Formerly Utilized Sites
Remedial Action Program
(FUSRAP)

Maywood Chemical Company Superfund Site

ADMINISTRATIVE RECORD

Operable Unit 2 - Groundwater

Document Number

GW-013

US Army Corps
of Engineers®
New York District

FUSRAP

Maywood Superfund Site

Groundwater Baseline Risk Assessment

Formerly Utilized Sites Remedial Action Program Maywood Superfund Site

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US Army Corps of Engineers

Contract No. DACW41-99-D-9001

July 2005, Revision 4

FINAL GROUNDWATER BASELINE RISK ASSESSMENT

FUSRAP MAYWOOD SUPERFUND SITE
MAYWOOD, NEW JERSEY

SITE-SPECIFIC ENVIRONMENTAL RESTORATION
CONTRACT No. DACW41-99-D-9001
TASK ORDER 0004
WAD 02

Submitted to:

Department of the Army
U.S. Army Engineer District, New York
Corps of Engineers
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July 2005
Revision 4

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RECORD OF REVISIONS

Revision Number	Description of Revision	Date
0	Draft	July 2003
1	Draft	October 2003
2	Draft	March 2004
2.2	Draft Final	August 2004
3	Draft Final issue to EPA	October 2004
4	Final incorporating EPA comments	July 2005

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ABBREVIATIONS, ACRONYMS AND FORMULAS

AEC	Atomic Energy Commission
AF	Soil-to-Skin Adherence Factor
AMNET	Ambient Biomonitoring Network
ARCS	Assessment and Remediation of Contaminated Sediments Program
Aromatics Area	Aromatic and Essential Oils Manufacturing Area
AT	Averaging Time
B	Permeability Coefficient Across the Viable Epidermis
bgs	below ground surface
BTEX	Benzene, Toluene, Ethylbenzene, Xylenes
BNI	Bechtel National, Inc.
BW	Body Weight
BWM	NJDEP Bureau of Water Monitoring
CDI	Chronic Daily Intake
cm^2	square centimeters
COPCs	Constituents of Potential Concern
CT	Central Tendency
DA_{event}	Absorbed Dose per Event
Dixo	Dixo Company
DOE	U.S. Department of Energy
ED	Exposure Duration
EF	Exposure Frequency
EPA	U.S. Environmental Protection Agency
EPC	Exposure Point Concentration
ERA	Ecological Risk Assessment
ER-L	Effects Range-Low
ET	Exposure Time
FA	Fraction Absorbed
FFA	Federal Facilities Agreement
FI	Fraction Ingested
FMSS	FUSRAP Maywood Superfund Site
FUSRAP	Formerly Utilized Sites Remedial Action Program
g	gram(s)
GSFo	Gamma Shielding Factor
GWRI	Groundwater Remedial Investigation
HEAST	Health Effects Assessment Summary Tables
HI	Hazard Index
HQ	Hazard Quotient
IR_i	Inhalation Rate
IRIS	Integrated Risk Information System
IR-S	Ingestion Rate of Sediment
IR-W	Ingestion Rate of Water
K	K is a one-sided normal tolerance factor for 95 percent coverage
LEL	Lowest Effects Level
Li_2CO_3	Lithium Carbonate
LiCl	Lithium Chloride
Li_3PO_4	Lithium Phosphate
µg/L	micrograms per liter
MCL	Maximum Contaminant Level

MCW	Maywood Chemical Works
MDA	Minimum Detectable Activity
MGD	Million Gallons per Day
mg/kg	milligrams per kilogram
mg/kg-d	milligrams per kilogram of body weight per day
mg/L	milligrams per liter
MISS	Maywood Interim Storage Site
mrem	Millirems
MSL	Mean Sea Level
NAWQC	National Ambient Water Quality Criteria
NAWQS	National Ambient Water Quality Standards
NCEA	National Center for Environmental Assessment
NEC	No Effect Concentration
NJDEP	New Jersey Department of Environmental Protection
NPL	National Priorities List
NWI	National Wetlands Inventory
ORNL	Oak Ridge National Laboratory
PAL 2.1	Point, Area, and Line Source Model
Pb-206	lead-206
Pb-210	lead-210
pCi/g	picoCuries per gram
pCi/g-y	picoCuries per gram per year
pCi/kg	picoCuries per kilogram
pCi/L	picoCuries per liter
pCi/mg	picoCuries per milligram
PEC	Probable Effect Concentration
PEM	Palustrine Emergent
PFO1	Palustrine Forested Broad-Leaved Deciduous
POW	Palustrine Open Water
ppb	Part per billion
ppm	Parts per million
PRG	Preliminary Remediation Goal
PSS1	Palustrine Scrub-Shrub Deciduous
PSS1/EM	Palustrine Scrub-Shrub Deciduous/Emergent
0	Mean
Ra-228	radium-228
rad	Radiation Absorbed Dose
RAGS	Risk Assessment Guidance for Superfund
RfC	Reference Concentration
RfD	Reference Dose
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
RME	Reasonable Maximum Exposure
S	standard deviation
SAV	submerged aquatic vegetation
Shaw	Shaw Environmental, Inc.
SLERA	Screening-Level Ecological Risk Assessment
Stepan	Stepan Company
Stone & Webster	Stone & Webster, Inc.
Sv/Bq	Sieverts per Becquerel
TAL	Target Analyte List
TEC	Threshold Effect Concentration
Th-232	thorium-232
THQ	Target Hazard Quotient

U-238	uranium-238
UCL	Upper Confidence Limit
USACE	United States Army Corps of Engineers
UTLs	Upper Tolerance Limits
VOC	Volatile Organic Compound

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EXECUTIVE SUMMARY

ES.1 INTRODUCTION

This groundwater baseline risk assessment (BRA) was prepared for the U.S. Army Corps of Engineers (USACE); submitted by Shaw Environmental, Inc. (Shaw) formally Stone & Webster, Inc., A Shaw Group Company; and prepared by Malcolm Pirnie, Inc. The purpose of this baseline risk assessment is to present an evaluation of human health and ecological risks associated with radiological and chemical contamination detected in groundwater, surface water, and sediment at the Formerly Utilized Sites Remedial Action Program (FUSRAP) Maywood Superfund Site (FMSS) located in Bergen County, NJ. The baseline risk assessment is comprised of a quantitative human health evaluation conducted in conformance with a Pathway Analysis Report, approved by the U.S. Environmental Protection Agency (EPA), Region II and a screening-level ecological risk assessment (SLERA). It is based on selected data from the Groundwater Remedial Investigation (GWRI) conducted at the FMSS, as described below.

Portions of the FMSS are radiologically impacted from process wastes and residues generated by the Maywood Chemical Works (MCW) from 1916 to 1956 during the recovery and refining of thorium and thorium compounds from monazite ores. The thorium concentrate was used in industrial products such as mantles for gas lanterns. The residues or tailings from the process operation contained low-level radioactive materials. Other processing operations at the MCW involved lithium compounds, detergents, alkaloids, essential oils, and products from tea and cocoa leaves. The MCW pumped process wastes to retention ponds constructed to the west of the plant. Some of the waste materials were excavated and used as fill and mulch for nearby properties in Maywood, Rochelle Park, and Lodi. Waste materials were also transported via the old Lodi Brook stream channel (later replaced by a storm water drain system) into Lodi. These activities resulted in the deposition of MCW waste materials over much of the local area. The FMSS is shown on **Figure ES-1**.

The objectives of the baseline risk assessment are to:

- Provide an analysis of potential health risks, currently and in the future, in the absence of any major action to control or mitigate contamination (i.e., baseline risks); and
- Assist in determining the need for and extent of remediation.

In addition, the baseline risk assessment provides a basis for comparing a variety of remedial alternatives and determining which will be most protective of human health and the environment.

The baseline risk assessment addresses:

- All radiological and chemical constituents detected in groundwater from the GWRI Study Area during Phase II of the GWRI, except for chlorinated solvent constituents from select monitoring wells attributed to a site (Dixo Company) located just north of the GWRI Study Area, and
- All radiological and chemical constituents detected in surface water and sediment from Westerly Brook, Lodi Brook, the Saddle River, and Coles Brook in the vicinity of the GWRI Study Area during Phase II of the GWRI.

The GWRI Study Area, shown on **Figure ES-2**, was established in the GWRI Work Plan.

ES.2 HUMAN HEALTH EVALUATION

The human health evaluation follows the typical four-step process to assess potential human health risks. The steps, discussed in further detail in the body of the report, are: Data Evaluation, Exposure Assessment, Toxicity Assessment, and Risk Characterization.

Data Evaluation

The data evaluation focuses on the compilation of usable radiological and chemical data for groundwater, surface water, and sediment collected during Phase II of the GWRI and the selection of constituents of potential concern (COPCs). Per EPA, Region II guidance, all constituents designated by the EPA as known human carcinogens were selected as COPCs and four constituents regarded as essential nutrients (calcium, magnesium, sodium, and potassium) were categorically eliminated as COPCs. The remaining constituents were selected or eliminated as COPCs based on comparison of their maximum detected concentrations to available risk-based screening criteria derived by the EPA. In addition, frequency of detection was used as an elimination criterion for some of the remaining constituents.

Two groundwater datasets were evaluated: one comprised of data from both overburden and bedrock monitoring wells to assess potential exposure and risk from potable use of the groundwater and another comprised of just the volatile organic chemical (VOC) data from overburden monitoring wells to assess potential exposure and risk following release to outdoor air around an excavation. Data from several shallow and deep monitoring well clusters in Lodi and one shallow monitoring well located on the Scanel property were excluded from the datasets because the locations are not hydraulically connected to the groundwater areas of concern, which all occur on the former MCW property. Data for tetrachloroethene and several of its degradation products from select monitoring wells located north and west of the MISS were also excluded from the datasets, as indicated above. Forty-one constituents were selected as COPCs in overburden and bedrock groundwater to evaluate the potable use scenario, including 15 VOCs, 14 inorganic chemicals, 4 rare earth elements, and 8 radionuclides. Six VOCs were selected as COPCs in overburden groundwater to evaluate the release to outdoor air around an excavation scenario.

Separate evaluations were made of the surface water and sediment data from Westerly Brook, Lodi Brook, the Saddle River, and Coles Brook collected during Phase II of the GWRI. In Westerly Brook, 19 inorganic chemicals, one rare earth element, and eight radionuclides (including Pb-210) were selected as COPCs in surface water and five inorganic chemicals, four rare earth elements, and eight radionuclides (including Pb-210) were selected as COPCs in sediment. In Lodi Brook, 18 inorganic chemicals, one rare earth element, and nine radionuclides (including Pb-210) were selected as COPCs in surface water and six inorganic chemicals, four rare earth elements, and eight radionuclides (including Pb-210) were selected as COPCs in sediment. In the Saddle River, 15 inorganic chemicals and four radionuclides (including Pb-210) were selected as COPCs in surface water and five inorganic chemicals, four rare earth elements, and eight radionuclides (including Pb-210) were selected as COPCs in sediment. In Coles Brook, 11 inorganic chemicals, one rare earth element, and six radionuclides (including Pb-210) were selected as COPCs in surface water and seven inorganic chemicals, four rare earth elements, and eight radionuclides (including pb-210) were selected as COPCs in sediment.

Exposure Assessment

Five categories of human receptors (“potentially exposed populations”) were identified and evaluated quantitatively: residents (both adults and children), workers, construction/utility workers, recreationists, and municipal workers. Their potential for exposure was evaluated for a number of current and future use scenarios based on conservative exposure point concentrations (EPCs) developed for the evaluation. Consistent with EPA guidance, the EPCs (i.e., the 95% upper confidence limit on the arithmetic average concentration or the maximum detected concentration) were combined with upper-bound exposure parameter values to estimate reasonable maximum exposure (RME). Scenarios where estimated risks based on RME exceeded the EPA acceptable levels (described below) were re-evaluated using central tendency (CT) exposure parameter values consistent with EPA, Region II guidance. The exposure assessment evaluated the potential for exposure to:

- Residents (adults and children) living in the vicinity of the FMSS who may consume or utilize local groundwater were evaluated. Although most or all residences within the FMSS have municipally supplied potable water, several domestic and public supply wells were identified in the well search and groundwater could be used as a source of potable water in the future given the Class II A New Jersey groundwater classification. Potential exposure via ingestion, dermal contact and inhalation of volatile COPCs released from the water during showering was evaluated.
- Workers (adults) working in the vicinity of the FMSS who may also consume groundwater, whose activities may include non consumptive use of the groundwater or whose workplace is, or could be, underlain by contaminated groundwater were evaluated for potential exposure via ingestion and dermal contact.
- Recreationists (resident adolescents) that live near the aboveground portion of Westerly Brook, the Saddle River, or Coles Brook who may contact surface water and/or sediment while wading or recreating along the shorelines were evaluated for potential exposure via dermal contact with surface water and sediment and ingestion of sediment. Potential exposure via consumption of sport fish from the Saddle River was evaluated qualitatively. There is no potential for exposure to surface water and sediment in Lodi Brook as its entire length has been routed through culverts under the streets.
- Construction/utility workers (adults) whose work may expose them to the shallow groundwater during work around an excavation were evaluated for potential exposure via dermal contact and inhalation of volatile COPCs released from overburden groundwater to outdoor air around the excavation.
- Municipal worker (adults) who may contact surface water and/or sediment while working (e.g., manhole inspection or clean out) in Lodi Brook, which is culverted over its entire length, and in the culverted portion of Westerly Brook were evaluated for potential exposure via dermal contact with surface water and sediment and ingestion of sediment.

Toxicity Assessment

The toxicity assessment characterizes the relationship between the magnitude of exposure to a constituent and the potential that an adverse effect will occur. The toxicity information is then quantitatively evaluated and the relationship between the dose of the constituent received and the incidence of adverse health effects in the exposed population is evaluated. Toxicity criteria have been derived by the EPA in the form of reference doses and reference concentrations to assess the potential for non-cancer health effects from oral and inhalation exposure, respectively, and slope factors to estimate increased cancer risk. Verified or provisional toxicity criteria for each COPC developed by the EPA were used for these purposes. Where no such toxicity criteria were available for a COPC, the potential for toxic effects was briefly described.

The toxicity criteria were combined with the intake/dose estimates made in the Exposure Assessment to determine whether exposure to a constituent can cause an increase in the incidence of a particular adverse health effect.

Risk Characterization

The exposure estimates (i.e., intakes or doses) made in the Exposure Assessment were combined with the toxicity criteria presented in the Toxicity Assessment to provide quantitative expressions of risk, in the form of hazard quotients (HQs) for assessing the potential for non-cancer health effects and excess lifetime cancer risks. Both the HQs and cancer risks were summed across the individual COPCs and population-specific exposure routes to derive total hazard indices and total cancer risks. The estimated risks were then compared to the EPA acceptable levels specified in the National Contingency Plan (NCP). For non-cancer health effects, the NCP states that acceptable exposure levels shall represent concentration levels to which the human population, including sensitive subgroups, may be exposed without adverse effect during a lifetime or part of a lifetime, incorporating an adequate margin of safety. In practice, the EPA defines this as both HQs and hazard indexes (HIs) less than or equal to 1. For known or suspected carcinogens, the NCP states that acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual which range from 10^{-6} (i.e., 1E-06 or 1 in 1,000,000) to 10^{-4} (i.e., 1E-04 or 1 in 10,000).

Where the total HI or total excess lifetime cancer risk were greater than the EPA acceptable levels, the COPCs that are the predominant contributors to the risk estimates are presented in **Tables ES-1** to **ES-4**. Where a total HI was greater than the EPA acceptable level, toxic endpoint-specific hazard indices were calculated and also presented in **Tables ES-1** to **ES-4**.

When assessing radiological risk from radionuclides that occur naturally in the environment, the risks for the various populations and exposure scenarios must be compared to the unavoidable risk from natural background radiation. For some-long term scenarios, the background risk can approach and even exceed the excess upper bound lifetime cancer risk of 10^{-4}. Monitoring wells were not specifically installed during the GWRI to characterize background. However, in the GWRI Report groundwater data from select overburden and bedrock monitoring wells were discussed as reasonably representative of FMSS background groundwater quality. Comparison of the "background" radionuclide concentrations in groundwater from these monitoring wells to the radionuclide concentrations used as EPCs indicated that the estimated lifetime cancer risks for the radionuclides represent background. The same might be true for surface water and sediment if background data were available for such comparisons.

Possible health effects from exposure to those COPCs without EPA toxicity criteria (1,1-dichloroethane, 4-chlorotoluene, lead, cerium, lanthanum, and yttrium) are briefly described. A discussion of the uncertainty in the human health evaluation is discussed.

The risk characterization indicated the following.

Current / Future Residents

Evaluation of potential exposure to resident adults assuming potable use of the groundwater resulted in risk estimates that exceed the EPA acceptable cancer risk range and the acceptable level for non-cancer health effects. A total HI of 4E+01 was estimated indicating a potential for adverse, non-cancer health effects; arsenic, benzene, iron, lithium, and 2-chlorotoluene in groundwater are the predominant contributors. A total excess lifetime cancer risk of 6E-03 was estimated; arsenic, benzene, and vinyl chloride are the predominant contributors to the risk estimates.

Evaluation of potential exposure to resident children assuming potable use of the groundwater resulted in risk estimates that exceed the EPA acceptable cancer risk range and the acceptable level for non-cancer health effects. A total HI of 1E+02 was estimated indicating a potential for adverse, non-cancer health effects; arsenic, benzene, iron, lithium, 2-chlorotoluene, manganese, and xylenes in groundwater are the predominant contributors. A total excess lifetime cancer risk of 2E-03 was estimated; arsenic and benzene are the predominant contributors to the risk estimates.

Current / Future Workers

Evaluation of potential exposure to workers assuming potable use of the groundwater resulted in risk estimates that exceed the EPA acceptable cancer risk range and the acceptable level for non-cancer health effects. A total HI of 1E+01 was estimated indicating a potential for adverse, non-cancer health effects; arsenic, benzene, iron, and lithium in groundwater are the predominant contributors. A total excess lifetime cancer risk of 1E-03 was estimated; arsenic is the predominant contributor to the risk estimates.

Current / Future Construction / Utility Workers

Evaluation of potential exposure to construction/utility workers assuming work in the vicinity of an excavation in which groundwater infiltrates the bottom of the excavation results in risk estimates that exceed the EPA acceptable level for non-cancer health effects. A total HI of 1E+01 was estimated indicating a potential for adverse, non-cancer health effects; benzene and 2-chlorotoluene in groundwater are the predominant contributors. The estimated total excess lifetime cancer risk is within the EPA acceptable risk range.

Current / Future Recreationists

Evaluation of potential exposure to resident adolescents assuming contact with surface water and sediment while wading and recreating in Westerly Brook, the Saddle River, or Coles Brook did not result in risk estimates in excess of the EPA acceptable cancer risk range or acceptable level for non-carcinogenic health effects. Occasional consumption of sport fish caught in the Saddle River in the study area should not pose health risks to recreationists.

Current / Future Municipal Workers

Evaluation of potential exposure to municipal workers assuming contact with surface water and sediment while conducting manhole inspection or clean-outs in the culverted sections of Westerly Brook or Lodi Brook did not result in risk estimates in excess of the EPA acceptable cancer risk range or the acceptable level for non-cancer health effects.

In summary, the human health evaluation indicates a potential for health risks to residents (adults and children) and workers from exposure to groundwater, should groundwater be used for potable purposes, and to construction/utility workers from exposure to groundwater, should shallow groundwater be contacted during activities involving excavation. The non-cancer hazards indices and excess lifetime cancer risks greater than the EPA acceptable levels are predominantly due to arsenic and benzene. Vinyl chloride is also a predominant contributor to the excess lifetime cancer risks greater than the EPA acceptable level. Iron, lithium, manganese, and 2-chlorotoluene are also predominant contributors to the non-cancer hazard indices greater than the EPA acceptable level. The GWRI Report indicates the following regarding these COPCs:

- The principal arsenic plume in overburden groundwater was identified in proximity to Former Retention Pond A located within the MISS while in bedrock groundwater, an arsenic plume emanating from the Former Retention Pond C within the MISS was identified. Arsenic in MISS groundwater is attributed to the former MCW disposal of coal/fly ash in the retention ponds.

  In addition, the groundwater data clearly show and anthropogenic source of arsenic that cannot be explained as ambient or background arsenic concentrations. The arsenic concentrations in overburden and bedrock groundwater during Phase II of the GWRI ranged from 2.4 to 2,600 µg/L (Appendix A, Table 2.1) and the average and 95% UCL arsenic concentrations are 41 and 191 µg/L, respectively (Appendix A, Table 3.1). However, the regional and "site-specific" (i.e., in MW-10S, MW-17S, and MW-18S) ambient / background groundwater data presented in the GWRI Report (USACE 2005) indicate arsenic concentrations from 1 to 3.8 µg/L.

- A benzene plume measuring approximately 350 feet in the direction of groundwater flow and 150 feet normal to flow was identified in overburden groundwater in proximity to Former Building 56/Former Retention Pond A within the MISS while in bedrock groundwater, a benzene plume was identified in proximity to Former Retention Pond C within the MISS. Additional source area characterization and plume delineation was conducted is provided in the GWRI Report (USACE 2005).
- Two lithium plumes were identified in overburden groundwater in proximity to Former Retention Ponds A and B located within the MISS and NRC Burial Pit 2 on the Stepan Company (Stepan) property. In bedrock groundwater, two lithium plumes were identified in proximity to Former Retention Ponds A and C within the MISS and within the Stepan property in proximity to the Former Aromatic and Essential Oils Manufacturing Area (Aromatics Area).

  In addition, the groundwater data clearly show an anthropogenic source of lithium that cannot be explained as ambient or background lithium concentrations. The lithium concentrations in overburden and bedrock groundwater during Phase II of the GWRI ranged from 1 to 16,100 µg/L (Appendix A, Table 2.1) and the average and 95% UCL lithium concentrations are 1,766 and 4,698 µg/L, respectively (Appendix A, Table 3.1). However, the regional and "site-specific" ambient / background groundwater data presented in the GWRI Report (USACE 2005) indicate lithium concentrations ranging from 0.82 to 26 µg/L.
- The elevated iron and manganese concentrations are attributed to the ongoing degradation of organic constituents (benzene, chlorotoluene, and chlorinated solvents) in groundwater and utilization (reduction) of these metals as alternate electron acceptors. The highest total iron (Fe) and manganese (Mn) concentrations are detected in monitoring wells impacted with organic constituents and are attributed to the reduction/dissolution of the metals (as Fe+2) and (Mn+2) from the aquifer matrix. Once the organic constituents are remediated/degraded, iron and manganese (as Fe+3 and Mn+4) would oxidize/precipitate in the aquifer and return to background groundwater concentrations.
- The source of vinyl chloride is probably on the Stepan property, in the Former Aromatics Area.

The radionuclides contribute relatively little to the total excess lifetime cancer risks and estimates of total radiological dose are less than the maximum dose limit for humans. In addition, most of the radiological risks and dose estimates may be due to background levels of the radionuclides.

ES.3 SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT

The SLERA is comprised of the following:

- Screening-level problem formulation, which includes a description of the environmental setting, preliminary COPCs, constituent fate and transport information, a discussion of ecotoxicity and potential receptors and exposure pathways, and a presentation of assessment and measurement endpoints.
- Screening-level ecological effects evaluation.
- Risk calculations (in the form of HQs and total HIs), using appropriate surface water and sediment screening values (i.e., toxicity benchmarks) for aquatic biota.

- Uncertainty assessment.

The SLERA is focused on aquatic biota and does not evaluate the potential risk to higher-level organisms (e.g., waterfowl, semi-aquatic mammals). Fish and benthic invertebrates are the receptors of potential concern, since these organisms have the greatest potential for exposure of the aquatic and semi-aquatic organisms that may utilize the water bodies.

In general, aquatic organisms tend to be more resistant to radiation than terrestrial mammals, and vertebrates are more radiosensitive than invertebrates. It has been demonstrated that adult fish have radiation sensitivities similar to terrestrial mammals if the response is followed for sufficient time, while invertebrates tend to be more resistant. The most sensitive periods in the life cycle of aquatic organisms are the early developmental stages and, generally, radiation sensitivity decreases with increasing time of development. It appears that reproductive and early developmental systems of vertebrates are most sensitive to chronic irradiation, in both aquatic and terrestrial environments. For purposes of this SLERA, fish are considered to be the potential receptors of concern for radiological constituents, since they have more potential for exposure from surface water and sediments than semi-aquatic birds or mammals, and they are more sensitive to radiological exposure than benthic invertebrates. For chemical constituents, fish and benthic invertebrates are the receptors of potential concern since these organisms have the greatest potential for exposure of the organisms that may utilize the water bodies.

None of the radiological constituents detected in surface water or sediment in any of the water bodies have HQs that exceed 1. Total hazard indices for radiological constituents in surface water and sediment are also less than one for each water body. This indicates that there is no potential for adverse ecological health effects from the presence of radionuclides in surface water and sediment in water bodies in the vicinity of the FMSS. Therefore, there are no radionuclides of potential concern selected for the FMSS.

As summarized in Table 3-16, a number of chemical constituents detected in surface water and/or sediment in each of the water bodies have HQs that exceed 1 and, therefore, are chemical constituents of potential concern. In surface water and sediment, these constituents include copper, iron, lead, manganese, silver, and zinc. In surface water, these constituents include aluminum, barium, boron, lanthanum, lithium, and uranium. In sediment, these constituents include antimony, arsenic, cadmium, chromium, and nickel.

However, the potential for adverse ecological health effects may be overstated due to the lack of upstream surface water and sediment samples from the evaluated water bodies. Most of the chemical constituents of potential concern have not been associated with the site and their concentrations in surface water/sediment may be the result of off-site, non-FUSRAP sources and upstream surface water/sediment quality.

As indicated in the GWRI Report, barium and silver are common constituents in coal/fly ash that was incorporated in fill used elsewhere on the former MCW and vicinity properties. According to aerial photographs, coal was also stored on adjacent off-site properties, and impacted sediment may have accumulated in stream drainages over time. Accordingly, these metals in surface water may be derived from off-site, non-FUSRAP sources. Boron has been detected/co-located with radiological constituents, however, the thorium extraction and lithium extraction processes did not utilize boron.

There were no apparent differences in the general appearance and ecological health of the upstream and downstream locations based on casual observations made during the visits to the surface water bodies.

Lodi Brook

In surface water, the maximum detected concentrations of barium (104 µg/L) and boron (176 µg/L) were found at sampling locations LB-3 and LB-8, respectively. Six of the seven surface water samples had barium concentrations that exceed the benchmark. All of the seven surface water samples had boron concentrations that exceed the benchmark. In sediment, the maximum detected concentration of lead (427 milligrams per kilogram [mg/kg]) was found at sampling location LB-7. All of the sediment samples had lead concentrations that exceed the benchmark.

The highest detected concentrations of lead in Lodi Brook are located downstream of the former MCW, which indicates a potential input of lead contaminated sediment from runoff or another source. The specific source of barium at the FMSS is not known, but it may be derived from local impacted fill material, as indicated above. Currently, Lodi Brook offers little natural habitat; except for a small reach in the northeastern portion of the FMSS, the remainder of the brook is culverted and flows underground before it ultimately discharges into the Saddle River.

Westerly Brook

The maximum detected concentrations of barium (242 µg/L), manganese (3,730 µg/L), and silver (59.4 µg/L) in surface water were detected at sample location WB-3. The maximum detected concentrations of boron (218 µg/L) and lithium (642 µg/L) were detected at sampling location WB-1. All of the five samples had barium, boron, lithium and silver concentrations that exceed the benchmarks. However, the concentrations of these from the more upstream locations were lower than the maximum detected concentrations, indicating the potential for downstream sources.

Former Retention Ponds A and C were identified in the GWRI Report (USACE 2005) as probable sources of lithium in the overburden aquifer, and are the likely sources of lithium in the bedrock aquifer. Former Retention Ponds D and E, which contained process waste that was excavated and placed in the NRC Burial Pits during the 1960s, are also a possible source of lithium. The specific sources of barium and silver are not known, but barium and silver may be derived from local impacted fill material, as indicated above.

Lithium does not occur in its free form in nature, but combines with other materials to form various lithium compounds. Lithium carbonate (Li_2CO_3) and lithium phosphate (Li_3PO_4) are relatively stable, non-flammable materials. Their low solubility in water makes them relatively benign to the environment (DOE 2000). Since lithium concentrations in surface water in Westerly Brook are high relative to the surface water benchmark of 14 µg/L, the lithium in surface water is most likely not in the form of Li_2CO_3 or Li_3PO_4. It more likely occurs in the form of one of the more soluble lithium compounds, such as lithium chloride (LiCl). Lithium chloride is a relatively stable, non-flammable material that is readily soluble in water. Aqueous solutions of LiCl can be corrosive to steel over time, and LiCl-contaminated water can be damaging to aquatic and plant life. Considering this, and the elevated concentrations of lithium in surface water relative to the surface water benchmark, lithium may present a risk to organisms inhabiting Westerly Brook. Currently, Westerly Book offers little natural habitat; the brook is culverted from just north of the MISS to approximately 500 feet upstream of a small pond immediately east of the Saddle River.

Saddle River

The maximum detected concentrations of barium (125 µg/L), boron (209 µg/L), and lithium (631 µg/L) in surface water were found at sampling locations SR-7, SR-3, and SR-3, respectively. All five of the surface water samples had barium and boron concentrations that exceed the benchmark. Two of the five surface water samples had lithium concentrations that exceed the benchmark. However, the minimum detected concentrations of these constituents were from the most upstream location (SR-2) and the concentration ranges for barium (112-125 µg/L) and boron (152-209 µg/L) are relatively narrow. The barium and boron concentrations, therefore, may be consistent with more upstream water quality such that they could be eliminated from further consideration as constituents of potential ecological concern. The maximum detected lithium concentration is about 100-fold greater than the minimum detected concentration, indicating the FMSS as a possible source.

Since SR-2 is located adjacent to the discharge of Westerly Brook into the Saddle River, Westerly Brook or the groundwater in its vicinity may be a source of lithium to the river. The specific source of barium at the FMSS is not known, but it may be derived from local impacted fill material, as described above.

Considering the properties of lithium discussed above, and the high concentrations of lithium in surface water relative to the surface water benchmark, lithium may present a risk to wildlife inhabiting the Saddle River.

The Saddle River flows through a densely populated, urbanized and industrialized region, with water quality in the vicinity of the FMSS reflective of numerous point sources, significant non-point source contributions, and high sediment oxygen demands. Water quality in the vicinity of Lodi, NJ is considered poor and, based on investigations of the macroinvertebrate communities, the biological health varies from healthy (non-impaired) in the upper half, to moderately impaired in the lower portions, to severely impacted in the lowest end.

Coles Brook

The maximum detected concentrations of barium (152 µg/L) and boron (54.4 µg/L) in surface water were found at sample locations CB-5 and CB-2, respectively. Three of the five surface water samples had barium concentrations that exceed the benchmark. All of the four surface water samples had boron concentrations that exceed the benchmark. However, the minimum detected concentrations of these constituents were from the most upstream sample (CB-1) and were more than 10-fold lower than the more downstream concentrations, indicating the potential for downstream sources.

In sediment, the maximum detected concentration of lead (304 mg/kg) was found at sample location CB-3. Two of the five sediment samples had lead concentrations that exceed the benchmark. However, only sample CB-3 showed an elevated concentration relative to that in the other four samples (20.2-40.2 mg/kg), indicating the potential for localized source.

The specific source of lead in the Coles Brook sediment samples is unknown, but may be derived from runoff of adjacent roads, railroad tracks and commercial properties. The specific source of barium at the FMSS is not known, but it may be derived from local impacted fill material, as described above.

In conclusion:

- There is adequate information to conclude that site-related ecological risks are negligible with respect to the radiological constituents and, therefore, there is no need for remediation on the basis of ecological risk.
- There is adequate information to conclude that site-related ecological risks are negligible with respect to the other inorganic constituents and, therefore, there is no need for remediation on the basis of ecological risk. Some of these constituents may be derived from off-site, non-FUSRAP sources and may reflect upstream surface water/sediment quality. Currently, Lodi Brook and

Westerly Brook are predominantly culverted and offer little natural habitat. Coles Brook does not appear to have been impacted by the site.

- There is a potential for adverse site-related ecological effects from lithium, and a more thorough assessment (e.g., environmental chemistry, fate and transport processes, etc.) may be warranted.

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1.0 INTRODUCTION

This groundwater baseline risk assessment (BRA) was prepared for the U.S. Army Corps of Engineers (USACE); submitted by Shaw Environmental, Inc. (Shaw) formally Stone & Webster, Inc., A Shaw Group Company; and prepared by Malcolm Pirnie, Inc. The purpose of this baseline risk assessment is to present an evaluation of potential human health and ecological risks associated with radiological and chemical constituents detected in groundwater, surface water, and sediment at the Formerly Utilized Sites Remedial Action Program (FUSRAP) Maywood Superfund Site (FMSS) located in Bergen County, NJ. The baseline risk assessment is comprised of a quantitative human health evaluation conducted in conformance with the draft *Pathway Analysis Report* (USACE 2003c) approved by the U.S. Environmental Protection Agency (EPA), Region II and a screening-level ecological risk assessment (SLERA). It is based on selected data from the Groundwater Remedial Investigation (GWRI) conducted at the FMSS (USACE 2005).

The *Groundwater Remedial Investigation Work Plan* (USACE 2000b) proposed two phases of office and field activities to perform an environmental characterization of groundwater at the FMSS, which is shown on **Figure 1-1**. It also established the GWRI Study Area as shown on **Figure 1-2**. The first phase (Phase I) of the GWRI included the:

- Review of previous investigations and local history from an industrial use perspective;
- Collection and laboratory analyses of soil and groundwater samples from Geoprobes® and existing monitoring wells;
- Measurement of groundwater levels;
- The performance of a limited surface and borehole geophysical survey;
- The performance of *in-situ* permeability tests; and
- The video-inspection of the culverted sections of two brooks located within and in the vicinity of the FMSS.

The information gathered during Phase I was used to evaluate the nature and extent of contamination and to refine the second phase (Phase II) proposed in the GWRI Work Plan. The *Phase I Interim Groundwater Remedial Investigation Report* (USACE 2000c) and the *Phase I Groundwater Data Report Addendum* (USACE 2001) document the findings of the Phase I investigation.

Phase II of the GWRI included the:

- Review of more recent environmental reports prepared for vicinity properties;
- Collection and laboratory analyses of groundwater samples from existing and newly installed monitoring wells and surface water and sediment samples;
- Performance of aquifer tests and a borehole geophysical survey using newly installed wells; and
- Measurement of groundwater and surface water levels.

The *Groundwater Remedial Investigation Report* (GWRI Report) (USACE 2005) documents the findings of both phases of the investigation. Following submission of preliminary GWRI results to the EPA, the USACE was directed to further investigate the source and downgradient extent of a bedrock benzene plume. From August 2002 to June 2003, the RI Addendum was completed following the RI Addendum Work Plan. The scope of work for the RI Addendum included installation of source area and downgradient bedrock monitoring wells, permeability testing and borehole geophysical logging of newly installed wells, water level measurements, and a new round of groundwater sampling for volatile organic compounds (VOCs). The results of the RI Addendum work are also included in the GWRI Report (USACE 2005).

The objectives of this baseline risk assessment are to:

- Provide an analysis of potential health risks, currently and in the future, in the absence of any major action to control or mitigate contamination (i.e., baseline risks); and
- Assist in determining the need for and extent of remediation.

In addition, the baseline risk assessment provides a basis for comparing a variety of remedial alternatives and determining which will be most protective of human health and the environment.

The human health evaluation follows guidance outlined in the EPA's *Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part A)* (EPA 1989a) and (*Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments*) (EPA 2001) and other EPA guidance cited throughout the evaluation. The SLERA follows the EPA's *Guidelines for Ecological Risk Assessment* (EPA 1998) and other EPA guidance cited throughout the assessment.

The baseline risk assessment addresses:

- All radiological and chemical constituents detected in groundwater from the GWRI Study Area during Phase II of the GWRI, except for chlorinated solvent compounds from select monitoring wells attributed to a site (Dixo Company) located just north of the GWRI Study Area (as shown on **Figure 1-1** and described subsequently in Sections 1.2.3 and 2.2.1), and
- All radiological and chemical constituents detected in surface water and sediment from the GWRI Study Area during Phase II of the GWRI.

The remainder of this section presents:

- A brief overview of the location and history of the FMSS;
- A summary of environmental activities at the FMSS;
- Descriptions of the setting, key physical attributes, and surrounding land uses; and
- The demographics of the FMSS locale.

Most of the information was excerpted from the GWRI Report (USACE 2005); more detailed descriptions and discussions of this information are presented in that report. Section 2.0 presents the evaluation of potential human health risks and Section 3.0 presents the SLERA. Section 4.0 presents the references cited throughout this report.

1.1 SITE BACKGROUND

The FMSS is located in a highly developed area of Bergen County in northeastern New Jersey, in the Boroughs of Maywood and Lodi and the Township of Rochelle Park. The FMSS consists of the federally-owned Maywood Interim Storage Site (MISS), the Stepan property, the Sears and immediately adjacent properties, a number of nearby commercial/government properties, and numerous private residences and township and county streets (**Figure 1-1**).

Portions of the FMSS are radiologically impacted from process wastes and residues generated by the Maywood Chemical Works (MCW) from 1916 to 1956 during the recovery and refining of thorium and thorium compounds from monazite ores. The thorium concentrate was used in industrial products such as mantles for gas lanterns. The residues or tailings from the process operation contained low-level radioactive materials. Other processing operations at the MCW involved lithium compounds, detergents, alkaloids, essential oils, and products from tea and cocoa leaves. The MCW pumped process wastes to retention ponds constructed to the west of the plant. Some of the waste materials were excavated and used as fill and mulch for nearby properties in Maywood, Rochelle Park, and Lodi. Waste materials were also transported via the old Lodi Brook stream channel (later replaced by a storm water drain system) into Lodi. These activities resulted in the deposition of MCW waste materials over much of the local area.

Stepan Chemical Company, now the Stepan Company, bought the MCW in 1959 and currently owns a portion of the original MCW property. Stepan produces specialty chemicals such as esters, lubricants, food ingredients, and other specialty products.

Between 1963 and 1968, Stepan undertook several cleanup actions. Contaminated material from west of Route 17 in Rochelle Park and on-site building rubble and debris were buried on portions of the Stepan property. Subsequent to these actions, areas west of Stepan were thought not to pose radiological concerns because the Atomic Energy Commission (AEC) released the areas for unrestricted use. However, in 1980, radiological contamination was discovered immediately west of Route 17 on the Ballod property (the former location of the retention ponds west of Route 17), which was formerly owned by Stepan. Radiological testing conducted by the State of New Jersey, the EPA, and the U.S. Department of Energy (DOE) from 1980 to 1983 revealed extensive radiological contamination at several locations. Based on the results of these investigations, the Maywood Site was included on the National Priorities List (NPL) in 1983. From 1984 through 1986, the DOE investigated and removed over 35,000 cubic yards of soil and debris from the Ballod property and 25 residential properties in Maywood, Lodi, and Rochelle Park. This material was stockpiled and secured at the MISS, which was acquired by the DOE in September 1985. The MISS is located on 11.7 acres of land previously owned by Stepan and abuts the Stepan property to the northwest.

In 1986, in conjunction with the DOE's radiological characterization of the Sears and adjacent properties, the EPA performed a preliminary study of non-radioactive chemical constituents. In late 1987 through the spring of 1988, in conjunction with the DOE's studies and investigations, the EPA collected "split" samples of soil and groundwater on the Stepan property. The analytical results indicated the presence of radiological constituents in soil and non-radiological constituents in soil and groundwater. In 1991, the EPA and the DOE signed a Federal Facilities Agreement (FFA) that detailed the cleanup responsibilities for the FUSRAP waste at the FMSS. According to the FFA,

> "FUSRAP waste shall mean and be specifically limited to:
>
> all contamination, both radiological and chemical, whether commingled or not, on the MISS and all radiological contamination above DOE's action levels related to past thorium processing at the Maywood Chemical Works site occurring on any Vicinity Properties. Also included is any chemical or non-radiological contamination on Vicinity Properties that would satisfy either of the following requirements.
>
> (1) The chemical or non-radiological contaminants are mixed or commingled with radiological contamination above DOE's action levels; or

(2) The chemical or non-radiological contaminants originated in the MISS or were associated with the specific thorium manufacturing or processing activities at the Maywood Chemical Works site which resulted in the radiological contamination."

As indicated previously, this baseline risk assessment addresses radiological and chemical constituents detected in groundwater, surface water, and sediment during the GWRI except for the chlorinated solvent compounds in groundwater attributed to a site located just north of the GWRI Study Area, as described below. Analysis of the groundwater data indicates that this contamination originates from the Dixo Company site, not from the MISS, and does not meet the definition of FUSRAP waste.

Baseline risks for exposure to soil, and preliminary baseline risks for exposure to groundwater, surface water, and sediment, were evaluated in the DOE's baseline risk assessment for the Maywood Site (DOE 1993). The baseline risks for soil were included in the EPA's Record of Decision for soil contamination at the FMSS. Soil cleanup activities on portions of the FMSS (i.e., the residential properties, municipal properties, and the interim storage pile previously located at the MISS) have been completed. However, the need, if any, for remedial actions for groundwater, surface water, and sediment at the FMSS will be addressed based on the GWRI and this baseline risk assessment.

1.2 PREVIOUS INVESTIGATIONS

1.2.1 FMSS

Bechtel National Inc. (BNI) conducted radiological surveys throughout the FMSS from 1984 through 1987. BNI then conducted a Remedial Investigation (BNI RI) at the 'Maywood Site' from 1989 through 1991, resulting in the *Remedial Investigation Report for the Maywood Site, New Jersey* (DOE 1992). The BNI RI covered the MISS, the Stepan property, eight residential properties, and five commercial/government properties that were defined as operable units by the DOE.

At the MISS, the focus was radiological and chemical contamination, and potential pathways for chemical migration. The analytical results indicated the presence of metals and rare earth elements at elevated concentrations (i.e., either above applicable criteria or above background levels). VOCs, predominantly tetrachloroethylene, trichloroethene, dichloroethenes, and vinyl chloride, were detected in the groundwater at concentrations above existing Federal Safe Drinking Water Act Maximum Contaminant Levels (MCLs). The source of the VOC contamination in the groundwater was not determined.

At the Stepan property, the focus was radiological contamination and the potential for hazardous waste mixed with radiological waste. The BNI RI determined that surface and subsurface soils at the Stepan property were contaminated with radioactive materials. Elevated radiological contamination was present in the vicinity of Burial Pits 1, 2, and 3 (DOE 1992, CH2M Hill 1994a, and USACE 2000b), in areas where thorium-processing operations were conducted, and where process residues were used as fill material in low-lying areas.

At the residential properties, the focus was radiological contamination. Radiological contamination was present in both surface and subsurface soils on the residential properties investigated. It was concluded that subsurface contamination resulted from sediment deposition in the former channel of Lodi Brook or its floodplain in all but two areas. At these two locations, contaminated building materials were manually transported to the properties.

At the commercial/government properties, the focus was radiological contamination, and the potential presence of chemical constituents associated with thorium processing. Limited radiological contamination was detected in surface and subsurface soils on these properties.

The BNI RI Report concluded that the nature and extent of groundwater contamination was incomplete. Additional delineation activities were proposed, along with the completion of a baseline risk assessment, and a more detailed radiological survey of the Stepan buildings.

1.2.2 Stepan Property

Although located within the FMSS, a separate Remedial Investigation/Feasibility Study (RI/FS) is ongoing at the Stepan property. The November 1994 Final Remedial Investigation Report, prepared on behalf of Stepan (CH2M Hill 1994a) for submission to the EPA under Administrative Order (Index No. II – CERCLA – 10105), documents the presence of:

- Elevated levels of benzene in soils and groundwater,
- Buried containers containing organic residues and aromatic hydrocarbons, ketones, or chlorinated solvents on the Sears property,
- Chlorinated hydrocarbons in the bedrock groundwater, and
- Elevated radiological readings in soil samples collected throughout the study area and in unfiltered groundwater samples.

During a subsequent Focused Investigation (CH2M Hill 1994b), 13 test pits were dug near the southwest corner of the Stepan property to further delineate the general horizontal and vertical extent of buried tanned leather hides. Samples of raw products or filter cakes associated with the former leather processing operation were found to contain elevated total chromium concentrations. In addition, a June 1995 investigation by the New Jersey Department of Environmental Protection (NJDEP) found floor drains from the protein extraction building draining into a storm sewer manhole leading to Lodi Brook. Surface runoff from the tanned leather hide storage area was also found to drain into that manhole.

A Groundwater Remediation Pilot Test Report (CH2M Hill 1998) documented the presence of three separate BTEX (i.e., benzene, toluene, ethylbenzene, xylenes) plumes in the groundwater beneath the Stepan property. The first plume is located at the former Aromatic and Essential Oils Manufacturing Area (Aromatics Area). Samples collected from the Aromatics Area plume contained more than 30,000 parts per billion (ppb) total BTEX, consisting primarily of benzene, in the overburden groundwater. The second plume is located approximately 100 feet northwest of the Aromatics Area plume. Total BTEX concentrations of up to 150,000 ppb were detected in the overburden groundwater near a concrete subsurface structure that was identified during the pilot test. Significant concentrations of BTEX compounds were identified in the liquid and sludge contained within the structure. The third plume is located at the former Central Tank Farm Area. Total BTEX concentrations of up to 7,400 ppb and 5,700 ppb have been detected in the bedrock and overburden groundwater, respectively.

The GWRI Report (USACE 2005) indicates that the presence of the benzene plumes is significant considering that elevated benzene concentrations have been detected in numerous samples collected from monitoring wells located on the MISS. However, neither the interrelationship of the three plumes nor the geometry of the plumes have been completely defined, although it appears that the Stepan BTEX plumes are distinct from the benzene plume within the MISS.

Stepan discharges approximately 2.4 million gallons per day (MGD) of non-contact cooling water, scrubber water, cooling water, cooling tower blow down, and storm water to Lodi Brook. In addition, several spills occurred at Stepan and were noted as being discharged into Lodi Brook. During on-site NJDEP investigations, observations were made of waste product being washed down the storm sewer leading to Lodi Brook.

1.2.3 Dixo Company

Dixo Company (Dixo), which is involved in the packaging of industrial adhesives, is located north of the FMSS at 158 West Central Avenue, Rochelle Park. A preliminary assessment and investigation report prepared by the NJDEP (1998a) stated that Dixo is a primary source of tetrachloroethene contamination in area groundwater. A 5,000-gallon above ground tetrachloroethene storage tank was formerly located at the facility. As stated in the NJDEP report, the highest concentrations of tetrachloroethene (830 parts per million [ppm]) and trichloroethene (120 ppm) in soil were detected from a soil sample collected adjacent to the 5,000-gallon above-ground tetrachloroethene storage tank. Similarly, the highest concentrations of tetrachloroethene (140,000 ppb), 1,1-dichloroethene (69,000 ppb), and trichloroethene (20,000 ppb) in groundwater were detected in samples collected from Geoprobe® borings adjacent to the 5,000-gallon above-ground tetrachloroethene storage tank.

The NJDEP report (1998a) states that, sample results confirm a release of tetrachloroethene to groundwater at the location of a 5,000-gallon above ground storage tank, which previously held tetrachloroethene. Significant levels of contamination adjacent to and downgradient from the tank implicate Dixo as a primary source of contamination for the Rochelle Park Swim Club well (located 2,000 feet hydraulically downgradient; adjacent to the Saddle River) and, possibly, for the West Magnolia Avenue wells to the northeast. The report also states that a storm sewer catch basin located in the facility's parking lot discharges to Westerly Brook.

A remedial investigation report prepared by Dixo in September 2002 (NJDEP 2002a) presented the results of soil and groundwater sampling conducted at the 158 West Central Avenue property. High concentrations of tetrachloroethene (and other solvents) were detected in overburden (75,000 ppb) and bedrock wells (20,000 ppb) on the Dixo site. The high concentrations of chlorinated solvent detected in overburden and bedrock groundwater on that property is a potential source of solvent detected in wells on the FMSS (USACE 2005).

The GWRI (USACE 2005) found elevated concentrations of tetrachloroethene, trichloroethene, and dichloroethenes in overburden and bedrock groundwater samples collected in the GWRI Study Area downgradient of the Dixo site. Since the plotted plumes for these constituents are not derived from the MISS, these constituents are not considered FUSRAP waste. As a result, and as discussed further in Section 2.2.1, tetrachloroethene, trichloroethene, 1,1-dichloroethene, 1,2-dichloroethene, and vinyl chloride data from monitoring wells within these plumes were omitted from the baseline risk assessment.

1.3 PHYSICAL CHARACTERISTICS OF THE FMSS

The following is a general description of the physical characteristics of the FMSS. More detailed information is provided in the GWRI Report (USACE 2005).

1.3.1 Surface Features

The topographic surface of the FMSS ranges from an approximate high of 75 feet above mean sea level (MSL) to a low of approximately 28 feet above MSL. The land generally slopes toward the southeast, with the exception of a prominent north-south trending ridge located along the western boundary in Rochelle Park. The FMSS reaches maximum elevations of 75 feet above MSL along the ridge and northeast site boundary, along Hunter Avenue. The lowest point (28 feet above MSL) is located at the southwest FMSS boundary; near well cluster MW-17 in Lodi. In the northern half of the FMSS (North of Essex Street), the land slopes southwest and east to wetlands on the Sears property. The wetlands form the headwaters for Lodi Brook, which flows southwest through the FMSS to the Saddle River in Lodi.

1.3.2 Meteorology / Climate

The National Weather Service has characterized climatological conditions at Newark International Airport, which is located approximately 20 miles south of the FMSS. The climate in the region is humid and is typified by moist, warm summers and moderately cold winters with wind of moderate velocity. Prevailing winds in the area are from the southwest, with only slight seasonal variations in direction, and are affected primarily by the influence of the Atlantic Ocean and the topography of the surrounding area.

The mean annual temperature measured at Newark International Airport is 54.6º Fahrenheit (ºF). The maximum and minimum mean monthly temperatures are 77.3ºF (July) and 31.7ºF (January), respectively. The average annual precipitation is 43.47 inches. Monthly precipitation averages range from about 3.0 inches in February to about 4.5 inches in July.

1.3.3 Geology

Boring data show that five stratigraphic units are present in most areas of the FMSS. The logged units include fill, sand, upper undifferentiated unit, gravel, and lower undifferentiated unit. Thin, discontinuous layers of peat/meadow mat deposits were also encountered, but were not included as a stratigraphic unit due to their limited extent. The lower undifferentiated unit overlies bedrock in most site areas, and is locally absent. The lower undifferentiated unit is an unsorted mixture of dense till, weathered rock fragments and gravel, sand, silt, and clay. The lower undifferentiated unit is distinguished from the upper undifferentiated unit by the presence of dense till and/or coarse bedrock fragments and gravel. The lower undifferentiated unit reaches a maximum thickness of 12 feet, however, it is generally less than 5 feet thick in most locations.

