u>			ני
	ENTER	ENTER	ENTER	ENTER	FNTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
MORE	Stratum A	Sizarum A	Stratum A	Stratum 4	Siratum B	5ുക്കുന്ന 8	Siralyn 9	Stratom B	Stratum C	Strategy C	Stratum C	Spale* C
	SÇŞ	so dry	sof lotal	so water-filled		sor ary	sc-Hotal	sof water-filled	SCS	so:dy	s set total	no Americles
	sc: lyne	bulk constry	porusity n ^a	peresity.	50 <u>15</u> 00	bulk depady	pordetiv n ^e	90:05:17 91 ⁶	so"//ce	eu vidensky K. ^d	perae iy ng	poresty 9_°
	Lethico Sall III. , Haramariani	a." (grom")		du" (emblecti)	i . pono: Sipe mara netros	Pa [®] Igromij		(sm/cm/)	Page 200	r. igʻamir		24 (2011 (2011)
		15 100 1	Chill e 5s)	(Zaragara		19 000 1	our Dessi.	3200 (0.00)		19 01	rundessi	,244 (244)
	<u>;;</u>	<u>:4ê</u>	0.442	0.168	S	1 56	0.275	0.054	ę	165	0.375	1 0054
	ENTER	RSTAS	ENTER	ENTER	ENTER	ENTER	ENTFR		ENTER			
MORE	Enclosed		enriused	Enclased					Average vapor			
<u> </u>	50866	ნუჩი იე	spece	Spare	Final Disease	Figor-wall	Imposts		flaw rate into bidg			
	Figor Intoknossi,	gressure differential	foor ength	(op: width	space height	şeam ciaca A din,	arekonange rale		CR eave d'ant la calculat			
	keeps	AP	L _B	W.	M _B	*	FR		C ₁₀ ,			
	(cm)	Igicm-s ² I	76/01	(0-1	(cm)	(gm)	[116]		(0.50)			
								-				
		45	1000	1000	244	Ç 1	0.75	2	5			
MORE	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER						
<u> </u>	Averaç ng	Averaging	_	_	Tergel	Target hazard						
	: T e [c ·	tarre for	Exposure duration	Esposore	nya ke	acabent for						
	cari-nogens. Alv	nenesis regens.	ED.	Noquency. ER	caic rio-jen% *q	noncart ribgers TMO						
	2(5)	(yra)	146	[days yr]	<u>juniless</u>	(undlass)						
			T			_ 						
	<u>/a</u>			750	<u> </u>	L						
						386 (38-5) 975-						
ENO					groundwater	Concentration						

Dilfusivity in air, D _a (cm ² /s)	Oiffusivity in water, D ₊ (cm ² /s)	Henry's !aw constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T _a (°C)	Enthalpy of vaporization at the normal boiling point, AH _{v.o} (cal/mol)	Normal boiling point, T _a (°K)	Critical temperature, T _c (°K)	Organic carbon partition coefficient, K _{ee} (cm³/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (ug/m³) ⁻¹	Reference conc RfC (mg/m³)
7.20E-02	8.20E-06	1.84E-02	25	8.288	394.40	620.20	1.55E+02	2.00E+02	5.9E-06	2.8 E -01

ENO

INTERMEDIATE CALCULATIONS SHEET.

Expansare duration, t (sec)	Source- by Id-ng separation, L ₁ (cm)	Stratum A soit archited poresity, θ_a^{-4} $1 cm^2 cm^3$)	Stratum B soil a reflect corosity, the (cm ² /4ft ³)	Stratum C so I arr-Cled oprosity, e _s C (em ² /cm ²)	Stral_m A effective total fluid saturation 5., (cmitemit)	Strat ्या A soil intrinsed bermeability, k (दण [‡] ।	Strature A sec relative air permeatily Relative	Stratum A soil effective vapor permeability, 	Thickness of caprilary zone, est (cm)	Total porosity in capit ary zone e., (em ³ /cm ²)	An-filled porosity in capiliary zone, 8 _{ect} (omf/omf)	Water-filled poresity in papit any zone θ_{max} (conform ²)	Ficor- wal, seam permeter X _{res} (cm)
9,455+05	. 50	Ç 274	<u>[032</u> 1	<u>0 32 4</u>	0 245	, 59E-0a	0 865	1_CSE-09	46 58	0 447	0.057	0.375	T 2000 3
Bidg ventilation rate, Quare (cm ² /s)	Area of enclosed space pelow grade, A ₃ (cor ²)	Crack- to-fold area ratio, n (unaless)	Crack cepth below grade, Zowy (cm)	Enthaloy of vaporization at avel groundwater temperature, SM, rs (ca/mol)	Henry's law constant at avel groundwater temperature, this (athism*/me!)	Herry's law constant at avel groundwater temperature. Hing (unitiess)	Vapor viscosily at avel soil temperature, urs (g emis)	Stratum A effective diffusion conflicient D ^{**} , tom [*] (s)	Stratum B effective diffusion coefficient Dff() (cmf/s)	Sizelam C effective diffusion coefficient D**** (cm*(s)	Cabillary zone effective off/stron coefficient Offic	Tota: overail effective diffusion coefficient Offiv (cmf/s)	Diffusion gath ength. La (cm)
1 59E+04	1 066 • 06	3.77E/04	15	9,543	6.30E-03	3.56E-01	1,76E-04	4,95E-00	0.00 <u>E+30</u>	0,056+00	4,978-05	5 29E-05	<u> </u>
Convection path length, L _p (cm.)	Saurce vapor cond C ₁₅₀₅₄ (ug/m ³)	Grack radius fouc (pm)	Average vapor flow rate into blog , $Q_{\mu\nu}$, $Q_{\mu\nu}$	Crack effective diffusion coefficient, Differ look (x)	Area of crack, Alien yorn ⁽¹⁾	Exponent of equivatent foundation Peolet number exp(Pe ²) [unitleSx]	Infinite source indoor alteruation coefficient o (whitess)	Intinue source bidg cond George (pg/m²)	Unit insk factor, URFF (ugrm³) *	Reference sond , RfC (mg/m²)			
15	<u>4.98€</u> +02	0 10	8.32E+01	4 95E-03	4 CCE+02	8 79E+162	6 54E-05	3 265-02	5 9E-06	2.8E-01]		

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure	Indoor exposure	Risk-based indoor	Pure component	Final indoor	Incremental risk from Vapor	Hazard quotient from vapor
groundwater conc	groundwater conc.,	exposure groundwater	water solubility,	exposure groundwater	intrusion to indoor air.	infrusion to indoor air.
carcinogen (µg/L)	noncarcinogen (µg/L)	conc., (µg/L)	\$ (µg/L)	conc., (µg/L)	carcinogen (unitless)	noncarcinogen (unitless)
NA NA	NA NA	NA	2.00E+05	NA	7 9E-08	1.1E-04

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

PRG SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater cond.	indoor exposure groundwater conc.	Risk-based indoor exposure groundwater	Pure component water solubility,	Final indeor exposure groundwater	Incremente! risk from vapor intrusion to indoor air,	Hazard quotient from vapor intrusion to indoor air,
carcinogen (mg/L)	noncarcinogen (mg/L)	conc., (mg/L)	\$ (mg/L)	conc (mg/L)	carcinogen (unitless)	noncarcinogen (unitless)
1.77E+01	1.26E+04	1.77E+01	2.00E+05	1.77E+01	NA NA	NA NA

MESSAGE AND ERROR SUMMARY BELOW. (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE; The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"

GW-ADV ersion 3.1, 02/04	CALCULATE RIS	SKIBASED GROU'	NOWATER GOND	SNTRATION (#1	tok "X" in "YES" bo	×i						
Reset Ip		YES	OR									
Defaults	CALCULATE IN	CREMENTAL RISK	IS FROM ACTUAL	L GROUNDWAT	ER CONCENTRAT	KON engantat natyes	i i postandini kaligrad	indwater ogstillaet	34)			
		Y85	x									
	ENTER	FNTFR										
	Chamica:	ground water										
	CAS No	. טייכט										
	inumbers any nojeashas)	G., 3-31)			2he—ea							
	79016	1455+90	7		Trichloroetnys	ine]						
	·				'							_
	FH1#R	ENTER Jepin	ENTER	ENTER Totals mo	ENTER Stade pero varua d		ENTER	ENTER	ENTER Soi		ENTER	
FMORE .	Average	Delowigrade	Donlh	Fa	Dogramas)hcks ess			stratum A		User-dafined	1
L_ -	apili aorawbeuorg	to ballam of enclases	Depit balow grade	. Thickness of sor	ot soll stratum 8.	of soil stratum C,	Sail Strait.m	SCS	929 3001ypa		stratum A sp/ vager	Į
	lemperaluie.	space floor	lo water table	stratum A.	(Propriyation of 0)		cync' y above	sol type	(used to estimate	C/R	permeability.	Į
	~ s	s.r	L _{w.}	۸, ۱	n _β	r _c	water lasts	cirectly above	Soli vapor		k_	1
		(sm)	(επ)	(CM)	(cm)	jem)	(Ester A, B, or C)	water lable	permeab/kv)		(am²)	4
	<u> </u>		65	65	D.	0	A	- at	a ·			-
			_					•				7
	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
MORE	Stratum A	Sitaton A	51/alum A	Sharami A	Strature B	System B	Stratum B	2hatum 8	Stratum C	Strarum C	Shalom G	Stratum C
<u> </u>	908	sovidny pulk dans (y.	sod retail peresdy	SO Mater-Siled poros ty		soil dry bulk density.	Son total	schwalerfilled pprosty	505	SULTY DANGETS (y.	so coral perosity	s) waterfiled pomysty
	50:) p# .uchuu 501	76	partially r.*	6.4	<u>SCHITYON</u> Transp Sch	Ps.	600000 #	4.5	Sold Typen	Dark Christy.	No.	65-75-11. A_1
	Maramerers	(gen).	.codless)	(am ³ rsim ³)	Party st.	19 (m ³)	(Ln l'ess)	iom ² sm ² :	- arametro	(<u>s sm</u>)	<u></u>	i Sing-Card La
	Ci	149	5 44?	0,168	8	1.56	0.375	2 054	8	168	0.475	0.594
	SNTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER		ENTER			
MORE	Endosed space	Se -blag	Enclosed space	ნითადი ალმშლ	Endlosed	Floor-way	1-390		Average vdpor flow rate into bidg			
	floca	Dressure	Boot	noor	spane	seam (rack	air Aschange		24			
	mrakrigas	orforces#	langth.	خالات	neight.	widin	rane	-	ease blank is calcula	ie		
	الروس	۔ مد	Lb	We	м,	20	=R		۵			
	<u> (ст).</u>	'g'(π-sf!	10.7%	(cht)	*C:=11	(cm)_	17.57	_	(L /0)			
	10	40	1007	1000	244		0.25					
MORE	ENTER	ENTER	ENTER	ENTER	FNTER	ENTER						
L_ <u>+</u>	Averaging	A wiraging			Targel	Fargel mazand						
	' re a far	lime for	Exactors	Expositive	nar Ip.	quotient for						
	caid riogens AT _e	nordarunogens, AT _{KC}	deration E0	face€ndy. ∂F	taronog ers. 78	noncarpinogens. 1≅O						
	/ms)	1429)	(yrs)	(days/yr)	(art Bess)	(un-9ess)						
	70	<u> </u>	30	350	, CE-06							
				,								
Γ έÑŌ⊤i						rateirsk-based [Epocentration						
L												

Diffusivity in air, D _a (cm²/s)	Oiffusivity in water, O _w (cm²/s)	Henry's law constant at reference temperature, H (atm-m³/mol)	Henry's law constant reference temperature, T _R (°C)	Enthatpy of vaporization at the normal boiling point. 2H _{v,0} (cal/mol)	Normal boiling point, T _e (°K)	Critical temperature, T _C (°K)	Organic carbon partition coefficient, K _{ec} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor. URF (µg/m³)*1	Reference conc., RfC (mg/m ³)
7,90E-02	9.10E-06	1.03E-02	25	7.505	360.36	544.20	1.66E+02	1.47E+03	1.1 <u>E</u> -04	3.5E-02

INTERMEDIATE CALCULATIONS SHEET.

Eigrosure curation, (sec)	Source swiding separation, L ₁ (cm)	Stratum A soft ambitied perosity, $\theta_4^{-\alpha}$ (em^3/em^3)	Stratum B soil air-filled porosity R _a ^B (cm ² /cm ²)	Stratum C soi art-filled perosity, P ₁ C (Cm ² (cm ²)	Straum A effective total fluid saturation, Su (cm ² /cm ²)	Stratum A soil intrinsic permeability, k, (cm²)	Stratum A set relative air permeability, λ_{ij} (cm ²)	Stratum A so the effective vapor perorpability k, (cm²)	Thickness of capillary zone, L ₁₂ (CT)	Fotal porceally of capillary gone no. (cm ⁻¹ /cm ⁻¹)	Air-filed porusity in capillary zone θ_{sor} [cm ⁻¹ /cm ³]	Water-filled pcrossity in capitary zone, \$\begin{align*} al	Floor- wall seam per meter, X _{cres} (cm)
9.46E+08	50	0.274	0.321	C.321	. C 245	1 265-09		1 09E-09	46 88	0,442	C 067	0.375	4 000
8.dg. vycotation rate. O _{scard} 	Area of enclosed space se ow grade A _a	Crack- to-total area ratio, n (unitless)	Crack depth delow grace, Z _{ing} , (cm)	Enthalpy of vaper. Zation all ave. groundwater temperature. 3H _{21s} (calimol)	Menny's law constant at avel groundwater temperature Hrs Tatin-m ³ /mo't	Hemy's law constant at ave groundwater temperature, hits (unitless)	Vapor viscosny at avel soil temperatura. Pha (gliom-s)	Stratum A effectiva diffusion coefficient Offi (em/vs)	Stratum B effective cittusion coefficiont 0'" (cm ² /s)	Stratum C effective diffusion coefficient Offic (cm²/s)	Capillary zone effective diffusion coefficient, Office (cm²/s)	Total overall effective diffusion conflicient, D***, (cm*/s)	Odfusion path longth 4: (cn))
1.59£+04	1 06E+06	3 7/E-04	l. — 15	8 544	5 05E-03	2.17E-01	1 76E-04	5.43E-03	0.00E+00	j 0 <u>005+0</u> 0]	5,785-05	6 16E-05	50
Convection path angth. L. (cm)	Source vapor condu. Cooke y(3)(n)	Grack radius form)	Average vapor Sow rate into bidg., O ₄₆₄ (cm ⁵ /s)	Crack effective diffusion coefficient point (cm²/s)	Area of crack, Area (conf)	Exponent of equivalent foundation. Ped et monder, exp(Pel) (unit ess).	Infinite source indoor attenuation to the total control of the total con	Infinite source Sidg conc Concord tpg:m²;	Unii insk factor URF (ug:m²) '	Reference conditions (REC Img/m²)			

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncardinogen (µg/L)	Risk-based indoor exposure groundwater conc. (µg/L)	Pure component water solubility, S {µg/L}	Final indoor exposure groundwater conc., (µg/L)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA NA	NA NA	NA NA	1 47E+06	NA NA	1.0E-06	6.3E-04

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

PRG SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor	Indoor	Risk-based	Pure	Fioal	Incremental Hazard risk from quotient	
expo s ure	exposure	rndoor	component	indoor	vapor from vapor	
groundwater	groundwater	exposure	water	exposure	intrusion to intrusion to	
conc.,	conc.,	groundwater	solubility,	groundwater	indoor air, indoor air.	
carcinogen	noncardinogen	conc	s	cond.,	carcinogen noncarcinogen	
(mg/L)	(mg/ L)	_(mg/L)	_(mg/L)	(mg/L)	(unitless) (unitless)	_
				·		_
1.35E+00	2.22E+03	1.35E+00	1.47E+06	1.35E+00	NA NA]

MESSAGE AND ERROR SUMMARY BELOW (DO NOT USE RESULTS IF ERRORS ARE PRESENT).

MESSAGE: The values of Coource and Chaiding on the INTERCALCS worksheet are based on unity and do not represent actual values.

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

GW-AOV Version 3.1 C2/04	CALCULATE RISE	KIBASED GROUN	DWATER CONC	ENTRAT CN 1811	'ar X'⊶n YES box	н						
Reset to		YES	OR)								
Defaults	CALCULATE NO	REMENTAL RISK:		. GROJADWATS	ER CONCENTRATE	ON (enigy "X" in TYE:	Si cawane in haligrous	complex conditions	Per)			
		YE5	x)								
	ENTER	ENTER or (al										
	Chemical CAS No	Grondwater										
	(numbers chy	C.										
	70 04snes)	(j.g.v.)			Chemical							
	79C16]	1.405+00	}		Trichlorpethyle	гв						
	ENTER	ENTER Depin	ENTER	ENTER Totals on a	ENTER Stadd up to value o	ENTER	ENTER	ENTEH	EMTEA Sol		SNTER]
MORE .	Average	ce aw grado			Thekness	Phickmass		·	svalum A		User-defined	
L_ <u>+</u>	sp ground water	lo ballom of enplosed	Depth two-services	Thickness of sod	of sp shalom B	of soil straicm C,	S Silatum	E 1.77	\$53		Yelkon T. A	
	group owalis temperature	toace foot.	5610wiq180e 55 water fable	spacem A	(Entor Jave or 0)	Entervalue or 0)	Conc. rateve	5178 1514- 58	50) (50) 500 (0.05) TAKO	J-R	S: #8001 Serment in	
	τ,	ε.	١٨,	%	ln,	7_	water table	sirent, above	so vagor		•	
	1,01	(5)70)	jem;	;c.T.	(6)6)	(um!	<u>(Enler & B. st C)</u>	, water lable	germenty (y)		ic.mir.	4
	41	15	65	65	0	0	ů.	CL	દા 🗀			<u> </u>
	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	EN1ER	ENTER	ENTER	ENTER	ENTER
MORE	Svalam A SC5	Shalom A	Strafum A soil total	Stratum A soil water-tined	5haton B SGS	Stratum B sot d∿r	Stratum B	Stratum B	Stratum C SCS	Stratum C	Spalor C	Stratum 2 Not water-50ed
	505 5013pe	soff dry outsidensity	poros :y	00109 Ty.	504 HPC	bulk density	sportala sportala	sort water-filled policylly.	Zár Jápa Prop	50° dry buy density	soli lota: parosity	pures ly
	CHAMPSON	2.	r*	2,*	Contrac Sol	ro*	-0	9 <u>.</u> e	. noweg had	76	n ²	e_²
	Faramerers	ig/cm ³)	[60 0055]	(cm ² (cm ²)	Parameters.	(5/cm²)	(Ond OSS)	(cm ³ /cm ³)	1 Parament	kgram ⁱ i	<u>iur "essi</u>	jem?sm1
	C:	1.48	0.442	<u> </u>		' 66	0.275	0.054	s	1.66	0.175	0.054
	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER		ENTER			
MORE	Enclosed	50 · 0 do	Sociosed Soace	Endiased Space	Enclosed	Hoor-wall	Indoor		Average vapor Row rate into bido			
	5486 0 Cass	Ser-e-dg prassura	Rope	Coor	50006	seam crack	an exchange		25			
	on careas.	a Forantia	'ang)i:	wich.	height.	w-dif-	rete.	5.0	rake tilank to parcolah	•		
	Lorge	4º :	Ly	₩,	M _y	*	E4		o*~			
	(6.7%)	(f) Cross ¹)	(cun)	((m)	ler(I	-(c-)	11.51	-	TV.			
	$\mathfrak{t} = \mathscr{H} \subseteq \overline{\mathbb{Z}}$.050	§ 1976	244	2:	0.25]	<u> </u>			
MORE	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER						
	Averaging Pare (c)	4 • e •ag∙ng 1 me for	Sapesure	Exposure	Target usa lgr	Farge: nazard quotient for						
	carcinogens	concarologens,	don't on.	frequency,	card negens.	mondare negens						
	AT ₆	AT _W	50 5	E¢	74	IPO						
	<u>(vis)</u>	(6/5)	(yrs)	(daysryt)	(Louiess)	(an 1.655)						
	70	35	30	j <u>aso</u>	05-06	L:						
END						Pafeir skibased concentration	 					
V + 1.14							,					

Diffusivity in air, D _a (cm ² /s)	Diffusivity in water. D _w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m³/mol)	Henry's law constant reference temperature, T _R (°C)	Enthalpy of vaporization at the normal boiling point, AH _{2 b} (cal/mot)	Normal boiling point, T _B (°K)	Critical temperature, T _C (°K)	Organic carbon partition coefficient, K _{oe} (cm ³ /g)	Pure component water sofubblity. S (mg/L)	Unit risk factor, URF (µg/m³) ⁻¹	Reference conc., R(C (mg/m³)
7.90E-02	9.10E-06	1.03E-02	25	7.505	360.36	544.20	1.66E+02	1.47E+03	2 0E-06	6 0E-01

INTERMEDIATE CAUCULATIONS SHEET

Exposure duration, t (500)	Source- building separation L _T (cm)	Similari A soil setti ed parosdy 8,4 (cm²lem²)	Stratem 8 soil air-fixed porosity. $\theta_{a}^{(p)}$ (configurit)	Stratum C so: a r-filled porosity. g. ² (pre ³ (om ³)	Stratum A effective total flood saturation S _e (cm ² /cm ²)	Stratum A soft infrinsic permeability, k (cm²)	Stratum A Spi: refailive a r permeability, X ₁ (cm ²)	Stratum A soli offective vapor permeability. k, (cm²)	Thickness of capillary zone, L _{rs} (cm)	Total percenty in capit ary zone. ^-, (cm ³ /cm ²)	Air-filed perosity in capillary zone Gara Iom ^{2/} om ³)	Water (led paros ty in cap) ary zone, $\theta_{ext} = \frac{\theta_{ext}}{(cm^3 cm^3)}$	Fragrewalt seam perimeter, X _{1.3%} (om)
9 4SE+08	. 50	0 274	0 321 1	0.321	0 245	: 2 <u>6E-09</u>	2865		46 88	0.442	10 067	<u>0.3</u> 75	4.000
Bildg, vent, aften vate Q _{conse} (cm ² /s)	Area of end used space helow grade, A _a (cm²)	Crack- le-letal area ात्री छ. म (uncless)	Crack depth pelow grade, Zewa (Cro)	Emitia pyloti vapor zatroniat avel, groundwater temperature, ΔH, τs (cal/ng/)	Henry's law constant at any, groundwater temperature. His (atm-m ³ /mo)	hierry's law constant at awe groundwater temperature, Hiss Lundessy	Vapo: viscosity at axe isoli temperature att. (grom-s)	Stratum A effective diffusion coefficient Offic (cm ² /s)	Stratum 9 effective diffusion coefficient 0"" (cm²/s)	Stratum C effective diffusion coefficient D' (com ² (s)	Capillary zone effective diffusion coefficient $\mathfrak{D}^{eff}(t)$	Total overall uffective diffusion coefficient D'", icm*(s)	Diffusion path length Ly (cm)
.69E+04	1.066-06	3 776-C4	15	8 544	5.05F-03	2 17E-C1	1 76E-04	5 <u>4</u> 3E- <u>03</u>		0 00E+00	5.78E-05	6 165-05	50
Convection pair ength i.e [cm]	Source vapor cond . C _{howe} (ug/m ³)	Crack radius, Comp (cm)	Average vapor flow rate into pidg . One (cm ² /s)	Crack effective diPusion coefficient, D ^{esco} (cm ⁻² /s)	Area of Grack, Acus (on: ⁷ 1	Exponent of equivalent foundation. Peclet number, exp(Pe).	infinite source indoor alternuation coefficient or (unit ess)	ofinite spurce bidg condit County (gg/m²)	Unil risk (actor, URC (Jajim ⁸) ¹	Reference condi- RIC (mg/m³)			
15	3.035+02	0 10	8 33E+01	\$ 43F-03	4 00E+02	5 33E+166	7 59E-05	2 <u>30E-02</u>	2 0E-06	5 CE-01]		

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater cond., cardinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S {ug/L}	Final indoor exposure groundwater cond., (ug/L)	Incremental Hazard risk from quotient vapor from vapor intrusion to intrusion to indoor air, carcinogen noncarcinogen (unitless) (unitless)
NA	NA	NA .	1.47E+06	NA	1,9E-08 3,7E-05

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

PRG SHEET

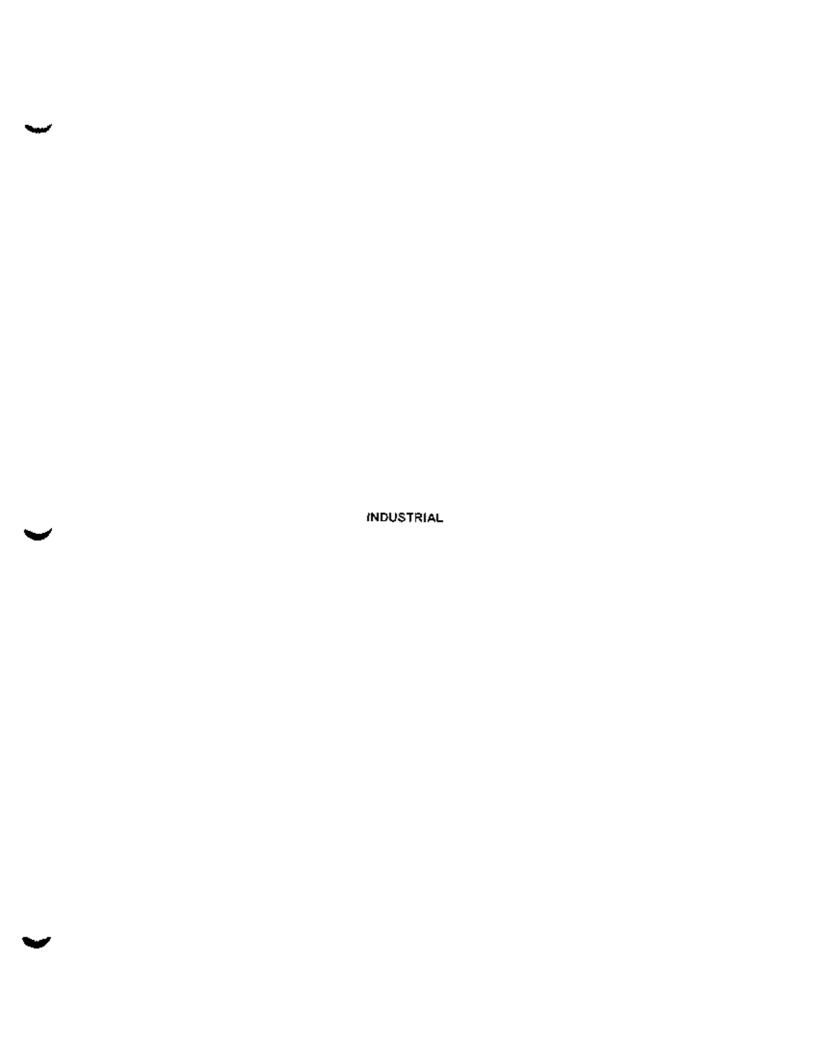
RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

					Incremental	Hazard
Indoor	Indoor	Risk-based	Pure	Final	risk from	quotient
exposure	exposure	indoor	component	indoor	vapor	from vapor
groundwater	groundwater	exposure	wa(er	exposure	intrusion to	intrusion to
сопс	conc.,	g/oundwater	solubility.	groundwater	indoor air,	indoor air,
carcinogen	noncarcinogen	conc.,	\$	conc.,	carcinogen	noncarcinogen
(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(unit!ess)	(unitless)
						
7.41E+01	3.81E+04	7.41E+01	1.47E+06	7.41E+01	NA	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Csource and Chuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"



GW-ADV Version 3.1, 02/04	CALGULATE RIS	K-SASED GROUP	NOW ATER CONC	ENTRATION (4)	nier "X" in "YES" be	e)						
<u>. — </u>		YES	Γ	1								
Reset to			OR	•								
Defaults	CALCULATE NO	HEMENTAL RISK	5 FROY ACTUAL	GROUNDMAT	ER CONCENTRAT	CN (enter "X" in "YE	51 box and initial gro.	nd water condities	CWI			
		YES	Х	1								
				•								
	ENTER	ENTER Puls										
	Chemica:	groupGwater										
	CAS No	6977.										
	mumbers only	ರ್ಷ										
	ot dashesi	(J-9-L)	-		(Спет сві							
	177184	1425-30]		Tetrachloroethy	впе						
	LNIES	ENTER	ENTER	ENTER	ENTER	FN"ER	ENTER	ENTER	ENTER'		FATER	7
		Qepm.			ist wad up to value s				5.0			
MORE	Average	treine grade			T- C+7855	Thickness			Statut A		User delined	
L <u>+</u>	507	ro botrom	Septa	Thick-mas	o* 50 i	of sed	Sc.		855		g)rate milA	
	groundwater	r, authorized	pelow grada	of so.	scatam 9.	shalom C	#!mom	scs	so type		\$2,144,000	i
	hemografiche.	space Noor	ic water lab'e	shall miA		(Entervalve or 0)	Sheliky above	se! (vpe	(used to estimate		Facilities ()	1
	.4.	i,	! ***	· •	"B	7.	water rable.	а жийу абоче	50 F-4007		• •	1
	(10)	(078)	(Em)	UPU .	<u> </u>	ich)	Enter A.B. or Cr	x aler lab €	permea(**(v)		(L/m²)	-
	ţ <u>TX</u>	15	65	65	0	, 3	A	E1.	eu.			1
	ENTER	LNTER	ENTER	ENTER	ENTER	ENTER	ENTER	CMTER	ENTER	LNIER	ENTER	FALER
MORE	Strate + A	Stratum A	Stratum A	Stratum 4	Stratum B	Stratore B	Stratum B	Stratum B	Stratum C	Shalon C	Smarum C	Shalon C
<u> </u>	865	50: Cry	sp/ (s/a)	spiliwater/inep		soil dry	50-1044	so water-blod	505	SOLDIN	50: :014	son water-ticled
	Soll Spore	built density	ocros (v	peras 'y	so type	DU KIDONS TY B	F-one set y m [®]	GOMSHY. Aj ^y	NO - lype	our density.	some in	porys :/. 9_°
	Consumition :	Fo.		e	.00 жило. Ри знач ен	,, ⁴			, скучал бол Раса терету	٠,٠		
		(decise _y)	(Put () #2.4.)	(CT*:2T*)		(grow ^a)	junit ess)	(confresh)		ig cordi	jundinsk)	(cm/gm/)
	23.	148	3 442		Š.	66	0.5/5	j 0.05a	5 ,	7 66	0.375	3,054
	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER		ENTER			
MORE	Englosed		Chelosed	Englased					Auminge vapor			
	Space	501-01cg	Space	space	Enclosed	Flograwad	1.0004		Townsia Ploping			
	Rear	91474913 16 : 0410 ⁷⁰ 13	Noor	9000	50300	snam crack	on ywnerige		OS rawa Mark ta halipyiy			
	rucaness. Lugg	7.3	'eng'h	0.00 °° 5°- 6	regr: ⊣-	# 019 %	100g E R		олип возна от насучи Одо	-		
	(Cm)	g (m.s²)	L _e (CM)	0000	∃a (इक्ट)	(cm)			e go			
		9 - 1 - 1		,,,,,,	WT)			-	9.001			
	1	40	1000	1000	300	0.) 83	3	- h			
MORE	ENTER	ENTER	ENTER	ENTER	ENTER	SMIER						
	Averaging	Avaraging			25-265	Larger Mazaro						
	1 me 151)rm e (0)	Employ 1.10	E11.09010	244 54	quetent fer						
	cardinogens	noncard hogens	duration	!requency	card regens	nongarornag ans Turn						
	AT ₁	AT _N	55	EF Maria a	- n	THQ						
	1975;	(<u>ery)</u>	<u>[v</u> '5]	(days yr)	(uniless)	Fuggaz.						
	70	75] 725	350	1 05-05	I						
					Ukaa in cala.	Jaminisk-pased						
FND						concentration						

Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m³/mol)	Henry's law constant reference temperature, T _R (°C)	Enthalpy of vaporization at the normal boiling point, \(\Delta H_{\sigma} \) (cal/mol)	Normat boiling point. T _B (°K)	Critical temperature, T _C (³ K)	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m²)	Reference conc., RfC (mg/m³)
7.20E-02	8.20E-06	1.84E-02	25	8,288	394.40	620 20	1.55E+02	2.00E+02	5.9E-06	2.8E-01

INTERMEDIATE CALCULATIONS SHEET

Ecosure duration t (Section)	Source- by ding separation, L ₁ (cm)	Stratum A so: air lifed perpoly, e _a * (cm ³ /cm ³)	Scatum B soft artifiled perosity, B _a ^B tern ¹ (cm ²)	Stratum C soft air/fixed purchasy, e _s * (on fixer))	Stratom A effective fetal full di saturation, Significants	Stratum A soil crisios d permead fly, k, (cm ²)	Stratum A scal relative an permeability, k _{in} (arr ²)	Stratum A spy- effective vapor permeability, k, (cmf)	Thickness of capitlary zone List (cm)	Total porosily in capitary world. total tary world. total tary tary tary tary tary tary tary tary	A refilled goodstylin capitary zone B _{est} (cm ² /cm ²)	Water-filled porcesty in capit any zone, B _{act} (cm ² c m ²)	Figorials wall seam perimeter, X _{max} , (cm)
7 88E+C8	50	0.274	0 321	0 321	C 245	1 26 <u>E</u> -09	2.502	1.098-09	45.88	0.442	C 967	0.375	4 2000 ,
Bidg ventiation rate, O _{N Mag} (om/s)	Area of enclosed space selow grade, A _g ipm*)	Crack- lo-tota- area rotio n (un uess)	Crack cepth below grade, Z _{**p} , (cm)	Enths by of vapor zation at sixeligroundwater temperature, DH _{uts} (catinot)	Hemy's (aw constant at aveligroundwater temperature, Hry cath-milmor)	Ffenry's law constant at axe groundwater temperature, Mira [Louiless]	Vapor visitually at avel so temperature, prom-st	Stratum A effective a ffusion codf trent, D***/ (cm*(s)	Shotum a effective diffusion coefficient, D*1, (cm*/s)	Stratum C offective ciffusion coefficient Offic (cmfrs)	Capillary zone effective diffusion coefficient Offici (omfis)	Total overal effective diffusion coefficient Gfff (conf/s)	Diffusion pain length. E.; (cm)
5.92E+04	1,066,406	3.77≦-04	15	9 543	8 30E-03	i <u>3 558-01</u>	1.75E-04	4 95E- <u>03</u>	0 <u>COE</u> -CO	0.005+00	(4 9₹F 05	5 297-05	50
Convection path angle, L, (om)	Source vapor condu Cuesto (µg/m²)	Crack racius. (Gra)	Average vapor how rate into bidg . Q _{ros} (cm ³ /s)	Crack effective of Auston coefficient, 0000 [cmm/s]	Area of crack Area (cm ²)	Exporential equivalent (duncation Page of number, exp(Pe') (unit less)	Thrule source indoor after valid on coefficient, or [unitiess]	Salimite sporce aldg cond . G _{NAMO} (agrim ²)	Unit 1954 (actor URF (yg/m ²) ¹¹	Reference condi- RIC (regimi)			_
(15, 1	_4 98€ <u>•02</u>	C.10	8 33E-01	4 95E-03	4.00E+92	8795-182	1 80E-05	7 987-03	5 9E-06	2 8E-C1]		

___END___

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor	Indoor	Risk-based	Pure	Final	Incremental risk from	Hazard quotient
exposure	exposure	indoor	component	indoar	vapor	from vapor
groundwater	groundwater	exposure	water	exposure	intrusion to	intrusion to
conc.,	conc.,	groundwater	solubility.	groundwater	indoor air,	indoor air.
carcinogen	noncarcinogen	cond.	S	cond.,	carcinogen	noncarcinogen
(μg/L)	(μg/L)	(μg/L)	(μg/L)	(µg/L)	(unitless)	(unitless)
	· · · · · · · · · · · · · · · · · · ·					
NA.	NA.	NA	2.00E+05	NA	1.2E-08	2. 0E -05

MESSAGE AND ERROR SUMMARY BELOW. (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

PRG SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

					Incremental	Hazard
Indoor	Indoor	Risk-based	Pure	Final	risk from	quotient
exposure	exposure	indoor	component	indoor	vapor	from vapor
groundwater	groundwater	exposure	water	exposure	intrusion to	intrusion to
conc.,	conc.,	groundwater	solubility.	groundwater	indoor air,	indoor air,
carcinogen	noncarcinogen	conc.,	S	conc.,	carcinogen	noncardinogen
(mg/L)_	(mg/L)	(mg/ L)	(mg/ L .)	(mg/L)	(unitless)	(unitless)
1.22E+02	7.17E+04	1.22E+02	2.00E+05	1.22E+02	NA NA	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT).