The gravel unit overlies the lower undifferentiated unit at most locations and consists of a fine gravel and medium to coarse sand. The gravel is generally poor to moderately well sorted, and contains bedrock fragments. The gravel unit is frequently absent in borings, where the upper undifferentiated unit, or less commonly, the sand unit, lie directly on the lower undifferentiated unit or bedrock. The gravel unit reaches a maximum thickness of 16.0 feet at well MW-16D in Lodi.

The upper undifferentiated unit overlies gravel at most locations and consists of unsorted mixtures of silt, sand, clayey-sands, and clayey gravel. The upper undifferentiated unit reaches a maximum 12 feet thickness at well MW-14D in Lodi. The sand unit is laterally extensive and overlies the upper undifferentiated unit. The sand unit consists of fine-medium sand and gravel, and reaches a maximum thickness of 13 feet at well MW-16D.

Fill overlies the sand unit, and is encountered at most locations in the FMSS. The fill is highly variable in composition, and consists of clay, sand, and gravel with brick fragments, black to blue-gray to white mottled “clayey” material (encountered in MISS area), concrete chips, wood chips, and other miscellaneous materials. Fill deposits are thickest in the area of former retention ponds located on the MISS.

Overall, overburden in the FMSS reaches a maximum thickness of 36 feet at well MW-16D, which is located at the southern extent of the FMSS.

Bedrock beneath the FMSS consists of alternating beds of red brown sandstone, siltstone and shales. The uppermost zone of bedrock beneath the FMSS is highly weathered with primarily horizontal bedding planes and joints, many of which appear partially healed with calcite. The bedrock appears to be systemically fractured with widely spaced (discrete) fracture zones.

Depressions in the bedrock surface are noted at the Lodi Brook headwaters on the Sears property, and along the trace of Lodi Brook in Lodi. Depressions are also observed along the trace of Westerly Brook in Rochelle Park. These features, and resultant drainages, may have formed due to differential erosion of soft rock units or bedrock structures (i.e., fractures, folds). The thickest overburden deposits are mapped in these areas and are probably of fluvial origin.

1.3.4 Hydrogeological Characteristics

Groundwater elevation contours in the unconsolidated (overburden) aquifer and the shallow bedrock aquifer closely follow the surface topography, and are under unconfined, or water table conditions. The overburden and bedrock groundwater flow varies from northwest to south on the FMSS, with local MISS groundwater flow varying from northwest to southwest toward the Saddle River. The overburden aquifer discharges into Lodi Brook and the Saddle River, whereas the shallow bedrock aquifer probably discharges into the Saddle River. Overburden and bedrock groundwater contours are shown in **Figures 1-3** and **1-4**, respectively.

Water level data collected during Phase II of the GWRI indicated that the water table was encountered as shallow as 0.9 feet bgs and as deep as 24.49 feet bgs; the average depth to groundwater was about 10 feet bgs. Seasonal fluctuations (minimum/maximum of 13 quarterly rounds) of overburden wells ranged from 1 to 6.86 feet during the year. Seasonal fluctuations within the shallow bedrock aquifer ranged from 1.81 to 6.60 feet.

The overburden aquifer is absent in a large portion of the FMSS, where the aquifer pinches out against shallow bedrock. The aerial extent of the zone of saturated overburden deposits at the FMSS fluctuates seasonally, and may be seasonal or transient in thin aquifer areas.

Historical overburden and bedrock well cluster elevation data were compared to identify vertical groundwater gradients on the FMSS. A substantial number of cluster locations (18) show consistent vertical gradients over time. Most cluster locations on the MISS show a consistent downward gradient from the overburden to bedrock aquifer. Other clusters located further downgradient in Rochelle Park and Lodi show a net upward gradient from bedrock to overburden aquifer.

1.3.5 Groundwater Use

The NJDEP classifies both overburden and bedrock groundwater underlying the FMSS as Class II-A (NJAC 7:9-6). The primary designated use of Class II-A groundwater is potable water and conversion (through conventional water supply treatment, mixing or other similar technique) to potable water. Secondary designated uses include agricultural water and industrial water.

A well search involving a file search of the NJDEP Bureau of Water Resources database was conducted to locate wells in the vicinity of the FMSS. An inventory of all permitted wells and soil borings located within a 0.5-mile radius of the FMSS boundary was compiled based on three searches centered on the MISS, the Scanel property, and the New Jersey Motor Vehicle Commission. The results of this well search, shown on **Figure 1-5**, indicate the approximate locations of wells classified as potable supply, domestic, and industrial use. As to be expected in a developed area, most of the permits are for monitoring wells, piezometers, and soil borings for environmental investigation activities. Other permits are for gas vents and oil/gas exploration. The results of this well search were reviewed to identify, locate, and characterize any wells supplying water for domestic, commercial, public (i.e., hospitals and schools), industrial, or municipal use in the vicinity of the FMSS. The results indicate that there are:

- Two public supply wells with total depths of 403 and 470 feet;

- Ten domestic wells ranging in depth from 75 to 300 feet; and
- Fourteen industrial wells ranging in depth from 20 to 435 feet.

A second well search of all wells with water purveyor and allocation permits (withdrawals greater than 100,000 gallons per day) within a 5-mile radius was compiled based on a search centered on the MISS. While this second well search was conducted for a 5-mile radius around the MISS, NJAC 7:26-3.7 requires only a 1-mile radius search. Therefore, three circles with a 1-mile radius were drawn centered on the MISS, the Scanel property, and the New Jersey Motor Vehicle Commission to capture those wells identified in and around the FMSS boundary. The results on **Figure 1-6** show approximate locations of the wells identified and indicate that there are three water purveyor and allocation permits within and around the FMSS. The "well" identified as 4041PS is actually a surface water intake on the Saddle River used by Stepan.

There are no municipal water supply intakes in surface waters within 1 mile of the FMSS. Stepan draws water from the Saddle River approximately 0.5 miles downgradient (to the west) of the MISS, for non-contact cooling purposes.

Rochelle Park and Maywood obtain potable water from United Water New Jersey, which draws water from reservoirs located on the upper or fresh water portion of the Hackensack River. Lodi obtains potable water from the Passaic Valley Water Commission, which draws water from diversions on the Passaic and Pompton Rivers. From time to time, Lodi also receives water from interconnections with United Water New Jersey. Both utilities treat, filter, and disinfect the surface waters prior to final release to their customers.

1.3.6 Surface Waters

Surface waters in the vicinity of the FMSS include the Saddle River, Lodi Brook, Westerly Brook, and Coles Brook. Portions of the Saddle River are located west-southwest (downstream) of the FMSS and run southwest. As indicated above, there is a surface water intake on the Saddle River downstream (within 1 mile) of the FMSS for industrial usage. The entire length of Lodi Brook and most of Westerly Brook, tributaries of the Saddle River, have been routed through culverts under the streets. Historical aerial photographs indicate that the Lodi Brook headwaters used to begin within the MCW property. The aboveground portion of Westerly Brook consists of a section approximately 500 feet in length, immediately prior to its confluence with the Saddle River. A video inspection survey on portions of the culverted Westerly Brook and Lodi Brook was completed in January 2000. Portions of the culverts are located below the groundwater table and in some locations on top of the bedrock. The integrity survey of the culverts revealed significant infiltration of groundwater into the culverts through cracks and joints. During dry periods when the groundwater table drops below the culvert invert elevation in some locations, water flow within the culvert may exfiltrate into the environment through these same cracks and joints.

Coles Brook, a tributary of the Hackensack River, is located southeast of the MISS and runs northeast; its headwaters begin adjacent to a vicinity property (Scanel) with detected FUSRAP waste contamination. There are no surface water intakes in Coles Brook; however, Coles Brook eventually runs into (approximately 2 miles downstream) the Hackensack River where there are surface water intakes.

1.4 LAND USE AND DEMOGRAPHY

As indicated previously, the FMSS is located in a suburban residential, commercial, and industrial area, encompassing the Boroughs of Maywood and Lodi and the Township of Rochelle Park. Based on U.S.

Census information for the year 2000, the populations of Maywood, Lodi, and Rochelle Park are 9,523, 23,971, and 5,528, respectively (see **Table 1-1**).

These populations represent changes from 1980 of -3.8%, +0.1%, and -1.3%, respectively, and changes from 1960 of -16.9%, +1.2%, and -9.7%, respectively. The total population decline/increase for the three communities combined from 1980 is -1.1% and from 1960 is -5.0%. Therefore, it can be assumed that the population in the vicinity of the FMSS is not expected to change dramatically in the future. The age breakdown of the year 2000 populations is presented in **Table 1-2**.

2.0 HUMAN HEALTH EVALUATION

This section presents an evaluation of potential human health risks associated with radiological and chemical constituents detected at the FMSS. The evaluation is described below and presented in the series of tables that comprise the EPA's Risk Assessment Guidance for Superfund (RAGS Part D) (EPA 2001e) format. These tables are provided in Appendix A. Identification information for the FMSS is presented in Appendix A, Table 0. The conceptual site model that provides the basis for this human health evaluation is presented in tabular form in Appendix A, Table 1 and in graphical form in **Figure 2-1**.

2.1 OVERVIEW

The human health evaluation follows the four-step process typically used to assess potential human health risks. This process is illustrated in **Figure 2-2** and described below.

Data Evaluation

Relevant site data are compiled and analyzed to determine the usability of the data and to select constituents (i.e., radionuclides and chemicals) of potential concern (COPCs) that are representative of the contamination detected at the FMSS.

Exposure Assessment

Actual and/or potential radionuclide and chemical release and transport mechanisms are identified, potentially exposed human populations and possible exposure pathways and routes of exposure are described, concentrations of the COPCs at potential points of human exposure are determined, and human exposures to the COPCs are estimated.

Toxicity Assessment

Quantitative and/or qualitative toxicity data for each COPC are summarized and toxicological criteria with which to characterize risks are identified.

Risk Characterization

The likelihood and magnitude of adverse health risks, in the form of non-cancer HQs and excess lifetime cancer risks, are estimated. Sources of uncertainty in the evaluation are then noted and discussed.

2.2 DATA EVALUATION

The data evaluation focuses on the compilation of usable radiological and chemical data and the selection of COPCs. Radiological and chemical data used to evaluate the potential exposure pathways presented in Appendix A, Table 1 were those data collected from monitoring wells and surface water and sediment locations during Phase II of the GWRI. Other environmental data, such as water quality parameters (e.g., sulfate) not directly used in the human health evaluation are excluded from the following discussion. While the groundwater, surface water, and sediment data sets are presented and discussed in the GWRI Report (USACE 2005), data summary tables, organized to facilitate the data evaluation, are presented in Appendix A, Tables 2.1 through 2.10 and discussed below. These tables also present the criteria (e.g., screening toxicity values and frequency of detection) used to select COPCs. This process, described below, identifies those COPCs that, if contacted, may pose potential risks to human health.

The quality assurance/quality control program for the GWRI was performed in compliance with the *Chemical Data Quality Management Plan* (USACE 2000a) and the *Groundwater Remedial Investigation Work Plan* (USACE 2000b). Field quality control samples collected during sampling included trip blanks, equipment rinseate/field blanks, confirmation samples (radiological), and U.S. Army Corps of Engineers (USACE) replicates.

Radiological analyses were performed by Eberline Services, Oak Ridge Laboratory (formerly ThermoRetec Laboratory) of Oak Ridge, TN. Chemical analyses were performed by LVLI Lionville Laboratory Inc. (formerly RCRA) of Exton, Pa. and STL Laboratories of Shelton, Connecticut. Data validation was performed in accordance with the USACE's *CENWK-EC-EF Data Quality Evaluation Guidance* (USACE 1999) and the EPA, Region II Data Validation Procedures, as presented in the GWRI Report (USACE 2005).

The Data Useability Worksheet was completed in accordance with RAGS Part D, to record and identify data quality issues that relate to data useability for risk assessment. The Data Useability Worksheet is presented in Appendix A.

The decision process for the selection of COPCs in groundwater, surface water and sediment is described below. All chemicals designated by the EPA as Class A human carcinogens, including all radionuclides, were selected as COPCs, regardless of the other selection criteria. The essential nutrients (i.e., calcium, magnesium, potassium, and sodium) were categorically eliminated as COPCs.

For groundwater, chemical data from the overburden and bedrock monitoring wells were screened against the EPA, Region IX Preliminary Remediation Goals (PRGs) for tap water (EPA, ed). Consistent with EPA Region II guidance, PRGs based on non-cancer health effects were reduced by one-tenth to represent a target hazard quotient (THQ) of 0.1. Radionuclide data from the overburden and bedrock monitoring wells were screened against EPA PRGs for radionuclides (EPA 2001b). Constituents with maximum concentrations greater than these risk-based criteria were selected as COPCs in groundwater.

In addition, VOC data for the overburden monitoring wells were screened against groundwater screening levels provided in the EPA's *Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)* (EPA 2002a). The groundwater screening levels for scenario-specific vapor attenuation factors provided in Table 3c-GW of the guidance, using a target cancer risk level of 10^{-6} and an attenuation factor of $7x10^{-4}$ were used. However, as with the Region IX PRGs, those screening levels based on non-cancer health effects were reduced by one-tenth to represent a THQ of 0.1. The attenuation factor of $7x10^{-4}$ was selected from Figure 3b of the guidance under the conservative assumptions that the overburden is sand, the depth to groundwater is 10 feet, and buildings include basements. Constituents with maximum concentrations greater than these risk-based criteria were selected as COPCs in overburden groundwater.

Risk-based criteria for human exposure via direct contact with surface water and sediment do not exist. Therefore, with the exception of the essential nutrients, all radionuclides and chemicals detected in surface water were selected as COPCs. At the direction of the EPA, Region II, chemical data for sediment were screened against the EPA, Region IX PRGs for residential soil (EPA 2002d). Consistent with EPA Region II guidance, PRGs based on non-cancer health effects were reduced by one-tenth to represent a THQ of 0.1. Constituents with maximum concentrations greater than these risk-based criteria were selected as COPCs in sediment.

Finally, following EPA guidance (EPA 1989a), for sample sizes greater than or equal to 20, if the detection frequency of a constituent was less than 5% and the constituent was not considered to be site-related, was detected infrequently in one or two media, and/or was not detected or not detected at high concentrations in other media, it was eliminated as a COPC.

A number of detected constituents do not have PRGs or groundwater screening levels. With few exceptions, constituents without PRGs or groundwater screening levels were retained as COPCs. Only where they were detected at low frequencies were such constituents eliminated as COPCs.

Plate 1 is a sample location map for groundwater and Plate 2 is a sample location map for surface water and sediment. Figures depicting the distribution of the constituents detected in the groundwater, surface water, and sediment are presented in the GWRI Report (USACE 2005).

COPCs for groundwater, surface water, and sediment are indicated on Appendix A, Tables 2.1 to 2.10 and summarized below.

2.2.1 Groundwater

The groundwater data set is comprised of all monitoring well data collected during Phase II of the GWRI, except as noted below. During Phase II of the GWRI, groundwater samples were collected from 55 DOE/USACE monitoring wells, Stepan monitoring wells, and newly installed monitoring wells screened in the overburden and 70 DOE/USACE monitoring wells, Stepan monitoring wells, and newly installed monitoring wells screened in the bedrock. Groundwater was analyzed for radionuclides, target analyte list (TAL) metals plus hexavalent chromium, lithium and boron, and rare earth elements. The radionuclides included thorium-232 (Th-232), radium-228 (Ra-228), and Th-228 (isotopes in the thorium series); uranium-238 (U-238), U-234, Th-230, and Ra-226 (isotopes in the uranium series); and U-235 (a minor constituent of natural uranium). Groundwater samples collected from monitoring wells located north of Essex Street in the FMSS were also analyzed for VOCs. Although analyses for gross alpha and gross beta were added to Phase II of the GWRI sampling program and reported for 54 bedrock monitoring wells, these results were not used in this evaluation since they are not radionuclide-specific.

The following data were excluded from the groundwater data set, for the reason indicated:

- Data from several shallow and deep monitoring well clusters in Lodi (MW-14, MW-15, MW-16, MW-17, MW-18) and one shallow monitoring well (MW-21S) located on the Scanel property because the locations are not hydraulically connected to the groundwater areas of concern, which all occur on the former MCW, as identified in the GWRI Report (USACE 2005). The Lodi monitoring well clusters were sampled for radionuclides, TAL metals plus lithium and boron, and rare earth elements. The monitoring well located on the Scanel property (MW-21S) was sampled for VOCs, radionuclides, TAL metals plus lithium and boron, and rare earth elements. Data from the Lodi and Scanel property monitoring wells are presented in Appendix B. These data will be discussed in the Risk Characterization, in comparison to the exposure point concentrations (EPCs) and associated risk estimates.
- Data for 1,1-dichloroethene, 1,2-dichloroethene, tetrachloroethene, trichloroethene, and vinyl chloride from select monitoring wells located north and west of the MISS. Elevated levels of tetrachloroethene, trichloroethene, and dichloroethenes were detected in groundwater on and in the vicinity of the Dixo site and in nearby downgradient overburden and bedrock wells. There are no other apparent sources for chlorinated solvents (other than the Dixo site) at these well locations. Data from select monitoring wells that were removed from the database are presented in Appendix C. The location of these monitoring wells, iso-concentration contours for the chlorinated VOCs, and related groundwater data from monitoring wells on the Dixo site are shown on figures provided in the GWRI Report (USACE 2005) and presented in Appendix C.

Certain monitoring wells were sampled more than once during Phase II of the GWRI; in these cases, the maximum detected concentration of each constituent was used. Data for field duplicates were averaged with their original sample, on a constituent-by-constituent basis, where one-half the detection limit [or the full minimum detectable activity (MDA) in the case of radionuclides, consistent with EPA (1989a) guidance] was used for non-detects. In some cases screening-level samples were collected and in some cases limited laboratory analyses were conducted (i.e., surfactants only) on a sample. These results were not used because the samples were either not collected as primary samples or were not analyzed for constituents of concern to this evaluation.

Since there is substantial vertical groundwater flow (and mixing) between the overburden and bedrock aquifer in the FMSS, data from overburden and bedrock monitoring wells were combined for selection of COPCs for the potable use exposure pathway. Groundwater quality data for all overburden and bedrock monitoring wells are summarized in Appendix A, Table 2.1. The range of detected concentrations, data qualifiers, location of the maximum detected concentration, frequency of detection, range of detection limits, concentration used for screening, screening toxicity value, COPC flag, and the rationale for deletion or selection are provided for each detected constituent. Federal drinking water MCLs are also presented, for comparison only.

Forty-two constituents were selected as COPCs in groundwater to evaluate the potable use scenario at the FMSS. These COPCs include:

- Fifteen VOCs including acetone, benzene, chlorobenzene, chloroform, 2-chlorotoluene, 4-chlorotoluene, 1,2-dichloroethane, 1,2-dichloroethene (total), ethylbenzene, 4-methyl-2-pentanone, tetrachloroethene, toluene, trichloroethene, vinyl chloride, and xylenes;
- Fourteen inorganic chemicals including aluminum, antimony, arsenic, barium, boron, cadmium, iron, lead, lithium, manganese, nickel, silver, zinc, and uranium;
- Four rare earth elements including cerium, lanthanum, neodymium, and yttrium; and
- Nine radionuclides including Ra-226, Ra-228, Th-228, Th-230, Th-232, U-234, U-235, U-238, and lead-210 (Pb-210). Although not quantified in groundwater during the GWRI, Pb-210 was included as a COPC since it is a member of the uranium series between Ra-226 and stable Pb-206, the end of the decay chain.[1]

Data for VOCs detected in overburden monitoring wells were summarized separately for selection of COPCs to evaluate potential exposure pathways involving subsurface vapor intrusion into indoor air and vapor release to outdoor air during construction activities involving excavation. Groundwater quality data for VOCs detected in all overburden monitoring wells are summarized in Appendix A, Table 2.2. The range of detected concentrations, data qualifiers, location of maximum detected concentration, frequency of detection, range of detection limits, concentration used for screening, screening toxicity value, COPC flag, and the rationale for deletion or selection are provided for each detected VOC.

Six VOCs were selected as COPCs in overburden groundwater to evaluate the potential for exposure via subsurface vapor intrusion into indoor air and release to outdoor air during construction activities involving excavation. These COPCs include benzene, 2-chlorotoluene, 4-chlorotoluene, ethylbenzene, vinyl chloride, and xylenes (total).

1 The few studies available indicate that secular equilibrium is not a normal condition in groundwater and that Pb-210 concentrations are typically less than Ra-226 concentrations. Nevertheless, conservatism in the human health evaluation process dictates that potential risks from Pb-210 be considered, particularly since it is long-lived and is not included in the cancer slope factor in the EPA HEAST Tables (EPA, 2001a) for its precursor, Ra-226 plus daughter isotopes.

2.2.2 Surface Water and Sediment

As indicated earlier in Section 1.3.7, a video inspection survey on the culverted portions of Westerly Brook and Lodi Brook revealed that significant infiltration of groundwater into the culverts was occurring through cracks and joints. Similarly, during dry periods when the groundwater table drops below the culvert invert elevation in some locations, water flow within the culvert may exfiltrate into the environment through these same cracks and joints. Due to this apparent connection, surface water and sediment may be media of concern in both current and future exposure pathways, if contacted.

The surface water and sediment data sets are comprised of all of the surface water and sediment data collected during Phase II of the GWRI. Surface water and sediment samples were analyzed for radionuclides, TAL metals plus lithium and boron, and rare earth elements. In addition, surface water samples were analyzed for hexavalent chromium. Data for field duplicates were averaged with their original sample, on a constituent-by-constituent basis, where one-half the detection limit (or the full MDA in the case of radionuclides) was used for non-detects.

Surface water data are summarized in Appendix A, Tables 2.3 to 2.6, separately for each of the surface water bodies. The range of detected concentrations, data qualifiers, location of the maximum detected concentration, frequency of detection, range of detection limits, COPC flag, and rationale for deletion or selection are provided for each detected constituent.

Sediment data are summarized in Appendix A, Tables 2.7 to 2.10, separately for each of the surface water bodies. The range of detected concentrations, data qualifiers, location of the maximum detected concentration, frequency of detection, range of detection limits, concentration used for screening, screening toxicity value, COPC flag, and the rationale for deletion or selection are provided for each detected constituent.

Lodi Brook

Eighteen (18) inorganic chemicals, 1 rare earth element, and 9 radionuclides (including Pb-210) were selected as COPCs in surface water in Lodi Brook. Six inorganic chemicals, four rare earth elements, and eight radionuclides (including Pb-210) were selected as COPCs in sediment in Lodi Brook.

Westerly Brook

Nineteen (19) inorganic chemicals, 1 rare earth element, and 8 radionuclides (including Pb-210) were selected as COPCs in surface water in Westerly Brook. Five inorganic chemicals, four rare earth elements, and eight radionuclides (including Pb-210) were selected as COPCs in sediment in Westerly Brook.

Saddle River

Fifteen (15) inorganic chemicals and 4 radionuclides (including Pb-210) were selected as COPCs in surface water in the Saddle River. Five inorganic chemicals, four rare earth elements, and eight radionuclides (including Pb-210) were selected as COPCs in sediment in the Saddle River.

Coles Brook

Eleven inorganic chemicals, one rare earth element, and six radionuclides (including Pb-210) were selected as COPCs in surface water in Coles Brook. Seven inorganic chemicals, four rare earth elements, and eight radionuclides (including Pb-210) were selected as COPCs in sediment in Coles Brook.

2.3 EXPOSURE ASSESSMENT

The objective of the exposure assessment is to estimate the type and magnitude of human exposure to the COPCs that are present in, or migrating from, the environmental media being evaluated.

2.3.1 Potentially-Exposed Populations

The potential for exposure was evaluated for a number of current and future scenarios. The following populations in the vicinity of the FMSS have the potential to be exposed to the COPCs both currently and in the future:

- Residents (adults and children) living in the vicinity of the FMSS who may consume or utilize local groundwater or whose residence is, or could be, underlain by contaminated groundwater. Although most or all residences within the FMSS have municipally-supplied potable water, several domestic and public supply wells were identified in the well search and groundwater could be used as a source of potable water in the future given the Class II-A New Jersey groundwater classification. As indicated earlier in Section 2.2.1, the potential for subsurface vapor intrusion into residences should not be a concern based on the concentrations and locations of the volatile COPCs in overburden groundwater.
- Workers (adults) working in the vicinity of the FMSS who may consume groundwater, whose activities may include non-consumptive use of the groundwater, or whose workplace is, or could be, underlain by contaminated groundwater. Although most or all commercial/industrial properties within the FMSS have municipally-supplied water, several domestic, public supply, and industrial wells were identified in the well search and groundwater could be used as a source of potable water in the future given the Class II-A New Jersey groundwater classification. As indicated in Section 2.3.2, with the exception of the Stepan property, the potential for subsurface vapor intrusion into commercial/industrial buildings should not be a concern based on the concentrations and locations of the volatile COPCs in overburden groundwater.
- Recreationists (resident adolescents) that live near Westerly Brook, the Saddle River, or Coles Brook who may contact surface water and/or sediment while wading or recreating along the shorelines or who may consume fish caught from these water bodies. Regarding the general accessibility to these water bodies:
    1. Access to Westerly Brook is limited as it is generally located behind industrial properties, is culverted over much of its length, and has dense vegetation along its banks. Approximately 500 feet of open channel passes through a residential neighborhood downstream of the MISS before discharging to a pond and ultimately the Saddle River.
    2. Access to the Saddle River varies. Along much of its stretch downstream of the GW Study Area, steep banks and dense vegetation limit access. The river is more accessible in other areas, particularly in the Rochelle Park Area upstream of the study area.
    3. Coles Brook is accessible in the vicinity of the Scanel property, bordering a small garden apartment complex along that stretch.

There is no real access to Lodi Brook as it is culverted over most of its length. The only portion that flows in a natural channel is located in the northeastern portion of the FMSS, on the Sears property.

Regarding the potential for exposure via consumption of sport fish caught in these water bodies, the NJDEP, Division of Fish and Wildlife, Bureau of Freshwater Fisheries indicated that:

1. The NJDEP stocks the Saddle River with trout upstream of the FMSS (i.e., beginning approximately 3 miles upstream of the FMSS at the Dunkerhook Area and continuing upstream to the New York State border) and although most sport fishing for trout takes place upstream of the FMSS, it is possible that some trout migrate into and are caught in the vicinity of the FMSS.
2. Sport fishing for pan fish (e.g., sunfish) and eels takes place in the Saddle River and that, at times, anadromous fish (e.g., herring or striped bass) are present in the Saddle River. Greater fishing pressure takes place in the river upstream of the FMSS (i.e., upstream of Route 4) with lesser fishing pressure in the lower sections of the river. It is possible that some sport fishermen may consume their catch.
3. Westerly Brook, Lodi Brook and Coles Brook are unlikely to support sport fishing.

The potential for exposure to the COPCs in surface water and sediment via consumption of sport fish from the Saddle River will be discussed in the Risk Characterization.

- Construction/utility workers (adults) whose work may expose them to the shallow groundwater during work around an excavation.
- Municipal worker (adults) who may contact surface water and/or sediment while working (e.g., manhole inspection or clean-out) in the culverted portions of Westerly Brook and/or Lodi Brook.

2.3.2 Exposure Pathways

The exposure pathways selected for evaluation are provided in Appendix A, Table 1. The scenario time frame, environmental medium, exposure medium, exposure point, receptor population, receptor age, exposure route, type of analysis (i.e., quantitative or qualitative), and rationale for the selection or exclusion of an exposure pathway are provided.

Residential and industrial groundwater use in the vicinity of FMSS is limited, as described in Section 1.3.5. However, based on the classification of and the documented use of the groundwater, potable use of groundwater in residential and commercial/industrial scenarios was considered a current and future exposure pathway. Commercial agricultural use of groundwater is not a current, and most likely not a future, exposure pathway.

Further examination of the VOC data for the overburden monitoring wells presented in Appendix A, Table 2.2 was made, with an emphasis on the number of samples (and their locations) with concentrations above the EPA groundwater screening levels from their subsurface vapor intrusion guidance (EPA 2002a), the basis for the EPA groundwater screening levels, and comparison to adjusted EPA groundwater screening levels. **Table 2-1** presents the comparison.

The EPA screening levels are based on potential exposure of adults in a residential setting. For carcinogens, the screening levels are derived for target cancer risks of 10^{-4}, 10^{-5}, and 10^{-6}; for non-carcinogens, the screening levels are derived for a THQ of 1. Where a EPA risk-based screening level fell below the chemical's MCL, the EPA substituted the MCL as the screening level. To make the EPA screening levels relevant for evaluating the potential for exposure of adults in a commercial/industrial setting, the screening levels for carcinogens (i.e., the actual screening levels, not the substituted MCLs) were adjusted by a factor of 0.198 (i.e., 8/24 hours/day x 250/350 days/year x 25/30 years) and the screening levels for non-carcinogens were adjusted by a factor of 0.333 (i.e., 8/24 hours/day). As presented in table, further examination indicated the following:

- Benzene was detected in just two samples at concentrations above the EPA screening level (5 µg/L): 2,500 µg/L in PT-2S and 63 µg/L in OBMW3. PT-2S is located on the Stepan property where groundwater remediation by Stepan is taking place. OBMW3 is located on the Sears property. The concentration in PT-2S is above the adjusted screening level for 10^{-4} risk while the concentration in OBMW3 falls between the adjusted screening levels for 10^{-5} and 10^{-6} risk.

- There are no screening levels for 2-chlorotoluene and 4-chlorotoluene, however the detected concentrations were 0.5 J µg/L or less. The highest of these concentrations were in OVPZ-17 located on the MISS.
- Ethylbenzene was detected in just one monitoring well at a concentration above the EPA screening level (700 µg/L): 1,100 µg/L in OBMW18. OMBW18 is located on the Stepan property where groundwater remediation by Stepan is taking place. This concentration is within a factor of two of the screening level and falls between the adjusted screening levels for 10^{-4} and 10^{-5} risk.
- Vinyl chloride was detected in one monitoring well at an estimated concentration equal to the screening level (2 µg/L): 2 J µg/L in PT-2S. PT-2S is located on the Stepan property where groundwater remediation by Stepan is taking place. This concentration falls between the adjusted screening levels for 10^{-5} and 10^{-6} risk.
- Xylenes were detected in just one monitoring well at a concentration above the EPA screening level (3,200 µg/L): 4,900 µg/L in OBMW18. OBMW18 is located on the Stepan property where groundwater remediation by Stepan is taking place. This concentration is within a factor of two of the screening level and a factor of five greater than the adjusted screening level.

Thus, it appears that only the benzene concentration in groundwater from PT-2S located on the Stepan property poses a potential health threat to current and future workers. However, as indicated, groundwater remediation is taking place on the Stepan property. As a result, no further evaluation of the potential for exposure from subsurface vapor intrusion into residential or commercial/industrial buildings (e.g., through vapor transport modeling) is warranted.

Water level data collected during Phase II of the GWRI indicate that the water table was encountered as shallow as 0.9 feet bgs and as deep as 24.49 feet bgs; the average depth to groundwater was about 10 feet bgs. Therefore, groundwater is a current and future exposure pathway during construction activities involving excavation.

Migration of the COPCs through groundwater, surface water, and sediment may occur in all surface waters in the vicinity of FMSS. Therefore, surface water and sediment, if contacted, are current and future exposure pathways.

2.3.3 Data Utilization

In utilizing the analytical data to derive representative EPCs, samples and their duplicates were not considered separately; constituent concentrations in the sample and its duplicate were averaged as described earlier in Section 2.2.1. If a COPC was not detected in a sample, it was assumed to be present at one-half its limit of detection (for chemicals) (EPA 2003b) or at the MDA (for radionuclides). Using these levels as conservative 'proxy' concentrations assumes that a constituent may be present at a concentration just below the reported detection limit or MDA, and may tend to overestimate the risk. Data assigned a qualifier indicating that the numerical value is an estimated quantity, or that the identity and quantity are based on presumptive evidence, were treated the same way as data without such qualifiers.

In order to determine the COPC concentrations to which an individual might be exposed over many years, representative EPCs were calculated from the available/usable data sets described earlier in Sections 2.2.1 and 2.2.2. The EPA (2002c, 1992b, 1989a) recommends that the arithmetic average concentration of the data be used for evaluating long-term exposure and that, because of the uncertainty associated with estimating the true average concentration at a site, the 95% upper confidence limit (UCL) on the arithmetic average be used as the EPC. The 95% UCL on the arithmetic average concentration provides reasonable confidence that the true average will not be underestimated. The EPA indicates that, in calculating a 95% UCL on the arithmetic average concentration, where there is a question about the distribution of the data set, a statistical test should be used to identify the best distributional assumption for the data set (EPA 2002c, 1992b). The ProUCL Version 2.1 program developed by Lockheed Martin for the EPA, Region III through the EPA's Technology Support Center for Monitoring and Site Characterization was used to test the distributional assumptions and calculate the 95% UCLs.

In a few cases where the 95% UCL on the arithmetic average concentration was greater than the maximum detected concentration, the maximum detected concentration was used as the EPC. The maximum detected concentration was also used as the EPC where a data set is comprised of less than 10 samples (e.g., surface water and sediment in individual water bodies).

The EPCs for the COPCs in groundwater, surface water, and sediment are presented in Appendix A Tables 3.1.RME through 3.10.RME.

Based on the EPCs in groundwater, EPCs for the volatile COPCs in indoor air in the bathroom during and after showering (to evaluate potential exposure of resident adults and children) and in outdoor air over an excavation (to evaluate potential exposure of construction/utility workers) were estimated as described in Appendix D. Concentrations of the volatile COPCs in shower and bathroom air during and following showering were estimated using the "Schaum model" (Schaum et al 1992).

Concentrations of the volatile COPCs in outdoor air over an excavation were estimated under the assumption that shallow groundwater infiltrates the excavation and the volatile COPCs are released from pooled water at the bottom of the excavation. Emission rates for this scenario were derived using the EPA's *Guideline for Predictive Baseline Emissions Estimation for Superfund Sites* (EPA 1995a). Resulting volatile COPC concentrations in outdoor air over an excavation were determined using the EPA-approved Point, Area, and Line source (PAL 2.1) model, version 89272 (EPA 1992a). Since the depth to the water table varies across the FMSS, as described earlier in Section 1.3.4, scenarios where the water table is deeper than an excavation are possible. Under these conditions, volatile COPCs could be released from the water table and diffuse through the overlying soil before infiltrating an excavation. Since evaluation of the pooled water scenario should be adequately protective of this scenario, it was not evaluated further.

2.3.4 Estimates of Chemical Intake / Exposure

Estimates of chemical intake and exposure were developed to portray reasonable maximum exposure (RME) that might be expected to occur under current and future exposure scenarios. Thus, the highest exposure that might reasonably be expected to occur at the FMSS, one that is well above the average case of exposure but within the range of possibility, was considered. Per EPA, Region II guidance, if risks in excess of EPA acceptable levels were determined for an exposure pathway, the pathway was reevaluated using central tendency (CT) exposure parameter values, where appropriate, in the place of the upper-bound values used in the RME analysis.

The exposure equations for estimating radionuclide and chemical intakes, dermally absorbed doses, and external gamma radiation exposure, as well as the parameter values used in the equations, are presented in Appendix A, Tables 4.1.RME to 4.9.RME and described below. Application of the exposure equations results in chronic daily intake (CDI) or, for dermal contact exposure, absorbed dose, expressed in milligrams per kilogram of body weight per day (mg/kg-d) for chemical COPCs and results in exposure in picocuries (pCi) of radionuclide per year of exposure per g of sediment (pCi/g-y) for external gamma radiation.

The CDI (intake for radionuclides) is the amount of chemical (radionuclide) at the exchange boundary (e.g., mg/kg-d). A fundamental assumption in the estimate of the dermally absorbed dose is that absorption continues long after the exposure has ended (EPA 2001d); thus, the final absorbed dose (DA_{event}) is estimated to be the total dose dissolved in the skin at the end of the exposure. All of these equations require a chemical or radionuclide concentration or the 'average' concentration contacted over the exposure period (e.g., milligrams per liter [mg/L] groundwater). In practice, this is the 95% UCL on the arithmetic average concentration. These equations also require a contact rate, which is the amount of contaminated medium contacted per unit time or event (e.g., l water/day). Body weight, the average body weight over the exposure period (in kg), and averaging time (AT), the time period over which exposure is averaged in days, are used only in exposure equations for chemical COPCs.

The AT depends on the type of toxic effect being assessed. When evaluating exposures for potential long-term, non-cancer health effects, intakes were calculated by averaging over the period of exposure. This is equal to the exposure duration (ED) multiplied by 365 days/year. When evaluating potential excess lifetime cancer risks, intakes were calculated by prorating the total cumulative intake over a lifetime (i.e., lifetime average daily intake). For calculation purposes, this is equal to 70 years multiplied by 365 days/year. This distinction is consistent with the hypothesis that the mechanism of action for each of these health effects endpoints is different. The approach for carcinogens is based on the assumption that a high dose received over a short period of time is equivalent to a corresponding low dose spread over a lifetime. These and other COPC, population, and evaluation related parameters are discussed below, by medium and receptor population.

Generally, dermal uptake of radionuclides is not an important route of exposure since the dermal permeability constants for radionuclides are small, unless uptake occurs through cuts or wounds. However, due to the type and level of radiological contamination at the FMSS, dermal uptake of radionuclides is not of concern. External radiation exposure due to submersion in water contaminated with radionuclides is possible; however, due to the shielding effects of water and the generally short durations of such exposures, external gamma radiation was not considered for exposure to groundwater and surface water. External gamma radiation was only evaluated for exposure to sediment; as described below, shielding effects provided by the surface water were not taken into account.

Groundwater

The exposure parameters necessary to estimate COPC intakes by resident adults and children, via potential ingestion of, dermal contact with, and inhalation of COPCs in tap water are as follows.

Ingestion rates (IR-W) of 2 liters/day and 1 liter/day are assumed for adults and children, respectively; they represent the 90th percentile values for daily water consumption for adults and infants.

Since the greatest, but not exclusive, opportunity for dermal exposure in the home is during showering, the entire surface area of the body was used to evaluate dermal exposure. Surface areas (SA) of 18,000 square centimeters (cm^2) and 6,600 cm^2 are used for adults and children, respectively. These values represent the average of 50th percentile total body surface areas for adult males and females and a time-weighted average surface area for a 0- to 6-year old child using 50th percentile total body surface areas for male and female children, respectively (EPA 2001d).

Several parameters for evaluating dermal exposure to chemical COPCs by estimating the absorbed dose per event (DA_{event}) are needed. These include chemical-specific parameters including a fraction absorbed

(FA), a dermal permeability coefficient (Kp), and a lag time per event (tau-event). The Kp reflects movement across the skin to the underlying skin layers and into the bloodstream. The chemical-specific parameter for the ratio of the permeability coefficient (Kp) of a chemical through the stratum corneum relative to its permeability coefficient across the viable epidermis (B), does not appear in the equation for DA_{event} for short exposure times because DA_{event} is not a function of B at short exposure times, where the amount of chemical absorbed depends only on permeability of the stratum corneum (Kp). The chemical-specific values for FA, Kp, B, and tau-event used in this evaluation are provided in Appendix E.

A screening procedure for evaluating dermal contact with water where the receptor is also exposed via ingestion (i.e., resident adults and children and workers) was conducted according to EPA guidance (EPA 2001d). Following this screening procedure, a COPC was evaluated for the dermal contact exposure route only if intake from dermal contact exceeds 10% of the intake from ingestion. In addition, for dermal contact with the volatile COPCs, the EPCs in groundwater were adjusted by a factor of 0.6. This adjustment accounts for the fact that as the volatile COPCs are released from the water to air, less of the VOCs are available for dermal contact. Based on a generalized volatilization factor for VOCs in shower water of about 75% (over a range of 50% to 90% depending on the VOC) and the assumption that volatilization occurs linearly over time, Schaum et al (1992) recommend that the average concentration of a VOC dissolved in the water be estimated as 60% of the initial VOC concentration.

An inhalation rate (IR_i) of 0.83 m^3/hour was assumed in evaluating exposure of resident adults to vapor-phase chemicals released from the water; this represents an average IR_i for an average adult (EPA 1991a). For a child, age 6, an IR_i of 0.3 m^3/hour during rest activities was assumed (EPA 1997d).

Exposure times (ET) for dermal contact of 15 minutes/day for adults during showering and 27 minutes/day for children during bathing were used (EPA 2003b). ET for inhalation during and after showering/bathing while in the bathroom of 34.8 minutes/day (or 0.58 hours/day) for adults and 60 minutes/day (or 1 hour/day) for children were assumed (EPA 2001d).

An exposure frequency (EF) of 350 days/year was used for residents, assuming 15 days away from the home over the course of a year (EPA 1991a). The ED was assumed to be 30 years (the 90^{th} percentile time at one residence) for adults and 6 years for children. However, in evaluating excess lifetime cancer risks for resident adults the ED of 30 years was based on 6 years at the child's rate of exposure and 24 years at the adult's rate of exposure (EPA 1991a). The average body weight (BW) of an adult is 70 kg while that of a child ages 0 to 6 is 15 kg (EPA 1989a).

The exposure parameters necessary to estimate COPC intakes by adult workers, via potential ingestion of and dermal contact with COPCs in tap water, are as described above for the adult resident, with the following exceptions. An ET of 8 hours/day, an EF of 250 days/year, assuming a 2-week vacation over the course of a year (EPA 1991a), and an ED of 25 years (EPA 1991a) were assumed. A SA of 2,479 cm^2, corresponding to the surface area of the hands, forearms, and face (calculated as one-third the surface area of the head) was assumed (EPA 2001d).

The exposure parameters necessary to estimate COPC intakes by construction/utility workers, via potential dermal contact and inhalation exposure to the COPCs in groundwater, were generally as described above for workers with the following exceptions. A SA of 2,077 cm^2, corresponding to the surface area of the hands and forearms, was assumed (EPA 2001d). An IR_i of 2.3 m^3/hr was used to assess inhalation of volatile COPCs in groundwater potentially released to outdoor air around an excavation (EPA 1991a). An ET of 8 hours/day, an EF of 180 days/year because construction work is limited in duration, and an ED of 1 year were assumed.

The intake/exposure estimates for resident adults, resident children, and workers potentially exposed to the chemical COPCs in groundwater are provided in Appendix A, Tables 7.1.RME to 7.3.RME. The intake/activity estimates for resident adults, resident children, and workers potentially exposed to the radiological COPCs in groundwater are provided in Appendix A, Tables 8.1.RME to 8.3.RME.

Surface Water and Sediment

For recreationists (assumed to be resident adolescents), dermal contact with surface water was estimated based on an assumed SA of 3,880 cm^2; this represents the average surface area of the hands, lower-legs, and feet of adolescents ages 12 to 18 (EPA 2001d). Chemical-specific values for FA, Kp, B, and tau-event are presented in Appendix E.

An average ingestion rate (IR-S) of 100 mg of sediment/day was used to evaluate incidental ingestion of sediment (i.e., as might result from hand-to-mouth behavior) (EPA 1997d). The "fraction ingested" (FI) is the fraction of total amount of contacted sediment that is presumed to be contaminated. A FI of 1 was used in this evaluation with the assumption that 100% of the sediment ingested is contaminated with concentrations equivalent to the estimated EPCs.

Consistent with EPA guidance for dermal risk assessment (EPA 2001d), dermal contact with sediment was estimated for arsenic only because it is the only COPC in sediment for which a chemical-specific dermal absorption factor is available. A dermal absorption fraction of 0.03 for arsenic was used (EPA 2001d). Like dermal contact with surface water, a SA of 3,880 cm^2 was used. A soil-to-skin adherence factor (AF) of 0.2 mg/cm^2 was used (EPA 2001d).

An ET of 2 hours/day, an EF of 50 days/year, which equates to about once a week per year or twice a week during the warmer months per year, and an ED of 6 years were assumed. The BW was assumed to be 55.7 kg; this represents the average of the 50^{th} percentile body weights for males and females aged 12 to 18 years (EPA 1997d).

For municipal workers, the exposure parameters used to estimate dermal contact with surface water and ingestion of and dermal contact with sediment are the same as those described above for construction/utility worker exposure to groundwater, with the following exceptions. An IR-S of 330 mg/day was used to estimate incidental ingestion of sediment (EPA 2001c). An AF of 0.242 mg/cm^2, which is an activity body part-specific geometric mean soil AF for the face, forearms, and hands of utility workers derived by the EPA (2001d), was used to estimate dermal contact with sediment. An EF of 4 days/year, which equates to once a quarter, and an ED of 25 years were assumed.

Exposure to gamma radiation emitted by the decay of radionuclides in sediment was evaluated for the recreationists and municipal workers. The EPA gamma shielding factor (GSFo) default value of 1 was used to evaluate the risk from exposure to external gamma radiation (EPA 1989a). The outdoor time fractions (Fos) for both populations were assumed to be 1.0 because all of the exposure to sediment occurs outdoors. The ETs, EFs, and EDs were the same as described above for recreationists and municipal workers.

The intake/exposure estimates for recreationists and municipal workers potentially exposed to the chemical COPCs in surface water and sediment are provided in Appendix A, Tables 7.4.RME to 7.8.RME. The intake/activity estimates for recreationists and municipal workers potentially exposed to the radiological COPCs in surface water and sediment are provided in Appendix A, Tables 8.5.RME to 8.9.RME.

2.4 TOXICITY ASSESSMENT

The toxicity assessment, also termed the dose-response assessment, serves to characterize the relationship between the magnitude of exposure and the potential that an adverse effect will occur. It involves determining whether exposure to a constituent can cause an increase in the incidence of a particular adverse health effect, and characterizing the nature and strength of the evidence of causation. The toxicity information is then quantitatively evaluated and the relationship between the dose of the constituent received and the incidence of adverse effects in the exposed population is evaluated.

The EPA and other regulatory agencies have performed toxicity assessments for numerous chemicals and cancer potency assessments for numerous radionuclides. The guidance they provide was used in this evaluation. These include verified reference doses (RfDs) or verified reference concentrations (RfCs) for the evaluation of non-cancer health effects from chronic exposure to chemicals and cancer potency slope factors for the evaluation of excess cancer risks from lifetime exposure to chemicals and radionuclides. Sources of toxicological information and criteria, in order of preference, included:

- Integrated Risk Information System (IRIS), which is a EPA database containing current toxicity criteria for many chemicals (EPA 2003a);
- EPA Health Effects Assessment Summary Tables (HEAST), which are tabular presentations of provisional toxicity criteria (EPA 2001a, 1997c); and
- The EPA Superfund Technical Support Center's National Center for Environmental Assessment (NCEA) which provided additional provisional toxicity criteria, as available, when no criteria were available in IRIS or HEAST (EPA 2000b, 2003c, 2003d, and 2003e).

2.4.1 Non-cancer Health Effects from Chronic Exposure to Chemical COPCs

The potential for non-cancer health effects associated with chemical exposure was evaluated by comparing an estimated intake (such as CDI) over a specified time period with a reference dose (RfD) derived for a similar exposure period. The RfD is an estimate of a daily exposure level for the human population, including sensitive sub-populations, that is likely to be without an appreciable risk of deleterious effects during a lifetime. According to the EPA, RfDs often have an uncertainty spanning perhaps an order of magnitude or greater. Chronic RfDs used in this evaluation are specifically developed to be protective of long-term exposure to a chemical. For construction/utility workers whose exposure was assumed to have occurred over a one-year period, subchronic RfDs are the more appropriate criteria. However, as subchronic RfDs are often lacking or in some cases set equal to chronic RfDs, chronic RfDs were used as conservative approximations.

The RfDs for the characterization of potential chronic non-cancer health effects via oral and inhalation exposures are presented in Appendix A, Tables 5.1 and 5.2, respectively, along with the primary target organ, the source of the RfD, and combined uncertainty and modifying factors used in the derivation of the RfD. Generally, order-of-magnitude (i.e., in increments of 10) uncertainty factors reflect the various types of data (e.g., a No Observable Adverse Effect Level from a valid chronic study in humans) used to estimate the RfDs. Modifying factors, which can range from greater than zero to 10, reflect qualitative professional judgment regarding scientific uncertainties (e.g., the completeness of the overall database) not covered by the uncertainty factor.

RfDs for oral exposure were available for most of the COPCs. RfDs were not available, however, for dermal exposure. In their absence, oral RfDs were used and adjusted as per EPA guidance (EPA 2001d, 1989a) to reflect absorbed dose. This allows for comparison between exposures estimated as absorbed doses and toxicity values expressed as absorbed doses. The oral-to-dermal adjustment factors and the adjusted RfDs are presented in Appendix A, Table 5.1.

The radiochemical uranium metal is considered to be a kidney toxicant and, as such, the EPA has developed an RfD for uranium. Therefore, the potential for non-cancer health effects from exposure to uranium metal was evaluated. Where uranium metal analyses were not conducted or uranium metal was not detected in any of the samples, concentrations of the individual radionuclides U-234, U-235, and U-238 were summed and then converted to total uranium metal. Total uranium concentrations in pCi/L (for groundwater and surface water) or pCi/kg (for sediment) were converted to µg/L or µg/kg using a geometric average activity:mass ratio of 0.9 pCi/µg (EPA 2000a).

A limited number of reference concentrations (RfCs) for inhalation exposure are available. The available RfCs were converted into RfDs based on a standard IR_i of 20 m^3/day and a standard body weight of 70 kg.

The potential for non-cancer health effects is evaluated using the ratio of the CDI to the RfD (i.e., CDI/RfD), termed a HQ. The HQ assumes that there is a level of exposure (i.e., the RfD) below which it is unlikely for even sensitive subpopulations to experience adverse health effects. If the HQ exceeds 1, then there may be concern for potential non-cancer health effects. The greater the HQ is above 1, the greater the level of concern.

2.4.2 Carcinogenic Risk from Lifetime Exposure to Chemical COPCs

Regardless of the mechanism of effect, risk evaluation methods employed by the EPA generally derive from the hypothesis that thresholds for cancer induction by carcinogens do not exist and that the dose-response relationship is linear at low doses. Based on this hypothesis, the EPA has derived estimates of incremental excess cancer risk from lifetime exposure to potential carcinogens. Generally, the EPA establishes the carcinogenic potency of the chemical through critical evaluation of the various test data and fitting dose-response data to a low-dose extrapolation model. The slope factor, which describes the dose-response relationship at low doses, is expressed as a function of intake [i.e., $(mg/kg\text{-}d)^{-1}$]. The oral and inhalation slope factors for the carcinogenic COPCs presented in Appendix A, Tables 6.1 and 6.2, respectively, were used to estimate finite, upper limits of risk at low dose levels administered over a lifetime. For children, the estimated cancer risk reflects the potential risk over a lifetime due to childhood exposure. The weight-of-evidence classification for carcinogenicity and the basis and source of slope factor are also presented in Appendix A, Tables 6.1 and 6.2.

Excess lifetime cancer risks are estimated by multiplying the CDI averaged over a 70-year lifetime by the slope factor. The resulting risk estimate is expressed as a unitless probability (e.g., 2×10^{-5} or 2 in 100,000) of an individual developing cancer. This linear equation is valid only at low risk levels (i.e., below estimated risks of 10^{-2}). When intakes may be high (i.e., estimated risks above 10^{-2}), the EPA (1989a) recommends an alternate calculation (using the one-hit equation) that is also consistent with the linear low-dose model. According to the EPA, this overall approach for estimating excess lifetime cancer risk does not necessarily give a realistic prediction of risk. The true value of the risk at trace ambient concentrations is unknown, and may be as low as zero.

As with RfDs, the EPA has not derived slope factors for dermal exposure. In their absence, slope factors for oral exposure were used and adjusted as per EPA guidance to reflect absorbed dose. This allows for risk estimation based on exposures estimated as absorbed doses and slope factors expressed as absorbed doses. The oral-to-dermal adjustment factors and the adjusted slope factors are presented in Appendix A, Table 6.1.

2.4.3 Carcinogenic Risk from Lifetime Exposure to Radiological COPCs

The carcinogenic potential from radiation exposure is the only health effect of concern due to chronic exposure to the radionuclides present at the FMSS, with the exception of the potential for non-cancer health effects from exposure to uranium metal. Long-term radiation exposure has been found to increase the risk of developing cancer in humans. By applying carcinogenic slope factors to any dose, no matter how small, the risk assessment methodology is consistent with the no-threshold hypothesis (i.e., that any radiation dose conveys some carcinogenic risk). Due to range of radionuclide concentrations at the FMSS, acute effects from high level, short-term radiation exposures are not possible and were, therefore, not evaluated as part of this evaluation.

Cancer slope factors for the evaluation of cancer risk from lifetime exposure to radionuclides were obtained from HEAST (EPA 2001a). The cancer slope factors for ingestion (expressed as risk/pCi) are presented in Appendix A, Table 6.1 and the cancer slope factors for external radiation (expressed as risk/year per pCi/g soil) are presented in Appendix A, Table 6.4. Selected radionuclides and radioactive decay chain products are designated with the suffix "+D" to indicate that cancer risk estimates for these radionuclides include the contributions from their short-lived decay products, assuming secular equilibrium with the parent radionuclide in the environment.

2.4.4 Chemical Mixtures

EPA guidance was also used to evaluate the overall potential for non-cancer health effects and cancer risks posed by multiple chemicals. For the evaluation of non-cancer health effects, EPA guidance assumes that subthreshold exposures to several chemicals at the same time could result in an adverse health effect. The sum of the HQs (for individual chemicals, exposure routes, exposure pathways, or potentially-exposed populations) is the HI. When the HI exceeds 1, there may be concern for potential health effects. Generally, hazard indices are only used in the evaluation of a mixture of chemicals that induce the same effect by the same mechanism of action. In this evaluation, the hazard indices of mixtures of chemicals that can have different effects were used as a screening-level approach, as recommended by the EPA (1989a). This approach may overestimate the likelihood of adverse, non-cancer health effects. Then, for hazard indices that were greater than the EPA acceptable level, toxic endpoint-specific hazard indices were calculated based on the toxicological endpoint used to derive the RfD.

For the evaluation of excess lifetime cancer risks, EPA guidance indicates that the individual risks associated with exposure to each constituent can be summed. This approach, which was used in this evaluation, assumes independence of action by the constituents involved (i.e., that there are no synergistic or antagonistic constituent interactions and that all constituents produce the same effect: cancer).

2.4.5 Qualitative Assessment of COPCs without Toxicity Criteria

EPA-derived toxicity criteria were not available to quantitatively assess the potential for human health risks for the following COPCs: 4-chlorotoluene, 1,1-dichloroethane, lead, and the rare earth elements cerium, lanthanum, and yttrium. Possible health implications that may be associated with exposure to these chemicals are described in the Risk Characterization.

2.5 RISK CHARACTERIZATION

The chemical COPCs and exposure route specific non-cancer HQs and excess lifetime cancer risks associated with potential exposure to the receptors considered in this evaluation are presented in Appendix A, Tables 7.1.RME to 7.9.RME. The radiological COPCs and exposure route specific excess lifetime cancer risks associated with potential exposure to the receptors considered in this evaluation are presented in Appendix A, Tables 8.1.RME to 8.8.RME. The total non-cancer hazard indices and excess lifetime cancer risks for the COPCs summed for all exposure routes, and the total pathway non-cancer hazard indices and excess lifetime cancer risks (i.e., summed for all COPCs and exposure routes), are presented in Appendix A, Tables 9.1.RME to 9.9.RME and discussed below.

Where the total HI or total excess lifetime cancer risk are greater than the EPA acceptable levels, the COPCs that are the predominant contributors to the risk estimates are presented in Appendix A, Tables 10.1.RME to 10.3.RME; the risks for those COPCs identified as predominant contributors are either greater than the EPA acceptable levels or contribute significantly to total risks greater than the EPA acceptable levels. Where a total HI is greater than the EPA acceptable level, toxic endpoint-specific hazard indices were calculated and presented in Appendix A, Tables 9.1.RME to 9.9.RME and 10.1.RME to 10.3.RME. Potential cancer risks are assessed through the computation of a probability estimate, the likelihood of developing a cancer following exposure to the COPCs under the set of exposure conditions evaluated.

The estimated risks are compared to the EPA acceptable levels specified in their National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (EPA 1990). For non-cancer health effects, the NCP states that acceptable exposure levels shall represent concentration levels to which the human population, including sensitive subgroups, may be exposed without adverse effect during a lifetime or part of a lifetime, incorporating an adequate margin of safety. In practice, the EPA defines this as both HQs and HIs less than or equal to 1. For known or suspected carcinogens, the NCP states that acceptable exposure levels are generally concentration levels that represent an excess upper bound lifetime cancer risk to an individual which range from 10^{-6} (i.e., 1E-06 or 1 in 1,000,000) to 10^{-4} (i.e., 1E-04 or 1 in 10,000).

When assessing excess lifetime cancer risks from radionuclides that occur naturally in the environment, the risks for the various populations and exposure scenarios must be compared to the unavoidable risk from natural background radiation. For some-long term scenarios, the background risk can approach and even exceed the acceptable excess upper bound lifetime cancer risk of 10^{-4}. This can be accomplished by comparison of the groundwater data from background wells to data from site monitoring wells. Since the inorganic constituents also occur naturally in the environment, it is also prudent to be cognizant of background concentrations when interpreting risk estimates. Monitoring wells were not specifically installed during the GWRI to characterize background. However, in the GWRI Report (USACE 2005), groundwater data from overburden monitoring wells MW-10S, MW-17S, and MW-18S and bedrock monitoring wells B38W02D, MW-10D, MW-17D, and MW-18D were discussed as reasonably representative of FMSS background groundwater quality. Consistent with EPA guidance (1989b), a tolerance interval approach was used to statistically compare groundwater data from the background wells and site monitoring wells; comparisons were made for the radiological COPCs and the four inorganic COPCs with estimated risks greater than the EPA acceptable levels (i.e., arsenic, iron, lithium, and manganese, as presented in the following sections). The purpose of the tolerance interval approach is to define a concentration range from background well data within which a large proportion of the monitoring well data should fall with high probability (EPA, 1989b). Data from the monitoring wells can then be checked for evidence of contamination by simply determining whether they fall in the tolerance interval; data greater than the tolerance interval is evidence that data from the site monitoring wells are not from the same distribution as the background well data. According to EPA (1989b), this is interpreted as statistically significant evidence of contamination.

One-sided tolerance intervals (i.e., upper tolerance limits or UTLs) were calculated from the groundwater data from the background wells based on a normal distribution (resulting in conservative UTLs that are underestimated rather than overestimated). The UTLs were calculated from the mean (0) and standard deviation (S) of the data from the relationship: UTL = 0 + KS. K is a one-sided normal tolerance factor for 95 percent coverage with 95 percent probability for the appropriate sample size as provided by the EPA (1989b; Appendix B, Table 5). Groundwater data from the site monitoring wells were then compared to the UTLs, as presented in **Table 2-2**. COPC concentrations that exceed the corresponding UTLs provide evidence of contamination.

As indicated in **Table 2-2**, concentrations of five of the eight radionuclides exceed the UTLs with frequencies of detection greater than the UTLs ranging from three to 17 percent. This indication of limited contamination is consistent with the findings of the GWRI Report (USACE 2005). As also indicated in **Table 2-2**, with one minor exception, the EPCs for the radionuclides used in this human health evaluation are less than the UTLs. Therefore, the estimated lifetime cancer risks for the radionuclides, presented below, represent background. As indicated in **Table 2-2**, concentrations of the four inorganic COPCs exceed the UTLs with frequencies of detection greater than the UTLs ranging from 20 to 62 percent. This indication of contamination is consistent with the findings of the GWRI Report (USACE 2005), as discussed below. As also indicated in **Table 2-2**, the EPCs for the four inorganic COPCs used in this human health evaluation are considerably greater than the UTLs.

2.5.1 Current / Future Residents

These scenarios assume potable use of the groundwater by resident adults and children. The total HI (Appendix A, Table 9.1.RME) for potential exposure of resident adults to the COPCs in groundwater from ingestion, dermal contact, and inhalation (of the volatile chemical COPCs) is 4E+01 (i.e., 40); this HI is greater than the EPA acceptable level of 1, indicating a potential for adverse, non-cancer health effects from such exposure. Arsenic, benzene, iron, lithium, and 2-chlorotoluene are the predominant contributors to the total HI. The toxic endpoint specific hazard indices for kidney, hematological, immune system, and skin effects are greater than the EPA acceptable level. The estimated total excess lifetime cancer risk (Appendix A, Table 9.1.RME) is 6E-03 (6 in 1,000), greater than the EPA acceptable risk range. Arsenic, benzene, and vinyl chloride are the predominant contributors to the total risk estimate.

The total HI (Appendix A, Table 9.2.RME) for potential exposure of resident children to the COPCs in groundwater from ingestion, dermal contact, and inhalation (of the volatile chemical COPCs) is 1E+02 (i.e., 100); this HI is greater than the EPA acceptable level of 1, indicating a potential for adverse, non-cancer health effects from such exposure. Arsenic, benzene, iron, lithium, 2-chlorotoluene, manganese, and xylenes are the predominant contributors to the total HI. The toxic endpoint specific hazard indices for kidney, hematological, immune system, and skin effects are greater than the EPA acceptable level. The estimated total excess lifetime cancer risk (Appendix A, Table 9.2.RME) is 2E-03 (2 in 1,000), greater than the EPA acceptable risk range. Arsenic and benzene are the predominant contributors to the total risk estimate.

COPC-specific hazard indices greater than the EPA acceptable level and estimated excess lifetime cancer risks greater than the EPA acceptable risk range are presented in Appendix A, Tables 10.1.RME and 10.2.RME for resident adults and children, respectively.

2.5.2 Current / Future Workers

This scenario assumes potable use of the groundwater by workers. The total HI (Appendix A, Table 9.3.RME) for potential exposure of workers to the COPCs in groundwater from ingestion and dermal contact is 1E+01 (i.e., 10); this HI is greater than the EPA acceptable level of 1, indicating a potential for adverse, non-cancer health effects from such exposure. Arsenic, benzene, iron, and lithium are the predominant contributors to the total HI. The toxic endpoint-specific hazard indices for kidney, hematological, immune system and skin effects are greater than the EPA acceptable level. The estimated total excess lifetime cancer risk (Appendix A, Table 9.3.RME) is 1E-03 (1 in 1,000), greater than the EPA acceptable risk range. Arsenic is the predominant contributor to the total risk estimate.

COPC-specific hazard indices greater than the EPA acceptable level and estimated excess lifetime cancer risks greater than the EPA acceptable risk range are presented in Appendix A, Table 10.3.RME.

2.5.3 Current / Future Construction / Utility Workers

This scenario assumes work in the vicinity of an excavation (of assumed size) for utility maintenance and/or repair. The total HI (Appendix A, Table 9.4.RME) for potential exposure of construction/utility workers to the COPCs in groundwater from dermal contact and inhalation of vapors released to outdoor air is 1E+01 (i.e., 10); this HI is greater than the EPA acceptable level of 1, indicating a potential for adverse, non-cancer health effects from such exposure. Benzene and 2-chlorotoluene are the predominant contributors to the total HI. The toxic endpoint-specific hazard indices for hematological and immune system effects are greater than the EPA acceptable level. The estimated total excess lifetime cancer risk (Appendix A, Table 9.4.RME) is 3E-05 (3 in 100,000), within the EPA acceptable risk range.

COPC-specific hazard indices greater than the EPA acceptable level are presented in Appendix A, Table 10.4.RME.

2.5.4 Current / Future Recreationists

These scenarios assume exposure to surface water and sediment by resident adolescents while wading and otherwise recreating in Westerly Brook, the Saddle River, and Coles Brook. The total HI (Appendix A, Table 9.5.RME) for potential exposure of recreationists to the COPCs in surface water and sediment in Westerly Brook from ingestion and/or dermal contact is 6E-02 (i.e., 0.06); this HI is less than the EPA acceptable level of 1, indicating that adverse, non-cancer health effects from such exposure are unlikely. The estimated total excess lifetime cancer risk (Appendix A, Table 9.5.RME) is 3E-06 (3 in 1,000,000), within the EPA acceptable risk range.

The total HI (Appendix A, Table 9.6.RME) for potential exposure of recreationists to the COPCs in surface water and sediment in the Saddle River from ingestion and/or dermal contact is 4E-02 (i.e., 0.04); this HI is less than the EPA acceptable level of 1, indicating that adverse, non-cancer health effects from such exposure are unlikely. The estimated total excess lifetime cancer risk (Appendix A, Table 9.6.RME) is 3E-06 (3 in 1,000,000), within the EPA acceptable risk range.

The COPCs in surface water and sediment in the Saddle River are not particularly bioaccumulative in fish. The highest of the fish bioaccumulation factors for the COPCs in surface water (e.g., for chromium and uranium) are orders of magnitude lower that those for more bioacumulative constituents (e.g., DDT or polychlorinated biphenyls). Therefore, occasional consumption of sport fish caught in the Saddle River in the study area should not pose health risks to recreationists.

The total HI (Appendix A, Table 9.7.RME) for potential exposure of recreationists to the COPCs in surface water and sediment in Coles Brook from ingestion and/or dermal contact is 4E-02 (i.e., 0.04); this HI is less than the EPA acceptable level of 1, indicating that adverse, non-cancer health effects from such exposure are unlikely. The estimated total excess lifetime cancer risk (Appendix A, Table 9.7.RME) is 3E-06 (3 in 1,000,000), within the EPA acceptable risk range.

2.5.5 Current / Future Municipal Workers

These scenarios assume exposure to surface water and sediment by municipal workers while working (e.g., manhole inspection or clean-out) in the culverted sections of Westerly Brook and Lodi Brook. The total HI (Appendix A, Table 9.8.RME) for potential exposure of municipal workers to the COPCs in surface water and sediment in Lodi Brook from ingestion and/or dermal contact is 1E-02 (i.e., 0.01); this HI is less than the EPA acceptable level of 1, indicating that adverse, non-cancer health effects from such exposure are unlikely. The estimated total excess lifetime cancer risk (Appendix A, Table 9.8.RME) is 9E-06 (9 in 1,000,000), within the EPA acceptable risk range.

The total HI (Appendix A, Table 9.9.RME) for potential exposure of municipal workers to the COPCs in surface water and sediment in Westerly Brook from ingestion and/or dermal contact is 1E-02 (i.e., 0.01); this HI is less than the EPA acceptable level of 1, indicating that adverse, non-cancer health effects from such exposure are unlikely. The estimated total excess lifetime cancer risk (Appendix A, Table 9.9.RME) is 1E-06 (1 in 1,000,000), within the EPA acceptable risk range.

2.5.6 COPCs without Toxicity Criteria

The potential for human health risks from exposure to 4-chlorotoluene, 1,1-dichloroethane, lead, and the rare earth elements cerium, lanthanum, and yttrium is discussed qualitatively since EPA-derived toxicity criteria were not available to evaluate them quantitatively.

4-Chlorotoluene

4-Chlorotoluene is a colorless, flammable liquid with a chloroaromatic odor. On combustion, 4-chlorotoluene forms toxic gases including carbon monoxide, hydrogen chloride, and possibly phosgene. Insufficient data are available on the toxicological effects of this chemical. However, symptoms of exposure to 4-chlorotoluene include irritation of the skin, eyes, and upper respiratory tract, defatting of the skin, headache, dizziness, numbness, loss of consciousness, and central nervous system depression. Chronic exposure may cause some liver and kidney dysfunction.

1,1-Dichloroethene

1,1-Dichloroethane is a colorless, oily, man-made liquid. It evaporates quickly at room temperature and has an odor like ether. When 1,1-dichloroethane is released to the environment, it usually exists as a vapor rather than a liquid. It is used primarily to make 1,1,1-trichloroethane and a number of other chemicals. It is also used to dissolve other substances such as paint, varnish and finish removers, and to remove grease. 1,1-Dichloroethane was used as a surgical anesthetic, but is no longer.

Almost all of the 1,1-dichloroethane from industrial sources that is released goes into the air. 1,1-Dichloroethane can also be found in the environment as a breakdown product of 1,1,1-trichloroethane in landfills where no air comes in contact with the 1,1,1-trichloroethane. 1,1-Dichloroethane does not dissolve easily in water. The small amounts released to water can evaporate easily into the air. 1,1-Dichloroethane remains as a vapor in the air for about two months and dissolved in water for about 5 days. The vapor in air can be washed out by rain or broken down by sunlight. 1,1-Dichloroethane in water will evaporate. Small amounts of 1,1-dichloroethane released to soil can also evaporate into the air or move through the soil to enter groundwater. It is not known how long 1,1-dichloroethane remains in the soil. Although it does not dissolve easily in water, low levels can be found in water.

Exposure to 1,1-dichloroethane can occur by breathing air containing its vapors in the outdoor air or in the workplace, or by drinking water contaminated with it. Reliable information on how

1,1-dichloroethane affects the health of humans is not available. Because brief exposures to 1,1-dichloroethane in the air at very high levels have caused death in animals (16,000 ppm), it is likely that exposure to such high levels of 1,1-dichloroethane in the air can also cause death in humans. Some studies in animals have shown that 1,1-dichloroethane can cause kidney disease after long-term, high-level exposure in the air. 1,1-Dichloroethane caused cancer in animals given very high doses (over 3,000 mg/kg-d) by mouth for a lifetime. Delayed growth was observed in the offspring of animals who breathed high concentrations of 1,1-dichloroethane during pregnancy. The severity of these effects may increase when people or animals are exposed to increased levels of 1,1-dichloroethane. Since these effects were seen in animals at high doses, it is also possible that they could occur in humans exposed to high levels of 1,1-dichloroethane. However, there is no information to indicate that these effects do occur in humans.

Lead

Chronic exposure to low levels of lead may result in hematologic (blood and blood-forming), neurobehavioral, kidney, and other effects in humans (ATSDR 1999). Effects such as slowed nerve conduction velocities, altered testicular function, reduced hemoglobin production, and other signs of impaired heme synthesis, and blood pressure effects have been observed in adults. Children, who represent a sensitive portion of the population, may experience an array of pathophysiological effects. Electro-physiological effects, impaired cognitive performance (as measured by IQ tests, performance in school, and other means), heme synthesis impairment, inhibition of pyrimidine and alanine synthesis, interference with vitamin D hormone synthesis, and early childhood growth reductions have been observed in children. In addition, factors influencing neurological development such as low birth weights and decreased gestational age and deficits in mental indices have been reported in infants.

The EPC for lead in groundwater (i.e., the 95% UCL on the arithmetic average concentration) of 3.72 µg/L is less than the action level for lead in drinking water of 15 µg/L. The EPCs for lead in surface water in Lodi Brook (7.7 µg/L), Westerly Brook (5.4 µg/L), and the Saddle River (10.8 µg/L) (i.e., the maximum detected concentrations) are also less than the action level for lead in drinking water of 15 µg/L. The EPCs for lead in sediment in Lodi Brook (427 mg/kg) and Westerly Brook (276 mg/kg) (i.e., the maximum detected concentrations) are less than the recommended soil screening level for adult, non-resident receptors of 750 mg/kg provided in the EPA's RAGS D Adult Lead Worksheet (EPA 2001e). The EPCs for lead in sediment in Westerly Brook (276 mg/kg), the Saddle River (47.5 mg/kg), and Coles Brook (304 mg/kg) (i.e., the maximum detected concentrations) are less than the recommended soil screening level for residential soil of 400 mg/kg. Therefore, lead in groundwater, surface water, and sediment, at the levels indicated, should not pose a health concern to the receptors considered in this evaluation. As such lead exposure modeling using the EPA's IEUBK model for resident children and the EPA's adult worker exposure model, and completion of the corresponding RAGS D lead worksheets, were not warranted.

Cerium, Lanthanum, and Yttrium

Cerium, lanthanum, and yttrium are part of the rare earth elements known as lanthanides. Lanthanides have many technological applications including metallurgy applications, glass and ceramic applications, phosphor / luminescence applications, and catalytic applications. In general, the lanthanides have a low toxicity rating, especially when they are present in material with a low aqueous solubility. When administered orally, poor absorption from the gastrointestinal tract tends to render the lanthanides benign. The oral toxicity of lanthanide oxides in rats and mice has been compared to that of table salt. This property has led to their use as markers in nutritional studies.

2.5.7 Radiological Dose Assessment

The EPA (1997a) has indicated that cleanups of radionuclides are governed by the risk range for all carcinogens established in the NCP when applicable and relevant and appropriate requirements (ARARs) are not available or are not sufficiently protective. As presented in Appendix A, Table 2.1, the individual uranium radionuclide concentrations (in pCi/L) in each groundwater sample were summed, converted to mass concentrations using an activity:mass ratio, and compared to the MCL for total uranium. All total uranium concentrations are less than the MCL. As also presented in Appendix A, Table 2.1, concentration data for Ra 226 and Ra 228 in each groundwater sample were summed and compared to the MCL for combined Ra 226 and Ra 228 (5 pCi/L). The combined Ra 226 and Ra 228 concentrations exceed the MCL in two monitoring wells: MW-9S (6.2 pCi/L) and B38W-14D (5.2 pCi/L). Nevertheless, as indicated in **Table 2-4**, the total estimated lifetime cancer risks from exposure to the radiological COPCs, for each population, are within the EPA risk range.

In addition to the radiologic cancer risk assessment, the estimated intakes of the radionuclides of potential concern presented previously were converted to effective dose equivalents (EDE) and then summed for each population to estimate the total estimated dose. This conversion was made to evaluate the total estimated dose for each population relative to the 15 millirem per year (mrem/yr) maximum dose limit for humans (EPA 1997a).

The EDE for each radionuclide was calculated by multiplying the estimated radionuclide intakes by exposure-to-dose conversion factors published by the EPA in Federal Guidance Reports No. 11 and 12 (EPA 1988; 1993). **Table 2-3** summarizes the dose conversion factors taken from Federal Guidance Report No. 11 (EPA 1988) for ingestion exposure and Federal Guidance Report No. 12 (EPA 1993) for external radiation exposure.

The exposure-to-dose conversion factors for ingestion exposure in Sv/Bq were multiplied by 3,700 to convert to conventional units of mrem/pCi (EPA 1988). The exposure-to-dose conversion factors for external radiation exposure in Sv/Bq-s-m^3 were multiplied by 1.868E+17 to convert to conventional units of mrem/pCi/g-year (EPA 1993).

The EDE for each radionuclide was then calculated by multiplying the estimated radionuclide intakes by the exposure-to-dose conversion factors in the radiological dose assessment tables presented in Appendix F. However, in order to calculate EDEs based on exposure over one year, the ED term was removed from the intake equations for ingestion exposure and was set equal to 1 year in the intake equations for external radiation exposure. The total estimated dose for each population was then calculated by summing the EDEs for all radionuclides over all exposure routes for each population. The total estimated dose for each population from the radiological dose assessment tables in Appendix E are summarized in **Table 2-4**.

The total estimated dose for each population evaluated is well below the 15 mrem/yr maximum dose limit for humans (EPA 1997a).

2.5.8 Uncertainty Analysis

Some uncertainty is inherent in the process of conducting predictive, quantitative human health evaluations. Environmental sampling and analysis, fate and transport modeling, and human exposure modeling are all prone to uncertainty, as are the available toxicity data used to characterize risks.

Environmental Sampling and Analysis

Uncertainty associated with environmental sampling is generally related to the limitations of the sampling in terms of the number and distribution of samples, while uncertainty associated with the analysis of samples is generally associated with systematic or random errors (i.e., false positive or negative results). Thus, exposure may be overestimated or underestimated depending on how well the environmental medium is characterized.

As discussed in Section 2.2.1, groundwater data from several shallow and deep monitoring well clusters in Lodi (MW-14, MW-15, MW-16, MW-17, MW-18) and one shallow monitoring well (MW-21S) located on the Scanel property were excluded from the dataset used in this evaluation because the locations are not hydraulically connected to the groundwater areas of concern, which all occur on the former MCW property, as identified in the GWRI Report (USACE 2005). Groundwater data from the Lodi and Scanel property monitoring wells are presented in Appendix B.

A comparison of the groundwater data from the Lodi monitoring wells to the EPCs for groundwater used in this evaluation indicated that the maximum detected concentrations of aluminum, cerium, yttrium, Ra-226, Th-230, U-234, and U-235 slightly exceed the EPCs but are well within the concentration ranges of the groundwater data used to derive the EPCs. Concentrations of barium and cerium in groundwater from the Scanel monitoring well exceed the EPCs for groundwater used in this evaluation, but are well within the concentration ranges of the groundwater data used to derive the EPCs. The concentration of U-234 in groundwater from the Scanel monitoring well exceeds the EPC used in this evaluation and slightly exceeds the high end of the concentration range of the data used to derive the EPC. In addition, for those chemicals for which EPCs were not derived because they were not selected as COPCs, including the essential nutrients, the maximum detected concentrations in groundwater from the Lodi monitoring wells and the Scanel monitoring well are well within the detected concentration ranges used in this evaluation to select COPCs. Thus, exclusion of the groundwater data from the Lodi and Scanel property monitoring wells from this evaluation should have little to no impact on the risk estimates. Likewise, risk estimates based on groundwater data from the Lodi monitoring wells and the Scanel property well should not be appreciably different from the risk estimates presented in this evaluation.

Background groundwater, surface water, and sediment quality was not specifically characterized during the GWRI. As a result, some of the naturally occurring constituents (i.e., the inorganic chemicals) that were selected as COPCs may have been evaluated unnecessarily and may be inappropriate contributors to the estimated site-related risks. This was not the case, however, for arsenic, iron, lithium, and manganese in groundwater, as presented earlier. Additionally, a small percentage of groundwater samples may be biased high for inorganic and radiological constituents as a result of turbidity measurements exceeding 50 NTU.

Fate and Transport Modeling

Constituent release and transport modeling were used to estimate EPCs for the COPCs in shower/bathroom air for the shower scenarios and in outdoor air above an excavation for the construction/utility worker scenario. Uncertainty associated with such modeling is related to the accuracy with which environmental conditions and processes, and the characteristics of the shower/bathroom flow/dimensions and excavation, are modeled.

COPC release and transport were evaluated based on screening-level emissions and atmospheric dispersion models that, due to their relative simplicity, tend to overestimate these processes. For example, source depletion over time (e.g., through COPC release or environmental degradation) was not taken into account. The potential inhalation exposure scenarios were modeled in ways that likely overestimated exposure and risk.

Human Exposure Modeling

The number of non-detects in the data for the COPCs in overburden and bedrock groundwater is quite large (see Appendix A, Table 2.1), as indicated in the following tabulation.

# of COPCs with ≤ 15% non-detects	7
# of COPCs with > 15% but < 75% non-detects	19
# of COPCs with ≥ 75% non-detects	15

This tabulation is based on the EPA's (2002c) consideration of when "a very small percentage of the data is censored (e.g., ≤ 15%)" and when "the proportion of non-detects is high (e.g., ≥ 75%)." This amount of "censored" data, and the treatment of non-detects in this evaluation (i.e., substitution of ½ DL or the MDA for the chemical and radioactive COPCs, respectively), may result in uncertainty in the 95% UCL on the arithmetic average concentrations used to represent the EPCs. The EPA (2002c) indicates that:

- There is no general rule about which substitution method will yield an appropriate 95% UCL on the arithmetic average concentration,
- The uncertainty associated with the substitution method increases as the number of non-detects in the data increases, and
- If the proportion of non-detects is high (> 75%), no substitution method will work well.

As indicated in the following tabulation, a similar situation is noted with the data for the COPCs in overburden groundwater used to evaluate potential release to outdoor air around an excavation (see Appendix A, Table 2.2).

# of COPCs with ≤ 15% non-detects	0
# of COPCs with > 15% but < 75% non-detects	4
# of COPCs with ≥ 75% non-detects	2

As a result, the EPCs represented by the 95% UCLs may be underestimated or overestimated.

The computational method used to compute the 95% UCL on the arithmetic average concentrations depends on the distribution of the data. Statistical testing to determine the data distributions was conducted using the ProUCL software and 95% UCL on the arithmetic average concentrations recommended by the software were selected as the EPCs. Most of the EPCs were computed using the nonparametric Chebychev inequality, an approach that provides a conservative and stable estimate of the EPC, subject to the uncertainty noted above. For boron, iron, Ra-226, and U-234 in groundwater, the data distributions were determined to be lognormal and the ProUCL recommended 95% UCL on the arithmetic average concentrations based on the H-statistic. As shown in Appendix A, Table 3.1.RME, these 95% UCL on the arithmetic average concentrations are not unreasonable in comparison to the arithmetic means. Current EPA guidance (2002c) suggests using the Chebychev inequality with minimum-variance unbiased estimators (MVUE) for the mean and variance to obtain a UCL of the mean for lognormally distributed data sets and indicates that approach may yield an estimated UCL that is more useful than that obtained from the H-statistic method. However, in reviewing the ProUCL output, 95% UCL on the arithmetic average concentrations based on the 95% and 99% Chebychev (MVUE) are higher than the H-UCLs for these COPCs. Therefore, 95% UCL on the arithmetic average concentrations based on the H-statistic were used for these COPCs.

Assumptions and model input parameters that result in RME estimates were used in the exposure assessment; the actual frequencies and durations of exposure would probably be less than evaluated so that long-term exposure should be overestimated.

Potential exposure to chemicals in groundwater from dermal contact during showering (or bathing/washing) is based on data from unfiltered water samples and, as chemicals adsorbed to particulates in the water may be unavailable for dermal absorption, exposure may be overestimated. According to the EPA (2001d), the final dermally absorbed doses and dermal contact risk estimates should be considered highly uncertain. Kp is probably the most uncertain of the parameters used to estimate dermally absorbed dose. In addition, the FA is obtained from a graph to the nearest one significant figure, contributing to the uncertainty in the dermally absorbed dose for water.

While aspects of the exposure assessment methodology can result in overestimation or underestimation of long-term exposure, exposure is probably overestimated, overall, for the potentially exposed populations evaluated. The EPCs used in the exposure assessment (i.e., the 95% UCL on the arithmetic average concentration or the maximum detected concentration) were estimated without consideration of environmental migration, transformation, degradation, or loss and should result in overestimates of long-term exposure.

Available Toxicity Data

The derivation of the toxicity criteria that form the basis of the risk characterization can result in overestimates or underestimates of potential health risks. In most cases, the toxicity criteria are derived from extrapolation from laboratory animal data to humans, with the inclusion of modifying and/or uncertainty factors. As indicated in Appendix A, Tables 5.1 and 5.2, the oral and inhalation RfDs contain modifying and/or uncertainty factors that range as high as 10,000. RfDs and cancer slope factors for oral exposure were adjusted and used to assess exposure from dermal absorption. While the criteria for oral exposure are adjusted for such use following EPA guidance, oral absorption for the organic COPCs was assumed to be 100%; this may underestimate dermal contact risk for some chemicals. For those chemicals with specific oral absorption factors, consideration was not given to the absorption efficiency of the exposure vehicle used in the studies on which the toxicity criteria are based; this may overestimate or underestimate dermal contact risks for some chemicals. For benzene, where the EPA provides a range of cancer potency, the more conservative (i.e., health protective) oral and inhalation cancer slope factors were used. For some constituents, the toxicity criteria are provisional values provided by NCEA that have not undergone the level of scientific scrutiny given the verified toxicity criteria provided in IRIS.

For trichloroethene, provisional toxicity criteria provided by NCEA that are currently undergoing scientific reevaluation were used. These include an oral RfD, an inhalation RfC, and a range of cancer slope factors. As with benzene, the most conservative cancer slope factor was used. This value (4E-01 per mg/kg-d) suggests that the cancer potency of trichloroethene is about 40 times greater than previously believed (based on the previously recommended cancer slope factor of 1.1E-02 per mg/kg-d). However, following their release in August 2001:

- An EPA Science Advisory Board review panel and the scientific community provided extensive comments on the trichloroethene risk assessment and provisional toxicity criteria, and
- The trichloroethene risk assessment and provisional toxicity criteria are under review by the National Academy of Science.

While NCEA has ceased recommending the use of the provisional toxicity criteria in risk assessments, they recommend consultation with the EPA regional risk assessor. EPA, Region II continues to recommend use of the 2001 provisional toxicity criteria and, if the potential for risks are indicated, recommends reevaluation based on the previous provisional toxicity criteria and toxicity criteria derived by the California Environmental Protection Agency. While such reevaluation is not necessary in this human health evaluation, it should be noted that the EPA may revise the toxicity criteria again following their review of the comments and additional scientific studies and input from the National Academy of Science. The impact of any additional revisions on the risk estimates for trichloroethene provided in this evaluation is uncertain.

Finally, for some chemicals, health criteria are insufficient to determine RfDs or slope factors for oral and/or inhalation exposure.

Central Tendency

Assumptions and model input parameters that result in RME estimates were used in the exposure assessment; the actual frequencies and durations of exposure would probably be less than evaluated so that long-term exposure should be overestimated. A CT analysis was conducted, in conformance with EPA, Region II requirements, for those potentially exposed populations with total hazard indices and total excess lifetime cancer risks based on the RME estimates that are greater than the EPA acceptable levels. In the CT analysis, the risk estimates were re-calculated based on less conservative values for a number of exposure parameters (i.e., representing 50th percentile or median values) where such values were available (e.g., ET or ED for residents and workers) (EPA 1997d and/or 2001) or modified based on professional judgment (e.g., t-event and EF for construction/utility workers). The same EPCs used in the RME estimates were used in the CT analysis. As described previously, a factor of 0.6 was applied to the EPCs used to evaluate dermal contact with groundwater in the residential tap water use scenarios to account for the fraction volatilized while showering. The CT parameter values are presented in Appendix A, Tables 4.1.1.CT, 4.2.1.CT, 4.3.1.CT, 4.4.1.CT, and 4.5.1.CT.

The CT analyses indicated the following:

- For resident adults (Appendix A, Tables 9.1.1.CT and 10.1.1.CT), the total HI and the hazard indices for kidney, hematological, immune system, and skin effects remain greater than the EPA acceptable level and the total excess lifetime cancer risk remains greater than the EPA acceptable risk range.
- For the resident children (Appendix A, Tables 9.2.1.CT and 10.2.1.CT), the total HI and the hazard indices for kidney, hematological, neurological, immune system, and skin effects remain greater than the EPA acceptable level and the total excess lifetime cancer risk remains greater than the EPA acceptable risk range.
- For workers (Appendix A, Tables 9.3.1.CT and 10.3.1.CT), there was no change in the total HI or target organ-specific hazard indices and they remain greater than the EPA acceptable level. The total excess lifetime cancer risk remains greater than the EPA acceptable risk range.
- For the construction/utility workers (Appendix A, Tables 9.4.1.CT and 10.4.1.CT), the total HI and the hazard indices for hematological and immune system effects remain greater than the EPA acceptable level.

2.6 DISCUSSION AND CONCLUSIONS

The human health evaluation indicates a potential for health risks to residents (adults and children) and workers from exposure to groundwater, should groundwater be used for potable purposes, and to construction/utility workers from exposure to groundwater, should shallow groundwater be contacted during activities involving excavation. The non-cancer hazards indices and excess lifetime cancer risks greater than the EPA acceptable levels are predominantly due to arsenic and benzene. Vinyl chloride is also a predominant contributor to the excess lifetime cancer risks greater than the EPA acceptable level. Iron, lithium, manganese, 2-chlorotoluene, and xylenes are also predominant contributors to the non-cancer hazard indices greater than the EPA acceptable level. The GWRI Report (USACE 2005) indicates the following regarding these COPCs:

- The principal arsenic plume in overburden groundwater was identified in proximity to Former Retention Pond A located within the MISS while in bedrock groundwater, an arsenic plume emanating from the Former Retention Pond C within the MISS was identified. Arsenic in MISS groundwater is attributed to the former MCW disposal of coal/fly ash in the retention ponds.

  In addition, the groundwater data clearly show and anthropogenic source of arsenic that cannot be explained as ambient or background arsenic concentrations. The arsenic concentrations in overburden and bedrock groundwater during Phase II of the GWRI ranged from 2.4 to 2,600 µg/L (Appendix A, Table 2.1) and the average and 95% UCL arsenic concentrations are 41 and 191 µg/L, respectively (Appendix A, Table 3-1). However, the regional and “site-specific” (i.e., in MW-10S, MW-17S, and MW-18S) ambient / background groundwater data presented in the GWRI Report (USACE 2005) indicate arsenic concentrations from 1 to 3.8 µg/L.

- A benzene plume measuring approximately 350 feet in the direction of groundwater flow and 150 feet normal to flow was identified in overburden groundwater in proximity to Former Building 56/Former Retention Pond A within the MISS while in bedrock groundwater, a benzene plume was identified in proximity to Former Retention Pond C within the MISS. Additional source area characterization and plume delineation is provided in the GWRI Report (USACE 2005).

- Two lithium plumes were identified in overburden groundwater in proximity to Former Retention Ponds A and B located within the MISS and NRC Burial Pit 2 on the Stepan property. In bedrock groundwater, two lithium plumes were identified in proximity to Former Retention Ponds A and C within the MISS and within the Stepan property in proximity to the Former Aromatics Area.

  In addition, the groundwater data clearly show an anthropogenic source of lithium that cannot be explained as ambient or background lithium concentrations. The lithium concentrations in overburden and bedrock groundwater during Phase II of the GWRI ranged from 1 to 16,100 µg/L (Appendix A, Table 2-1) and the average and 95% UCL lithium concentrations are 1,766 and 4,698 µg/L, respectively (Appendix A, Table 3-1). However, the regional and “site-specific” ambient / background groundwater data presented in the GWRI Report (USACE 2005) indicate lithium concentrations ranging from 0.82 to 26 µg/L.

- The elevated iron and manganese concentrations are attributed to the ongoing degradation of organic constituents (benzene, chlorotoluene, and chlorinated solvents) in groundwater and utilization (reduction) of these metals as alternate electron acceptors. The highest total iron (Fe) and manganese (Mn) concentrations are detected in monitoring wells impacted with organic constituents and are attributed to the reduction/dissolution of the metals (as Fe^{+2}) and (Mn^{+2}) from the aquifer matrix. Once the organic constituents are remediated/degraded, iron and manganese (as Fe^{+3} and Mn^{+4}) would oxidize/precipitate in the aquifer and return to background groundwater concentrations.

  In addition, the groundwater data clearly show that the iron and manganese concentrations cannot be explained as ambient or background levels. The iron and manganese concentrations in overburden and bedrock groundwater during Phase II of the GWRI ranged from 17.3 to 166,000 µg/L and 2.1 to 28,000 µg/L, respectively (Appendix A, Table 2-1). The average and 95% UCL iron concentrations are 13,962 and 73,167 µg/L, respectively; and the average and

95% UCL manganese concentrations are 2,688 and 6,649 µg/L, respectively (Appendix A, Table 3-1). However, the "site-specific" ambient / background groundwater data presented in the GWRI Report (USACE 2005) indicate iron and manganese concentrations ranging from 34.3 to 977 µg/L and 14 to 189 µg/L, respectively.

- The source of vinyl chloride is probably on the Stepan property, in the Former Aromatics Area.

The radionuclides contribute relatively little to the total excess lifetime cancer risks and estimates of total radiological dose are less than the maximum dose limit for humans. In addition, most of the radiological risks and dose estimates may be due to background levels of the radionuclides.

3.0 SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT

3.1 INTRODUCTION AND OVERVIEW

This section presents a SLERA consisting of an initial evaluation of surface water and sediment chemical data collected from each of the water bodies in the FMSS vicinity. It integrates information gathered from the GWRI with toxicological information to evaluate whether detected constituents present potential risks to aquatic biota in the water bodies. The SLERA was performed following current regional and national guidance for ecological risk assessments (ERAs) at hazardous waste sites. This guidance includes:

- Guidelines for Ecological Risk Assessment (EPA 1998).
- Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments. (EPA 1997b).
- Risk Assessment Handbook, Volume II: Environmental Evaluation (USACE 1996).

The SLERA is comprised of the following:

- A screening-level problem formulation, which includes a description of the environmental setting, preliminary COPCs, constituent fate and transport information, a discussion of ecotoxicity and potential receptors and exposure pathways, and a presentation of assessment and measurement endpoints.
- A screening-level ecological effects evaluation.
- A screening-level risk calculation, using appropriate surface water and sediment screening values for aquatic biota.
- An uncertainty assessment.

The SLERA is focused on aquatic biota and does not evaluate the potential risk to higher-level organisms (e.g., waterfowl, semi-aquatic mammals). If constituent concentrations in surface water or sediments exceed ecological screening criteria, further ecological investigation and a more detailed ERA may be recommended. The components of the SLERA are discussed in more detail below:

Problem Formulation

A portion of the problem formulation given in Section 3.2 is identifying biological receptors and habitats that may be potentially exposed to FMSS-related constituents. This includes compiling information on the location and the natural history of the water bodies. Existing information includes descriptions of habitats and sensitive areas, aerial photography and other available mapping. Field inspections are also conducted.

Also included in the problem formulation is a description of constituents in the water body surface water and sediment, constituent fate and transport information, a discussion of ecotoxicity and potential receptors and exposure pathways, and a presentation of assessment and measurement endpoints.

Risk Characterization

Surface water and sediment data from the GWRI were used in screening detected constituents in Section 3.3. Chemical concentrations detected in surface water were screened against New Jersey Surface Water Quality Standards (NJAC 7:9B), National Ambient Water Quality Standards (NAWQS) (EPA 1991b), and other available surface water benchmarks.

Detected chemical concentrations in sediment were screened against available sediment screening benchmarks, using a hierarchy system. In addition to benchmarks provided by the NJDEP (1998b), many of the screening values were taken from the DOE's Oak Ridge National Laboratory (ORNL) document entitled Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Sediment-Associated Biota: 1997 Revision (Jones et al 1997). The hierarchy of benchmarks is discussed further in Section 3.3.

Detected radionuclide concentrations were screened against radiological benchmarks for surface water and sediment developed by the ORNL in the document entitled *Radiological Benchmarks for Screening Contaminants of Potential Concern for Effects on Aquatic Biota at Oak Ridge National Laboratory, Oak Ridge, Tennessee* (Bechtel Jacobs Company 1998). These benchmarks are discussed further in Section 3.3.

Uncertainty Assessment

Uncertainty is inherent in every risk assessment. Sources of uncertainty and the potential effects the uncertainties may have on the conclusions of the SLERA are discussed in Section 3.4.

Discussion and Conclusions

In Section 3.5, discussion and conclusions about the potential for current or future risks to aquatic biota in the water bodies are drawn based on the SLERA.

3.2 PROBLEM FORMULATION

3.2.1 Environmental Setting

The following sections describe the environmental resources within and in the immediate vicinity of the FMSS.

3.2.1.1 Land Use

Land use within the boundaries of the FMSS is primarily residential, industrial and commercial, as shown in **Figure 3-1**. Other land uses within the FMSS include recreational land, forested land, wetlands, and transportation. In general, the vicinity of the FMSS is a densely-populated, urbanized and industrialized region, with very little open space.

3.2.1.2 Surface Waters

Surface water bodies in the vicinity of the FMSS include the Saddle River, Westerly Brook, Lodi Brook and Coles Brook. These water bodies are described separately below, and shown on Plate 2.

Saddle River

The Saddle River runs along the western border of the FMSS (**Figure 3-1**) and flows in a southerly direction toward the Passaic River. Its watershed has a drainage area of approximately 61 square miles and the river flows 23 miles from its headwaters in Rockland County, NY through Bergen County, to its confluence with the Passaic River at Garfield and Wallington, NJ. The Saddle River flows through a densely populated, urbanized and industrialized region. As a result, water quality conditions in the region's waters are reflective of numerous point sources, significant non-point source contributions, and high sediment oxygen demands (NJDEP 1997). The Saddle River and its tributaries are classified as FW2-NT (non-trout production waters) by the NJDEP. The waters of the lower Saddle River will not support the primary contact (swimming) designated use. The Saddle River fully supports the "aquatic life support" designated use in its upper half (e.g., in Saddle River Borough and Ridgewood), and partially supports the use along most of its lower region (e.g., in Fair Lawn and Rochelle Park) except at its downstream-most end where there is no support (e.g., in Garfield).

A monitoring station is maintained in the Saddle River at Lodi, by the NJDEP (1997). At this station, monitoring of surface water has indicated highly elevated nutrient, bacteria and sodium levels, resulting in poor water quality. This location is also threatened with possible ammonia toxicity. The NJDEP Bureau of Water Monitoring (BWM) has been conducting biomonitoring studies on the State's water bodies since the early 1970s (NJDEP 2000b). In 1992, BWM designed and initiated the Ambient Biomonitoring Network (AMNET), with biomonitoring for benthic macroinvertebrate populations. The biological health of the Saddle River, based upon macroinvertebrate community sampling (conducted as part of AMNET), varies from healthy (non-impaired) in the upper half, to moderately impaired in the lower portions and to severely impaired in the lowest end (NJDEP 2000b). It is suspected of being primarily impacted by urban/suburban runoff, although point sources do exist in the watershed.

Westerly Brook

Westerly Brook, a tributary of the Saddle River, runs through the northwestern portion of the FMSS (**Figure 3-1**). It is a perennial stream fed by surface water runoff and groundwater discharge. The brook originates approximately 3,200 feet north of the FMSS. Historically, Westerly Brook flowed south in a natural open channel towards the FMSS. Currently, portions of the brook north of the FMSS are diverted through culverts as it passes beneath township roads. **Figure 3-2** shows the culverted and open or natural channel portions of the brook.

Westerly Brook was routed through a culvert in the early 1970s starting just north of the MISS. Inside the MISS, the culvert changes direction (approximately 90 degrees) at three locations before exiting the MISS towards the west. The culvert runs beneath Route 17 and an assisted living facility to a residential area before surfacing west of St. Anne Place. Westerly Brook then extends as a natural channel for approximately 500 feet, ultimately reaching a small pond immediately east of the Saddle River. A walled channel diverts water from the pond directly to the Saddle River.

A video survey conducted of the Westerly Brook culvert pipe under the MISS and the former Ballod property found that the pipe was in generally poor condition, and indicated leaking joints and heavy groundwater infiltration.

Lodi Brook

Lodi Brook is also a tributary of the Saddle River and flows southward through the center of the FMSS. It originates in the low marshy areas on the Sears property and is probably fed by shallow groundwater at the headwaters and upper reaches. Most of the open stream channel of Lodi Brook was replaced by a subsurface storm drain system in the 1940s. The only portion of Lodi Brook that flows in a natural channel is located in the northeastern portion of the FMSS, on the Sears property (**Figure 3-1**). The remainder of the brook is culverted and flows underground before it ultimately discharges into the Saddle River, approximately 1,000 feet south of Route 46. **Figure 3-2** shows the culverted and open portions of the brook.

Coles Brook

Coles Brook is located adjacent to the Scanel property, approximately 3000 feet east of the MISS (**Figure 3-1**). Coles Brook flows in a northeasterly direction, and ultimately discharges to the

Hackensack River. Tributaries of the Hackensack River that join the main stem between the Oradell Dam and the confluence with Overpeck Creek are classified as FW2-NT/SE1 by the NJDEP. Coles Brook falls within this area. The FW2-NT water classification refers to freshwaters that are generally not suitable for trout because of their physical, chemical or biological characteristics, but are suitable for a wide variety of other fish species. The SE1 classification indicates a saline water body in which shellfish harvesting, primary and secondary contact recreation and maintenance, migration and propagation of the natural and established biota can take place.

3.2.1.3 Wetlands

National Wetlands Inventory (NWI) mapping shows no mapped wetlands within the boundaries of the FMSS. Several wetland areas are present in the immediate vicinity of the FMSS, however, as shown in **Figure 3-3**. Most of these wetlands are associated with the Saddle River and Coles Brook, and are classified as Palustrine Emergent (PEM), Palustrine Forested Broad-Leaved Deciduous (PFO1), Palustrine Open Water (POW), Palustrine Scrub-Shrub Deciduous (PSS1) and Palustrine Scrub-Shrub Deciduous / Emergent (PSS1/EM). The Saddle River and Coles Brook are shown as streams on **Figure 3-3**.

New Jersey State wetlands mapping shows several small herbaceous wetland areas within the boundaries of the FMSS, as shown in **Figure 3-4**. Other wetlands in the FMSS vicinity are classified as deciduous scrub/shrub, deciduous wooded, disturbed wetlands (modified), and managed wetlands (modified). The Saddle River and Westerly Brook are shown on this mapping as streams, although most of Westerly Brook on the FMSS is currently culverted. The open portion of Lodi Brook near the Sears property and Coles Brook near the Scanel property are shown as linear wetlands.

A field reconnaissance of the properties within the FMSS was conducted in July 2002 by a Malcolm Pirnie, Inc. biologist. During this reconnaissance, it was observed that the herbaceous wetland shown in **Figure 3-4** on the Sears property is associated with the open portion of Lodi Brook. This wetland is an emergent system, consisting of cattails (Typha latifolia), common reed (Phragmites australis) and purple loosestrife (Lythrum salicaria). Other than the presence of some wetland vegetation along the brooks and some drainage swales, no other wetland systems were observed within the boundaries of the FMSS during the field reconnaissance.