MESSAGE: The values of Csource and Chuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"

END

Page 5 of 5

GW-AUV	CALCULATE RIS	K.BASED G9QUA	DWATER COSC	enTRATION (er	tar "X" in "YE 5" op	a'						
Version 3 1 02/04 		765	OR	j								
Defaults (CALCULATE INC	REMENTAL RISK		GROUNDINA	FR CONCENTRAT	ON temper (XIIIA) ME	S speard headpool	ndwater condition	Qw)			
		YE5	x]								
	ENTER	ENTSR										
		india.										
	Chemical contract	graundwater										
	CAS No Journage only	conc. Gw										
	no dasnes)	59 U			Chemical							
	79016	1 435+G0	- 1				1					
	13016		-		Trichloroethyt	976]					_
	ENTER	ENTER Depth	ENTER	FNTER Totals mu	ENTER SLADO (A 10 YA)J# :	<u>€NTÉΩ</u> of _{cur} oce G28:	FNTER	ENTER	FNTER		ENTER]
MORE	Average	below grase			Trickness	Thickness	ĺ		attelern A		general participant	ľ
L ± `	500	to bellow	Cepto	houress	c* sc ·	0' 50'	59d		505		stratum 4)
	groundwater	of enclosed	below grade	of soil	spatum B	stratum C.	SIGH. T	805	5011,00		soll vapor	[
	temperature.	Knace Foot,	lo water (abin)	Shatum A.	(Enter value or 8)	(Emiter value ov Co	orecry above	soff) pe	1.300 '0 h3! male	03	perineanity	Į
	T _≥	یا	١,,,		': .	t _e	waterkas ≠	directly applies	sof vacor		*.	ĺ
	(°G)	(sm)	(5 7 1)	(GT)	(em)	jam's	(Enter A, Billon C)	waterkobie	partileability)		:pre?i	
				·								ļ
	11		65	65			L^	f c.				J
	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	CYTER	ERTER	ENIEH	ENTER	ENTER	ENTER
MORE	Stratum A	5tratum A	Siratort A	Sharon A	51a116	5!ralu ≠ 9	Shattim B	Stratu ≠ B	Shalom C	Siratum C	Stratum C	SCALLT C
; ↓	SC S	50 dry	scal sola	so waters, at	905	so ' dhy	500.10%	s. waferû ed	505	50 LC7	524 (319)	5.5 Algorifiled
	So Typ e	pulk censity	paros ly	poros!,	୍ରବ୍ୟ (କୁଲ୍ଲ	Suite density	ph/1099y.	profesity.	soffype	Out gens to	perpary	norașily.
	1 W/ Ct 400.	3.°	F* .	θ_^	1.000 (500	≥e ^b	n ⁴	4,0	1004-2000	64	43	e_6
	A Paramaters	(g.cm)	(grategy)_	وتحويا حور	manamenens.	g szelt	(SE1 PSA)	وأهي أجرر	PARTY PA	93 <u>76</u> _	(unlikess)	(Jan ^L om ²)
	<u>ci</u>	' 48	0 442	0.168	5	-65	7378	<u>. €854</u>		- 66	0.375	j 0.054 }
	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER		ENTER			
MORE	Enclosed		Enclosed	Encloses	.	. .			Awrage vapor			
L . <u></u>	space c	Spi-trag	5 pa 2 6	Space	Ent csed	Front war	#ndocr		"low rate into aidig			
	Sapr It caress	pressure	f por	Foe-	Space	3#4 T (785*	ain exchange		CR			
		d-Mehentilar SP	61.510	∧.3II . Wa	heig*:	A dib	iate ⊊-3		eave o any to da quia o	:2		
	L., g.,	(5'57'·5 ²)	C.		Ht	*			C _{to}			
	(CT)	3 24.3	(661)	įCΨ.	(cm)	15,405		-				
		40	1000	(500	192	0:	5.83	3				
MORE	ENTER	ENTER	ENTER	ENTER	SHIER	ENTER						
	Averaging	Averaging	=	=	Targe)	Target mazaro						
	1. To 151	Three for	ETPUSUIB	54005/JF6	n par for	cuoliant for						
	caronogens or	nordak negers. Ar	dyrahön. EG	fégyendy. Ef	Cāro negēris.	nuncaronagans nunc						
	Ar _c	AT _{re}	EO		₹Q _(um).ess)	PO PORTAGE						
	275.	<u> </u>	3/60	:04 - 5 <u>5 - 1</u>		(ond #\$5)	•					
	ψ	25	I25	<u>250</u>	T08-56		1					
END :						Jaie naviga seg popparore: gr						
					2							

Diffusivity in air. D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's faw constant reference temperature, T _R	Enthalpy of vaporization at the normal boiling point, \(\Delta H_{v,b} \) (cal/mol)	Normal boiling point. T _s (°K)	Critical temperature, T _C (°K)	Organic carbon partition coefficient, K _{ee} (cm³/g)	Pure component water so'ubility. S (mg/L)	Unit risk factor, URF (µg/m ³) ¹²	Reference cond., RIC (mg/m³)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544 20	1.66E+02	1.47E+03	1.1E-04	3.5E-02

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, 1 (sec)	Source- building separation. Li (cm)	Stratum A such and red perosity, et. ^A (cm ³ /cm ³)	Stratum 8 so: arridited perosity (g ⁿ (om ² /om ²)	Stralum C 504 and fled perosity 8,5 (smilem)	Stratum A effective tela fluid saturation, S _y (cm²,cm²)	Stratum A se " -6/5/ns t permeability k _cm/h	Stratum A so retative air permeability k _{ij} (cm ²)	Stretom A sun effective vacor permeability kt (pm²)	Thickness of eag. Wy zone. Use (271)	Total perbany in empideny cone (conform)	Artifices perosity in caphary zone theresent)	Water-Hilled porosity in capi fary work, have (chiffenf)	Froot- wall scam permeter, X _{outh} comi
7.88E 408		0 274	0.321	G.32:	0.245	1 26E-09	0 885	i 159E-59	46 83	6442		0375	± 200
Blog vocilation rate, Q _{beking} tom [†] /st	Area of enclosed space oe ow grade A _B (cm ²)	Grack- to-lokal area ralio. T (uniless)	Crack decth decth grade Z _{race} (cm)	Enthalpy of vaporization at avel, groundwater tomperature, AH, 25 (cal/mol)	Honry's law constant at avel groundwaler temperature, ht-s (ato-milmol)	elonny's Yaw constant at avel groundwaler remperature. Higg (undless)	Vapor Viscosity at avelisor temperature, ura (gitmis)	Stratum A offective diffusion coefficient Offix (cm ² /s)	Straium 9 přective diffusion coeffusion(0*", (cm²/s)	Stratum C affective diffusion coefficient D*** (cm**s)	Capitary zone effective diffusion coefficient, D ^{eff} er (cm ² is)	Folial overall affective collision coefficient, D""- (cm²/s)	Ciffusion path engin, L ₂ (cm)
6 92E+04	TOBE-C€	3.77E-04		8.544	5 C5E-Q3	2 17E-01	1.76E-04	5.43E-03	0 <u>;3E+C</u> 0	_C 0 <u>0E+50</u> _	5 78E-05	<u>6 165-05</u>	50
Convection path tength, L, (cm)	Source vapor cond. C _{hilder} (yg m ³)	Crack radius. fowe (cm)	Average vapor flow rule nto c.dg . O ₁₀ (cm ³ /s)	Crack effective diffusion coefficient Communications (cmm) state of the coefficient communication coefficient communication coefficient co	Area of crack, Ayas cost?}	Exponent of equivalent foundation Pecies dumper, expide' (ess)	ofinite source indoor abenuation coefficient in turnt essi	Infinite source to be soors : Grynnas tag m ³ t	Unit risk factor, LRF tog m³)	Reference cond RIC (mg/m ²)			
	3 63E 402	5.9	8 336+01	5 43E-C3		5 33E+166	1 85E-05	<u> 5635-03.</u>	1 'E D4	3 5E-C2	:		

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncardinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)	Incremental risk from vapor intrusion to Indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA NA	NA NA	NA NA	1.47E+06	NA NA	1.5E-07	1.1E-04

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

PRG SHEET

RISK-8ASED GROUNDWATER CONCENTRATION CALCULATIONS:

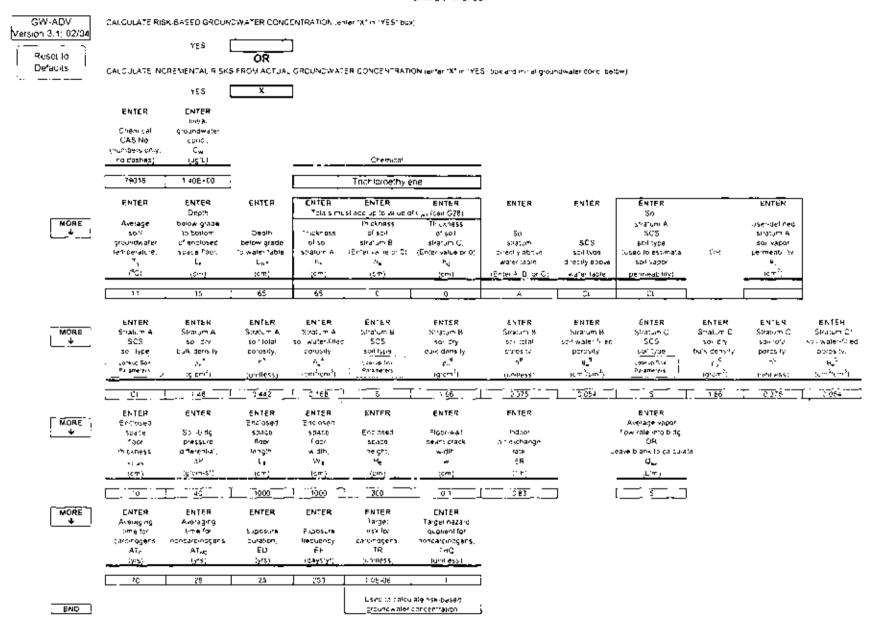
INCREMENTAL RISK CALCULATIONS:

Indoor	Indoor	Risk-based	Pure	Final	Incremental risk from	Hazard quotient
exposure	exposure	indoor	component	indoor	vapor	(rom vapor
groundwater	groundwater	exposure	water	exposure	intrusion to	intrusion to
conc.,	conc.,	groundwater	solubility.	groundwater	indoor aic,	indoor air,
carcinogen	noncarcinogen	CONÇ.,	\$	çonc	çardinogen	noncardinogen
(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(unitless)	(unitless)
9.24E+00	1.27E+04	9.24E+00	1.47E+06	9.24E+00	NA .	NA NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Csource and Chuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"



Diffusivity in air, D _a (cm²/s)	Diffusivity in water, D _w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m³/mol)	Henry's law constant reference temperature, T _R (°C)	Enthalpy of vaporization at the normal boiling point, \(\Delta H_{\text{b}} \) (cal/mo/)	Normal boiling point, T _e {"K}	Critical temperature. To (⁶ K)	Organic carbon partition coefficient, K _{ot} (cm³/g)	Pure component water salubility, S {mg/L}	Unit risk factor, URF (µg/m³) ⁻¹	Reference conc., RfC (mg/m³)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	2.08-08	6.0E-01

INTERMEDIATE CALCULATIONS SHEET

Exposprie duration, 7 (sec)	Source- bursing separation, 1- (cm)	Stratum A sor air-fried upfosity, θ_a^{-1} $[acc^2/cm^2]$	Stratum B soft air-lifled perosity, g _a s tent ² /cm ²)	Stratum C soil arcfilled porosity, 8 ² (arc ⁴ /cr ⁴)	Stratum A inflective total fluid saturation. Significant formation of the saturation.	Stratum A soil intrinsic permeability, k (cm²)	Straium A scr relative air deimerabily, k _{in} 'orn')	Stralum A sc effective vapor permosbirity, k _a ;amili	Thickness of capitary zone, L _{ia}	Total approach in capillary cone. **Cone (con*con*)	Air-filed perosity in cap, lary zone θ_{ext} (cm^3/cm^3)	Water-Hied porosity in capitary zone, 0 _{ccr} (cm/(cm ²)	Floor- wall seam per meter, X _{risk} s (cm)
7 <u>885+08</u>	50	Q.274	0 321	0,321	0.245	1 7 365-59	<u> </u>	1 09E-09	46 B 3	0 442	0.067	0.375	4 000
Bidg. wenthing rate Gruere (cm ¹⁹ s)	Area of encuand space pelow grabe, An (cm²)	Crack- to-total area ralio, :: (unitless)	Grack depth below grade, Z _{rock} (cm)	Enthology of vaporization at avel groundwater temperature aHurs (cal-moli	herry's law constant at ave, groundwater temperature, Hrs (atm-m ³ /mol)	flerry's law constant at aveligroundwater temperature Hing (unitioss)	Vapor viscosily at asyllyci Jemseralure urs (glom-s)	Stratum A effective diffusion coefficient Offi (trivits)	Stratum B effective outusion coefficient Offig (onfisi	Stratum C effective diffusion coefficient D'Tc (cm²/s)	Capitlary cone effective confliction coefficient D"' (com/s)	Total overal effective of Pusion coefficient, Ufficient, (cm ⁻¹ /s)	Diffusion path ength, Uni
6 925+04	1 06E+00	3.77E-04	15	8 544	5 05E-03	2 17E-01	768-54	5 43 E-03	0.006400	0.cce+0c	5 /8F-05	6 17E-05	
Convection path ength L _v [cm.]	Source vapor cone. G.,,,,,,	Crack radius, r _{ole} , (cm)	Average vapor flow rate into pidg , O _{ast} (cm ³ %)	Crack effective diffusion coefficient O ^{rack} (cm ⁴ /s)	Area of crack A. a ;cm²!	Expunent of equivalent foundation Peclet number, exp(Pef)	bStrate source urdoor aftenual on coorficient, or (unificess)	Infinite source a eg. conc Cours (pg/ss²)	Uan risk ractor URF (µg/m²)	Reference (Jong (R*C (mg/m²)			
15	3 53E+52	7-010	B 33E+C:	5.43E-03	4 005+02	5 335+156	1.86E-05	5.638-03	2.0E-06	6 DE-C*	1		

ENÔ

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc. noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc (µg/L)	Pure component water solubility, S _(µg/L)	Final indoor exposure groundwater conc., (ug/L)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, concarcinogen (unitless)
NA	NA	NA	1.47E+06	NA .	2.8E-09	6.4E-06

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

PRG SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

	Indoor	índoor	Risk-based	Pure	Final	Incremental risk from	Hazard ouotient
	exposure	exposure	indoor	component	ir door	vapor	from vapor
	groundwater	groundwater	exposure	water	exposure	intrusion to	intrusion to
	cond	conc.,	groundwater	solubility,	groundwater	indoor air.	indoor air.
	carcinogen	noncarcinogen	conc.	S	conc	carcinogen	noncarcinogen
,	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(unitless)	(unit!ess)
ı	E 00E 100	0 100 105	5.08E+02	1.475.06	5005(00	N.A	l NA
1	5.08E+02	2.18E+05	3.00C *0Z	1. <u>4</u> 7E+06	5.08E+02	NA NA	NA NA

MESSAGE AND ERROR SUMMARY BELOW. (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: The values of Csource and Chuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"



GW-ADV (Version 3.1, 02/04) YE5 Reset to Defaults ·-- ... YES. ENTER ENTER 'n hat Criemica. groundwater CASINE 6070 ٥, inumbers only. 550 COLUMNDAS 1525401 67653 MôRE I MORE

CALCULATE RISK RASED GROUNDWATER CONCENTRATION (onler fix in 1YES) 55%)

OR

CALCULATE INCREMENTAL RISKS FROM ACTUAL GROUNDWATER CONCENTRATION (emer) x 1/2 (1755) becarded to a created action of below a

Chemical Chroniform

D034 1

ĒN¹EĀ	EN169 Gesth	ENTER	SNTER Totals On	ENTER ysi add up to value of	ENZER Lugarani G28i	FRTER	FNTSA	ENTER So		FNIFR
Average split groundwater temperature, 10 150:	bolow grada to boltom of endiosed space fluor tr ((本)	Dooth below grade to water table. Lw: (510)	Thickenss of said stratom A Fig. (2.70)	Disponents (# sould stratum # , (Enter value or 0 , Telepone	Trickness of seri straturi C Entgrisalue of 0, Fo Igmi	Son Shalum prechalatove warentadie, gSharie, Bilbricky	SUS no i type dwody apole _ %ster toble	Shatum A 505 50 type (Lyac to estimate soft vapor permedo 53	9A	ds exidefined stratum A soft vapor dermeability h, [kimf]
-1	'5	110		! b [s		

ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
Stratum A	Stratum A	Stranger A	Şiralum A	Stranger B	Stratum &	Statum B	Shahum B	Straturn C	5Yandm C	Stratum C	314:50 C
905	sol dry	soil lotal	sof water/"et:	SCŞ	soft dry	Kori foral	90 "water-lillige	505	soul dry	son total	sod water-fided
sari !ypa	bulk cars (y	pgrowly,	parasily	sol 'ype	bulk density.	Sorosity	DO1081ly.	80 + 3yb e	bulk depairy.	parasa,	poresity.
ا 60 صدده	o.	r*	θ,* ;	Journal 504	F.ª	r.a	$\theta_{\mathbf{p}}^{-}$	10013, 501	PE.	=	e _n c
Parameter (.g/c <u>m</u> ?}	(974 ass)	comfromit in	Caremeters	(gr(m ⁴)	(⊆Pr**€SS)	$(\sin^2(m^4)$	Parameters I	igrum":	(unit bos)	$ie^{-i\sigma^2/\varrho}m^2)$

ENTER Englosed	ENTER	ENTER Enclosed	ENTER Enclosed	ENTER	ENTER	E₩TER*	ENTER Average vapor
space foor	So Nelog pressure	space "pgr	50 400 1007	Enclosed state	Figor-wa seam crack	odeer a-revarange	Bowirale into aldig GR
Mickelsa Lygga	2 Mere=* a* A™	length '-a	Alden. Wi∎	negra.	A 1717 194	rate SR	Leave 5,2nk to colculate G _{eo}
(Circ)	्य दणार्जाः	<u>%":</u>	<u>(575)</u>	(CTV)	<u>jibrej</u>	(3.5)	0.00
'0	40	1500	1000		0.1	2.76	9

		. – . – -						 -	
	'0	40	1500	1000		01	2.76		ע
MORE	ENTER Exercising ng	ENTER Averaging	ENTER	ENTER	€NT⊆R Target	ENTEN Target hazard			
	time to:	nme for introduction	Exposure duration,	Erposure Imguency	risk for rakt begens	quallent for noncard riogens			
	cura nogens A [®] :	AT _{eq}	ED	EF	- -	TriC			
	<u> </u>	<u> </u>	(975)	days yrı	n Hessi	joral ess)			
	70		30	353					
END				i		ulare risk-based richte-halten			

MORE ↓

Oiffusivity in air, D _a (cm ³ /s)	Diffusivity in water, D _w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m ³ /mot)	Henry's faw constant reference temperature, T _R (°C)	Enthalpy of vaporization at the normal boiling point, AH _{ab} (cal/mol)	Normal boiling point, T _S (°K)	Critical temperature, T _C (°K)	Organic carbon partition coefficient, K _{oe} (cm³/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m³) ⁻¹	Reference cond., RfC (mg/m³)
[1.04E-01	1.00€-05	3.66E-03	25	6.988	334.32	536.40	3.98E+01	7 92E+03	2.3E-05	4.9E-02

INTERMEDIATE CAUCULATIONS SHEET

Exposure duration, t (sec)	Source- pullding separation L _T [cm]	Stratum A soil a r-filled corosity e ₄ * (cm ¹ /cm ³)	Stratum B soft arefilled parosity, B _a ⁵ (cm ³ /cm ²)	Stratum C soil air-filled porosity, 6.2 (cm//cm²)	Stratum A effective total fluid saturation Sile (cm² cm²)	Stratum A soit intrinsic purmeability, k icm²;	Stratum A soil relative air permeasility, k ₃ (om ³)	Stratum A sch effective vapor permeability, k, (cm²)	Thickness of capitary zone L _{i,c}	fota perosity in capitary zone, n _e (cm²(cm²)	Artified sorosity in capillary zone θ_{azz}	Water-filted porosity in capitary zone, e _{ner} (om ³ .cm ²)	Floor- wall seam permeter, X _{mate} (cm)
9.46€ • 08	95	<u>0 276</u>	0,32	0.321	0.004	9 93 E-08	0 396	9 92E-98	17.05	0.73	0.077	0 253	4,000
Bidg ventialion rate O _{bed so} (cm ³ /s)	Area of enclosed space selow grade. A _e (cm ²)	Orack- to-lotal area ratio n jur_foss)	Crack depth below grade. Z ₂₀₁ , (cm)	Eniha by of vapor zalionia: aveligroundwaler femperature, AH, -s (calvino)	Henry's law constant at avel groundwater temperature, \$16.5 (athi-en'/mul)	Horry's law constant at avel groundwaler lemberature, His (unitess)	Vapor visigsityiat avellook tempirature, leis (grums)	Stratum A offective diffusion coefficient, C***. (cm*/s)	Stratum 9 eMedine d Musron coefficient 0"'s (om ² 's)	Stratum C offective diffusion coefficient D''((cm²/s)	Capitary zone effective diffusion sperficient, $D^{\rm eff}_{\rm to}$ (ton^2 s).	Total overal effective diffusion coefficient, D ^{eff} 1 (Lum ² (s))	Ortusion (aith leagth, -1 (cm)
1 69F+04	1 06E+06	3 77E-04	15	7,544	T 1595E:03	8 288-02	T 1 76£-Ç5	7315-02	0.00E-00	C ODE +GO	1,96E-04	1028-03	95
Convection path rength, L ₁ (cm)	Source vapor condition Graces (og/m²)	Crack radius, leizek (cm)	Average vapo: flow rate into 5 dg . Q _{sol} (cm ⁵ :s)	Cruck effective diffusion coefficient O ^{ther} (cm ³ s)	Area of crack, Aces (cm²)	Exponent of equivalent foundation. Ped ell umber, exp(Pell) (Lnt.ess)	the le source indoor alteruation coefficient, ix (unit cost)	infinite source bidg condition Columns (ag/m ²)	Unit 15K factor URF (ug/m ³) ¹¹	Reference cenel, RIC (mg/m²)			
5	1.26E+03	010	8 33E±01	1,3° E-02	4 00E+02	<u> 821</u> E+68	5 935-04	7.46E-01	2 3É-05	4.9E-02]		

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater cond., (ug/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA NA	NA	7.92E+06	NA	7.0E-06	1.5E-02

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

PRG SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater cond., cardinogen (ug/L)	Indoor exposure groundwater cond noncardinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc (µg/L)	tocremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (untless)
2.13€+00	1.03E+03	2.13E+00	7.92E+06	2.13E+00	NA_	NA NA

MESSAGE AND ERROR SUMMARY BELOW. (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Csource and Obuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"

DAYA ENTRY SHEET

GW-A0V Version 3.1, 02/04	CALCULATE RISA	·	NOWATER CONCE	NERATION (ec	:≠r TXT in TYEST bol	n						
		YES										
Reset to			OR									
Qefaults	CALCULATE NO	REMENTAL 5 5K	S FROM ACTUAL	GROUNDWAT!	FRICONCENTRAT	ON /enter TXT in TYE!	Sigokaro iba grou-	odwaler nont, beli	GA'			
		Y5 S	X	ł								
	FNTFR	ENCER In ; al										
	Chemical	groundwater										
	CAS No	0000										
	(numbers array	C.,										
	กอ ออกกตร)	ربانوس زبانوس			Chemical							
	79015	7 995+93	- 7				1					
	7 ,9919 1	7 405 443		<u> </u>	Trichfordethyle	:^B						_
	ENTER	ENTER Depir	ENTER	ENTER Tetats thu	ENTER Stadblepip value o	ENTER of Unit Cell G291	ENTER	ENTER .	ENTER Sail		ENTER	
MORE	Awarage	below grade			Thickness	Prickness			sical are A		User-defined	1
نے 🚣 🚅	20%	to b ottom	Depth	Prichness	0,20	al sol	So		SCS		span = A	1
	groundwater	of enciosed	perow grade	a' 500	stratum B	stratum C.	SIFETURE	505	spilype		50 - WITO'	
	(emperaturé	space Foor.	co water table.	stratum A.	kEnter value of 0 i	(Einter value or 0)	d rectly action	s 3 / lype	(Used to estimate	26	perimeetidity	
	T ₅	ι.	L _M 1	^-	-#	ا نر	water (3D b	errectly above	so vapor		, K.,	
	(fC)	icm)	(575)	(CT)	(6m)	(50)	(Sn(er Al Bilbr C)	water lable	perceasiony)		(cm²)	」
				<u></u>								1
	11		T 1.9		ů	<u> </u>	<u> </u>	<u>i5</u>				J
	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	EVIER	ENTER	ENJER	ENTER	ENTER
MORE	Statum A	Stratum A	Stratum A	Siratum A	S*****	Stratum B	Shatter B	Sparant R	Scalot C	Spaint C	Swapum D	Siratum C
<u> </u>	SCS	204 6.7		so water/free		ደው (ሪካ	\$2,7250	50 waterdined	SCS	seri dry	so loral	nament es
	so_type_	bu'k densdy	porazky:	parusity.	so type	bu + densi-	posses ov	pongsily	sc :yee	COM CREATA	coros ly	perasity
	(0.000000	6,5	0*	947	LOTALL SON	r, e _A	;. 	٩,٥	1 JAN 331	e.	.,c	4.1
	> = <u>-</u>	الأصعوا	(900 898)	jem sm i	Perandian	g om b	p. # (#56)		Maria restanta	9:7	(ADDRESS)	contiom()
		180	0.330	0.054	5	165	7 703757		5	1 65	L (232)	7557
	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	£NTER		ENTSH			
MORE	Englosed	212.11	Frc.ab#1	Enclosed		, KI	C. I Cit		Average vaper			
. ↓	space	Sallaling	spare	space	Sociated	Floorway.	troogs		flow rate into pidg.			
	6 a tor	0:6555-6	fee	100	эраСе	seam crack	a nextrange		C4			
	thickness.	d Merentia	iecyth.	A. 01f	he ye	width,	rale	L.	eave blank to catoura	ie		
	in the second	AP	٠,	<i>3</i> 7∎	н,	*	54		G.,			
	(6.71)	:g-cm-s ² 1	(694)	(65)		(proj			<u> </u>			
		40	1530	1 1000	244	21	0.25	- 1				
			•					•				
MORE !	ENTER	ENTER	ENTER	ENTER	CNTER	ENTER						
L * :	Averaging	Averaging			Targel	Torge: Fazard						
	time to	Time for	E+005:::##	Exposure	55 • IC*	Quiphent for						
		กษาและขางรูชาร.		ragearch	Jaroinogens.	Forearchogans.						
	Aľ.	AT _{ec}	ED	ĒF	7 -2 2-3-2-3-3-3-3-3-3-3-3-3-3-3-3-3-3-3-3-3	Ting.						
	(515)	<u> </u>	الخاتوا	(6972-71)	(unit ess)	(unitiess)						
		26	.3	350	1.05-26	:						
END						gonderika: on	 					
				,			•					

Diffusivity in air, D _a (cm²/s)	Diffusivity in water, O _w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m²/mol)	Henry's law constant reference temperature, T _R	Enthalpy of vaporization at the normal boiling point, \(\Delta H \text{, a} \) \(\Delta H \text{, a} \) \(\text{(cal/mol)} \)	Normal boiling point, T _a (°K)	Critical temperature, T _C (°K)	Organic carbon partition coefficient, K _{ac} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit tisk factor, URF (µg/m³) ⁻¹	Reference cond RfC (mg/m³)
7.90E-02	9.10E-06	1.03E-02	25	7.505	360.36	544.20	1.66E+02	1,47E+03	1.1E-04	3.5E-02

INTERMEDIATE CALCULATIONS SPEET

Exposure duration : (sec)	Source- building separation Ly (5m)	Straform A soil aur-feled porcesty 0,4 (cm²/cm²);	Stratum S spri aurithled corosity, e _e ⁸ (cm ³ :cm ³)	Stratum D soil air-filled porcsity, 6.5 (cm²/cm²)	Stratum A effective total fluid saturation St. tom ¹ cm ¹ ;	Stratum A soil nichs c permeatribly, K yen ⁴)	Stratum A 50 relative air pormyability, k _a ,pre**)	Stratum A soil effective vapor permeacolity, k, (cm²)	Thickness of capitary purie, c _{er} (cm)	Total paresity of capitary zone no pare/tom²)	Ad-filted perosity in capit any izone, illed conficent)	Water-filled portunity in capifary zone θ_{abs}	Floor- wall seam permeter X _m , tom!
9 465 F08	95	0.276	0 321	0.321	0.004	9.94E-08		9 92F-08	1705	<u> 533 </u>	v.577	T 0 253 T	1 4 ecc
9idg vent abon rate Q _{eveng} (cm²s)	Area of enciosed space below yrade A _e (con ²)	Crack- lo-total area rotio, if (un-tless)	Crack depth pelow grade Z _{crack} (cer)	Enthalpy of vaporization at ave groundwarer temperature .3H. 15 {cat/mot/	Henry's aw constant at avelgroundwater temperature Hrs Tallet m ² (moti	Henrys (aw constant al two groundwater temperature Hits (unitiess)	Vapor viscosily a) ave. soli lemperature uns (gionnis)	Stratum A effective diffusion coefficient O*** (cm*/s)	Stratum B effective diffusion coefficient Deff (cm*'s)	Stratum C offective diffusion coefficient Dffe (cmf/s)	Cap Pary zone effective diffusion spefficient, D***; (cm*-s)	Total overal officially officiall	Diffusion path engin, I ₁₀ (cm)
1695-04] F.dee - 0e]	3 //E-64	(:5	8 544	6.08E-03	2 1/±.01	1 765-04	9 97E-03	0.03 £ +50	0.00±+00	1 45E-C4	7.556-04	95
Convention path ength, es (conf	Source vapor somo . Grana (ug/m³)	Crack redrus rose- (cos)	Average vapor flow rate into bidg , Gen (cm) si	Crack effective diffusion coefficient Description (cmi/s)	Area of crack, Area (cm²)	Exponent of equivalent leanage on Peciet number, exp(Pei) (unit ess)	ofinite source indoor attenuation coefficient in juntifies (ofinite source bidg cond . Garries (regrot)	Unit Hisk factor URF (Lg/m ³)	Reference cond RfC (mg·m²)			
1.5	5 <u>2</u> E+ <u>2</u> 3	L _ 0_10 _	<u> </u> 8335+0:	9 97E-03	4 90E+02	<u>5 28</u> E+90 _	4 52E-04	6.85E-61	15.04	3 5€-02)		

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

					Incremental Haza	rđ
Indoor	Indoor	Risk-based	Pure	Final	risk from quotie	∌nt
expasure	exposure	indoor	component	indoor	vapor from va	арог
groundwater	groundwater	exposure	water	exposure	intrusion to intrusio	in to
conc.	conc.,	groundwater	solubility,	groundwater	indoor air, indoor	air,
carcinogen	noncarcinogen	COTIC.,	S	cond.,	cardinogen noncardir	nogen
(μg/L)	(μg/L)	(µg/L)	(μg/ L)	(μ g/L)	(unitless) (unitle	ss)
. NA	NA	NA	1.47E+06	NA NA	3.1E-05 1.9E-	02

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

ÉNĎ

PRG SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure	Indoor exposure	Risk-based indoor	Pure component	Final indoor	incremental risk from vapor	Hazard quotient from vapor
groundwater conc carcinogen	groundwater солс., noncarcinogen	exposure groundwater	water solubility.	exposure groundwater conc	intrusion to indoor air, carcinogen	intrusion to indoor air, noncardinages
(µg/L)	(ug/L)	cond., (µg/L)	(μg/L)	(µg/L)	(unitless)	(unitless)
2.26E-01	3.73E+02	2.26E-01	1.47E+06	2.26E-01	NA	NA NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS (FIERRORS ARE PRESENT)

MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

Page 5 of 5

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

GW-ADV Version 3.1; 02/04	CALCULATE RIS	KIBASED CROUN	OWATER CONC	e, POTABRE	nler "X in "YES" to	x:						
Reset to		155	OR	1								
Oefaults	CAUCULARE NO	HEMENTAL RISK:	S FROM ACTUAL	GROUNDWAT	ER CONCENTRAT	KON (enternationaryE	Siliboviand initial grou	nowaler candiliber	=w)			
		YE5	'x']								
	ENTER	ENTER India.										
	Çост са!	groundwater										
	CAS No	come.										
	rombers anly.	S.,			C							
	ra das jos;	<u></u>	•		Спет са		1					
	/9016	7 50E-00		L	Engnioroethyle	ene						
	ENTER	ENTER Cepth	ENTER	ENTER Tatals = a	ENTER ist add op to valua c	ENTER of Contracti G281	ENTER	ENTER	ENTER Soil		ENTER	}
MORE	Average	below grade			Probless	Thickness			Shation A		User-gef 199	t
<u> </u>	\$0."	lo holiom	⊜ ер ст	Thickness	ລະຄວາ	04 Soil	50		5C5		strai∟⊤ =	!
	ground water Inimperature	o' enclosed space Noor	be ow grade to water labie.	of soft stratum A.	siralum 8 -{Enter value and:	stratum C. (Entar value or 0)	shatum directly above	505 sp/ (ype	soil type (used to estimate	CR.	sell vapor permeability	1
	T ₅	L,	L _M 1	h _e	ta te vitaliana.	rc	water tabin	cornet y above	so vapar	V	t.	<u> </u>
	;°Ć)	(0.00	(607)	1501	lorn)	<u> </u>	(Enter AliBitatiO)	∧a′er (able	permeability)		ائصي	1
		• • • •										1
	'1	15	' -13	0.0		99	. ــــــــــــــــــــــــــــــــــــ		S]
	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
MORE	5/rafust A	\$1171-m A	Stratum A	Sitalum A	Span. T M	Shatom B	Strature B	Smailum B	Stratum C	Stratum C	Scatum C	Seatom C
للعلا	SCS	SETTION.	50 (5%)	 valentingd 		sori ary	so tara	sod water-filled	SCS	sof dry	so trial	Strader-Silva months
	solfspe solub tot	55% density	porosity.	porasily ing	- * <u>**</u> ** \\	Guik density Ky ²	porosity T	9,6 00,254*	_ 901 378	Por density	peros IV. E ^E	90.05%.
	Permeters .	ig o≕li	560 Le55!	ng saing and	, rouse half in Payame are in	.6 c−1'		7 •\and (+2)	, 10-95 504 644-14164	9 6m 1.	(c.(1888)	i Gray Carry
							vr ress,					
	s	. ــ ـ ـ وق كـــ ــ ــ	2,320	<u> </u>	L	<u> </u>	37/9	J0.054,	L s	1.66	1, 1, 9, 3, 25, 1	<u>0.554</u>
"WORE "	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER		ENTER			
, MONE	Enclosed Space	So⊸চবছ	Enclosed space	anchaed space	Englosed	Figgs-weilt	hidole		Average vapor Now rate minibility			
	9000	pressure	Foor	100	SEACH	soam crac+	a reacharige		OF			
	% ckness	offerential.	engin.	meth	neight	wi@?i.	:200	į,	ожна фідок прісагой в	4:		
	2020	3P	L.	₩.	۲	w	ER .		3~			
	((0)	(g·cm/s²)	(c**)	(cm)	<u>(37)</u>	10 m)	(7/6)	-	9.7)			
	10	4.7	1000					כ	ليستنش			
MORE	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER						
L	Averaging	Averaging		.	Target	Farger nazaro						
	I.me for	; rre for	Επρουνή συσμοσ	Ехрозиле Кильелов	nsk for carpropers	Quotioni for						
	caronogens. AT _C	noncarcinogáns. AT _M	auranon. ED	'requ e ncy. E≓	sarsing gens TR	narraig negens. THO						
	(Y.2)	(vis)	(5.2)	(days/yr)	(ar (ess)	lunifess)						
	y 76	20	20	350	1.05-06	1 3						
					Lised to pale	a allo devi-entres]					
I EMD)						1000000164U110	I					

Diffusivity in air, D _a (cm²/s)	Diffusivity in water. D _w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T _R ("C)	Enthalpy of vaporization at the normal boiling point, \(\Delta H_{v,b} \) (cal/mol)	Normal boiling point, T _B (°K)	Critical temperature, T _C (°K)	Organic carbon partition coefficient, K _{od} (cm³/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m³)	Reference conc., R*C (mg/m³)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	2.0 E-0 6	6.0E-01

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, 7 (sec)	Source- building separation Ur (cm)	Stratum A 50 out-1 lipd porosity, 9 _a ³ (cm ³ /cm ³)	Stratum B sup- ant-filled percently $\theta_a^{(a)}$ (cm*(cm*)	Stratum C soil and filed portasity, §_1^2 (orn*tem*)	Shatum A effective colar fluid saturation, Se (cm²/cm²)	Stratum A %c .nk.ns.c sermicability k (cm²)	Stratum A soil relative arr permend try h _e (cm²)	Stratum A so effective vapor permeability k (confi	Thickness of capillary rone, -us (cm)	Total perosity in cash lary sone. Out (2 m²/(2 m²)	Au-filled porce by in capillary zune $\theta_{\rm sup}$ remificin ³)	Water-Filed policyty in capit any zone θ_{ext} (umbomb)	Floor- wall seam perimeter X _{cash} (cm)
9.455-08	95	0.276	0 321	C 32*	0.004	9 <u>94</u> E-08	0 996	9 92E-08	17.05	0.33	0.077	0 253	4.000
Blog. ventilation nate, O _{science} (om/s)	Area of enclosed space below grade As (cm ⁻)	Crack- Io-lotal area rako. n (unitless)	Crack depth below grade. Z _{crack} (cm)	Enthalpy of vaporization at awd groundwaler temperature, 234,75 (cai/mol)	Henry's law constant ar aver groundwaler temperature, His (atmin ² /mol)	Henry's law constant at avel groundwater temperature, H1 ₇₂ (unitless)	Vapor viscos (y at ave, soil tempurature Pra (giom-s)	Stratum A officialized diffusion obelificient, D ^{on} * (cm²/s)	Stratum B effectiva diffusion coefficient D*** (om*/s)	Stratum C effective diffusion cupficients Dff_ (cm^2/s)	Capitary zone effective diffusion coefficient. D ^{eff} ic (cm ² (s)	Total overall effective diffusion coefficient D*Tr (cm²/s)	C Musich path engin, L ₂ [cm]
_169E+04	1 066+05	3 77E-04	15 1	8.544	5.05E-03	2 17E-C1	1.76E-04	9.97E-02	0.00E+00	0.00E+00	1 45E-04	7.55 <u>E-04</u>	95
Convection path tength, L _n (cm:	Source vapor conc Curve (ug/m²)	Crack radius. Inex (pm)	Average vapor "ow rate into blog. O _{ko} (cm ³ /s)	Orack effective diffusion coefficient, Direct (cm²-s)	Area of crack. Ac. _{ex.} (cm ²)	Exponent of agovalent loundation Peclet number, exo(Pe') (un kess)	Infinite source indoor alternation coofficient (contless)	Introde sparce bidg, condly, Capaca (ag/m²)	Unit 154 Lictor URF [pg:m1] '	Reference condu RIC (mg/m/)			
<u>'5</u> 1	1.92E+03	0.10	8.33E+C1	9 97E-03	4 00E+02	5 ZRE 190	4 576/04	E 855-0°	2.0E.C8	<u> 6 cΓ-01</u>	J		

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor	Indoor	Risk-based	Pure	Final	Incremental risk from	Hazard quotient
exposure	exposure	indoor	component	indoor	vapor	from vapor
groundwater	groundwater	exposure	water	exposure	intrusion to	intrusion to
conc.	conc.,	groundwater	solubility,	groundwater	indoor air,	indoor air,
carcinogen	noncarcinogen	conc.,	\$	conc.,	carcinogen	noncarcinogen
(µg/L)	(µg/L)	(µg/L)	(μg/L)	(μg/L)	(unitless)	(unitless)
NA	NA_	NA	1.47E+06	NA	5.6E-07	1.1E-03

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

PRG SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater cond cardinogen (µg/L)	Indoor exposure groundwater cond., noncartinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater cond (µg/L)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air. roncardinogen (unitless)
1.24E+01	6.40E+03	1.24E+01	1.47E+06	1.24E+01	NA NA	NA NA

MESSAGE AND ERROR SUMMARY BELOW. (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Oscurce and Obuilding on the INTERCALOS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"

DATA ENTRY SHEET

GW-ADV Version 3.1; 02/04 Resel to Defaults		Aé S	OR	3	iler XII a MESIBa Eq. 204Ga 478A II		51 bokanti nolaliginul	rowellor conc. ser	ow)			
· — ·—		YES	x	1								
		156		1								
	LNTER	ENTER India										
	Chamical	groundwalnr										
	CAS No	carp.										
	inumbers on y	C.										
	*0 Basces]	<u>Ugʻtj</u>	-		Themica'							
	/50'4	1 00:5+51]	Viri	/ anto: de (antor	oet ene;						
	ENTER	ENTER Gepth	ENTER	ENTER Tola sign.	EN ^C ER Stage up to se celo	ENTER 0' - ₂₀₁ (cen G78)	ENTER	ENTER	ENTER Soi		ENTER]
MORE	Avelage	below grade			hickness	Ink-ress			51/20urn A		US#Magliced	
	SCA	ic boilor	Oapth.	Theoress	of soil	0150.	\$)		SUS		stratum b	
	gravnowaler	af enclosed	br:o≠ çraqe	olso	similari 5	stratum E	\$VASLOT	509	sol type	06	so vacor	
	'emperature T	space Poor,	:p water table	Shalar A		(Enter value or 6)	organy agova n afertasia	sof Type directly above	rused to estimate soft vapor	.""	perneadity >	
	τ _ς (°2)	۱.,	La-	l .'	. "#	r _c			l '		ж. (с.т. ⁷)	Į.
		(em)	Jeni;	(60))	(5171)	icm;	(Erion A Blon C)	water table	germenbirty*		ict.	1
	11	15	110	110	D	. 0	A	<u> </u>	5			†
												•
	ENTER	ENTER	ENTER	FMTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
MORE	Stralum A	Sirarum A	Stratum A	Stratum A	Siratum B	Stratum B	Stratum 6	Stratum B	Stratum C	Stratum C	Shallure C	Stratum C
. ↓	\$C5	soil dry	so lotal	sol water-tilled	SCS	50- ary	\$50,00091	soil water-filled	50,5	so i dry	so lg:al	soil waigr-filing
	sol lype	out a density.	noresity.	poresity.	sol type	bulk density.	parasay.	nerosity.	soll'yee	burk density,	corasily;	properly.
	Lockwo Soil	υ _ο ^*	هم	9,1	Estrop Sol	۰,•	n,	0_6	Leokud Seu	260	₽¢.	0.,"
	Parameters	(g/cm²)	(unilless)	rom²(cm²)	, parameter,	(g-cm²)	[ancess]	Kim ₃ (cm ³)	і ^Б ратынія	igronti	junilæssy	(cm²/cm²)
			2 330	<u> </u>		[18 6]	0.275	2 0 54		file	<u> </u>	0.054
	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER		ENTER			
MORE.	Enclosed		Enclosed	Enclosed					Average vapor			
	space	So ibidg	space	22900	Indicased	Floor-wat	Indoor		flow rate into bidg			
	floor	pressure	floor	Nour	space	seam crack	a ne schange		Ott			
	It coress	를 Merential 소리	langV:	40.000	' e girt. 	N-dir	iale ER	L	eave 6 and to da cula?	н		
	L		Lg 	W _H	rtg	*			Q _{+,} , -q -∞-1			
	1Cm/	(glam-st)	((m)	((T)	(9/9)	12.73	;1 *1	-	1, 11, 11			
	<u> </u>	40	1000] 1800	714	J 1 7 1	0.75	_	<u>.</u> 5			
MORE	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER						
	Averaging	Averaging			Targel	Terget hazard						
	some for	time for	E JOSSAFE	Exp@sure	r se lo	acalter) for						
	cart nogers	noneuromagens.		hequency.	Carcino Jens.	noncaromogens.						
	4T.	47.0	ED	EF.	_u	CMT						
	(yrs)	(yes)	(yrs)	(daysiyi)	(_nd-#55)	(und ess)						
		<u></u>	30	350	1 DE-06	ļ .	1					
END :						ulate risk-başed concentration						
<u> </u>				'	Company of the Company		,					

Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Henry's law constant al reference temperature, H (atm-m³/mol)	Henry's law constant reference temperature, T _R (°C)	Enthalpy of vaporization at the normal boiling point, \(\Delta H_{v.b.} \) (cal/mol)	Normal boiling point, T _a (°K)	Critical temperature, T _C ([®] K)	Organic carbon partition coefficient, ^{Koc} (cm ³ /g)	Pure component water solubility. S {mg/L}	Unit risk factor, URF (µg/m²)	Reference cond., RfC (mg/m³)
1.06E-01	1.23E-05	2.69E-02	25	5,250	259.25	432.00	1.86E+01	8.80E+03	4.4E-06	1.0E-01

INTERMEDIATE CALCULATIONS SHEET

Exposure duration : (sec)	Source- eo lding separakon, L _T (cm)	Stratem A so: serfilled corosity; θ_s^A (cm ³ /cm ³);	Stratum 3 so : air-biled scrosity, the (embods)	Stratum C soil art-filled perosity A _s ^C (em ³ /cm ³)	Stratum A offective lotal fluid saturation, S _a (cm ³ /cm ³)	Skatum A soil Inkinsic permeability k _i (cm²)	Stratum A soil relative air pormeabily k., [cm²]	Stratum, A soil effective vapor permeability, K (cm²)	Thickness of capillary zone. C:r (cm)	Total porosity in capillary zone. n ₂ iom ³ (cm ³)	Air-filled porosity in capillary zone. θ_{a,r_2} (cm^3/cm^2)	Water-filed cotosity in capit any zone. $\theta_{m/2}$ $(cm^3)cm^3$	Floor- wat. seam perimeter, X ₂₂₄ , (ph)
9 46E+08	<u>\$</u> 5	0 <u>276</u>	0.35;	C 321	C 004	9 94E-08	0 098_	9 \$2E-08	1705	0 33	0.077	0 253	4,000
Blay ventilation rate George (orn/fs)	Area of end osed space below grade As (orn1)	Crack- to-total area rate n (unitless)	Crack depth below grade Z2. (cm)	Enthalpy of vaporization at avelorization temperature. Athurs (calling)	Henry's law constant at ave groundswiter temperature. Hrs (atmost lime) i	Henry's law constant of ave groundwater temperature. Hits (undess)	Vapor viscosilyat ave soil temperature, this Vgrowej	Stratum A difective diffusion directionant, Dff, (cmf/s)	Stratum B offective diffusion poutflocent Offin (cm ² (s)	Stratum C effective diffusion coefficient D ^{eff} e (cm ² /s)	Capillary zone effective diffusion coefficient Offici (cm²/s)	Total overal effective diffusion coefficient, Dr", (cm²/s)	Diffusion puth length: L; (cm)
1 69E+04	1 06E +06	3.77E-04	: :5	4 989	1.78E-02	7 63E-01	1.768.04	1.345.02	D 00E +00	0000400	1 90E-04	9 95E C4	95
Convection path ength La	Source vapur consider G _{mark} (<u>ygrm³)</u>	Crack radius, Comb (con)	Average vapor flow rate into pidg : O _{tor} (cm ² /s)	Crack effective diffusion toeffective Down (cm ² /s)	Area of Crock, A _{cross} (Cm ²)	Exponent of equivalent loundation Peclet number, exp[Pe ¹] (unitless)	Infinite source according accordingly coefficient (unitiess)	Infinite source bidg, cond , General (ug m ³)	Unit nsk factor, URF (ug/m ³) ¹	Relevence cond. AIC (mg/m ³)	_		
	7.635+03	['0-0	, 8 <u>338∙</u> 91	1 34E-02	4.00E4Q2	4.118+67	5 79E-04	<u>44'E+00</u>	4 4E-05	1 5E-01	-		

ENO,

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater cond., cardinogen (µg/L)	Indoor exposure groundwater conc., poncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (ug/L)	Final indoor exposure groundwater conc., (µg/L)	Incremental risk from vapor intrusion to indoor air, carcinogen {unitless}	Hezerd quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA	NA NA	8.80E+06	NA NA	8.0E-06	4.2E-02

MESSAGE AND ERROR SUMMARY BELOW. (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

PRG SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

					Incremental	Hazard
Indoor	indopr	Risk-based	Pure	Final	risk from	quotient
exposure	exposure	indoor	component	indoor	vapo r	from vapor
groundwater	groundwater	exposure	water	exposure	intrusion to	intrusion to
conc.,	conc.,	groundwater	solubility.	groundwater	indoor air,	indoor air,
carcinogen	noncarcinogen	conc.,	S	çond.,	carcinogen	noncarcinogen
(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(unit/ess)	(unitless)
1.25E+00	2.36E+02	1.25E+00	8.80E+06	1.25E+00	NA	NA NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"

INDUSTRIAL

GW ADV Version 3.1: 02:04	CA, CULATE RISE	₹ 04550 GROU	NOWATER CONC	es, POTAPIRE	der two in 1755 tos	٠.						
Reset to			QR	1								
Defaults :	CALCULATE INC	REMENTAL HISK	KS FROM ACTUAL	GROUNDWAT	eg CONCENTRAT:	ON remigration in 195.	51 box endlic tipligrou	ngwaighdond bei	DW1			
		YES	X]								
	ENTER	ENTER Initial										
	Chemical	groundwalter										
	CAS No	coric										
	(narnzers coly). no payhes)	ر اوس (باوس	_		Chart (a							
	67663	1 306+01	_	<u> </u>	Ch ore/erm							
	ENTER	ENTER Jenn	ENTER	FMTFR Total con	ENTER SI 400 CD ID NO CB C	ENTER	ENTER	ENTER	EMTER Sol		ENTER	1
MORE	Average	Selów grade		1.05 .	77 : Kness) nickness			stratum A		User-defined	
س_ا	so /	10 805047	Depth.	Thickness	of sq:	01.50%	\$×.		SCS		stratum A	
	groundw aler	of end oses come form	below grade	of sp	stratum B	stratum C.	Source:	505	AC TYPE		sp" vapor	
	lemperature. I _s	space Foot. Li	(o water (able. L _w -	Shatan A	(Eule, Agics 2, 0)	(Sector value or 0) Po	1 (#61)) pb 256 w8(ef (8b %)	50 Hype SaeChy abov#	:used to estimate 50 kappy	03	permeability A _a	
	ec)	10151	(CE)	ICΨ	jem <u>j</u>	(cm)	(Enter A. 5, or C)	water table	permeability)		(che ²)	
		15	1'0	1:0				5 5	<u></u>			-
							·		<u> </u>			
	ENTER	ENTER	ENTER	ENTER	ENIER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTEK
MORE	Stratum A	Shatum A	Stratom A	Shalon: A	Stratum 9	Siratum H	Shatum 9	Strate in B	Stratum C	Stratom C	Stratum C	Stratum C
Ĺ <u>, </u>	SC5 sortype	solidly busidensity.	\$6 (total) denosity.	so water-fined porosity		scildra bu « density	se fotal garasty	so water-filled porosity,	SC5 90" typ e	solidiy bun densily	se della" perasity	So waterfiled pricerty
	. 200 1954	F:	r.*	0.*	755-16-25- 750-16-25-	p. ⁴	42 72.1	e_*	. (et ap kel	r-	FC 02/1	0,0
	Parameter	Igremi')	(unicess)	Aum (cm²)	F#ATER1	(g/am/5)	(Unitess)	(sm ³ cm ³)	Parameters	ig cm)	(0.9955)	$\sin^2(c\pi^2)$
	5 !	1 99	J - 0.330	0.054	S	165	2,375	T 0,054	s	1 65	0.375	0.054
	ENTER	FNTER	ENTER	ENTER	ENTER	ENTER	ENIER		ENTER			
MORE	Snoased		Ersos⊕a	Encrosed					Average vagor			
	space foor	Surfactig Oracisore	scace feor	Space Coor	Enclosed Space	Processal Neumorack	ndoor an en henge		flaw varie into plog CR			
	Shickness.	differential.	:e::gil:	e din.	76 q75	4 3"5	/816	1-	pany plank to da cula	e.		
	البريون	2h	Lb	We		₩.	근국		C _{pre}			
	(pm)	(g-cm-s²)	(CT)	(CT)	(sm)	.cm)_	(1 h)	-	<u> </u>			
	10	4ĉ	1 1000	<u> </u>		[\$ 47]				
MORE ,	ENTER	ENTER	ENTER	ENJER	ENTER	ENTER						
<u>i</u>	Averaging	Averaging			Target.	Target Hazard						
	lime for cartinogêns	nancan, nogens	Elegania Guraten	Exposine Requency	nsk for card negens	Guet ent for noncatorragers						
	AT:	AT _{4C}	EJ	€F	10	THO						
	(9/4)	(54.8)	(45)	/days/yrj	(citr' ess)	[Lo Peas]						
	<u></u>		TIBI	IIST I	1000		1					
					Used to call.	Jate nek-basad	I					
END						(Oncentration	!					

Diffusivity in air, O _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m³/mol)	Heary's law constant reference temperature, TR (°C)	Enthalpy of vaporization at the normal boiling point, \(\Delta H_{v,b} \) (cal/mol)	Normal boiling point, T _B (°K)	Critical temperature, T _C (°K)	Organic carbon partition coefficient, K _{oc} (cm³/g)	Pure component water solubility, S (mg/L)	Um) risk factor, URF (µg/m³) ⁻¹	Reference cond., RfC (mg/m³)
1.04E-01	1.00E-05	3.66E-03	• 25	6.988	334.32	536.40	3.98E+01	7.92E+03	2.3E-05	4.9E-02

INTERMEDIATE CALCULATIONS SHEET

Exposure dumbon, 7 (sec)	Source- building separation Li (cm)	Stratum A soil amilyled corosity 9.1 fem ¹ /em ² ;	Stratum 5 soci arrivled porosity $g_s^{(0)}$ (cm^2/cm^2)	Sirpuni C so: ar-Filed porosity, q ^C (cm ¹ /cm ²)	Stratum A effective total fixed saturation, Se (ornhomf)	Stratum A soil this name cermeability k, (cm²)	Stratum A spoil retailme air permeability Ku tomfi	Sharom A son effective vager permeability k, (ont ²)	Thickness of sacreary zone. L _{sc} (cm)	Total potosity in capillary Zune, n _{er} (um²rom²)	Air-filled porosity in capillary zone $\theta_{e_{1}}$ (cm ² /cm ²)	Water-fried parosity in capitary zone 0 _{4.7} (cm ³)(cm ³)	filoor- wall seam cennietor, X _{Own} <u>(</u> om)
T 7 88E+08	95		0.321	C.321		9 94E-08	995	9 97E-08	T 17 25 T	L _0.33	C 077	ā 253	4.000
Bidg. ventilation rate. ටුදා _{මැත} [cm ³ /s]	Area of enclosed space below grade A ₈ (om ²)	Crack- lo-lotal arca ratiu n (unilless)	Crack depth below grade, Z ₁₉₆₆ (cm)	Enthalpy of vaporitation at ave, groundwater temperature, dM _{vis} (eatimot)	Henry's law constant at avel groundwater temperature, H ₁₂ (ulmom ² /mol)	Henry's law constant at ever groundwaler temperature. HELS (undless)	Vapor viscosity all avel soil (empirrature, uns (gignn-s)	Stratum A effective diffusion coefficient, D*" ₄ (cm ² /s)	Stratum B effoctive c ffusion cceff cicnt D*** (cm*/s)	Stratum C effective diffusion coefficient, D*" _c (cm ² /s)	Capiliary zone effective diffusion coefficient of "" (cm²/s)	Total overal: effective ciliusion coefficient, D***, (cm*/s)	Diffusion path rength, U _d (ant)
₹ 57E+04	1.586 (05)	37/E-04	15	7 544	* 95E-03	8 38E-02	1 76E-04	1.31E-02	0 505+00	1 0.00E+00	1.98E-04	1 <u>52E-03</u>	95
Convection nath length, La (cm)	Source waper condition Counce (Japan)	Crack redius, r.,,,,	Average vapor flow rate into bldg , $\Omega_{\rm tot}$ (cm ³ /s)	Crack effective diffusion coefficient C ^{ount} (cm ² /s)	Area of crack Area Tomit	Exponent of equivalent losmoston Pactet number, exp(Pe ¹) (undess)	ichnig spirce indogr attenuation coefficient ic (unifess)	infinite spurco bidg cond C _{ristors} (agrm³)	Uo I risk factor, URF Ipg(m²) ⁽¹	Reference cond RIC (mg/m³)			
15	26E-03	0.10	[833E401]	1 318-02	4.00E+07	8 215+66	1.45E-94	1.83E-C1	2.35-05	1 4 95 02	! :		

END .

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater cond., cardinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc (µg/L)	Pure component water solubility. S (µg/L)	Final indoor exposure groundwater cond., (ug/L)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA NA	NA NA	NA	7.92E+06	NA	1.0E-06	2.6E-03

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

PRG SHEET

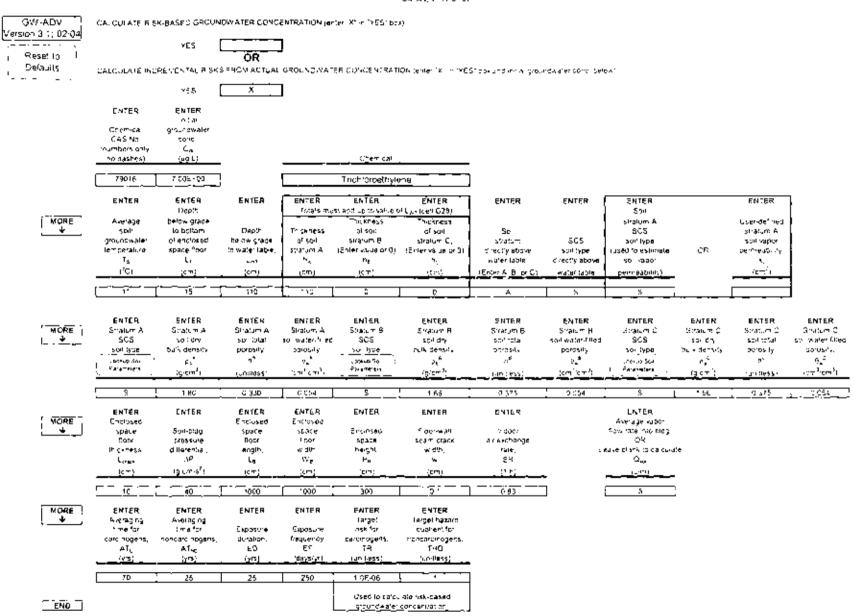
RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor	Indoor	Risk-based	Pure	Final	risk	emental : from	Hazard quotient	
exposure groundwater conc	exposure groundwater conc	indoor exposure groundwater	component water solubility,	indoor exposure groundwater	intru	apor ision to oor air.	from vapor intrusion to indoor air.	
carcinogen (µg/L)	noncarcinogen (µg/L)	conc (μg/L)	\$ (μg/L)	conc (µg/L)	card	inogen itless)	noncarcinogen (unitless)	
1.46E+01	5.87E+03	1.46E+01	7.92E+06	1.46E+01		NA .	NA NA	

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Caource and Chailding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"



Diffusivity in air, D _a (cm²/s)	Diffusivity in water, D _w (cm ² /s)	Henry's law constant a) reference lemperature, H (atm-m³/mo!)	Henry's law constant reference temperature, T _R	Enthalpy of vaporization at the normal boiling point, \(\Delta H_{v,b} \) (cal/mol)	Normal boiling point, T _B (°K)	Critica! temperature. T _C (°K)	Organic carbon partition coefficient, K _{pe} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m³) ⁻¹	Reference conc RfC (mg/m³)
7.90E-02	9.10E-06	1.03E-02	25	7.505	360.36	544.20	1.66E+02	1.47E+03	1.1E-04	3.5E-02

INTERMEDIATE CALCULATIONS SHEET

Exposure duration t Isoci	Source- building superation, L- (cm)	Stratum A so: air-filled perosity, esh (cm ¹ /cm ¹)	Stratum B \$00. arcticled percestly, $\theta_{s}^{(g)}$ $(sm^{2}cm^{2})$	Sizatum C soil arr-6 fed porosfy, 8,5 (cm ³ /cm ³)	Stratum A effective rote, fluid saturation Su confidenti	Sitatum A soil . Tir nsic permentility k (cm²)	Shalom A ser! relative air permeabaty A _{to} (cm1)	Stralum A son effective vapor permeativity, k, (cm²)	Thickness of capillary zone. Ly (cm)	Total porosity in capitary cone for (sm²/cm²)	Air-f, led perosity in capit ary yone ten?con?	Water-filled porgsity in capillary cone A ₂₋₁ run- ² /cm ²)	Algar- wa. seam perimater X _{par} , tomi
7 <u>88</u> E•08	95	0 276		0.321	0.204	994E-08		6 93E-08	□	[<u>c 33</u>	9077	[c <u>253</u>]	j4,0 <u>00</u>
Bidg wedlaate= rate C _{orears} (cm²rs)	Area of end osed space befow grade. A _a (cmf)	Grack- to-tola area ratio, 'I (unit ess)	Crack depth below grade, Zown (cm)	Emitia py of vaporization at ave, groundwater temperature, Attyris (callimot)	Printy's taw constant at awe, groundwater temperature, Mrs (atm-m3mol)	Fienry's law constant at ave. groundwater temperature His (unitless)	Vapor wicosity at avel sor temperature, Pro (grom-s)	Stratum A effective diffusion operiorient, D ^{AP} A (cm ² /s)	Stratum B Effective caffusion coefficient Dff(s 1cmf/s)	Stratum C effective diffusion coefficient, D*", (cm ² /s)	Capillary cone effective diffusion coefficient, D ^{eff} us (am ² /s)	Total over all effective diffusion coefficient, D*", (cm*/s)	D Musical path length: Us (2m)
6.97E+04	1,06E+06	3.77E-04	15	8.544	5 05É-03	2 17E-01	1 7 <u>6E-</u> 04	9.97E-03	0.006+00	0.005+90	1 45E-04	7.55E-04	- 26
Convection path rength. La (em)	Source vapor cond . C _{soor} (µg·m ¹)	Crack radius, r _{esec} (cm)	Average vapor flow rate rate bidg One (om ¹ /s)	Crack elfective diffusion coefficient, Daner (cm ⁻⁷ /s)	Area of prack, Allow (pm²)	Exponent of require ent foundation Podel number exp(Pe ¹) (undeps)	Infinite source indoor attenuation coefficient o (unit ess)	infinite source ag cons. Cons. (pg)**	Unil risk factor USP (ug·m²) [†]	Reference cond RfC [mg/m ¹]			
	1.528 • 03		1 8.39E+U1	9 9/E-03	- 3 cc€+02	5 78E+90	[_1 <u>1</u> 1E-0 <u>4</u>]		<u> 1,16-04 </u>	<u>0.58-02</u>	Ì		

END)

RESULTS SHEET

INCREMENTAL RISK CALCULATIONS:

					Incremental	Hazard
Indoor	Indoor	Risk-based	Pure	Final	risk from	quotient
exposure	exposure	indoor	component	indoor	vapor	from vapor
groundwater	groundwater	exposure	water	exposure	intrusian to	intrusion to
conc.,	conc.,	groundwater	solubility,	groundwater	indoor air,	indoor air,
carcinogen	noncarcinogen	conc	s	conc.,	carcinogen	noncarcinogen
(hg/L)	(<u>µg</u> /L)	(μ g/L)	(μg/L)	(μg/L)	(unitless)	(unitless)
						
NA	NA	NA .	1.47E+06	NA NA	4.5E-06	3.3E-03

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

PRG SHEET

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater cond., cardinogen (µg/L)	Indoor exposure groundwater cond noncardinagen (µg/L)	Risk-based indoor exposure groundwater cond (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc {ng/L}	intrusion to indoor air,	Hazard quotient from vapor intrusion to indoor air, incarcinogen (unitless)
1.55E+00	2.13E+03	1.55E+00	1.47E+06	1.55E+00	NA NA	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Osource and Obuilding on the INTERCALOS worksheet are based on unity and do not represent actual values.

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

GW-ADV Version 3 1; 02/04 Resel to	CALCULATE 5.50	K-BASED GROU! YES	NOWATER CONC	ENTRATION (en	ogr IXI in TYEST po	ı;						
Defaults	CAUCULATE INC	REMENTAL RISK	(S FROM ACTUAL	GROUNDWATI	ER CONCENTRATI	PDN (erser TXT in 1465	5) how and initial group	rowaler conditiels	ew!			
		YES	<u> </u>	3								
	ENTER	FNTFR										
	Ohomica: CAS No	cave Bionagwwier									•	
	(numbers only no dashes)	C _A (J.g.L.)			Ceens cal							
	79016	7 95E+00	- 1		7 rich orbeithyld	rne						
	ENTER	ENTER	L RATHS	ENIER	ENTER	ENTER	FATER	ENTER	ENTER		FNTER	7
		Septh	22	1	stiacd up to value a	oliu _{ma (d} en G26)		0.0	Sp.			1
MORE	Average solf	De Owlighade 10 9000m	Georgia	Thickness	Printeress physial	Thickness phso:	ão		stratum A SCS		Cserver' ned Shallaro A	Ì
	groundwater	of entrosed	cerow grade	of soil	Straton B	stratum G	Stalem	505	\$01:ype		sed vapor	1
	16 ጥ ቢህነልነ . 'e. ፕ _ን	space Noor. ik	io warontabia Uwa	Stratuer A	TEMPLYANGE OF ST	(Enter value or 3) h _e	directly above water table	softype dowelly above	(used to estimate No inapor	07	penneabudy ku	1
	<u>(%:</u>	(unit)	(¢Ψ)	jeni;	((m)	(c/r)	/Onter A. B. or Ct	water table	сентевој (у)		;cm ¹)	╛
	11 1	15	i 1:0	115	Ľ		4				í ———	1
					···········							•
	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
MORE +	Stratum A	Stranom A	Sitalum A	Statum A	Siratury B	Stratoπ θ	Stratum B	System 6	Sharum C	Shall-to C	Stranom C	Shalor C
	SCS son type	10 Gry Ou A Gens ty.	so-i iblal potos (y.	so water-filled povesity.	505 504 type	son dry bulk de19ny.	sed (gta) werosay.	Soil waterfried privosity.	505 5011/0 0	solicry back dense,	soil folkti pø/6s (y.	so water-Med polosty
	Julyap Sur	, le **	F.*	6,4	103-4-20-	P, #		0.4	- 67-40 Sel	Fo"	m ⁽	9 <u>.</u> 2
	Parameters	(g/sm ³)	(unitless)	sem ³ lem ²)	Partector	:g/pm ²)	runil'855	10 m ³ /sm ³)	Personates	(c.cm²)	(Unificate)	(cm^2/cm^2)
	5 i		2,330	3 054	S	1 56	0.375	0.054		: 66	1 2375	0.054
	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER		ENTER			
MORE	Enalosed	2.1.2.2	Enclosed	Enciases	2171210	Caren	Ç		Average vapor			
<u> </u>	space	Sol-bldg	space	space	Factored	Froot-Nar	indop.		Pow rate into bidg			
	Hogr Inichness,	prossiire alferentiar	floor iengin,	Spor Webb	space reigni	yeam crac∙ widih	air exchange (2)e,		FØ 'n'opina or anka a vea			
	ا دید	75	Ly .	₩ _B	-te	*	žA.	.,	G _w	. -		
	5570)	(ç cm-s²)	(am)	[cm]	.60!	(6m)	0.59		g mj			
		42			<u>267</u>	21	C 53		_ · ;			
MORE	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER						
L. <u>.</u> +	Averaging	Averaging	Exposure	Exposure	Targe! ngs 'ex	Target hazard						
	i melior caro apgens	time for nanzuromagens		fre disensity	pan, conjens.	geskent for noncarchitigens						
	AT.	47.65	ED.	Er	TR) NO						
	252	5751	39155	124 yevyn)	G-dless)	(0r-1025)						
	[75	25	<u>] 25</u> 0]	1.0E-26							
END						väleir ski-babed Congentr <u>ation</u>						

	Diffusivity in water. D _w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m³/moi)	Henry's law constant reference temperature. T _R (°C)	Enthalpy of vaporization at the normal boiling point, \(\Delta H_{2,b} \) \((ca\)/mol\)	Normal boiling point, T _B (°K)	Critical temperature, T _c (°K)	Organic carbon partition coefficient, K _{so} (cm ³ /g)	Pure component water solubility, S {mg/L}	Unit risk factor. URF (µg/m³) ¹	Reference cond., RfC (mg/m³)
7.90E-02	9.1 0E-0 6	1.03E-02	25	7.505	360.36	544.20	1.66E+02	1,47E+03	2.0E-06	6.0E-01

INTERMEDIATE CALCULATIONS SHEET

Exposure duration t (sec)	Source- building separation (cm)	Stratum A sp3 air-tifled porosity 8,4 (cm ² /cm ³)	Stratum B sor air-tified parcsity. θ_a^B (cm^3cm^3)	Straigns C soil air-filled gorosity, e _g c (orn ^a rom ²)	Straturs A effective total fluid saturation Sta (om²(om²)	Stratom A sou intrinsic permeability, k (cm²)	Stratum A po / refative an permeability, k _m (cm²)	Stratum A your effective vapor permeablity, A, (cm²)	Thickness of capillary zone L., (cm)	Total porestly in capi lary cons, o., (cm²/cm²)	Air-filled porosity in capillarly zone, Pakir Icm ³ /cm ³]	Water-Pied perosity in capitary zone, 0 _{mat} (orn ³ /cm ³)	Floor- wal seam perimeter X _{UES} (cm)
7 58E+08	95	0.275	0.32	0.321	0 0 0 0 4	9.94E-GB	19.999	9.92E-08	17,05	0.33	<u>C</u> 077	0.253	4,000
8 dg verstation rate $Q_{0,4999}$ (cm^3 's)	Area of end osed space below grade A _B (cm ²)	Creck- to-tola- area natio. n	Crack depthe below grade Z	Enthalpy of happingation at avel groundwater temperature 2H _{1.15} (de molt	Itemy's taw constant at use igroundwater temperature Hwy (at mind time)	Nemy's law constant at the groundwaler remperature Hins sumbless)	Vapor wsklosky at aveliso temperature, wsk ug/om/sy	Stratum A effective diffusion coefficient D ^{eff} u (Cm ² y)	Scatum 8 affective diffusion upeticient 9ffs (onfix)	Stratum C offer the diffusion coeffusion C**[(om^2,s)]	Caprilary zone effective diffusion coefficient Offici (amilia)	Total siver off effective of Position Coefficient, Dords (comment)	Diffusion pain rengin. La (cm)
<u>6,925,04</u>	L 106 <u>E-06</u>	3,77 <u>E</u> -04		8 544	(5.75F-03	2.17E-01	1 /6E-04	9 9 / E-03	[poce-co		1.45E-04_	7 <u>5</u> 98.0 <u>4</u>	I _ 95
Convedica- path ength U _a (cm)	Source vapor cond . Cross (pg·m²)	Crack radius, feas (cm)	Avarage vapor flow rate of cidg. Class (circles)	Crack effective diffusion coefficient Deff (cm(ls))	Area of Orpox Acres (cm²)	Expansat of equiva into foundation Peclet number, exp(Pe') (unitless)	infinde source indoor aftervacion coefficient to (unit ess)	obnite spunce uidg cond , C ₍₂₀₀₀₎ [ag-m²)	Unic 7.6k factor URF (4.9 m ³)*	iRelerance cond . RIC (mg/m³)			
15	1.525+03	0.10	8.33E+C1	9.97E-03	4.005+02	5.28E+90	J 11E-04	1 68E-01	2 05-08	6 DE-U1	1		

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

1ndoor	Indoor	Risk-based	Pure	Final	Incremental risk from	Hazard quotient
exposure	exposure	indoor	component	indoor	vapor	from vapor
groundwater	groundwater	exposure	water	exposure	intrusion to	intrusion to
conc.,	conc.,	groundwater	solubility,	groundwater	indoor air,	indoor air,
carcinogen	noncarcinogen	conc	S	cond.,	carcinogen	noncarcinogen
(µg/L)	(µg/L)	(μg/L)	(µg/L)	(µg/L)	(unitless)	(unitless)
NA	NA NA	NA NA	1.47E+06	NA	8.2E-08	1.9E-04

MESSAGE AND ERROR SUMMARY BELOW. (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

PRG SHEET

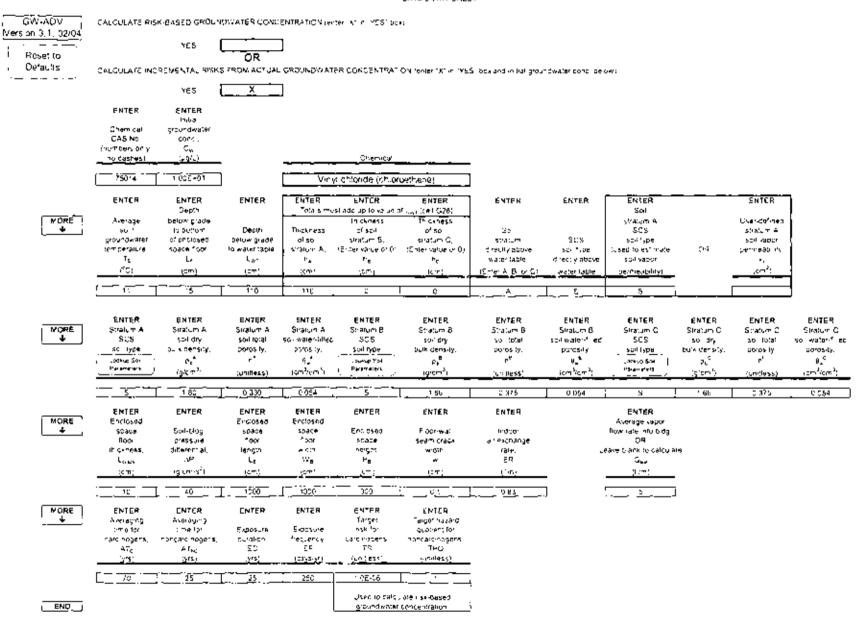
INCREMENTAL RISK CALCULATIONS:

Indoor	Indoor	Risk-based	Pure	Finaf	Incremental risk from	Hazard quotient
exposure	exposure	indoor	component	indoor	vapor	from vapor
groundwater	groundwater	exposure	water	exposure	intrusion to	intrusion to
conc.,	conc.,	groundwater	solubility.	groundwater	indoor air,	indoor air.
carcinogen	noncardinogen	conc.,	\$	conc	carcinogen	noncarcinogea
(μg/L)	(ug/L)	(ug/L)	(μg/L)	(μg/L)	(unitless)	(unitless)
8.53E+01	3.66E+04	8.53E+01	1,47E+06	8.53E+01	NA NA	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE. The values of Csource and Obuilding on the INTERCALOS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"



Diffusivity in air. O _a (cm²/s)	Diffusivity in water, D _w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m ³ /mot)	Henry's law constant reference temperature, T _R (°C)	Enthalpy of vaporization at the normal boiling point. 3H _{vib} (cal/mol)	Normal boiling point, T ₆ (°K)	Critical temperature, T _C (^e K)	Organic carbon partition coefficient, K _{oc} (cm³/g)	Pure component water solubility, S (mg/L)	Umi risk factor. URF (µg/m³) ¹¹	Reference conc., RfC (mg/m³)
1.06E-01_	1.23E-05	2.69€-02	25	5,250	259.25	432.00	1.86E+01	8.80E+03	4.4E-06	1.0E-01

INTERNADIATE CALCULATIONS SHEET.

Exposure donal on (sec)	Source- syriding separation. L: (on)	Shalum A spii pur-filed perosity, ty, iomiliomili	Stratum B spil air-filled pordsity, A. ^B (em ³ /cm ²)	Stratum C sor an-filled perosity, A _s C (cm ² /cm ²)	Stratum A effective total 5 and satural on, Sy (cm ² /cm ²)	Stratum A soil inference permeability, k (cm²)	Stratum A so." relative air permeability his (cm ²)	Stratum A so ' effective vapor permeability, k, tom ² t	Thickness of capitary zone L _{sz} (cm)	Total porosity in dapt, ary zone, "kr (om²/om²)	An-I red percestly in cap, fary zone, θ_{a-2} (zm^2-zm^2)	Water-filled perosity in expillary zone. θ _{allo} (cm ² /cm ²)	Floori well soam permeter, X ₁₉₆ 6 (cm)
7.B8E+08_	95	0,276	1 0 32t T	G 321	0.004	9.945-08	0 998	g 92E-08	17,05	0.33	0027	0 253	4 000
Bidg vent atten rate Classing (cm//s)	Area of enclosed space below grade, As (cm²)	Crack- to-tola area ratio. '1' (unit ess)	Crack depin below grade, Zogs (cm)	Entratoy of vapor cation at ave, groundwater temperature 3H, 15 (calvino)	Henry's law Cunstant at avel groundwater temperature Hrs (amilimo)	Heriry's law constant at aver groundwater lemberature, (4)-5 (unit ess)	Viapar Viscosify at avel 50 tompgrature Pry 19/2/m-s)	Stratum A effective diffusion coefficient D*** (confis)	Stratum B effective oi/flusion cuefficient D**'s (con*'s)	Stratum C effective diffusion coefficient D''' (om'/s)	Capillary zone effective diffusion coefficient Official	Total overall effective diffusion coefficient, or ", , , , , , , , , , , , , , , , , , ,	Diffusion (xaith feight) -1 (cm)
6.92E+04	1,06 <u>E+0</u> 6	3.77E-04]15[4 989	1 /6E-02	7.63E-01	1-1-1.75E-04	1 134E/02	5 55E • CC	C CCE+90	1,30E-04	9.955-04	<u>95</u> ,
Convection pain ength. Le (cm)	Source vapor conditions Cooks (Jg/m²)	Grack radius, foles (cm)	Average vapor flow rate into bridg. Open (com l/s)	Crack effective orfusion poetkpient, D ^{eser} (cm ⁻⁷ s)	Area of chack, Area, (cm1)	Exponent of aguivalent founcation Pedial frumber exp(Pel) (unitless)	Trimite source mopor afternation coefficient or (universe)	Infinite source oldgi consil Geografi (gg/m²)	Un4 16k 1866: VRF (µg/m³) "	Reference condi- RIC (mg/m²)			
15	7.63E+03	G 1C	8 33E+01]	1 34E-92	4 00E+02	- A.11E467	1 42E-04	' 108E+30	4 45-06	J 10E-01)		

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)	Incremental risk from vapor intrusion to Indoor air, carcinogen (unitless)	Hazard quot:ent from vapor intrusion to indoor air. noncarcinogen (unitless)
NA.	NA NA	NA	8.80E+06	NA]	1.2E-06	7.4E-03

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

PRG SHEET

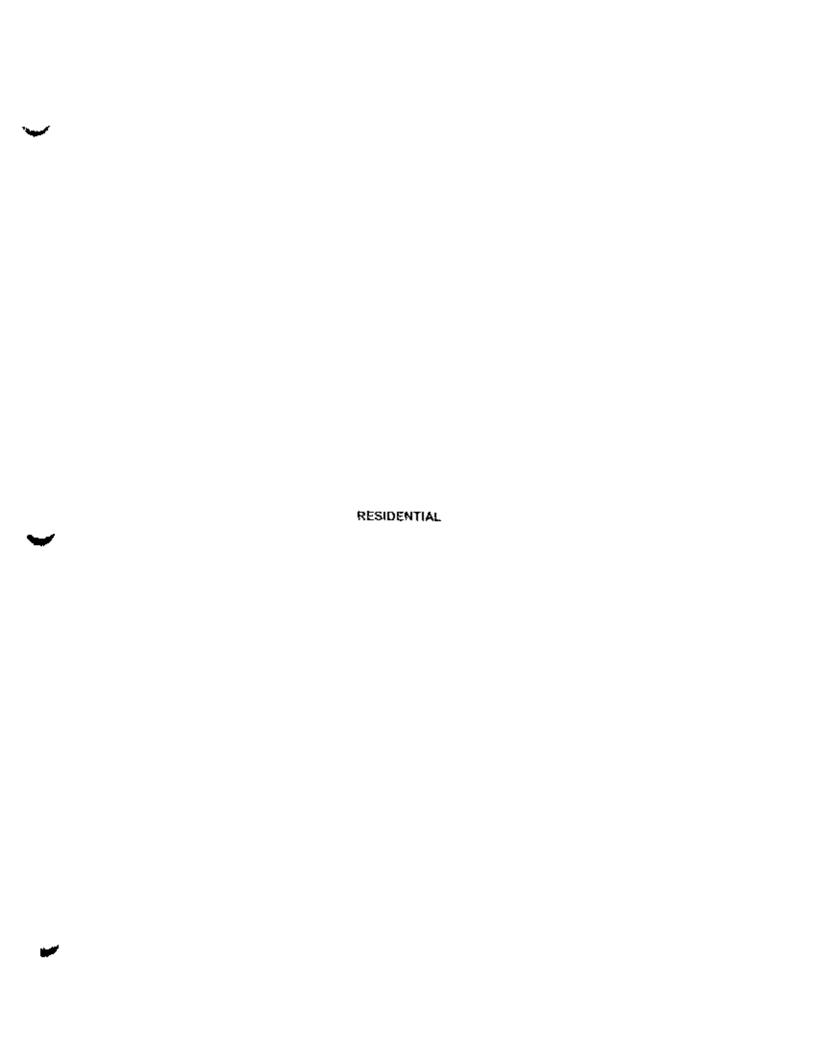
RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater cond., carcinogen	Indoor exposure groundwater cond., noncarcinogen	Risk-based indoor exposure groundwater conc	Pure component water solubility, S	Final indoor exposure groundwater conc	Incremental risk from vapor intrusion to indoor air, carcinogen	Hazard quotient from vapor intrusion to indoor air, noncarcinogen
carcinogen (mg/L)	noncarcinogen	conc. (mg/L)	S (mg/L)	conc (mg/ <u>L)</u>	carcinogen (unitiess)	noncarcinogen (unitless)
8.60E+00	1.35E+03	8.60E+00	8.80E+06	8.60E+00	NA NA	NA

MESSAGE AND ERROR SUMMARY BELOW. (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"



DATA FRIRY SHEET

GW-ADV (Version 3.1, 02/04) I Roset to Oefourts		K BASED GROUN YES (OR]			Silbox and in ball groun	rowaler consider	o « ;			
		45 5	Х)								
	ENTER	ENTER										
	Спетира	in tat groundwaler										
	CAS No	70-c										
	inombers coly no dashas)	C _a /ng4)			Chemical							
	79016				Techlerochyle	ere	· •					
	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	EN:ER	ENTER	ENTER		ENTER	ì
NOHE -	Average	Depth Below grade		- Jans 1765	Thickness	Inickness			Soil Sonium A		asnodiif nea	.
<u> </u>	Sort	to corban	Depth	Piickrigss	ರ್ 50	al sail	Şc i		SCS		stratum A	Į
	groundwater remperature.	of et closed space floor	čelow gráde 10 water jable.	of you	shatan B Baran Jamar Da	stratum C, (Entervolue or 3)	Shalat	509	sarii,pa	CR	sol vapor	1
	erripera sile.	t.	Lai	shalom A. Na	F8 (CUIB- 24 G6 G- 0)	h _e	direcily above water ratie	so Type dynasty above	iused to estimate	0.4	ректеабыйу 4.	ì
	(25)	(Cro)	(C21)	Icht)	jees)	<u> (47) </u>	Crter A B or C;	water table	permealor(v)		(sm²)	i
	- 11	15	190			·						}
		. 19 ;	139	199	- 9 -	ξ) -	Ĺ _ <u>LS</u>	LS			,
- Neps-	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
MORE I	Stratum A SIDS	Stratum 4 Amiliany	Siratom A sa∽tolet	Stratum A no livratured	Stratum 5 SCS	Sharan A solon	Standin B spillotal	Shatim 5 so water-Higa	Shabim C SCS	Shaller C soliety	Stratum C sor total	Spalor C so, water&led
	so lye#	bloc density.	porașily.	porosity	sol type	to a density	pores ty	priosay,	50 lype	DUR BATARY	90105 by	pomos ly
	55	c.*	r.*	e_*	Cooked So	r's ^B	a "	6,,6	Language March	n√°_	97	9",
		ig'(m²)	(unitess)	(cerl cref)	Parameter	[g/km ³]	(JIO 1955)	perturb	PAST4:65	;q c=";	(301,895)	gara yara
	LS	150	0.270	0.076		1 65	0.975	0.054	. 3	1.65	0 375	9,004
	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER		ENTER			
MORE .	h noigned	So სხიც	Enclosed	Factored space	Englosog	Figor-wall	10.1234		Average vapor			
		ე(#55 ∪ / €	space face	foor	space	seam crack	inaga: ar exchange		flaw rate injoiping.			
	TP://kP/095	ortlangers an	เดาดูเก	width,	height,	width.	1810.	L•	dave brank to da sula	ie		
	المراجعة	Λ=	۱.	Wa.	ч _в	γ.	문목		٥			
	(GT)	(g·cm/s²)	(:m)	К Ψ)	(cm)	<u>((T)</u>	11.6)	•	<u>i[.m)</u>			
	ID	43	1000	1000 1	244	0.1	0.25	i	5			
MORE	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER						
<u> </u>	Awriaging Line for	Averaging ; mailtor	Yxtosur∎	Exposure	Target rsk for	gedheni for						
	card nogens.	noncaronogens,	Shishbo	fraguency.	cardinggens,	rendardin oge ns.						
	AT _C	4-~	EO	EF.	79	THQ.						
	(4.2)	(9/3)	lys)	(Gays yr)	.v: die\$\$1	(un 1855)	ı					
	70		30	350	1 0E-0 6		1					
					ised to says	Jare risk-based						
END				Į		CONCENTAGION						
				_			-					

Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, $D_w = (cm^2/s)$	Henry's law constant at reference temperature, H (atm-m³/moi)	Henry's law constant reference temperature, T _R (°C)	Enthalpy of vaporization at the normal boiling point, \(\Lambda H_{v,b} \) (cal/mof)	Normal boiling point, T _B (°K)	Critical temperature, T _C (°K)	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m³)	Reference cond RfC (mg/m ³)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	1.1E-04	3.5E-02

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, T (sec)	Source- building separation, L ₁ (cm)	Stratum A sort and fled corosity θ_s^A (cm²/cm²)	Stratum 8 soil art-fried porosity θ (cm²/cm²)	Stratum C soli a r-filled consuly, g _s ¹ (cm ² (cm ²)	Stratum A effective tota fluid suturalign Su (cm² cm²)	Stratum A squ infrinsic permeability, k (pm²)	Stratum A 50/ relative air permeability, Kia (cm²)	Stratum A 50 effective vapor permeability k, (cm²)	Thickness of capt any zone. L _{rt} tom;	Fota perosity in capit ary zone ny (cm²-om²)	And ediporosity in capitary zone, \$\$\text{\$\tex{\$\$\text{\$\text{\$\text{\$\text{\$\text{\$\text{\$\text{\$\text{\$\text{\$\texittit{\$\text{\$\text{\$\texittit{\$\text{\$\texitit{\$\text{\$\tex{\$\texititit{\$\text{\$\texititt{\$\text{\$\texitittit{\$\text{\$\tex	Water filled porosity in paperary zone. θ_{ext} (om ² /om ²)	Ficor- wa't seam perindle- X _{err} , (em)
9.458-05	135	0 294	0.321	0.321	D Q84	638.08	10.955	1,55E-08	[18_75	i0 <u>3</u> 7	0.067	3 303	4,000
Blog ventilation rate, Operation (cm ⁻¹ /s)	Area of enclosed space to ow grade. As to mother than the control of the control	Crack- to-total area retro, n (Janifess)	Crack depth defow grade, Zmex (cm)	Enthalpy of vacorization at avergroundwater temperature, δH_{crit} (cal/mol)	History's faw constant at tive igroundwaler lemperalure, Hrs rator-m ² (mol)	Mynrys law constant at ava groundwaler lymperature, Hins (unit ess)	Vapor viscosily at ave soil tomograture Prs loigm-s)	Sirutum A effective diffusion coefficient, D ^{eff} * (cirt ¹ /s)	Stratum B effective c ffusion coefficient, Dffis (coeffs)	Stratum C effective diffusion coefficient Offic (cm)(s)	Capitlary zone effective o ffusiun coefficient D*** coefficient	Total overall effective diffusion coefficient. Official (coming)	Diffus.on path length, its (cm)
* 69E+04	1 C6E.+C6	3.77€-C4	(15	â,544	5 u5E-03	2.178.01	1.76E-04	9.7 <u>9</u> E-03	0 00E+00	<u> </u>	7 <u>83</u> E-35	<u>0_37E</u> -04_	135i
Convection path length L _v (cm.)	Source vapor cond. G _{rante} (µg/m²)	Crack radius forale (cm)	Average vapor Low rate (no blog), Q _{set} (cm ² /s)	Urack offective diffusion coefficient, Does (cm ² /s)	Area of crack Alies (conf)	Erponent of equivalent foundation Peciet number, exp(Pe ²) (unifiess)	Infinite source indicar alternation coefficient a junifess)	Infinite Suarce Is dig Cond Couler Lug(m²)	Unitiesk risk factor JRS (pg/m²)	Reference cond RtG (mg/m²)			
15	Z 1/€ ×57		8.335-01	9 79E-03	4 005+02	2 57E+92	[2 376754 T	[5 (3£,62 °	THE CO	3 5E-52]		

ENO

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor	Indoor	Risk-based	Pure	Final	Incremental risk from	Hazard quotient
exposure	exposure	indoor	component	indoor	vapor	from vapor
groundwater	groundwater	exposure	water	exposure	intrusion to	intrusion to
conc.,	conc.,	groundwater	solubility,	groundwater	indoor air,	indoor air,
carcinogen	полсагсілодел	солс.,	S	conc.,	carcinogen	noncarcinogen
(ug/L)	(µg/L)	(μg/L)	(µg/L)	(μg/L)	(unitless)	(unitless)
	 	 				
NA NA	j NA	NA	1.47E+06	NA NA	2.3 E -06	1.4E-03

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

PRG SHEET

INCREMENTAL RISK CALCULATIONS:

					Incremental	Mazard
indoor	l nd oor	Risk-based	Pure	Final	ก่รk โกอกา	quotient
exposure	exposure	indoor	component	indoor	vapor	from vapor
groundwater	groundwater	exposure	water	exposure	intrusion to	intrusion to
conc.,	conc.,	groundwater	solubility.	groundwater	indoor air,	indoor air.
carcinogen	noncardinogen	conc.,	\$	conç.,	carcinogen	noncarcinogen
(mg/L)	(mg/L)	(m/g/L)	(mg/L)	(mg/L)	(unitless)	(unitfess)
						·
4.31E-01	7.11E+02	4.31E-01	1.47E+06	4.31E-01	NA NA	NA .