3.2.1.4 Vegetation and Wildlife

Vegetation

The FMSS and the surrounding area are urban/suburban in nature and are highly developed. As such, there is very little wildlife habitat in the FMSS vicinity. Other than ornamental plantings and mowed lawns, scattered patches of wooded and herbaceous vegetation exist along stream corridors and along the dividing lines of commercial/industrial properties. **Table 3-1** lists vegetation species observed during the July 2002 field reconnaissance.

Along the western boundary of the FMSS, wooded and herbaceous vegetation lines the banks of the Saddle River. Wooded vegetation consists of ash (Fraxinus spp.), oak (Quercus sp.), box elder (Acer negundo), elm (Ulmus sp.), willow (Salix sp.), maple (Acer sp.), sycamore (Platanus occidentalis), mulberry (Morus sp.) and tree-of-heaven (Ailanthus altissima). Herbaceous species in these areas include purple loosestrife (Lythrum salicaria), garlic mustard (Alliaria officinalis), goldenrods (Solidago spp.), Japanese knotweed (Polygonum cuspidatum), Virginia creeper (Parthenocissus quinquefolia), grape (Vitis sp.), nettles (Urtica spp.), pokeweed (Phytolaca americana), poison ivy (Toxicodendron radicans), and morning glory (Ipomoea sp.). Vegetation associated with Westerly Brook to the north of the FMSS is similar to that associated with the Saddle River. The overstory consists mostly of box elder, maples and tree-of-heaven, while the understory consists mostly of Japanese knotweed, Virginia creeper, poison ivy, ornamental bittersweet (Celastrus orbiculatus), and nettles.

Open areas associated with the Scanel property adjacent to Coles Brook are dominated by silver maple (Acer saccharinum), tree-of-heaven, sycamore and elm as overstory, with Japanese knotweed, bull thistle (Cirsium vulgare), jewelweed (Impatiens capensis), pokeweed, garlic mustard, bitter dock (Rumex obtusifolius), bittersweet nightshade (Solanum dulcamara), grape, and multiflora rose (Rosa multiflora) as understory. A small strip of common reed exists along the railroad tracks on the western boundary of the Scanel property.

Other wooded areas exist on property boundaries throughout the FMSS. Vegetation in these areas is typical of disturbed urban/suburban areas and includes tree species such as tree-of-heaven, box elder, maples, catalpa (Catalpa bignonioides), sycamore, mulberry, and willow. Herbaceous species in these areas include goldenrods, Virginia creeper, pokeweed, ground ivy (Glechoma hederacea), bull thistle, grape, ornamental bittersweet, Queen Anne’s lace (Daucus carota), mugwort (Artemisia vulgaris), and ragweed (Ambrosia artemisiifolia).

Typical freshwater aquatic plants present in the Saddle River might include water celery, pondweed, and water chestnut. However, it is not likely that the Saddle River has much submerged aquatic vegetation (SAV) at locations near the site, considering the depth and velocity of the river. Vegetation that provides structure and habitat for fish and other aquatic wildlife is most likely comprised of trees and shrubs that grow along the banks and are rooted below the high water mark of flood events. The NJDEP Division of Fish and Wildlife indicated that SAV has not been observed in the Saddle River and that SAV most likely does not exist there. Westerly Brook and Lodi Brook are predominantly culverted, prohibiting the presence of aquatic vegetation. Even if SAV is present at certain times of the year, seasonal flooding most likely hinders population establishment.

Wildlife

Wildlife observed at the FMSS during the July 2002 site reconnaissance includes bird species such as red-winged blackbird (Agelaius phoeniceus), sparrows (Spizella sp., Passer sp.), American crow (Corvus brachyrhynchos) and mourning dove (Zenaida macroura). Raccoon (Procyon lotor) tracks were observed on the banks of Coles Brook at the Scanel property, and a woodchuck (Marmota monax) was seen on the upland portion of the Scanel property. Small fish, most likely minnows, were observed in Coles Brook. A great egret (Casmerodius albus) was observed in the Saddle River, just north of the FMSS.

According to a 1981 survey provided by the NJDEP Division of Fish and Wildlife, fish species in the Saddle River in the vicinity of the site include carp, largemouth bass, pumpkinseed, white perch, American eel, banded killifish, and white sucker.

Other wildlife species typical of developed areas may also inhabit the FMSS and vicinity. These may include small perching birds such as starling (Sturnus vulgaris), common grackle (Quiscalus quiscula), blue jay (Cyanocitta cristata), American robin (Turdus migratorius) and pigeon (Columba livia) and small mammals such as the Eastern cottontail rabbit (Sylvilagus floridanus), Virginia opossum (Didelphis virginiana), muskrat (Odontra zibethecus), gray squirrel (Sciurus carolinensis), house mouse (Mus musculus), and Norway rat (Rattus norvegicus). A small number of reptile and amphibian species [e.g., common garter snake (Thamnophis sirtalis) and American toad (Bufo americanus)] probably inhabit the FMSS and vicinity as well.

Threatened and Endangered Species

The NJDEP's Natural Heritage Program was contacted regarding the potential presence of threatened or endangered species and/or significant habitats in the vicinity of the FMSS. The Natural Heritage Data Base does not have any records for rare plants, animals, or natural communities within or in the immediate vicinity of the FMSS. The Landscape Project (Version 1.0) shows that suitable habitat patches of emergent wetland and forested wetland occur within the immediate vicinity of the FMSS. The Landscape Project was developed by the NJDEP, Division of Fish and Wildlife, Endangered and Nongame Species Program to map critical habitat for rare animal species. It does not have any records for rare species in those habitat patches (NJDEP 2002b).

3.2.2 Preliminary Constituents of Concern

The ERA prepared for the MISS (DOE 1993), concluded that several constituents were of particular concern in various environmental media. In surface water, lithium, 1,2-dichloroethene, and 1,1,2,2-trichloroethane were COPCs, but relative risks could not be calculated because there were no toxicity benchmarks for these constituents. There were no COPCs identified for sediments of Westerly and Lodi Brooks. Since additional surface water and sediment sampling was conducted at the FMSS in October 2001 during Phase II of the GWRI, the results of the additional sampling are screened against applicable criteria and toxicity benchmarks to develop an updated list of COPCs for surface water and sediment.

As part of Phase II of the GWRI, a total of 21 surface water samples were obtained from Westerly Brook, Lodi Brook, Coles Brook and the Saddle River. Five surface water samples were obtained from both Westerly Brook and the Saddle River. Seven surface water samples were obtained from Lodi Brook and four surface water samples were collected from Coles Brook. Surface water samples were analyzed for Ra-226, Ra-228, isotopic thorium, total and/or isotopic uranium, TAL metals plus boron, hexavalent chromium and lithium, and rare earth elements. A total of 22 sediment samples were obtained from Westerly Brook, Lodi Brook, Coles Brook and the Saddle River. Five sediment samples were obtained from both Coles Brook and the Saddle River. Six sediment samples were obtained from both Westerly Brook and Lodi Brook. Sediment samples were analyzed for radiological parameters, TAL metals plus lithium and boron, and rare earth elements. Radiological data for surface water and sediment from the October 2001 sampling event are summarized in Tables 3-2 through 3-3, respectively. The frequency of detection, range of detected concentrations and range of MDA are presented in Tables 3-2 and 3-3 as well. Chemical data for surface water and sediment from the October 2001 sampling event are summarized in Tables 3-4 and 3-5, respectively. The frequency of detection and range of detected concentrations are also presented. Plate 2 shows the surface water and sediment sampling locations. All surface water and sediment sampling locations are regarded as downstream of the FMSS.

3.2.3 Constituent Fate and Transport

The thorium processing operation conducted at the former MCW was the primary origin of the contamination. Numerous neighboring properties became contaminated as a result of waste disposal operations, construction activities, and surface water runoff, thus providing secondary sources. Interim remedial actions resulted in a stockpile of wastes at the MISS property that has recently been removed. Thus, the primary sources of surface water and/or related contamination are:

- Material deposited by stream flow along Lodi Brook,
- Former retention ponds on the MISS property,
- Buried drums on the Sears property,

- Contaminated fill material on residential and other industrial/government properties, and
- Burial pits on the Stepan property.

Chemical and radiological constituents may have been transported from the properties into the water bodies during overland runoff from storm events and/or from groundwater infiltration. For three of the FMSS properties along Route 17 North, (Architectural Windows, Ramsey Auto Group, and Sunoco), a swale on the property is assumed to have deposited radioactive material. The swale and previously deposited fill are the primary mechanisms for the radioactive contamination in the areas of these properties. Transport of material would likely either be by ground or surface water. Fill material at the Sears property is described and documented in the GWRI Report (USACE 2005). The fill and drums of material were transported and dumped and buried prior to the construction of the current building. The area to the east of the Sears building also forms the headwaters for Lodi Brook. Impacted soils and sediments from the former MCW were transported downstream in Lodi Brook, creating a secondary source of contamination. Contaminated fill from the former MCW was used in the vicinity properties, and may also have been transported to Lodi Brook with runoff. Contaminated sediment in Lodi Brook is probably derived from erosion and runoff of soils, upstream sediments and/or bank deposits in impacted areas on Sears or other adjacent properties.

The Scanel Company property and the Hackensack & Lodi Railroad are isolated clusters previously used as a fill area. The fate and transport of material from this property is unique given the property location adjacent to Coles Brook. Coles Brook forms the Eastern boundary of the Scanel Property, and serves as a drainage pathway from Essex Street.

A section of the Westerly Brook pipe on the MISS, and junction/culvert pipe on the NYS&WRR easement, are located adjacent to overburden lithium and arsenic plumes plotted in the GWRI Report (USACE 2005). Contaminated groundwater may be infiltrating into the Westerly Brook culvert pipe at this and other locations. Westerly Brook ultimately flows into the Saddle River, and may be source of constituent input to the river.

In addition to direct overland runoff from properties immediately adjacent to the water bodies, stormwater runoff from other properties may have been transported to the water bodies via the local stormwater collection systems. Once deposited into the water bodies, constituents would tend to collect in the bottom sediments and would thereby be potentially available for uptake by benthic organisms and higher forms of wildlife (e.g., fish and fish-eating birds or mammals).

3.2.4 Ecotoxicity and Potential Receptors

Fish and benthic invertebrates are the receptors of potential concern, since these organisms have the greatest potential for exposure of the aquatic and semi-aquatic organisms that may utilize the water bodies.

In general, aquatic organisms tend to be more resistant to radiation than terrestrial mammals, and vertebrates are more radiosensitive than invertebrates (NCRP 1991). It has been demonstrated that adult fish have radiation sensitivities similar to terrestrial mammals if the response is followed for sufficient time, while invertebrates tend to be more resistant. The most sensitive periods in the life cycle of aquatic organisms are the early developmental stages and, generally, radiation sensitivity decreases with increasing time of development. It appears that reproductive and early developmental systems of vertebrates are most sensitive to chronic irradiation, in both aquatic and terrestrial environments (NCRP 1991).

For purposes of this SLERA, fish were considered to be the potential receptors of concern for radiological constituents, since they have more potential for exposure from surface water and sediments than semi-aquatic birds or mammals, and they are more sensitive to radiological exposure than benthic invertebrates. For chemical constituents, fish and benthic invertebrates were the receptors of potential concern since these organisms have the greatest potential for exposure of the organisms that may utilize the water bodies.

3.2.5 Complete Exposure Pathways

Evaluating potential exposure pathways is one of the primary tasks of the ecological characterization of a site. For an exposure pathway to be complete, a constituent must be able to travel from the source to ecological receptors and, for chemical constituents, to be taken up by the receptors via one or more exposure routes. The complete exposure pathway of concern for constituents at the FMSS involves deposition into water bodies from contaminated properties via erosion, overland runoff and/or discharge from the stormwater sewer system, and subsequent contact with or uptake of constituents in sediments by fish and benthic invertebrates. These exposure pathways are shown in the ecological conceptual site model, **Figure 3-5**.

Exposure routes for radiological constituents include radiation doses to fish both internally (via consumption of benthic organisms and incidental consumption of sediment) and externally (via contact with sediment and surface water). As discussed below in Section 3.3.1.1, the sediment screening benchmarks for radiological constituents take into account exposure from surface water as well as sediment. Exposure routes for chemical constituents include contact with and ingestion of constituents in sediment by benthic organisms.

3.2.6 Assessment and Measurement Endpoints

For a SLERA, assessment endpoints are any adverse effects on ecological receptors, where receptors are plant and animal populations and communities, habitats, and sensitive environments. Adverse effects on populations can be inferred from measures related to impaired reproduction, growth and survival.

A measurement endpoint is a measurable ecological characteristic that is related to the valued characteristic chosen as the assessment endpoint. The screening ecotoxicity values available for constituents in surface water and sediment are based on generic assessment endpoints (e.g., protection of aquatic communities from changes in structures or function) and are applicable screening-level measurement endpoints for the FMSS.

With minor exceptions (e.g., mercury), the chemical constituents in surface water and sediment in the Saddle River are not particularly bioaccumulative in fish. The highest of the fish bioaccumulation factors for the chemical constituents in surface water (e.g., for chromium and uranium) are orders of magnitude lower that those for more bioacumulative constituents (e.g., DDT or polychlorinated biphenyls). Therefore, the potential for bioaccumulation of these chemical constituents in higher-level organisms supported by the Saddle River, and the other water bodies in the FMSS, is not of concern.

3.3 RISK CHARACTERIZATION

3.3.1 Ecological Effects Evaluation

3.3.1.1 Radiological Constituents

Sediment screening benchmarks for radionuclides developed by the ORNL in the document entitled *Radiological Benchmarks for Screening Contaminants of Potential Concern for Effects on Aquatic Biota at Oak Ridge National Laboratory, Oak Ridge, Tennessee* (Bechtel Jacobs Company 1998) were used in this SLERA. The benchmark development approach presented in the ORNL document is based on formulas and exposure factors developed by Blaylock et al (1993) for estimating the dose rates to representative aquatic organisms. Those formulas were used to calculate water and sediment concentrations of individual radionuclides that result in a total dose rate to fish from selected radionuclides of 1 radiation absorbed dose or "rad" per day (1 rad/day), which is the recommended acceptable dose rate to natural populations of aquatic biota (NCRP 1991). The radiological screening benchmarks are based on fish because, as discussed in Section 2.4, vertebrates are more radiosensitive than invertebrates (NCRP 1991).

Radiation exposures to fish at the sediment/water interface are likely to be driven by external exposures to contaminated sediments. The exception is for alpha-emitters, such as Th-230, for which internal exposure is of concern.

Two types of benchmarks were derived in the ORNL document: single-medium benchmarks (i.e., for surface water or sediment) and multi-media benchmarks. The single-medium benchmarks are based on exposures to radionuclides in one medium but not the other. These benchmarks are intended to be used when both water and sediment data are available, as in this SLERA. The multi-media benchmarks are for use when only one medium was sampled at a site.

Due to the uncertainty associated with the radiological benchmarks, a compromise approach to screening is recommended in the ORNL document: the maximum exposure concentration should be compared with a threshold of 0.25 rad/day as an initial screening tool. Therefore, the benchmarks provided in the ORNL document were divided by four for use in this SLERA.

Unlike exposures to chemicals, which are expressed as the concentration in water or sediment, exposures to radionuclides are expressed as the dose rate received by the organism. Dose rates that account for the biological effects to the organism are additive. That is, the total dose rate is the sum of the normalized dose rates for each radionuclide. The benchmarks presented in the ORNL document were derived to be protective of both internal and external exposures from parent isotopes and all short-lived decay products. Ra-228 is included in the benchmark value for Th-232+D as a daughter product.

The radiological screening benchmarks developed by ORNL are intended for use as screening values only. They are for use in ERAs of natural populations of aquatic biota. The recommended limit of 1 rad/day is not considered appropriate for the assessment of risks to individual organisms (e.g., threatened and endangered species) (NCRP 1991).

3.3.1.2 Chemical Constituents

NJDEP surface water standards for freshwater aquatic life are not available for constituents detected in surface water in the vicinity of the FMSS. Therefore, surface water benchmarks used in the screening process are those given in Suter and Tsao (1996). These benchmarks represent National Ambient Water Quality Criteria (NAWQC) for chronic effects in freshwater, Tier II Secondary Chronic values for freshwater, and lowest chronic values for freshwater organisms. Surface water benchmarks for the rare earth elements (i.e., cerium, dysprosium, lanthanum, neodymium, and yttrium) are those found in Sneller et al (2000) and represent maximum permissible concentrations of these constituents in surface water.

Sediment screening benchmarks were selected for this SLERA using a hierarchy system. Many of the benchmarks are taken from the ORNL document entitled Toxicological Benchmarks for Screening Contaminants of Potential Concern for Effects on Sediment-Associated Biota: 1997 Revision (Jones et al 1997). Benchmarks were selected based on their availability in the following order:

- Guidance for Sediment Quality Evaluations (NJDEP 1998b). Lowest Effect Level (LEL) values for freshwater sediment.
- Guidance for Sediment Quality Evaluations (NJDEP 1998b). Effects Range-Low (ER-L) values for marine/estuarine sediments. Although these benchmarks are for marine/estuarine sediments, the NJDEP recommend their use for freshwater sediments when freshwater sediment benchmarks are not available.
- EPA Office of Solid Waste and Emergency Response (EPA 1996a) Ecotox Thresholds (cited in Jones et al 1997).
- Assessment and Remediation of Contaminated Sediments Program (ARCS) values [Threshold Effect Concentration (TEC), Probable Effect Concentration (PEC), high No Effect Concentration (NEC)] (EPA 1996b) (cited in Jones et al 1997).
- Ontario Ministry of the Environment (Persaud et al 1993) LEL (cited in Jones et al 1997).
- Other values, either derived by another State (e.g., Washington) (cited in Jones et al 1997) or found in available literature.

Sediment benchmarks for the rare earth elements are those found in Sneller et al (2000) and represent maximum permissible concentrations of these constituents in sediment.

3.3.2 Exposure Estimation

For purposes of this SLERA, it was assumed that fish and benthic organisms in each water body are exposed to constituents at the maximum detected concentrations, regardless of the location of the maximum detected concentrations in the water bodies. The results of radiological and chemical analyses of surface water and sediment samples obtained during the Phase II GWRI, presented previously in Section 3.2.2, were used in the risk calculations in Section 3.3.3 below.

3.3.3 Risk Calculation

3.3.3.1 Radiological Constituents

The sediment screening benchmarks presented in the ORNL document (Bechtel Jacobs Co., 1998) discussed in Section 3.3.1.2 were derived to be protective of internal and external exposures from parent isotopes and all short-lived decay products. If the total dose rate from all radionuclides and exposure pathways exceeds an acceptable threshold, further analysis may be needed to determine the hazards posed by radionuclides. If, however, the total dose rate falls below an acceptable threshold, radionuclides may be eliminated from further study. The acceptable threshold for this SLERA is a calculated HI (HI) of 1; a HI greater than 1 indicates a potential for adverse ecological health effects. A HI is calculated by adding HQs from each radionuclide. HQs are calculated by dividing the radionuclide concentration in sediment (the maximum concentration detected in the samples) by the benchmark for that radionuclide. The HI is an index based on the total dose rate to the organism and accounts for all three exposure pathways: the total internal dose, the total external dose from water, and the total external dose from sediment.

Tables 3-6 and **3-7** show the results of the risk characterization for the radiological constituents in surface water and sediment, respectively, for each of the water bodies. HQs were well below one for each of the radiological constituents in each water body. HIs were below one for each water body.

3.3.3.2 Chemical Constituents

HQs and HIs were also calculated for chemical constituents at each of the water bodies. The acceptable threshold for this SLERA is a calculated HQ or HI of 1; an HQ or HI greater than 1 indicates a potential for adverse ecological health effects. Results of the risk characterization are discussed separately below for each of the water bodies.

Lodi Brook

As shown in **Table 3-8**, HQs for aluminum, barium, boron, copper, iron, lanthanum, lead, lithium, manganese, and silver in surface water are greater than 1. The HI calculated for surface water is 163, higher than the threshold of 1. Much of the HI is due to boron (HQ = 110) and barium (HQ = 26). HQs for the other constituents are less than 10. In sediment, HQs are greater than 1 for antimony, arsenic, cadmium, chromium, copper, iron, lead, manganese, nickel and zinc, as shown in **Table 3-9**. The HI calculated for sediment in is 53, with lead having the highest HQ (14). The HQs for the other constituents are less than 10.

Westerly Brook

As shown in **Table 3-10**, HQs for aluminum, barium, boron, iron, lanthanum, lead, lithium, manganese, silver and zinc in surface water are greater than 1. The HI calculated for surface water is 456, higher than the threshold of 1. Much of the HI is due to silver (HQ = 165), boron (HQ = 136), barium (HQ = 61), lithium (HQ = 46) and manganese (HQ = 31). The HQs for the other constituents are less than 10. In sediment, HQs are greater than 1 for cadmium, chromium, copper, iron, lead, nickel, silver, and zinc, as shown in **Table 3-11**. The HI calculated for sediment is 32, with lead having the highest HQ (9). All of the sediment HQs are less than 10.

Saddle River

As shown in **Table 3-12**, HQs for barium, boron, lead, lithium, manganese, and silver in surface water are greater than 1. The HI calculated for surface water is 219, higher than the threshold of 1. Much of the HI is due to boron (HQ = 131), lithium (HQ = 45) and barium (HQ = 31). The HQs for the other constituents are below 10. In sediment, HQs are greater than 1 for arsenic, copper, lead, and zinc, as shown in **Table 3-13**. The HI calculated for sediment is 11, with the highest HQs being 2, for copper and lead.

Coles Brook

As shown in **Table 3-14**, HQs for barium, boron, manganese and total uranium in surface water are greater than one. The HI calculated for surface water is 82. Much of the HI is due to barium (HQ = 38) and boron (HQ = 34). HQs for the other constituents are less than 5. In sediment, HQs are greater than 1 for arsenic, cadmium, chromium, copper, iron, lead, nickel, and zinc, as shown in **Table 3-15**. The HI calculated for sediment is 37, with the highest HQs being 10 for lead and 8 for copper.

Sediment benchmarks are not available for beryllium, boron, calcium, lithium, magnesium, potassium, and sodium. Of the chemicals for which benchmarks are not available, it is unlikely that the essential nutrients calcium, magnesium, potassium, and sodium present risks to benthic invertebrates.

3.4 UNCERTAINTY ASSESSMENT

Uncertainty is inherent in the process of conducting a SLERA. As indicated in the Human Health Evaluation, uncertainty may be associated with the environmental sampling and analysis, the exposure characteristics, and the available toxicity benchmarks.

A major uncertainty in this SLERA is the lack of surface water and sediment samples from the evaluated water bodies from locations sufficiently upstream of the FMSS. Without such data, the constituents detected in surface water and sediment are evaluated in this SLERA as if they are related to the FMSS. Since it is quite possible that some of these constituents represent background conditions or may be the result of point or non-point source discharges upstream of the FMSS, the potential for ecological health risks identified in this SLERA may be overstated. Additionally, surface water sample SR-4 from the Saddle River had a turbidity measurement above 50 NTU. As a result, inorganic and radiological constituent concentrations in SR-4 may be biased high.
Another point of uncertainty lies in the assumption that each of the wildlife receptor species feeds only upon food items found in the areas sampled. For species with very small home ranges (e.g., benthic invertebrates), this assumption is likely to be close to actuality. However, other receptors (e.g., fish) may consume food sources other than those considered in the assessment, the exclusion of which could either over- or underestimate the potential risk. It is possible that receptors may not feed entirely within the vicinity of the FMSS, but may forage in other areas as well (e.g., upstream of the FMSS).

Overall, a generally conservative approach was taken in the SLERA, including the use of maximum detected constituent concentrations and the use of screening-level sediment benchmark values, which are inherently conservative. The radiological benchmarks were divided by a factor of four to further add conservatism to the assessment. This approach is consistent with EPA guidance (EPA 1997b) which states that, "It is important to minimize the chance of type II error (the likelihood that the actual risk is greater than that predicted)." This SLERA, therefore, tends to overestimate risk rather than underestimate risk to receptor species.

3.5 DISCUSSION AND CONCLUSIONS

None of the radiological constituents detected in surface water or sediment in any of the water bodies have HQs that exceed 1. HIs for radiological constituents in surface water and sediment are also less than one for each water body. This indicates that there is no potential risk to aquatic biota from the presence of radionuclides in surface water and sediment in water bodies in the vicinity of the FMSS. Therefore, there are no radionuclides of potential concern selected for the FMSS.

As summarized in Table 3-16, a number of chemical constituents detected in surface water and/or sediment in each of the water bodies have HQs that exceed 1 and, therefore, are chemical constituents of potential concern. In surface water and sediment, these constituents include copper, iron, lead, manganese, silver, and zinc. In surface water, these constituents include aluminum, barium, boron, lanthanum, lithium, and uranium. In sediment, these constituents include antimony, arsenic, cadmium, chromium, and nickel.

However, as discussed in the previous section, the potential for adverse ecological health effects may be overstated due to the lack of upstream surface water and sediment samples from the evaluated water bodies. Most of the chemical constituents of potential concern have not been associated with the site and their concentrations in surface water/sediment may be the result of off-site, non-FUSRAP sources and upstream surface water/sediment quality.

As indicated in the GWRI Report (USACE 2005), barium and silver are common constituents in coal/fly ash that was incorporated in fill used elsewhere on the former MCW and vicinity properties. According to aerial photographs, coal was also stored on adjacent off-site properties, and impacted sediment may have accumulated in stream drainages over time. Accordingly, these metals in surface water may be derived from off-site, non-FUSRAP sources. Boron has been detected/co-located with radiological constituents, however, the thorium and lithium extraction processes did not utilize boron.

The surface water bodies of the FMSS are discussed separately below. Sample locations are shown on Plate 2. There were no apparent differences in the general appearance and ecological health of the upstream and downstream locations based on casual observations made during the visits to the surface water bodies.

Lodi Brook

In surface water, the maximum detected concentrations of barium (104 µg/L) and boron (176 µg/L) were found at sampling locations LB-3 and LB-8, respectively. Six of the seven surface water samples had barium concentrations that exceed the benchmark. All of the seven surface water samples had boron concentrations that exceed the benchmark. In sediment, the maximum detected concentration of lead (427 mg/kg) was found at sampling location LB-7. All of the sediment samples had lead concentrations that exceed the benchmark.

The highest detected concentrations of lead in Lodi Brook are located downstream of the former MCW, which indicates a potential input of lead contaminated sediment from runoff or another source. The specific source of barium at the FMSS is not known, but it may be derived from local impacted fill material, as indicated above. Currently, Lodi Brook offers little natural habitat; except for a small reach in the northeastern portion of the FMSS, the remainder of the brook is culverted and flows underground before it ultimately discharges into the Saddle River.

Westerly Brook

The maximum detected concentrations of barium (242 µg/L), manganese (3,730 µg/L), and silver (59.4 µg/L) in surface water were detected at sample location WB-3. The maximum detected concentrations of boron (218 µg/L) and lithium (642 µg/L) were detected at sampling location WB-1. All of the five samples had barium, boron, lithium and silver concentrations that exceed the benchmarks. However, the concentrations of these from the more upstream locations were lower than the maximum detected concentrations, indicating the potential for downstream sources.

Former Retention Ponds A and C were identified in the GWRI Report (USACE 2005) as probable sources of lithium in the overburden aquifer, and are the likely sources of lithium in the bedrock aquifer. Former Retention Ponds D and E, which contained process waste that was excavated and placed in the NRC Burial Pits during the 1960s, are also a possible source of lithium. The specific sources of barium and silver are not known, but barium and silver may be derived from local impacted fill material, as indicated above.

Lithium does not occur in its free form in nature, but combines with other materials to form various lithium compounds. Li_2CO_3 and Li_3PO_4 are relatively stable, non-flammable materials. Their low solubility in water makes them relatively benign to the environment (DOE 2000). Since lithium concentrations in surface water in Westerly Brook are high relative to the surface water benchmark of

14 µg/L, the lithium in surface water is most likely not in the form of Li_2CO_3 or Li_3PO_4. It more likely occurs in the form of one of the more soluble lithium compounds, such as lithium chloride (LiCl). Lithium chloride is a relatively stable, non-flammable material that is readily soluble in water. Aqueous solutions of LiCl can be corrosive to steel over time, and LiCl-contaminated water can be damaging to aquatic and plant life. Considering this, and the elevated concentrations of lithium in surface water relative to the surface water benchmark, lithium may present a risk to organisms inhabiting Westerly Brook. Currently, Westerly Book offers little natural habitat; the brook is culverted from just north of the MISS to approximately 500 feet upstream of a small pond immediately east of the Saddle River.

Saddle River

The maximum detected concentrations of barium (125 µg/L), boron (209 µg/L), and lithium (631 µg/L) in surface water were found at sampling locations SR-7, SR-3, and SR-3, respectively. All five of the surface water samples had barium and boron concentrations that exceed the benchmark. Two of the five surface water samples had lithium concentrations that exceed the benchmark. However, the minimum detected concentrations of these constituents were from the most upstream location (SR-2) and the concentration ranges for barium (112-125 µg/L) and boron (152-209 µg/L) are relatively narrow. The barium and boron concentrations, therefore, may be consistent with more upstream water quality such that they could be eliminated from further consideration as constituents of potential ecological concern. The maximum detected lithium concentration is about 100-fold greater than the minimum detected concentration, indicating the FMSS as a possible source.

Since SR-2 is located adjacent to the discharge of Westerly Brook into the Saddle River, Westerly Brook or the groundwater in its vicinity may be a source of lithium to the river. The specific source of barium at the FMSS is not known, but it may be derived from local impacted fill material, as described above.

Considering the properties of lithium discussed above, and the high concentrations of lithium in surface water relative to the surface water benchmark, lithium may present a risk to wildlife inhabiting the Saddle River.

The Saddle River flows through a densely populated, urbanized and industrialized region, with water quality in the vicinity of the FMSS reflective of numerous point sources, significant non-point source contributions, and high sediment oxygen demands. Water quality in the vicinity of Lodi, NJ is considered poor and, based on investigations of the macroinvertebrate communities, the biological health varies from healthy (non-impaired) in the upper half, to moderately impaired in the lower portions, to severely impacted in the lowest end.

Coles Brook

The maximum detected concentrations of barium (152 µg/L) and boron (54.4 µg/L) in surface water were found at sample locations CB-5 and CB-2, respectively. Three of the five surface water samples had barium concentrations that exceed the benchmark. All of the four surface water samples had boron concentrations that exceed the benchmark. However, the minimum detected concentrations of these constituents were from the most upstream sample (CB-1) and were more than 10-fold lower than the more downstream concentrations, indicating the potential for downstream sources.

In sediment, the maximum detected concentration of lead (304 mg/kg) was found at sample location CB-3. Two of the five sediment samples had lead concentrations that exceed the benchmark. However, only sample CB-3 showed an elevated concentration relative to that in the other four samples (20.2-40.2 mg/kg), indicating the potential for localized source.

The specific source of lead in the Coles Brook sediment samples is unknown, but may be derived from runoff of adjacent roads, railroad tracks and commercial properties. The specific source of barium at the FMSS is not known, but it may be derived from local impacted fill material, as described above.

In conclusion:

- There is adequate information to conclude that site-related ecological risks are negligible with respect to the radiological constituents and, therefore, there is no need for remediation on the basis of ecological risk.
- There is adequate information to conclude that site-related ecological risks are negligible with respect to the other inorganic constituents and, therefore, there is no need for remediation on the basis of ecological risk. Some of these constituents may be derived from off-site, non-FUSRAP sources and may reflect upstream surface water/sediment quality. Currently, Lodi Brook and Westerly Brook are predominantly culverted and offer little natural habitat. Coles Brook does not appear to have been impacted by the site.
- There is a potential for adverse site-related ecological effects from lithium, and a more thorough assessment (e.g., environmental chemistry, fate and transport processes, etc.) may be warranted.

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TABLES

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TABLE ES-1
RISK SUMMARY
REASONABLE MAXIMUM EXPOSURE
FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
			Benzene	6E-04	4E-04	--		1E-03	Immune	5E+00	2E+00	--	7E+00
			2-Chlorotoluene	--	--	--			Body Weight	2E+00	--	6E-01	3E+00
			Vinyl Chloride	3E-04	3E-06	--		3E-04	--	--	--	--	--
			Arsenic	4E-03	--	--		4E-03	Skin	2E+01	--	--	2E+01
			Iron	--	--	--			Chronic iron overload	7E+00	--	--	7E+00
			Lithium	--	--	--			Kidney	6E+00	--	--	6E+00
			Manganese	--	--	--			--	--	--	--	--
			Chemical Total	5E-03	--	4E-04		6E-03		4E+01	2E+00	6E-01	4E+01
		Exposure Point Total						6E-03					4E+01
	Exposure Medium Total							6E-03					4E+01
Medium Total								6E-03					4E+01
Receptor Total							Receptor Risk Total	6E-03				Receptor HI Total	4E+01

Total Kidney effects HI Across All Media =	6E+00
Total Developmental effects HI Across All Media =	3E+00

TABLE ES-2
RISK SUMMARY
REASONABLE MAXIMUM EXPOSURE
FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
			Benzene	2E-04	2E-04	--		4E-04	Immune	1E+01	1E+01	--	2E+01
			2-Chlorotoluene	--	--	--			Body Weight	5E+00	--	1E+00	6E+00
			Vinyl Chloride	1E-04	1E-06	--		1E-04	--	--	--	--	--
			Xylenes (total)	--	--	--			Body weight, mortality	1E-01	1E+00	3E-02	2E+00
			Arsenic	2E-03	--	--		2E-03	Skin	4E+01	--	--	4E+01
			Iron	--	--	--			Chronic iron overload	2E+01	--	--	2E+01
			Lithium	--	--	--			Kidney	2E+01	--	--	2E+01
			Manganese	--	--	--			CNS	3E+00	--	--	3E+00
			Chemical Total	2E-03	--	2E-04		2E-03		9E+01	3E+00	1E+00	1E+02
		Exposure Point Total						2E-03					1E+02
	Exposure Medium Total							2E-03					1E+02
Medium Total								2E-03					1E+02
Receptor Total							Receptor Risk Total	2E-03				Receptor HI Total	1E+02

Total Kidney effects HI Across All Media =	2E+01
Total Neurological effects HI Across All Media =	3E+00

TABLE ES-3
RISK SUMMARY
REASONABLE MAXIMUM EXPOSURE
FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
			Benzene	1E-04	--	--		1E-04	Immune	2E+00	--	--	2E+00
			Arsenic	1E-03	--	--		1E-03	Skin	6E+00	--	--	6E+00
			Iron	--	--	--			Chronic iron overload	2E+00	--	--	2E+00
			Lithium	--	--	--			Kidney	2E+00	--	--	2E+00
			Chemical Total	1E-03	--	--		1E-03		1E+01	--	--	1E+01
		Exposure Point Total						1E-03					1E+01
	Exposure Medium Total							1E-03					1E+01
Medium Total								1E-03					1E+01
Receptor Total							Receptor Risk Total	1E-03				Receptor HI Total	1E+01

Total Kidney effects HI Across All Media =	2E+00
Total Skin effects HI Across All Media =	6E+00
Total Immune System effects HI Across All Media =	2E+00

TABLE ES-4
RISK SUMMARY
REASONABLE MAXIMUM EXPOSURE
FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
			Benzene	--	--	--			Immune	--	4E+00	3E+00	6E+00
			2-Chlorotoluene	--	--	--			Body Weight	--	--	4E+00	4E+00
			Chemical Total	--	--	--		--		--	4E+00	6E+00	1E+01
		Exposure Point Total											1E+01
	Exposure Medium Total												1E+01
Medium Total													1E+01
Receptor Total				Receptor Risk Total					Receptor HI Total				1E+01

Total Developmental effects HI Across All Media =	4E+00
Total Immune System effects HI Across All Media =	6E+00

Table ES-5

Hazard Quotients Exceeding One - Chemical Constituents
FUSRAP Maywood Superfund Site

Constituent	Lodi Brook		Westerly Brook		Saddle River		Coles Brook	
	Surface Water	Sediment	Surface Water	Sediment	Surface Water	Sediment	Surface Water	Sediment
Aluminum	1.1		3					
Antimony		2						
Arsenic		5				1.4		1.1
Barium	26		61		31		38	
Boron	110		136		131		34	
Cadmium		2		3				5
Chromium		7		2				2
Copper	2	6		6		2		8
Iron	1.2	2	3	1.3				1.2
Lanthanum	4		3					
Lead	2	14	2	9	3	2		10
Lithium	7		46		45			
Manganese	4	1.3	31		1.4		2	
Nickel		4		3				2
Silver	5		165	1.1	3			
Uranium (total)							4	
Zinc		9	2	4		2		5

Table 1-1
Population Trend and Density

Location	Size in Square Miles	1950	1960	1970	1980	1990	2000	2000 People per Square Mile
Maywood	1.31	8,667	11,460	11,087	9,895	9,473	9,523	7,269
Lodi	2.29	15,392	23,502	25,163	23,956	22,355	23,971	10,468
Rochelle Park	1.04	4,483	6,119	6,380	5,603	5,587	5,528	5,315
Bergen County	238.73	539,139	780,255	897,148	845,385	825,380	884,118	3,703

Source: Bergen County Department of Planning and Economic Development
2000 Census Factfinder (http://factfinder.census.gov)

Table 1-2
Population of Adults and Children in Year 2000

	Maywood	Lodi	Rochelle Park	Bergen County
Children (< 5 years old)	618	1,533	312	55,363
Children (5 to 9 years old)	563	1,422	307	58,772
Children (10 to 14 years old)	537	1,360	269	56,901
Children (14 to 19 years old)	462	1,293	226	48,850
Adult (> 19 years old)	7,343	18,363	4,414	664,232

Source: 2000 Census Factfinder (http://factfinder.census.gov)

Table 2-1
Comparison of VOCs Detected in Overburden Groundwater to EPA and Adjusted EPA Screening Levels for Subsurface Vapor Intrusion

Chemical of Potential Concern	EPA Groundwater Screening Level for Residential Receptor		Overburden Groundwater		Adjusted EPA Groundwater Screening Level for Industrial Receptor			
	10^{-6} Risk (µg/L)	THQ = 0.1 (µg/L)	Concentration (µg/L)	Location	10^{-4} Risk (µg/L)	10^{-5} Risk (µg/L)	10^{-6} Risk (µg/L)	THQ = 0.1 (µg/L)
Benzene	5* (2)	N/A	2,500	PT-2S	1,010	101	10.1	NA
			63	OBMW3	1,010	101	10.1	NA
2-Chlorotoluene	NA	NA	0.5 J	OVPZ-17	NA	NA	NA	NA
4-Chlorotoluene	NA	NA	0.2 J	OVPZ-17	NA	NA	NA	NA
Ethylbenzene	700* (9.8)	N/A	1,100	OBMW18	4,949	494.9	49.5	NA
Vinyl Chloride	2* (0.36)	N/A	2 J	PT-2S	182	18.2	1.8	NA
Xylenes (total)	NA	3,200**	4,900	OBMW18	NA	NA	NA	970

Notes:
* = The USEPA set the screening level to the Federal maximum contaminant level (MCL) for drinking water since the 10^{-6} risk screening level is less than the MCL. The actual screening level is presented in parenthesis.
** = The USEPA screening level of 32,000 µg/L based on a THQ = 1 was reduced by one-tenth to represent a THQ = 0.1.
NA = Not available
N/A = Not applicable
THQ = Target hazard quotient

Table 2-2
Comparison of Site Groundwater Data to Upper Tolerance Limits (UTLs) on Background Groundwater Data

COPC	UTL[1,2]	Units	Frequency of Detection > UTL	% > UTL	Concentration Range > UTL	EPC[3]
Ra-226	0.66	pCi/L	16/93	17	0.68 – 1.92	0.56
Ra-228	1.59	pCi/L	9/100	9	1.78 – 4.73	1.46
Th-228	0.82	pCi/L	3/100	3	1.3 – 6.89	0.87
Th-230	2.93	pCi/L	0/102	0	NA	0.84
Th-232	0.96	pCi/L	0/104	0	NA	0.49
U-234	1.72	pCi/L	13/85	15	1.82 – 11.01	1.56
U-235	0.94	pCi/L	0/105	0	NA	0.43
U-238	1.27	pCi/L	12/84	14	1.37 – 3.03	1.15
Arsenic	4.81	µg/L	22/115	20	5 – 2,600	191
Iron	9,667	µg/L	37/115	32	10,300 – 166,000	73,167
Lithium	35.49	µg/L	71/115	62	38 – 16,100	4,698
Manganese	2,560	µg/L	45/115	40	2,630 – 28,000	6,649

Notes:
1 = For monitoring wells MW-10S, MW-17S, MW-18S, B38W02D, MW-10D, MW-17D, and MW-18D
2 = Including non-detects at the minimum detectable activity for radionuclide COPCs and ½ the detection limit for inorganic COPCs
3 = EPC = exposure point concentration = 95% UCL on the arithmetic average concentration
NA = Not Applicable

Table 2-3
Exposure-to-Dose Conversion Factors (Effective Dose Equivalent)

Radionuclide	Ingestion*		External**	
	Sv/Bq	mrem/pCi	Sv/Bq-s-m^3	mrem/pCi/g-year
Ra-226	3.58E-07	1.32E-03	4.15E-20	7.75^{E}-03
Ra-228	3.88E-07	1.44E-03	0.00E+00	0.00E+00
Th-228	1.07E-07	3.96E-04	1.22E-20	2.28^{E}-03
Th-230	1.48E-07	5.48E-04	2.33E-21	4.35E-04
Th-232	7.38E-07	2.73E-03	1.16E-21	2.17^{E}-04
U-234	7.66E-08***	2.83E-04	1.01E-21	1.89^{E}-04
U-235	7.19E-08***	2.66E-04	9.49E-19	1.77^{E}-01
U-238	6.88E-08***	2.55E-04	6.53E-22	1.22^{E}-04
Pb-210	1.45E-06	5.37E-03	8.27E-21	1.54^{E}-03

Notes:
*FGR 11
**FGR 12, for soil contaminated to a depth of 1 cm
***for f1 = 0.05 (hexavalent)

Table 2-4
Radiological Dose Assessment

Population	Total Estimated Dose (mrem/year)	Total Estimated Incremental Cancer Risk
Adult Resident	4E+00	4E-05
Child Resident	3E+00	6E-06
Worker	2E+00	2E-05
Recreationist Westerly Brook	1E-01	3E-06
Recreationist Saddle River	1E-01	2E-06
Recreationist Coles Brook	9E-02	2E-06
Municipal Worker Lodi Brook	2E-01	8E-06
Municipal Worker Westerly Brook	3E-02	1E-06

TABLE 3-1

Vegetation Inventory
FUSRAP Maywood Superfund Site

Scientific Name	Common Name
Trees and Shrubs	
Acer negundo	Box Elder
Acer saccharinum	Silver Maple
Acer sp.	Maple
Ailanthus altissima	Tree-of-Heaven
Catalpa bignonioides	Catalpa
Fraxinus sp.	Ash
Juniperus virginiana	Red Cedar
Morus sp.	Mulberry
Pinus sp.	Pine
Platanus occidentalis	Sycamore
Populus deltoides	Cottonwood
Quercus alba	White Oak
Quercus palustris	Pin Oak
Quercus sp.	Oak
Robinia pseudoacacia	Black Locust
Salix nigra	Black Willow
Salix sp.	Willow
Sassafras albidum	Sassafras
Ulmus sp.	Elm
Herbaceous	
Alliaria officinalis	Garlic Mustard
Ambrosia artemisiifolia	Ragweed
Artemisia vulgaris	Mugwort
Asclepias syriaca	Common Milkweed
Celastrus orbiculatus	Ornamental Bittersweet
Cirsium vulgare	Bull Thistle
Daucus carota	Queen Anne's Lace
Glechoma hederacea	Ground Ivy
Impatiens capensis	Jewelweed
Ipomoea sp.	Morning Glory
Lythrum salicaria	Purple Loosestrife
Parthenocissus quinquefolia	Virginia Creeper
Phragmites australis	Common Reed
Phytolaca americana	Pokeweed
Plantago lanceolata	English Plantain
Plantago major	Common Plantain
Polygonum cuspidatum	Japanese Knotweed
Rosa multiflora	Multiflora Rose
Rumex obtusifolius	Bitter Dock
Solanum dulcamara	Bittersweet Nightshade
Solidago altissima	Tall Goldenrod
Solidago spp.	Goldenrod species
Toxicodendron radicans	Poison Ivy
Typha latifolia	Broad-leaved Cattail
Urtica spp.	Nettle species
Vicia spp.	Vetch species
Vitis sp.	Grape

Source: MPI Field Reconnaissance, July 2002.