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: The values of Csource and Chuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

	GW-ADV sion 3 1; 02/04;	CAUCULATE RIS	K-BASED GROUN	4DWATER CONC	ENTRATION (en	tar txt with EST co	.1						
			YES]								
	Reset to Defaults	CAUCULATS INC	REMENTAL FISK	OR S FROM ACTUAL	GROUNDWAT	εκ σονωσημαπ	ON (engrith) in the	Si bekardında gita	ሳይኤልየያሳር ጋግር ነውያና	ow!			
•			YES]								
		CNTER	ENTER										
		Chemica	m hai groundwarer										
		CAS No.	come.										
		promotions only.	. C a.										
		no dashēs)	(F3/L)	•		<u>Operaça</u>							
		79016	1005+00	J		1 richtoroethyle	ne						
		ENTER	ENTER Depth	ENTER	ENTER Totals mu	ENTER stiedd og (a value o	ENTER La-Jeall GZ91	ENTER	ENTER	ENTER Soi		ENTER]
	MORE	Amrage	below grade			Thickness	Trickness			stratum A		Jack-nebrad	
		50.7	(o baltam	Dapin	Thickness	ol soli	27 \$304	Son		SCS		stratum A	1
		groundwaler (er/toe/a)ure.	o) ericlased spaCe floor	below grade Is water face.	of sort shatum A.	stratum 8. IEmeriya ya or 0:	stratum C (Ectar value or 0)	stratum diractly above	SCS so type	scirtyde Tused to eathwile	ac.	berguespirik Zo kabor	
		T3	L,	L _W 1	1,	70	Pc	water labe	directly above	50: ASPOT	· ·	Poesp ;	ነ
		<u>CÉI</u>	(cm)	(pm)	(cm)	(em)	lcm;	(Effer All Block C)	water (able	permesbility;		12001	1
		1'	19	150	150	0	J	A	LS	2.1			-
		ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	FNTER	ENTER	ERTER	ENTER	ENTEĤ	ENJER
	MORE	Stratum A	Shalum A	Stratum A	Statut A	Stratum E	Straium 9	Signor B	Stratum B	≲ೆಡಬ್ಬರು € ೧೦೦೪	Stratum C	Stratum C	Sirator G
		905	govidny Ou v Endistry	so Hota. porasity	se water/filed parosity,	925 3 0 - 19 08	sori ory bulk dopsity	se trola povest _e	so water&@ed paresdy	SCS	soli siy bulk denso _{li}	soil (c'a) oaros (y	so water file: polasily
		= SQ - Sype Note by Sta	na ⁴	n ^a	3.°	-x-00 5th	25 g	p.2004	474	, soft (<u>yp</u> re 1,004 or Soft	P)	20131.9	9
		Parameters .	(g/cm²)	lumiless)	(sm² cm²)	Parameters	(3:00°)		smilemi)	Parameters .	ig-cm ¹ ;	(unitess)	jem ² jem ² j
						<u> </u>		1_000551	· 				
		LS	1.60	0376	0.075	<u> </u>	1.66	0.375	0.054	<u>\$</u>	1 66	0.275	0.054
	MORE	ENTER Enclosed	ENTER	EnfER En: ased	ENTEA Enclosed	ENTER	ENTÉR	ENTER		ENTER Average vapor			
	"\J``	space	Sol-blan	50000	500080	Enclosed	Floorwall	Incoor		flow rate into bidg.			
		fasr	pressura	150v	flour	эрасе	Seam crack	aid exchange		CR Í			
		(hickness	d/fleren::al	eagn.	WICH	height	W-50	rate	Lt	eave plans to de cola	ie:		
		1,000	73	-E	W.	P4 _p	**	F6		C**			
		<u> (ст:</u>	egitmes²)	(cw)	(cm)	[L:1]	12.70		-	<u>(Um)</u>			
		10 10	40	1505	5095	244	31	0.26	_	€			
	MORE	ENTER	ENTER	ENTER	FNYER	ENTER	FNTER						
	· *	Averaging time for	Averaging ume for	Гировиге	Exposure	Targel Hak for	Taiger, nazaió qualient for						
		raik negers	noncard nogens	Curation.	frequency.	Caru Hagens.	noncarorogers						
		ΑT _c	AT _{sc}	ED	ĒF	*₹	THQ.						
		<u>(ym)</u>	(9%)	(43)	(days yr)	<u>[6741855]</u>	jura essi						
		70	33	<u></u>	367	108-66							
							lare : sa-based						
	END					groundwater	concentiation	I					

Diffusivity in air. D _a (cm²/s)	Diffusivity in water. D _w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m³/mol)	Henry's law constant reference temperature, T _R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T _B	Ontical temperature, T _C (°K)	Organic carbon partition coefficient, K _{cc} (cm ³ /g)	Pure component water solubility. S (mg/L)	Unit risk factor, URF (µg/m³) ⁻¹	Reference conc., RfC (mg/m³)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	2.0E-06	6.0E-01

INTERMEDIATE CALCULATIONS SHEET

Exposure curation I lisect	Source- building securation, L ₁ (cm)	Stratum A soil air-luted perosity, e _a * (cm*/cm*);	Shatum B soli archiled porosily, $\theta_{\rm s}^{(0)}$ (cm².cm²)	Stratum C soil air-filled corosity, e _a ^C (configm ³)	Stratum A effective retail fluid saturation S _{tr} (om ³ cm ³)	Stratum A soil intrinsic permeability k, (cm²)	Stratum A soil relative air permeability N _e (cm ²)	Stratum: A soil effective valor permeability. K. (cm ²)	Thickness of capit any zone.	Total porosity in capillary zone n _M (cm ² /cm ²)	A ribiled perosity in capitary zone. $\theta_{\rm ext}$ $(cm^2)cm^2);$	(Vater-filled periosity in capillary cone, b _{eta} (con ³ iom ³)	Floor- wal Seam per-meter X _{CM} , (cm)
9.46E+08	135	0.294	0 321	3,321	0.094	1 63E-08	0.955	1 55E-38	18.75	0.37	0.067	0.353	4 900
Elegi ventration rate O _{1 para} (confes)	Area of enclosed space below grade As Lom ² ;	Grack- le-lotal area rako, n (unitlass)	Crack depth ternw grade Z _{aw} . (cm)	Enthalpy of voconization at ave. groundwater temperature, 0H.1-5 (calimer)	Hemy's law constant at avelighter dwaler lemperature H _{TV} (a'm-m ¹ mol)	Henry's law constant at avelignoundwater temperature Hing (un Pess)	Vapor viscos ly at aver son temperature, ent (giomis)	Stratum A effective fild flusion coefficient Dff_ (cm ² /s)	Sustam B effective diffusion coefficient 0" k tom'(s)	Shatum C effective diffusion cself elent, Offic (emris)	Capitary zone effective effusion coefficient Offici (cmf/s)	Total over at effective diffusion sperits ent \mathbb{C}^{\bullet} (cm²/s)	DiKusion path length, La (cm)
1 69E+04	1 06E+C6	3 77E-04	:5	8,544	5.05E-03	2 1/E-01	1.76E-04	9 79E-03	0.00E+00	0.00E+00	7.83E-05	5 375-04	
Convection path ength C_{μ}	Source vapor cond , C _{FOCA} (ug m²)	Crack radius rokk (cm)	Average Napor Flow rate Into blog , Q ₁₇₄ (cm ³ /s)	Crack effective diffusion coefficient, D ^{oest} (cm*/s)	Area of creats. Accession (Lord)	Exponent of equivalent foundation Peolet number, exs(Pe ¹) (unit ess)	Infinite Source Indoor Ritenuation coefficient G (unit ess.)	ofin to source to dg cond Cyunwy (ug/m²)	Unit risk factor, URF (ye/m²)*	Reference condic RIC (mg/m²)			
	2,175+02	0.10	8.33E+01	9.79E-03	4 00E-02	2 57E+92	2.37€-04	5 13E-02	2.05-06	6_0E-01]		

RESULTS SHEET

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater cond., cardinogen (µg/L)	Indoor exposure groundwater cond., noncardinogen (µg/L)	Risk-based indoor exposure groundwater cond. (ug/L)	Pure component water solubility, S (µg/L)	Finat indoor exposure groundwater conc., (µg/L)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA_	NA NA	NA NA	1.47E+06	NA	4.2E-08	8.2E-05

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

PRG SHEET

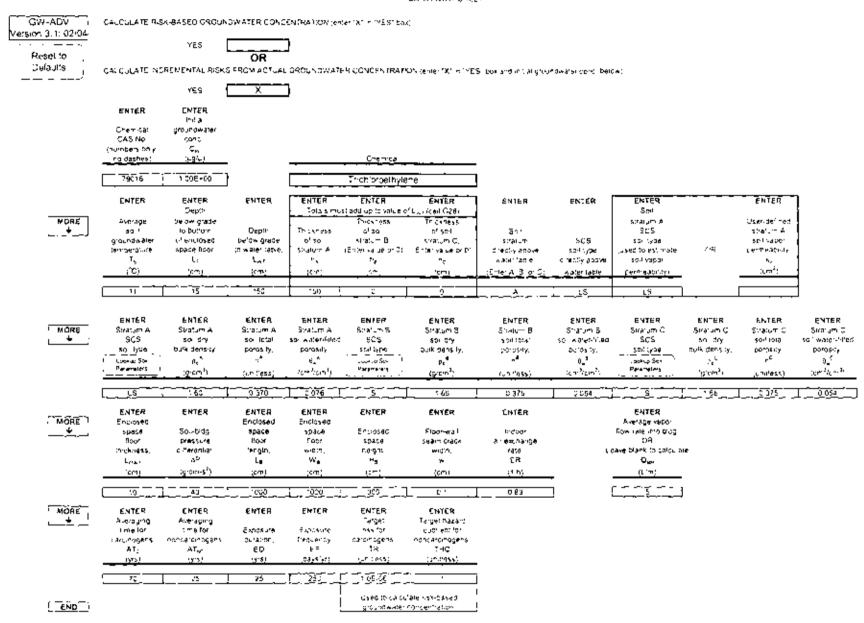
RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater cond carcinogen (mg/L)	Indoor exposure groundwater cond., noncarcinogen (mg/L)	Risk-based indoor exposure groundwater conc (mg/L)	Pure component water solubility, S (mg/L)	Final indoor exposure groundwater cond., (mg/L)	Incremental Hazard risk from quotient vapor from vapor intrusion to intrusion to indoor air, indoor air, carcinogen noncarcinogen (unitless) (unitless)
2.37E+01	1.22E+04	2 378+01	1.47E+06	2.37E+01	NA NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Csource and Obuilding on the INTERCALOS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"



Oiffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T _R (°C)	Enthalpy of vaporization at the normal boiling point, \[\Delta H_{\sigma 6} \] \[\text{(cal/mol)} \]	Normal boiling point, T ₈	Critical temperature, T _C (⁴ K)	Organic carbon padition coefficient, K _{sc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor URF (µg/m³)	Reference conc., RfC (mg/m³)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	1.1E-04	3.5E-02

INTERMEDIATE CALCULATIONS SHEET

Election	Source- building separation Lr (cm)	Straium A soil a r-filled puresity θ_a^A (cm²(cm²)	Stratum B soc. art-filled porosity, B _a ⁶ (cm ³ /cm ³)	Stratum C som av-filled perpetty e _e C (cm ³ /cm ³)	Stratum A affective total flund saturation S ₊ (em ² /cm ²)	Stratum A \$0 - intrinsic permeability k (cm²)	Stratum A 50.1 relative an permeability, k _a (cm²)	Stratum A soil effect ve vapor pormexibility, k, (crn*)	Thickness of capillary zurie,	Fotal poresity in capitlary zune, n _{ce} (cm ⁴ /am ³)	Arr-filled parpsity in capillary zone θ_{act} (cm ¹ /cm ³)	Water-filled sprosity in capillary zone, θ_{a+b} (cm ² /cm ²).	Floor- wall seam per meter, X _{ores} [cm]
7.88E+08	135	0.294	0.321	0 321	O G84	1 53E-08	0 955	55E-08	18 /5	0.3/	0 067	0,393	4,000
Bidg ventilation rate, O _{bstant} (cm ² /s)	Area of ericlosed space pelow grade A _g (cm ²)	Crack- fo-total area ratio (_unf eys)	Crack depth below grade, Z ₁₀ , (cm)	Enitalpy of vapor-zakon all avel groundwater four peratura, their -s (calimo)	Medry's faw constant at awdigroundwater temperature, 25th (utm-m ² /mol)	Menny's low constant at and groundwater temperature, Hits (unitiess)	Vapor viscos fy al lavel soil temperatury, (glom-s)	Stratum A affective a ffusion apertic ent D*** (cm*,s)	Stratum 8 effective diffusion confluent 0ffls (cmils)	Stratum C effective c ffusion coefficient, Offic (cmf.s)	Capiliary vone offective diffusion scetticsent, D***	Total overall efficing diffusion coefficient D'" tomissi	Diffusion posti englin, L _e yom)
6 925+04	1.06E+36	3.77E-04	15	8544	5 C SE-03	2 17E-01	1 76E-04	9,798-03	0.00E+00	0.005+00	7.83E-05	5 375-54	135
Convection path rength Ly (cm)	Source vapor conc . C _{G, eq} (yg/m ³)	Crack radius (con)	Average vagor flow rate rate blog : Q _{sea} (2 m ² /s)	Crack effective diffusion coefficient, D ^(***) (om ² /s)	Area of crack. Area (crn²)	Exponent of equivalent foundation. Pediel number, exp(Pet) (unificate)	Inherto source indoor after values coefficient, or conflicessi	tolipie sparce prog cond C ₁₀₀₀ (ug/m ³)	Unit risk factor URF (ugimt)	Reference cond RfQ (mg/m ²)			
15	2 178+02	0.10	8 33E+0	9.795-03	4 D0E+02	2.57€+92	5 61E-05	1 26E-02	1 15:04	3 6E-02			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater cone {µg/L}	Pure component water solubrlity, S (µg/L)	Final indoor exposure grounowater conc., (µg/L)	Incremental risk from vapor intrusion to indoor air. carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA NA	NA NA	NA	1.47E+06	NA	3.4E-07	2.5E-04

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

ËND

PRG SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater cond., carcinogen	Indoor exposure groundwater conc., noncarcinogen	Risk-based indoor exposure groundwater conc	Pure component water solubility. S	Final indoor exposure groundwater cond.,	Incremental risk from vapor intrusion to indoor air, carcinogen	Hazard quotient from vapor intrusion to indoor air, noncarcinogen
(mg/L) 2.96E+00	(mg/L) 4.06E+03	(mg/L) 2.96£+00	(mg/L)	(mg/L) 2.96E+00	(unitless)	(unitiess)

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: The values of Csource and Coulding on the INTERCALCS worksheet are based on unity and do not represent actual values.

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

GW-ABV Version 3 1, 02/04	CALCL: ATE HIS	к-наяғи сесқуу	DPOD RETAWD	ENTRATION (or	cor "X" in "YES" po:	z;						
		YES										
Reset to			QR									
Defauls ,	CALCULATE INC	REMENTAL RISKS	FROM ACTUAL	GROUNDWAT	ER GONCENTRA II	ON remediation (YE)	Si pakara naki grada	dwarpribbed be	0-41			
·												
		*±3:	X	J								
	ENTER	ENTER										
	E11.EN	Inipa:										
	Chemical	g/bundwator										
	CAS No	cane										
	(numbers only,	57										
	op cashes)	(Jag/L)			Chenical							
	79016	1.00E+00			Techloraethyle	ne .						
												,
	FNTER	ENTER	ENTER	ENTER "	ENTER	ENTER	CHTER	ENTER	ENTER 50		CNTCP	
MORE	4	Depth Pulson and a		10045 110	Shaddica to value o Thickness							1
**************************************	Average sout	below grade to believ	Эвр:h	Thickness	0! 80:	Thickness of soil	So.		stratum A SCS		User-defined Stratum A	
	alonudwaie.	of enclosed	be aw grade	of soil	silatum B	stratum C	siratum	scs	Surlippe		SO VALCO	
	Inmontation,	Space Foot.	io water lable.	stranum A.	(Enternation and)		directly above	501 ly00	(used to estimate	OR	permeability	
	Ts	Le	١.,	h _e	P _A	P6	water lable	directly above	Sor Vapos		k_	
	r*Ci	(5m)	(cm)	(sm)	icm;	(cm)	(Errer Al Block C)	w _u ser rable	permeability)		(cm²)	
		.,,		1				1				1
	11	'5	190	150	υ	0	A	LS	48			J
	ENTÉR	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
MOR€ :	Stratum A	Skasum A	\$14km A	Stratum A	Strate of H	Strahilm 9	Stratum B	Sharum B	Stratum C	Sistaion C	Stratuch C	Stratum C
	SC\$	50 ¢y	so lotal	Softwater-liting	303	spii dry	ser losar	softwater/filled	SCS	50 DY	soil rola	So warer-filled
	AUT JAISE	bulk density	porosity.	90°0\$4y.	soil type	tick density	perosity.	50°0\$ 7y.	5017/de	биів сётуку.	pores ty	20.021,
	10:410.534	¢.*	n*	e."	. cm. 42 501	5e**	۴*	€_8	Loon up Nov	7n°	5:	θ,
	Parameters	ið.cw.,i	[aniless]	$-\frac{(c+\gamma)(m_1)}{2}$	2M344-67	(g/8m²)	(artiess)	(car ² /cm²)	Parterels.	ig čm ¹ l	(protess)	ican licen l
			2 272	2976 [] [s	166	2 275	5 0 H 4 T	Ţ∵ <u>\$</u> —. Ţ	196	0.375	0.054
	ENTER	ENTER	ENTER	CHTER	ENTER	ENTER	ENTER		ENTER			
MÔRE	Enclused		Enclosed	E-cirkeo					Awrage vapor			
L	space	გაი-ხივე	10864	space	Endiosed	Floor-wair	Page or		Рож газе ило в од			
	Bapr	pressure	1960	Coor	space	seam stack	air eichange		O≅.			
	H. 64P#44	o ≝erentia . ∆∂	length	WIGIP	ne gra.	wair.	'are. ER		PAYED APE ID 03 CO.AT	e		
	ارون در درست	igrom-s ²)	ሁ∎ (ራጥ)	W _a (cm)	.∺A	*	(' n)		Ω _{±ν} (L/m)			
	(CT)		15.11.7	(ca)	(cm)	(SP)	\ '''	-	, L			
	[10,]	42	1900	1000	200	21	284]	<u> </u>			
MORE	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER						
	Averaging	Averaging			Targei	Terget nazard						
	1 m.n 164	t me for	E ≠005∪re	Exposure	ess to:	qualient for						
	cura magens.	noncaronogens.	curation.	1equency ⊆£	carcinegans 72	roccare hogaes,						
	ΑΓ _C (γrs)	А ^т ыс. (усы)	EO (γr\$)	(STAR A.I	(couless)	THQ (JP 1859)						
							· 1					
	70	75	25	250	1.0E-06	1						
						Jutu risk-baseo						
[END]					gioundwater	concentration	I					

Diffusivity in air, D _a (cm²/s)	Diffusivity in water, D _w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m³/mol)	Henry's law constant reference temperature, T _R (°C)	Enthalpy of vaporization at the normal boiling point, \(\Delta H_{v,5} \) (cal/mol)	Normal boiling point, T ₈ (°K)	Critical temperature, T _C (3K)	Organic carbon partition coefficient, K _{oc} (cm³/g)	Pure component water solubility, S (mg/L)	Unit risk factor. URF (µg/m³) ⁻¹	Reference cond RfC (mg/m³)
7.90E-02	9. <u>10</u> E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1 47E+03	2.0E-06	6.0E-01

INTERMEDIATE CALCULATIONS SHEET

Exposure duration (sec)	Source- pullaing securation Ur (cm)	Stratum A soil a r-filled portestly, e,* rom/fom/r	Stratum B soil art-filled porosity $\theta_a^{(g)}$ (orn-tern ²)	Stratum C 50% a of fled 50% osity, 6 S (cm²(cm²)	Stralum A offsetive total find seturation Se youthers()	Stratum A so nthosic conneability k (cm²)	Scalam A soil relative a r permeability X _n tom ²)	Stratum: A son effective vapor permeability K, (om ²)	Thickness of capit ary zone. Let (5m)	Total percenty in capillary zone n _{in} tom ¹ 'om ¹ ;	Air-lifed parceity in capillary zone. tomicomits to the community	Warer-filled porosity in capitary corre	Floor- wall seam Sommeter, X-324 3000
7.86E+98	135	0.794	0.321	0.32*	0.084	1 53E-08	0 955	1 55E-08	[<u>18_7</u> 5	0.37	0.0 <u>67</u>	_ 0,303	1_4.000
Bidg. verblation rate, Q _{bean} (cm ² 's)	Area of unclosed space pelow grade. As com ² t	Crack- to-tota area ratio n (unifess)	Crack depth below grade, Z _{reo} (cm)	Enthalpy of vaporization at axeligroundwaler temperature, ARV-5 (cavmol)	Identy's law constant at aveligroundwaler temperature, Hills (attri-m ³ /mol)	Heriry's law constant at avel groundwater temperature. Efficient (aniless)	Vapor viscosity el ave soil temperature, µrs (grom-x)	Stratum A effective diffusion doefficient, D ^{effi} 4 (cm ⁻² /s)	Smaller B effective c Musich chefferent D*** (cm*/s)	Structural Control effective diffusion coefficient Coffic (cm1/s)	Capillary zone effective diffusion coefficient, p ^{oo} fice (com ⁶ /s)	illotat gwerail effective didus on coefficient Driff, (cmf/s)	Diffusion path ungth La (cm)
6 97E+04	1 06E+06	3 77 € • 04	15	8,544	5 C5E-03	2 17E-01	1 76E-04	9.79E-03	0.008+00	0.00E+00	7 83E-05	5 37 E-D4	
Convection path rength, L _v (cm)	Source vapor condi- Cassas (pg/m²)	Grack zadius. (osc. (cm)	Average vapor flow vate into plegt, G _{tot} (cm ³ /s)	Grack effective diffusion coefficient, Diffe* (cm ² (s)	Area of crack Allow (cm²)	Exponent of equivalent foundation. Pot et number exp(Pe') (unitess)	ofinile source indoor afterwallen coefficient, c (undless)	infinite source oldg. cond. Convo. Ingler'i	Uot nsk factor URF (µg/m³)	Ruference cond . RfC Img(m ³)			
	2 175+02	0.10	8.33E+01	<u>9.79E-00</u>	<u>4.005+02</u>	2 57E+92	[_581 E -\$5	1 <u>_26</u> E_02	2 5 <u>E-96</u>	_6.0 <u>5</u> -01			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor	Indoor	Risk-based	Pure	Final	Incremental risk from	Hazard quotient
exposure	exposure	indoor	companent	indoor	vapor	from vapor
groundwater	groundwater	exposure	water	exposure	intrusion to	intrusion to
conc.,	conc.,	groundwater	solubility.	groundwater	indoor air,	indoor arr,
carcinogen	noncarcinogen	conc.,	S	conc	carcinogen	noncarcinogen
(μg/L)	(µg/L)	(μg/L)	(µg/L)	(μg/L)	(unitless)	(unitless)
NA	NA NA	NA	1.47E+06	NA	6.2E-09	1.4E-05

MESSAGE AND ERROR SUMMARY BELOW. (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

PRG SHEET

INCREMENTAL RISK CALCULATIONS:

					Incremental	Hazard
Indoor	Indoor	Risk-based	Pure	Final	risk from	quotient
exposure	exposure	indoor	component	indoor	vapor	from vapor
groundwater	groundwater	exposure	water	exposure	intrusion to	intrusion to
conc.,	conc.,	groundwater	solubility.	groundwater	indoor air,	indoor air.
carcinogen	noncarcinogen	conc.,	S	conc.,	carcinogen	noncarcinogen
(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(unitless)	(unitless)
·					· '	· · ·
1.63E+02	6.97E+04	1.63E+02	1.47E+06	1.63E+02	NA	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Csource and Chuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"

SITE 15

GW-ADV	CALCULATE RIS	K- G ASED GROUN	OPPO PETAWO	ENTRATION (e	iler (xr. in YES) bo	τ <u>-</u>						
Version 3 1, 02/04		YSS.]								
Reset to Defaults	CALCULATE INC	REVENTAL RISK	OR S FROM ACTUA!	L SROUNDWAT	ER CONCENTRATI	ON (enley fX1 in fY5)	Steekand near grou	rowaler condicte:	544;			
		YES	x	3								
	ENTER	ENTER basa										
	ርሳቂጥ ረብ።	groundwater										
	CAS No (cumbers poly,	ngns Cw										
	no dashes)	5. 5 .)		——	Chemical							
	67863	100E+00]		Ch.oretorn		,					
	ENTER	ENTER Beeth	ENTER	ENTER Codes mo	ENTER slightly to value h	€NTER *Cartos G28:	ENTER	ENTER	ENTER Sc		ENTER]
MORE	Average	below gradn		_	Of Carriers	Thickness			stratum A		User-defined	
	5007	la baltum	Cept	Thomps	c' sc.'	0; 90,	504		Scs		A muleyiz	
	groundwater L e roperature,	of end beed Space floor.	below grade to water table	of set stratom A	stratum 9, uEstamustra er Cir	stratom 5. (Shter value or 01	syaium Syasiy above	\$05 sc type	solitype (used to est mate	05	50 Albar Dermicability	
	74	Ly	L _* -	5. alo. 1	te te	t _e	Aalantab +	directly above	Selvador	0-	k.	
	(*€;	(em)	(cm)	(c+)	10-0	(cm)	(511er 4 18 or 2)	wioler fabre	permeability)	ı	(cm²)	
	-1	- '5	220	250	C		A	L5	L5			_
				- "	· · · · ·		<u>-</u>					•
	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
MORE	Stratum A	Sirator: A	Stratum A	Spatum A	System 5	Stratum 5	Scalum B	Stratum 5	Stratum C	Stratum C	Siratum C	Stratum C
! <u>*</u>	825	sal dry	sari lota.	solivazent, es		sol dy	500 1014	so water@ed	scs	soley	sp Heia	spil water/lied
	20, lAbe	bulk consity	parasily,	porosity	so type —	bulle density.	Establish	CO-DS-IV	softyge	park dejunja	porabily	corosity
	қолық 52- Расрефіясы	^* [*] .	n*	¥_*	Leursia Sar Maranatera	o:•	7,5	3."	Carron Sol	r.	5 ²	e_:
		$\langle g (T') \rangle$	(UniCess)	icm ₁ -cm ₃ :		(g/zm²)	Juni essi	ram/ram/y		(g-(m ')	(ondess)	iom" gm²i
	ιş	. 20	0.450	0.576	Ë	1 65	0.375	0.054	ŝ	1 (4)	0.375	‡ 054
14000	Enter Enclosed	ENTER	ENTER	ENTER	EN T€ R	ENTER	EHIES		ASTMA			
MQRE ↓	Speca	So -bidg	Enclased Space	Enclosed applie	Shobsed	Figor-way	190001		Average vapo: Fow rate into plog			
C <u>. </u>	Roor	pressure	Noor	100.	5\$41 0	Sear Cack	arriexe" ange		CR			
	Angkness.	c-facer(-a)	leng!=	width.	F9 g7 j.	W-SIF	rate	Le	вачы Біалік (о соліціа	le .		
	Longo	3D	L.	41.6	~ ,	₩.	-8		O _{y,}			
	(0.00)	.grames?;	(cm)	(GE)	<u></u>	(9%)	17.51	-	(U/m)	ı		
	10		1000	1000	744	£ 1	0.25	3	5			
MORE	ENTER	ENTER	ENTER	ENTER.	ENTER	ENTER						
· . • 	Averaging	Averaging	c	s	(arge)	Target hazard						
	firme fo: tarolnogens.	vine for richcardinogens	Ворольств сыга! оп	Emposore Magueto,	risk for data nogens.	gyptemifor nancare regens						
	AT _C	Alic	€2	EL.	TA	740						
	<u> </u>	(52)	(<u>e</u> (8)	(daysiya)	(unjess)	(unitiess)						
	70	<u></u>	20	350	- <u>(35468</u>		1					
	-					alers - based	- :					
END						over si pases Concentration	Ì					

Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, $O_{\rm w}$ (cm ² /s)	Henry's law constant at reference temperature, H (atm-m³/mol)	Henry's law constant reference temperature, T _R (°C)	Enthalpy of vaporization at the normal boiling point, AH _{a,b} (cal/mol)	Normal boiling point, T _B (°K)	Critical temperature, T _C (°K)	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor. URF (µg/m³)	Reference conc., RIC (mg/m ³)
1.04E-01	1.00E-0 5	3.66E-03	25	6,988	334.32	536.40	3,98E+01	7.92E+03	2.3E-05	4.9E-02

INTERMEDIATE GALCULATIONS SHEET

Exposure duration, T (sec)	Source- building separation, L _T	Stratum A sort air-filed porosity, 9.* (Lm²(cm²)	Stratum B soul air-filled porpsity, \$\theta_0^2 (cm ² /cm ²)	Stratum C son a r-filled porosity, g _s ^C (om ^h om ³)	Stratum A effective total fluid saturation, S ₂ tom ² /om ² t	Stratum A soil intrinsic permeadi illy, k iom²)	Stratum A 500 re-alive air permoability, k _u (cm ²)	Stratum A soil effective vapor permeability k (cm²)	Thickness of capit ary zone List (57)	Tolar porosity in capillary izone n _o (cm ³ /cm ³)	Air-filled porosity in capillary zone, 8, 17 (cm ³ /cm ³)	Water-filled perosity in cap itary zone $A_{n,p}$ $tern^{1}(am^{3})$	Floor- wall seam por meler, X _{res} , (cm)
946E+08	18ส์	0.374	0.321	0.321	7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7	1.63E-08	0 984	j1 <u>57E-</u> 28	18 75	<u> 545</u>	C.147	0.303	4000
8.dg ventilation rate, O _{bertie} 	Area of enclosed space below grade A _b (cm ²)	Crack- to-lota! area ratio. n tunnifess)	Crack depth bylow grade, Z _{rim} , (cm)	Enthalpy of vaporization at away groundwater (emperature, aM _{n-15} (entimor)	Henry's law constant at aveligroundwater temperature, H- ₅ (atm-m ³ /mp))	Henry's faw constant at avelgroundwaler lemperature. His, (unit ess)	Valoor Miscosidy at ave, soil temperature lais (grom-s)	Stratum A effective orfusion spelf signt, D***2 Iom**s)	Stratum 8 effective diffusion coefficient, Dff ₈ (co ² /s)	Stratum C effective a ffusion agettalent, D*** (con*(s))	Capillary zong effective diffusion coefficient Office (cm*'s)	Total overal effective eiffusion coefficient Doffin (cmf/s)	Offusion pain length, Nu (cm)
1 59E+04	1 065 105	3 77E-Ç4	15	7,544	<u>1195E-03</u>	9 38E-02	1 75E 04	1 94 2 -02	0 COE+00		Б 86E-04	[fe 22 6 -53	T-185
Convection path length Ls (cm)	Source Mapor Joens Grade (pg/m²)	Crack redus, few lon)	Average vasor Powirate into bidg Q _{ave} (cnt ¹ /s)	Crack effective diffusion coefficient, D ^{max} (cm ² /S)	Area of Crock A _{rea} , (cro ⁸)	Exponent of equivalent foundation for the foliat	officie source indeor alteroution coefficient o tuerfess)	intimite source bidg cond Governa (ug/m ¹)	Un (1684 (actor URF (ug/m²) ¹	Reference cond RIG /aig/nif)			

END __

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor	Indoor	Risk-based	Pure	Final	Incremental risk from	Hazard guotient
exposure	exposure	indoor	component	indoor	vapor	from vapor
groundwater	groundwater	exposure	water	exposure	intrusion to	intrusion to
conc.,	conc.,	groundwater	solubility,	groundwater	indoor air,	indoor air,
carcinogen	noncarcinogen	conc.,	\$	conc.,	carcinogen	noncardinogen
(μg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(unitless)	(unitless)
NA	NA NA	NA NA	7.92E+06	NA NA	3.5E-06	7.3E-03

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

PRG SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., cercinogen (mg/L)	Indoor exposure groundwater conc., noncarcinogen (mg/L)	Risk-based indoor exposure groundwater conc., (mg/L)	Pure component water solubility, S (mg/L)	Final indoor exposure groundwater conc., (mg/L)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
8.56£-01	4.14E+02	8.56E-01	7.92E+06	8.56E-01	, NA	NA NA

MESSAGE AND ERROR SUMMARY BELOW. (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE. The values of Cource and Coulding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"

GW-ADV Version 3.1; 92:04	CAUCULATE RIS	K-BASED GROUN YES	OWATER CONC	:/NIPAT:ON::en	ler "X" m. 185-504	•						
Reserta !			DR DR	_								
⊃efaults	CALCURATE NO	rşvental rişk.		GROUNDWATE	ER CONCENTRATE	CM reinder 1X1 im 1Y81	51 Cok and mina: Sion	: awarer conditie	9 + 1			
		YES	x]								
	EHTER	ENTER In-ya:										
	Chamica CAS No	groundwaler code :										
	(numbers paly,	c.										
	na dashes)	[ag/c1			Chemial							
	b76e3	3 005 • 00]		Chloreform							
	ENTER	ENTER Bapte	ENTER	ENTER	ENTEA s: add up :: aa ya o	ENTER	ENIER	ENTER	ERTER 50		ENTER	1
MORE	Average	38.0w \$120 e			Prickonss	Tiricaness			Silanum A		Esprice*ced	[
[**]	500	to bottom	Capth	Tryckness	01.50%	0'501	50		858		Strolum A	1
	groundwater	of ancios so	рејам длаве	of so.	stratum B	stratum C	\$0.8000	528	spriyae		se/ivapor	J
	(emperature,	space Poor	to water lable	stratum A	(Einter value or 3)		cirectly backs	sor type	Land to est male	24	Signature, A	ì
	7,5	• •	L.,-	, ₁ ,	7 ₈	r _c	warer (able.	а чесну аврум	SC VACOS		¥	
	181	(0.44)	10.77		(cm)	((개)	(Enler A.B. or G)	water table	gemesb"Wt		(cm²)	4
	1:	15	Z30	200				المراجع المرا	t (5			1
		—. <u>-'*</u> — _—	1 600			<u> </u>	·	ـــهد ـــــــــــــــــــــــــــــــــ	<u> </u>		· <u> </u>	1
F	ENTER	SMTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
MORE +	Stratom A	Shalum A	Stratum A	Seature A	56atum 8	Shaluni B	Spature B	Stratom 6	Stratum C	Santon C	S^⊋t√r C	Straium C
	9C5	solitory pulk density.	so i fotali porosity,	Sou water-fixed porce by:	୫୦% ୧୯୯/ହେଖ	SQL OFY	\$01 10081	SOIL MAIRY-IT EC		sgridty Back density,	50 1:0:8I	sod water-fire
	30. (ypa		2000 y.			bulk de∩Sifγ. •	purosity.	prozes ty s	<u>50 119₽⊕</u>		peresny.	SOME IN
	Todayo Soft Farantaiana	7.5		0,	Lossye Soli Parameren	e,*			. 29-05 504 Phankies	p.5.		0.
	<u></u>	'çrem')	[undiess]	(em/special)	· _ · · _ · · _ ·	(Security	_wmless;	louy, and	<u> </u>	(Çileni)	[65:0655]	(m²/(m²)
	[usj	V 50	£ 450	2.076	<u>_</u>	166	<u> 0 975</u>	3 054	5	7.66	<u> </u>	0.654
MORE	ENTER Enclased	ENTER	ENTER Enclosed	ENTER Enclosed	ENTER	ENTER	ENTER		ENTER			
→ !	Space	So North	5pac e	8690e	Enclased	Floor-wall	Indesi		Average vapo: Cowirate into 6/36			
	floor	pressure	'00'	Rear	space	seam Crace	an exchange		04			
	!'nckriess,	C Meréndia	remgih.	w:011.	Deight	wich.	rale.	·	ease blank to corculas	•		
	Long	75	Lě	W ₀	rý,	W	58		Q.			
	(cm)	igicmis ⁴)	(cm)	(arr)	,cm);	$\langle c\sigma \rangle$	(14h)		40.m3			
								-				
	10j	40	1509	1000	300	51	183	J				
MORE	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER						
	Awaraging	Averaging			Tarşe:	Target Nazard						
	(interfac	(me 'ur	Ельювиче	Exposure	n 54 TO1	qualient for						
	Carerhogens.	noncard ogens	outation.	fequency.	cam rugers.	noncard Pogens.						
	AT _f	AT.	EO	E=	5 ii	TMQ						
	(3.2)	'vrs:	(yrs)	[64/Styr]	(on the sky	120 3 0551						
	<u>, > </u>	25	25	253	105.09							

Used to calk diate risk pased.

ground water concentration

ENO

Oiffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _x (cm ² /s)	Henry's law constant at reference lemperature, H (atm-m³/mot)	Henry's law constant reference temperature, T _q (°C)	Enthalpy of vaporization at the normal boiling point, \(\Delta H_{\nu_b} \) (cal/mol)	Normal boiling point, T ₆ (°K)	Critical température, T _C (^e K)	Organic carbon partition coefficient, K _{oc} (cm³/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m³)*\	Reference cond., RfC (mg/m³)
1.04E-01	1.00E-05	3 66E-03	25	6,988	334.32	536,40	3.98£+01	7.92E+03	2.3E-05	4.9E-02

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, r (sec)	Source- building separation 17 (cm)	Stratum A soli a r-filled parasity, B ₄ * (cm ¹ /cm ²)	so i ar-filled corpsity, θ_s^{-1} (cm^3/cm^3)	Stratum C soil a refilled porpsity \$2 (cm*/cm²)	Stratum A effective total flora saturation, Sign (com²/cm²)	Stratum A so ' intrinsic permeability, k, (cm²)	Stratum A soil relative art permeability kg (cm²)	Stratum A soil effective vapor permeability. k (cm²)	Thickness of capillary zone Let	Total paresey in capi fary zone, n _e , (omhomh)	Air-fued octos tylic capitary zone, θ_{air} (om ² /cm ²)	Water-Hed porcesty in capillary zone, e _{ne} conform ²)	Floor- wa" sean' serimeter X ₂₋₆₀ (cm)
7.85E+08	<u> 185</u>	: 0,374	0.321	0321	<u> 0 057</u>	<u>1</u> 63E-ú8	0.964	1.575.05	18.75	C 45	C 147	0.303	4,000
Bidg. victoral on rate. Occupie (om ¹ /s)	Area of enclosed space below grade. An tom ² ;	Chack- lo-lotal area ratio, 1; (unidess)	Grack depth below grad) Zelas (em)	Enthalpy of vaporization at ave. groundwater tender alone. 54%, 15 (Calimpi)	idotoy's iaw constant at aveligioundwatur lemperature. His Jamen fumpti	Mennys aw constant at Avo groundwater temperature HTs Tundessi	Vapor viscosity at, avel soil removinature, bits (glomist)	Stratum A effective diffusion conflicient Dffu tomfisit	Stratum B effective coffusion coefficient C*"s	Stratum C effective diffusion notefficient D*** (4m**(5))	Capitary zone effective offusion coefficient, Deffection	Fotal overall effective diffusion speticient offi- comfissi	D Musion path length, L _a (sm)
6 97E+04	; ōee+55	3 77F C4	1	7,544	958-03	9.38E-02	76E-04	1 84E-02	0 00E+00	i 0.00E+00	E-86E-34	4 20C 02	
Convection path length, L, (cm)	Source value: conc Cyruce (µg/m²)	Crack radius.	Average vapor flow rate rilo blog.	Crack effective diffusion coefficient, Diffusion	Area of crack A (-) (com))	Exponent of equivalent foundation Pocted number, exp(Pe ²) (in 1988)	Infinite Source Indoor attenuation goefficient (c) [unit ess]	nlin je source bidg cond : Common	Utul risk lagiot URP	Reference cure FHC (mg/m²)	1 2025.91	6,225,03	
15	2.52€+07	, C 1D	a 33E-01]	1 94E.QZ	4,006+02	3.87E+46	3.6 °E-04	9.08E-02	2 3E-05	<u>. 49€-52</u>]		

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor	Indoor	Risk-based	Pure	Final	Incremental Hazard risk from quotien	
exposure	exposure	indoor	component	indoor	vapor from vap	or
groundwater	groundwater	exposure	water	exposure	intrusion to intrusion	to
conc.,	conc.,	graundwater	solubility.	groundwater	indoor air, indoor ai	iτ,
carcinogen	noncarcinogen	conc.,	S	conc.,	carcinogeл попсатогло	gen
(µg/L)	<u>(μg/L)</u>	(µg/L)	(μg/L)	(µg/L)	(unitless)(unitless	s)
NA	NA	NA	7.92E+06	NA	5.1E-07 1.3E-03	3

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT).

SCROLL DOWN TO "END"

PRG SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater cond., carcinogen (mg/L)	Indoor exposure groundwater conc., noncarcinogen (mg/L)	Risk-based indoor exposure groundwater cond., (mg/L)	Pure component water solubility, S (mg/L)	Final indoor exposure groundwater cond (mg/L)	incremental nisk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncardinogen (unitless)
5.87E+00	2.36E+03	5.87E+00	7.92E+06	5.87E+00	NA	NA NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Csource and Obuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"

RESIDENTIAL

ĞW-ADV	CAUCULATE RIS	K-BASED GROUN	IDW ATER CONCE	NTRATION : Br	iteriiX in 1465 boi	1						
Version 3.1; 02/04												
-		YES		l								
. Reset to			OR	•								
Defaults				ar.a	FC-1000-1-1-1-1-101-14							
\	CALCULATEINE	WE ACALLAC SIZE	S FROM ACTUAL	SHOUNDWAT	ER COZCENIRA.	CLA (NO:0N_X, PULAE	81 вохіаль і тыры дугый	rawatu spop pago	(W)			
												
		vi(S	×	,								
	ENTER	ENTER										
	_	n Jigi										
	Chemica	districtivates										
	CAS No	tord.										
	(rumbers only	, C.,										
	no dashes)	(ngru)			China (a)		ı					
	20546	1.035.05	1				•					
	79516	1 02E+00]	l	Trichforcethyle	v.e]					
	ENTER	ENTER	ENTER	ENTER	SMIER	ENTER	ENTER	ENTER	ENTER		ENTER	
		Depin		Totals m.	ist 800 up to value c			1	501			1
MORE	Average	GBb: § woled			Pinckress	Thickness			Similary A		Usande ined	1
 .	\$0.tr	უ დაქვით	Сюр;п	Thickness	01.50	of sail	Sail		328		Stratom A	
	Alphugwaje.	al endicated	de awigr ada	of soil	straicm B	Stratum C	strature	805	204 (408		stativation	
	remparatura,	арасе брок.	lo water lable.	siratum A.		(Erservade or 5)	dorectly above	Kad Type	jused to astimate	≎ 5	Device Bability	
	T _K	L.	لما	''4	^h a	n _±	water table;	directly above	sor vapor		k.	
	:fC)	(\$ZE)	(cm)	(6m)	ļ¢Ψ)	(5.0.)	(Enter AliB or C)	water table	Dermie ability)		(cm²)	1
									· · · · · · · · · · · · · · · · · · ·	ı		4
	7.3	15	*41	140	S	0	A	. કા	<u>St</u>		<u> </u>	J
	FAZER	ENTER	ENTER	ENTER	ENTER	EN7ER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
MORE	Stratum A	Straium A	Sivatum A	Strarum A	Stratum H	Siratum B	Shatum B	Skatum B	Siratum C	Stratum C	Stratum C	Siratum C
¥ !	SCS	sol dry		soli water-filind		no dry	sarrola	sod valent e¢	SCS	soldr,	inial or	son water-61 ed
	softype	buildersoy	perbuty	parasity	sc/19pe	pulk nonsky	serosily.	peroxity	sai I _r pa	box density	50199 ()	oprosity,
	.00-00 55	e.*	es [±]	a_^	30,000,000	C.	nt	b_*	202105 Sou	25	e.c	6.
	Parkings	ight".	(40) 8551	(cm (cm²)	Periods	(g'o'n')		indist*)	Caramaters	gines.	S = 0_== .	(cm ³ cm ³)
	<u>.</u>		1300.255	100 1 100 7			<u> </u>				(un fless)	,
	1	1.60	0 370	0 103	5	165	6375	0 054	5	, 9¢	0.376	0.054
						—— : ——						
	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER		ENTER			
MORE	Enclased		Englosed	Englayed					Average rupor			
ئ_ٹ	Space	Sert brog.	space	space	Endlused	Floor.vya'i	mdaer		flow rate into bidgi.			
	Roar	Dre2\$are	Rope	ligge	spute	seam crack	a renofange		OR .			
	hickness.	different at	ængth.	w.000	ne gra	W.C.;,	-ale	T.E.	ave Swink to defend	le		
	L.,,,,	7₽	Ly	W e	149	^	64		O.,			
	(0.00)	(g-om+s1)	(001)	(cm)	((m)	;cm)	(* P)		(L00)			
	:5	10	'959	,000	744	0.	0.25	J				
			E1.75B		541755							
MORE !	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER						
	Averaging	Averaging	C-may-re	5 - m.s. / ms	Targon	Target hazard						
	ിന്ക്ര′	lime lo	Eleposore Analysis	č «Posure	15k f0f	cackent los						
	caromogens AT _C	സൗർദ്ധഹരുമ്പും ATപ്പ	auration. EID	Meguency Ex	eafonogens. TR	néncarolnagans. TAG						
	1975)	(40)	(yrs)	idays (yr)	(un Pess)	(undess)						
	<u> </u>	. 101-21	17.2	(20)2.7	San Heavy	ien. sate at i	•					
	c — 70 ~—	<u></u>	T] :- [350]								
					, \		<u>:</u>					
					Used to on co	idle vsk-based						
END					qrcjuedwates	<u>ourrogenteation</u>	l					

Diffusivity in air. D _a (cm²/s)	Diffusivity in water, D., {cm²/s}_	Henry's law constant at reference temperature, H (atm-m ³ /mot)	Henry's law constant reference temperature. T _R (°C)	Enthalpy of vaporization at the normal boiling point, \(\Delta H, \text{\chi} \)	Normat boiling point, T ₉ (°K)	Critical temperature, T _C (°K)	Organic carbon partition coefficient. K _{oo} (cm³/g)	Pure component water solubility. S (mg/L)	Unit risk factor, URF (µg/m³) ⁻¹	Reference conc., RIC (mg/m²)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1 66E+02	1.47E+03	1 1E-04	3.56-02

NTERMEDIATE CALCULATIONS SHEET

Exposure deralijin ; (sec)	Squrce- boliding separation, L ₁ (cm)	Stratum A soil are filted perosity P _a * (cm³/cm³)	Stratum 8 so the art-filled persisty, θ_a^{-9} (cm ² /cm ²)	Stratum C soil air dit ed peresny 9, ^C (em ³ /cm ³);	Stratum A effective lotal fluid saturation, S _a (em ² tem ²)	Stratum A soil clinisis permeability, k, (cm²)	Stratum A so i relative a r permeability, k _y (2 ^{-o 1})	Stratum A soil effective vapor permeability, 4 (cm²)	Thickness of capillary zone, Sec. (cm)	Total porosity in capillary zone, n _G [cm ² /cm ³]	Air-filled scrosity in sapillary zone $\theta_{a/2}$ (cm^2/cm^2)	Water-filed perosity in case lary zone. "Have (cm ³ /cm ³]	Flour- wall searc per meler, X _{ow} , (cm)
9 46E (C8]	125	0.267	C 321	0 321	C 193	5 94E-09	5.895	5.325-09	25 00	D 37	0.050	0 320	4 000
Blog, wentilation rate C _{torang} (om ³ /s)	Area of vinclesed space below grade. As (cm²)	Crack- lo-lotal area ratio n (unilless)	Crack depth below grade, Z _{DA} , (cm)	Enthurpy of vapor cation at the groundwater femperature, who is a cation of the cation	Henry's law censtant at avel groundwaler temperature, Hrs (almoni/mol)	Menry's law constant al avel groundwater temperature, HT ₁₃ (undess)	Vapor visitosity at avel so temperature ukra (glomis)	Stratum A offective diffusion conflictent D ^{eff} ic (cm ² /s)	Stratum 8 effective diffusion coefficient, D ^{eff} e (cm ² /s)	Stratum C effective diffusion duelfulent, D ^{sh} e (cm ² /s)	Capil ary zone effective diffusion coefficient Office (cm ² /s)	Total cyeral effective cultison cuefficient, Dff, icent, icenf(s)	Orfusion pair length -4 (cm)
.69E -04	1 08E+06	3.77E-04	15	B 544	5 055:03	2 17E-01	1.76E-04	7 10E-03	0.00E+00	0 00E+60	3.42E-05_	688-04	125
Convection bath fength,	Source vapor cond , C ₁₀₀₀ (ug/m ¹)	Crack radius r _{owk} (cm)	Average vapor flow rate into oldgi, Q _{ast} (cm ³ %)	Crack effective diffusion coefficient, Description	Area of Grack, Area (om²)	Exponent of equivalent loundation Peolet number exp(Pe ¹) (unit ess)	Infinite source indigor altenual pr coefficient in junitless;	Infinite source oldg, condi, Graces (agrm)	Unit res lactor, URF (µg/m³) ¹	Reference cond RIC (organi)			
15	1 09E+03	0.10	8 33E+01	7 105-03	4 CCE+02	2 2BE+127	T 8 25E-05	8 985-03	1 (E-04	3 5E-C2	-		

END .

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater cond., cardinggen	Indoor exposure groundwater conc., noncarcinogen	Risk-based indoor exposure groundwater conc	Pure component water solubility, S	Final indoor exposure groundwater conc.	Incremental risk from vapor intrusion to indoor air, carcinogen	Hazard quotient from vapor intrusion to indoor air, noncarcinogen
carcinogen (µg/L)	noncarcinogen	солс., (µg/L)	S (μg/L)	conc , (µg/L)	carcinogen (unitless)	noncarcinogen (unitless)
NA NA	NA	NA	1.47E+06	NA	4.1E-06	2.5E-03

MESSAGE AND ERROR SUMMARY BELOW. (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

PRG SHEET

INCREMENTAL RISK CALCULATIONS:

					Incremental	Hazard
lr:door	indoor	Risk-based	Pure	Final	risk from	quotient
exposure	exposure	indoor	component	indoor	vapor	from vapor
groundwater	groundwater	exposure	water	exposure	intrusion to	intrusion to
cond.,	conc.,	groundwater	sclubility,	groundwater	indoor air.	indoor air,
carcinogen	noncarcinogen	conc.,	S	conc	carcinogen	noncarcinogen
(mg/L)	<u>(mg/L)</u>	(mg/L)	(mg/L)	(mg/L)	(unitless)	(unitless)
		_				
1.24E+00	2.04E+03	1.24E+00	1.47E+06	1.24E+00	NA.	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: The values of Coource and Chuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

GW-ADV I Zersion 3.1, 02/04	CALCUI ATS RIS	K-RASED GROUS	NOWATER CONC	ENTRATION (e-	neviti v 1955. bo	x;						
Reset to		YES	ÓŘ]								
Delaulis	CAUTOLATEINE	PEMENTAL RICK	is from actual	, GROUNDWAY	ER CONCENTRATI	May re-us: UXT in TVE:	Silbox and initial gree	ndwale: conclis e :	704			
		1.52	Х)								
	ENTER	FNTER										
	Cremital	ingal groundwaler										
	CAS No ,purabers cally.	cons C _a										
	no dashes;		_		Chemical							
	/9016 j	5 025+00]		Trichloroalhyle	era						
	ENTER	ENTER Septi	ENTER	FHTER Totals mu	ENTER isl add up to value t	ENTER Z Lu-Idea G291	ENTER	ENTER	ENTER Sort		FNTER]
MORE	Average	эл ож дгале		<u> </u>	Thickness	Thickness			stratum A		Jser-delined	
· <u> </u>	\$0 '	is color	Оер;п ••••••••••••••••••••••••••••••••••••	Thickness	ef seil	al zau	Sea		505		Shatum A	
	groundwater Verngerarune,	of enclosed space floor	ce ow grade to water lacid.	of \$00 stratum A.	5100cm B. JEdicziyae.pt 01	stratum C. (Boter value or 3)	s'ra'um evec' y above	SCS soz∶ypa	so Type Tokeo to estimato	CR	SO MADON DOMINE ACTIVITY	
	T _s	Lr	Lai	F	**	h _c	Auter rap e	directly above	20, 4900,		k.	
	(°C)	(cm)	(cm)	(57%)	jemj	(sin)	(Enter AliBian C)	Wale* 190/6	регтован (у)		je 15.	1
			1 :40	140		1 8	ą	1 S.	<u> </u>		:	1
						•		•	<u> </u>			•
			ENTER	ENTER	ENTER	ENTEH	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
	ENTER	ENTER	ENIES	Eld L Cid	ENIEN	EGIVER	ENTER	EIA, EL	Enter	Elec E.		
MORE	Stratum A	Stratum A	Stratum A	Strature A	Stratum B	Stratum R	Stratum B	Stratum B	Scalum C	Spatur C	Stratum C	Strafulm C
MORE T	Stratum A SCS	Stratum A solitory	Stratum A sort total	Similar' A sa water-bitog	Stratum B SCS	Stratum Ri solidry	Stratum B sovitalal	Stratum B sod water-filled	Scalon G SCS	Statum C set dry	Stratum C soft total	Strafum C spit water-Infed
	Shalom A SCS Soll Spe	Stratum A solidity butk density.	Stratum A sort total porosity.	Stratum A sp. water-hitod percenty.	Stratum B SCS so lybe	Stratum R solidry bulk does ty	Stratum B sovictal percety	Stratum B soil water-filled port/Sity.	Scalon C SSS 99-198e	Stratum C scrildfy bulk Censity	Stratum C soft total porosity	Strafum C spit water-Inf e d porosity.
	Siletom A SCS SOLICE Comp So Li Parameters	Stratum A son Gry bulk density, pe [*]	Stratum A sort total perosity. p*	Stratum A ser water-bittod percently, e.*	Stratum B SCS	Stratum Ri solidry bulk does ty A _p	Stratum B 50 - Idial porosity 5	Stratum B soit water-filled pombity, e _e H	Scalon G SCS	Shalom C solidny buildensity	Stratum C soft total perosity n ²	Strafum C spit water-Infed ponesty. egh
	Shellom A SCS SOLIGOE Choice So L. Parameters	Stratum A solidity butk density.	Stratum A sort total porosity.	Stratum A sp. water-hitod percenty.	Stratum B SCS so type topsup Soa	Stratum R solidry bulk does ty	Stratum B sovictal percety	Stratum B soil water-filled port/Sity.	Spalem G SCS - <u>90° lyDe</u> - 20° a Sw	Stratum C scrildfy bulk Censity	Stratum C soft total porosity	Stratum C spit water-Infect ponosity, e_* .cm*.cm*)
	Siletom A SCS SOLICE Comp So Li Parameters	Stratum A son Gry bulk density, pe [*]	Stratum A sort total perosity. p*	Stratum A ser water-bittod percently, e.*	Stratum B SCS so type topsup Soa	Stratum Ri solidry bulk does ty A _p	Stratum B 50 - Idial porosity 5	Stratum B soit water-filled pombity, e _e H	Spalem G SCS - <u>90° lyDe</u> - 20° a Sw	Shalom C solidny buildensity	Stratum C soft total perosity n ²	Strafum C spit water-Infed ponesty. egh
<u>i ♥</u> ;	Stratum A SCS SCI (506 Non-100 So Parameters	Stratum A solidiy durk density, he [*] (grom [†])	Sirotum A sorticial portos (y. p.* 12n-4ess)	Stratum A sal water-fitted perpany, B	Siratum B SC5 <u>80 1988</u> .omusica : Patamica I	Stratum Fi so dry Bulk does ty no ^{ff} (grant ³)	Stratum B solicital percesty y ^a (an (ess)	Stratum B sod water-filled porosity, e_fill (services);	Scatum C SCS 90-195e 10-25m 1 Parameter	Spatem G spilldry builders by Party /grown)	Stratum C soft total perosity n/2 sun Tessit	Stratum C spit water-Infect ponosity, e_* .cm*.cm*)
. ₩ORE	Shatom A SCS SCI type Characters Parameters St ENTER Enclosed	Stratum A storictly outsidensity, As 'gram') 150 ENTER	Stratum A soft lotal portos by photos by the soft lotal portos by the s	Stratum A say water-fitted persons, e.f. cmilemit; 0 103 ENTER Seniosed	Stratum B SCS SU type LoadSoot Paramera t	Stratum Fi so dry bulk don's ty no ⁴ (grant ²) 1 66 ENTER	Stratum B socials portady p (an (ess) 0.375	Stratum B sod water-filled porosity, e_fill (services);	Shatum C 505 90-195e 10-25 Sw 1 Permitter 8 ENTER Average Valor	Spatem G spilldry builders by Party /grown)	Stratum C soft total perosity n/2 sun Tessit	Stratum C spit water-Infect ponosity, e_* .cm*.cm*)
<u>i ♥</u> ;	Stratum A SCS SCI (506 Non-100 So Parameters	Stratum A son Gry Outs density, As 'grom')	Sirotum A sorticial portos (y. p.* 12n-4ess)	Stratum A sal water-fitted perpany, B	5tra1um 8 505 <u>80 type</u> 103005604 1 Peramon 1	Stratum Ri solidry bulk does by Pa ⁶ (grant ²)	Stratum B solitolal perceity ne (an (exa)	Strature B soil water-filled ports thy e ₃ th (term from h) 0.534	Shatum C 505 500 lpbe 100 lpbe 100 lpbe 1 Reserves 8 I ENTER Average valour 100 lbb lbb	Stratum C scale dry but nicensity Asi (grown) 1 Ang	Stratum C soft total perosity n/2 sun Tessit	Stratum C spit water-Infect ponosity, e_* .cm*.cm*)
. ₩ORE	Stratum A SCS Schilyte Schilyte Charles Schilyte Charles Schily Enter Enclosed Space Room (humbess).	Sinatum A solid by Care Solid	Stratum A sort total porter by physical porter by physical porter by the sort	Stratum A star water-filled personny, etc.	Stratum B SCS SU type LowupSoul Perament S ENTER Enclosed Space Congrel	Stratum Files of dry tout close ty tout close ty tout tout tout tout tout tout tout to	Stratum Bisocitals protestly and feed of the seed of t	Strature B soil water-filled ports thy e ₃ th (term from h) 0.534	Shatum C 505 504/506 Long Son i Parameters 5 ENTER Asserage values Townstee and budg CR Advisigness on Calculate	Stratum C scale dry but nicensity Asi (grown) 1 Ang	Stratum C soft total perosity n/2 sun Tessit	Stratum C spit water-Infect ponosity, e_* .cm*.cm*)
. ₩ORE	Stratum A SCS Schitze	Sinatum A soliday and soliday	Stratum A sort total porter by physical porter by physical porter by the sort by the sort by the sort benefits and by the sort benefits.	Stratum A sor water-filled personny, with combination of the combinati	Stratum B SCS SU type LowupSout Personner S ENTER Entlosed Space Entight	Stratum Files of dry tout clars by tout clars by tout clars by tout tout tout tout tout tout tout tou	Stratum B socials portrady p (an less) 0.375 ENTER Incote are exchange tale or	Strature B soil water-filled ports thy e ₃ th (term from h) 0.534	Shatum C 505 hps 100 hps 10	Stratum C scale dry but nicensity Asi (grown) 1 Ang	Stratum C soft total perosity n/2 sun Tessit	Stratum C spit water-Infect ponosity, e_* .cm*.cm*)
. ₩ORE	Stratum A SCS Schilyte Schilyte Charles Schilyte Charles Schily Enter Enclosed Space Room (humbess).	Sinatum A solid by Care Solid	Stratum A sort total porter by physical porter by physical porter by the sort	Stratum A sor water-filled personny, e.g.,	Stratum B SCS SU type Lowup South Parameter S ENTER Enclosed Space Enight d LOT)	Stratum Files of dry tout close ty tout close ty tout tout tout tout tout tout tout to	Stratum Bisocitals protestly and feed of the seed of t	Strature B soil water-filled ports thy e ₃ th (term from h) 0.534	Shatum C 505 504 lybe 104 at 5m I Asserted S ENTER Average valor 104 attended CR Average halon 104 attended CR Average halon 104 attended CR Average halon 104 attended CR Average halon 105 attended CR Average halon CR	Stratum C scale dry but nicensity Asi (grown) 1 Ang	Stratum C soft total perosity n/2 sun Tessit	Stratum C spit water-Infect ponosity, e_* .cm*.cm*)
. ₩ORE	Stratum A SCS Schitze	Sinatum A soliday and soliday	Stratum A sort total porter by physical porter by physical porter by the sort by the sort by the sort benefits and by the sort benefits.	Stratum A sor water-filled personny, with combination of the combinati	Stratum B SCS SU type LowupSout Personner S ENTER Entlosed Space Entight	Stratum Files of dry tout clars by tout clars by tout clars by tout tout tout tout tout tout tout tou	Stratum B socials portrady p (an less) 0.375 ENTER Incote are exchange tale or	Strature B soil water-filled ports thy e ₃ th (term from h) 0.534	Shatum C 505 hps 100 hps 10	Stratum C scale dry but nicensity Asi (grown) 1 Ang	Stratum C soft total perosity n/2 sun Tessit	Stratum C spit water-Infect ponosity, e_* .cm*.cm*)
MORE.	Stratum A SCS SOL Street Common Sol Parameters St. ENTER Enclosed Space Room (MARSS), Long 100ml	Stratum A solidity Outsidensity. As for the density. As for the density of the de	Stratum A sort total ports (y. p.f. 12ndess) 10.370 ENTER Enclosed space floor length, Ly (cre)	Stratum A say water-filled personny. B	Stratum B SCS SU 1908	Stratum Files of dry four consists of the files of the fi	Stratum B Sociotal portistly 10 (an text) 0 375 ENTER Incorr or exchange sale or (4.n)	Strature B soil water-filled ports thy e ₃ th (term from h) 0.534	Shatum C 505 504 lybe 104 at 5m I Asserted S ENTER Average valor 104 attended CR Average halon 104 attended CR Average halon 104 attended CR Average halon 104 attended CR Average halon 105 attended CR Average halon CR	Stratum C scale dry but nicensity Asi (grown) 1 Ang	Stratum C soft total perosity n/2 sun Tessit	Stratum C spit water-Infect ponosity, e_* .cm*.cm*)
MORE.	Stratum A SCS Schildren A SCS Schildren A SCS Schildren A Schildren Schildre	Stratum A solidity Outsidensity. As 'Stratum' 1500 ENTER Solid dig or essure of Perential. SP (grames') 40 ENTER Averaging	Siretum A sort total ports (y. p.f. 12nd-253) ENTER Enclosed space floor length. Ly (con) 1000 ENTER	Stratum A say water-filled personny. B	Stratum B SCS SU type Lowestor Parameter S ENTER Entiosed Space Integral Integral Ention 244 ENTER Target	Stratum Filipon dry touk consisty touk consisty touk tous dry touk tous tous tous tous tous tous tous tous	Stratum B Sociotal portistly 10 (an text) 0 375 ENTER Incorr or exchange sale or (4.n)	Strature B soil water-filled ports thy e ₃ th (term from h) 0.534	Shatum C 505 504 lybe 104 at 5m I Asserted S ENTER Average valor 104 attended CR Average halon 104 attended CR Average halon 104 attended CR Average halon 104 attended CR Average halon 105 attended CR Average halon CR	Stratum C scale dry but nicensity Asi (grown) 1 Ang	Stratum C soft total perosity n/2 sun Tessit	Stratum C spit water-Infect ponosity, e_* .cm*.cm*)
MORE.	Stratum A SCS Sci lyttle SCS Sci lyttle Common Sci Parameters St. Enter Enclosed Space Room Provides St. Load Load Sci Parameter	Stratum A solid by Outs density. As 'special' 150 ENTER Solid dig pressure of the online. Special control of the online. Special control of the online. Special control of the online. Special control of the online. Special control of the online. ENTER Averaging time for	Siretum A sort total ports by ph tendens to the sort of the sort o	Stratum A say water-filled personny. By the combination of the combin	Stratum B SCS SU type Lowupson Peranton S ENTER Enclosed Shace Finight Th LOTT) ENTER Target Lowupson The Lo	Stratum Files of dry tout close by opf (grant) 1 66 ENTER Floor-wall Seam crack with A (crit) In S ENTER Target hazara such ent for	Stratum B Sociotal portistly 10 (an text) 0 375 ENTER Incorr or exchange sale or (4.n)	Strature B soil water-filled ports thy e ₃ th (term from h) 0.534	Shatum C 505 504 lybe 104 at 5m I Asserted S ENTER Average valor 104 attended CR Average halon 104 attended CR Average halon 104 attended CR Average halon 104 attended CR Average halon 105 attended CR Average halon CR	Stratum C scale dry but nicensity Asi (grown) 1 Ang	Stratum C soft total perosity n/2 sun Tessit	Stratum C spit water-Infect ponosity, e_* .cm*.cm*)
MORE.	Stratum A SCS Schildren A SCS Schildren A SCS Schildren A Schildren Schildre	Stratum A solidity of the soli	Siretum A sort total ports (y. p.f. 12nd-253) ENTER Enclosed space floor length. Ly (con) 1000 ENTER	Stratum A say water-filled personny. B	Stratum B SCS SU type Lowestor Parameter S ENTER Entiosed Space Integral Integral Ention 244 ENTER Target	Stratum Filipon dry touk consisty touk consisty touk tous dry touk tous tous tous tous tous tous tous tous	Stratum B Sociotal portistly 10 (an text) 0 375 ENTER Incorr or exchange sale or (4.n)	Strature B soil water-filled ports thy e ₃ th (term from h) 0.534	Shatum C 505 504 lybe 104 at 5m I Asserted S ENTER Average valor 104 attended CR Average halon 104 attended CR Average halon 104 attended CR Average halon 104 attended CR Average halon 105 attended CR Average halon CR	Stratum C scale dry but nicensity Asi (grown) 1 Ang	Stratum C soft total perosity n/2 sun Tessit	Stratum C spit water-Infect ponosity, e_* .cm*.cm*)
MORE.	Stratum A SCS Solitive Commons Solitive Commons Solitive Enter Enclosed Space Room (Markets), Lower Commons Solitive Enter Enclosed Space Enter	Stratum A solid by Outs density. As 'special' 150 ENTER Solid dig pressure of the online. Special control of the online. Special control of the online. Special control of the online. Special control of the online. Special control of the online. ENTER Averaging time for	Siretum A sort lotal cores ty, ph. 12ndes55 12nd	Stratum A sor water-filling personny 8	Stratum B SCS SU 1908	Stratum Fill so dry for for for for for for for for for for	Stratum B Sociotal portistly 10 (an text) 0 375 ENTER Incorr or exchange sale or (4.n)	Strature B soil water-filled ports thy e ₃ th (term from h) 0.534	Shatum C 505 504 lybe 104 at 5m I Asserted S ENTER Average valor 104 attended CR Average halon 104 attended CR Average halon 104 attended CR Average halon 104 attended CR Average halon 105 attended CR Average halon CR	Stratum C scale dry but nicensity Asi (grown) 1 Ang	Stratum C soft total perosity n/2 sun Tessit	Stratum C spit water-Infect ponosity, e_* .cm*.cm*)
MORE.	Stratum A SCS solitive trains So. 1 Parameters St. ENTER Enclosed space floor (maness, Load Loan Loan Loan Loan Loan Loan Loan Loan	Stratum A solidity of the soli	Siretum A sort total ports (y. p.f. 12ndess) Dendess) ENTER Enclosed space floor length. Ly (cm.) 1 1000 ENTER Exposore garantees floor length. Ly (cm.)	Stratum A son water-filling probably. By Stratum Combined Probably	Stratum B SCS SU 1908 LOWESTAN PROMISSON PROMISSON PROMISSON PROMISSON PROMISSON SCENER Entlesed Space Forgal HA LETT) 244 ENTER Target LOWESTAN CARCEGAMS TR	Stratum Fill so dry for the sold dry for the sold dry for the sold dry for the sold dry for the sold dry for the sold dry for the sold dry for the sold dry for the sold dry for the sold dry for noncompanion of the sold dry for the sold dry for for the sold dry	Stratum B Sociotal portistly 10 (an text) 0 375 ENTER Incorr or exchange sale or (4.n)	Strature B soil water-filled ports thy e ₃ th (term from h) 0.534	Shatum C 505 504 lybe 104 at 5m I Asserted S ENTER Average valor 104 attended CR Average halon 104 attended CR Average halon 104 attended CR Average halon 104 attended CR Average halon 105 attended CR Average halon CR	Stratum C scale dry but nicensity Asi (grown) 1 Ang	Stratum C soft total perosity n/2 sun Tessit	Stratum C spit water-Infect ponosity, e_* .cm*.cm*)
MORE.	Stratum A SCS SOL Street Commo Sol Parameters St. ENTER Enclosed Space Room (Markets), Lower Commo Sol Co	Stratum A solidity out density. As forced to the solid ty out density. As forced to the solid type of	Siretum A sort lotal cores ty, ph. 12-4-553. ENTER Enclosed space floor tength. Ly (cont.) 1000 ENTER Exposure out to the control of th	Stratum A sor water-filled personny, B sm orm of 103 ENTER fan open spatia filled fil	Stratum B SCS SU type Lowus South Parameter SCS Francisco Francisco Francisco SACP Francisco Fra	Stratum Files of dry four consists of dry four four files of the four four four four four four four four	Stratum B Sociotal portistly 10 (an text) 0 375 ENTER Incorr or exchange sale or (4.n)	Strature B soil water-filled ports thy e ₃ th (term from h) 0.534	Shatum C 505 504 lybe 104 at 5m I Asserted S ENTER Average valor 104 attended CR Average halon 104 attended CR Average halon 104 attended CR Average halon 104 attended CR Average halon 105 attended CR Average halon CR	Stratum C scale dry but nicensity Asi (grown) 1 Ang	Stratum C soft total perosity n/2 sun Tessit	Stratum C spit water-Infect ponosity, e_* .cm*.cm*)

Diffusivity in air, O _a (cm ² /s)	Diffusivity in water, D _w (cm²/s)	Henry's law constant al reference temperature, H (atm-m³/moi)	Henry's law constant reference temperature. T _R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T _B (°K)	Critical temperature. T _C ("K)	Organic carbon partition coefficient, K _{ee} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk (actor, URF (µg/m³)*	Reference cond., RfC (mg/m³)
7.90E-02	9.10E-06	1.03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	2.0E-06	6.0E-01

END___

NERMEDIATE CALCULATIONS SHEET.

Exposure duration (sec)	Source- be ding suparution, L- (cm)	Stratum A squi aur-fit ed purosity, $\theta_a^{(a)}$ (cm ³ /cm ³)	Stratum B soil aur-Mied porceity 9, 8 (cm ³ /cm ²)	Stratum C soil ardi ed perosity, es ^C (cm ² (cm ²)	Shakan A offective lotelituid saturation, Sy (orf/lom/)	Stratum A soil intrinsic permeasility, ix (cm²)	Stratum A sometal vg am permeability k _u (cm²)	Siyatum A Sod offective vapor permeability, A (Limit)	Thickness of captuary zone, L., (cm)	Total porosity in capitiany zone n _{ty} (cm ³ cm ³)	Air-lined perosity in capit ary zone the standard (cm ² /cm ²)	Water-filled porosity in papidary zone $\theta_{e^{-1}2}$ (cm²/cm²)	Floor- wall seam per meter, X _{mers} (cm)
9 465+Ca	25	0.267	, 0.321	0.321	0_193	_5,94E-09	0.895	5 32E-09	25.50	0.37	2,092	<u>C 32C</u>	4 000
isidy ventration rate Grown (om ² 's)	Area of emitosed space be ow grade. As (cm²)	Crack- to-fotal area ratio, n (unit ess)	Crack depth delow grade, Z _{race} (on)	Eintha pylot vapor zation al avel groundwater temperature, 2H ₁₇₅ (baltino)	Henry's law constant at axe groundwater temperature Hrs (atm-m ³ -mot)	Henry's raw constant at aver groundwater temperature, Hins 	Vapor viscosny at avel sor lemperature, stra (grom-s)	Stratum A effective diffusion coefficient Offi (om ² (s)	Stratum 8 in Meutive califusion coefficient 0*"s (cm*/s)	Stratum C effective d.ffusion coefficient, D ^{eff} c (cm ² /s)	Cap hary zone effective diffusion coefficient D************************************	Total overall effective offusion coefficient, Drift (cm ² /s)	Diffusion path langth, ha (cm)
69E+04		3.775-04	15	8 544	5 05E-03	2 '/E-01		7.50E-03		0.00E-00	3 42E-65	685-04	128
Convection path length La tomi	Source vapor cond . Concos (p.g. m ³)	Crack radios r _{use} , (em)	Average vapor Pow rate into bidg : Q _{sp} (cm ² /s)	Crack effective diffusion coefficient D ^{arke} (cm ² /s)	Area of chack, Ay p. (cm²)	Eropheni of equivalent foundation Pot et cumper exp(Pe ¹) (unit esp)	leting source proper altenuation coefficient or (unitess)	Intinite source tidg cond C _{11,574} upg m²)	Uni; risk factor: URF (µ0 m ⁻²)*	Reference cond RfC (mg/m ³)			
<u>15</u> [_1 <u>09</u> E <u>*03</u> _	0.10	8 33E+D1	7 10E-03	4.00E+02	2 28E+127	8 2 <u>6</u> E- <u>C</u> 5 ,	<u>5.985.02</u>	2 CE;06	<u>€0€₹:</u>	ì		

RESULTS SHEET

INCREMENTAL RISK CALCULATIONS:

					Incremental Hazard
Indoor	Indoor	Risk-based	Pure	Final	risk from quotient
exposure	exposure	indoor	component	rcobni	vapor from vapor
groundwater	groundwater	exposure	water	exposure	intrusion to intrusion to
conc.,	conc.,	groundwater	solubility,	groundwater	indoor air, indoor air.
carcinogen	noncarcinogen	conc.,	\$	conc.,	carcinogen noncarcinogen
(μg/L)	(μg/L)	(µg/L)	(μg/L)	(μg/L)	(unitless) (unitless)
					
NA_	NA	NA	1.47E+06	NA	7.4E-08 1.4E-04

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

END

Site 20 - TGE - CallEPA Towarty Criteria

PRG SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INGREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater cond., cardinogen (mg/L)	Indoor exposure groundwater cond noncarcinogen (mg/L)	Risk-based indoor exposure groundwater cond (mg/L)	Pure component water solubility, S (mg/L)	Final indoor exposure groundwater cond., (mg/L)	Incremental risk from vapor intrusión to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
(mg/L)	3,50E+04	(nig/L) 6.80E+01	1.47E+06	6.80E+01	NA NA	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Osource and Obuilding on the INTERCALOS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"

•						Dally Eduda Suga	:1					
GW-A0V Mersion 3.1; 02/04	CALCULATE RIS	KK-BASED GROUN	ONOD RETAING	EN™RATION ,e	rie: XI w 1995 too	π ;						
Reset to		YES :	OR]								
Defacits	CALCULATE NO	CREMENTAL RISK:		TAWQNUOPG.	ZR CONCENTRATI	ON (enter 1K) in 1YE:	St poward in Natigroup	dwaler concliber	gwl			
		YE\$ '	X)								
	CNTER	EMTER Polisi										
	Счет сві	groundwater										
	CAS No	corc,										
	inumbers anly.	C.										
	no dastas;	(Egr.)			Cherrical							
	79015	5 975 ± 00]		7 richioraethyle	er B						
	ENTÉR	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER		ENTER	l
[NORE		Seph		Totals me	st and up to value o				3-5-1			,
+	Averaça so /	bolow grade to bottom	Depth	Trickness	Prickness also:	Thickness of soil	Sc-		stratum A GCS		Liser-definied Sîralun: A	ŀ
	groundwater	rf rrobsed	below cyade	05 804	stratum E	skalen C.	stratum	sas	Sa IyDA		self-aper)
	temperature.	space foot.	lo water lable	svatem 4		(Enter value or 0)	Grest viabber	sad (_r pe	used to estimate	೧₹	permittantly)
	т,	Lr	Lwi	h,	n:	n,	warer table	ovect y apove	sa, vepa:		K ₁)
	; <u>"tt)</u>	(11)	(am)	<u> </u>	(3/m)	(cm)	"Enter A St or Cit	weller lable	permeability)		(Cm²)	Į
	- 1	15	140	140	r.		Α	St	Su. 5			!
		•	•					-		•		•
	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
MORE	Stratum A	Shatum A	Sizatum A	Stratum, A	Stratum B	Stratum 8	Shanim B	Strafum B	Stratum C	Stratum C	Stratum G	Sharpin C
لـــــــــــــــــــــــــــــــــــــ	505	sondry bulk decady	so lotal	Spiritable for the company of the co		אסיי לרץ מי ולי או א	sa Hota	so water-lived	305 30/1/pe	Solvitiy bu vidensily	april letal	iso i wateni le: porosity
	and type		páras ly. n*	67. 67.	sol type	bulk density. al ^e	pprosity. _p e	poresily	-	F ₂ ^C	parasity	20.221.4
	, constants	(gram')		والمحارسي	Localo Sali il Peranglara	2, (5)(65 ⁴)		اد مد (در سام) مارخ	т Эсмир Бо Помете его	re reconst.		e = 3, c = 3;
		<u> </u>	run (BSS)	,,		19 (11.1	(√m#ess)	10.11.12.1			(unitless)	
	SL	1.60	J 370] 3,103	g	1 GR	0.075	J 054	5	1.65	0.375	0.054
CHOOS.	ENTER Snamsed	ENTER	ENTER Enclosed	ENTER Ensissed	ENTER	ENTER	ENTER		ENTER			
MORE 1	Space	Sowbide	space	20406	Enclosed	Froor-wall	Indoor		Average vacor Row rate into bidg			
	DO04	pressure	hour	Door	50308	s€-µm crack	a cerchange		D9			
	:hckmass.	differential.	ength.	w:C7:	he ght	WIGO.	rale.		eave Clank to datcolat	•		
	L _v ,	₫₽.	بها	Y* B	14	*	드역		3,,,			
	(:⊐)	ig an isa'y	lom:	(cm)	((a)	(cm)	(1.h)		(Linn)			
	*9	40	000'	1000	980	L 0'	9.63]	5			
MORE	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER						
	Averaging	Awaraging	(<i>5</i>	Tarşe:	Turge! hagard						
	time for carcinogaes,	time for tongardingens	Exposure auratian	Exposure frequency,	usk for carprogens	cuptient for rendure negens						
	AT ₂	AT _{eC}	FD.	EF	19	140						
	0/3)	(v:8)	إكامي	(days)yr)	(and max)	(ondess)						
		24	T25	250	CÉ-0€		1					

Used to cargulate hisk-based groundwater candenosycon

Diffusivity in air, D _a (cm ² /s)	Dilfusivity in water, D _w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m³/mol)	Henry's law constant reference temperature, T _R (°C)	Enthalpy of vaporization at the normal boiling point, \(\text{\Delta H}_{\text{\chi}} \) \(\text{\Calif (cal/mol.)} \)	Normal boiling point, T _e (^e K)	Critical temperature, T _C (^c K)	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit nsk factor, URF (ug/m²)	Reference conc RfC (mg/m³)
7.90E-02	9.10E-06	1.03E-02	25	7.505	360.36	544.20	1.66E+02	1.47E+03	1.1E-04	3.5F-02

INTERMEDIATE CALCULATIONS SHEET.