Table 3-2

Summary of Radiological Results: Surface Water
FUSRAP Maywood Superfund Site

Constituent	Lodi Brook			Westerly Brook		
	Frequency of Detection	Range of Detected Concentrations (pCi/L)	Range of Minimum Detectable Activity (pCi/l)	Frequency of Detection	Range of Detected Concentrations (pCi/L)	Range of Minimum Detectable Activity (pCi/l)
RA-226	7 / 7	0.3244 - 1.297	0.5 - 1.09	4 / 5	0.4399 - 0.921	0.2583 - 0.7958
RA-228	7 / 7	2.198 - 8.229	1.325 - 2.282	4 / 5	0.7799 - 4.799	0.7856 - 1.652
TH-228	2 / 7	0.3306 - 1.581	0.3307 - 0.5024	2 / 5	0.0078 - 0.4862	0.2414 - 0.4108
TH-230	6 / 7	0.6678 - 2.099	0.2486 - 0.6908	5 / 5	0.3718 - 0.8283	0.3391 - 0.5567
TH-232	2 / 7	0.3217 - 0.4706	0.319 - 0.6069	0 / 5	ND	0.3386 - 0.5814
Total Uranium	NA	NA	NA	1 / 1	0.8123	0.0243
U-234	7 / 7	0.4122 - 1.454	0.289 - 0.916	4 / 4	1.18 - 1.402	0.2521 - 0.5033
U-235	2 / 7	0.3246 - 0.5106	0.236 - 0.847	2 / 4	0.282 - 0.336	0.2661 - 0.4652
U-238	6 / 7	0.298 - 0.6896	0.2266 - 0.7811	3 / 4	0.4846 - 0.7297	0.2788 - 0.429

Constituent	Saddle River			Coles Brook		
	Frequency of Detection	Range of Detected Concentrations (pCi/L)	Range of Minimum Detectable Activity (pCi/l)	Frequency of Detection	Range of Detected Concentrations (pCi/L)	Range of Minimum Detectable Activity (pCi/l)
RA-226	5 / 5	0.465 - 1.564	0.3872 - 0.6881	4 / 4	0.218 - 0.3767	0.3248 - 0.4226
RA-228	0 / 5	ND	0.7018 - 0.8921	0 / 4	ND	0.6494 - 1.117
TH-228	0 / 5	ND	0.2157 - 0.4466	0 / 4	ND	0.2306 - 0.3987
TH-230	5 / 5	0.3602 - 1.062	0.278 - 0.5958	4 / 4	0.4725 - 0.7647	0.3982 - 0.5923
TH-232	2 / 4	0.3945 - 0.5746	0.2775 - 0.5653	3 / 4	0.4182 - 0.4667	0.3148 - 0.4633
Total Uranium	5 / 5	0.409 - 0.835	0.2031	2 / 2	0.5413 - 6.555	0.0203
U-234	NA	NA	NA	2 / 2	1.845 - 2.01	0.4999 - 0.5053
U-235	NA	NA	NA	0 / 2	ND	0.3511 - 0.5082
U-238	NA	NA	NA	2 / 2	1.177 - 1.367	0.5031 - 0.5407

NA = Not Analyzed
ND = Not Detected

Table 3-3

Summary of Radiological Results: Sediment
FUSRAP Maywood Superfund Site

Constituent	Lodi Brook			Westerly Brook		
	Frequency of Detection	Range of Detected Concentrations (pCi/g)	Range of Minimum Detectable Activity (pCi/g)	Frequency of Detection	Range of Detected Concentrations (pCi/g)	Range of Minimum Detectable Activity (pCi/g)
RA-226	6 / 6	1.201 - 10.41	0.3028 - 0.5048	6 / 6	0.73 - 2.833	0.1527 - 0.5012
TH-228	6 / 6	0.6661 - 23.58	0.1524 - 0.1976	6 / 6	0.5319 - 0.9395	0.1308 - 0.4032
TH-230	6 / 6	0.8021 - 4.484	0.1378 - 0.2204	6 / 6	0.828 - 1.289	0.1316 - 0.4354
TH-232	6 / 6	0.3348 - 21.48	0.1222 - 0.2611	6 / 6	0.47 - 0.7262	0.1216 - 0.293
U-234	6 / 6	0.7596 - 6.215	0.1767 - 0.2195	6 / 6	0.7024 - 1.304	0.163 - 0.4697
U-235	5 / 6	0.01597 - 0.2726	0.103 - 0.203	2 / 6	0.1423 - 0.1743	0.1363 - 0.4589
U-238	6 / 6	0.3359 - 5.764	0.1461 - 0.2084	6 / 6	0.7312 - 1.408	0.1739 - 0.3499

Constituent	Saddle River			Coles Brook		
	Frequency of Detection	Range of Detected Concentrations (pCi/g)	Range of Minimum Detectable Activity (pCi/g)	Frequency of Detection	Range of Detected Concentrations (pCi/g)	Range of Minimum Detectable Activity (pCi/g)
RA-226	5 / 5	0.7754 - 2.59	0.2926 - 0.7595	5 / 5	0.7476 - 1.568	0.2146 - 0.4363
TH-228	5 / 5	0.2348 - 0.9583	0.1241 - 0.2384	5 / 5	0.6989 - 2.214	0.1202 - 0.1818
TH-230	5 / 5	0.794 - 2.221	0.141 - 0.3541	5 / 5	0.6158 - 1.031	0.1204 - 0.2165
TH-232	5 / 5	0.2406 - 1.011	0.1587 - 0.2981	5 / 5	0.298 - 1.798	0.081 - 0.2213
U-234	5 / 5	1.073 - 1.659	0.093 - 0.215	5 / 5	1.026 - 2.382	0.1579 - 0.2418
U-235	2 / 5	0.1633 - 0.1767	0.0965 - 0.1878	1 / 5	0.1246	0.1363 - 0.2298
U-238	5 / 5	0.8676 - 1.186	0.1029 - 0.1761	5 / 5	0.5219 - 1.341	0.1238 - 0.2832

Table 3-4

Summary of Chemical Results: Surface Water
FUSRAP Maywood Superfund Site

Constituent	Lodi Brook		Westerly Brook		Saddle River		Coles Brook	
	Frequency of Detection	Range of Detected Concentrations (µg/L)	Frequency of Detection	Range of Detected Concentrations (µg/L)	Frequency of Detection	Range of Detected Concentrations (µg/L)	Frequency of Detection	Range of Detected Concentrations (µg/L)
Aluminum	7 / 7	65.9 - 97.3	4 / 5	22.7 - 255	2 / 5	38 - 67.8	1 / 4	47.3
Antimony	0 / 7	ND	0 / 5	ND	0 / 5	ND	0 / 4	ND
Arsenic	6 / 7	2.4 - 9.7	4 / 5	3.8 - 48.7	1 / 5	8.8	0 / 4	ND
Barium	7 / 7	56.6 - 104	5 / 5	113 - 242	5 / 5	112 - 125	4 / 4	0.68 - 152
Beryllium	1 / 7	0.09	0 / 5	ND	0 / 5	ND	0 / 4	ND
Boron	7 / 7	53.6 - 176	5 / 5	95.1 - 218	5 / 5	152 - 209	4 / 4	3.3 - 54.4
Cadmium	0 / 7	ND	1 / 5	0.54	0 / 5	ND	0 / 4	ND
Calcium	7 / 7	50900 - 84700	5 / 5	7710 - 116000	5 / 5	61400 - 114000	4 / 4	159 - 81400
Cerium	0 / 7	ND	0 / 5	ND	0 / 5	ND	0 / 4	ND
Chromium VI	0 / 7	ND	0 / 5	ND	0 / 5	ND	0 / 4	ND
Chromium, total	7 / 7	1.1 - 2.2	2 / 5	1 - 4.9	3 / 5	0.68 - 1.1	0 / 4	ND
Cobalt	3 / 7	0.73 - 1.6	1 / 5	1.8	0 / 5	ND	1 / 4	0.92
Copper	7 / 7	3.5 - 23.7	5 / 5	1.5 - 4.9	5 / 5	1.7 - 11.3	4 / 4	1.3 - 6.1
Dysprosium	0 / 7	ND	0 / 5	ND	0 / 5	ND	2 / 4	4.8 - 5
Iron	7 / 7	320 - 1160	5 / 5	543 - 3460	5 / 5	215 - 317	4 / 4	31.3 - 927
Lanthanum	1 / 7	38.4	1 / 5	35.3	0 / 5	ND	0 / 4	ND
Lead	4 / 7	2.6 - 7.7	2 / 5	4 - 5.4	1 / 5	10.8	0 / 4	ND
Lithium	7 / 7	11.5 - 94.6	5 / 5	23.6 - 642	5 / 5	6.2 - 631	4 / 4	0.48 - 7.7
Magnesium	7 / 7	7610 - 16900	5 / 5	9600 - 16900	5 / 5	17100 - 19200	4 / 4	101 - 16800
Manganese	7 / 7	101 - 434	5 / 5	201 - 3730	5 / 5	117 - 173	3 / 4	119 - 286
Mercury	0 / 7	ND	2 / 5	0.11 - 0.12	0 / 5	ND	0 / 4	ND
Neodymium	0 / 7	ND	0 / 5	ND	0 / 5	ND	0 / 4	ND
Nickel	7 / 7	1.95 - 3.2	5 / 5	2.1 - 7.9	4 / 5	1.3 - 1.9	1 / 4	1.2
Potassium	7 / 7	4560 - 10450	5 / 5	3540 - 32200	5 / 5	6280 - 31700	3 / 4	2730 - 3090
Selenium	0 / 7	ND	0 / 5	ND	0 / 5	ND	0 / 4	ND
Silver	4 / 7	1.1 - 1.3	2 / 5	8.6 - 59.4	1 / 5	0.98	0 / 4	ND
Sodium	7 / 7	42300 - 53000	5 / 5	3350 - 7580	5 / 5	55500 - 74800	4 / 4	61.4 - 47300
Thallium	1 / 7	4.3	1 / 5	6.1	0 / 5	ND	0 / 4	ND
Uranium (total)	NA	NA	1 / 1	1.2	2 / 5	0.907 - 1.233	1 / 2	9.683
Vanadium	7 / 7	0.95 - 3	2 / 5	0.84 - 3.3	2 / 5	0.82 - 1.21	0 / 4	ND
Yttrium	0 / 7	ND	0 / 5	ND	0 / 5	ND	0 / 4	ND
Zinc	7 / 7	18.9 - 39.5	5 / 5	14.8 - 186	5 / 5	8.1 - 23.2	2 / 4	4.9 - 6.2

NA = Not Analyzed
ND = Not Detected

Table 3-5

Summary of Chemical Results: Sediment
FUSRAP Maywood Superfund Site

Constituent	Lodi Brook		Westerly Brook		Saddle River		Coles Brook	
	Frequency of Detection	Range of Detected Concentrations (mg/kg)	Frequency of Detection	Range of Detected Concentrations (mg/kg)	Frequency of Detection	Range of Detected Concentrations (mg/kg)	Frequency of Detection	Range of Detected Concentrations (mg/kg)
Aluminum	6 / 6	3020 - 7510	6 / 6	2930 - 6470	5 / 5	1610 - 4270	5 / 5	3110 - 9390
Antimony	5 / 6	0.27 - 4.8	6 / 6	0.49 - 1.6	0 / 5	ND	3 / 5	0.33 - 1.9
Arsenic	6 / 6	1 - 30.5	6 / 6	1.9 - 5.8	5 / 5	0.52 - 8.3	5 / 5	1 - 6.7
Barium	6 / 6	40.7 - 132	6 / 6	31.3 - 93.4	5 / 5	40.9 - 68	5 / 5	20.8 - 179
Beryllium	5 / 6	0.24 - 0.78	4 / 6	0.25 - 0.46	5 / 5	0.06 - 0.47	2 / 5	0.25 - 0.27
Boron	5 / 6	7.5 - 79.8	0 / 6	ND	0 / 5	ND	3 / 5	11.5 - 15.1
Cadmium	6 / 6	0.27 - 0.89	6 / 6	0.36 - 1.7	5 / 5	0.05 - 0.43	5 / 5	0.18 - 3
Calcium	6 / 6	7405 - 21900	6 / 6	2310 - 7710	5 / 5	490 - 4820	5 / 5	3790 - 23600
Cerium	6 / 6	7.3 - 758	6 / 6	6.3 - 15.1	4 / 5	9.3 - 12.7	3 / 3	12.2 - 30.3
Chromium	6 / 6	18.2 - 191	6 / 6	9.6 - 60.8	5 / 5	3.7 - 11.6	5 / 5	7.1 - 59.4
Cobalt	6 / 6	3 - 16.6	5 / 5	3.5 - 6.9	5 / 5	1.5 - 6	5 / 5	3 - 7.8
Copper	1 / 1	96	3 / 3	31.7 - 96.8	5 / 5	5.7 - 26.6	5 / 5	19.1 - 131
Dysprosium	6 / 6	0.77 - 3.9	6 / 6	0.51 - 1.1	4 / 5	0.49 - 1.2	2 / 3	0.63 - 1
Iron	6 / 6	9330 - 37300	6 / 6	8050 - 25800	5 / 5	4350 - 17600	5 / 5	8650 - 24700
Lanthanum	6 / 6	5.9 - 355	4 / 4	4 - 4.9	4 / 5	4.75 - 6.7	1 / 3	50.8
Lead	6 / 6	33.8 - 427	6 / 6	50.9 - 276	5 / 5	7.2 - 47.5	5 / 5	20.2 - 304
Lithium	6 / 6	3.6 - 94.6	6 / 6	4.1 - 11.3	5 / 5	3.1 - 7.8	5 / 5	4.3 - 11.9
Magnesium	6 / 6	1400 - 7240	6 / 6	1490 - 4830	5 / 5	662 - 3000	5 / 5	2830 - 5380
Manganese	6 / 6	94.4 - 580	6 / 6	62.7 - 207	5 / 5	49.1 - 414	5 / 5	73.4 - 250
Mercury	5 / 6	0.04 - 0.11	4 / 6	0.03 - 0.07	2 / 5	0.02 - 0.06	0 / 5	ND
Neodymium	6 / 6	5.1 - 301	6 / 6	3.5 - 8.4	4 / 5	3.2 - 6.2	3 / 3	6.3 - 15.6
Nickel	6 / 6	11.4 - 61	6 / 6	11.1 - 48.6	5 / 5	3.1 - 14.1	5 / 5	7.5 - 36.8
Potassium	6 / 6	233 - 454	6 / 6	305 - 805	5 / 5	149 - 360	5 / 5	302 - 1220
Selenium	2 / 6	0.34 - 0.39	3 / 6	0.39 - 1.6	0 / 5	ND	2 / 5	0.6 - 1.5
Silver	0 / 6	ND	1 / 6	1.1	4 / 5	0.19 - 0.66	1 / 5	0.83
Sodium	6 / 6	273 - 3840	6 / 6	160 - 287	5 / 5	76.3 - 152	5 / 5	153 - 542
Thallium	0 / 6	ND	0 / 6	ND	0 / 5	ND	0 / 5	ND
Vanadium	6 / 6	12.5 - 21.4	6 / 6	8.9 - 28.7	5 / 5	3.2 - 17	5 / 5	11.2 - 63.4
Yttrium	6 / 6	3.5 - 11	6 / 6	2.6 - 6.4	5 / 5	1.1 - 6.6	3 / 3	3.6 - 10.3
Zinc	6 / 6	108 - 1020	6 / 6	154 - 452	5 / 5	26.9 - 176	5 / 5	64 - 565

ND = Not Detected

Table 3-6

Risk Characterization - Radiological Constituents of Concern in Surface Water
FUSRAP Maywood Superfund Site

Constituent(1)	Maximum Detected Concentration pCi/L	Surface Water Benchmark(2) pCi/L	Hazard Quotient(3)	Hazard Index(4)
Lodi Brook				
Ra-226 + D	1.297	40	0.03	
Ra-228	8.229	-	-	
Th-228 + D	1.581	15.03	0.1	
Th-230	2.099	103.3	0.02	
Th-232 + D	0.4706	119.5	0.004	
Total Uranium	NA	-	-	
U-234	1.454	1010	0.001	
U-235 + D	0.5106	1093	0.0005	
U-238 + D	0.6896	1138	0.0006	0.2
Westerly Brook				
Ra-226 + D	0.921	40	0.02	
Ra-228	4.799	-	-	
Th-228 + D	0.4862	15.03	0.03	
Th-230	0.8283	103.3	0.008	
Th-232 + D	0.5814 *	119.5	0.005	
Total Uranium	0.8123	-	-	
U-234	1.402	1010	0.001	
U-235 + D	0.336	1093	0.0003	
U-238 + D	0.7297	1138	0.0006	0.07
Saddle River				
Ra-226 + D	1.564	40	0.04	
Ra-228	0.8921 *	-	-	
Th-228 + D	0.4466 *	15.03	0.03	
Th-230	1.062	103.3	0.01	
Th-232 + D	0.5746	119.5	0.005	
Total Uranium	0.8354	-	-	
U-234	NA	1010	NA	
U-235 + D	NA	1093	NA	
U-238 + D	NA	1138	NA	0.08
Coles Brook				
Ra-226 + D	0.3767	40	0.01	
Ra-228	1.117 *	NA	NA	
Th-228 + D	0.3987 *	15.03	0.03	
Th-230	0.7647	103.3	0.007	
Th-232 + D	0.4667	119.5	0.004	
Total Uranium	6.555	NA	NA	
U-234	2.01	1010	0.002	
U-235 + D	0.5082 *	1093	0.0005	
U-238 + D	1.367	1138	0.001	0.05

Notes:
(1) "+ D" indicates isotopes for which the benchmark includes the dose rate from short-lived daughter products.
(2)Source: Bechtel Jacobs Company LLC, 1998.
(3)Hazard Quotient (HQ) = Maximum Detected Concentration in Surface Water / Surface Water Benchmark
(4)Hazard Index (HI) = Sum of HQs for each Water Body.
- = Not Available; The Th-232 + D benchmark includes the daughters Ra-228 and Ac-228.
NA = Not Analyzed
*Value is the Minimum Detectable Activity (MDA), since the constituent was not detected.

Table 3-7

Risk Characterization - Radiological Constituents of Concern in Sediment
FUSRAP Maywood Superfund Site

Constituent[(1)]	Maximum Detected Concentration pCi/g	Sediment Benchmark[(2)] pCi/g	Hazard Quotient[(3)]	Hazard Index[(4)]
Lodi Brook				
Ra-226 + D	10.41	7,050	0.001	
Th-228 + D	23.58	8,275	0.003	
Th-230	4.484	28,000,000	0.0000002	
Th-232 + D	21.48	13,675	0.002	
U-234	6.215	25,000,000	0.0000002	
U-235 + D	0.2726	74,000	0.000004	
U-238 + D	5.764	437,500	0.00001	0.006
Westerly Brook				
Ra-226 + D	2.833	7,050	0.0004	
Th-228 + D	0.9395	8,275	0.0001	
Th-230	1.289	28,000,000	0.00000005	
Th-232 + D	0.7262	13,675	0.0001	
U-234	1.304	25,000,000	0.0000001	
U-235 + D	0.1743	74,000	0.000002	
U-238 + D	1.408	437,500	0.000003	0.0006
Saddle River				
Ra-226 + D	2.59	7,050	0.0004	
Th-228 + D	0.9583	8,275	0.0001	
Th-230	2.221	28,000,000	0.00000008	
Th-232 + D	1.011	13,675	0.0001	
U-234	1.659	25,000,000	0.0000001	
U-235 + D	0.1767	74,000	0.000002	
U-238 + D	1.186	437,500	0.000003	0.0006
Coles Brook				
Ra-226 + D	1.568	7,050	0.0002	
Th-228 + D	2.214	8,275	0.0003	
Th-230	1.031	28,000,000	0.00000004	
Th-232 + D	1.798	13,675	0.0001	
U-234	2.382	25,000,000	0.0000001	
U-235 + D	0.1246	74,000	0.000002	
U-238 + D	1.341	437,500	0.000003	0.0006

Notes:
(1) "+ D" indicates isotopes for which the benchmark includes the dose rate from short-lived daughter products.
(2) Source: Bechtel Jacobs Company LLC, 1998.
(3) Hazard Quotient (HQ) = Maximum Concentration in Sediment / Sediment Benchmark
(4) Hazard Index (HI) = Sum of HQs for each Sampling Area.

Table 3-8

Risk Characterization - Chemical Constituents in Lodi Brook Surface Water
FUSRAP Maywood Superfund Site

Constituent	Maximum Detected Concentration (µg/L)	Surface Water Benchmark[1] (µg/L)		Hazard Quotient[2]	Hazard Index[3]
Aluminum	97.3	87	a	**1.1**	
Arsenic	9.7	190	a	0.1	
Barium	104	4	b	**26**	
Beryllium	0.09	87	a	0.001	
Boron	176	1.6	b	**110**	
Calcium	84700	116,000	c	0.7	
Chromium, total	2.2	210	a	0.01	
Cobalt	1.6	23	b	0.07	
Copper	23.7	12	a	**2**	
Iron	1160	1000	a	**1.2**	
Lanthanum	38.4	10.1	d	**4**	
Lead	7.7	3.2	a	**2**	
Lithium	94.6	14	b	**7**	
Magnesium	16900	82000	c	0.2	
Manganese	434	120	b	**4**	
Nickel	3.2	160	a	0.02	
Potassium	10450	53000	c	0.2	
Silver	1.3	0.36	b	**4**	
Sodium	53000	680000	c	0.08	
Thallium	4.3	12	b	0.4	
Vanadium	3	20	b	0.2	
Zinc	39.5	110	a	0.4	163

Notes:
[1]Notes indicate sources of Benchmarks.
[2]Hazard Quotient (HQ) =
Max. Detected Conc./Surface Water Benchmark
(Shading indicates that HQ > 1.0)
[3]Hazard Index (HI) = Sum of HQs within chemical class.
NA = Not Available

Benchmark Sources (Suter and Tsao, 1996):
a National Ambient Water Quality Criteria - Chronic
b Tier II Secondary Chronic Value
c Lowest Chronic Value - All Organisms
d Maximum Permissible Concentration (Sneller et al., 2000)

Table 3-9

**Risk Characterization - Chemical Constituents in Lodi Brook Sediment
FUSRAP Maywood Superfund Site**

Constituent	Maximum Detected Concentration (mg/kg)	Sediment Benchmark[(1)] (mg/kg)	Hazard Quotient[(2)]	Hazard Index[(3)]
Aluminum	7510	58030 a	0.13	
Antimony	4.8	2 b	**2.4**	
Arsenic	30.5	6 c	**5.1**	
Barium	132	700 d	0.19	
Beryllium	0.78	NA	NA	
Boron	79.8	NA	NA	
Cadmium	0.89	0.6 c	**1.5**	
Calcium	21900	NA	NA	
Cerium	758	18800 e	0.04	
Chromium	191	26 c	**7**	
Cobalt	16.6	10000 d	0.002	
Copper	96	16 c	**6**	
Dysprosium	3.9	2200 e	0.002	
Iron	37300	20000 f	**2**	
Lanthanum	355	4700 e	0.1	
Lead	427	31 c	**14**	
Lithium	94.6	NA	NA	
Magnesium	7240	NA	NA	
Manganese	580	460 f	**1.3**	
Mercury	0.11	0.2 c	0.6	
Neodymium	301	7500 e	0.04	
Nickel	61	16 c	**4**	
Potassium	454	NA	NA	
Selenium	0.39	290 d	0.001	
Sodium	3840	NA	NA	
Vanadium	21.4	50000 d	0.0004	
Yttrium	11	1400 e	0.008	
Zinc	1020	120 c	**9**	53

Notes:

[(1)]Notes indicate sources of Benchmarks.

[(2)]Hazard Quotient (HQ) =
Max. Detected Conc./Sediment Benchmark
(Shading indicates that HQ > 1.0)

[(3)]Hazard Index (HI) = Sum of HQs

NA = Not Available

Benchmark Sources:

a ARCS PEC (Jones et al., 1997).
b ER-L (NJDEP, 1998)
c LEL (NJDEP, 1998)
d NOAA SQuiRTs - background (NOAA, 1999)
e Maximum Permissible Concentration (Sneller et al., 2000)
f Ontario MOE LEL (Jones et al., 1997)

Table 3-10

Risk Characterization - Chemical Constituents in Westerly Brook Surface Water
FUSRAP Maywood Superfund Site

Constituent	Maximum Detected Concentration (µg/L)	Surface Water Benchmark[1] (µg/L)	Hazard Quotient[2]	Hazard Index[3]
Aluminum	255	87 a	**3**	
Arsenic	48.7	190 a	0.3	
Barium	242	4 b	**61**	
Boron	218	1.6 b	**136**	
Cadmium	0.54	1.1 a	0.5	
Calcium	116000	116,000 c	1	
Chromium, total	4.9	210 a	0.02	
Cobalt	1.8	23 b	0.08	
Copper	4.9	12 a	0.4	
Iron	3460	1000 a	**3**	
Lanthanum	35.3	10.1 d	**3**	
Lead	5.4	3.2 a	**2**	
Lithium	642	14 b	**46**	
Magnesium	16900	82000 c	0.2	
Manganese	3730	120 b	**31**	
Mercury	0.12	1.3 b	0.1	
Nickel	7.9	160 a	0.05	
Potassium	32200	53000 c	0.6	
Silver	59.4	0.36 b	**165**	
Sodium	7580	680000 c	0.01	
Thallium	6.1	12 b	0.5	
Uranium (total)	1.2	2.6 b	0.5	
Vanadium	3.3	20 b	0.2	
Zinc	186	110 a	**2**	456

Notes:
[1]Notes indicate sources of Benchmarks.
[2]Hazard Quotient (HQ) =
Max. Detected Conc./Surface Water Benchmark
(Shading indicates that HQ > 1.0)
[3]Hazard Index (HI) = Sum of HQs within chemical class.

Benchmark Sources (Suter and Tsao, 1996):
a National Ambient Water Quality Criteria - Chronic
b Tier II Secondary Chronic Value
c Lowest Chronic Value - All Organisms
d Maximum Permissible Concentration (Sneller et al., 2000)

Table 3-11

Risk Characterization - Chemical Constituents in Westerly Brook Sediment
FUSRAP Maywood Superfund Site

Constituent	Maximum Detected Concentration (mg/kg)	Sediment Benchmark[(1)] (mg/kg)	Hazard Quotient[(2)]	Hazard Index[(3)]
Aluminum	6470	58030 a	0.1	
Antimony	1.6	2 b	0.8	
Arsenic	5.8	6 c	1	
Barium	93.4	700 d	0.1	
Beryllium	0.46	NA	NA	
Cadmium	1.7	0.6 c	**3**	
Calcium	7710	NA	NA	
Cerium	15.1	18800 e	0.0008	
Chromium	60.8	26 c	**2**	
Cobalt	6.9	10000 d	0.001	
Copper	96.8	16 c	**6**	
Dysprosium	1.1	2200 e	0.001	
Iron	25800	20000 f	**1.3**	
Lanthanum	4.9	4700 e	0.001	
Lead	276	31 c	**9**	
Lithium	11.3	NA	NA	
Magnesium	4830	NA	NA	
Manganese	207	460 f	0.5	
Mercury	0.07	0.2 c	0.4	
Neodymium	8.4	7500 e	0.001	
Nickel	48.6	16 c	**3**	
Potassium	805	NA	NA	
Selenium	1.6	290 d	0.006	
Silver	1.1	1 c	**1.1**	
Sodium	287	NA	NA	
Vanadium	28.7	50000 d	0.001	
Yttrium	6.4	1400 e	0.005	
Zinc	452	120 c	**4**	32

Notes:
[(1)]Notes indicate sources of Benchmarks.
[(2)]Hazard Quotient (HQ) =
Max. Detected Conc./Sediment Benchmark
(Shading indicates that HQ > 1.0)
[(3)]Hazard Index (HI) = Sum of HQs
NA = Not Available

Benchmark Sources:
a ARCS PEC (Jones et al., 1997).
b ER-L (NJDEP, 1998)
c LEL (NJDEP, 1998)
d NOAA SQuiRTs - background (NOAA, 1999)
e Maximum Permissible Concentration (Sneller et al., 2000)
f Ontario MOE LEL (Jones et al., 1997)

Table 3-12

Risk Characterization - Chemical Constituents in Saddle River Surface Water
FUSRAP Maywood Superfund Site

Constituent	Maximum Detected Concentration (µg/L)	Surface Water Benchmark[(1)] (µg/L)	Hazard Quotient[(2)]	Hazard Index[(3)]
Aluminum	67.8	87 a	0.8	
Arsenic	8.8	190 a	0.05	
Barium	125	4 b	**31**	
Boron	209	1.6 b	**131**	
Calcium	114000	116,000 c	1	
Chromium, total	1.1	210 a	0.01	
Copper	11.3	12 a	0.9	
Iron	317	1000 a	0.3	
Lead	10.8	3.2 a	**3**	
Lithium	631	14 b	**45**	
Magnesium	19200	82000 c	0.2	
Manganese	173	120 b	**1.4**	
Nickel	1.9	160 a	0.01	
Potassium	31700	53000 c	0.6	
Silver	0.98	0.36 b	**3**	
Sodium	74800	680000 c	0.1	
Uranium (total)	1.23	2.6 b	0.5	
Vanadium	1.21	20 b	0.06	
Zinc	23.2	110 a	0.2	219

Notes:
[(1)]Notes indicate sources of Benchmarks.
[(2)]Hazard Quotient (HQ) =
Max. Detected Conc./Surface Water Benchmark
(Shading indicates that HQ > 1.0)
[(3)]Hazard Index (HI) = Sum of HQs within chemical class.

Benchmark Sources (Suter and Tsao, 1996):
a National Ambient Water Quality Criteria - Chronic
b Tier II Secondary Chronic Value
c Lowest Chronic Value - All Organisms
d Maximum Permissible Concentration (Sneller et al., 2000)

Table 3-13

Risk Characterization - Chemical Constituents in Saddle River Sediment
FUSRAP Maywood Superfund Site

Constituent	Maximum Detected Concentration (mg/kg)	Sediment Benchmark[(1)] (mg/kg)	Hazard Quotient[(2)]	Hazard Index[(3)]
Aluminum	4270	58030 a	0.07	
Arsenic	8.3	6 c	**1.4**	
Barium	68	700 d	0.1	
Beryllium	0.47	NA	NA	
Cadmium	0.43	0.6 c	0.7	
Calcium	4820	NA	NA	
Cerium	12.7	18800 e	0.0007	
Chromium	11.6	26 c	0.4	
Cobalt	6	10000 d	0.001	
Copper	26.6	16 c	**2**	
Dysprosium	1.2	2200 e	0.001	
Iron	17600	20000 f	0.9	
Lanthanum	6.7	4700 e	0.001	
Lead	47.5	31 c	**2**	
Lithium	7.8	NA	NA	
Magnesium	3000	NA	NA	
Manganese	414	460 f	0.9	
Mercury	0.06	0.2 c	0.3	
Neodymium	6.2	7500 e	0.001	
Nickel	14.1	16 c	0.9	
Potassium	360	NA	NA	
Silver	0.66	1 c	0.7	
Sodium	152	NA	NA	
Vanadium	17	50000 d	0.0003	
Yttrium	6.6	1400 e	0.005	
Zinc	176	120 c	**1.5**	11

Notes:
[(1)]Notes indicate sources of Benchmarks.
[(2)]Hazard Quotient (HQ) =
Max. Detected Conc./Sediment Benchmark
(Shading indicates that HQ > 1.0)
[(3)]Hazard Index (HI) = Sum of HQs
NA = Not Available

Benchmark Sources:
a ARCS PEC (Jones et al., 1997).
b ER-L (NJDEP, 1998)
c LEL (NJDEP, 1998)
d NOAA SQuiRTs - background (NOAA, 1999)
e Maximum Permissible Concentration (Sneller et al., 2000)
f Ontario MOE LEL (Jones et al., 1997)

Table 3-14

Risk Characterization - Chemical Constituents in Coles Brook Surface Water
FUSRAP Maywood Superfund Site

Constituent	Maximum Detected Concentration (µg/L)	Surface Water Benchmark[(1)] (µg/L)	Hazard Quotient[(2)]	Hazard Index[(3)]
Aluminum	47.3	87 a	0.5	
Barium	152	4 b	**38**	
Boron	54.4	1.6 b	**34**	
Calcium	81400	116,000 c	0.7	
Cobalt	0.92	23 b	0.04	
Copper	6.1	12 a	0.5	
Dysprosium	5	9.3 d	0.5	
Iron	927	1000 a	0.9	
Lithium	7.7	14 b	0.6	
Magnesium	16800	82000 c	0.2	
Manganese	286	120 b	**2**	
Nickel	1.2	160 a	0.01	
Potassium	3090	53000 c	0.06	
Sodium	47300	680000 c	0.07	
Uranium (total)	9.683	2.6 b	**4**	
Zinc	6.2	110 a	0.1	82

Notes:
(1)Notes indicate sources of Benchmarks.
(2)Hazard Quotient (HQ) =
Max. Detected Conc./Surface Water Benchmark
(Shading indicates that HQ > 1.0)
(3)Hazard Index (HI) = Sum of HQs within chemical class.

Benchmark Sources (Suter and Tsao, 1996):
a National Ambient Water Quality Criteria - Chronic
b Tier II Secondary Chronic Value
c Lowest Chronic Value - All Organisms
d Maximum Permissible Concentration (Sneller et al., 2000)

Table 3-15

Risk Characterization - Chemical Constituents in Coles Brook Sediment
FUSRAP Maywood Superfund Site

Constituent	Maximum Detected Concentration (mg/kg)	Sediment Benchmark(1) (mg/kg)	Hazard Quotient(2)	Hazard Index(3)
Aluminum	9390	58030 a	0.2	
Antimony	1.9	2 b	1	
Arsenic	6.7	6 c	**1.1**	
Barium	179	700 d	0.3	
Beryllium	0.27	NA	NA	
Boron	15.1	NA	NA	
Cadmium	3	0.6 c	**5**	
Calcium	23600	NA	NA	
Cerium	30.3	18800 e	0.002	
Chromium	59.4	26 c	**2**	
Cobalt	7.8	10000 d	0.001	
Copper	131	16 c	**8**	
Dysprosium	1	2200 e	0.0005	
Iron	24700	20000 f	**1.2**	
Lanthanum	50.8	4700 e	0.01	
Lead	304	31 c	**10**	
Lithium	11.9	NA	NA	
Magnesium	5380	NA	NA	
Manganese	250	460 f	0.5	
Neodymium	15.6	7500 e	0.002	
Nickel	36.8	16 c	**2**	
Potassium	1220	NA	NA	
Selenium	1.5	290 d	0.005	
Silver	0.83	1 c	0.8	
Sodium	542	NA	NA	
Vanadium	63.4	50000 d	0.001	
Yttrium	10.3	1400 e	0.007	
Zinc	565	120 c	**5**	37

Notes:
(1)Notes indicate sources of Benchmarks.
(2)Hazard Quotient (HQ) =
Max. Detected Conc./Sediment Benchmark
(Shading indicates that HQ > 1.0)
(3)Hazard Index (HI) = Sum of HQs
NA = Not Available

Benchmark Sources:
a ARCS PEC (Jones et al., 1997).
b ER-L (NJDEP, 1998)
c LEL (NJDEP, 1998)
d NOAA SQuiRTs - background (NOAA, 1999)
e Maximum Permissible Concentration (Sneller et al., 2000)
f Ontario MOE LEL (Jones et al., 1997)

Table 3-16

Hazard Quotients Exceeding One - Chemical Constituents
FUSRAP Maywood Superfund Site

Constituent	Lodi Brook		Westerly Brook		Saddle River		Coles Brook	
	Surface Water	Sediment	Surface Water	Sediment	Surface Water	Sediment	Surface Water	Sediment
Aluminum	1.1		3					
Antimony		2						
Arsenic		5				1.4		1.1
Barium	26		61		31		38	
Boron	110		136		131		34	
Cadmium		2		3				5
Chromium		7		2				2
Copper	2	6		6		2		8
Iron	1.2	2	3	1.3				1.2
Lanthanum	4		3					
Lead	2	14	2	9	3	2		10
Lithium	7		46		45			
Magnesium			31					
Manganese	4	1.3			1.4		2	
Nickel		4		3				2
Silver	5		165	1.1	3			
Uranium (total)							4	
Zinc		9	2	4		2		5

Shading indicates a hazard quotient that is 10 or greater.

FIGURES

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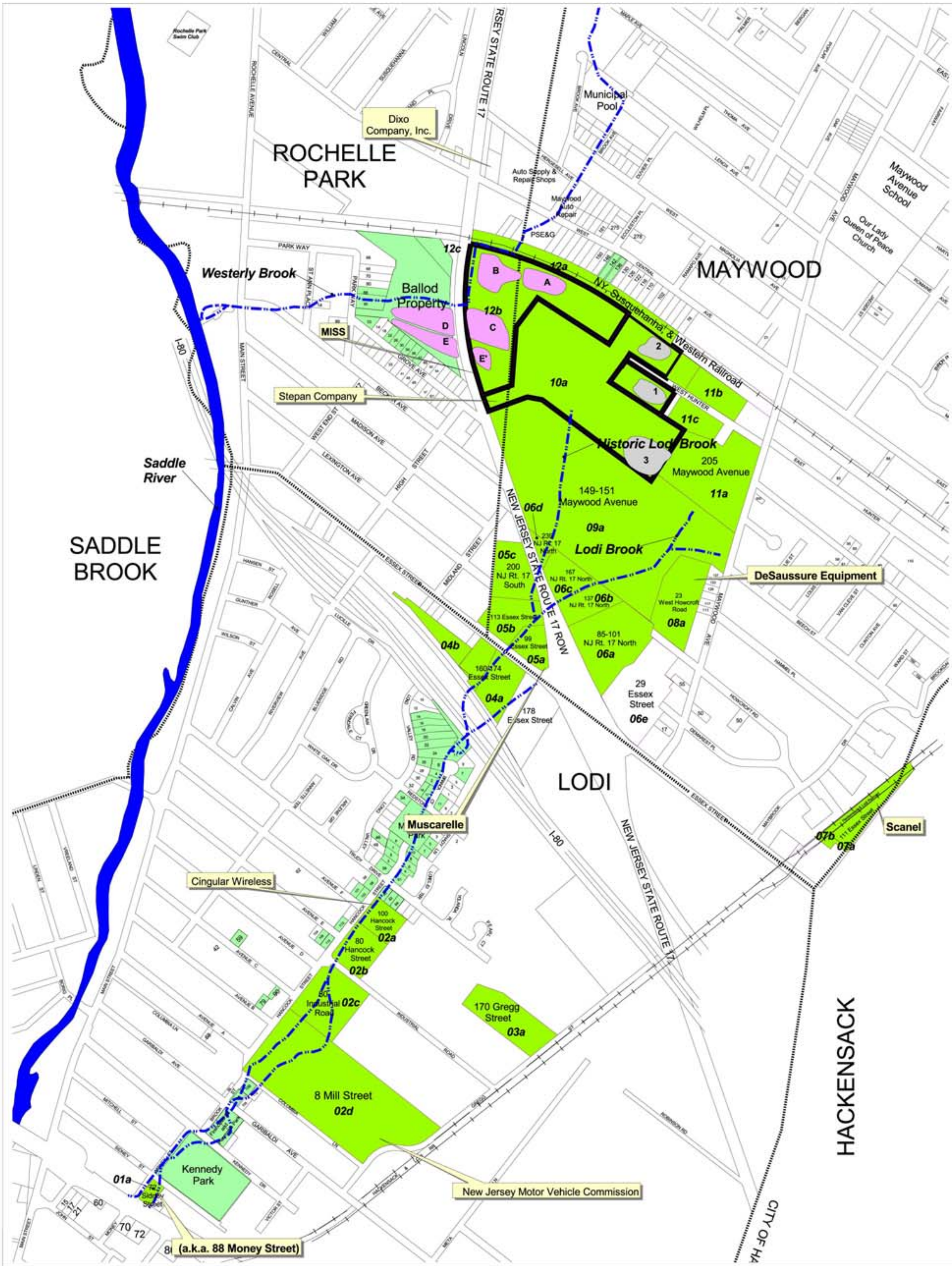


Phase 1 Properties
Remediated

Phase II Properties
Scheduled for remediation

Burial Pits

Retention Ponds

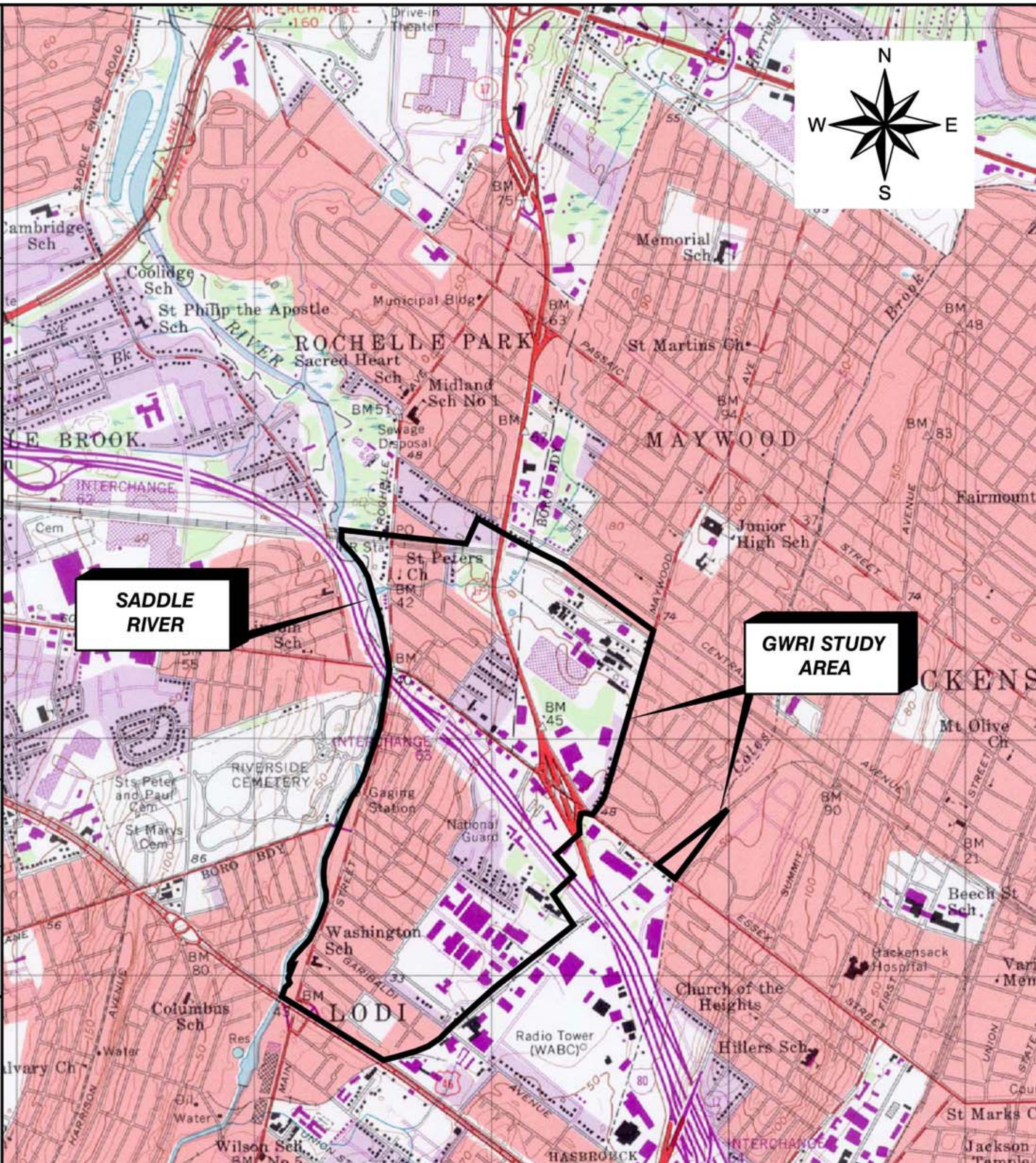
Figure ES-1
FMSS and Surrounding Properties

Note: The location and status of the vicinity properties shown on this map are for general reference only. The USACE is reviewing historical archives to confirm the accuracy of the property locations and status depicted on the map. If you have specific questions about a particular property, please contact the USACE Public Information Center at 75A West Pleasant Avenue, Maywood, New Jersey or call 201-843-7466. Or, visit the FUSRAP Maywood Chemical Company Superfund Site website at <www.fusrapmaywood.com>.

N W E S

US Army Corps of Engineers®
FUSRAP Maywood Superfund Site
Shaw® Shaw Environmental, Inc.

0 600 1200 Feet



SCALE

0 2000 4000 FEET

FIGURE ES-2

GWRI STUDY AREA MAP

MAYWOOD SUPERFUND SITE, NEW JERSEY

US Army Corps of Engineers

FUSRAP Maywood Superfund Site

Shaw Environmental, Inc.

REFERENCE:

7.5 MIN USGS TOPOGRAPHIC MAP OF HACKENSACK, NJ QUADRANGLE. DATED: 1997

OFFICE	DATE	DESIGNED BY	DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
Pittsburgh, PA	2/15/05	--	A. Smith	G. Gaillot	--	108783-A12

Xref: .
Image: 108783IM-1 FMSS

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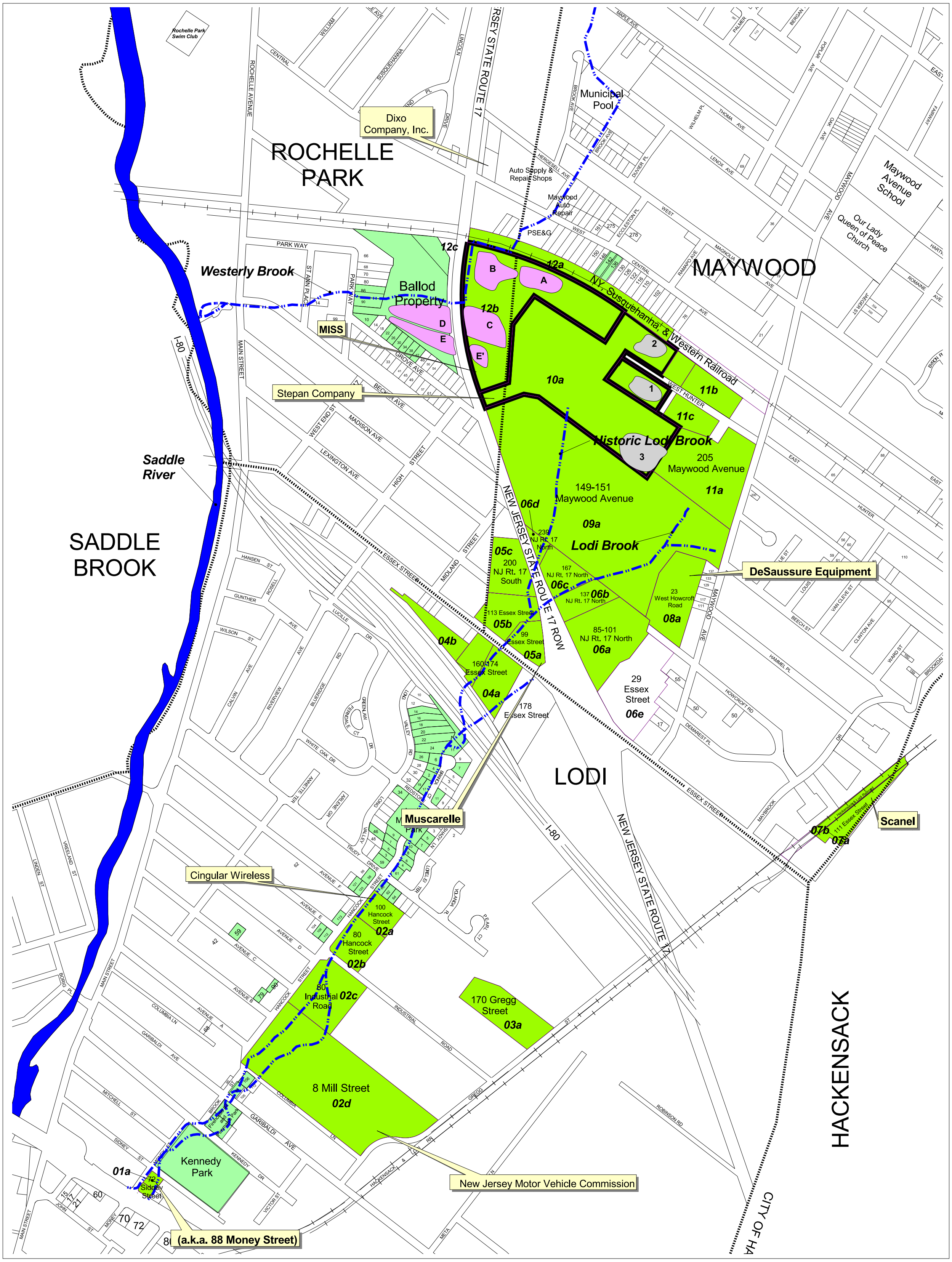
Plot Date/Time: 07/11/05 03:42pm
Plotted by: greg.jones



Phase 1 Properties
Remediated

Phase II Properties
Scheduled for remediation

Burial Pits

Retention Ponds

Figure 1-1
FMSS and Surrounding Properties

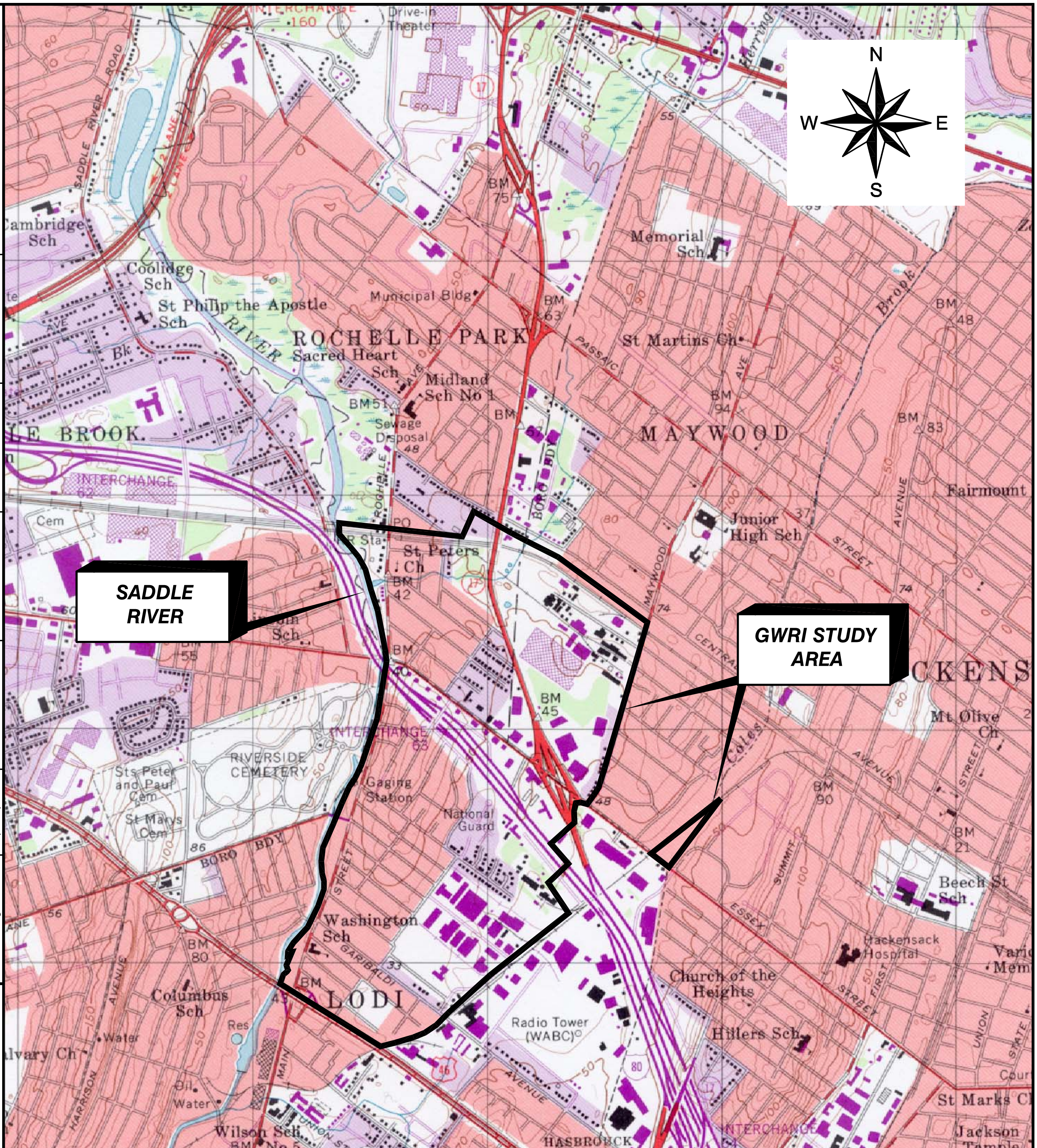
Note: The location and status of the vicinity properties shown on this map are for general reference only. The USACE is reviewing historical archives to confirm the accuracy of the property locations and status depicted on the map. If you have specific questions about a particular property, please contact the USACE Public Information Center at 75A West Pleasant Avenue, Maywood, New Jersey or call 201-843-7466. Or, visit the FUSRAP Maywood Chemical Company Superfund Site website at <www.fusrapmaywood.com>.

N W E S

US Army Corps of Engineers
FUSRAP Maywood Superfund Site
Shaw Shaw Environmental, Inc

0 600 1200 Feet

BOSFS01\maywood\task0205\gis\0205_ri_bra.apr • ri_bra • July 14, 2005



S C A L E

0 2000 4000 FEET

REFERENCE:

7.5 MIN USGS TOPOGRAPHIC MAP OF
HACKENSACK, NJ QUADRANGLE. DATED: 1997

FIGURE 1-2

GWRI STUDY AREA MAP

MAYWOOD SUPERFUND SITE, NEW JERSEY

US Army Corps of Engineers

FUSRAP Maywood Superfund Site

Shaw Environmental, Inc.

DRAWING NUMBER 108783-A12

APPROVED BY --

CHECKED BY G. Gaillot

DRAWN BY A. Smith

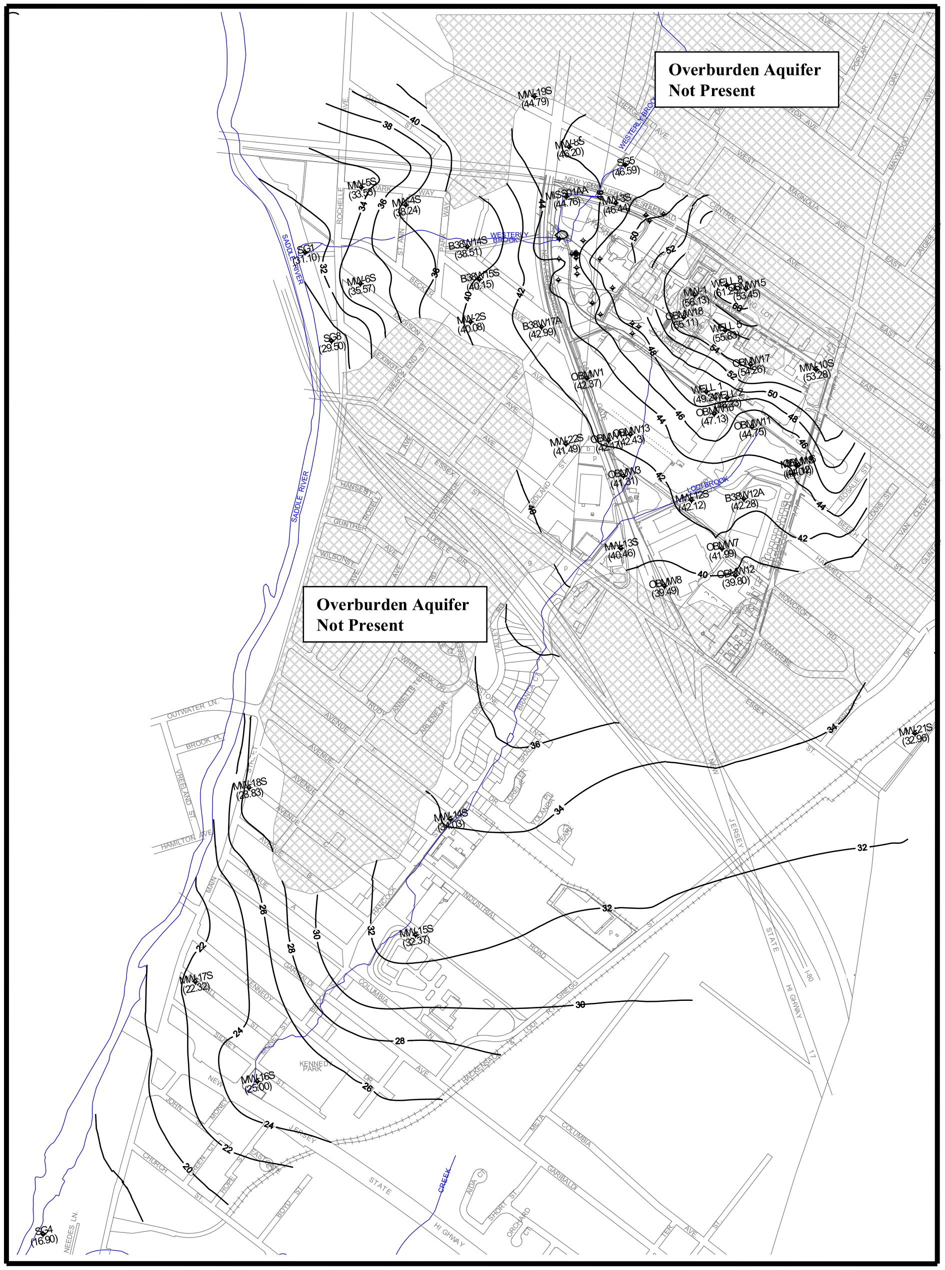
DESIGNED BY --

DATE 2/15/05

OFFICE Pittsburgh, PA

Xref: .
Image: 108783IM-1 FMSS

O:\Project\108783\108783A12.dwg
Plot Date/Time: 07/11/05 03:42pm
Plotted by: greg.jones



Legend:

MW-15S (32.37) — Overburden Monitoring Well

Zone of 0 ft. Saturated Thickness (i.e., overburden aquifer not present).