Exposure duration f	Source building soparation, tr (cm)	Stratum A son air-filled corosity, $\theta_a^{\ h}$ (cord/cm²)	Stratum B soft archited corosity Ψ_{\bullet}^{F} (cm ³ /cm ³)	Stratum C sor a refined cores ty e ^C (cm ³ /cm ³)	Stratum A effective total fluid saturation Si _e (cm ³ /cm ²)	Straign A so introsed peursability k (cm²)	Spalum A so I relative air permeobrity, k _q (cm ²)	Stratum A soil effective vapor permeability, k, (cm²)	Thickness of capitary zone U _r , (cm)	Total porosity n capillary sone. [4r (cm³rcm³)	Air-filled poresity in capit ary zone. θ _{Airs} (cm ³ /cm ³)	Water-filled poresity in capitary cone. \$\tilde{\text{g}}_{\text{s}^2}\$ \$\text{(cm}^3\cm^3)\$	Floor- wall seam connider, X _{nest} (co.)
7,88E+08	125	C 267	0.321	0.321	0.193	5.94E-09	0.895	5 32E-09	25 DD	<u> </u>	0.050	0.320	4 000
Blog, ventilation rate, Q _{1,000} , (or ³ /a)	Area of unclosed space below grade As turn!	Cracks 10-lotai grea ral o. T _i (unit ess)	Crack depth pelow grade Z _{re} , (cm)	Entivelyy of vapor zation all ave. groundwater temporature 5%, rs. (calimo.)	Henry's law constant at avoilgroundwaler lemperalure, H-5 (alm-m ³ /mol)	Honry's law constant at avolgroundwater temperature Higs Lumitiess (Vapor vistosity al ave. soil (emperature, less (g/cm-s)	Stratum A effective diffusion operficient, D** com*/st	Stratum B eMcclive diffusion coefficient D*** 1.00**/5)	Stratum C effective diffusion coefficient D ¹¹ 0 (cm ² s)	Capillary zone effective diffusion coefficient Of "-e (cm²/s)	Total overall effective diffusion spefficient. Official confidence of the confidenc	Orthwoon pailt langth La (on)
6 97E+04	1 06E+06	3 //E-04	[15	8 544	5 057 03	2 17E-01		7 10E-03	0 0 <u>0E+</u> 00	0.005+00	3 4 <u>2E-0</u> 5	1 68E-04	125
Convection ##th #ength La (em)	Source wiper cond . Charles (ug/m ⁻¹)	Crack radius, r _{ode} s (cm)	Average vapor Pow rate into tudg Q _{ast} (cm ² /s)	Chack effective diffusion confficient D ²⁻²⁴ (Ch ² /S)	Area o! grack A _{elas} , (6m²)	Exponent of aguiva ent foundation Poolet number exc(Po') (unitioss)	Infacte source indoor altenuation coefficient (t junitess)	orinite source bidg cond. Course (ug:m²)	Uni nsk factor (JQF (JQFn ²) ¹	Reference condi, RfC (mg/m²)			
Γ ⁻ -45	1 59E+03	σ. σ.10 · · ·	[θ.33 E•c 2***	7.10E-03	['455E+62 '''	2 285+127	2 C25-05	7 20F 02	T 1 16-04	3.5 E -02			

ENO__

RESULTS SHEET

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc (µg/L)	Pure component water solubility, S (µg/L)	Final Indoor exposure groundwater cond., (µg/L)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA NA	NA NA	NA NA	1.47E+06	NA]	5.9E-07	4.3E-04

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

PRG SHEET

INCREMENTAL RISK CALCULATIONS:

Indoor	Indoor	Risk-based	Pure	Final		Hazard Juotient
exposure	exposure	indoor	component	indoor	vapor fro	m vapor
groundwater	groundwater	exposure	water	exposure	intrusión to inf	rusion to
cond.,	conc.,	groundwater	solubility,	groundwater	indoorlair. in	door air,
carcinogen	noncarcinogen	cond.,	\$	conc	çardinogen none	carcinogen
(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(unitless) (i	unitless}
						
8.48E+00	1.17E+04	8.48E+00	1.47E+06	8.48E+00	NA NA	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

GW ADV	CASCULATE BY	ж жазыр өнрил	OWATER CONC	ENTRATION (ent	or IXI in IMEST ba	ч						
Version 3 1; 02:04				t								
Resel to		7E2		[
Defaults	CALC: ATC INC	OCUFNIN 2002	OR S Sector action	TIBO IND NATE	a concentati	ON James W. A. 1964	Si povianous na igrej.					
1. 22 17	5×2045-15140	- J= ~ 5 M + W - J- 3 M	2 11 12 10 40 10 40	(MODING IVAI)	(4 00 4C 1 4 1 4 1 4 1 1 1 1 1 1 1 1 1 1 1 1	O1818** (F. X 1** 17.	т времена оже фр.	- imaxi 55-15 (0);	Va.			
		YES	x]								
	FNTER	ENTER										
		lest at										
	2hemica. CAS No	groundwaler cont										
	(numbers only	C _A										
	no dashes)	(JigrL)			Chemical							
	75016	5.02E+90			Enich-ordethy-e	ne						
	ENTER	FNTER	FNTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER		- SNTER	1
	-	Dep:h	• • • • • • • • • • • • • • • • • • • •		si acd up to value s				Sou		•]
MORE	Avezage sodi	below grade to pollog	Oepur	Thomass	Thickness of soil	Thickness of soil	So.	'	stratum A SCS		Oser-delined Shalom A	
	979,000 %ale r	of gnoloseg	perswigrado	of soil	Siraiu T R	siraium G.	504"305	SCS	so lyce		solvago:	
	(amonyature)	spach "do	m water table			(Finial value of 0)	directly above	506 Lypic	çayeti iş eslimate	24	proposability	
	r _s _l *ca	ار. د	s dyr	74	F _e	? <u>c</u> :	water lab e.	directly above	\$0- vapor		k. (c.m²)	
	101	(64)	<u>:c</u> m	(0.0)	(cm)	<u>iemi</u>	(Entire A. B. or C)	water lable	participation (v)		P	1
	11	15	140	143	<u> </u>	Ö		<u> </u>	3.]
MORE	ENTER Stratum A	ENTER Sitalom A	ENTER	ENTER	ENTER Statum B	ENTER	ENTER	ENTER	ENTER Statute €	ENTER Skalet C	ENTER Skatum C	ENTER
+	80S	soldy	Sivatum A solitota	Straight A soil water-filled	SCS	Siralum B soil dry	S:ratum B sel telat	Stranum B so water-bligg	SCS	501 CT	Special	Siratum C so., watgr4 lag
	Soil Syste	Do-4 den84y.	porosity,	peresity	so lyae	bulk dons ly.	porosity.	porasily.	so lyce	bolk density	gordálly.	porusity
	Parameters		٠,*	ú",	Locket Sak	e a	n=	4_A	Marco 504	μ_{z}^{c}	-1	e_*
	P3/3-P4/4	<u>'g'am'ı</u>	(chilless)	(cm² tm²)	heartest	lgrom")	[undiass]	(cm ² /cm ²)	i ialahen	(5/cm ²)	(unil éss)	ارسابر عادا
	<u>12</u>	' 60	5 370	0.103	2	' 66	0.375	0.054	\$	' 6E	0.375	0 054
	ENTER	ENTÉR	ENTER	ENTER	ENTER	SNTER	ENTER		€N/ER			
MORE :	Enclosed space	So -6+2g	Freloke¢ space	Enrigged space	Eric osed	Fingr-wa	legger		Alexago vegos liberatio into bidg			
<u></u>	Noor	pressure	flance	Hoor	STACE	Seam crace	a sie stoange		OR OR			
	In caress	offerential.	lengih	WIGIF	ne att	with	7374	L	eave Mark to calcula	'e		
	Lyappa	ΔP :-:	La .	Wa	**a	.**	5.R		್ಕ್ತಿ.			
	(CM)	(glam-sil)	lc∓)	(cm)	<u></u>	<u>(cπ)</u>	<u></u>	•	(LWI)			
	(15	40	1900	1000	300	0.	0.63)	[1		
MORE	ENTER	ENTER	ENTER	FNTER	ENTER	ENTER						
i	Averaging	Averaging	·	F	Targer	arger hasaio						
	time for card regens.	i molfar ransaro,nagans,	Sixposure duration,	Exposure frequency,	risk for carcinog e ns	qualisatifor noncarcinagens,						
	AT _c	AT _{ric}	ΕĎ	42	79	11:0						
	(y'%)	075)	(yrs)	(days yr)	(undess)	(aPd 455)						
			25		1 0E-06		1					
					Used to calc.	lafe i sk-based	ı					
END		•				сспсилігаціоп						

Diffusivity in air, D _a (cm ² /s)	Odfusivity in water, D _w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m³/mol)	Henry's law constant reference temperature, T _R (°C)	Enthalpy of vaporization at the normal boiling point, LH _{v,b} (cal/mol)	Normal boiling point, T _B	Critical temperature, To (°K)	Organic carbon partition coefficient, Koc (cm³/g)	Pure component water solubility. S (mg/L)	Unit risk factor, URF (µg/m³) ⁻¹	Reference cond., RfC (mg/m ³)
7 90E-02	9.10E-06	1 03E-02	25	7,505	360.36	544.20	1.66E+02	1.47E+03	2.0E-06	6.0E-01

INTERMEDIATE CALCULATIONS SHEET

Exposure duration, t	Source- building separation, Lr (cm)	Stratum A soil art-f, led porosity, A ₂ ^A (cm ² /cm ²)	Stratum B soil air-filed porosity. θ_s^{-n} (cm^2/cm^2)	Stratum C son a: \(\hat{h}\) red portss(y, \(\text{q}\) \(\text{cm}\)\(\text{cm}\)\(\text{cm}\)	Shall in A effective lotal fluid saturation Su formitients	Stratum A so refersion permeability k, com ²	Stratum A soil relative an permeasity Ki, comin	Stratum A sor effective vaccor dermeability k, (cm ²)	Thickness of capitary zone Light Logical Logic	Total porosity in capitary zone n _s (cm ² /cm ²)	Air filled porosity in capillary zone, θ_{a+a} (cm ² /cm ⁴)	Water-filled corosity in capitary zone $\theta_{a=0}$	Floor- wall seam perimeter: Xissi (cm)
7.58E+08	125	. 0 267	<u>l6.</u> 32';	0.32*	0.183	5 945-09	0.895	5 32E-09	25 00	<u>C37</u>	<u> </u>	0.320	4.000
9 dg ventiakon rate. Oوسیس (cm ² 5)	Area of end osed space celow grade, A _B	Crack- lo-roial area ratio n iun liess;	Crack depth below grade, Zigo (cm)	Enthalpy of vaporization at avel groundwater letriperature, 544, rs (callmol)	Heory's law constant at avel groundwater temperature, His (atni-milano)	Heary's law constant at avergroundwater temperature. HTvs uselfless)	Vapo: s scosity al ave, soil temporative, un; tg cm-s!	Stratum A effective diffusion ocefficient, Offis (cmf/s)	Stratom B effective diffusion coefficient Offin (cmf/s)	Stratum () effective diffusion coefficient D'ff (omfrs)	Capitary Zone effective diffusion coefficient, D** _{sy} (cm*'s)	Total overall effective diffusion coefficient Officient (commiss)	Diffusion path ength, f-a (cm)
G 92€+04	1.06E±06	3.77E-04	15	8,544	5.05E-03	2.178-01	1.76E-04	7.109-03	0 DUE 400] TO 00E+00	3 42E-C5	1 68E-04	125
Convection path tength, L, (cm.)	Seurce vapor cerol: C _{source} (ug/m²)	Grack radius, four (om)	Average vapor flaw rate into blog t Q ₁₀₄ (cm ² /s)	Grack effective diffusion coefficient D ^{GRAC} (cm ² /s)	Area of crack, Along (cm ²)	Exponent of equivalent foundation. Pecifel number, exp(Per) (on less)	tofinile source indocr attenuation coefficient ix (unitiess)	Infinite source ladg censil Course (again ²)	Und nsk fector URF (ug/m²)	Reference cond RfC (mg/m²)			
15	109E+03	0,10_	<u>8 3</u> 3€ <u>+0</u> 1	7 16E-03	4 00/5+02	2 28E+127	2 02E-05	2 Z0E-02	2 <u>5E-06</u>	ē ce.ç-			

___END___

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoar	Indoor	Risk-based	Pure	Final	Incremental risk from	Hazərd quotient
exposure	exposure	indoor	component	ndoor	vapor	from vapor
groundwater	groundwater	exposure	water	exposure	intrusión to	intrusion to
conc.,	conç.,	groundwater	solubility,	groundwater	indoor air,	indoor air,
carcinogen	noncarcinogen	conc.	\$	conc.,	carcinogen	noncarcinogen
(μg/L)	(μg/L)	(µg/L)	(µg/L)	(µg/L)	(unitiess)	(unitless)
						
NA	NA NA	NA NA	1.47E+06	NA	1.1E-08	2.5€-05

MESSAGE AND ERROR SUMMARY BELOW. (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

PRG SHEET

INCREMENTAL RISK CALCULATIONS:

					Incremental	Hazard
Indoor	indoor	Risk based	Pure	Final	risk from	quotient
exposure	exposure	indoor	component	indoor	vapor	from vapor
groundwater	groundwater	exposure	water	exposure	intrusion to	intrusion to
conc.,	conc.,	groundwater	solubility.	groundwater	indoor air,	indoor air,
carcinogen	noncarcinogen	conc.,	\$	conc.,	carcinogen	noncarcinogen
(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(บกitless)	(unitless)
				· · ·-	<u> </u>	· · ·
4.67E+02	2.00E+05	4.67E+02	1.47E+06	4.67E+02	NA NA	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"

GW-AOV	CALCULATE RIS	KIBASED GROUN	DVOC RETAWD.	ENTRATION (ex	renik in YESIUD	τ)						
Version 3 1; 02/04												
		ARG	L	1								
Reset to			OR									
Defaults	CALCULATE INC	REMENTAL RISK	S FROM ACTUAL	GROUNDWAT	er concentrati	IDN (enter 1x) in TYE	5 box and in heligiour	igwaig/ conclibe!	CW1			
		YES	x	ו								
		77.5		J								
	ENTER	EXTER										
		ir (ai										
	Chamica CAS No	å.onuqæajet										
	(numbers only,	የውሳር ር _ም										
	no cashes)	<u>:.1 @ L:</u>	_		<u>Chemical</u>							
			•				•					
	67093	3 200-00]	L	<u>Chlarotarm</u>		İ					
	ENTER	ENTER	ENTER	ENCER	ENTER	FN7ER	ENTER	ENTER	ENTER		ENTER	1
		Depth			si aad ga ig valle d		2	2	So			
MORE	Average	celow grade		<u> </u>	Zackneys	Theaness			strature A		os el etelmes	
	351"	(o ballom	Ono!+	Thickness	0'501	of so:	5v		505		stratum A	
	groundwaler	ol encloseá	brisw grade	0' 50	Skalen H	Straton: C.	\$1/4)um:	SCS	SO lype	2.5	so I vecor	l .
	lem seralure s	spase Noor L,	(a wate: lab∙e. L _{eri}	Shatum A.	t _a	iEmericatue or 0). ng	One olivies ove water rable	50% lype 3 rectly above	(used to ast mare so value	(78)	εε'⊤εα⊒ :, Α,	ľ
			:cm:	(07) _		ი. (cm)	(Foie: A.B. or C.)	ARET IRD 8	permicability)		ism'i	l .
												1
	[;]	15	712	210	0		A	SL SL	. Si			J
	ENTER	SWIER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
MORE	50a0, m A	Stratum A	Stratum A	Simpon A	Stratum 9	Stratum B	Shatum 5	Shalom B	Stratum C	Stratum C	Stratum C	Stratum C
	SCS so lyce	sail cry bulk density	so (5 6 4) 50105 (y)	sof water-lifted perosity.		90 dry bulk density	se (graf persity	sof water-filed porosity,	908	storidry pulk density	se calal perasity	sort water-filter porce by
	, .65100.50	F ₅	20 05 .y.	6.°	. sajiyse .avusisa il	e,°	,100 DS 1.9	9. *	SO TYPE : Course So	ρ.	ec es	e,c
	Suprame 1	10.cm,1	(600(825)	pomilioni)	Parameters .	/g/sm ³)	<u></u>	(amiliani)	Perendiara	giam ^a)	(cont-e 5 5)	·am²em²:
	<u> </u>		10	12 1217			34,634				<u> </u>	
	2.	1 50	[0.4%D	3 103		1 66	2 3 7 5	0.254	5	' El:	<u>. [03/5</u>	<u> : ::5</u> a
	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER		ENTER			
MORE →	finciosed		Enclosed	Enclosed					Average values			
ا+	393ce	Sail-ಕಗಿಕ ್ಕ	75ace	20078	E-Cosea	S'our-wall	Indear		lic wirate into bidg			
	foor (5.6kb855	orassore orassore	floor length,	foor width	50348 na gni	Seam (lagk wigh)	Jirewitange rate,		OR galan tilatik (o galawa)			
	L.,	501€16.0° € 1.	La .	W ₂	۲,		:: v. E#		(1) (1) (1) (1) (1) (1) (1) (1) (1) (1)	•		
	(6m)	$(g^{(a,m)}s^{a})$	(a.m.)	(cm)	(am)	(em)	(36)		(=/ C 2)			
								•	·-· ,			
	<u> </u>				294	L0 <u></u> _		J	(
MORE	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER						
	Averagorg	Averaging	-		Targer	Tang e t hazand						
	time for Carchogens	Time for pronoversagens.	27005 019 3018000	Euposure *recub∩cy.	nsk for sakt nogens	oughert for noncarbragens						
	AT _t	A Tree	ED.	E=		TriO						
	(998)	(vrs.)	'v(\$)	(days (m)	(Unitess)	(_miless)						
	70	30	30	350	1.05-06		l					
		. V.		,		·						
[" ĒNO "]						Jaloinsk-pased						
<u> </u>					groungwa'er	rendertration						

Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m³/mol)	Henry's law constant reference temperature, (°C)	Enthalpy of vaporization at the normal boiling point, \[\Delta H_{e,2} \] \[\langle (cal/mol) \]	Normal boiling point, T ₉	Critical temperature, T _C (°K)	Organic carbon partition coefficient, K _{oc} (cm³/g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m³)*	Reference cond., RfC (mg/m³)
1.04E-01	1.00E-05	3.66E-03	25	6,988	334.32	536,40	3.98E+01	7.92E+03	2.3E-05	4.9E-02

INTERMEDIATE CAUCULATIONS SHEET

Exposure duration t (sec)	Source- building separation, L _T (cm)	Stratum A sort aintirited porosity, e_* (em²/cm²)	Stratum B spi air-59ed perosity 8,8 (cm ³ (cm ³)	Stratum C spir amfiled porosity, e _s c (cm ¹ /cm ²)	Stratum A effective total fluid saturation S _{in} (cm ³ /cm ³)	Stratum A so- intrinsic parmeability, k, (cm²)	Stratum A solineative air permeability, k _{ia} (om ²)	Stratum A soil effective vapor corribativity. 	Thickness of capitary zone L _u jornj	Total poresity in capit any cone. """ (cm ² /cm ²)	Arthled ocrosity in capitary zone A _{rch} (cm ² (cm ²)	Water-In ed perceity in capil-ary 2018. Para (cm ² /cm ²)	Floor- wat- seam perimeter X ₁₉₀₄ (cm)
9.45E+08	195	0.347	0.321	0 321	0 155	5.94E-09	0.917	5 456-09	25.00	<u></u>	0.130	0 520	4,000
Bidg, ventilation rate, Q _{serving} (on ⁻⁷ s)	Area of enclosed space pelow grade. Ay (cm ²)	Crack- lo-lotal area raho c (un l'ess)	Grack depth below grade Zugy (cm)	Enthalpy of vaporization at ave, groundwater temperature, affurs (cal/mor)	Hodry's law constant at avel groundwider temperature, Poy (attrib ² /mot)	Menry's law constant at ave. groundwater temperature. Hins (unidass)	Vapor viscosity at awe, soil lemberature, les (giom-s)	Stratum A effective of fusion coefficient Dff_a Londrise	Stratum B offective diffusion coefficient, D''' (cm ² /s)	Stratum C effective diffusion coefficient D ^{eff} c Lem ² /s)	Capillary zone effective difficient coefficient Office (cm ³ /s)	Total overall effective diffusion coefficient, D**- tom*(s)	Diffusion path rengith, U _a
1.69E+04	1 00E+06	3.77E-Ca	15	7 544	1.95F-03	8 38E-C2	1.76E-04	1,51E-02	0.00 <u>E+00</u>	_0.00E+00	_5 <u>93E-04</u> _	3 65 <u>E-03</u>	<u>[195</u>
Convection path length, L _p (cm)	Source vapor consi. Graves (ugim ³)	Crack rag us. r _{otes} (cra)	Average vapor flow rate into blog . Qua rom ² /s)	Crack effective diffusion coefficient, Dominati	Area of crack, Area (conf)	Exponent of oglivation foundation Pediet number, exc(Pel) run fless;	Attentite source induce afternation coefficient cuefficient cuefficient cuefficient	Infinite source bidg cond Cond Curany pagement	Unit risk lactor URF (अक्ट m ³ 1)	Reference cong , RIC (mg/m²)			
15	2 52E+02	G 10	6.33E+C1 <u>i</u>	1.516-02	4 00E+02	6 17E+59	9 46E-04	2_38 E -01	2 3E-05	4.9E-02]		

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater cond., cardinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc., (µg/L)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NÄ	NA NA	NA	7.92E+06	NA	2.2 E -06	4 7E-03

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

PRG SHEET

INCREMENTAL RISK CALCULATIONS:

					incremental	Hazard
Indoor	Indoor	Risk-based	Pure	Final	risk from	quotient
exposure	exposure	indoor	component	indoor	vapor	from vapor
groundwater	groundwater	exposure	water	exposure	intrusion to	intrusion to
conc.,	conc.,	groundwater	solubility,	groundwater	indoor air,	indoor air,
carcinogen	noncarcinogen	conc.,	S	conc.,	carcinogen	noncarcinogen
(mg/L)	(mg/L)	_(mg/L)	(mg/L)	(mg/L)	(unitless)	(unitless)
		-				-
1.33E+00	6.44E+02	1.33E+00	7.92E+06	1.33E+00	NA NA	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: The values of Csource and Chuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"

GW-AUV	CALCULATERIS	K-BASED GHOU	COMMIES DOVE	EN-RAT GNIAN	(0.12.01.5%,00	. ;						
ersion 3.1 C2/C4		YES		1								
Reset to		123	ÖR	J								
Defaults	0.000 0.000 0.00	SELENTAL GION		ERO INDIAN	eo cancentos t	AU 1-1-1 V - WEI	Silibah and milial group		- 1			
	CACCIONIE INC.	4.00 (10) 14 ((2 - YON AU DAG	310034517411	EN CONSCENSION .	04 (enter % - 15)	a car ana mina 5.00	-349/81 55/15 GE	or;			
		74.5	Х]								
	ENTER	ENTER										
	Chemica	n ba' groundwaler										
	CAS No	conc										
	(numbers only	C _A										
	no pashes;	. 554).	_		Chemical							
	79016	5.005-01	1		7: Chiorouthyle	:ne						
			_									
	ENTER	ENTER Depth	EMTER	ENTER Totals tha	EMTER stagd up to value to	ENTER d Lagrand G28)	ENTER	ENTER	ENTER So:		ENTER]
MORE	Average	below grade			nickness	Thickness			stratum A		user-delined	[
_ ↓ .	30.0	to bettern	Depth	Trickness.	21197	5f 80.	Sp		SCS		Stratum A	l .
	groundwater	of enctas e c	oc swigrade	01 soll	stratum B	stratum C	Stratum	SCS	saltype		sprivagor	1
	remperature.	space foot	in water table	stratum =	i⊕nter value or 0;	(Enter value or 0)	Grecilly above	501 N/6	rusod (Glestichate)	€.₹	Demneability.	1
	T _S	Lr	-,-	7.	^s	Pro	Augren 1964e	directly atxine	Soil vapor		٨,	i
	(°G)	(crey	_(cm)	(c+)	[c=1	10年)	(Erder A Broy C1	wale: tarve	permean by)	J	(cm²)	4
	[T 210	210	··· · ·			SL	St. i			4
	<u> </u>		<u> </u>	1 2.0		. ,						_
	* INTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	LNIER	ENTER	ENTER	CHIER	ENTER
_ MORE_	Stratum A SCS	Stratum A	Straggre A	Stratum A so werestilled	Stratum B SGS	Stratum B	Stratoni B soci totali	Strafum 6	Statum C SCS	Stratum C	Strature C	Shalo≠ C
	so lype	sofidiy bulk dansily	50 (0)8(00°05-(y.	porosity.	SOL TYPE	soli dry Su k density.	porosity.	so wuter-filled porosity.	_se_type	solicity but sideosity	so (bla) porosity.	so water/illed polosity
	.001-00-501	2.	r ^A	e_*	Lock-up 551	er b	n)	₩. B	,	Pa ²	PC 02-17.	9.6
	Perameters j	(gram' <u>1</u>	(unidess)	iom ³ (pim ³)	Paramerers	الرسامة	Jan 7655]	iom ³ /sm ³)	Pite an exerc	igicπ ³ ;	(unitess)	iom ³ iom ³ i
	``````````	<u> </u>	di diessi		· · · · · · · · · · · · · · · · · · · 		10111633				(0, 0.15)	
	51.	: 50	0.450	0,00	<u>s</u>	1 86	E 342	2.054		1 65	0.375	0.054
	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER		ENTER			
MORE	Enclosed.		Enclosed	Enclosed	E	5			Average vagor			
L_ +	spale flact	Sallard	5pace 1901	50a60 1001	Enclosed space	Flogr-well seam crack	inggor av exchange		gala elmi etta wo3 #D			
	in Langua	pressure different≱t.	leng:r	w gin	reght	width,	(5)4 30. 400. 40.24	L	eave blank to calicula	:•		
	L,	ΔP	ل	We	н,	₩.	5.5		C _{ks}			
	(pm)	ig/cm/s ^t i	(am)	(pm)	(cv)	(cm)	(16)		(4m) _			
			T - 400a - 1	[1003]	246		r -— 	-		•		
	:0	43	1000		_	<u> </u>	0.25	j		J		
N ORE	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER						
<u> </u>	averaging	Avereç ny	C	F	Farger	Target Patard						
	time for Larc regens.	(mailor publish sogens	Exposure Laboration	Exposure Proguency	nskifor Garsinogens	cuchestilor http://gronogena						
	aT _t	AT ₁₄	€Đ	EF	TR	THQ						
	(5/5)	(yrs)	lyra)	(daystyr)	(unitless)	(unitess)						
			30	. 35D	1054.5	1						
	L <u>(v</u>)		_1	. 270	1 65419	'						
					Used to galdy	Jato nsk-basod						
ENO					groundwater	concentration						

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D _a (cm ² /s)	Ciffusivity in water. D _w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m ³ /mol)	Henry's law constant reference temperature, T _H	Enthalpy of vaporization at the normal boiling point, AH _{ab} (cal/mol)	Normal boiling point, T _B (°K)	Critical temperature. T _C (⁵ K)	Organic carbon partition coefficient. K _{oc} (cm ³ /g)	Pure component water solubility. \$ (mg/L)	Unit risk factor, URF (ug/m ³)]	Reference cond RfC (mg/m ³)
7. 90E -02	9.10E-06	1.03E-02	25	7.505	360.36	544.20	1.66E+02	1.47E+03	1 1E-04	3.5E-02

NTERMEDIATE CAUCULATIONS SHEET

Exposure curation T (sire)	Source- building separation, Ly (pm)	Stratum A soil air-filed porosity, θ_a^A (om filem 1)	Stratum B soil ar-Flied porosity, θ_a^{-B} (cm^3/am^3)	Stratum C soci air-fi fed porcesty, g_C (cm/kgm²)	Shatom A effective total 50 d saturation Su tomicos ²)	Stratum A son intrasic permeability (cm²)	Stratum A spil relative air permead. Ay k _{re} re=**;	Stratum A so effective valoor cermeacility k, (cm1)	Thickness of capillary zone. Ling (cm)	Falat corosity = capitary zone n _{ra} tom*cow*s	Air-fined percently in uapit any zone. θ_{art} (cm^2/cm^3)	Water-filed porosity in capillary rone. 01.11 (cm ³ /cm ¹)	Floors wait seam perimeter: X _{chait} [5m]
9 46E+09	195	0 347	0.32*	0.321	<u>C 155</u>	5 94E-09	<u> 0 917</u>	5 45 <u>E-09</u>	.75 00	0.45	0 130	0 320	4,000
Bidg ventitation rate. O _{bstand} (cm ³ /s)	Area of enclosed space be ow grade. Ap cm ³ ;	Oracis- to-total grea ratio, n (un tess)	Crack depth below grade, Z _{crack} (co.)	Entherpy of vaporization at ave, ground water temperature, 2H, rs (covincil)	Henry's law constant at awy groundwater temperature, Hrs (atm-m³/mol)	Mennys law constant at ave groupowater lemperature, hins (undless)	Vapor viscosity at aveligori temperature (alignes)	Stratum A effective diffusion coefficient, D*" (cm*/s)	Stratum B effective diffusion coefficient, D***s Lom**/s)	Stratum C effective diffusion coefficient C*Tic (cm²/s)	Capiliary considers affective different, D**., (cm*/s)	Total overall effective diffusion coefficient Offic (am ² /s)	Diffusion cata ungth, Ca (cm)
1.59E+04	_ 1 0 <u>5E •06</u>	3.77E-54	1 15	<u>8,544</u>	5 <u>05</u> E-03	2 17E-01	1 76E-04	1.15E-02	0.00E+00	0 CCE+06	4 45E-24	2.75E-03	ц. 195
Convection path length, L _p (cm)	Source vaper condition (ue/m ³)	Crack radius 1. as (cm)	Average vapor flow rate into blog . Qual (cm ² /s)	Örack effective diffusion coefficient D ^{ocks} (cm ² /s)	Area of crack Aces (cm²)	Exponent of equivalent foundation Peo et number, exp.(Pe)	nteste scurpe indoor afteruation coefficient tr junitiess)	Infinite source o dg corcu المهارة (اليواهة)	Unit 158 factor, URF [ag(m²)*)	References conc. RIC (#g/m²)			
2253	1.08E+02	<u>G 10</u>	8 33€+01	1,15E-02	4 00E+02	5 165+76	7.47E-C4	8.095-02	1.1E-04	3 SE-02			

___ END

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater cond cardinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (ug/L)	Pure component water solubility, S (µg/L)	Final indoor exposure groundwater conc (µg/L)	Incrementat risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
NA	NA NA	NA NA	1.47E+06	NA _	3.7E-06	2.2E-03

MESSAGE AND ERROR SUMMARY BELOW. (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

PRG SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

					Incremental	Házard
Indoor	Indoor	Risk-based	Pure	Final	risk from	quotient
exposure	exposure	indoor	component	indoor	vapor	from vapor
groundwater	groundwater	exposure	water	exposure	intrusion to	intrusion to
conc.	conc	groundwater	solubility,	groundwater	indoor air,	indoor air,
carcinogen	noncarcinogen	conc	\$	conc.,	carcinogen	noncardinogen
(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(unitless)	(unitless)
1.37E-01	2.26E+02	1.37E-01	1.47E+06	1.37E-01	NA.	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: The values of Csource and Chuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

GW-ADV Version 3.1; 02/04	CALCULATE RIS	K-BASED GROUN	OMOD PETAVIC	ENTHATION (v)	rental hiYE51co.	¢.						
		YES		1								
Reset to Defaults	CALCULATE NO	REMENIAL RISK	OR SIFROM ACTUAL	GROUNDWA)	eR GONCENTRANI	ON (enter 1X) -s (YES	al poe and in hat grow	nowaiercono be	5 4)			
·		YES	гх	1								
	LNTER	ENTER		-								
		fret at										
	Chemica CAS No	groundwaler cond										
	frumbers only.	C.										
	no dashes)	(65 L)			C10mical							
			-									
	79016	5 COE-C1]		Trichloroethyle	in e						
	ENTER	ентея Околь	ENTER	ENTER Totals ma	ENTER e: add ua (a va'ue o	ENTER La-Juel G281	EN-ER	ENTER	FVFER 50		ENTER	}
MORE	Average	below grade			Thickness	Thiskness			stratum A		User-defined	
↓;	sail	lo bollam	Depth	Thickness	at so/	pl Son	50		505		stratum 4	1
_	groundwater	ol enclosad	below grade	of soil	stratum B	Stratum C	21487Jun	5CS	act type		100641-02	Į.
	terriperature	Space Roor	20 water labie	stratum A.	¿Enter value or 0)	ith attention on the	five cay agoing	so. (ye q	Lusard to History after	88	рест≢лонну	ì
	т,	١.	-01	h.	۲4	h _e	water laure.	piroci, above	sol vacor		N	
	(°C)	[cm]	(677)	(Um)	(Crit)	(CT)	(South All ar C)	water table	germeab*(₂)	ı	(tm²)	1
	1.	15	1 210	2.0	0		<u>-</u>	•··—- _{s.}	si	l	- -	-
	' '		. ,,,,	· · · ›				° <u></u>	30			3
	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER
MORE						Stratum B			Shajuni C			Straium C
l whre	SPROM A	気がおして 本	aratum A	SIGNOTO M.	attalium g		21.9(71.0)	2014/07/01/07	OF A JUST OF	373101110	DITMINE C	
₩	Siratum A SQS	Stratum A soil dry	Srigtum A sok (blai	Similare A so water * ac	Stralum B SCS	sol dry	Stretum 6 solitora:	Stratum B soil water-follod	5C5	5) 3)ሀጥ ር \$3) ረግ	Stratum C sp. lotal	so warer-filled
	SGS		so - total porosity,			sol dry bulk censity	solitora: perosity					so warenfilled porosity.
	909 soil (yae cosses Sos	soil dry bulk density	so- (stat	so waler." Ac	şcs	sol dry bulk censity	Soll total:	soil water-filled	5C5	son dry pulls beginny	so lotal	so warenfilled porosity.
	SCS sn!_type	solidy	so - total porosity,	so water? ac perdaity	SCS 50 lyse	sol dry	solitora: perosity	soil water-filled corosity.	SG5 sol_:ype	ያው፤ ረጉ	so libtali povos ty.	so warer-filled
[wore	SCS smillype coverso. Parameters	soil dry bulk density, Fa ² (g.cm ¹)	sol (plai) perpsity, n ⁴ (unithess)	so water." Ac perasity 9," (cm'/cm')	SCS so lyse_ I Jacob So ii	sel dry buik nems ty Pa ^B (g(cm ³)	solitola: geros ty n ^e (un fless)	soil water-filed tronosity. 8_ ⁶ 	SCS S01 type Lambs Sul Parameters	souldry bulk bensky, bu ¹ sg/cm ² !	so lotal peros (y, _n e (_e m)lesso	so water-filled porosity. 6_1 (cm ³ cm ³)
[************************************	SCS smillyae cooker Soc Parameters	spilidry bulk density, F ₃ ^ (g.cm ¹)	so - (stall perosity, n ⁴ (unifiess)) 0 450	so water." Ac percently 9,1 remiter ")	SCS 50 Type 1 Johns Sa 1 Meanwhile S	soil dry buik density Pa ^B (g(cm ³)	solitorati percenty (unificant) 0.375	sod water-filled regressly, e_e	SC5 sollype tomo Sul Parameters	sonidh outh benso _k , ou ^f	so lictal geros (y. _g e	so warer-filled porosity, ff
	SCS sol (yac toxica So Parametra SU ENTER	soil dry bulk density, Fa ² (g.cm ¹)	so- (stall gerosity, n ² (unifess) 0 450 ENTER	so water, ac personly 9,1 (cm/cm/) 1 0.103 ENTER	SCS 50 lyse Locrat Sol () Meanwhere	sel dry buik nems ty Pa ^B (g(cm ³)	solitola: geros ty n ^e (un fless)	soil water-filed tronosity. 8_ ⁶ 	SC5 sollyde tomo Sull Parameters	souldry bulk bensky, bu ¹ sg/cm ² !	so lotal peros (y, _n e (_e m)lesso	so water-filled porosity. 6_1 (cm ³ cm ³)
! ↓	SCS shiftype cover so shiftype cover so shiftype shifty shiftype s	solidry bulk density 6,1 19-cm ² ; 159 ENTER	so - (atal) parasity, n* (bod/ess) 0 450 ENTER Enclosed	so water ac percently 9.1 (cm/cm/) 1 0 103 ENTER Enclosed	SCS SO Type Today So Type Meanwhite S ENTER	sol dry buik density P: ^B (g(cm²) 168 ENTER	501 total perosity (In Fess) 0.375	soil water-filed tronosity. 8_ ⁶ 	SCS sollype Loron Sut Parameter S ENTER Average vapor	souldry bulk bensky, bu ¹ sg/cm ² !	so lotal peros (y, _n e (_e m)lesso	so water-filled porosity. 6_1 (cm ³ cm ³)
	SCS sort type toward Sort Parameters St ENTER Enclosed space	scilidry bulk density, Fs ² Ig.cm ¹ ; 150 ENTER Satisfag	so- (blail perosity, n ⁴ (undfess) 0 450 ENTER Enclosed space	so water," ac persisty 9," 10m/cm/); 10m/cm/); 10m/cm/); ENTER Enclosed apace	9CS so lyse li corur So li Meanwiths S ENTER anclosed	Solidry buik density P. F. (glotta) 1.66 ENTER Floor wall	50 Lotal gards by of (un / loss) 0.375 6NTER	soil water-filed tronosity. 8_ ⁶ 	SCS SOLLYGE Looked Sall Parameters 5 ENTER Average vapor Tow rare into bidg	souldry bulk bensky, bu ¹ sg/cm ² !	so lotal peros (y, _n e (_e m)lesso	so water-filled porosity. 6_1 (cm ³ cm ³)
! ↓	SCS seed type tooked So- Parameters St ENTER Enclosed space foor	solidry bulk density, F, 1g.cm ¹ ; 159 ENTER Solvalog pressure	so - (blail perosity, http://de.com/ess;) 0.450 ENTER Frictional space from	so water and person of the per	SCS 50 lype 1 location 1 Measures S ENTER Enclosed Space	soil dry buik density Prince (glore 3) 1 68 ENTER Proof wall saam stack	Solitoral percent (unificant) 0.975 ENTER Index ax exchange	soil water-filled parestry. e_** (ci=*/c/m*) (+0.54)	SCS sol type Locato Sur Parameter S ENTER Average vapor Fow rare into bilg CR	504 dry 2.48 density, 0 ₄ ² 1946 m ⁻² ;	so lotal peros (y, _n e (_e m)lesso	so water-filled porosity. 6_1 (cm ³ cm ³)
! ↓	SCS sold type contacts page maters SL ENTER Enclosed space floor thouses,	scilidry bulk density, Fs ² Ig.cm ¹ ; 150 ENTER Satisfag	so (blail porosity, n ⁴ (bodiess)) 0.450 ENTER Enclosed space from	so water ac persity 9.^ (cm'/cm') 0.003 ENTER Encade 1 cor with	SCS so lyse 1 locat So 1 lyse 2 locat So 1 lyse 3 l	Solidry buik density P. F. (glotta) 1.66 ENTER Floor wall	50 Lotal gards by of (un / loss) 0.375 6NTER	soil water-filled parestry. e_** (ci=*/c/m*) (+0.54)	SCS Sol type Loron Sur Parameter S ENTER Aserage sapar flow rare into big CR cave black to be cula	504 dry 2.48 density, 0 ₄ ² 1946 m ⁻² ;	so lotal peros (y, _n e (_e m)lesso	so water-filled porosity. 6_1 (cm ³ cm ³)
! ↓	SCS seed type tooked So- Parameters St ENTER Enclosed space foor	scill dry bulk density, 6,1 19,0m ¹ ; 150 ENTER Salitalog pressure afforent at,	so - (blail perosity, http://de.com/ess;) 0.450 ENTER Frictional space from	so water an pressity 9.0 cm*/cm*/ 1 0.003 ENTER Enclosed space 1 cor width 1/4	SCS 50 lype 1 location 1 Measures S ENTER Enclosed Space	Soil dry bulk density Printer (glomin) 1 55 ENTER Floorwall Sham crack Alling	Solitoral portos ty // // // (con / test) 0.375 EMIER Indoor alicerologe sate	soil water-filled parestry. e_** (ci=*/c/m*) (+0.54)	SCS sol type Locato Sur Parameter S ENTER Average vapor Fow rare into bilg CR	504 dry 2.48 density, 0 ₄ ² 1946 m ⁻² ;	so lotal peros (y, _n e (_e m)lesso	so water-filled porosity. 6_1 (cm ³ cm ³)
! ↓	SCS sol type covariable parameter SU ENTER Enclosed space foor Ib curess, Covariable somb	scill dry bulk density, 6,0 (g.cm²); 1,50 ENTER Salvalog pressure exterential, AP (g.cm-s²)	so (blai peroxfy, n ⁴ (unfless)) 0.450 ENTER Enclosed space (foor length, Letter)	so waler? ac prossity 9, 9 (cm) (cm) ? ENTER End osed space 1 corr width, 57 % (cm) .	SCS 1/28 1 John School 1 John	soil dry bulk density Prince 19 (githm 1) 1 66 ENTER Proof wall saam brack width W (cm)	SOLITORAL SOCIO STATE (UM (CESS) C 375 ENTER Indoor As exchange sate SH, 4 51	soil water-filled parestry. e_** (ci=*/c/m*) (+0.54)	SCS Sol type Locato Sur Parameter S ENTER Average vapor Tow rare into bidg CR pave blans to bid surface CR pave blans to bid surface CR pave blans to bid surface CR pave blans to bid surface CR pave blans to bid surface	504 dry 2.48 density, 0 ₄ ² 1946 m ⁻² ;	so lotal peros (y, _n e (_e m)lesso	so water-filled porosity. 6_1 (cm ³ cm ³)
MORE:	SCS sold type control type cont	solidry bulk density, 6,5 19-cm ² ; 159 ENTER Solvatory production at, AP	so total persety, n ⁴ (unitess)) 0.450 ENTER Enclosed space feoringly, La	so water? an porasity 9.0 cm*/cm*/s . 0.103 ENTER Enclosed space 1 corr width, V/A (cm).	SCS so lyse locat so	Soil dry bulk density President (glown) 1 66 ENTER Floorwall snam brack width w	Solitoral percent of the solitor of	soil water-filled parestry. e_** (ci=*/c/m*) (+0.54)	SCS Sol type Loron Sur Parameters 5 ENTER Average vapor fow raw into big CR pave block to be cula	504 dry 2.48 density, 0 ₄ ² 1946 m ⁻² ;	so lotal peros (y, _n e (_e m)lesso	so water-filled porosity. 6_1 (cm ³ cm ³)
MORE:	SCS soil type toward Son Parameters SU ENTER Enclosed space floor (boxess, Communication) 10 ENTER	scill dry bulk density, e, f ig.cm ² ; 159 ENTER Solvatog prostute optional at, ive ig.cm-s ² ; 40 ENTER	so (blai peroxfy, n ⁴ (unfless)) 0.450 ENTER Enclosed space (foor length, Letter)	so waler? ac prossity 9, 9 (cm) (cm) ? ENTER End osed space 1 corr width, 57 % (cm) .	SCS Location 1 Location 3 Location 3 Location 3 Location 3 Location 4 Locatio	soil dry bulk density Print (glornia) 1 68 ENTER Proof wall saam stack width W (cm) C 1 ENTER	SOLITORAL SOCIONAL SOCIONAL CONTROL CO	soil water-filled parestry. e_** (ci=*/c/m*) (+0.54)	SCS Sol type Locato Sur Parameter S ENTER Average vapor Tow rare into bidg CR pave blans to bid surface CR pave blans to bid surface CR pave blans to bid surface CR pave blans to bid surface CR pave blans to bid surface	504 dry 2.48 density, 0 ₄ ² 1946 m ⁻² ;	so lotal peros (y, _n e (_e m)lesso	so water-filled porosity. 6_1 (cm ³ cm ³)
! ↓	SCS sol type control Sol Parameter SU ENTER Enclosed space foor Ib curess, Com- iom 10 ENTER Averaging	scilidry bulk density, 6,1 150 ENTER Scholog prostule offerential, 12 40 ENTER Averaging	so (blail perostly, y ⁴ (uniffess)) 0.450 ENTER Enclosed space (foor langth, La (um) 1000 ENTER	so water an pressity ye're with the mile of the control of the con	SCS 1/28 1 John School	soil dry bulk density 2	SOLITORAL SOCIONAL SOCIONAL CONTROL CO	soil water-filled parestry. e_** (ci=*/c/m*) (+0.54)	SCS Sol type Locato Sur Parameter S ENTER Average vapor Tow rare into bidg CR pave blans to bid surface CR pave blans to bid surface CR pave blans to bid surface CR pave blans to bid surface CR pave blans to bid surface	504 dry 2.48 density, 0 ₄ ² 1946 m ⁻² ;	so lotal peros (y, _n e (_e m)lesso	so water-filled porosity. 6_1 (cm ³ cm ³)
MORE:	SCS soil type to soil type to soil type to soil type to soil the soil type to soil the soil type to soil the so	scill dry bulk density, 6,5 19-cm ² ; 150 ENTER Salvalog pressure afficient at, 72 (glom-s ²) 40 ENTER Averaging 110 for	so (blail porosity, n ⁴ (bodiess)) 0.450 ENTER Professed space froot length, La (bm) Teco ENTER Exposure	so water an person y grant form? O 103 ENTER Secretary space foot open and form? I 1000 ENTER Secretary state foot open and foot open	SCS to lyse 1 location 1 Meanwhite S ENTER anciosed begin, 4, 10m 1 Y44 ENTER Target risk (a)	soil dry bulk density President (glows) 1 66 ENTER From wall sham brack width W (cm) Cil ENTER Target hazard submetal for	SOLITORAL SOCIONAL SOCIONAL CONTROL CO	soil water-filled parestry. e_** (ci=*/c/m*) (+0.54)	SCS Sol type Locato Sur Parameter S ENTER Average vapor Tow rare into bidg CR pave blans to bid surface CR pave blans to bid surface CR pave blans to bid surface CR pave blans to bid surface CR pave blans to bid surface	504 dry 2.48 density, 0 ₄ ² 1946 m ⁻² ;	so lotal peros (y, _n e (_e m)lesso	so water-filled porosity. 6_1 (cm ³ cm ³)
MORE:	SCS soil type towns So- Parameters SL ENTER Enclosed space floor plooress, town town ENTER Averaging The for carcinogens,	scilidry bulk density, e.f. ig.cm ² ; 159 ENTER Scholog preshule extremi al. AP (g.cm-s ²) 40 ENTER Averaging (maifor	so (blail porosity, n ⁴ (unitess) 0.450 ENTER Findissed space floor length, Lettern) 1000 ENTER Exposure durstion,	so waler? Ac person's game of the person of	SCS to lyse 1 control of the lyse 1 control of the lyse 2 control	soil dry bulk density Print (gitter 3) 1 68 ENTER Proof wall swarm stack width, w (cm) Cit ENTER Target hazard a Lotherd for	SOLITORAL SOCIONAL SOCIONAL CONTROL CO	soil water-filled parestry. e_** (ci=*/c/m*) (+0.54)	SCS Sol type Locato Sur Parameter S ENTER Average vapor Tow rare into bidg CR pave blans to bid surface CR pave blans to bid surface CR pave blans to bid surface CR pave blans to bid surface CR pave blans to bid surface	504 dry 2.48 density, 0 ₄ ² 1946 m ⁻² ;	so lotal peros (y, _n e (_e m)lesso	so water-filled porosity. 6_1 (cm ³ cm ³)
MORE:	SCS sol type contains solutions St ENTER Enclosed space floor Incaress, town tom) ENTER Averaging Time for care negetia.	Scilidry bulk density, Esh ig-conft; 159 ENTER Soft-alog prostule differential, AP (g-con-sf) 40 ENTER Averaging time for noncer opens, AT _{xx}	so (blail personly, y (uniffess)) 0.450 ENTER Enclosed space (foor length, Le (cm) T000 ENTER Exposure duration, ED	so water an pressity and form of the pressity and form of the pressite and	SCS 1/28 1 John Son 1/28 2 S ENTER 2 notosing space height, 4 s 1/244 ENTER Target risk for salaringers 5	soil dry bulk density Printer (glomin) 1 55 ENTER Floor wall shart brack with with (em) Cil ENTER Target hazard authors for proparatingens, THQ	SOLITORAL SOCIONAL SOCIONAL CONTROL CO	soil water-filled parestry. e_** (ci=*/c/m*) (+0.54)	SCS Sol type Locato Sur Parameter S ENTER Average vapor Tow rare into bidg CR pave blans to bid surface CR pave blans to bid surface CR pave blans to bid surface CR pave blans to bid surface CR pave blans to bid surface	504 dry 2.48 density, 0 ₄ ² 1946 m ⁻² ;	so lotal peros (y, _n e (_e m)lesso	so water-filled porosity. 6_1 (cm ³ cm ³)
MORE:	SCS soil type tooling to the parameters SL ENTER Enclosed space floar floaress, tern) 10 ENTER Averaging The for calc hogers, AT, tyrs)	scilidry bulk density, 6,5 19,0m ³ ; 159 ENTER Soluting pressure differential, 18 40 ENTER Averaging 1106 for ronder rogers, ATIg. 1ym)	so (blail porosity, n ⁴ (uniffess)) 0.450 ENTER Enclosed space (foor length, Let (uniffess)	so waler? Ac person's game of the person of	SCS to lyse 1 control of the lyse 1 control of the lyse 2 control	soil dry bulk density Print (gitter 3) 1 68 ENTER Proof wall swarm stack width, w (cm) Cit ENTER Target hazard a Lotherd for	SOLITORAL SOCIONAL SOCIONAL CONTROL CO	soil water-filled parestry. e_** (ci=*/c/m*) (+0.54)	SCS Sol type Locato Sur Parameter S ENTER Average vapor Tow rare into bidg CR pave blans to bid surface CR pave blans to bid surface CR pave blans to bid surface CR pave blans to bid surface CR pave blans to bid surface	504 dry 2.48 density, 0 ₄ ² 1946 m ⁻² ;	so lotal peros (y, _n e (_e m)lesso	so water-filled porosity. 6_1 (cm ³ cm ³)
MORE:	SCS sol type contains solutions St ENTER Enclosed space floor Incaress, town tom) ENTER Averaging Time for care negetia.	Scilidry bulk density, Esh ig-conft; 159 ENTER Soft-alog prostule differential, AP (g-con-sf) 40 ENTER Averaging time for noncer opens, AT _{xx}	so (blail personly, y (uniffess)) 0.450 ENTER Enclosed space (foor length, Le (cm) T000 ENTER Exposure duration, ED	so water an pressity and form of the pressity and form of the pressite and	SCS 1/28 1 John Son 1/28 2 S ENTER 2 notosing space height, 4 s 1/244 ENTER Target risk for salaringers 5	soil dry bulk density Printer (glomin) 1 55 ENTER Floor wall shart brack with with (em) Cil ENTER Target hazard authors for proparatingens, THQ	SOLITORAL SOCIONAL SOCIONAL CONTROL CO	soil water-filled parestry. e_** (ci=*/c/m*) (+0.54)	SCS Sol type Locato Sur Parameter S ENTER Average vapor Tow rare into bidg CR pave blans to bid surface CR pave blans to bid surface CR pave blans to bid surface CR pave blans to bid surface CR pave blans to bid surface	504 dry 2.48 density, 0 ₄ ² 1946 m ⁻² ;	so lotal peros (y, _n e (_e m)lesso	so water-filled porosity. 6_1 (cm ³ cm ³)

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D _a (cm²/s)	Diffusivity in water, D _w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m³/mot)	Henry's law constant reference temperature, T _R (°C)	Enthalpy of vaporization at the normal boiling point, \(\Delta H_{ob} \) (cal/mol)	Normal boiling point, T _B (°K)	Critical temperature, T _C (°K)	Organic carbon partition coefficient, K _{oe} (cm³/g)	Pure component water solubility. S (mg/L)	Unit risk factor, URF (µg/m²)	Reference cond , RIC (mg/m³)
7.90E-02	9.10E-06	_ 1.03E-02	25	7.505	360.36	544.20	1.66E+02	1.47E+03	2 0E-06	6 0E-01

INTERMEDIATE CALCULATIONS SHEET

Exposure duration (54c)	Source- building separation, L ₁ (cm)	Stratum A sc ' air-filled porosity, θ_s^{λ} $\{cm^3/cm^3\}$	Shatum B soft arr-filled purceity $\theta_{\bullet}^{(3)}$ (cm^2cm^2)	Siretum Q sort avriviled Apriosity a _s ^C (cm ³ (cm ³)	Stratum A effective fotal fluio saturation, Sig (sm ³ -cm ³)	Stratum A soil introse permeability, k (cm²)	Spatian A so: relative air peringability ke pam ² 1	Stratum A soil effective vapor permeability k (cm²)	Thickness of capillary zone L _{cr} (om)	Total porcessy in capitiany zone. Par (cm ³ /cm ³)	As-filled porosity in capitlary zone. $0_{1,x}$ (cm^2/cm^2)	Water-filled corposity of capillary zone dura (cm ³ /cm ³)	Floor- wall seam perimeter, X _{cres} , (cm)
\$ 46E+C8	195	0.347	0.321	5 321	0.156	5 54E-09		9 <u></u> 245 <u>E-</u> 09	25 GO	0.45	0.130	0.329	4 30D
Blog ventuation rate Q _{respond} (cm ³ /s)	Area of enclosed space be two grade. As look!	Grack- to-total prea rako, n (umitess)	Crack depth below grade Z _{ore} , (cm)	Enthalpy of valvoritation at avel groundwater temperature, \(\Delta H = 5\) (cav/mol)	rienry's law constant at aveligroundwater temperature. Hing (atminuthmot)	Houry's law constant at avergroundwater temperature. Hing (unitess)	Vuper- viscosily all ave, soil temperature ess (gion-s)	Stratum A effective affusion adeffusion Deff (cm*/s)	Stratum at effective diffusion coefficient Dfffs (coeffs)	Stratum C effective c flusion coefficient D**[c (cm²/s)	Capit ary zone offective offective coefficient Office (cm ² /s)	Total overall effective diffusion coefficient $\mathbf{O}^{\mathbf{s}^*}$ (cm²(s)	Diffusion path engin La (cm)
1 69E+04	1.06E+06	3 77E-G4	<u> </u>	8 5 14	5.05E-03	2.17E-01	1 76E-34	\ 15E-02	0 00E+00	0.005+20	4.45E-C4	<u>Z 75E-03</u>	196_
Convection path length ' (em)	Source vapor condit Cyeute (ag/m²)	Crack radius. Comin (com)	Average vapor flow rate into 5.3g., One Icm ¹ /s)	Crack offective diffusion coefficient, D ^{ose} (cm ² /s)	Area of crack A _{rea c} (em ^c)	Exponent of equivalent foundation Pecter number, expipe 1 (unitess)	Infinite source indoor altenuation coefficient or (unitiess)	infinite source uldg. cond . Comba [Lg/m³]	Unit risk lactor URF (µg·m²) ¹	Reference cond . BIC (mg/m²)			
15	1.08E+02	Ð 10	8.33E+01	1 15E-Q2	4.00E +07	5 15E+78	7.47E-04	8 09E-02	2 DE-05	6.0E-01	!		

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater cond., cardinogen (µg/L)	Indoor exposure groundwater conc., noncarcinogen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water so!ubility, S (µg/L)	Final Indoor exposure groundwater cond., (ug/L)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen {unitless}
NA	NA	NA	1.47E+06	NA	6.6E-08	1.3E-04

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT).

SCROLL DOWN TO "END"

PRG SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

					Incremental	Hazard
Indoor	Indoor	Risk-based	Pure	Final	risk from	quotient
exposure	exposure	indo or	component	indoor	vapor	from vapor
groundwater	groundwater	exposure	water	exposure	intrusion to	intrusion to
conc.,	conc.,	groundwater	solubility.	groundwater	indoor air,	indoor air.
cardinogen	noncarcinogen	cond	S	conc.,	carcinogen	noncardinogen
(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/ L)	(unitless)	(unitless)
7.52E+00	3.87E+03	7.52E+00	1.47E+06	7 52E+00	NA	NA .

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF FRRORS ARE PRESENT)
MESSAGE: The values of Coource and Coulding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"

GW-ADV Version 3 1: <u>02</u> /04	CALCULATE RIS		NOWATER CONC	ENTRATION (er	denixi milYESibo	c;						
Resel to		YES	OR	_								
Defaults	CALCULATE INC	REMENTAL RISK		TA NGALICAD.	ER CONCENTRAT	OMrenier IX im MES	51 bowland in-ballighbu	ntwater card it a	g * ;			
		YES	X]								
	ENTER	ENTER										
	Chemical	⊪rijal groundwater										
	CAS No	cons.										
	(numbers only, na dashes)	C _w gag Lj			Onem ca							
	67663	3.00E-00]		Chioroform							
	ENTER	ENTER Depth	ENTER	ENTER Totals To	ENTER staction to value o	ENTER	ENTER	ENTER	ENTER Sail		ENTER	1
MORE	Average	ce swigrada	_		Prichness	Trickness			Sica. Two Vi		US05-CRF CAC	Į.
	york igraundwalar	to baller? of entiresed	Oapii: te aw grade	Thickness a so	of soil shatum S	of soil stratum C.	So:	SCS	SGS scilipe		stratum A seri vapor	İ
	10m per 8:ur0	space libor	in water table.	shatani A.	:Emærkalu€ of C;	-Enternation of 07	a spoilly above	Soft type	jused to est hiato	24	per hearyd ly,	
	T _s		t _n ,	n,	Pig.	n ₂	water table	С 1800у авихе	501 49 007			ľ
	(fC)	(cm)	(cm)	(cm)	icm,	(cm)	Criter A. H. or C)	nates la que	реглена (ну)		(5 m ²)	ł
		15	210	210	Ç	С	A	SL SL	51.			}
	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER	FNTER
MÖRE	Stratoin A 5CS	Swatum A sort any	Stratum A sor total	Stratum A sor water-filed	5) alon B 505	ნოკიულ წ გა, dry	Stratum S solucial	Stratum B soit water-birds	Siraium C SCS	Stratum C sof dry	Stratum C so listal	Stratum C so water/fled
	sol type	pulk density.	90°05 (y.	20°05 (y.	sol syse	oute density.	parastry,	90'05 ty.	sol type	bolk density	porgady.	parasity
	Nocetop Sept	Pr.	n "	€.*	Cooker Sol Parameters	•	nº	٠,٠	Lowup Soil . Parame etc	76°	rº:	9,0
	Palame ers	ig/sm²;	(redless)	is was Geragi		(g-pm²)	tundless)	(5:n ² (0) ²)		ig emili	[Lin/less]	cm (cm²)
		1 50	0 450	T_10 :00 <u></u> !	s	1 66	0.375	0,054	S	1.56	0.375	0.054
MORE	ENTER	ENTER	ENTER	ENTER Enclosed	ENTER	ENTER	ENTER		ENTER Average vapor			
	Enclosed space	Son-blog	Entiose0 scate	570-05#3 55 868	Engloses	Floorweal)	150er		Your rare into bidg.			
	00	rvessuro	100¢	f 301	19800	SART COST	air Bathange		CR ęsyę piacy to daid val			
	'''''''''''' 1955. '+√-+	a "aran; a'. 3≘	'⊕…g ''. ∟ _e	v. 4m. W	+ 0, g - 1. :He	** =:**	1414 ER	· ·	Çerin ranı da erina erina Çerin	•		
	(cin)	$(g(am)a^2)$	(100)	(sm)	icπ'	(47)	,5.63	_	(k.m)			
	'0	40	1000	1000	200		2.83	_				
MORE	ENTER	ENTER	ENTER	ENTER	ENTER	ENTER						
<u> </u>	Averaçing	Averaging			Target	Targe; naga-d						
	finne for Cardin oge ns	Inne for nončara negetis.	Erodisura duration.	Esposure hequency,	insk for Gwelnegens,	gooken! for noncard-nogens						
	AT-	AT _M	50	EF.	70	T+C						
	/ym²	<u>(</u> (2)	(915)	(days yr,	(um/less)	iur (ess)						
	70	25	25	250	105.66		}					
							!					

CHEMICAL PROPERTIES SHEET

Diffusivity in air. D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m³/mol)	Henry's law constant reference temperature. T _R (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T ₀	Critical temperature, T _C (°K)	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (ug/m³) 1	Reference conc RfC (mg/m³)
1.04E-01	1.00€-05	3.66E-03	25	6,988	334.32	536.40	3.98E+01	7.92E+03	2.3E-05	4.9E-02

Exposure duration, t (sept	Source- building segaration. L- (cm)	Stratum A soil an-filled porosity, B _a * (cm ³ /cm ³)	Straturn B soil air-filled porcsity, 6,1 (cm ³ -cm ³)	Stratum C son air-fi ed poresity, 6,6 icm ³ /cm ³ /	Stratum A effective total fluid sateration, Sile (cm//cm/)	Stratum A soil intrinsic permoad illy k (cur ¹)	Stratum A soil relative act permetio ity, 4, (cm²)	Stratum A soil effective vapor permeability k, (cm²)	Thickness of capillary zone L _L (cm)	Total purposity in capitary zone. """ """ """ """ """ "" """ "	Air-Med perosity in capit ary 2006. 0 ₄₋₂ /om ³ -cin ³)	Waler-filled porosity in capillary cone, film form ¹]	Floor- wall seam perimeter, X _{mes} _{am} r
7.88E+08	195	0.347	0.321	0.321	<u> </u>	5.94E-09	C 917	5 45E-09	25 00	0 45	0,130	G 320	4,000
Bidg. vent/ation faile Oswina (om ⁻¹ s)	Area of enclosed space below grade. As	Crack- to-lotal area ralio, t) (unit ess)	Crack depth telow grade, Z _{owa} (cm)	Enthalpy of vaporization at alse, groundwater temperature alflins (calmot)	Henry's law constant at avel groundwater temperature His (atminishmo)	Henry's taw constant at avel groundwater temperature. Why (unit oss)	Vapor viscosity at uvel son temperarure (glomis)	Stratum A effective diffusion acefficient, D*** (cm²/s)	Stratum B effective diffusion coefficient D** (cm*/s)	Stratum C effective diffusion coefficient Offic (confis)	Cap vary zono effective diffusion coefficient D ¹⁷ _{rr} (cm² is)	Total overal effective citiusion coefficient, D***- [cm²/s)	Diffusion pair ength, i.e.
€ 92E+04	_1 06E+06	3 77E-04	15	7,544	1 95E C3	6 3BE-02	1 76E-04	1.5°E-02	D 00E+cc	0.00€+00	5 93E-04	3 65E-03	195
Convection path length L _t	Source vapor conditions Constant (49/m²)	Grack radius Tosos (cm)	Averago vapor Powirate into bidg Q _{not} (om ² /s)	Crack effective diffusion coefficient Office (cm²/s)	Area of orack Acus (cm²)	Erophent of requiration foundation Ped of tumber exp(Pel) (unitless)	infinite source indoor abtenuntion codificient d (unit ess)	Infinite source bidg cond. Cristing tyg/m ³)	Unit 16k factor, URF (µg/m²)	Reference conditions RfQ Img(=3)			
15	2_52E+C ₂ 2	0.10	8 33E+01	1.51E-02	4.00E+G2	6 *7E-59	2 32E-04	5.835-02	2 35:05	4.9E-C2			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor	Indoor	Risk-based	Pure	Final	Incremental risk from	Hazard quotient
exposure	exposure	indoor	component	indoor	vapor	from vapor
groundwater	groundwater	exposure	water	exposure	intrusion to	intrusion to
conc.,	conc.,	groundwater	solubility,	groundwater	indoor air,	indoor air,
carcinogen	noncarcinogen	conc.,	. S.	conc.,	çarcinogen	noncardinogen
(µg/L)	(μg/L)	(μg/L)	(kg/L)	(μg/L)	(unitless)	(unitless)
NA	NA	NA	7.92E+06	NA	3.3€-07	8.1E-04

MESSAGE AND ERROR SUMMARY BELOW. (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

PRG SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

					Incremental	Hazard
Indoor	Indoor	Risk-based	Pure	Finai	ris⊀ from	quotient
exposure	exposure	indoor	component	indoor	vapor	from vapor
groundwater	groundwater	exposure	water	exposure	intrusion to	intrusion to
conc	conc.,	groundwater	solubility,	groundwater	indoor air,	indoor air,
carcinogen	noncarcinogen	conc.,	S	conc.,	carcinogen	noncarcinogen
(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(unitless)	(unitless)
9.15E+00	3.68E+03	9.15E+00	7.92E+06	9.15E+00	NA NA	NA

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: The values of Csource and Chuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"

ÉND

GW-ABV Version 3.1, 02/04	CALCULATE 9/8/		POWER CONC	ENTRATION (er	deritz wickESchoo	a)						
Reset to		YES	OR	J								
Defau is	CALCULATE INC	REMENTAL RIS		GROUNDWAT	ER CONCENTRATI	ION jenier (X) in 178;	5" bex and inhalign o	ndwater condition	0 - 41			
		YE5	X]								
	ENTER	ENTER										
	Chemical	indi al groundwater										
	CAS No	cond.,										
	(fumbers only,	رين <u>۱۳۵/۱ – </u>			Chemical							
	790'6	5 00E-01	-									
	(180)	3 -UE-01	_		Trichleroethy's	ene						
	ENTER	ENTER Dep ^{os}	ENTER	ENTER Johnson	ENTER struction of the second	ENTER	ENIER	ENTER	ENTER So		ENTER]
MORE	Average	below grade		1012,5	Prickness	Thickness			SIF3"JELA		User-Jelinno	
	\$50	to bottom	Dapit	Thickness	a! soil	of soil	\$6		505		siratom A	
	Budgara Marus	of englosed	telow grace	also	stratum 8,	stratum C.	SI/90um	SC5	sod type		sor vapor	
	(emperature	scace fee.	fo water table L _{ext}	strate = =	h _i	(Entire value of Q)	огос: у афома жалет (аф. е.	stor Fyde direkt y abboro	guventionst trace soit valuer	;)→	permoacor, k,	
	ec.	** *e:=::	love)		(SD)	<u>ግ</u> ቷ :cm)	(Farer 4 Billion C)	water labic	permeabilis		ις το ^{τ.}	
				 -			(1.4 1.14(1)	#111.H- 1180 E	7.2			1
			<u> </u>	210	=======================================) <u> </u>	— · <u>,, </u>	- SL	SL SL]
	ENTER	ENTER	ENTER	ENTER	ENTER	SNIER	ENTER	ENTER	ENTER	ENIER	ENTER	ENTER
MORE	Stratum A	Stratum A	Statum A	Stratum A	Stratum B	Swatum B	Straton B	Stratum Ø	Stratu≠ C	Strate= C	Stelo⊤ C	Seature C
*	SC5	Soil dry		Soil water-lifted		so dry	sou fela	spillwater* ed	5G5	SU dry	Symbola Country	Syn water-fund
	so lype	be • density. ⊘a*	porās (y. m [*]	peres (y. e_	SON (VD-0 on-us Son	0u'k dens√v. P∎	erdere tyr ⊕≣	n" _a Gerozya	Soil type Trokep See	Dulk Jeris IV. Pe ^C	6-0-05 ly	parasity. Al ^S
	. Palameters	γο (<u>5</u> 12011)	(unitess)	is m ^a rcimali	Pageres	Fa Igichi'i	100,0055;	tom Vace fo	Page eque	ig cer ^t i	(unitess)	iomágmái
				•					· · · · · · · · · · · · · · · · · · ·			-
	<u> </u>	. <u>150</u>	<u> </u>	<u> </u>	5	166	2375	0.051] s = 1	1 66	G 375	0.054
MORE	ENTER Enclosed	ENTER	ENTER Encloses	ENTER Encloses	ENTER	ENTER	EVIER		ENTER Average vapor			
₩OKE ,	50300	Sc -odg	500586	20%ce Euclosed	Ent baed	Floor-wa	Indoor		Pow rate into bidg			
	fest	pressure	Noor	Nosr	SCATE	seam craça	air nistrange		9н			
	if (•₽ + \$5.	d-Moreobal	`ն ր ցնի,	wicth	haight	w.(07	rate.	U	ealee blank to coloulab	•		
	ليود	aº,	L ₀	Wa	₹	*	E국		Ç.			
	(६००)	(g'orf-s ⁷)	(cm)	(CT)	(sm)	icm;	(1.5)	-	(L m)			
	,	40		1909	262	j <u>01</u>	C 63					
MORE	ENTER	ENTER	ENTER	GNTER	ENTER	ENTER						
<u></u>	Averaging See Africa	Averaging tree-for	=	= ========	Target	Target hazard						
	time for cord regens.	himē foi noncurentigens	Επρο ς υι ∉ αυγείοπ.	Exposure frequency	nak far rardinugens	nough cologers duot entitor						
	AT_	AT _w	. C0 8.0 .	EF	19	THO						
	yrs.	<u> </u>	(v/s)	(days'en	run Pessi	(undess)						
			25	250	- CE-66	J	!					
						Jale hisk-based						
END						koncertjation	ı					

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D _a (cm²/s)	Diffusivity in water, D _w (cm ² /s)	Henry's law constant at reference temperature, H (atm-m³/mol)	Henry's law constant reference temperature, T ₂ (°C)	Enthalpy of vaporization at the normal boiling point, $\Delta H_{v,b}$ (cal/mol)	Normal boiling point, T _B (°K)	Critical temperature, T _C (^c K)	Organic carbon partition coefficient, K _{oc} (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m³) 1	Reference conc RfC (mg/m³)
7.90E-02	9.10E-06	1.03E-02	25	7.505	360.36	544.20	1.66E+02	1.47E+03	1.1E-04	3.5E-02

ÉND

INTERMEDIATE CALCULATIONS SAFET

Exposure dyration : (sec)	Source- building separation, Un (cm)	Stratum A soil air-filled porosity, 6,* (oir-fillem*)	Stratum B sof artified perusity, n, ⁶ (cm//cm ³)	Stratum C ser- unrifited perosity, e _s C (em ² icm ²)	Stratum A effective tare flood saturation Sie (cm ² (sm ³)	Stratum A soil intrinsic permeachdy, k [cm²]	Stratum A Sc: relative air perineability, No. (cm²)	Stratum A son effective vapor pormeability k, .com/j	Thickness of captitary zone, L _{et} (cm)	Total poresity in capiliary zone, n _{st} (cm ³)cm ³)	Art-filled corpsity in capitary zone Θ_{KC} (cm ³ /cm ³)	Water-I-fled perosity in Caprillary zone, B _{not} (cm ³ -cm ³)	Floor- wal seam per.mster X (cm)
7.88E+C8	195	€.327	ĭ 6. 32;	0 321	0.156	5 94E-09	L-1884/1-	5 458.09	25 00	<u>; </u>	0 130	0.320	4 550
Bidg vent latign rate G ₂₋₄₆ v (cm ³ /s)	Area of enclosed space be ow grade As (2m ²)	Crace- to-tola' area ratio () (Unitess)	Crack depth defow grade, Zugn (500)	Enthalpy of vaporization at ave groundwater temperature 2H _{eff} (covinol)	Hemy's law constant at ave groundwater for purature, Mils (atm-m ² mol)	Henry's law constantiat ave groundwater temperature. Hrig (writiess)	Vapor viscosity at ave loci- temperature, Prs (glom-s)	Siratum A effictive coffusion coefficient Cffs (upf(5))	Shatum B offective diffusion coefficient D*** ₀ (Cm ² .5)	Stratum C offective officient coefficient Uff; (4mfs)	Constary zone effective diffusion coefficient, Drff or tomatish	Total overall effective diffusion coefficient D ⁽¹⁾ (Um ² (s))	Detusion pain length ev (cm)
6.92E+04	_ : C6E+C6_	3.775-04		8.544	5 C5E-03	2.17E-01	T 176E 24	T 1 15E.02		ฮจีอฮ์+สืบ] T47257.04	7 75E-03	T = 195
Convection path length.	Source vapor cond. Cubes (ug/m³)	Crack radius, rose (cm)	Average vapor Cow rate salo bidg Q _{cot} (om ³ /s)	Crack officiality diffusion coefficient, Diffusion (comf(s))	Area of props, A _{comp} (pm²)	Exponent of equivalent foundation Peclet number, exa(Pel) (unitless)	Infinite source indoor alternation coefficient if (unitess)	latinite source bidg conc Cowers (pg/m²)	Unii nsk factor, URF (ugmi)	Relatence cond RfO (mg·m ³)			