32 — Equipotential Contour in feet above Mean Sea Level (MSL). Contour Interval = 2 feet.

Note: Figure 1-5 initially appeared as Figure 3-19a of the GWRI – November 2004

Note: The location and status of the vicinity properties shown on this map are for general reference only. The USACE is reviewing historical archives to confirm the accuracy of the property locations and status depicted on the map. If you have specific questions about a particular property, please contact the USACE Public Information Center at 75A West Pleasant Avenue, Maywood, New Jersey or call 201-843-7466. Or, visit the FUSRAP Maywood Chemical Company Superfund Site website at <www.fusrapmaywood.com>.

Horizontal Scale in feet

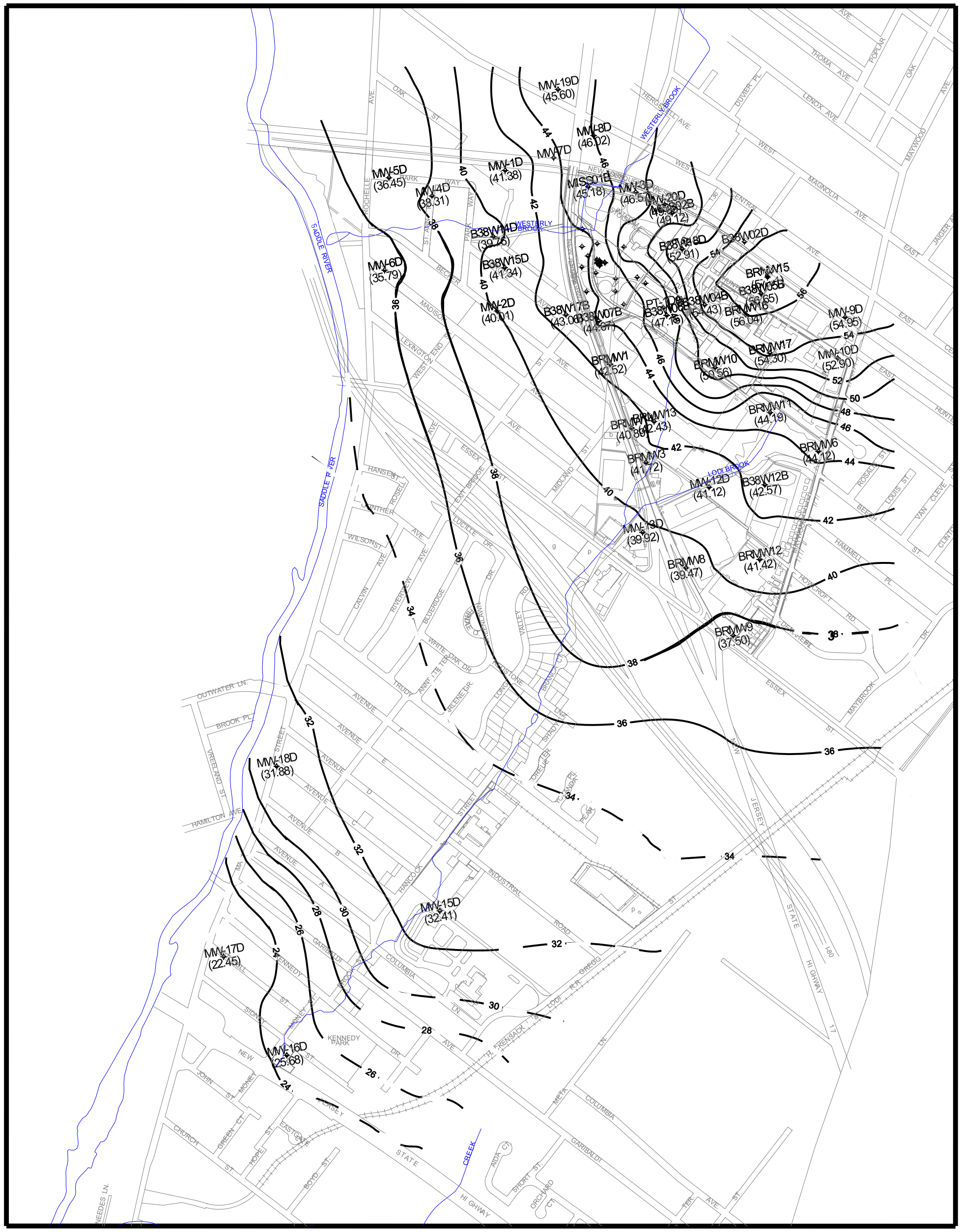
0 500 1000 1500

Figure 1-3
Overburden, Groundwater Surface Elevation Map of FMSS
(July 2001 Synoptic Event)

US Army Corps of Engineers.

FUSRAP Maywood Superfund Site

Shaw Environmental, Inc.



Legend:

MW-15D (32.41) Shallow Bedrock Monitoring Well (July, 2001 Head Measurement Displayed in Parentheses.)

32 Equipotential Contour in feet above Mean Sea Level (MSL).
Contour Interval = 2 feet.

Note: Figure 1-4 initially appeared as Figure 3-15a of the GWRI – November 2004

Horizontal Scale in feet

0 500 1000 1500

Note: The location and status of the vicinity properties shown on this map are for general reference only. The USACE is reviewing historical archives to confirm the accuracy of the property locations and status depicted on the map. If you have specific questions about a particular property, please contact the USACE Public Information Center at 75A West Pleasant Avenue, Maywood, New Jersey or call 201-843-7466. Or, visit the FUSRAP Maywood Chemical Company Superfund Site website at <www.fusrapmaywood.com>.

Figure 1-4
Shallow Bedrock, Groundwater Potentiometric Surface Map of FMSS (July 2001 Synoptic Event)

US Army Corps of Engineers
FUSRAP Maywood Superfund Site
Shaw Environmental, Inc.

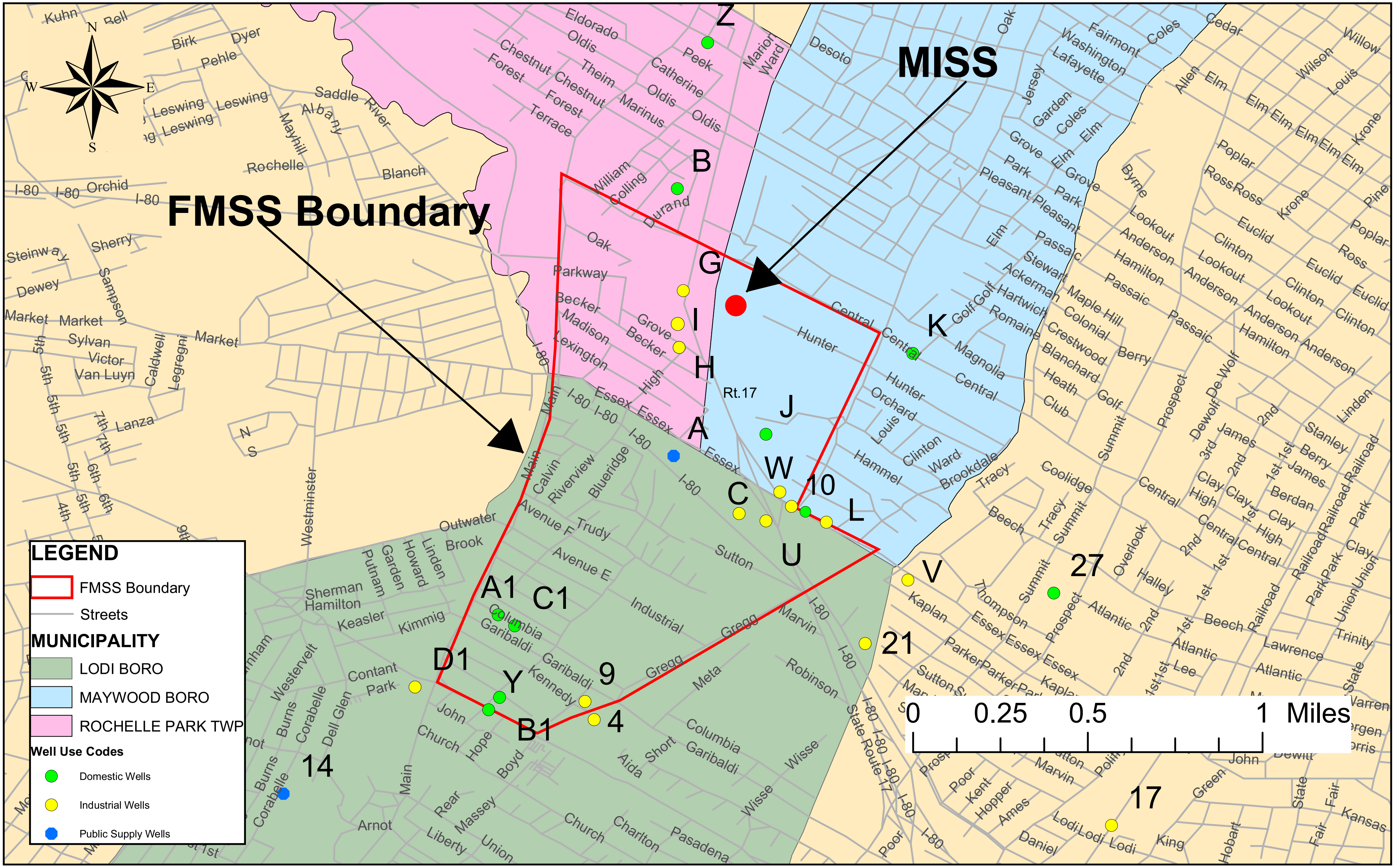


Figure 1-5
Well Inventory Location Map

US Army Corps of Engineers
FUSRAP Maywood Superfund Site
Shaw Shaw Environmental, Inc

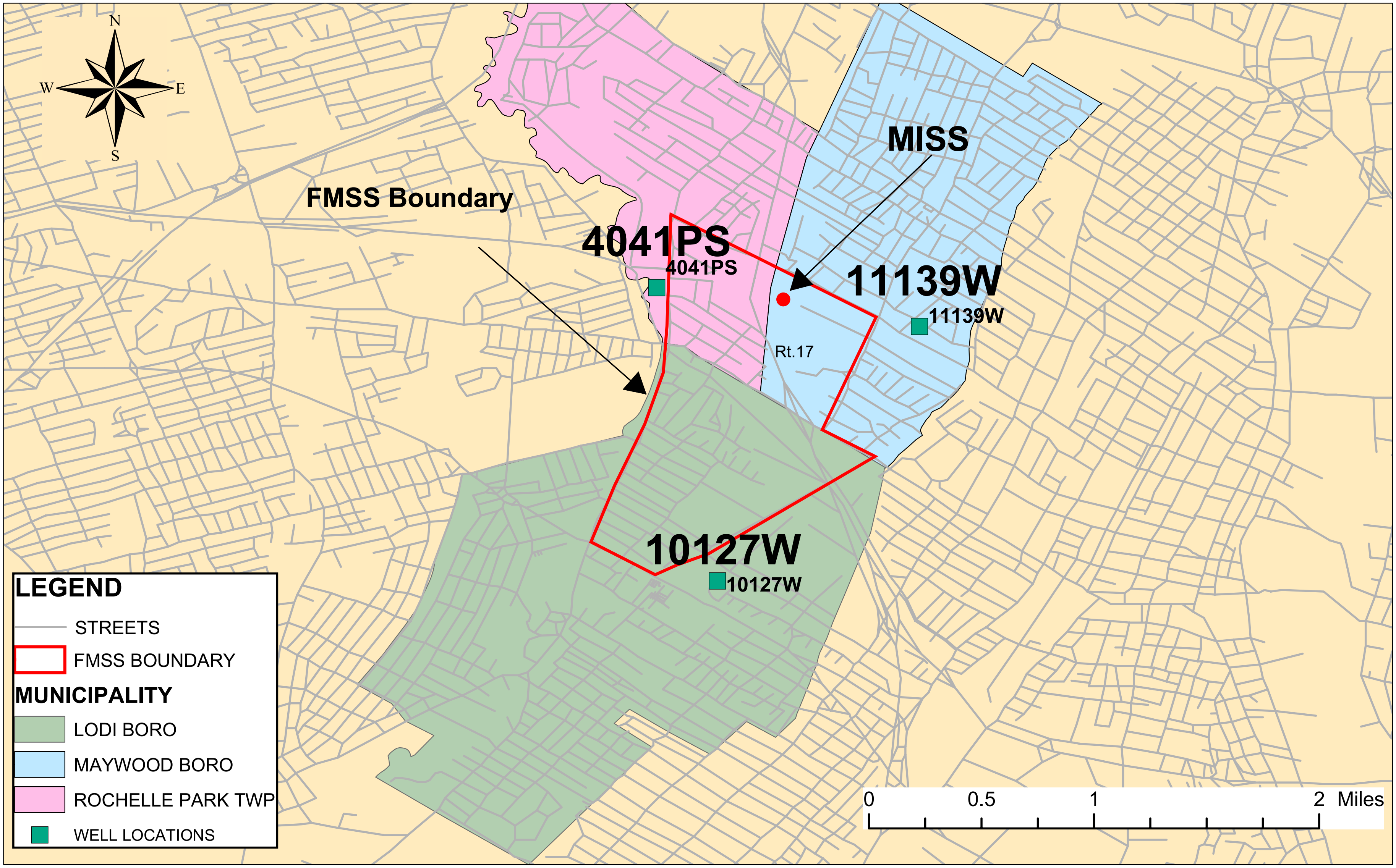


Figure 1-6
Water Purveyor and Allocation Permit Well Location Map

US Army Corps of Engineers
FUSRAP Maywood Superfund Site
Shaw Shaw Environmental, Inc

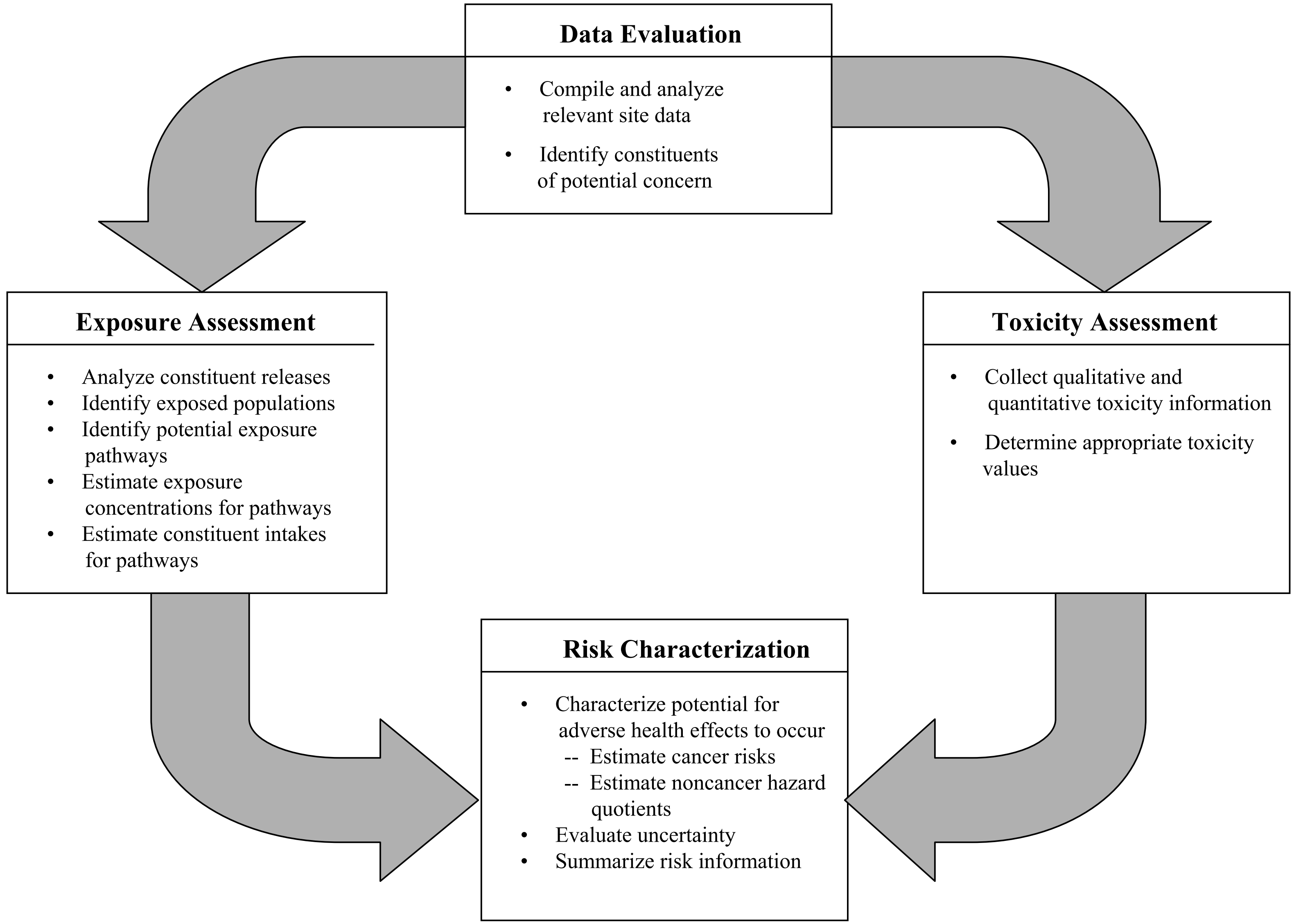
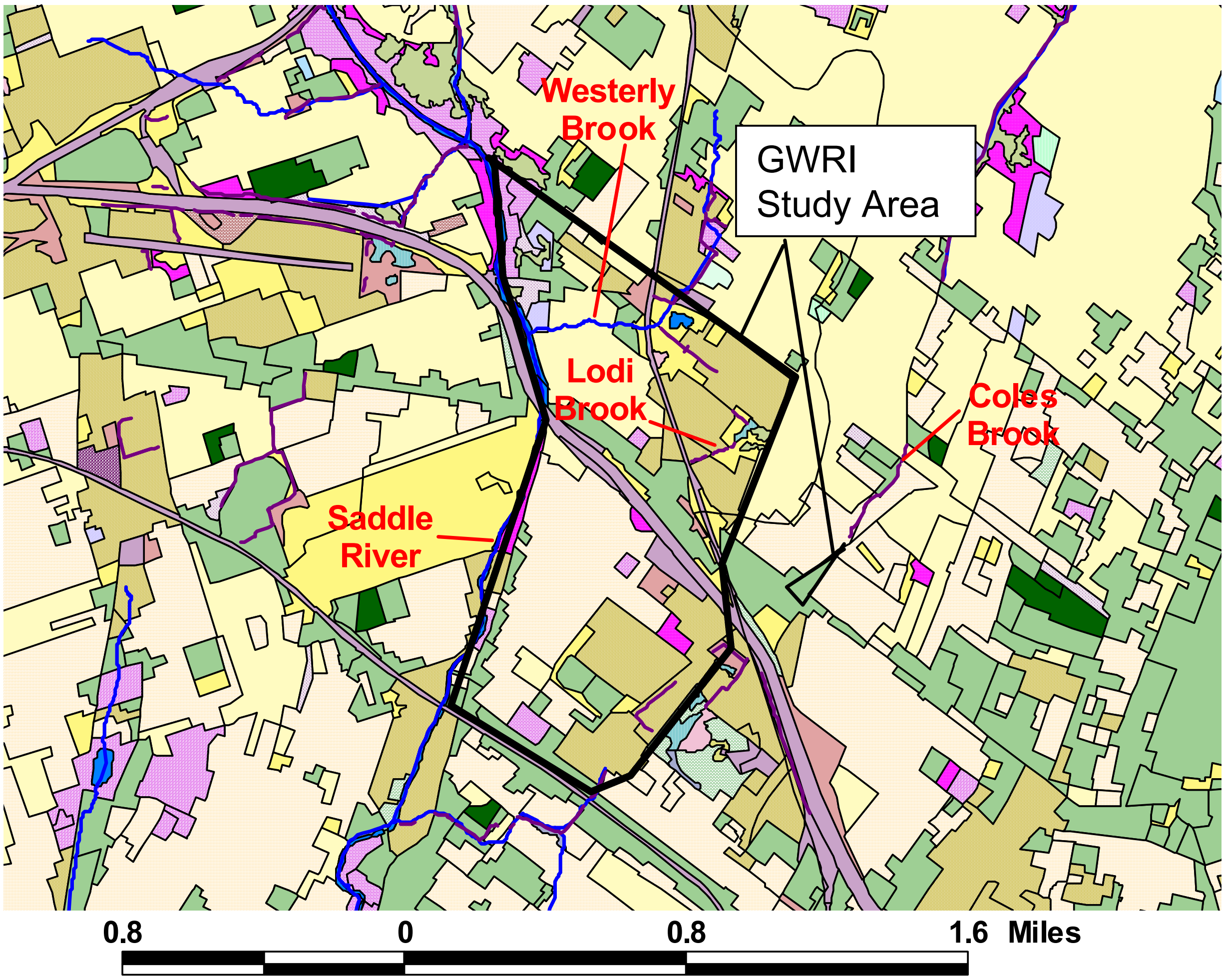


Figure 2-1
Components of a Baseline Risk Assessment

US Army Corps of Engineers. FUSRAP Maywood Superfund Site. Shaw Shaw Environmental, Inc.



Legend:

- Linear Wetlands
- Streams
- Lakes

Land Use

- ALTERED LANDS
- ARTIFICIAL LAKES
- ATHLETIC FIELDS (SCHOOLS)
- COMMERCIAL/SERVICES
- DECIDUOUS BRUSH/SHRUBLAND
- DECIDUOUS FOREST (10-50% CROWN CLOSURE)
- DECIDUOUS FOREST (>50% CROWN CLOSURE)
- DECIDUOUS SCRUB/SHRUB WETLANDS
- DECIDUOUS WOODED WETLANDS
- DISTURBED WETLANDS (MODIFIED)
- HERBACEOUS WETLANDS
- INDUSTRIAL
- MANAGED WETLAND IN BUILT-UP MAINTAINED REC AREA
- MANAGED WETLAND IN MAINTAINED LAWN GREENSPACE
- MIXED URBAN OR BUILT-UP LAND
- OLD FIELD (< 25% BRUSH COVERED)
- ORCHARDS/VINEYARDS/NURSERIES/HORTICULTURAL AREAS
- OTHER URBAN OR BUILT-UP LAND
- RECREATIONAL LAND
- RESIDENTIAL, HIGH DENSITY, MULTIPLE DWELLING
- RESIDENTIAL, RURAL, SINGLE UNIT
- RESIDENTIAL, SINGLE UNIT, LOW DENSITY
- RESIDENTIAL, SINGLE UNIT, MEDIUM DENSITY
- STREAMS AND CANALS
- TIDAL RIVERS, INLAND BAYS, AND OTHER TIDAL WATERS
- TRANSITIONAL AREAS
- TRANSPORTATION/COMMUNICATIONS/UTILITIES

Source: NJDEP GIS Resource Data

N

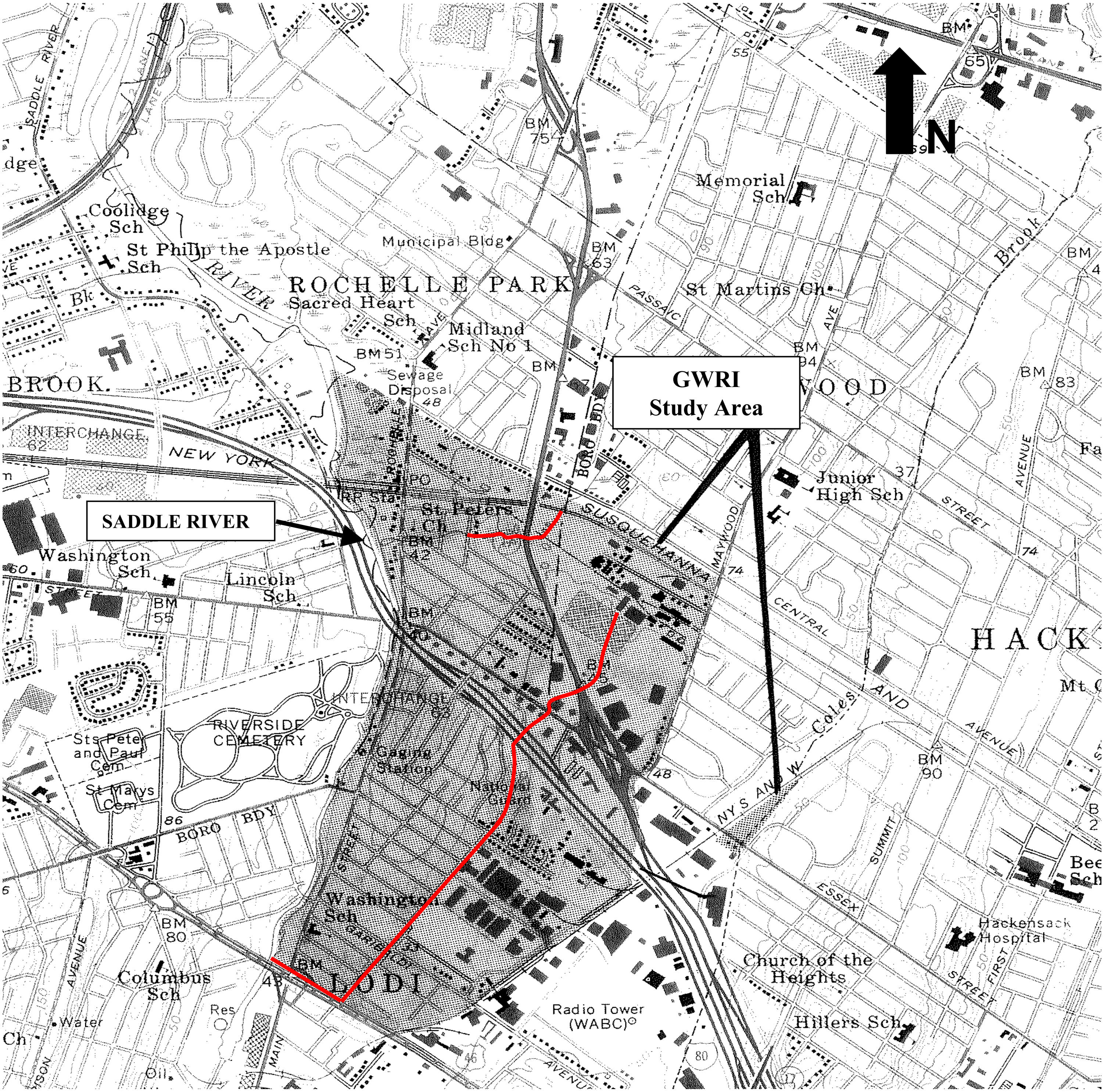
Note: The location and status of the vicinity properties shown on this map are for general reference only. The USACE is reviewing historical archives to confirm the accuracy of the property locations and status depicted on the map. If you have specific questions about a particular property, please contact the USACE Public Information Center at 75A West Pleasant avenue, Maywood, New Jersey or call 201-843-7466. Or, visit the FUSRAP Maywood Chemcial Company Superfund Site website at <www.fusrapmaywood.com>.

Figure 3-1
Land Use Map

US Army Corps of Engineers

FUSRAP Maywood Superfund Site

Shaw Environmental, Inc.



Legend:

Culverted Portions of Lodi and Westerly Brooks

Reference:
Hackensack, NJ USGS Quadrangle. Dated 1955, Photorevized in 1981.

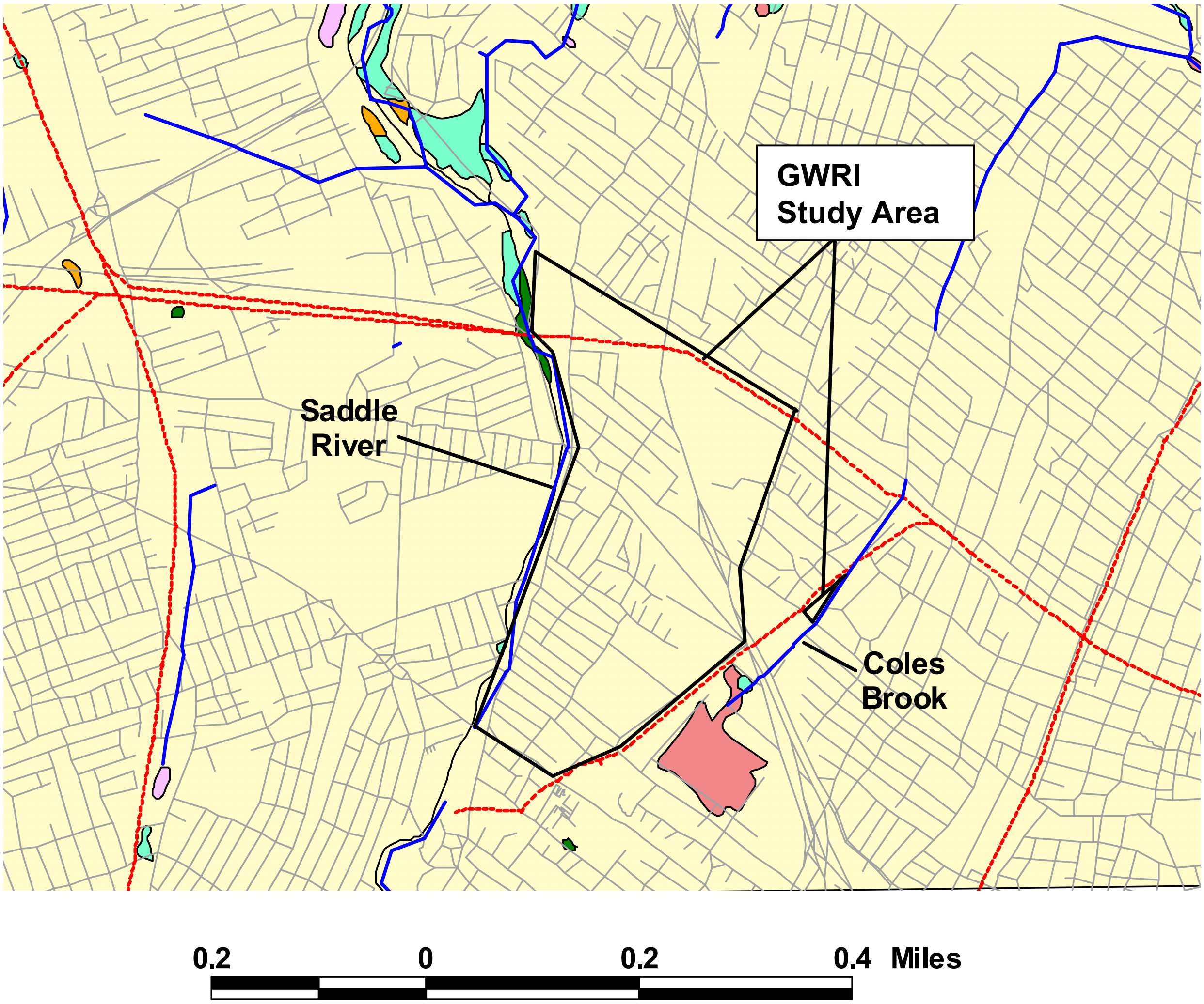
Note: The location and status of the vicinity properties shown on this map are for general reference only. The USACE is reviewing historical archives to confirm the accuracy of the property locations and status depicted on the map. If you have specific questions about a particular property, please contact the USACE Public Information Center at 75A West Pleasant Avenue, Maywood, New Jersey or call 201-843-7466. Or, visit the FUSRAP Maywood Chemical Company Superfund Site website at <www.fusrapmaywood.com>.

Horizontal Scale in feet.

0 1000 2000

Figure 3- 2:
Culverted Sections of Lodi and Westerly Brooks

US Army Corps of Engineers
FUSRAP Maywood Superfund Site
Shaw Shaw Environmental, Inc.

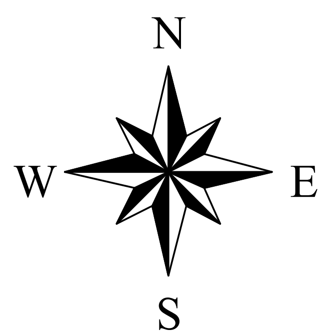


Legend:

- Streams
- Railroads
- Roads

Wetlands

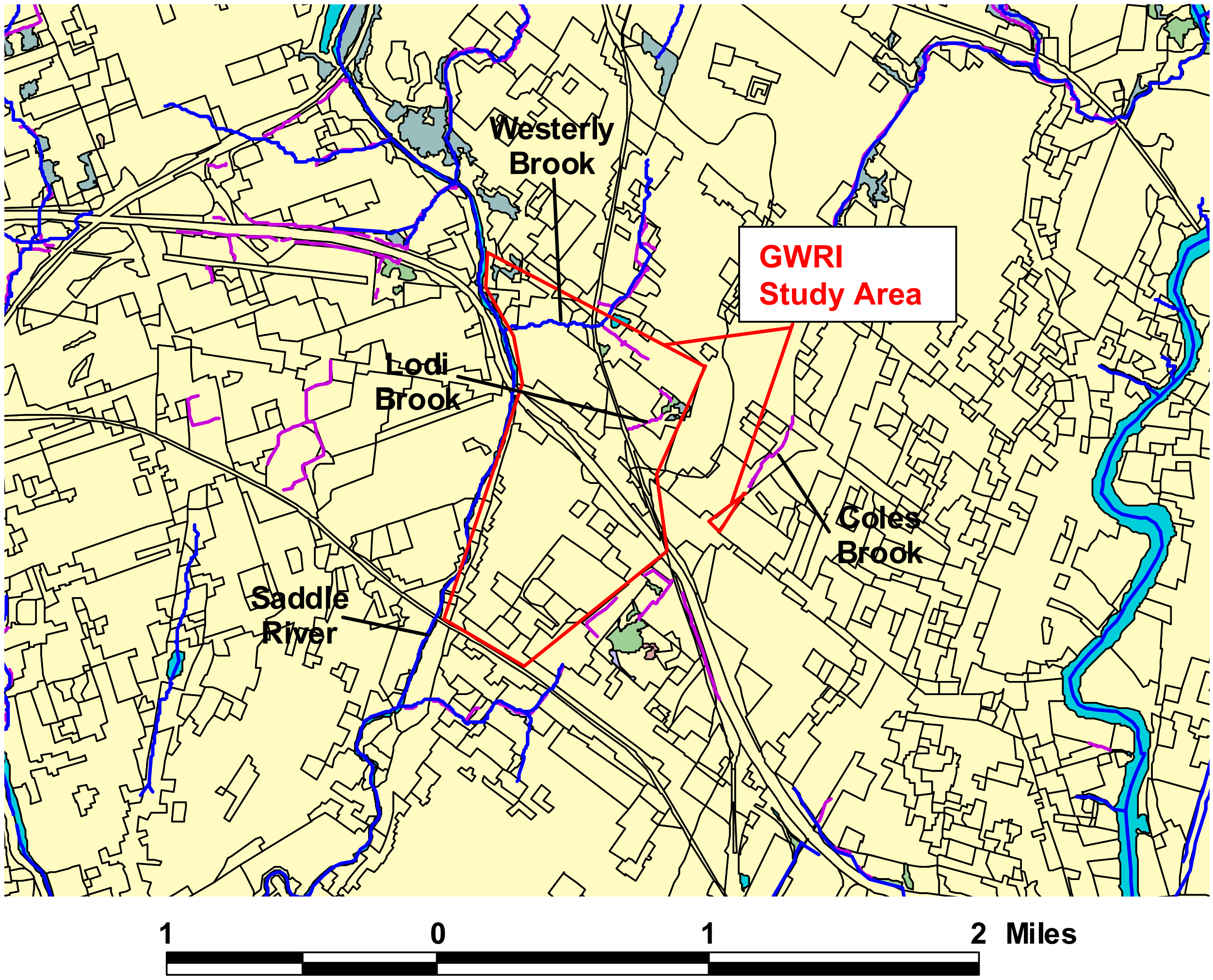
- PEM
- PFO1
- POW
- PSS1
- PSS1/EM
- U



Note: The locaiton and status of the vicinity properties shown on this map are for general reference only. The USACE is reviewing historical archives to confirm the accuracy of the property locations and status depicted on the map. If you have specific questions about a particular property, please contact the USACE Public Information Center at 75A West Pleasant Avenue, Maywood, New Jersey or call 201-843-7466. Or, visit the FUSRAP Maywood Chemical Company Superfund Site website at <www.fusrapmaywood.com>.

Figure 3-3
National Wetlands Inventory Map

US Army Corps of Engineers
FUSRAP Maywood Superfund Site
Shaw Shaw Environmental, Inc.

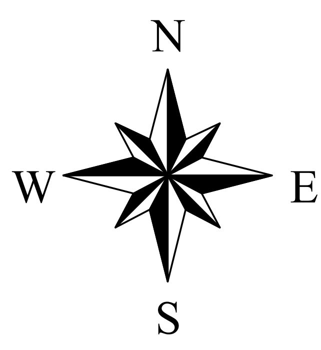


Legend:

- Streams
- Linear Wetlands
- Lakes, Open Water

Wetlands

- DECIDUOUS SCRUB/SHRUB WETLANDS
- DECIDUOUS WOODED WETLANDS
- DISTURBED WETLANDS (MODIFIED)
- HERBACEOUS WETLANDS
- MANAGED WETLANDS (MODIFIED)



Note: The location and status of the vicinity properties shown on this map are for general reference only. The USACE is reviewing historical archives to confirm the accuracy of the property locations and status depicted on the map. If you have specific questions about a particular property, please contact the USACE Public Information Center at 75A West Pleasant Avenue, Maywood, New Jersey or call 201-843-7466. Or, visit the FUSRAP Maywood Chemcial Company Superfund Site website at <www.fusrapmaywood.com>.

Figure 3-4
New Jersey State Wetlands Map

US Army Corps of Engineers
FUSRAP Maywood Superfund Site
Shaw® Shaw Environmental, Inc.

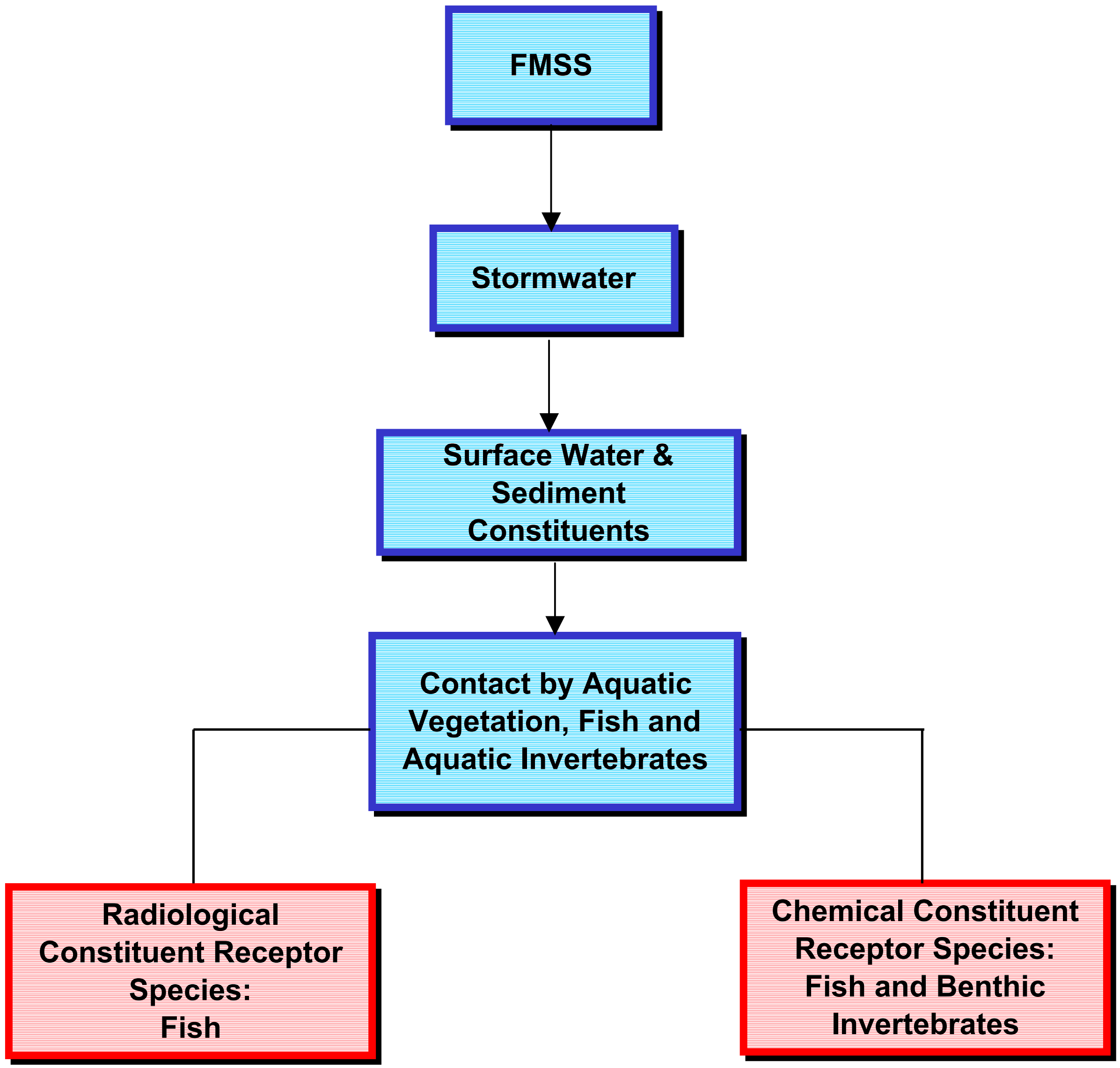


Figure 3-5
Ecological Conceptual Site Model

US Army Corps of Engineers
FUSRAP Maywood Superfund Site
Shaw Environmental, Inc.

PLATES

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LEGEND:

- MW-8S — OVERBURDEN GROUNDWATER WELL (INCLUDES A, AA, OR S SUFFIX AND OB PREFIX)
- MW-8D — BEDROCK GROUNDWATER WELL (INCLUDES B, D, DD, DA, OR DB SUFFIX AND BR PREFIX)
- MW-8D — OVERBURDEN OR BEDROCK PUMPING WELL (BR PREFIX DENOTES BEDROCK AND OB/OV DENOTES OVERBURDEN WELL)
- FORMER RETENTION POND
- FORMER RETENTION POND - REMEDIATED
- NRC BURIAL PIT

BOLD AND ITALICIZED WELL IDENTIFICATION DENOTES BEDROCK WELL WAS PACKER TESTED. REFER TO TABLE 3-5 FOR SAMPLE DEPTHS AND RESULTS.

Note: The location and status of the vicinity properties shown on this map are for general reference only. The USACE is reviewing historical archives to confirm the accuracy of the property locations and status depicted on the map. If you have specific questions about a particular property, please contact the USACE Public Information Center at 75A West Pleasant Avenue, Maywood, New Jersey or call 201-843-7466. Or, visit the FUSRAP Maywood Chemical Company Superfund Site website at <www.fusrapmaywood.com>.

PLATE 1
MONITORING WELL LOCATIONS

US Army Corps of Engineers

FUSRAP Maywood Superfund Site

Shaw Shaw Environmental, Inc.

\\Bosfs01\Maywood\Maywood\Task0510\drawings\GWRI-Wells.apr LAYOUT: Monitoring Wells 34x22 10 February 2003

LEGEND:

- ▲ SR-3 — SEDIMENT AND SURFACE WATER SAMPLE LOCATION
- UD-6 — SEDIMENT SAMPLE LOCATION
- △ LB-2 — SURFACE WATER SAMPLE LOCATION
- FORMER RETENTION POND
- FORMER RETENTION POND - REMEDIATED
- NRC BURIAL PIT

Note: The location and status of the vicinity properties shown on this map are for general reference only. The USACE is reviewing historical archives to confirm the accuracy of the property locations and status depicted on the map. If you have specific questions about a particular property, please contact the USACE Public Information Center at 75A West Pleasant Avenue, Maywood, New Jersey or call 201-843-7466. Or, visit the FUSRAP Maywood Chemical Company Superfund Site website at <www.fusrapmaywood.com>.

PLATE 2
SURFACE WATER AND SEDIMENT SAMPLE LOCATIONS
PHASE 2 - 2000

US Army Corps of Engineers

FUSRAP Maywood Superfund Site

Shaw Shaw Environmental Inc

\\Bosfs01\Maywood\Maywood\Task0510\drawings\GWRI-Sediment-Phase2.apr LAYOUT: Sediment-Surface Water-Phase2-34x22 10 February 2003

APPENDIX A

RISK ASSESSMENT GUIDANCE FOR SUPERFUND PART D (RAGS PART D)

Tables
Data Useability Worksheet

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RAGS PART D

Tables

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TABLE 0

SITE RISK ASSESSMENT IDENTIFICATION INFORMATION

FUSRAP MAYWOOD SUPERFUND SITE

Site Name/OU:	FUSRAP Maywood Superfund Site (a.k.a. Maywood Chemical Co.)
Region:	2
EPA ID Number:	NJD980529762
State:	New Jersey
Status:	Currently on the final NPL
Federal Facility (Y/N):	N
EPA Project Manager:	Angela Carpenter
EPA Risk Assessor:	Michael Sivak
Prepared by (Organization):	Malcolm Pirnie, Inc.
Prepared for (Organization):	U. S. Army Corps of Engineers, Kansas City District
Document Title:	Baseline Risk Assessment for the FUSRAP Maywood Superfund Site for Groundwater, Surface Water, and Sediment
Document Date:	
Probabilistic Risk Assessment (Y/N):	N
Comments:	The FUSRAP Maywood Superfund site is contaminated with both radioactive and chemical constituents. For the groundwater operable unit, a Remedial Investigation/Feasibility Study is in progress. In 1993, the U.S. Department of Energy conducted an initial characterization of baseline risks for human and ecological receptors, for potential exposure to groundwater, surface water, and sediment, based on data available at that time. For the soil operable unit, a Record of Decision has been issued, a pre-design investigation and remedial designs have been completed, and remedial actions are in progress.

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TABLE 1

SELECTION OF EXPOSURE PATHWAYS

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Current	Groundwater	Tap Water		Resident	Adult	Ingestion	Quant	Residential wells may be used for potable purposes in the area.
						Dermal	Quant	Residential wells may be used for potable purposes in the area.
						External radiation	None	External radiation exposure due to submersion in water contaminated with radionuclides is possible; however, due to the shielding effects of water and the generally short durations of such exposures, external gamma radiation was not considered for exposure to groundwater and surface water.
		Bathroom/ Shower Air				Inhalation	Quant	Residential wells may be used for potable purposes in the area.
		Indoor Air				Inhalation	Qual	Residences potentially underlain by contaminated groundwater.
		Tap Water		Resident	Child	Ingestion	Quant	Residential wells may be used for potable purposes in the area.
						Dermal	Quant	Residential wells may be used for potable purposes in the area.
						External radiation	None	External radiation exposure due to submersion in water contaminated with radionuclides is possible; however, due to the shielding effects of water and the generally short durations of such exposures, external gamma radiation was not considered for exposure to groundwater and surface water.
		Bathroom/ Shower Air				Inhalation	Quant	Residential wells may be used for potable purposes in the area.
		Indoor Air				Inhalation	Qual	Residences potentially underlain by contaminated groundwater.
		Tap Water		Worker	Adult	Ingestion	Quant	Potable water use may occur in the workplace within the area.
						Dermal	Quant	Potable water use may occur in the workplace within the area.
						External radiation	None	External radiation exposure due to submersion in water contaminated with radionuclides is possible; however, due to the shielding effects of water and the generally short durations of such exposures, external gamma radiation was not considered for exposure to groundwater and surface water.
		Indoor Air				Inhalation	Qual	Buildings potentially underlain by contaminated groundwater.
		Groundwater		Constuction/Utility Worker	Adult	Dermal	Quant	Construction/utility workers whose work may expose them to the shallow groundwater.
						External radiation	None	External radiation exposure due to submersion in water contaminated with radionuclides is possible; however, due to the shielding effects of water and the generally short durations of such exposures, external gamma radiation was not considered for exposure to groundwater and surface water.
		Ambient Air				Inhalation	Quant	Construction/utility workers whose work may expose them to the shallow groundwater.
	Surface Water	Surface Water		Recreationist	Adolescent	Dermal	Quant	Adolescents that live near Westerly Brook, Coles Brook, or the Saddle River may contact surface water and sediment while wading or recreating.
						External radiation	None	External radiation exposure due to submersion in water contaminated with radionuclides is possible; however, due to the shielding effects of water and the generally short durations of such exposures, external gamma radiation was not considered for exposure to groundwater and surface water.
		Fish		Recreationist	Adolescent	Ingestion	Qual	Fish caught recreationally may be consumed.
	Surface Water	Surface Water		Municipal Worker	Adult	Dermal	Quant	Municipal workers whose work may expose them to surface water and sediment in the culverted portions of Westerly Brook and/or Lodi Brook.
						External radiation	None	External radiation exposure due to submersion in water contaminated with radionuclides is possible; however, due to the shielding effects of water and the generally short durations of such exposures, external gamma radiation was not considered for exposure to groundwater and surface water.
	Sediment	Sediment		Recreationist	Adolescent	Ingestion	Quant	Adolescents that live near Westerly Brook, Coles Brook, or the Saddle River may contact surface water and sediment while wading or recreating.
						Dermal	Quant	Adolescents that live near Westerly Brook, Coles Brook, or the Saddle River may contact surface water and sediment while wading or recreating.
						External radiation	Quant	Adolescents that live near Westerly Brook, Coles Brook, or the Saddle River may contact surface water and sediment while wading or recreating.
		Fish		Recreationist	Adolescent	Ingestion	Qual	Fish caught recreationally may be consumed.
	Sediment	Sediment		Municipal Worker	Adult	Ingestion	Quant	Municipal workers whose work may expose them to surface water and sediment in the culverted portions of Westerly Brook and/or Lodi Brook.
						Dermal	Quant	Municipal workers whose work may expose them to surface water and sediment in the culverted portions of Westerly Brook and/or Lodi Brook.
						External radiation	Quant	Municipal workers whose work may expose them to radiation emitted from sediment in the culverted portions of Westerly Brook and/or Lodi Brook.