15	1 08E+02	0.10	8 33€+01 <u>i</u>	15E-02	4 005-02	5_15E+78	1 826-04	1.98E-02	1 1E-04	3 SE-02			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor	Indoor	Risk-based	Pure	Final	Incrementai risk from	H <i>azard</i> quotient
exposure	exposure	indoor	component	indoor	vabor	from vapor
groundwater	groundwater	exposure	water	exposure	intrusion to	intrusion to
сопс.,	conc.,	groundwater	solubility.	groundwater	indoor air,	indoor air.
carcinogen	noncarcinogen	conc.,	S (a(1.)	conc.,	carcinogen	noncardinogen
(μg/L)	(μg/L)	(μg/L)	(μg/L)	(μg/L)	(unitless)	(unitless)
				· - ··		 _
NA	NA .	NA	1.47E+06	NA NA	5.3E-07	3.9E-04

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

PRG SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

					Incremental	Hazard
Indoor	Indoor	Risk-based	Pure	Finat	risk from	quotient
exposure	exposure	indoor	trianocimop	indeor	vapor	from vapor
groundwater	groundwater	exposure	water	exposure	intrusion to	intrusion to
conc.,	core.,	groundwater	solubility.	groundwater	indoor air,	indoor air,
carcinogen	noncarcinogen	cone.,	ş	conc.,	carcinogen	попсатстродел
(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(unitless)	(unitless)
9.38E-01	1.29E+03	9.38E-01	1.47E+06	9.38E-01	NA	NA]

MESSAGE AND ERROR SUMMARY BELOW: (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Osource and Obuilding on the INTERCALOS worksheet are based on unity and do not represent actual values.

MESSAGE: Risk/HQ or risk-based groundwater concentration is based on a route-to-route extrapolation.

SCROLL DOWN TO "END"

GW-ADV rs on 3.1 -02/04	CAUCULATE RIS	SK-BASEO GRGUN	OWATER CONC	ENTRATION (c.	vier "X" in "YES" bo	ıx;						
Reset to		YES	OR]								
Defaults	CALCULATE IN	CREMENTAL RISK		GROUNDIVAL	ER GGNCENTRA)	DOM (enter 1x1 in 1YE)	Stipoviand in Najigybu	ndwaler condition	law i			
		YES	χ	3								
	ENTER	ENDÉR Voltai										
	Chemica CAS Nu	graundwaler Graundwaler										
	(numbers Only, no dashes)	e, ggt:			Chemical							
	79D16	5.008/01			Enchloraethyli	ere						
	ENTER	ENTER Dapth	ENTER	ENTER forals the	ENIER isi add un jo voluni:	ENTER of Late (cell G28)	ÉNTER	FNTER	ENTER Sol		ENTER]
MORE ±	Average soili groundwaler lemberalure,	befow grade To bolkom of enclosed opace Poor.	Depth telow grade to water table.	Thickness of soil stratum A.	Proceess of soil spatient B	Torckness of sor straight C (En privative or C)	So stratym directly above	\$69 so/1y⊃e	straium A SCS stiftydd rusad it estinaid	38 38	Jagricehood stratum A soli vapor permeability	
	τ _ν : 'Cι	Li Kari	500 I	h _a ,em)	Fg (12주)	h _c (sm)	Adreniable <u>Source Royroy</u>	oweczy above wareglacin	sod vapor po <u>rm</u> eabl <u>icty)</u>		k, (2m²)	<u> </u>
	1!	IS.	213	210	. 0	: :	A	<u> </u>	51.		<u> </u>	<u> </u>
MOŘE 4	ENTER Statum A 5CS	ENTER Statem A Section	ENTER Stratum A sorticial	ENTER Shatum A soft aptenditied	ENTER Statum B SC5	ENTER Straillim D Solidry	ENITER Stratum S so lotal	ENTER Stratum B Soil woler-1 fed	ENIER Stalum C SCS	ENTER Shatem C Southy	ENTER Stratum C softmal	ENTER Siraton C so water/lied
	SON (900 Cooked Sok	ου vidensity. Γιαρμέ	cores (y.	eprosity.	50 - 1956 1324-0 \$07	bulk denyity Ps ^d	20105 (5).	L-SiceSity:	SO Type	auth pennity	ports by,	porasily. 9 ₄ 5
	(fara-terera	13×00°)	gun linsk)	(cm ² cm ² cm ²	Personalaria	4970m ³ 1		$(m^2/2m^2)$	Personant	.g/2m ² ;	(an ileas)	(cm³/cm²)
	5L	150	T 450	3 103	S	66	0.375	0.054	5	1 66	0.375	0.054
MORE	ENTER Ecopsad	ENTER	ENTER Enclosed	ENTER Englosed	ENTER .	ENTFR	ENTER		ONTER Average vapor			
<u> </u>	space Noor	Six vitidgi pressure	50000 1900	agrade NGO:	Enclosed Spaco	7 por wall se a m grack	Indoor ali 9x74 a nge		Fore tale into blog CR			
	ir Janesa. Lugu	ulferen al. عرد	iongri. La	94:000. 1976	height. ∺a	erigin.	raig F.A.	-	#ина онаок то са си'а: Ш _ю	:e		
	<u>іст;</u>	(g/c/π·s²)	(s=)	(cm)	(2.07.)	(cm)	11 F	_	1.'T)			
	10,		1000	*000	300	<u> </u>	9.63	כ	5			
MORE :	FNTER Averaging	ENTER Averaging	ENTER	ENTER	EMTER Target	SNTER Farger nazara						
	Lore for	hme for	£100000	Ехрольте	nsk ⁴ ar	subbentifer						
	çardingens AT _C	nentarphogens, AT ₄₀	≤ural-co. ED	fectorcy 65	carbinogens TR	aposatorogens CHT						
	<u> </u>	(y/s)	(9/5)	[CA : 5 : 41]	(6) 110551	(umites5)						
	70	. 25	25	250	1.08405	<u> </u>						
END .						ulate hisk-pased Loogs Bothwood						

CHEMICAL PROPERTIES SHEET

Diffusivity in air, D _a (cm ² /s)	Diffusivity in water, D _w (cm ² /s)	Henry's law constant at reference temperature. H (atm-m³/mol)	Henry's law constant reference temperature, \$\mathcal{I}_R\$ (°C)	Enthalpy of vaporization at the normal boiling point, ΔH, 5 (cal/mol)	Normal boiling point, T _B (°K)	Critical temperature, T _C	Organic carbon partition coefficient, K ₂₀ (cm ³ /g)	Pure component water solubility, S (mg/L)	Unit risk factor, URF (µg/m³)	Reference conc., RfC (mg/m³)
7.90E-02	9.70E-06	1.03E-02	25	7.505	360,36	544.20	1.66E+02	1.47E+03	2.0E-06	6.0E-01

INTERMEDIATE CALCULATIONS SHEET

7 xposure duration 1 (sec)	Source- building separation, un (sail)	Stratum A Soit air-filted porosity, 8,1 (cm²-cm²)	Stratum B soil a.c-filea paresity, e _s ² (om² cn²)	Stratum C soil air tilled porosity e _a c (cm ¹ /cm ²)	Stratum A effective fols fixed submetion S _e form ^b orm ^b)	Stratum A soil infrinsic permeability, k, (cm²)	Stratem A sor relative air permeability, k ₄ (om ²)	Stratum A sod effective vacor permeatility, k, (cm²)	Thickness of capillary zone. List (cm)	Total peresity in capitally zene. n., (cm² cm²)	Art-filled porosity in capitary zone. θ_{ATA} (cm//cm/)	Water-(illed peroxity in cup, llary zone, B _{acc} (orn ¹ orn ²)	Floor- wa seam perimeter, Xi.e.
7.88E+08	195	0.347	T 0.32	0 321	0.15ë	5 94E-09	T	S 45E-09	25 00	045	5/30***	0320	4,0 <u>00</u>
Bidg. vent aton rate. Course (cm ³ /s)	Area of enclosed space below grade, A ₄ (cm ²)	Crack- to-total area ratio. T junificas)	Crack depth below grade, Z _{own} (cos)	Eniha pyloti vaporization al avel groundwafer temperature .VH, rs (ca-mol)	Menny's law constant at avel groundwater temperature, H _{rs} (almim ³ /mot)	Henry's law constant at avergroundwater temperature Hing (unitless)	Vapor viscosity al aver sort lemperature utrs lg/cm-sj	Strait on A strait of the control of	Stratum 8 effective diffusion coefficient D''' ₈ (cur ² (s)	Stratem C effective diffusion coefficient Offic (cm ³ /s)	Capitary zone effective diffusion coefficient Comfig Lomfish	Total overall effective orfusion coefficient D^{eff}_{a} : (c^{-2}/s)	Diffusion path engin, L, (cm)
6_9 25+ 04_	L ŋ65-06	3 77E-04	15	8 544	5.05é-03	2.*7E-01	765-04	1 15E-02	c 00E+95	0.008+00	4 45E-04	2.758-03	195
Convection path length, L _p (cm)	Source vapor condu C _{roser} (µg/m³)	Grack radicts, fows (cm)	Average vace: flow rate into oldg Qua (om ³ is)	Crack effective diffusion coefficient. Diffet (cm ² /s)	Area ut eraok, عربيد الاس ^ا را	Exponent of equivalent foundation People in moer, exp(Pe ¹)	infinite spande indoor after ustion coefficient or for fless;	infinite source 5 dg conc C _{entrol} (1910)	Unit hisk factor, URF (ug/m ³) ¹	Reference cond RfC img/m²!			
	1.08E+02	0.50	6.33E+01	1.15E-Ç2	3 C0E +0\$	5 15E+78	1.83E-04	1 986-02	2 0E-06	6 0E-01			

RESULTS SHEET

RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater conc., carcinogen (µg/L)	Indoor exposure groundwater conc., noncarcinagen (µg/L)	Risk-based indoor exposure groundwater conc., (µg/L)	Pure component water solubility, S {µg/L}	Final Indoor exposure groundwater cond., (µg/L)	intrusion to i indoor air.	Hazard quotient rom vapor ntrusion to indoor air, ncarcinogen (unitless)
NA	NA	NA	1.47E+06	NA	9.7E-09	2.3E-05

MESSAGE AND ERROR SUMMARY BELOW. (DO NOT USE RESULTS IF ERRORS ARE PRESENT)

SCROLL DOWN TO "END"

PRG SHEET

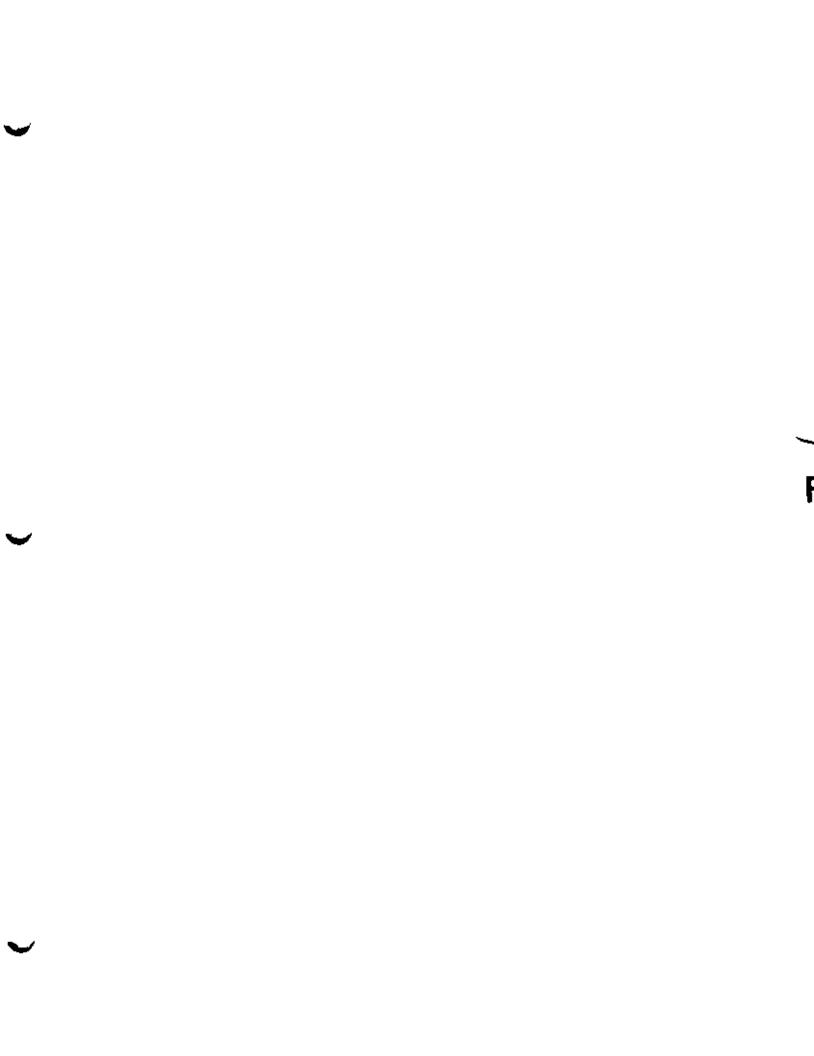
RISK-BASED GROUNDWATER CONCENTRATION CALCULATIONS:

INCREMENTAL RISK CALCULATIONS:

Indoor exposure groundwater cond., cardinogen (mg/L)	Indoor exposure groundwater conc., noncarcinogen (mg/L)	Risk-based indoor exposure groundwater cond	Pure component water solubility, S (mg/L)	Final indoor exposure groundwater cond., (mg/L)	Incremental risk from vapor intrusion to indoor air, carcinogen (unitless)	Hazard quotient from vapor intrusion to indoor air, noncarcinogen (unitless)
5.16E+01	2.21E+04	5.16E+01	1.47E+06	5.76E+01	NA NA	NA

MESSAGE AND ERROR SUMMARY BELOW. (DO NOT USE RESULTS IF ERRORS ARE PRESENT)
MESSAGE: The values of Csource and Cbuilding on the INTERCALCS worksheet are based on unity and do not represent actual values.

SCROLL DOWN TO "END"



APPENDIX F

HUMAN HEALTH RISK ASSESSMENT RAGS PART D TABLES

LIST OF TABLES RAGS PART 0 TABLE 9 SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCS

Table No. REASONABLE MAXIMUM EXPOSURES 9.1.RME Construction Workers - Site 3 9.2.RMF Adult Residents - Site 3 9.3.RMF Construction Workers - Site 7 9.4.RME Adult Residents - Site 7 9.5.RME Construction Workers - Site 15 9.6.RME Adult Residents - Site 15 9.7.RME Construction Workers - Site 20 9.8.RME Adult Residents - Site 20 CENTRAL TENDENCY EXPOSURES 9.1.CTE Construction Workers - Site 3 9.2.CTE Adult Residents - Site 3 9.3.CTE Construction Workers - Site 7 9.4.CTE Adult Hesidents - Site 7 9.5.CTE Construction Workers - Site 15 9.6 CTE Adult Residents - Site 15 9.7.CTE Construction Workers - Site 20 9.8.CTE Adult Residents - Site 20

TABLE 9 I FMS

SUMMARY OF RECEPTION RISKS AND PAZAROS FOR COPCS

REASONABLE MAXIMUM EXPOSURE

SITES 3-7, 14-15, 18, AND 20 GROUNDWATER RECORD OF DECISION.

NSB-MION, GROTON, CONNECTIONS

Scenario Timetrame Folure

Receptor Population - Construction Worker

Peouptor **Ag**n: Adult

Мелут	Exposure Aladium	Exposure Porti	Cheriscal of Potential			Carcinoger o	: H-54	•••	Mon Cardinogen di Mazerd Quoseni					
1	!	ļ	Content	Inges964	Polit 6500	Эента.	Laleidal	Caposure	የ፤ ጣልሃ የ	Ingestion	http://doc	Derna.	Expose()	
					Į.		(Flatiation	Postes Total	Target Organity)				Foules folal	
Graundwatni	(i/curdwaler	Site 3	.1.2-1nch proethane		<u> </u>	1 BE-13	$\overline{}$. eF .0	6-00đ			D 60005	0.00005	
,	1	1	" nchaproe! hene			5 SE 11	\ · 1	556.00	Uniter			0 600	0.000	
i e			Veryl C/vor/de	1		1 5€-09		1 56 09	Civer			D 00005	0 00005	
			веплоци(ругене			2.6€-01		2.66-07	NA.					
			Ordenzoja njanihracene			9.20-07	.	9.20-07	NA.					
			поелон 2.3-саюулело	i .		7.35.68	.	7.3E-08	54A		l . i	-		
	}		Alpha BHC			1 66-09	.	1 65-09	NA			0.00004	0.00004	
			Arseng			6 SF-09		ଜ ଚଳ ସମ	5kg CV9			3 DO1	0.00	
			Congreçai Total	·		13E 06		1.3F 86	f			R.001	0.007	
]	<u> </u>	Esposuse Poin; Trila						:31⊾06					0.001	
	Exposure A	recum Total						13E05					0.001	
Medium Togal			<u></u>					1 3E 05					0.001	
Pinonptor Total						Pece	ріан Пі зи , Тонаў	1 36 05			Пес	eptor Hi Total	0.001	

From Basewide Greinfowkier Operative Chit Romedia: Investigation Update/Feasibility Shidy (1905) 20041

1A916 9.2.HMS

SUMMARY OF RECEPTION RISKS AND HAZAROS FOR COPCS.

REASONABLE MAXIMUM EXPOSURE

SITES 3, 7, 14, 15, 18, AND 20 GROUNDWATER RECOPD OF DECISION. NSB-NUON, GROTON, CONNECTICUT

Scenario Turiereine: Auture Recopyst Population - Personni насархан**Ад**е: Аашт

Modeum	Exposure Medium	Ехровиле Ром;	Chemical of Palentas			Carchogerk	:Ryk			Mon-Caron	nogenic Hazard	Quenert	
			Сожен	Ingestion	inhaleton ,	Decumos	Cxternal (Had-al-an)	Exposure Poules Total	Primary Target Organis)	Ingesison	חפווהנגלרו	Dermal	Exposure Acules Iclai
Ground+atter	Groundwater	5/ie 3	1.1,2-Trofrorbethans	1 3E-06		9 XE-08		1.4E-06	Brood	ונס		B 0009	U 01
	1		Tuchk/oginerie	28E-07		3 ZE 08	[2 9€-07	Live	0009		0.001	U.01
l	1		viny. Change	1.7E-05		6 8C 07	-	1.86-05	Liver	0.02		0 0007	0.02
			Senzo, a (oynere	1.15-05		1,86 04		1.8€-04	MÁ	!			
	1		Dibenzo(a,nyan)hracene	2.6E-05		6 JE-04		5 6€-04	NA				
)	1		Indeno(1,2,3-colpyrenc	3 05-06		5 05405		53005	NA NA]			
1			Apha BHC	2 !E 06		1,25-06		3 15-06	NA.	0.002		0.0009	0 002
			Arsenic	4 5F-Q4		1 1€ 06		4 5 5 0 4	Sen, CVS	2.3		0.306	23
			Chemical Total	5 (F-04		8 65 64	· i	1.45.03	1	24	· '''	031	24
		Exposore Parit Total						1.46 Q3					24
F	E xposure	Metion Total						1.47-33	<u> </u>				24
	Szpundwater	Ste 3	1,1,2-TroNatoelNate	Υ ·	3 3F-06			9 3 F 06	Blood		0.0,		0.31
		1	Trottomettiene	i	2 68 D7			2 GE 07	t ver] '		
		ŀ	Virigit Chloride	} -	1.7E 05			: 7E-05	1 ver		2.02		0.027
!			Балгона:сучене						NA				ł
A			Depenzora, rivany rescore						NA.				l
			indenschi2.0 colpyrenc	f					NA .				i
			Apha-RHC	1 .					NA.				
l .			ARRIC	<u> </u>		. <u></u>			S45, CV5				
l l			Chemica Total		: 5.5.08	· ·	<u> </u>	1 95 65	Ĭ	· ·	3 04		0 (34
	L	Eupasurk Point Tota	•	<u> </u>				1.99 05					014
L	Exposine Megium Total							1 4 E C3					24
Arednum I alai								1,46,60					2.4
Receptar Folal						Pece	ctor Risk Total	1.45,00			Pec	epter Hillfolar	2.8

Nose:

Inhalation exposures are assumed to be equal to the exposures from higeston of groundward. From Bankwide Groundwater Operatio Only Remodial investigation updaterFeasibility Study (*1548, 2004). Тота! В сое нг 0.03 fore GVS HI 23 3.05 Total liver PI Total Sket HI 23

TABLE 93 RME

SUMMARY OF RECEPTOR RISKS AND HAZARUS FOR COPCS.

REASONABLE MAX YOM EXPOSURE

SIRES 3-7, M-15, 16 AND 20 GROUNDWATER RECORD OF DECISION

NEW MION, GROTON CONNECTICUT

Scane на Тупеблати - Рыбые

Secupior Population - Constitutinan Worker

Receptor Age. Adult

Madeletti	Exposure Medium	Exposure Posei	Chemical of Potencal	İ		Caronogene	Hise			Von-Carcin	ogenic H a zard	Cuol ent	
			Conce-n	Ingestion	irtzanon	Denmad	Fiziama! (Rapiation)	Fugus ye Roules Tolei	Py many Target Organ(5)	mjeston	Inf a/a/-or	Berna!	Exposive) Houles Total
Groundwater	Ground+argr	Torpedo Shops (Side 7)	1.3-Orchioropenseine]			Γ		None Specified	· ·		0.002	\$200.0
		(LA-Cicivorobensene	l	l · 1	2.05.68	1 • 1	2.06-08	Nane Specified			0.002	0.002
			Caforobenzeire		- '		-		Live			0.003	0.003
		1	Berizeno			3 2E-10	I - I	3.25-13	None Specified			0.0001	0.0001
		í	Trichloroethene	i		6.55·F0	i · 1	6 5E-10	Live			3 0007	0 3307
			Bis(7-R!hylhexyl)ghtha alo			6.8E-08	l . i	8.66-09	L vei			0.02	0.02
			Herachioropenzer#	1		3 35-07	I - I	3 35 37	.wer			0.02	0.02
			Arsenic	l l] [Sam				
			Вачел.		1				CVS, Felox				
			Chromom			1	.		None Specified	ļ .		0.04	004
			4490	ļ .	1				NA.				·
			Varadium	.∦ .	1	i _	L		Nene Specificá		<u> </u>	00.	901
		L	Shemica Total	· ·		4 2E-07]	4.2E-07	Ì		·	0.09	0.39
	<u> </u>	l'épasore Point Total		1				4 2E 07	ii				0 0 0 9
	Exposor	Medium Total						4.26-07					009
Ved om Total				Υ				4 2E-67					0.09
Receptor Total						Pecc	oto i Flan Torgo	4 26:07			Hec	ертан Ні Па!лі	0.39

From Basewide Groundwater Operatio Und Remind 2 Investigation Report, TrNUS (2002a)

TABLE 94 RME

SUMMARY OF RECEPTOR RISKS AND MAZAHUS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

SITES 0, 7, 14, 15, 18, AND 20 GHOUNOWATER SHOOPD OF DECISION INSERNION, GROTON, CONNECTIOUS

Scorand Inteliatie, Fulure Heceptor Population, Resignist Heceptor Age, Adult

Nedum	Faposure Medium	€aposre Pont	Chemical of Polential			Сатсягодети	fings:			Non-Cart 1	ogenc hazard	Outlient	
			Corcein	ngesilon	Innaration	Ocima	Estema (Registron)	Exposure Anures Tosas	Portvary Target Organisa	tiqe\$lap:	Inharation	Gern:ai	Exposule Roules Tota
roundwater	Grootstwater	Пографо Shope (544; 7)	1.3-DicNorsberizene	î	<u> </u>			_	None Specified	Q 65	· ·	3.Ç4	0.05
			1.4-DicNoroCenzene	2.68/05		1 36 05		3.9€ 05	Mone Specified	0.08		0.64	0:
	1		Chlorogenzene				.		tryer	9.2		33.0	0.0
	1		Peuscol	13€-06		1.50-07		1.4€ 06	None Specified	0.62		0.002	0.02
		1	Techloroethorse	3.06.06	l '	3 86-07	i)	3.36.0€	Livië-	01	'	C 01	Pι
	1		Bisj2-ethylhexyliphthalais	3.1F-Q5)	4.75-96	1	7 9E Q5	Card:	03		0.4	. Q7
			Héres: Novocenzene	5 6F 05	1	2 35 04		2 96 04	Corp.	01		34	05
			Arsene	2 0E 04				2.0% 04	SAn	10			1.0
			Barright		1 .				CVS Febus	3.7			0.2
			Chrom.,m.		1				None Speched	12		25	14
			LERD						NA.				
	ļ		Yanadam						None Speched	26] .	006	0.6
			Chemical Tolal	3.71-404		298 (4		6 IF 04	1	38		1.3	51
		Exposero Port I Idal						616.04					5 I
	Exposura	Medium Total						6 16.04	T				5.1
	Groundwater	Terpode Snops (Sile 7)	1.3-Delikročenzene	Υ	· · ·		· ·		None Specified	· ·	105		0.05
			1,4-Dichtytopenzene		2.60-05			2 6€ 65	None Specified		0.08		0.CB
		}	Chloropenzene						Care	ļ	0.7		37
		1	Велиен		+3€-06			1 35-06	None Specified	1	0.02		0.62
	ł		Increasement		0.0€-06			3 05 06	Lever	1			3 '
			B-5(2 elhyheryriphonalaile						t.vei	1			
			Hexacheroserzene			-			Lyer				
			Arsenc						Ske]			
			Raint-						CVS, Fetus	1			
			Chrom an						None Specified				
			Lund						NA.]] .		
]		Vanagem						None Specified				
			Cnemical Total	1	3 07- 35			3 C+ O5	1	 -	0.5		
		Saposula Perri 1088	•	1			·	3.Ç#-Q\$					C 5
	Exposure Mildium Total		-					3.0€ 95	 		_		0.5
eduro Tutar	.,4.			```	<u> </u>			E 4E-04	·····				5.6

Note:

Inna alion exposures and assumed to be equal to the exposures from ingestion of groundwarer. From 64sewide Groundwater Operable Oct Remedia Truestigation Report, 71NUS (2002a)

Total Sein Bil	10
Total Liver Hit	1, <u>\$</u>
Foral CVS F4	0.2
Total Zelos At	ů2
Tala, None Specified 40	24

TABLE 3.5 PMF

SUMMARY OF RECEPTION PISKS AND HAZARDS FOR COPCS.

REASONABLE MAXIMUM EXPOSURE

SIRES 3, 7, 14, 15, 18, AND 20 GROWNOWATER RECORD OF DECISION.

NSB-NUGN, GROTON, CONNECTIOUT

Scenario Timeframo Futuro Receptor Population Construction Walker Receptor Age - Apult

Medium	Exposule Medium	Exposure Pont	Cubarca.			Саго паделя	-Ank		Non Carorrogeno Hazard Guoteni						
i			Concern	ngestion	'erhalal-on	Demail	Euremal	##BOSOTE	Pluriary	ingestion	Inhalaion	Dermal	Ezposure		
1	J	<u> </u>	<u> </u>	<u> </u>			(Pagasion)	Roules * stal	Targe: Organis;			<u>!</u>	Revies Total		
Graundwater	Groundwater	540 : 5	Cagneon				·		Килеу			0.002	0.002		
		<u></u>	Chemical Tutal			· · · · ·						0.002	0.002		
ŀ		Exposure Point Total		Ĭ					[<u> </u>				0.002		
		led om Fotali	·	<u> </u>									0.005		
Medium Total	· · - · · · · · · · · · · · · · · · · ·	·· ··· ···		<u> </u>									0.005		
Receptor Total						Roce	rov R.sk *orar	. .			Пег	ерзон ні Гозаї	0.005		

TABLE S & RME

SUMMARY OF MECENTION RISKS AND HAZAROS FOR COPCS. THE ASONABLE MAXIMUM EXPOSURE.

SITES 3-7, M, 16, 19, AND 20 GADUNDWATER RECORD OF DEGISION INSERTION, GROTON, CONNECTION

Scenario funcifame Parale Receptor Population - Resident Receptor Age: Adult

Medicm	E±posirie Medich	Faposere Porti	Chemical of Potentian			Carcongen	: Fish			Non-Calci	nogenic Hazaro	Quehell	
		ļ	Concern	Ingésión	in'islation	Dermal	Enterral (Radiolon)	Exposure Poutes Total	Farget Organis;	inges; on	Inna ation	Oe-mai	Exposure Routes Total
Ground#aler	Groundwarer	5 to 15	சென்ற முற	<u> </u>	· · ·	· - · · · -	<u> </u>		Keney	02		0.01	0.2
ļ	Į.		Chemical Talal	- 7 ::			1		1	6.5	····	0.6	a. a
		Paposure Point Total	· · · · · · · · · · · · · · · · · · ·						i -				63
<u> </u>	Figosiae	Medum Falal										• • • • • • • • • • • • • • • • • • • •	6.3
i	Groundwater	S/a '5	Сертып	i i			· · ·		Kidney				
	[Chemical Tolar	<u> </u>			· :-		1				
ì	1	Expusure Paint Total	-·· — - ·-··- ·-						· · · · · ·				
ļ	Exposure Medium Total	1		~~~~					ì				03
Medium Total									î				0.3
Несерия Тогаг		· - · · · ·				Несе	ofor Pisk Total				Pec	ерга н Тога	03

FABLE 9.7 PME

SUMMARY OF PECEPICARISKS AND HAZARDS FOR COPE.

HEASONABLE MAXIMUM EXPOSURE

SITES 3-7-14-15-18 AND 20 GROUNGWATER HECORD OF DECISION.

ASSINGEN CHOICN, CONNECTICAL

Scenare Tucefrane Fubile

Pacapter Population Construction Worker

Receptor Age Adult

Nector	Exposure Vegan	Exposure Point	Chemical of Potential			Cartinogenio	: Pisk			- -			
Į.			Concom	Ingesteau	inhaleli on	Detail	Feternal	Европин	Pr (FAry	Ingestion	Infra afsun	Cernal	Еврофун
L	<u>.l</u>		l	J	l		(Be0.430n)	Ragins Total	Tenget Organ(s)	<u> </u>	Ll		Routes Total
Groundwarer	Groundwater	Area A Weapons Center (Sire 20)	The hickness and	· · · · · · · · · · · · · · · · · · ·	i — i	2.1€-10		₹1E-10	NĄ				
	i		Benful i cyrene						NA				
ŀ		1	Arseru:		i - i	1 1E-09	' - I	1 17-09	Skin CVS			0 0007	3 2002
			Chemical Lotal			1 \$5.09	· _	1 3E-09				0.0005	0.0002
	ļ	Expessive Ferni Total		1				1 DE 09		•			0.0002
	Fapon	ore Modern Total						131-09			_		6.0002
İ	Groundwaler	Area A Weapons Center (Sito 20)	Trichloroethena		1 1E-98		· · ·	I 1[-0A	NA.	· · ·			- "
			Benzolejbyrene				1 .		N.G				
i			Aisenic				l I		NA.				
		l	Chemwei Tolal		I IE-CB			V:F-08	ļ.			· -	
Ĭ	L	Exposure Point Total						1 ' E-Q8	J				
	Faposure Medium Total		_ ·	1				11[48	·				·
Modeum Foral								\ 2E:-08					0.0005
Doceptor Total						Hode	ptot Pisa, fotal	146.08	T		Dec	epser III Total	0.0005

Total CVS 40	0.0002
Total Shin HI	0.0002

ABLE 9 8 FIME

SUMMARY OF RECEPTOR WASSIAND PAZAROS FOR COPOS REASONABLE MAXIMUM EXPOSURE

SITES 0, 2, 14, 15, 16, AND 20 GROUNDWATER RECORD OF DECISION NSB-MUON GROTON CONNECTICUT

Scenario Timeframe Publie Haceptor Population Firstent Repositor Age (Adult

Мефур	Exposure Messum	Eisposwe Pain:	Charmes:			Carvinogena	Rşs	·	Non-Carologenic Mazard Guotioni					
			Carcein	Ingestion	Intralation	Démia:	Fater-s	Faposure	Pierrany	logestion	Inhalation	Upmel	Егрович	
	<u> </u>	l		L.			(Padator)	Rooles Total	Target Organ/s)]]	Roules 19(a)	
Gloundwater	Gradix/water	Ayna A Weapons Center (Site 20)	TrofAgraethene	7.7E 57		855-59		8 SE 07	NA.		· .	-		
	1		denzoja)pyrane	7 IF-06			l - i	7 1F-86	PeA		'	1 - 1		
		l .	Area .	5.6E-05		1 3E 07		5 6 E 6 5	Swn, CVS	93	[0.0007	c a	
	1		Chemical Total	6 4E 65		218 07	- 1	6.48-06		03		0.0007	¢ 3	
	l	Caponera Point Total						64F35					62	
	. Enpos	cre Vedicini Iolal		<u>. </u>				64[-05					03	
Į.	Groundwater	Area A Weapons Center (Site 20)	Inchégroalhane	1	7.7E-07		- 1	7.7E 07	NA.	· ·	-	-		
			denzoja pyrone	-		-]		R/A		1			
			Asserve]		, NA		!		-	
			Operacial Total		7.7€ 07		<u> </u>	7.7E 97			-	. 1	-	
		Exposura Point Total	-		•			7.7E 07		•	•		_	
	Expasure Medium Total	·				· · · ·		7.7F.4J						
Wed um Total	·			ĺ			```` j	6 \$ 8 - 05	i				03	
Receptor Total				-		Péter	nor Hisk Folial	6.5E-65	_		Hot	egro- Hi Tetal	03	

Note Total Sum III 3 3 Implication exposures are gistured to be equal to the exposures from registion of groundwater 5 3 3

TABLE 9 ! GTE

SUMMARY ON HECEPTOR RISKS AND MAZAGDS 10R COPCs

CENTRAL FENDENCY EXPOSURE

53755(3)(1) 14, 15, 18, AND 20 GROUNDWAVER MECORD OF DECISION

NSSINION GROTON COMMICTIOUS

Scanalio firmultame. Pulcto

Receptor Papulation: Construction Worker

Peceptor Age: Adult

Modium	Exposure Med ym	Erbosure Pour	Chemical of Potential Congen			Carcinogene	- Rusa			Mon Carc nogenic Hazard Quotient				
			Concern	Ingestion	~nhalahor	Cermus	Externa	Faposure	Promery	ingestion	!nlsalalign	Dermai	Exposure	
	!	<u> </u>	<u>. </u>	<u></u>	<u></u>		(Hadaboo)	Routes Intel	1argel Organ(s)				Roules Total	
Grauns+ater	Groundwaler	5eig 3	1,1,2-Trichtoroethane		- :	4 95 15	; -	4.9E-11	Dood	· '	1 !	0.99057	0.000005	
ł			Trightergethersq		-	17E31		1 /[-55	Live:			0.00002	B.00002	
			Vwyt Chierdn			4 ZE 10		€ 2€ 19	Lwer			0.00001	0.30001	
			Benzo(#)pywnn	∄ .		916.08	{ ·	9: 3C GB	NA.] . [
			Dipenso(a,n)an(braceno	ľ		3.26-67	1 • 1	3 2C-07	NA,		l i			
			mgeng(1,2,3 cdipylene	ļ		2,65-08	•	2.6€-0#	N:A		•	·	· 1	
<u> </u>		[Alona BHÇ	1 .		6 2E-10	ا ا	6.25-10	M.		'	3 00001	9.000001	
1	-	!	Arsenic			1 6F-09	· j	±6€-09	5ka, DVS			8 0003	9 0003	
1	1	<u></u>	Conmical fotal	1 .		6.60-07]	4.48-07	J	٠: .	_ ·	0.0000	£000 0	
		Pupostyre Point Tulal						4 4E-02					0,5003	
	Ехрочи в	Aodium Telak		<u> </u>				4 46 07					0.0003	
Medium Tolal							··	4.4F-07					0 ooc3	
Ancopto: Total						Recep	pie Rak Tota:	4 4E ()7			Pec	ескон ні Татаі	0 oat3	

From Basewide Groundwater Operable Unit Remedial Investigation UpdateReaStix ty Study (1:NUS, 2004).

TABLE 9.2 CTE SUMMARY OF RECEPTOR HISKS AND HAZARDS FOR COPCS CENTRAL RENDENCY EXPOSURE SINES 3, 7-14, 15, 48, AND 20 GROUNOWATER RECORD OF DECISION NES NICH GROTON CONNECTICUT

Scenar o Timetramen Pulture Racaptor Pópo atloni Ansident Heceptor Agé, Adus,

Madem	Exposure Medium	.Capasure Pomi	Chemical of Polentia			Carpinogenic	: P 4K			Non-Carde	юделк назакс	Сурнен	
			Concerr	Ingestion	inhalal-on	De mai	Faternal (Patienon)	Fapesure Houtes Total	Plumary Taiget Organ(s)	Ingest-on	Innalation	Osima	Papesurg Poults Total
гоопфеазел	Groundwater	5ce J	1,1,2-RecisionelFane	195-07		0.90,08	· ·	2 OE 07	Secq	0006	·	0.0005	0.037
			Trichlorgemene	3.60-08	- 1	5.2C-09		4 1E 08	Liver	E 004		0.0006	0.005
	1		Viryl Charide	2 45 06		1.00-07		2.56.08	Liver	€ 509		D 00004	0 cas
	1	i	Беплонеруеле	1 6E-08		2,90,06		3 19 65	NA			i	
	i	1	Doenzoa, njandikacene	3.60-06		1.00-04	1 . 1	1 1E B4	NA.		.		
		j	ingano:1,2,3 cdipyrens	4.26.07	-	8.75-06		8 75 06	NA.		1	i	
		1	Apha 650	2 90-07		2 00:97	}	■ 9E D4	NA.	0.0007		0,0005	0.001
		1	Arsenc	6 3E-05	. '	4 50-07	1 . 1	6 36 05	Ske, CVS	5.1	'	0003	1.1
			Chemica Tota	710-05		> 46-04	<u> </u>	\$ 10.04	l	1.1		0.00	1:
	J.,	Exposure Point Total						2 (E-G4					11
	Ergasure	Medium Talal						2 IE-04					11
	Croungwater	Site 3	1.4.2-1-chlorochann	1	# 9L-07			1 9F-07	8,000	· · · ·	0006		0.366
			Frict/orpethene		3.60-08			3 6F C8	Live:				
			Virigi CNorde	i	2 40-06			2 #6 06	Lwe [.]		3 009		0309
			Вельо(4) пунече						NA				
			Oxperacia, niladenacene						NA .		·		
			ingeno:1.2.3 cd;cyrene				-		NA		. ;]]	
			Agha BHC						NA .		'	1 1	
			Arsenc				<u> </u>		Skn CVS	L_ ···	- '	1]	
			Chemica: Total	J	260-06			2 GE 06	l	<u> </u>	0.02		3.07
		Exposure Poet Tela!						2.5€ 36					6.02
	Exposure Medium Total	įt.						2 20-64					11
edum Total]				2.26-04					11
#c#p104 T05#						Pace	osor Risk Total	7.2E-04	-		Пас	epige Hill foral	1.1

Note:

Inhalation exposures are assumed to be educing the exposures from ingestion of groundwater. From passwide Groundwater Operable Unit Hernedal Investigation Update/Feasigning Study (TINUS, 2004).

1ABLE 9.3 C1E

SUMMARY OF HECEPTOR PISKS AND HAZAROS FOR COPOS

CANTHAI, TENDENCY EXPOSURE

SITES 3, 7, 14, 15, 18, AND 2D GROUNDWATER HEDGED OF DEC SION NSB NEDN, GROTON CONNECTICUT

Scenario Timuframe: Tuture

Receptor Population Construction Worker

Receptor Age: Adulti

Medium	Exposure Meraum	Exposure Pont	Chemical of Potential			Свісмоўнь	-Д _{гу} k			Non-Cardin	ogenic Mazard	Quelient	
			Concern	:ngeshon	Inhalation !	Cerinal	Eiderfall (Had akon)	Exposure Rocles Tulai	Primiting Target Organ(s)	Indealine	Incatelion	Dermal (Exposure Houses Total
Srcondwaler	Grownowater	Torpedu Shags (Site 7)	1,3 DcNorubenzene	î	<u> </u>				None Specified			3 00009	9 0009
	ł		1,4 Dichlorobensene		,	3,92,70		0.26-10	None Specified		. ,	00000	0.0010
	1		Chiosobenzesie	Ι.	,				Live	.		0.007	0.002
			itenzene		1	250-11		2.5€-11	None Specified	'		0.00007	0.0007
	;		TricMorpelhene			1.70-11		1.7€-11	Liver			2000	0.0003
		1	3 s(2-elfyMexyl(ph(halate	ĺ	1 .	2 10-09		\$ 16.09	Civer 1	!		3,009	0.009
			dezechlor@@orzene			986-66		38€ 09	Lover	. '		6009	3 509
	•		Augen-¢						SAIr				1
	i		Barrom				1		CVS. Felos				
	}	i	Chromium				1 1		None Specifies	1		0.05	0.02
	}		Lean						NA.			٠.	
			Vanao um	J					None Speched			2405	0 306
	1	1	Спетіқа, Тога.			1 UHE -0.7		· 0E-67	1.		. :	0.05	0.05
	J	Faposicie Point Total						100.07	L.				Q 05
	€ ироълч	e Medium Folal					.,	1.0E-07					0.35
Wed o'm Total								7 dF-07					0.95
Peceptor Total						Fect	olov Rusa, Tora:	1 OF C7			Rec	eptor NI Total	0.05

From Basewide Groundwagor Operable Unit Remed at Investigation Report, Np.US (2002a)

TABLE 9.4 GTS

SUMMARY OF RECEPTION PASKS AND RAZARDS FOR COPCS

CENTRAL TENDENCY EXPOSURE

$54765\,3,\,7,\,14,\,15,\,18,\,AND\,RC\,GROUNDWATER HEDGRO OF DECISION$

NSB NEON, GPG TON, GDNNECTICUT

Scenario I metrame: Fillure Gecepto: Population: Resident Pecepto: Age. Addit

Mediam	Ефозие	Esposure	Chemical			Carc regene	Righ			Non-Caren	юделк Нагага	Qualert	
	мефип	Pont	al Potential Geneere	Ingestion	Imalation	Dermal	Figorea (Radiation)	Exposure Floutes Total	Pyrmany Target Organ(s)	Ingestion	inhalalion	Dermal	Esposuro Routes Total
Sigundwaler	Scoundwater	Torpead Shops (She 7)	1.3-O/chorabenzene						None Specified	o pca	<u> </u>	0.03	. co
			1.4-Dichtwopenzene	17E 07		1.31± 07		2.7F 07	None Specified	0.002		0.03	0.03
			Critorabenzene					•	Livei	3.804		004	0.05
			Barrena	50E-08		6 /E-09		5.7E 08	None Specified	3 002		0391	0.004
			Techlerealtano	3.50-06		5.1€-09		4 0E-08	(ver	3 004		9 309	0.61
			8is(2-ethythexyliphthalare	38E 07		676407		1.1⊑-08	, yer	301		93	03
			Mexac (volobor sone	7.3F-06		3.1F-05		3 9E-05	. vai	3 (4	!	00	6.3
	1		Arsemi	4.3E- 3 G	}		\	4 3F 36	Stan	0.07		. <u>.</u> '	7,0,0
			Benum						CVS. Felus	0.008			3 008
			Cledersom						None Specified	0.05		cs.	0.7
	j		Lead				!		NA.				
			Vaneoum						Nane Specified	0.02		0.04	3.0€
	1		Cnemical Total	1.20-05		3.26-05	. 1	447-05	ĺ	0.7		(8	1.1
		Exposure Point Total		ì				4.46-03	1	•			1.1
	Expasure	Modium Total		i T				4.45-65					1.
	Groundwater	Toipedo Snoos (Sire 7)	1.3 Cichlologenzens	ì					None Specifies		0.008		0.008
			1.4 Ckcrioropenzone		1.7E-07			9.70-07	None Specified		0.932		0.002
			Chlorobenzeno	ł .					lme.		0.004		0.004
			Renzera		5 QE-08			500-08	None Spec≯ed		0.002		0.002
		!	Trichlorgemene		3.56-08			350-08	Ļm•†°		0.364		0.004
			Вик(2-стлубляку/)рфилагана						Live:				
			Hesachlorebengono						LWDI	!			
			Assenç						\$Kin				
	1		Папит						CV5, Febus		1		
			Chromium						None Specified				. .
			fead						NA.				
		1	Vanadkim	j .					None Specified				
			Chemical Total	i	2 SE 07			2 5F-07	1		302	<u> </u>	002
		Exposure Point Total	·	1		•	•	2.5F-07	·				032
	Exposuré Medium Total			Ì				2 SE 07	î ——	•••			0 17
Mecrum Total								4.5E.05	î	_		· · · · ·	1.1
Pedeptor Tolai		· · · · · · ·		1		Recei	Not Pask Total	4 SE 05	<u> </u>		Fiec	epler Hi Talat	1.1

Nove

Inhalation exposures are ansumed to be edual to the exposures from ingestion of groundware. From Basewide Groundwaler Operable UNIT FlemeSet Investigation Report, TINUS (2002a).

TABLE 9.5 CTE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCS.

CENTRAL FENDENCY EXPOSURE

SITES 3, 7, 14, 15, 18, AND 20 SROUNDWATER RECORD OF DECISION

MSS NEGN, SROTON, CONNECTICAL

Scengrig Tundrame: Fulum Receptor Repulation: Construction Worker Receptor Age - Agust

Medium	Exposure Medium	E •posu• Pour	Chemica: of Porential			Cars nogeno	Pisk			Non Earth	ognic Haraid	Qualieni	
i			Canceln	Ingestion	Innnisiran	Dermal	5 of e-mail	Papesion	Pirmary	ingestion	ไกาลเมาเกา	Solmai	Exposure
<u></u>	·		l				(Kad-alion)	Hourns Total	Taigel (Jigan)s)			L	Roules Total
Groundwaler	Sroundwater	500 15	Caomium				· ·		k-dhny			0 9005	0.0005
		J	Chemical Folal)						1		0.0005	0.0005
	L	Exposura Point Total											0.0005
·	Гирозие М	leaum foial											0.0005
Medium Colal				I									0.0005
Heceptor Total			· —-	·		Pecep	ler Hisk Total	·			Pec	egror Hii Tojal	0 000s

TABLE 9.6 CTE SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCS CENTRAL TENDENCY EXPOSUAL SITES 9, 7, 14, 15, 16, AND 20 GROUNDWATER RECORD OF DECISION MS6-NLON, GROTON, CONNECTIOUT

Scenario Timultanie Fulure Receptoi Papulatori, Resident Receptor **Age | Adul**|

Vedun⊓	Екразите Мофил	F40csuré P0eri	Chemica: of Pulestia	İ		Carcinageno	: 1 45k			Non-Gero-	ragenic Hazard	Qualient	
			Consent	Ingestion	Inharation	Эсплаі	Esternal (Radiation)	Saposive Houtes Total	Purpary Farget Organ(s)	Inçesitor	infalalor	Dermal	Exposure Apules folal
Groundwater	Greundwater	Sep 15	Cadmium	· · ·					Kidney	01		0.005	C 1
			Chemical Total				- 1		i .	01		0.005	Ç 1
	l	tagosure Pomi Folgi											0.1
	Ē+D055√10	Ved-um Total							<u> </u>				Ç 1
	Groundwater	Site k5	Слэтыхс	<u> </u>					Kigney			· · ·	
þ		1	Ghernical Terak	<u> </u>	· ·		· ·		` .		···		
		Exposure Port Folal			•								
Fiom Basewida Graund⊭aler Орг	e - Faposure Medium Tota				•• • •			· ·			'		ÓΙ
Medicini Total									<u> </u>				91
Receptor (ctal						Rece	oper Rus - Total		i——		Пес	egos H. Tolsi	0.1

"ABLE 9 7 CTE

SUMMARY OF RECEPTOR PISKS AND HAZARDS 4 09 COPCs

CENTRAL TENDENCY EXPOSURE

SITES 3, 7, 14, 15, 18, AND 20 GROUNOWATER RECORD OF DECISION.

NSB-NUON, SPICION, SONNEGHOU?

Scenario Timelrame, Future

Receptor Population Construction Worker

Hacaptor Aga Adulf

Vec um	Engos an	Esposare Porv	Chemical of Potemal			Сакто оден и	-Ru			Hon-Care	Ogenia Parens	Фислапи	
ļ	1		Concern	Ingestión	uhalanen	Derma	Listamu	Exposure	Pomery	rigasion	(ruhgagaron)	Deimal	Etroppure
i	I			[]			(Redukan)	Boutes Total	Target Gayania)		i		Roulas (olal
Ciroundweler	Groundwasse	Area A Welapona Cerser (Side 70)	Tr-Chicage:herry	<u> </u>		7E-15	· ·	75 V	N/A		·		
	Į.)	Benzo(a)pyrene						Nº				
	}		Arsenc			JE-14	L_ ·	96-10	Sain CVS			Ç 000004	0.00064
			Chemical Total			2£ 16		3E 1G	ĺ	· ·		C 00004	0.00064
	i	Exposure 2 and Total	<u>. </u>	1				3ē x0					0.00004
		kura Madkum Tc'al		î <u>—</u> —				3E-10					0.00064
	Greenwares	Area A Weapong Certer (Site 20)	Trichloroalhene	· ·	JE-CS	 -	<u> </u>	37-09		· ·			
	ĺ		Benzo(a)pyreno				-		NA.				
	ļ		Aisena						NA.]	
	1		Chamical Total	i	0F-09	-	<u> </u>	3F 09	i			· 1	· - — "
		Exposure Point Total	v				_	UC-09	Ī		•		
1	Expanse Modulen Total			<u> </u>	-			3F €8					
Medium Total			<u>''</u>					3F-04					0.00004
Heceptor Latal		· · · · · · · · · · · · · · · · · · ·	 -			Recep	prov Brak Tgtal	DE-09			D _{ec}	eplacifit foral	0.00004

Total CVS IV 0 00004 Total Sam HI 0 00004

TABLE 9 B CIE

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPC4.

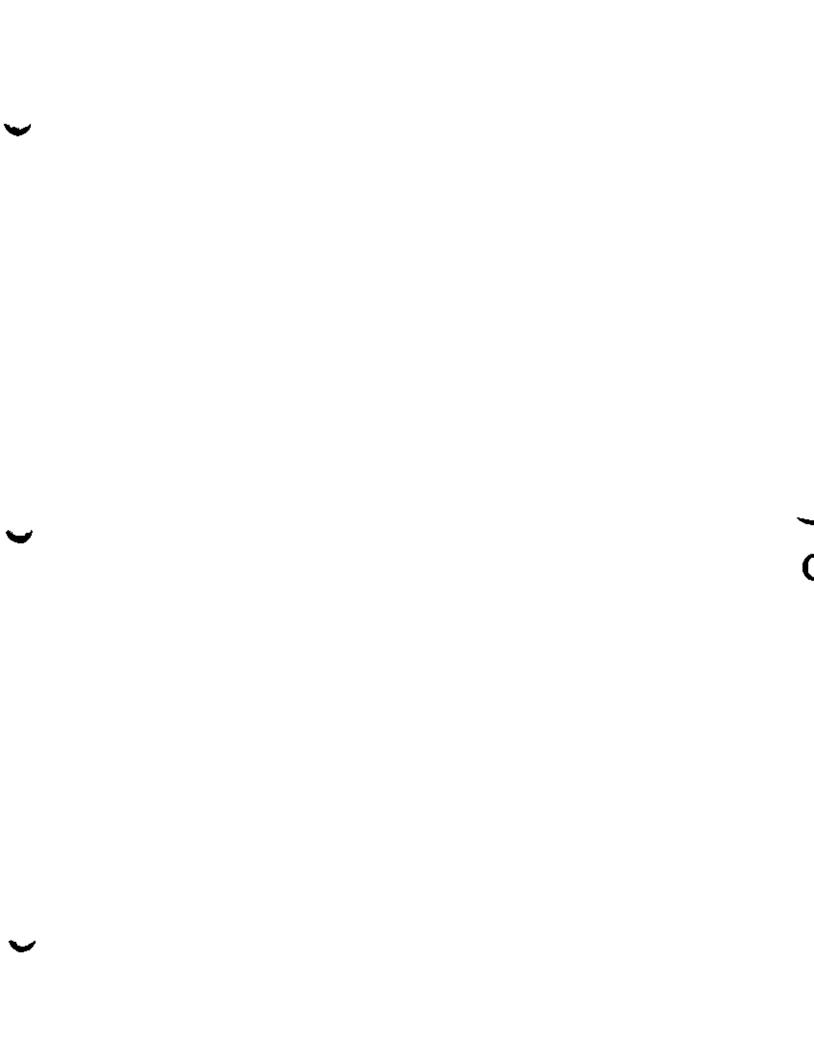
CENTRAL TENDENCY EXPOSURE

SITES 3.7.14 15.18 AND 20 GROUNDWATES RECORD OF DECISION NS8 NI ON GROTON CONNECTICUT

Scenaro (Imafrania: Futuro Podegior Population: Resident Hedogios Agel Adulti

Moder+	Edpokura Medium	Ехровия Реје	Chemical of Potential			Сақиюден	: Fusk			Nan Cu-s r	regene Havard	Qualiter	
			Concern	ngestion	Inna'alion	Dermal	External (Hadassor)	Exposure Routes Total	Primary Target Organish	ingestion	inhy'gran	Cernal	Caposure Rautes Total
Goodnamater	Granistacia:	Area A Weapons Center (Site 20)	file Margethena	1.16-07	-:	1 &E-08		1 26 47	NA				
	j		Велиода/сулчин-	6.00-07				6 CE 0/	VA.			٠.	
		1	Arsenc	7 9E 06		1 77-38		7.96.06	See CVS	91		0.0003	c:
	\	1	Chora;s' Idial	8 6F 36		31[-08	[· · ·]	A 7E-08	i	<u></u>	· ·	20003	C I
		Екровия Point Total	·					8 75-08		•			91
	Ente	sure Medium Total						8.7E.06					31
	Greundwelor	Area A Weapons Gerrer (Sire 20)	Treversethene	-	1 (F-C7			1 (F-C7	NA.		· ·	.:	
			Велго(в'юуголо						NA.		'		
			Arsenc			-			NA.				· .
		_	Chemical Total		116.67			r rE cr	1			-:	
		Exposule Point Tatal						11667					
	Ezposuré Medium Polar	· · · · · · · · · · · · · · · · · · ·	, .	Ĭ	`			119.67					<u>. </u>
Medigin Total				Ι				8 AE-06					61
Placeptor Total						Peçó	pior Facili Total	90-76			Flac	valar Hi Total	Ç I

For Swin III Or Interest to the apparation of groundwithin the apparation of groundwithin the second o



APPENDIX G

SELECTED REMEDY COST ESTIMATE

NSB-NLON
GROTON, CONNECTICUT
SITES 3 AND 7 GROUNDWATER (Alternatives GW 1-2 and GW 2-2)
NATURAL ATTENUATION WITH MONITORING AND INSTITUTIONAL CONTROLS
Report Worth Applyals for Report of Decision

		Siles 3/7 - Alt. GW 1-2		Site 7 - Alt, GW2-2	Total Year	Annual Discount	Present
Year	Capital Cost	Annual Cost	Capital Cost	Annual Cost	Çost	Pale at 3.2%	Worth
ō	\$59,189		\$59,713	_	\$118,901	1,000	\$:18,901
1		\$51,212		\$49,264	\$100,476	0.969	\$97,360
2		\$16,378		\$14,441	\$30,819	0.939	\$28,937
3		\$16,378		\$14,441	\$30,819	0.910	\$28,040
4		\$16,378		\$14,441	\$30,819	0.882	\$27,171
5		\$41,378		\$39,441	\$80,819	0.854	\$69,042
6		\$1,000		\$1,000	\$2,000	0.828	\$1,656
7		\$1,000		\$1,000	\$2,000	0.802	\$1,604
В		\$1,000		\$1,000	\$2,000	0.777	\$1,555
9		\$1,900		\$1,000	\$2,000	0.753	\$1,506
10		\$41,378		\$39,441	\$80,819	0.730	\$58,982
11		\$1,000		\$1,000	\$2,000	0.707	\$1,414
12		\$1,000		\$1,000	\$2,000	0.685	\$1,370
13		\$1,000		\$1,000	\$2,000	0.664	\$1,328
14		51,000		\$1,000	\$2,000	0.643	\$1,287
15		\$41,378		\$39,441	\$80,819	0.623	\$50,387
16		\$1,000		\$1,000	\$2,000	0.604	\$1,208
17		\$1,000		\$1,000	\$2,000	0.585	\$1,171
18		\$1,000		\$1,000	\$2,000	0.567	\$1,134
19		\$1,000		\$1,000	\$2,000	0.550	\$1,099
20		\$41,378		\$39,441	\$60,819	0.533	\$43,045
21		\$1,000		\$1,000	\$2,000	0.516	\$1.032
22		\$1,000		\$1,000	\$2,000	0.500	\$1,000
23		\$1,000		\$1,000	\$2,000	0.485	\$969
24		\$1,000		\$1,000	\$2,000	0.470	\$939
25		\$41,378		\$39,441	\$80.819	0.455	\$36,772
26		\$1,000		\$1,000	\$2,000	0.441	\$882
27		\$1,000		\$1,000	\$2,000	0.427	\$854
28		\$1,000		\$1,000	\$2,000	0.414	\$828
29		\$1,000		\$1,000	\$2.000	0.401	\$802
30		\$56,340		\$49,135	\$105,475	0.369	\$40,997

TOTAL PRESENT WORTH

\$623,275

SITE 23
NAVAL SUBMARINE BASE NEW LONDON
GROTON, CONNECTICUT
ALTERNATIVE 3-2: INSTITUTIONAL CONTROLS
CAPITAL COST

Hem	Quantity	Uni:		Unit C			I	Extende			Sublotei
	Qualitity	L LIII	Subcontract	Matenal	Labor	Equipmen:	Subcontract	Matenal	Fa po t	Equipment	SHORKET
PROJECT PLANNING 1 2 Prepare LUC AD Documents	150	h	nr		\$35.00		\$0	\$0	\$5,250	\$0	\$5,250
Subtotat							\$0	\$3	\$5,250	\$0	\$5,250
Local Area Adjustments							100.0%	96. 6 %	105.0%	105.0%	
							\$0	\$0	\$5.072	\$ C	\$5,072
Overhead on Labor Cost & G & A on Labor Cost & G	10%							\$0	\$1,521 \$507		\$1.52° \$50°
G & Alon Material Cost & G & Alon Subcontract Cost & G & Alon Equipment Cost &	10%						\$0	ΦΟ		\$0	51 51 54
Tatel Direct Cost			•				\$0	\$0	\$7,100	\$0	\$7,19
Indirects on Total Direct Cost জ Profit on Total Direct Cost জ										_	\$2,485 \$710
Subtotal											\$10,29
Health & Safety Monitoring @	0%									_	\$
Total Field Cast											\$10,29
Contingency on Total Field Costs © Engineering on Total Field Cost ©										_	\$ \$
TOTAL COST											\$10,29

SITE 23 NAVAL SUBMARINE BASE NEW LONDON GROTON, CONNECTICUT ALTERNATIVE 3-2: INSTITUTIONAL CONTROLS

ANNUAL COST						
Item	Item Cost Year 1	Item Cost Years 2 and 3	Item Cost Years 4 and 5	Item Cost Years 6 Ihrough 30	Item Cost Every 5 Years	Notes
Inspection	\$1,000	\$1,000	\$1,000	\$1,000		Annual LUC inspection (assume 6 hours at \$50/hr plus expenses)
Site Review					\$25,000	_ 5-year review
TQ7ALS	\$1,000	\$1,000	\$1,000	\$1,000	\$25,000	

SITE 23
NAVAL SUBMARINE BASE NEW LONDON
GROTON, CONNECTICUT
ALTERNATIVE 3-2: INSTITUTIONAL CONTROLS
PRESENT WORTH ANALYSIS

/oo- T	Capital	Annual	Total Year	Annual Discount	Present
/ear	Cost	Cost	Cost	Rate at 3.2%	Worth
0	\$10,295		\$10,295	1.000	\$10,295
1		\$1,000	\$1,000	0.969	\$969
2 3		\$1,000	\$1,000	0.939	\$939
3		\$1,000	\$1,000	0.910	\$9 10
4		\$1,000	\$1,000	0.882	\$882
5		\$26,000	\$26,000	0.854	\$22,204
5 6		\$1,000	\$1,000	0.828	\$828
7		\$1,000	\$1,000	0.802	\$802
8		\$1,000	\$1,000	0.777	\$777
9		\$1,000	\$1,000	0.753	\$753
10		\$26,000	\$26,000	0.730	\$18,980
11		\$1,000	\$1,000	0.707	\$707
12		\$1,000	\$1,000	0.685	\$685
13		\$1,000	\$1,000	0.664	\$654
14		\$1,000	\$1,000	0.643	\$643
15		\$26,000	\$26,000	0.623	\$16,198
16		\$1,000	\$1,000	0.604	\$604
17		\$1,000	\$1,000	0.585	\$585
18		\$1,000	\$1,000	0.567	\$5 6 7
19		\$1,000	\$1,000	0.550	\$550
20		\$26,000	\$26,000	0.533	\$13,858
21		\$1,000	\$1,000	0.516	\$516
22		\$1,000	\$1,000	0.500	\$500
23		\$1,000	\$1,000	0.485	\$485
24		\$1,000	\$1,000	0.470	\$470
25		\$26,000	\$26,000	0.455	\$11,830
26		\$1,000	\$1,000	0.441	\$441
27		\$1,000	\$1,000	0.427	\$427
28		\$1,000	\$1,000	0.414	\$414
29		\$1,000	\$1,000	0.401	\$401
30		\$26,000	\$26,000	0.389	\$10,114

TOTAL PRESENT WORTH \$118,998