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TABLE 1

SELECTION OF EXPOSURE PATHWAYS

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Groundwater	Tap Water		Resident	Adult	Ingestion	Quant	Residential and/or municipal wells may be used for potable purposes in the future.
						Dermal	Quant	Residential and/or municipal wells may be used for potable purposes in the future.
						External radiation	None	External radiation exposure due to submersion in water contaminated with radionuclides is possible; however, due to the shielding effects of water and the generally short durations of such exposures, external gamma radiation was not considered for exposure to groundwater and surface water.
		Bathroom/ Shower Air				Inhalation	Quant	Residential and/or municipal wells may be used for potable purposes in the future.
		Indoor Air				Inhalation	Qual	Residences potentially underlain by contaminated groundwater.
		Tap Water		Resident	Child	Ingestion	Quant	Residential and/or municipal wells may be used for potable purposes in the future.
						Dermal	Quant	Residential and/or municipal wells may be used for potable purposes in the future.
						External radiation	None	External radiation exposure due to submersion in water contaminated with radionuclides is possible; however, due to the shielding effects of water and the generally short durations of such exposures, external gamma radiation was not considered for exposure to groundwater and surface water.
		Bathroom/ Shower Air				Inhalation	Quant	Residential and/or municipal wells may be used for potable purposes in the future.
		Indoor Air				Inhalation	Qual	Residences potentially underlain by contaminated groundwater.
		Tap Water		Worker	Adult	Ingestion	Quant	Potable water use may occur in the workplace within the future.
						Dermal	Quant	Potable water use may occur in the workplace within the future.
						External radiation	None	External radiation exposure due to submersion in water contaminated with radionuclides is possible; however, due to the shielding effects of water and the generally short durations of such exposures, external gamma radiation was not considered for exposure to groundwater and surface water.
		Indoor Air				Inhalation	Qual	Buildings potentially underlain by contaminated groundwater.
		Groundwater		Construction/Utility Worker	Adult	Dermal	Quant	Construction/utility workers whose work may expose them to the shallow groundwater.
						External radiation	None	External radiation exposure due to submersion in water contaminated with radionuclides is possible; however, due to the shielding effects of water and the generally short durations of such exposures, external gamma radiation was not considered for exposure to groundwater and surface water.
		Ambient Air				Inhalation	Quant	Construction/utility workers whose work may expose them to the shallow groundwater.
	Surface Water	Surface Water		Recreationist	Adolescent	Dermal	Quant	Adolescent residents that live near Westerly Brook, Coles Brook, or the Saddle River may contact surface water and sediment while wading or recreating.
						External radiation	None	External radiation exposure due to submersion in water contaminated with radionuclides is possible; however, due to the shielding effects of water and the generally short durations of such exposures, external gamma radiation was not considered for exposure to groundwater and surface water.
		Fish		Recreationist	Adolescent	Ingestion	Qual	Fish caught recreationally may be consumed.
	Surface Water	Surface Water		Municipal Worker	Adult	Dermal	Quant	Municipal workers whose work may expose them to surface water and sediment in the culverted portions of Westerly Brook and/or Lodi Brook.
						External radiation	None	External radiation exposure due to submersion in water contaminated with radionuclides is possible; however, due to the shielding effects of water and the generally short durations of such exposures, external gamma radiation was not considered for exposure to groundwater and surface water.
	Sediment	Sediment		Recreationist	Adolescent	Ingestion	Quant	Adolescents that live near Westerly Brook, Coles Brook, or the Saddle River may contact surface water and sediment while wading or recreating.
						Dermal	Quant	Adolescents that live near Westerly Brook, Coles Brook, or the Saddle River may contact surface water and sediment while wading or recreating.
						External radiation	Quant	Adolescents that live near Westerly Brook, Coles Brook, or the Saddle River may contact surface water and sediment while wading or recreating.
		Fish		Recreationist	Adolescent	Ingestion	Qual	Fish caught recreationally may be consumed.
	Sediment	Sediment		Municipal Worker	Adult	Ingestion	Quant	Municipal workers whose work may expose them to surface water and sediment in the culverted portions of Westerly Brook and/or Lodi Brook.
						Dermal	Quant	Municipal workers whose work may expose them to surface water and sediment in the culverted portions of Westerly Brook and/or Lodi Brook.
						External radiation	Quant	Municipal workers whose work may expose them to radiation emitted from sediment in the culverted portions of Westerly Brook and/or Lodi Brook.

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TABLE 2.1

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Overburden and Bedrock Groundwater
Exposure Medium: Tap Water

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (N/C) (4)		Potential ARAR/TBC Value	Potential ARAR/TBC Source (5)	COPC Flag (Y/N)	Rationale for Selection or Deletion (6)
Tap Water	67-64-1	Acetone	1 J	350 B	µg/l	B38W17B	13/36	5-100	350 B	NA	60.8	nc	NA	--	Y	ASC
	71-43-2	Benzene	0.1 J	5,000	µg/l	BRPZ-5	40/116	1-100	5,000	NA	0.34	ca*	5	MCL	Y	AC
	75-27-4	Bromodichloromethane	0.1 J	0.1 J	µg/l	MW-25S	1/116	1-50	0.1 J	NA	0.18	ca	80	MCL	N	BSC
	78-93-3	2-Butanone	2 J	8 J	µg/l	BRPZ-5	3/76	5-500	8 J	NA	190	nc	NA	--	N	BSC
	75-15-0	Carbon Disulfide	0.1 J	0.35 J	µg/l	MISS03B	7/116	1-50	0.35 J	NA	104	nc	NA	--	N	BSC
	108-90-7	Chlorobenzene	0.1 J	21	µg/l	BRPZ-3RE	22/116	1-50	21	NA	10.6	nc	NA	--	Y	ASC
	67-66-3	Chloroform	0.1 J	6	µg/l	B38W14S	37/116	1-50	6	NA	0.62	ca/nc	80	MCL	Y	ASC
	74-87-3	Chloromethane	0.1 J	0.1 J	µg/l	OVPW-1S	1/116	2-100	0.1 J	NA	1.51	ca	NA	--	N	BSC
	95-49-8	2-Chlorotoluene	0.2 J	2,300 BD	µg/l	BRPZ-3RE	15/21	1-100	2,300 BD	NA	12	nc	NA	--	Y	ASC
	106-43-4	4-Chlorotoluene	0.1 J	1,200 BD	µg/l	BRPZ-3RE	12/21	1-100	1,200 BD	NA	NA		NA	--	Y	NSC
	75-34-3	1,1-Dichloroethane	0.1 J	3	µg/l	MW-7D	24/116	1-50	3	NA	81	nc	NA	--	N	BSC
	107-06-2	1,2-Dichloroethane	0.1 J	0.69 J	µg/l	BRMW14	9/115	1-50	0.69 J	NA	0.12	ca*	5	MCL	Y	ASC
	75-35-4	1,1-Dichloroethene	0.2 J	1	µg/l	MW-7D	8/113	1-50	1	NA	34	nc	7	MCL	N	BSC
	540-59-0	1,2-Dichloroethene (total)	0.1 J	110 D	µg/l	BRMW1	46/108	1-50	110 D	NA	6.1	nc (for cis)	10/7 [a]	MCL	Y	ASC
	78-87-5	1,2-Dichloropropane	0.2 J	0.89 J	µg/l	MW-7D	4/116	1-50	0.89 J	NA	0.16	ca*	5	MCL	N	LFD, NSR
	100-41-4	Ethylbenzene	0.1 J	1,100 D	µg/l	OBMW18	33/116	1-50	1,100 D	NA	2.9	ca	700	MCL	Y	ASC
	591-78-6	2-Hexanone	5	5	µg/l	BRPZ-5	1/114	5-250	5	NA	NA		NA	--	N	LFD, NSR
	108-10-1	4-Methyl-2-pentanone	1 J	36 J	µg/l	BRPZ-5	5/116	5-250	36 J	NA	16	nc	NA	--	Y	ASC
	75-09-2	Methylene Chloride	0.6 JB	340	µg/l	BRPZ-9	5/114	2-100	340	NA	4.28	ca	NA	--	N	LFD, LC
	100-42-5	Styrene	1 J	1 J	µg/l	BRPZ-5	1/116	1-50	1 J	NA	164	nc	100	MCL	N	BSC
	127-18-4	Tetrachloroethene	0.1 J	12	µg/l	MISS01B	28/104	1-50	12	NA	0.66	ca	5	MCL	Y	ASC
	108-88-3	Toluene	0.1 J	1,400	µg/l	BRPZ-5	52/116	1-50	1,400	NA	72	nc	1,000	MCL	Y	ASC
	71-55-6	1,1,1-Trichloroethane	0.1 J	3	µg/l	MW-7D	11/116	1-50	3	NA	317	nc	200	MCL	N	BSC
	79-00-5	1,1,2-Trichloroethane	0.1 J	3	µg/l	OBMW3	2/116	1-50	3	NA	0.20	ca	5	MCL	N	LFD, NSR
	79-01-6	Trichloroethene	0.1 J	8 J	µg/l	BRPZ-4 and MW-24D	28/106	1-50	8 J	NA	0.03	ca	5	MCL	Y	ASC
	75-01-4	Vinyl Chloride	0.1 J	200	µg/l	BRMW1	25/115	2-100	200	NA	0.02	ca	2	MCL	Y	AC
	1330-20-7	Xylenes (total)	0.1 J	4,900 BD	µg/l	OBMW18	52/116	1-50	4,900 BD	NA	21	nc	10,000	MCL	Y	ASC

TABLE 2.1

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Overburden and Bedrock Groundwater
Exposure Medium: Tap Water

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (N/C) (4)		Potential ARAR/TBC Value	Potential ARAR/TBC Source (5)	COPC Flag (Y/N)	Rationale for Selection or Deletion (6)
	7429-90-5	Aluminum	10.40	11,800	µg/l	WELL 8	77/114	12.4-200	11,800	NA	3,650	nc	NA	--	Y	ASC
	7440-36-0	Antimony	2.30	2.30	µg/l	MW-22S	1/115	1.7-60	2	NA	1.5	nc	6	MCL	Y	ASC
	7440-38-2	Arsenic	2.40	2,600	µg/l	MISS02A	37/115	2.3-16	2,600	NA	0.045	ca	10	MCL	Y	AC
	7440-39-3	Barium	3.7 J	9,750	µg/l	MISS05B	107/115	0.1-200	9,750	NA	255	nc	2,000	MCL	Y	ASC
	7440-41-7	Beryllium	0.10	5.30	µg/l	BRPZ-5	38/115	0.1-5	5	NA	7	nc	4	MCL	N	BSC
	7440-42-8	Boron	8	3,700	µg/l	MW-20D	112/115	1.6-500	3,700	NA	730	nc	NA	--	Y	ASC
	7440-43-9	Cadmium	0.28	16	µg/l	OBMW13	26/115	0.3-5	16	NA	1.8	nc	5	MCL	Y	ASC
	7440-70-2	Calcium	74.9	1,420,000	µg/l	OBMW10	115/115	7.8-5,000	1,420,000	NA	NA		NA	--	N	EN
	7440-45-1	Cerium	45.4	312	µg/l	B38W18D	3/111	35.3-43.7	312	NA	NA		NA	--	Y	SR
	18540-29-9	Chromium VI	0.019 J	0.24	µg/l	B38W12A	5/111	0.01-0.02	0.24	NA	11	nc	NA	--	N	BSC
	7440-47-3	Chromium, Total	0.76	689	µg/l	BRMW6	78/116	0.6-10	689	NA	5,475	nc	100	MCL	N	BSC
	7440-48-4	Cobalt	0.56	49.10	µg/l	MW-23D	72/115	0.7-50	49	NA	73	nc	NA	--	N	BSC
	7440-50-8	Copper	0.65	34.5	µg/l	OBMW10	56/115	0.5-25	35	NA	146	nc	1,300	AL	N	BSC
	7429-91-6	Dysprosium	3.40	25.20	µg/l	OBMW12	26/111	3.-3.1	25	NA	730	nc	NA	--	N	BSC
	7439-89-6	Iron	17.3 J	166,000	µg/l	BRPZ-9	108/115	15.6-100	166,000	NA	1,095	nc	NA	--	Y	ASC
	7439-91-0	Lanthanum	38.30	231	µg/l	B38W18D	5/111	14.9-33.8	231	NA	NA		NA	--	Y	SR
	7439-92-1	Lead	2.20	33.90	µg/l	MW-3D	21/115	1.9-11	34	NA	NA		15	AL	Y	NSC
	7439-93-2	Lithium	1.00	16,100 J	µg/l	MISS02B	109/115	0.1-100	16,100 J	NA	73	nc	NA	--	Y	ASC
	7439-95-4	Magnesium	23.4	348,000	µg/l	OBMW10	115/115	4.1-5,000	348,000	NA	NA		NA	--	N	EN
	7439-96-5	Manganese	2.1	28,000	µg/l	OBMW10	109/115	0.1-15	28,000	NA	88	nc	NA	--	Y	ASC
	7439-97-6	Mercury	0.16	0.16	µg/l	MISS02A	1/115	0.1-0.5	0.16	NA	1.1	nc	2	MCL	N	BSC
	7440-00-8	Neodymium	13.90	132	µg/l	B38W18D	22/111	13.2-15.4	132	NA	NA		NA	--	Y	NSC
	7440-02-0	Nickel	0.97	160	µg/l	B38W12B	94/115	0.9-40	160	NA	73	nc	NA	--	Y	ASC
	7740-09-7	Potassium	485 J	858,500	µg/l	BRPW-1D	112/115	10.7-25,000	858,500	NA	NA		NA	--	N	EN
	7782-49-2	Selenium	2.32	4	µg/l	BRMW6	4/115	2.2-15.5	4	NA	18	nc	50	MCL	N	BSC
	7440-22-4	Silver	1.00	4.20	µg/l	OBMW10	3/108	0.5-3	4	NA	18	nc	NA	--	Y	ASC
	7440-23-5	Sodium	79.70	33,400,000	µg/l	OBMW10	115/115	1.6-25,000	33,400,000	NA	NA		NA	--	N	EN
	7440-28-0	Thallium	2.7	4.80	µg/l	BRPZ-5	3/115	2.8-15	4.80	NA	0.24	nc	2	MCL	N	LFD, IDOM
	7440-62-2	Vanadium	0.51	20.10	µg/l	B38W12A	69/115	0.5-50	20.10	NA	26	nc	NA	--	N	BSC
	7440-65-5	Yttrium	1.80	41.6	µg/l	B38W18D	11/111	1.3-1.9	41.60	NA	NA		NA	--	Y	NSC
	7440-66-6	Zinc	2.10	3,490	µg/l	BRPZ-5	50/115	0.3-20	3,490	NA	1,095	nc	NA	--	Y	ASC
	7440-61-0	Total Uranium (7)	0.23	15.05	µg/l	BRPZ-4	113/113	N/A	15.05	NA	7.30E-01		30	MCL	Y	ASC

TABLE 2.1

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Overburden and Bedrock Groundwater
Exposure Medium: Tap Water

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (N/C) (4)	Potential ARAR/TBC Value	Potential ARAR/TBC Source (5)	COPC Flag (Y/N)	Rationale for Selection or Deletion (6)
	13982-63-3	Ra-226	0.13	1.92	pCi/l	MISS02A	77/93	0.13-1.252	1.92	NA	8.16E-04	NA	--	Y	AC
	15262-20-1	Ra-228	0.40	6.20	pCi/l	MW-9S	26/100	0.589-2.41	6.20	NA	4.58E-02	NA	--	Y	AC
	--	Ra-226 and Ra-228	0.27	6.20	pCi/l	MW-9S	111/111	--	--	--	--	5	MCL	--	--
	14274-82-9	Th-228	0.26	6.89	pCi/l	B38W18D	7/100	0.082-0.934	6.89	NA	1.59E-01	NA	--	Y	AC
	14269-63-7	Th-230	0.30	2.45	pCi/l	MISS05A	87/102	0.14-1.072	2.45	NA	5.23E-01	NA	--	Y	AC
	7440-29-1	Th-232	0.22	0.83	pCi/l	B38W17A	21/104	0.082-0.86	0.83	NA	4.71E-01	NA	--	Y	AC
	13966-29-5	U-234	0.22	11.01	pCi/l	BRPZ-4	76/85	0.11-1.659	11.01	NA	6.74E-01	NA	--	Y	AC
	15117-96-1	U-235	0.23	0.43	pCi/l	BRPW-1D	6/105	0.15-1.321	0.43	NA	6.63E-01	NA	--	Y	AC
	Q1567	U-238	0.30	3.03	pCi/l	MW-23D	47/84	0.14-1.691	3.03	NA	5.47E-01	NA	--	Y	AC

Footnote Instructions:

(1) The "(Qualifier)" codes used for the "Minimum Concentration" and "Maximum Concentration" are as follows:
J = Estimated Concentration
B = Detected in a Blank
D = Value from a diluted aliquot

(2) The maximum detected concentration is used for screening.

(3) No Site-Specific Background is available.

(4) For chemical consituents, the USEPA Region IX Preliminary Remediation Goals (PRGs) for tap water (USEPA, 2002c) updated October 1, 2002 were used.
PRGs are protective at a target hazard quotient of 0.1 and a target cancer risk of $1x10^{-6}$.
For radionuclides, the USEPA Preliminary Remediation Goals for Radionuclides from http://www.epa.gov/superfund/resources/radiation/index.htm current as of March 2001 were used (USEPA, 2001b).
nc = PRG based on noncarcinogenic effects
ca = PRG based on carcinogenic effects
ca* (where: nc < 100X ca)

(5) The codes used for the Potential ARAR/TBC Source are as follows:
AL = Action Level
MCL = Maximum Contaminant Level.
MCLG = Maximum Contaminant Level Goal

(6) The codes used for the "Rationale for Selection or Deletion" are as follows:
AC = A Carcinogen
ASC = Above Screening Criterion
BSC = Below Screening Criterion
LFD = Low Frequency of Detection (<5%)
EN = Essential Nutrient
NSC = No Screening Criterion
NA = Not Available
NSR = Not Site Related
SR = Site Related
LC = Lab Contaminant
IDOM = Infrequently detected in other media

(7) Estimated Total Uranium data by summing individual uranium radionuclides in pCi/l and converting to µg/l using a geometric average activity:mass ratio of 0.9 pCi/µg (USEPA, 2000a).

TABLE 2.2

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Overburden Groundwater
Exposure Medium: Indoor Air

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (NC/C) (4)		Potential ARAR/TBC Value	Potential ARAR/TBC Source (5)	COPC Flag (Y/N)	Rationale for Selection or Deletion (6)
Tap Water	67-64-1	Acetone	1 J	20 B	µg/l	B38W17A	7/13	5-5	20 B	NA	32,000	NC	NA	--	N	BSC
	71-43-2	Benzene	0.1 J	2,500 D	µg/l	PT-2S	9/50	1-4	2,500 D	NA	5.0	C β	5	MCL	Y	AC
	75-27-4	Bromodichloromethane	0.1 J	0.1 J	µg/l	MW-25S	1/50	1-4	0.1 J	NA	3.0	C	80	MCL	N	BSC
	78-93-3	2-Butanone	2 J	2 J	µg/l	OVPW-1S	1/33	5-5	2 J	NA	62,000	NC	NA	--	N	BSC
	108-90-7	Chlorobenzene	0.1 J	3 J	µg/l	PT-2S	2/50	1-4	3 J	NA	56	NC	NA	--	N	BSC
	67-66-3	Chloroform	0.1 J	6	µg/l	B38W14S	13/50	1-4	6	NA	80	C β	80	MCL	N	BSC
	74-87-3	Chloromethane	0.1 J	0.1 J	µg/l	OVPW-1S	1/50	2-8	0.1 J	NA	10	C	NA	--	N	BSC
	95-49-8	2-Chlorotoluene	0.2 J	0.5 J	µg/l	OVPZ-17	4/6	1-4	0.5 J	NA	NA		NA	--	Y	NSC
	106-43-4	4-Chlorotoluene	0.1 J	0.2 J	µg/l	OVPZ-17	4/6	1-4	0.2 J	NA	NA		NA	--	Y	NSC
	75-34-3	1,1-Dichloroethane	0.1 J	0.5 J	µg/l	MW-7S	4/50	1-4	0.5 J	NA	310	NC	NA	--	N	BSC
	107-06-2	1,2-Dichloroethane	0.1 J	0.3 J	µg/l	OBMW13	2/50	1-4	0.3 J	NA	5.0	C β	5	MCL	N	BSC
	75-35-4	1,1-Dichloroethene	0.2 J	0.2 J	µg/l	MW-7S	1/50	1-4	0.2 J	NA	27	NC	7	MCL	N	BSC
	540-59-0	1,2-Dichloroethene (total)	0.3 J	7	µg/l	OBMW11	12/48	1-4	7	NA	26	NC (for trans)	10/7 [a]	MCL	N	BSC
	78-87-5	1,2-Dichloropropane	0.2 J	0.2 J	µg/l	MW-7S	1/50	1-4	0.2 J	NA	5	NC	5	MCL	N	BSC
	100-41-4	Ethylbenzene	0.1 J	1,100 D	µg/l	OBMW18	14/50	1-4	1,100 D	NA	700	C β	700	MCL	Y	ASC
	127-18-4	Tetrachloroethene	0.2 J	3	µg/l	OBMW3	7/47	1-4	3	NA	5.0	C β	5	MCL	N	BSC
	108-88-3	Toluene	0.1 J	39 J	µg/l	OBMW18	18/50	1-4	39 J	NA	210	NC	1,000	MCL	N	BSC
	71-55-6	1,1,1-Trichloroethane	0.8 J	0.8 J	µg/l	MW-7S	1/50	1-4	0.8 J	NA	450	NC	200	MCL	N	BSC
	79-00-5	1,1,2-Trichloroethane	0.1 J	3	µg/l	OBMW3	2/50	1-4	3	NA	5.8	C	5	MCL	N	BSC
	79-01-6	Trichloroethene	0.1 J	2	µg/l	OBMW17	8/47	1-4	2	NA	5.0	C β	5	MCL	N	BSC
	75-01-4	Vinyl Chloride	0.1 J	2 J	µg/l	PT-2S	8/50	2-8	2 J	NA	2.0	C β	2	MCL	Y	AC
	1330-20-7	Xylenes (total)	0.1 J	4,900 BD	µg/l	OBMW18	22/50	1-4	4,900 BD	NA	3,200	NC (for p-xylene)	10,000	MCL	Y	ASC

Footnote Instructions:

(1) The "(Qualifier)" codes used for the "Minimum Concentration" and "Maximum Concentration" are as follows:
J = Estimated Concentration
B = Detected in a Blank
D = Value from a diluted aliquot

(2) The maximum detected concentration is used for screening.

(3) No Site-Specific Background is available.

(4) USEPA Draft Guidance for Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance). November 2002. EPA530-F-02-052. Groundwater Screening Levels for Scenario-Specific Vapor Attenuation Factors from Table 3c, using a target hazard quotient of 0.1 and a target cancer risk level of 1×10^{-6} and an attenuation factor of 7×10^{-4}.
NC = Groundwater Screening Levels for Scenario-Specific Vapor Attenuation Factor based on noncarcinogenic effects
C = Groundwater Screening Levels for Scenario-Specific Vapor Attenuation Factor based on carcinogenic effects
β = The target groundwater concentration is the MCL.

(5) The codes used for the Potential ARAR/TBC Source are as follows:
MCL = Maximum Contaminant Level.
(a): MCL for Combined Ra 226 & 228 is 5 pCi/L.

(6) The codes used for the "Rationale for Selection or Deletion" are as follows:
AC = A Carcinogen — BSC = Below Screening Criterion
ASC = Above Screening Criterion — LFD = Low Frequency of Detection (<5%)
NA = Not Available — NSC = No Screening Criterion

TABLE 2.3

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Surface Water (Lodi Brook)
Exposure Medium: Surface Water (Lodi Brook)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (N/C) (4)	Potential ARAR/TBC Value	Potential ARAR/TBC Source (5)	COPC Flag (Y/N)	Rationale for Selection or Deletion (6)
Lodi Brook	7429-90-5	Aluminum	65.9	97.3	µg/l	LB-2	7/7	10.6	97.3	N/A	N/A	NA	--	Y	DET
	7440-38-2	Arsenic	2.4	9.7	µg/l	LB-2	6/7	2.3 - 3.4	9.7	N/A	N/A	0.14 C,M,S	WQC	Y	AC
	7440-39-3	Barium	56.6	104	µg/l	LB-3	7/7	0.2	104	N/A	N/A	NA	--	Y	DET
	7440-41-7	Beryllium	0.09	0.09	µg/l	LB-4	1/7	0.1	0.09	N/A	N/A	NA	--	Y	DET
	7440-42-8	Boron	53.6 J	176 J	µg/l	LB-8	7/7	2.1	176 J	N/A	N/A	NA	--	Y	DET
	7440-70-2	Calcium	50,900	84,700	µg/l	LB-2	7/7	8.9	84,700	N/A	N/A	NA	--	N	EN
	7440-47-3	Chromium, Total	1.1	2.2 J	µg/l	LB-5	7/7	0.9	2.2 J	N/A	N/A	NA	--	Y	DET
	7440-48-4	Cobalt	0.73	1.6	µg/l	LB-8	3/7	0.9	1.6	N/A	N/A	NA	--	Y	DET
	7440-50-8	Copper	3.5	23.7	µg/l	LB-4	7/7	0.8	23.7	N/A	N/A	NA	--	Y	DET
	7439-89-6	Iron	320	1160	µg/l	LB-2	7/7	16.4	1,160	N/A	N/A	NA	--	Y	DET
	7439-91-0	Lanthanum	38.4	38.4	µg/l	LB-3	1/7	33.8	38	N/A	N/A	NA	--	Y	DET
	7439-92-1	Lead	2.6	7.7	µg/l	LB-2	4/7	2.1	7.7	N/A	N/A	NA	--	Y	DET
	7439-93-2	Lithium	11.5	94.6	µg/l	LB-2	7/7	0.2	94.6	N/A	N/A	NA	--	Y	DET
	7439-95-4	Magnesium	7,610	16,900	µg/l	LB-3	7/7	7.8	16,900	N/A	N/A	NA	--	N	EN
	7439-96-5	Manganese	101	434	µg/l	LB-2	7/7	0.2	434	N/A	N/A	NA	--	Y	DET
	7440-02-0	Nickel	1.95	3.2	µg/l	LB-8	7/7	1.2	3.2	N/A	N/A	4,600 B	WQC	Y	DET
	7440-09-7	Potassium	4,560	10,450	µg/l	LB-4	7/7	29.9	10,450	N/A	N/A	NA	--	N	EN
	7440-22-4	Silver	1.1	1.3	µg/l	LB-5	4/7	1.1	1.3	N/A	N/A	NA	--	Y	DET
	7440-23-5	Sodium	42,300	53,000	µg/l	LB-3	7/7	3.8	53,000	N/A	N/A	NA	--	N	EN
	7440-28-0	Thallium	4.3	4.3	µg/l	LB-5	1/7	3.6 - 4	4.3	N/A	N/A	6.3 B	WQC	Y	DET
	7440-62-2	Vanadium	0.95	3	µg/l	LB-2	7/7	0.9	3	N/A	N/A	NA	--	Y	DET
	7440-66-6	Zinc	18.9 J	39.5 J	µg/l	LB-2	7/7	0.4	39.5 J	N/A	N/A	26,000 U	WQC	Y	DET
	7440-61-0	Total Uranium [(7)]	1.0732	2.8525	µg/l	LB-4	7/7	N/A	3	N/A	N/A	NA	--	Y	DET
	13982-63-3	Ra-226	0.3244	1.297	pCi/l	LB-4	7/7	0.5 - 1.09	1.297	N/A	N/A	NA	--	Y	AC
	15262-20-1	Ra-228	2.198	8.229	pCi/l	LB-5	7/7	1.325 - 2.282	8.229	N/A	N/A	NA	--	Y	AC
	14274-82-9	Th-228	0.3306	1.581	pCi/l	LB-2	2/7	0.3307 - 0.5024	1.581	N/A	N/A	NA	--	Y	AC
	14269-63-7	Th-230	0.3598	2.099	pCi/l	LB-3	6/7	0.2486 - .6908	2.099	N/A	N/A	NA	--	Y	AC
	7440-29-1	Th-232	0.3217	0.4706	pCi/l	LB-4	2/7	0.319 - 0.6069	0.4706	N/A	N/A	NA	--	Y	AC
	13966-29-5	U-234	0.4122	1.454	pCi/l	LB-4	7/7	0.289 - 0.916	1.454	N/A	N/A	NA	--	Y	AC
	15117-96-1	U-235	0.3246	0.5106	pCi/l	LB-4	2/7	0.236 - .847	0.5106	N/A	N/A	NA	--	Y	AC
	Q1567	U-238	0.298	0.6896	pCi/l	LB-2	6/7	0.2266 - 0.7811	0.6896	N/A	N/A	NA	--	Y	AC

Footnote Instructions:

(1) The "(Qualifier)" codes used for the "Minimum Concentration" and "Maximum Concentration" are as follows:
J = Estimated Concentration
(2) No Screening is conducted.
(3) No Site-Specific Background is available.
(4) No Screening is conducted.
(5) The codes used for the Potential ARAR/TBC Source are as follows:
WQC = USEPA National Recommended Water Quality Criteria: 2002 (USEPA, 2002d).
B = This criterion has been revised to reflect the EPA's q1* or RfD, as contained in the integrated Risk Information System (IRIS) as of May 17, 2002. Ths fish tissue bioconcentration factor (BCF) from the 1980 Ambient Water Quality Criteria document was retained in each case.
C = This criterion is based on carcinogenicity of 10-6 risk.
M = USEPA is currently reassessing the criteria for arsenic.
S = This recommended water quality criterion for arsenic refers to the inorganic form only.
U = The organoleptic effect criterion is more stringent than the value for priority toxic pollutants.
(6) The codes used for the "Rationale for Selection or Deletion" are as follows:
AC = A Carcinogen
DET = Detected
EN = Essential Nutrient
(7) Estimated Total Uranium data by summing individual uranium radionuclides in pCi/l and converting to µg/l using a geometric average activity:mass ratio of 0.9 pCi/µg (USEPA, 2000a).

TABLE 2.4

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Surface Water (Westerly Brook)
Exposure Medium: Surface Water (Westerly Brook)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (N/C) (4)	Potential ARAR/TBC Value	Potential ARAR/TBC Source (5)	COPC Flag (Y/N)	Rationale for Selection or Deletion (6)
Westerly Brook	7429-90-5	Aluminum	22.7	255	µg/l	WB-3	4/5	10.6 - 22.7	255	NA	NA	NA	--	Y	DET
	7440-38-2	Arsenic	3.8	48.7	µg/l	WB-3	4/5	2.4 - 3.4	48.7	NA	NA	0.14 C,M,S	WQC	Y	AC
	7440-39-3	Barium	113	242	µg/l	WB-3	5/5	0.2	242	NA	NA	NA	--	Y	DET
	7440-42-8	Boron	95.1	218	µg/l	WB-1	5/5	2.1 - 2.7	218	NA	NA	NA	--	Y	DET
	7440-43-9	Cadmium	0.54	0.54	µg/l	WB-3	1/5	0.3	0.54	NA	NA	NA	--	Y	DET
	7440-70-2	Calcium	7,710	116,000	µg/l	WB-1	5/5	8.9 - 19.2	116,000	NA	NA	NA	--	N	EN
	7440-47-3	Chromium, Total	1	4.9	µg/l	WB-1	2/5	0.9	4.9	NA	NA	NA	--	Y	DET
	7440-48-4	Cobalt	1.8	1.8	µg/l	WB-3	1/5	0.8 - 0.9	1.8	NA	NA	NA	--	Y	DET
	7440-50-8	Copper	1.5	4.9	µg/l	WB-3	5/5	0.8 - 0.9	4.9	NA	NA	NA	--	Y	DET
	7439-89-6	Iron	543	3,460	µg/l	WB-3	5/5	16.4 - 21.8	3,460	NA	NA	NA	--	Y	DET
	7439-91-0	Lanthanum	35.3	35.3	µg/l	WB-4	1/5	33.8	35.3	NA	NA	NA	--	Y	DET
	7439-92-1	Lead	4	5.4	µg/l	WB-3	2/5	2.1	5.4	NA	NA	NA	--	Y	DET
	7439-93-2	Lithium	23.6	642	µg/l	WB-1	5/5	0.2	642	NA	NA	NA	--	Y	DET
	7439-95-4	Magnesium	9,600	16,900	µg/l	WB-1	5/5	6.7 - 7.8	16,900	NA	NA	NA	--	N	EN
	7439-96-5	Manganese	201	3,730	µg/l	WB-3	5/5	0.2	3,730	NA	NA	NA	--	Y	DET
	7439-97-6	Mercury	0.11	0.12	µg/l	WB-1	2/5	0.1	0.12	NA	NA	NA	--	Y	DET
	7440-02-0	Nickel	2.1	7.9	µg/l	WB-3	5/5	0.9 - 1.2	7.9	NA	NA	4,600 B	WQC	Y	DET
	7440-09-7	Potassium	3,540	32,200	µg/l	WB-1	5/5	29.9 - 40.9	32,200	NA	NA	NA	--	N	EN
	7440-22-4	Silver	8.6	59.4	µg/l	WB-3	2/5	1.1	59.4	NA	NA	NA	--	Y	DET
	7440-23-5	Sodium	3,350	7,580	µg/l	WB-1	5/5	3.8 - 4.1	7,580	NA	NA	NA	--	N	EN
	7440-28-0	Thallium	6.1	6.1	µg/l	WB-1	1/5	3.6 - 4	6.1	NA	NA	6.3 B	WQC	Y	DET
	7440-62-2	Vanadium	0.84	3.3	µg/l	WB-3	2/5	0.8 - 0.9	3.3	NA	NA	NA	--	Y	DET
	7440-66-6	Zinc	14.8 J	186 J	µg/l	WB-3	5/5	0.4	186 J	NA	NA	26,000 U	WQC	Y	DET
	7440-61-1	Total Uranium (7)	1.1998	1.1998	µg/l	WB-3	1/1	0.0243	1.1998	NA	NA	NA	--	Y	DET
	7440-61-1	Total Uranium (8)	2.2701	2.6819	µg/l	WB-1	4/4	N/A	2.6819	NA	NA	NA	--	Y	DET
	13982-63-3	Ra-226	0.4399	0.921	pCi/l	WB-3	4/5	0.2583 - 0.7958	0.921	NA	NA	NA	--	Y	AC
	15262-20-1	Ra-228	0.7799	4.799	pCi/l	WB-2	4/5	0.7856 - 1.652	4.799	NA	NA	NA	--	Y	AC
	14274-82-9	Th-228	0.0078	0.4862	pCi/l	WB-3	2/5	0.2414 - 0.4108	0.486	NA	NA	NA	--	Y	AC
	14269-63-7	Th-230	0.3718	0.8283	pCi/l	WB-2	5/5	0.3391 - 0.5567	0.8283	NA	NA	NA	--	Y	AC
	13966-29-5	U-234	1.18	1.402	pCi/l	WB-1	4/4	0.2521 - 0.5033	1.402	NA	NA	NA	--	Y	AC
	15117-96-1	U-235	0.282	0.336	pCi/l	WB-5	2/4	0.2661 - 0.4652	0.336	NA	NA	NA	--	Y	AC
	Q1567	U-238	0.4846	0.7297	pCi/l	WB-1	3/4	0.2788 - 0.429	0.7297	NA	NA	NA	--	Y	AC

Footnote Instructions:

(1) The "(Qualifier)" codes used for the "Minimum Concentration" and "Maximum Concentration" are as follows:
J = Estimated Concentration
(2) No Screening is conducted.
(3) No Site-Specific Background is available.
(4) No Screening is conducted.
(5) The codes used for the Potential ARAR/TBC Source are as follows:
WQC = USEPA National Recommended Water Quality Criteria: 2002 (USEPA, 2002d).
B = This criterion has been revised to reflect the EPA's q1* or RfD, as contained in the integrated Risk Information System (IRIS) as of May 17, 2002. Ths fish tissue bioconcentration factor (BCF) from the 1980 Ambient Water Quality Criteria document was retained in each case.
C = This criterion is based on carcinogenicity of 10^{-6} risk.
M = USEPA is currently reassessing the criteria for arsenic.
S = This recommended water quality criterion for arsenic refers to the inorganic form only.
U = The organoleptic effect criterion is more stringent than the value for priority toxic pollutants.
(6) The codes used for the "Rationale for Selection or Deletion" are as follows:
AC = A Carcinogen
DET = Detected
EN = Essential Nutrient
(7) Measured Total Uranium data.
(8) Estimated Total Uranium data by summing individual uranium radionuclides in pCi/l and converting to µg/l using a geometric average activity:mass ratio of 0.9 pCi/µg (USEPA, 2000a).

TABLE 2.5

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Surface Water (Saddle River)
Exposure Medium: Surface Water (Saddle River)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (N/C) (4)	Potential ARAR/TBC Value	Potential ARAR/TBC Source (5)	COPC Flag (Y/N)	Rationale for Selection or Deletion (6)
Saddle River	7429-90-5	Aluminum	38	67.8	µg/l	SR-6	3/6	18.7 - 22.7	67.8	N/A	N/A	NA	--	Y	DET
	7440-38-2	Arsenic	8.8	8.8	µg/l	SR-3	1/6	2.4 - 3.2		N/A	N/A	0.14 C,M,S	WQC	Y	AC
	7440-39-3	Barium	112	125	µg/l	SR-7	6/6	0.1	125	N/A	N/A	NA	--	Y	DET
	7440-42-8	Boron	152 J	209 J	µg/l	SR-3	6/6	1.8	209 J	N/A	N/A	NA	--	Y	DET
	7440-70-2	Calcium	61,400	114,000	µg/l	SR-3	6/6	11.9	114,000	N/A	N/A	NA	--	N	EN
	7440-47-3	Chromium, Total	0.68	1.1	µg/l	SR-4	3/6	0.6	1.1	N/A	N/A	NA	--	Y	DET
	7440-50-8	Copper	1.7	11.3	µg/l	SR-6 and SR-7	6/6	0.8	11.3	N/A	N/A	NA	--	Y	DET
	7439-89-6	Iron	215	317	µg/l	SR-6	6/6	10.8	317	N/A	N/A	NA	--	Y	DET
	7439-92-1	Lead	10.8	10.8	µg/l	SR-2	1/6	2.1 - 2.3		N/A	N/A	NA	--	Y	DET
	7439-93-2	Lithium	6.2	631	µg/l	SR-3	6/6	0.2	631	N/A	N/A	NA	--	Y	DET
	7439-95-4	Magnesium	17,100	19,200	µg/l	SR-4	6/6	7.7	19,200	N/A	N/A	NA	--	N	EN
	7439-96-5	Manganese	117	173	µg/l	SR-3	6/6	0.2	173	N/A	N/A	NA	--	Y	DET
	7440-02-0	Nickel	1.3	2.2	µg/l	SR-4	5/6	0.9 - 1.4	2.2	N/A	N/A	4,600 B	WQC	Y	DET
	7440-09-7	Potassium	6,280	31,700	µg/l	SR-3	6/6	18.6	31,700	N/A	N/A	NA	--	N	EN
	7440-22-4	Silver	1.4	1.4	µg/l	SR-4	1/6	0.5 - 1.1		N/A	N/A	NA	--	Y	DET
	7440-23-5	Sodium	55,500	74,800	µg/l	SR-3	6/6	3.1	74,800	N/A	N/A	NA	--	N	EN
	7440-62-2	Vanadium	0.82	1.5	µg/l	SR-4	3/6	0.7 - 0.8	1.5	N/A	N/A	NA	--	Y	DET
	7440-66-6	Zinc	8.1 J	23.2 J	µg/l	SR-6	6/6	0.7	23.2 J	N/A	N/A	26,000 U	WQC	Y	DET
	7440-61-1	Total Uranium (7)	0.9075	1.2339	µg/l	SR-2	2/5	0.2031	1.234	N/A	N/A	NA	--	Y	DET
	13982-63-3	Ra-226	0.3802	2.179	pCi/l	SR-7	5/5	0.3872 - 0.6881	2.179	N/A	N/A	NA	--	Y	AC
	14269-63-7	Th-230	0.3602	1.062	pCi/l	SR-7	5/5	0.278 - 0.5958	1.062	N/A	N/A	NA	--	Y	AC
	7440-29-1	Th-232	0.3945	0.5746	pCi/l	SR-3	2/4	0.2775 - 0.5653	0.5746	N/A	N/A	NA	--	Y	AC

Footnote Instructions:

(1) The "(Qualifier)" codes used for the "Minimum Concentration" and "Maximum Concentration" are as follows:
J = Estimated Concentration
(2) No Screening is conducted.
(3) No Site-Specific Background is available.
(4) No Screening is conducted.
(5) The codes used for the Potential ARAR/TBC Source are as follows:
WQC = USEPA National Recommended Water Quality Criteria: 2002 (USEPA, 2002d).
B = This criterion has been revised to reflect the EPA's q1* or RfD, as contained in the integrated Risk Information System (IRIS) as of May 17, 2002. Ths fish tissue bioconcentration factor (BCF) from the 1980 Ambient Water Quality Criteria document was retained in each case.
C = This criterion is based on carcinogenicity of 10^{-6} risk. Alternate risk levels may be obtained by moving the decimal point (e.g., for a risk level of 10^{5}, move the decimal poin in the recommended criterion one place to the right).
M = EPA is currently reassessing the criteria for arsenic.
S = This recommended water quality criterion for arsenic refers to the inorganic form only.
U = The organoleptic effect criterion is more stringent than the value for priority toxic pollutants.
(6) The codes used for the "Rationale for Selection or Deletion" are as follows:
AC = A Carcinogen
DET = Detected
EN = Essential Nutrient
(7) Measured Total Uranium data.

TABLE 2.6

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Surface Water (Coles Brook)
Exposure Medium: Surface Water (Coles Brook)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (N/C) (4)	Potential ARAR/TBC Value (5)	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (6)
Coles Brook	7429-90-5	Aluminum	47.3	47.3	µg/l	CB-2	1/4	22.7	47.3	N/A	N/A	NA	--	Y	DET
	7440-39-3	Barium	0.68	152	µg/l	CB-5	4/4	0.2	152	N/A	N/A	NA	--	Y	DET
	7440-42-8	Boron	3.3 J	54.4 J	µg/l	CB-2	4/4	2.7	54.4 J	N/A	N/A	NA	--	Y	DET
	7440-70-2	Calcium	159	81,400	µg/l	CB-5	4/4	19.2	81,400	N/A	N/A	NA	--	N	EN
	7440-48-4	Cobalt	0.92	0.92	µg/l	CB-5	1/4	0.9	0.92	N/A	N/A	NA	--	Y	DET
	7440-50-8	Copper	1.3	6.1	µg/l	CB-1	4/4	0.9	6.1	N/A	N/A	NA	--	Y	DET
	7429-91-6	Dysprosium	4.8 J	5 J	µg/l	CB-4	2/4	3.1	5 J	N/A	N/A	NA	--	Y	DET
	7439-89-6	Iron	31.3	927	µg/l	CB-2	4/4	21.8	927	N/A	N/A	NA	--	Y	DET
	7439-93-2	Lithium	0.48	7.7	µg/l	CB-4 and CB-5	4/4	0.2	7.7	N/A	N/A	NA	--	Y	DET
	7439-95-4	Magnesium	101	16,800	µg/l	CB-5	4/4	6.7	16,800	N/A	N/A	NA	--	N	EN
	7439-96-5	Manganese	119	286	µg/l	CB-4	3/4	0.2	286	N/A	N/A	NA	--	Y	DET
	7440-02-0	Nickel	1.2	1.2	µg/l	CB-2	1/4	0.9	1.2	N/A	N/A	4,600 B	WQC	Y	DET
	7440-09-7	Potassium	2,730	3,090	µg/l	CB-5	3/4	40.9	3,090	N/A	N/A	NA	--	N	EN
	7440-23-5	Sodium	61.4	47,300	µg/l	CB-5	4/4	4.1	47,300	N/A	N/A	NA	--	N	EN
	7440-66-6	Zinc	4.9 J	6.2 J	µg/l	CB-2	2/4	0.4	6.2 J	N/A	N/A	26,000 U	WQC	Y	DET
	7440-61-1	Total Uranium (7)	9.6826	9.6826	µg/l	CB-1	1/2	0.0203	9.683	N/A	N/A	NA	--	Y	DET
	7440-61-1	Total Uranium (8)	3.9590	4.1058	µg/l	CB-4	2/2	0.0203	4.106	N/A	N/A	NA	--	Y	DET
	13982-63-3	Ra-226	0.218	0.3767	pCi/l	CB-2	4/4	0.3248 - 0.4226	0.3767	N/A	N/A	NA	--	Y	AC
	14269-63-7	Th-230	0.4725	0.7647	pCi/l	CB-4	4/4	0.3982 - 0.5923	0.7647	N/A	N/A	NA	--	Y	AC
	7440-29-1	Th-232	0.4182	0.4667	pCi/l	CB-4	3/4	0.3148 - 0.4633	0.4667	N/A	N/A	NA	--	Y	AC
	13966-29-5	U-234	1.845	2.01	pCi/l	CB-5	2/2	0.4999 - 0.5053	2.01	N/A	N/A	NA	--	Y	AC
	Q1567	U-238	1.177	1.367	pCi/l	CB-4	2/2	0.5031 - 0.5407	1.367	N/A	N/A	NA	--	Y	AC

Footnote Instructions:

(1) The "(Qualifier)" codes used for the "Minimum Concentration" and "Maximum Concentration" are as follows:
J = Estimated Concentration

(2) Specify source(s) for the "Concentration Used for Screening".

(3) No Site-Specific Background is available.

(4) No Screening is conducted.

(5) The codes used for the Potential ARAR/TBC Source are as follows:
WQC = USEPA National Recommended Water Quality Criteria: 2002 (USEPA, 2002d).
B = This criterion has been revised to reflect the EPA's q1* or RfD, as contained in the integrated Risk Information System (IRIS) as of May 17, 2002. Ths fish tissue bioconcentration factor (BCF) from the 1980 Ambient Water Quality Criteria document was retained in each case.
U = The organoleptic effect criterion is more stringent than the value for priority toxic pollutants.

(6) The codes used for the "Rationale for Selection or Deletion" are as follows:
AC = A Carcinogen
DET = Detected
EN = Essential Nutrient

(7) Measured Total Uranium data.

(8) Estimated Total Uranium data by summing individual uranium radionuclides in pCi/l and converting to µg/l using a geometric average activity:mass ratio of 0.9 pCi/µg (USEPA, 2000a).

TABLE 2.7

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Sediment (Lodi Brook)
Exposure Medium: Sediment (Lodi Brook

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (N/C) (4)		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Lodi Brook	7429-90-5	Aluminum	3020	7510	mg/kg	LB-1	6/6	1.1 - 4.1	7510	N/A	7614	nc	--	--	N	BSC
	7440-36-0	Antimony	0.27	4.8 J	mg/kg	LB-7	5/6	0.21 - 0.42	4.8 J	N/A	3	nc	--	--	Y	ASC
	7440-38-2	Arsenic	1	30.5	mg/kg	LB-1	6/6	0.35 - 0.43	30.5	N/A	0.39	ca*	--	--	Y	AC
	7440-39-3	Barium	40.7	132	mg/kg	LB-1	6/6	0.02 - 0.04	132	N/A	537	nc	--	--	N	BSC
	7440-41-7	Beryllium	0.24 J	0.78 J	mg/kg	LB-4	5/6	0.01 - 0.02	0.78 J	N/A	15	nc	--	--	N	BSC
	7440-42-8	Boron	7.5 J	79.8	mg/kg	LB-1	5/6	0.21 - 0.49	79.8	N/A	1562	nc	--	--	N	BSC
	7440-43-9	Cadmium	0.27	0.89	mg/kg	LB-1	6/6	0.03 - 0.05	0.89	N/A	4	nc	--	--	N	BSC
	7440-70-2	Calcium	7405 J	21900 J	mg/kg	LB-6	6/6	0.9 - 3.5	21900 J	N/A	NA		--	--	N	EN
	7440-45-1	Cerium	7.3 J	758	mg/kg	LB-1	6/6	3.6 - 6.4	758	N/A	NA		--	--	Y	NSC
	7440-47-3	Chromium	18.2 J	191	mg/kg	LB-1	6/6	0.09 - 0.11	191	N/A	211	ca	--	--	N	BSC
	7440-48-4	Cobalt	3	16.6	mg/kg	LB-7	6/6	0.08 - 0.16	16.6	N/A	903	ca**	--	--	N	BSC
	7440-50-8	Copper	96	96	mg/kg	LB-1	1/1	0.16	96	N/A	313	nc	--	--	N	BSC
	7429-91-6	Dysprosium	0.77	3.9	mg/kg	LB-1	6/6	0.31 - 0.56	3.9	N/A	1564	nc	--	--	N	BSC
	7439-89-6	Iron	9330	37300	mg/kg	LB-8	6/6	1.7 - 3.9	37,300	N/A	2346	nc	--	--	Y	ASC
	7439-91-0	Lanthanum	5.9	355	mg/kg	LB-1	6/6	3.4 - 6.1	355	N/A	NA		--	--	Y	NSC
	7439-92-1	Lead	33.8	427 J	mg/kg	LB-7	6/6	0.21 - 0.38	427 J	N/A	40	nc	--	--	Y	ASC
	7439-93-2	Lithium	3.6 J	94.6	mg/kg	LB-1	6/6	0.02 - 0.04	94.6	N/A	156	nc	--	--	N	BSC
	7439-95-4	Magnesium	1400	7240 J	mg/kg	LB-7	6/6	0.79 - 1.2	7240 J	N/A	NA		--	--	N	EN
	7439-96-5	Manganese	94.4	580	mg/kg	LB-8	6/6	0.02 - 0.04	580	N/A	176	nc	--	--	Y	ASC
	7439-97-6	Mercury	0.04	0.11	mg/kg	LB-3	5/6	0.01 - 0.03	0.11	N/A	0.6	nc	--	--	N	BSC
	7440-00-8	Neodymium	5.1	301	mg/kg	LB-1	6/6	1.3 - 2.4	301	N/A	NA		--	--	Y	NSC
	7440-02-0	Nickel	11.4	61	mg/kg	LB-7	6/6	0.12 - 0.16	61	N/A	156	nc	--	--	N	BSC
	7440-09-7	Potassium	233	454	mg/kg	LB-1	6/6	3.0 - 7.4	454	N/A	NA		--	--	N	EN
	7782-49-2	Selenium	0.34	0.39	mg/kg	LB-3	2/6	0.33 - 0.6	0.39	N/A	39	nc	--	--	N	BSC
	7440-23-5	Sodium	273	3840	mg/kg	LB-1	6/6	0.39 - 0.74	3,840	N/A	NA		--	--	N	EN
	7440-62-2	Vanadium	12.5 J	21.4	mg/kg	LB-1	6/6	0.09 - 0.14	21.4	N/A	55	nc	--	--	N	BSC
	7440-65-5	Yttrium	3.5	11	mg/kg	LB-1	6/6	0.19 - 0.34	11	N/A	NA		--	--	Y	NSC
	7440-66-6	Zinc	108	1020	mg/kg	LB-7	6/6	0.04 - 0.07	1,020	N/A	2346	nc	--	--	N	BSC
	7440-61-1	Total Uranium[(6)]	1.4411	13.6129	mg/kg	LB-3	6/6	N/A	14	N/A	2	nc	--	--	Y	ASC
	13982-93-3	Ra-226	1.201	10.41	pCi/g	LB-1	6/6	0.3028 - 0.5048	10.41	N/A	NA		--	--	Y	AC
	14274-82-9	Th-228	0.6661	23.58	pCi/g	LB-1	6/6	0.1524 - 0.1976	23.58	N/A	NA		--	--	Y	AC
	14269-63-7	Th-230	0.8021	4.484	pCi/g	LB-1	6/6	0.1378 - 0.2204	4.484	N/A	NA		--	--	Y	AC
	7440-29-1	Th-232	0.3348	21.48	pCi/g	LB-1	6/6	0.1222 - 0.2611	21.48	N/A	NA		--	--	Y	AC
	13966-29-5	U-234	0.7596	6.215	pCi/g	LB-1	6/6	0.1767 - 0.2195	6.215	N/A	NA		--	--	Y	AC
	15117-96-1	U-235	0.01597	0.2726	pCi/g	LB-1	5/6	0.103 - 0.203	0.2726	N/A	NA		--	--	Y	AC
	Q1567	U-238	0.3359	5.746	pCi/g	LB-1	6/6	0.1461 - 0.2084	5.746	N/A	NA		--	--	Y	AC

Footnote Instructions:

(1) The "(Qualifier)" codes used for the "Minimum Concentration" and "Maximum Concentration" are as follows:
J = Estimated Concentration
(2) No Screening is conducted.
(3) No Site-Specific Background is available.
(4) For chemical consituents, the USEPA Region IX Preliminary Remediation Goals (PRGs) for residential soil (USEPA, 2002c) updated October 1, 2002 were used.
PRGs are protective at a target hazard quotient of 0.1 and a target cancer risk of $1x10^{-6}$.
nc = PRG based on noncarcinogenic effects
ca = PRG based on carcinogenic effects
ca* (where: nc < 100X ca)
ca**(where: nc < 10X ca)
(5) The codes used for the "Rationale for Selection or Deletion" are as follows:
AC = A Carcinogen
EN = Essential Nutrient
ASC = Above Screening Criterion
BSC = Below Screening Criterion
NSC = No Screening Criterion
(6) Estimated Total Uranium data by summing individual uranium radionuclides in pCi/l and converting to µg/l using a geometric average activity:mass rationof 0.9 pCi/µg (USEPA, 2000a).

TABLE 2.8

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Sediment (Westerly Brook)
Exposure Medium: Sediment (Westerly Brook

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (N/C) (4)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Westerly Brook	7429-90-5	Aluminum	2930	6470	mg/kg	UD-6	6/6	1.2 - 3.8	6470	N/A	7614 nc	--	--	N	BSC
	7440-36-0	Antimony	0.49	1.6 J	mg/kg	UD-7	6/6	0.23 - 0.39	1.6 J	N/A	3 nc	--	--	N	BSC
	7440-38-2	Arsenic	1.9	5.8	mg/kg	WB-1	6/6	0.27 - 0.4	5.8	N/A	0.39 ca*	--	--	Y	AC
	7440-39-3	Barium	31.3	93.4	mg/kg	UD-7	6/6	0.02 - 0.03	93.4	N/A	537 nc	--	--	N	BSC
	7440-41-7	Beryllium	0.25	0.46	mg/kg	WB-2	4/6	0.01 - 0.02	0.46	N/A	15 nc	--	--	N	BSC
	7440-43-9	Cadmium	0.36	1.7	mg/kg	UD-7	6/6	0.03 - 0.05	1.7	N/A	4 nc	--	--	N	BSC
	7440-70-2	Calcium	2310	7710	mg/kg	WB-2	6/6	0.99 - 3.2	7,710	N/A	NA	--	--	N	EN
	7440-45-1	Cerium	6.3 J	15.1	mg/kg	UD-6	6/6	3.8 - 6.0	15.1	N/A	NA	--	--	Y	NSC
	7440-47-3	Chromium	9.6 J	60.8	mg/kg	UD-7	6/6	0.07 - 0.11	60.8	N/A	211 ca	--	--	N	BSC
	7440-48-4	Cobalt	3.5	6.9	mg/kg	UD-6	5/5	0.09 - 0.15	6.9	N/A	903 ca**	--	--	N	BSC
	7440-50-8	Copper	31.7	96.8	mg/kg	UD-6	3/3	0.09 - 0.15	96.8	N/A	313 nc	--	--	N	BSC
	7429-91-6	Dysprosium	0.51	1.1	mg/kg	UD-6	6/6	0.34 - 0.52	1.1	N/A	1564 nc	--	--	N	BSC
	7439-89-6	Iron	8050	25800	mg/kg	UD-7	6/6	1.8 - 3.7	25,800	N/A	2346 nc	--	--	Y	ASC
	7439-91-0	Lanthanum	4	4.9	mg/kg	WB-2	4/4	3.7 - 5.7	4.9	N/A	NA	--	--	Y	NSC
	7439-92-1	Lead	50.9	276 J	mg/kg	UD-6	6/6	0.23 - 0.35	276 J	N/A	40 nc	--	--	Y	ASC
	7439-93-2	Lithium	4.1 J	11.3	mg/kg	UD-6	6/6	0.02 - 0.03	11.3	N/A	156 nc	--	--	N	BSC
	7439-95-4	Magnesium	1490 J	4830	mg/kg	UD-7	6/6	0.76 - 1.1	4,830	N/A	NA	--	--	N	EN
	7439-96-5	Manganese	62.7 J	207 J	mg/kg	WB-2	6/6	0.02 - 0.03	207 J	N/A	176 nc	--	--	Y	ASC
	7439-97-6	Mercury	0.03	0.07	mg/kg	WB-2	4/6	0.02	0.07	N/A	0.6 nc	--	--	N	BSC
	7440-00-8	Neodymium	3.5 J	8.4	mg/kg	UD-7	6/6	0.4 - 2.2	8.4	N/A	NA	--	--	Y	NSC
	7440-02-0	Nickel	11.1	48.6	mg/kg	UD-6	6/6	0.10 - 0.15	48.6	N/A	156 nc	--	--	N	BSC
	7440-09-7	Potassium	305	805	mg/kg	UD-6	6/6	3.3 - 6.9	805	N/A	NA	--	--	N	EN
	7782-49-2	Selenium	0.39	1.6	mg/kg	WB-4	3/6	0.38 - 0.56	1.6	N/A	39 nc	--	--	N	BSC
	7440-22-4	Silver	1.1	1.1	mg/kg	WB-5	1/6	0.11 - 0.13	1.1	N/A	39 nc	--	--	N	BSC
	7440-23-5	Sodium	160	287	mg/kg	UD-6	6/6	0.42 - 0.69	287	N/A	NA	--	--	N	EN
	7440-62-2	Vanadium	8.9 J	28.7	mg/kg	UD-7	6/6	0.09 - 0.13	28.7	N/A	55 nc	--	--	N	BSC
	7440-65-5	Yttrium	2.6	6.4	mg/kg	UD-7	6/6	0.21 - 0.32	6.4	N/A	NA	--	--	Y	NSC
	7440-66-6	Zinc	154	452	mg/kg	UD-6	6/6	0.04 - 0.07	452	N/A	2346 nc	--	--	N	BSC
	7440-61-1	Total Uranium (6)	1.7521	3.5232	mg/kg	WB-4	6/6	N/A	4	N/A	2 nc	--	--	Y	ASC
	13982-63-3	Ra-226	0.73	2.833	pCi/g	WB-2	6/6	0.1527 - 0.5012	2.833	N/A	NA	--	--	Y	AC
	15262-20-1	Th-228	0.5319	0.9395	pCi/g	UD-6	6/6	0.1308 - 0.4032	0.9395	N/A	NA	--	--	Y	AC
	14269-63-7	Th-230	0.828	1.289	pCi/g	WB-5	6/6	0.1316 - 0.4354	1.289	N/A	NA	--	--	Y	AC
	7440-29-1	Th-232	0.47	0.7262	pCi/g	WB-5	6/6	0.1216 - 0.293	0.7262	N/A	NA	--	--	Y	AC
	13966-29-5	U-234	0.7024	1.304	pCi/g	WB-4	6/6	0.163 - 0.4697	1.304	N/A	NA	--	--	Y	AC
	15117-96-1	U-235	0.1423	0.1743	pCi/g	UD-7	2/6	0.1363 - 0.4589	0.1743	N/A	NA	--	--	Y	AC
	Q1567	U-238	0.7312	1.408	pCi/g	WB-4	6/6	0.1739 - 0.3499	1.408	N/A	NA	--	--	Y	AC

Footnote Instructions:

(1) The "(Qualifier)" codes used for the "Minimum Concentration" and "Maximum Concentration" are as follows:
J = Estimated Concentration
(2) No Screening is conducted.
(3) No Site-Specific Background is available.
(4) For chemical consituents, the USEPA Region IX Preliminary Remediation Goals (PRGs) for residential soil (USEPA, 2002c) updated October 1, 2002 were used.
PRGs are protective at a target hazard quotient of 0.1 and a target cancer risk of $1x10^{-6}$.
nc = PRG based on noncarcinogenic effects
ca = PRG based on carcinogenic effects
ca* (where: nc < 100X ca)
ca**(where: nc < 10X ca)
(5) The codes used for the "Rationale for Selection or Deletion" are as follows:
AC = A Carcinogen
EN = Essential Nutrient
ASC = Above Screening Criterion
BSC = Below Screening Criterion
NSC = No Screening Criterion
(6) Estimated Total Uranium data by summing individual uranium radionuclides in pCi/l and converting to µg/l using a geometric average activity:mass ratio of 0.9 pCi/µg (USEPA, 2000a).

TABLE 2.9

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Sediment (Saddle River)
Exposure Medium: Sediment (Saddle River)

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (N/C) (4)	Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Saddle River	7429-90-5	Aluminum	1610	4270	mg/kg	SR-3	5/5	2.1 - 2.4	4270	N/A	7614 nc	--	--	N	BSC
	7440-38-2	Arsenic	0.52	8.3	mg/kg	SR-3	5/5	0.36 - 0.41	8.3	N/A	0.39 ca*	--	--	Y	AC
	7440-39-3	Barium	40.9	68	mg/kg	SR-3	5/5	0.01	68	N/A	537 nc	--	--	N	BSC
	7440-41-7	Beryllium	0.06	0.47	mg/kg	SR-3	5/5	0.01	0.47	N/A	15 nc	--	--	N	BSC
	7440-43-9	Cadmium	0.05	0.43	mg/kg	SR-3	5/5	0.04 - 0.05	0.43	N/A	4 nc	--	--	N	BSC
	7440-70-2	Calcium	490	4820	mg/kg	SR-3	5/5	1.3 - 1.5	4,820	N/A	NA	--	--	N	EN
	7440-45-1	Cerium	9.3	12.7	mg/kg	SR-3	4/5	3.8 - 4.5	12.7	N/A	NA	--	--	Y	NSC
	7440-47-3	Chromium	3.7	11.6	mg/kg	SR-3	5/5	0.07 - 0.08	11.6	N/A	211 ca	--	--	N	BSC
	7440-48-4	Cobalt	1.5	6	mg/kg	SR-3	5/5	0.08 - 0.09	6	N/A	903 ca**	--	--	N	BSC
	7440-50-8	Copper	5.7	26.6	mg/kg	SR-3	5/5	0.09 - 0.1	26.6	N/A	313 nc	--	--	N	BSC
	7429-91-6	Dysprosium	0.49	1.2	mg/kg	SR-3	4/5	0.33 - 0.39	1.2	N/A	1564 nc	--	--	N	BSC
	7439-89-6	Iron	4350	17600	mg/kg	SR-3	5/5	1.2 - 1.4	17,600	N/A	2346 nc	--	--	Y	ASC
	7439-91-0	Lanthanum	4.75	6.7	mg/kg	SR-6	4/5	3.6 - 4.3	6.7	N/A	NA	--	--	Y	NSC
	7439-92-1	Lead	7.2	47.5	mg/kg	SR-3	5/5	0.26 - 0.3	47.5	N/A	40 nc	--	--	Y	ASC
	7439-93-2	Lithium	3.1	7.8	mg/kg	SR-3	5/5	0.02 - 0.03	7.8	N/A	156 nc	--	--	N	BSC
	7439-95-4	Magnesium	662	3000	mg/kg	SR-3	5/5	0.86 - 0.99	3,000	N/A	NA	--	--	N	EN
	7439-96-5	Manganese	49.1	414	mg/kg	SR-3	5/5	0.02 - 0.03	414	N/A	176 nc	--	--	Y	ASC
	7439-97-6	Mercury	0.02	0.06	mg/kg	SR-3	2/5	0.01 - 0.02	0.06	N/A	0.6 nc	--	--	N	BSC
	7440-00-8	Neodymium	3.2	6.2	mg/kg	SR-3	4/5	1.4 - 1.7	6.2	N/A	NA	--	--	Y	NSC
	7440-02-0	Nickel	3.1	14.1	mg/kg	SR-3	5/5	0.16 - 0.18	14.1	N/A	156 nc	--	--	N	BSC
	7440-09-7	Potassium	149	360	mg/kg	SR-3	5/5	2.1 - 2.4	360	N/A	NA	--	--	N	EN
	7440-22-4	Silver	0.19	0.66	mg/kg	SR-7	4/5	0.06 - 0.12	0.66	N/A	39 nc	--	--	N	BSC
	7440-23-5	Sodium	76.3	152	mg/kg	SR-3	5/5	0.35 - 0.4	152	N/A	NA	--	--	N	EN
	7440-62-2	Vanadium	3.2	17	mg/kg	SR-3	5/5	0.08 - 0.09	17	N/A	55 nc	--	--	N	BSC
	7440-65-5	Yttrium	1.1	6.6	mg/kg	SR-3	5/5	0.2 - 0.24	6.6	N/A	NA	--	--	Y	NSC
	7440-66-6	Zinc	26.9	176	mg/kg	SR-3	5/5	0.08- 0.09	176	N/A	2346 nc	--	--	N	BSC
	7440-61-1	Total Uranium (6)	2.4588	3.2813	mg/kg	SR-4	5/5	N/A	3	N/A	2 nc	--	--	Y	ASC
	13982-63-3	Ra-226	0.7754	2.59	pCi/g	SR-2	5/5	0.2926 - .7595	2.59	N/A	NA	--	--	Y	AC
	14274-82-9	Th-228	0.2348	0.9583	pCi/g	SR-3	5/5	0.1241 - 0.2384	0.9583	N/A	NA	--	--	Y	AC
	14269-63-7	Th-230	0.794	2.221	pCi/g	SR-3	5/5	0.141 - 0.3541	2.221	N/A	NA	--	--	Y	AC
	7440-29-1	Th-232	0.2406	1.011	pCi/g	SR-3	5/5	0.1587 - 0.2981	1.011	N/A	NA	--	--	Y	AC
	13966-29-5	U-234	1.073	1.659	pCi/g	SR-4	5/5	0.093 - 0.215	1.659	N/A	NA	--	--	Y	AC
	15117-96-1	U-235	0.1633	0.1767	pCi/g	SR-4	2/5	0.0965 - 0.1878	0.1767	N/A	NA	--	--	Y	AC
	Q1567	U-238	0.8676	1.186	pCi/g	SR-2	5/5	0.1029 - 0.1761	1.186	N/A	NA	--	--	Y	AC

Footnote Instructions:

(1) The "(Qualifier)" codes used for the "Minimum Concentration" and "Maximum Concentration" are as follows:

(2) No Screening is conducted.

(3) No Site-Specific Background is available.

(4) For chemical consituents, the USEPA Region IX Preliminary Remediation Goals (PRGs) for residential soil (USEPA, 2002c) updated October 1, 2002 were used.
PRGs are protective at a target hazard quotient of 0.1 and a target cancer risk of $1x10^{-6}$.
nc = PRG based on noncarcinogenic effects
ca = PRG based on carcinogenic effects
ca* (where: nc < 100X ca)
ca**(where: nc < 10X ca)

(5) The codes used for the "Rationale for Selection or Deletion" are as follows:
AC = A Carcinogen
EN = Essential Nutrient
ASC = Above Screening Criterion
BSC = Below Screening Criterion
NSC = No Screening Criterion

(6) Estimated Total Uranium data by summing individual uranium radionuclides in pCi/l and converting to µg/l using a geometric average activity:mass ratio of 0.9 pCi/µg (USEPA, 2000a).

TABLE 2.10

OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Sediment (Coles Brook)
Exposure Medium: Sediment (Coles Brook

Exposure Point	CAS Number	Chemical	Minimum Concentration (Qualifier) (1)	Maximum Concentration (Qualifier) (1)	Units	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits	Concentration Used for Screening (2)	Background Value (3)	Screening Toxicity Value (N/C) (4)		Potential ARAR/TBC Value	Potential ARAR/TBC Source	COPC Flag (Y/N)	Rationale for Selection or Deletion (5)
Coles Brook	7429-90-5	Aluminum	3110	9390	mg/kg	CB-5	5/5	2.4 - 8.5	9390	N/A	7614	nc	--	--	Y	ASC
	7440-36-0	Antimony	0.33 J	1.9 J	mg/kg	CB-5	3/5	0.25 - 0.87	1.9 J	N/A	3	nc	--	--	N	BSC
	7440-38-2	Arsenic	1	6.7	mg/kg	CB-5	5/5	0.28 - 0.9	6.7	N/A	0.39	ca*	--	--	Y	AC
	7440-39-3	Barium	20.8	179	mg/kg	CB-5	5/5	0.02 - 0.08	179	N/A	537	nc	--	--	N	BSC
	7440-41-7	Beryllium	0.25	0.27	mg/kg	CB-1	2/5	0.01 - 0.04	0.27	N/A	15	nc	--	--	N	BSC
	7440-42-8	Boron	11.5	15.1	mg/kg	CB-5	3/5	0.29 - 1.0	15.1	N/A	1562	nc	--	--	N	BSC
	7440-43-9	Cadmium	0.18	3	mg/kg	CB-5	5/5	0.03 - 0.11	3	N/A	4	nc	--	--	N	BSC
	7440-70-2	Calcium	3790	23600	mg/kg	CB-4	5/5	2.0 - 7.2	23,600	N/A	NA		--	--	N	EN
	7440-45-1	Cerium	12.2	30.3	mg/kg	CB-5	3/3	4.2 - 13.3	30.3	N/A	NA		--	--	Y	NSC
	7440-47-3	Chromium	7.1	59.4	mg/kg	CB-5	5/5	0.06 - 0.23	59.4	N/A	211	ca	--	--	N	BSC
	7440-48-4	Cobalt	3	7.8	mg/kg	CB-5	5/5	0.1 - 0.34	7.8	N/A	903	ca**	--	--	N	BSC
	7440-50-8	Copper	19.1	131	mg/kg	CB-5	5/5	0.1 - 0.34	131	N/A	313	nc	--	--	N	BSC
	7429-91-6	Dysprosium	0.63	1	mg/kg	CB-4	2/3	0.37 - 1.2	1	N/A	1564	nc	--	--	N	BSC
	7439-89-6	Iron	8650	24700	mg/kg	CB-5	5/5	2.3 - 8.2	24,700	N/A	2346	nc	--	--	Y	ASC
	7439-91-0	Lanthanum	50.8	50.8	mg/kg	CB-5	1/3	4.0 - 12.7	50.8	N/A	NA		--	--	Y	NSC
	7439-92-1	Lead	20.2	304 J	mg/kg	CB-5	5/5	0.22 - 0.79	304 J	N/A	40	nc	--	--	Y	ASC
	7439-93-2	Lithium	4.3	11.9	mg/kg	CB-5	5/5	0.02 - 0.08	11.9	N/A	156	nc	--	--	N	BSC
	7439-95-4	Magnesium	2830	5380	mg/kg	CB-5	5/5	0.71 - 2.5	5,380	N/A	NA		--	--	N	EN
	7439-96-5	Manganese	73.4	250	mg/kg	CB-5	5/5	0.02 - 0.08	250	N/A	176	nc	--	--	Y	ASC
	7440-00-8	Neodymium	6.3	15.6	mg/kg	CB-5	3/3	1.6 - 5.0	15.6	N/A	NA		--	--	Y	NSC
	7440-02-0	Nickel	7.5	36.8	mg/kg	CB-5	5/5	0.1 - 0.34	36.8	N/A	156	nc	--	--	N	BSC
	7440-09-7	Potassium	302	1220	mg/kg	CB-5	5/5	4.4 - 15.4	1,220	N/A	NA		--	--	N	EN
	7782-49-2	Selenium	0.6	1.5	mg/kg	CB-5	2/5	0.35 - 1.2	1.5	N/A	39	nc	--	--	N	BSC
	7440-22-4	Silver	0.83	0.83	mg/kg	CB-5	1/5	0.12 - 0.41	0.83	N/A	39	nc	--	--	N	BSC
	7740-23-5	Sodium	153	542	mg/kg	CB-5	5/5	0.44 - 1.5	542	N/A	NA		--	--	N	EN
	7440-62-2	Vanadium	11.2	63.4	mg/kg	CB-5	5/5	0.09 - 0.3	63.4	N/A	55	nc	--	--	Y	ASC
	7440-65-5	Yttrium	3.6	10.3	mg/kg	CB-5	3/3	0.22 - 0.72	10.3	N/A	NA		--	--	Y	NSC
	7440-66-6	Zinc	64	565	mg/kg	CB-5	5/5	0.04 - 0.15	565	N/A	2346	nc	--	--	N	BSC
	7440-61-1	Total Uranium (6)	2.0072	4.3920	mg/kg	CB-3	5/5	N/A	4	N/A	2	nc	--	--	Y	ASC
	13982-63-3	Ra-226	0.7476	1.568	pCi/g	CB-2	5/5	0.2146 - 0.4363	1.568	N/A	NA		--	--	Y	AC
	14274-82-9	Th-228	0.6989	2.214	pCi/g	CB-3	5/5	0.1202 - 0.1818	2.214	N/A	NA		--	--	Y	AC
	14269-63-7	Th-230	0.6158	1.031	pCi/g	CB-2	5/5	0.1204 - 0.2165	1.031	N/A	NA		--	--	Y	AC
	7440-29-1	Th-232	0.298	1.798	pCi/g	CB-3	5/5	0.081 - 0.2213	1.798	N/A	NA		--	--	Y	AC
	13966-29-5	U-234	1.026	2.382	pCi/g	CB-3	5/5	0.1579 - 0.2418	2.382	N/A	NA		--	--	Y	AC
	15117-96-1	U-235	0.1246	0.1246	pCi/g	CB-2	1/5	0.1363 - 0.2298	0.1246	N/A	NA		--	--	Y	AC
	Q1567	U-238	0.5219	1.341	pCi/g	CB-3	5/5	0.1238 - 0.2832	1.341	N/A	NA		--	--	Y	AC

Footnote Instructions:

(1) The "(Qualifier)" codes used for the "Minimum Concentration" and "Maximum Concentration" are as follows:
J = Estimated Concentration

(2) No Screening is conducted.

(3) No Site-Specific Background is available.

(4) For chemical consituents, the USEPA Region IX Preliminary Remediation Goals (PRGs) for residential soil (USEPA, 2002c) updated October 1, 2002 were used.
PRGs are protective at a target hazard quotient of 0.1 and a target cancer risk of $1x10^{6}$.
nc = PRG based on noncarcinogenic effects
ca = PRG based on carcinogenic effects
ca* (where: nc < 100X ca)
ca**(where: nc < 10X ca)

(5) The codes used for the "Rationale for Selection or Deletion" are as follows:
AC = A Carcinogen
EN = Essential Nutrient
ASC = Above Screening Criterion
BSC = Below Screening Criterion
NSC = No Screening Criterion

(6) Estimated Total Uranium data by summing individual uranium radionuclides in pCi/l and converting to µg/l using a geometric average activity:mass ratio of 0.9 pCi/µg (USEPA, 2000a).

TABLE 3.1.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Overburden and Bedrock Groundwater
Exposure Medium: Tap Water

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean (1)	95% UCL (Distribution) (2)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic (3)	Rationale (4)
Tap Water	Acetone	µg/l	23.03	91.54 (NP)	350 (B)	91.54	µg/l	97.5% Chebyshev (Mean, Std)	NDD, MHS
	Benzene	µg/l	150	738 (NP)	5000	738	µg/l	99% Chebyshev (Mean, Std)	NDD, HEHS
	Chlorobenzene	µg/l	1.44	3.01 (NP)	21	3.01	µg/l	95% Chebyshev (Mean, Std)	NDD, MMS
	Chloroform	µg/l	1.29	2.70 (NP)	6	2.70	µg/l	95% Chebyshev (Mean, Std)	NDD, MMS
	2-Chlorotoluene	µg/l	218	1424 (NP)	2300 (BD)	1424	µg/l	99% Chebyshev (Mean, Std)	NDD, ES*
	4-Chlorotoluene	µg/l	117	764 (NP)	1200 (BD)	764	µg/l	99% Chebyshev (Mean, Std)	NDD, ES*
	1,2-Dichloroethane	µg/l	0.99	2.07 (NP)	0.69 (J)	0.69	µg/l	MAX	MAX<95% UCL
	1,2-Dichloroethene (total)	µg/l	3.08	10.05 (NP)	110 (D)	10.05	µg/l	97.5% Chebyshev (Mean, Std)	NDD, MHS
	Ethylbenzene	µg/l	14.86	76.04 (NP)	1100 (D)	76.04	µg/l	97.5% Chebyshev (Mean, Std)	NDD, MHS
	4-Methyl-2-pentanone	µg/l	5.53	11.16 (NP)	36 (J)	11.16	µg/l	95% Chebyshev (Mean, Std)	NDD, MMS
	Tetrachloroethene	µg/l	1.57	3.87 (NP)	12	3.87	µg/l	97.5% Chebyshev (Mean, Std)	NDD, MHS
	Toluene	µg/l	19.31	96.03 (NP)	1400	96.03	µg/l	97.5% Chebyshev (Mean, Std)	NDD, MHS
	Trichloroethene	µg/l	1.40	2.91 (NP)	8 (J)	2.91	µg/l	95% Chebyshev (Mean, Std)	NDD, MMS
	Vinyl Chloride	µg/l	4.64	16.60 (NP)	200	16.60	µg/l	97.5% Chebyshev (Mean, Std)	NDD, MHS
	Xylenes (total)	µg/l	51.47	316 (NP)	4900 (BD)	316	µg/l	97.5% Chebyshev (Mean, Std)	NDD, MHS
	Aluminum	µg/l	237	357 (T)	11800	357	µg/l	99% Chebyshev (MVUE)	**
	Antimony	µg/l	1.05	1.21 (NP)	2.3	1.21	µg/l	95% Chebyshev (Mean, Std)	NDD, MMS
	Arsenic	µg/l	41.23	191 (NP)	2600	191	µg/l	97.5% Chebyshev (Mean, Std)	NDD, MHS
	Barium	µg/l	226	768 (NP)	9750	768	µg/l	97.5% Chebyshev (Mean, Std)	NDD, MHS
	Boron	µg/l	312	391 (T)	3700	391	µg/l	H-UCL	Lognormal, 1.0< <1.5, n>25
	Cadmium	µg/l	0.45	1.07 (NP)	16	1.07	µg/l	95% Chebyshev (Mean, Std)	NDD, MMS
	Cerium	µg/l	21.08	32.78 (NP)	312	32.78	µg/l	95% Chebyshev (Mean, Std)	NDD, MMS
	Iron	µg/l	13962	73167 (T)	166000	73167	µg/l	H-UCL	Lognormal, 2.0< <2.5, n>70
	Lanthanum	µg/l	19.61	28.35 (NP)	231	28.35	µg/l	95% Chebyshev (Mean, Std)	NDD, MMS
	Lead	µg/l	2.09	3.72 (NP)	33.9	3.72	µg/l	95% Chebyshev (Mean, Std)	NDD, MMS
	Lithium	µg/l	1766	4698 (NP)	16100 (J)	4698	µg/l	99% Chebyshev (Mean, Std)	NDD, HEHS
	Manganese	µg/l	2866	6649 (NP)	28000	6649	µg/l	99% Chebyshev (Mean, Std)	NDD, HEHS
	Neodymium	µg/l	10.80	16.50 (NP)	132	16.50	µg/l	95% Chebyshev (Mean, Std)	NDD, MMS
	Nickel	µg/l	13.86	25.39 (NP)	160	25.39	µg/l	97.5% Chebyshev (Mean, Std)	NDD, MHS
	Silver	µg/l	0.45	0.62 (NP)	4.2	0.62	µg/l	95% Chebyshev (Mean, Std)	NDD, MMS
	Yttrium	µg/l	1.54	3.17 (NP)	41.6	3.17	µg/l	95% Chebyshev (Mean, Std)	NDD, MMS
	Zinc	µg/l	79.31	481.49 (NP)	3490	481.49	µg/l	99% Chebyshev (Mean, Std)	NDD, HEHS

TABLE 3.1.RME

EXPOSURE POINT CONCENTRATION SUMMARY

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Overburden and Bedrock Groundwater
Exposure Medium: Tap Water

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean (1)	95% UCL (Distribution) (2)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic (3)	Rationale (4)
	Total Uranium (5)	µg/L	2.36	3.22 (NP)	15.05	3.22	µg/L	95% Chebyshev (Mean, Std)	NDD, MMS
	Ra-226	pCi/l	0.50	0.56 (T)	1.92	0.56	pCi/l	H-UCL	Lognormal, 0.5< <1.0, all n
	Ra-228	pCi/l	1.11	1.46 (NP)	6.20	1.46	pCi/l	95% Chebyshev (Mean, Std)	NDD, MMS
	Th-228	pCi/l	0.58	0.87 (NP)	6.89	0.87	pCi/l	95% Chebyshev (Mean, Std)	NDD, MMS
	Th-230	pCi/l	0.78	0.84 (T)	2.45	0.84	pCi/l	Student's t	Lognormal, <0.5, all n (>5)
	Th-232	pCi/l	0.46	0.49 (N)	0.83	0.49	pCi/l	Student's t	Normally distributed
	U-234	pCi/l	1.38	1.56 (T)	11.01	1.56	pCi/l	H-UCL	Lognormal, 0.5< <1.0, all n
	U-235	pCi/l	0.49	0.53 (T)	0.43	0.43	pCi/l	MAX	MAX<95% UCL
	U-238	pCi/l	0.84	1.15 (NP)	3.03	1.15	pCi/l	95% Chebyshev (Mean, Std)	NDD, MMS
	Pb-210	pCi/l	--	--	--	0.56	pCi/l	(6)	(6)

Footnote Instructions:

(1) Arithmetic mean includes 1/2 detection limits for non-detects which may result in an arithmetic mean greater than the maximum detected concentration.
(2) Distribution of the 95% UCL is defined by the following codes: N for Normal, T for Transformed (Lognormal), NP for Nonparmetric.
(3) The Statistic selected to represent the EPC values is defined by the following codes:
MAX = Maximum detected concentration
H-UCL = Land's H-statistic
Student's t = Student's t-statistic
95% Chebyshev (Mean, Std) = 95% UCL based on the Chebyshev Theorem using the sample mean and sample standard deviation
97.5% Chebyshev (Mean, Std) = 97.5% UCL based on the Chebyshev Theorem using the sample mean and sample standard deviation
99% Chebyshev (Mean, Std) = 99% UCL based on the Chebyshev Theorem using the sample mean and sample standard deviation
(4) Rationale codes:
NDD = No Discernable Distribution
MMS = Mildly to moderately skewed data set
MHS = Moderately to highly skewed dataset
HEHS = Highly to extremely highly skewed
ES = Extremely skewed
Lognormal = Data set is lognormally distributed
MAX < 95% UCL = Maximum detected concentration is selected as the representative EPC because it is less than the 95% UCL.
= Standard deviaiton of the log transformed data
n = sample size
* = Although USEPA guidance indicates that extremely highly skewed data sets (F> 3.0) are badly behaved and need further investigation, the 99% Chebyshev (Mean, Std) is provided as the UC
Normally distributed = Follows a normal distribution
** = Data are lognormally distributed but the recommended 95% H-UCL is less than the arithmetic average.
Therefore, the 99% Chebyshev (MVUE) UCL, also assuming a lognormal distribution was selected.
(3) = Estimated Total Uranium data by summing individual uranium radionuclides in pCi/l and converting to µg/l using a geometric average activity:mass ratio of 0.9 pCi/µg (USEPA, 2001c).
(6) = Pb-210 is set equal to Ra-226

TABLE 3.2.RME

EXPOSURE POINT CONCENTRATION SUMMARY

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Overburden Groundwater
Exposure Medium: Tap Water

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean (1)	95% UCL (Distribution) (2)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic (3)	Rationale (4)
Tap Water	Benzene	µg/l	51.74	364 (NP)	2500 (D)	364	µg/l	97.5% Chebyshev (Mean, Std)	NDD, MHS
	2-Chlorotoluene	µg/l	0.62	N/A	0.5 (J)	0.50	µg/l	MAX	n < 10
	4-Chlorotoluene	µg/l	0.50	N/A	0.2 (J)	0.20	µg/l	MAX	n < 10
	Ethylbenzene	µg/l	29.36	170 (NP)	1100 (D)	170	µg/l	97.5% Chebyshev (Mean, Std)	NDD, MHS
	Vinyl Chloride	µg/l	0.99	1.31 (NP)	2 (J)	1.31	µg/l	95% Chebyshev (Mean, Std)	NDD, MMS
	Xylenes (total)	µg/l	108	720 (NP)	4900 (BD)	720	µg/l	97.5% Chebyshev (Mean, Std)	NDD, MHS

Footnote Instructions:

(1) Arithmetic mean includes 1/2 detection limits for non-detects which may result in an arithmetic mean greater than the maximum detected concentration.
(2) Distribution of the 95% UCL is defined by the following codes: T for Transformed (Lognormal), NP for Nonparmetric.
(3) The Statistic selected to represent the EPC values are defined by the following codes:
MAX = Maximum detected concentration
H-UCL = Land's H-statistic
95% Chebyshev (Mean, Std) = 95% UCL based on the Chebyshev Theorem using the sample mean and sample standard deviation
97.5% Chebyshev (Mean, Std) = 97.5% UCL based on the Chebyshev Theorem using the sample mean and sample standard deviation
(4) Rationale codes:
NDD = No Discernable Distribution
MMS = Mildly to moderately skewed data set
MHS = Moderately to highly skewed dataset
MAX < 95% UCL = Maximum detected concentration is selected as the representative EPC because it is less than the 95% UCL.
= Standard deviaiton of the log transformed data
n = sample size
n < 10 = No 95% UCL is calculated because the sample size is less than 10, by default EPC = Maximum detected concentration.
N/A = Not Applicable

TABLE 3.3.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic (1)	Rationale (2)
Lodi Brook	Aluminum	µg/l	--	--	97.3	97.3	µg/l	MAX	n<10
	Arsenic	µg/l	--	--	9.7	9.7	µg/l	MAX	n<10
	Barium	µg/l	--	--	104	104	µg/l	MAX	n<10
	Beryllium	µg/l	--	--	0.09	0.09	µg/l	MAX	n<10
	Boron	µg/l	--	--	176 (J)	176	µg/l	MAX	n<10
	Chromium, Total	µg/l	--	--	2.2 (J)	2.2	µg/l	MAX	n<10
	Cobalt	µg/l	--	--	1.6	1.6	µg/l	MAX	n<10
	Copper	µg/l	--	--	23.7	23.7	µg/l	MAX	n<10
	Iron	µg/l	--	--	1160	1160	µg/l	MAX	n<10
	Lanthanum	µg/l	--	--	38.4	38.4	µg/l	MAX	n<10
	Lead	µg/l	--	--	7.7	7.7	µg/l	MAX	n<10
	Lithium	µg/l	--	--	94.6	94.6	µg/l	MAX	n<10
	Manganese	µg/l	--	--	434	434	µg/l	MAX	n<10
	Nickel	µg/l	--	--	3.2	3.2	µg/l	MAX	n<10
	Silver	µg/l	--	--	1.3	1.3	µg/l	MAX	n<10
	Thallium	µg/l	--	--	4.3	4.3	µg/l	MAX	n<10
	Vanadium	µg/l	--	--	3	3	µg/l	MAX	n<10
	Zinc	µg/l	--	--	39.5 (J)	39.5	µg/l	MAX	n<10
	Total Uranium (3)	µg/l	--	--	2.8525	2.8525	µg/l	MAX	n<10
	Ra-226	pCi/l	--	--	1.297	1.297	pCi/l	MAX	n<10
	Ra-228	pCi/l	--	--	8.229	8.229	pCi/l	MAX	n<10
	Th-228	pCi/l	--	--	1.581	1.581	pCi/l	MAX	n<10
	Th-230	pCi/l	--	--	2.099	2.099	pCi/l	MAX	n<10
	Th-232	pCi/l	--	--	0.4706	0.4706	pCi/l	MAX	n<10
	U-234	pCi/l	--	--	1.454	1.454	pCi/l	MAX	n<10
	U-235	pCi/l	--	--	0.5106	0.5106	pCi/l	MAX	n<10
	U-238	pCi/l	--	--	0.6896	0.6896	pCi/l	MAX	n<10
	Pb-210	pCi/l	--	--	--	1.297	pCi/l	(4)	(4)

Footnote Instructions:

(1) The Statistic selected to represent the EPC values is defined by the following codes:
MAX = Maximum detected concentration
(2) Rationale codes:
n<10 = Sample size is less than 10.
(3) = Estimated Total Uranium data by summing individual uranium radionuclides in pCi/l and converting to µg/l using a geometric average activity:mass ratio of 0.9 pCi/µg (USEPA, 2001c).
(4) = Pb-210 is set equal to Ra-226

TABLE 3.4.RME

EXPOSURE POINT CONCENTRATION SUMMARY

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic (1)	Rationale (2)
Westerly Brook	Aluminum	µg/l	--	--	255	255	µg/l	MAX	n<10
	Arsenic	µg/l	--	--	48.7	48.7	µg/l	MAX	n<10
	Barium	µg/l	--	--	242	242	µg/l	MAX	n<10
	Boron	µg/l	--	--	218	218	µg/l	MAX	n<10
	Cadmium	µg/l	--	--	0.54	0.54	µg/l	MAX	n<10
	Chromium, Total	µg/l	--	--	4.9	4.9	µg/l	MAX	n<10
	Cobalt	µg/l	--	--	1.8	1.8	µg/l	MAX	n<10
	Copper	µg/l	--	--	4.9	4.9	µg/l	MAX	n<10
	Iron	µg/l	--	--	3460	3460	µg/l	MAX	n<10
	Lanthanum	µg/l	--	--	35.3	35.3	µg/l	MAX	n<10
	Lead	µg/l	--	--	5.4	5.4	µg/l	MAX	n<10
	Lithium	µg/l	--	--	642	642	µg/l	MAX	n<10
	Manganese	µg/l	--	--	3730	3730	µg/l	MAX	n<10
	Mercury	µg/l	--	--	0.12	0.12	µg/l	MAX	n<10
	Nickel	µg/l	--	--	7.9	7.9	µg/l	MAX	n<10
	Silver	µg/l	--	--	59.4	59.4	µg/l	MAX	n<10
	Thallium	µg/l	--	--	6.1	6.1	µg/l	MAX	n<10
	Vanadium	µg/l	--	--	3.3	3.3	µg/l	MAX	n<10
	Zinc	µg/l	--	--	186 (J)	186	µg/l	MAX	n<10
	Total Uranium (3)	µg/l	--	--	1.1998	1.1998	µg/l	MAX	n<10
	Total Uranium (4)	µg/l	--	--	2.6819	2.6819	µg/l	MAX	n<10
	Ra-226	pCi/l	--	--	0.921	0.921	pCi/l	MAX	n<10
	Ra-228	pCi/l	--	--	4.799	4.799	pCi/l	MAX	n<10
	Th-228	pCi/l	--	--	0.4862	0.4862	pCi/l	MAX	n<10
	Th-230	pCi/l	--	--	0.8283	0.8283	pCi/l	MAX	n<10
	U-234	pCi/l	--	--	1.402	1.402	pCi/l	MAX	n<10
	U-235	pCi/l	--	--	0.336	0.336	pCi/l	MAX	n<10
	U-238	pCi/l	--	--	0.7297	0.7297	pCi/l	MAX	n<10
	Pb-210	pCi/l	--	--	--	0.921	pCi/l	(5)	(5)

Footnote Instructions:

(1) The Statistic selected to represent the EPC values is defined by the following codes:
MAX = Maximum detected concentration
(2) Rationale codes:
n<10 = Sample size is less than 10.
(3) = Measured Total Uranium data.
(4) = Estimated Total Uranium data by summing individual uranium radionuclides in pCi/l and converting to µg/l using a geometric average activity:mass ratio of 0.9 pCi/µg (USEPA, 2001c).
(5) = Pb-210 is set equal to Ra-226

TABLE 3.5.RME

EXPOSURE POINT CONCENTRATION SUMMARY

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic (1)	Rationale (2)
Saddle River	Aluminum	µg/l	--	--	67.8	67.8	µg/l	MAX	n<10
	Arsenic	µg/l	--	--	8.8	8.8	µg/l	MAX	n<10
	Barium	µg/l	--	--	125	125	µg/l	MAX	n<10
	Boron	µg/l	--	--	209 (J)	209	µg/l	MAX	n<10
	Chromium, Total	µg/l	--	--	1.1	1.1	µg/l	MAX	n<10
	Copper	µg/l	--	--	11.3	11.3	µg/l	MAX	n<10
	Iron	µg/l	--	--	317	317	µg/l	MAX	n<10
	Lead	µg/l	--	--	10.8	10.8	µg/l	MAX	n<10
	Lithium	µg/l	--	--	631	631	µg/l	MAX	n<10
	Manganese	µg/l	--	--	173	173	µg/l	MAX	n<10
	Nickel	µg/l	--	--	2.2	2.2	µg/l	MAX	n<10
	Silver	µg/l	--	--	1.4	1.4	µg/l	MAX	n<10
	Vanadium	µg/l	--	--	1.5	1.5	µg/l	MAX	n<10
	Zinc	µg/l	--	--	23.2 (J)	23.2	µg/l	MAX	n<10
	Total Uranium (3)	µg/l	--	--	1.2339	1.2339	µg/l	MAX	n<10
	Ra-226	pCi/l	--	--	2.179	2.179	pCi/l	MAX	n<10
	Th-230	pCi/l	--	--	1.062	1.062	pCi/l	MAX	n<10
	Th-232	pCi/l	--	--	0.5746	0.5746	pCi/l	MAX	n<10
	Pb-210	pCi/l	--	--	--	2.179	pCi/l	(4)	(4)

Footnote Instructions:

(1) The Statistic selected to represent the EPC values is defined by the following codes:
MAX = Maximum detected concentration

(2) Rationale codes:
n<10 = Sample size is less than 10.

(3) Measured Total Uranium data.

(4) = Pb-210 is set equal to Ra-226

TABLE 3.6.RME

EXPOSURE POINT CONCENTRATION SUMMARY

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic (1)	Rationale (2)
Coles Brook	Aluminum	µg/l	--	--	47.3	47.3	µg/l	MAX	n<10
	Barium	µg/l	--	--	152	152	µg/l	MAX	n<10
	Boron	µg/l	--	--	54.4 (J)	54.4	µg/l	MAX	n<10
	Cobalt	µg/l	--	--	0.92	0.92	µg/l	MAX	n<10
	Copper	µg/l	--	--	6.1	6.1	µg/l	MAX	n<10
	Dysprosium	µg/l	--	--	5 (J)	5	µg/l	MAX	n<10
	Iron	µg/l	--	--	927	927	µg/l	MAX	n<10
	Lithium	µg/l	--	--	7.7	7.7	µg/l	MAX	n<10
	Manganese	µg/l	--	--	286	286	µg/l	MAX	n<10
	Nickel	µg/l	--	--	1.2	1.2	µg/l	MAX	n<10
	Zinc	µg/l	--	--	6.2 (J)	6.2	µg/l	MAX	n<10
	Total Uranium (3)	µg/l	--	--	9.6826	9.6826	µg/l	MAX	n<10
	Total Uranium (4)	µg/l	--	--	4.1058	4.1058	µg/l	MAX	n<10
	Ra-226	pCi/l	--	--	0.3767	0.3767	pCi/l	MAX	n<10
	Th-230	pCi/l	--	--	0.7647	0.7647	pCi/l	MAX	n<10
	Th-232	pCi/l	--	--	0.4667	0.4667	pCi/l	MAX	n<10
	U-234	pCi/l	--	--	2.01	2.01	pCi/l	MAX	n<10
	U-238	pCi/l	--	--	1.367	1.367	pCi/l	MAX	n<10
	Pb-210	pCi/l	--	--	--	0.3767	pCi/l	(5)	(5)

Footnote Instructions:

(1) The Statistic selected to represent the EPC values is defined by the following codes:

MAX = Maximum detected concentration

(2) Rationale codes:

n<10 = Sample size is less than 10.

(3) = Measured Total Uranium data.

(4) = Estimated Total Uranium data by summing individual uranium radionuclides in pCi/l and converting to µg/l using a geometric average activity:mass ratio of 0.9 pCi/µg (USEPA, 2001c).

(5) = Pb-210 is set equal to Ra-226

TABLE 3.7.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic (1)	Rationale (2)
Lodi Brook	Antimony	mg/kg	--	--	4.8 (J)	4.8	mg/kg	MAX	n<10
	Arsenic	mg/kg	--	--	30.5	30.5	mg/kg	MAX	n<10
	Cerium	mg/kg	--	--	758	758	mg/kg	MAX	n<10
	Iron	mg/kg	--	--	37300	37300	mg/kg	MAX	n<10
	Lanthanum	mg/kg	--	--	355	355	mg/kg	MAX	n<10
	Lead	mg/kg	--	--	427 (J)	427	mg/kg	MAX	n<10
	Manganese	mg/kg	--	--	580	580	mg/kg	MAX	n<10
	Neodymium	mg/kg	--	--	301	301	mg/kg	MAX	n<10
	Yttrium	mg/kg	--	--	11	11	mg/kg	MAX	n<10
	Total Uranium (3)	mg/kg	--	--	13.6129	13.6129	mg/kg	MAX	n<10
	Ra-226	pCi/g	--	--	10.41	10.41	pCi/g	MAX	n<10
	Th-228	pCi/g	--	--	23.58	23.58	pCi/g	MAX	n<10
	Th-230	pCi/g	--	--	4.484	4.484	pCi/g	MAX	n<10
	Th-232	pCi/g	--	--	21.48	21.48	pCi/g	MAX	n<10
	U-234	pCi/g	--	--	6.215	6.215	pCi/g	MAX	n<10
	U-235	pCi/g	--	--	0.2726	0.2726	pCi/g	MAX	n<10
	U-238	pCi/g	--	--	5.746	5.746	pCi/g	MAX	n<10
	Pb-210	pCi/g	--	--	--	10.41	pCi/g	(4)	(4)

Footnote Instructions:

(1) The Statistic selected to represent the EPC values is defined by the following codes:
MAX = Maximum detected concentration
(2) Rationale codes:
n<10 = Sample size is less than 10.
(3) = Estimated Total Uranium data by summing individual uranium radionuclides in pCi/l and converting to µg/l using a geometric average activity:mass ratio of 0.9 pCi/µg (USEPA, 2001c).
(4) = Pb-210 is set equal to Ra-226

TABLE 3.7.RME

EXPOSURE POINT CONCENTRATION SUMMARY

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic (1)	Rationale (2)
Lodi Brook	Antimony	mg/kg	--	--	4.8 (J)	4.8	mg/kg	MAX	n<10
	Arsenic	mg/kg	--	--	30.5	30.5	mg/kg	MAX	n<10
	Cerium	mg/kg	--	--	758	758	mg/kg	MAX	n<10
	Iron	mg/kg	--	--	37300	37300	mg/kg	MAX	n<10
	Lanthanum	mg/kg	--	--	355	355	mg/kg	MAX	n<10
	Lead	mg/kg	--	--	427 (J)	427	mg/kg	MAX	n<10
	Manganese	mg/kg	--	--	580	580	mg/kg	MAX	n<10
	Neodymium	mg/kg	--	--	301	301	mg/kg	MAX	n<10
	Yttrium	mg/kg	--	--	11	11	mg/kg	MAX	n<10
	Total Uranium (3)	mg/kg	--	--	13.6129	13.6129	mg/kg	MAX	n<10
	Ra-226	pCi/g	--	--	10.41	10.41	pCi/g	MAX	n<10
	Th-228	pCi/g	--	--	23.58	23.58	pCi/g	MAX	n<10
	Th-230	pCi/g	--	--	4.484	4.484	pCi/g	MAX	n<10
	Th-232	pCi/g	--	--	21.48	21.48	pCi/g	MAX	n<10
	U-234	pCi/g	--	--	6.215	6.215	pCi/g	MAX	n<10
	U-235	pCi/g	--	--	0.2726	0.2726	pCi/g	MAX	n<10
	U-238	pCi/g	--	--	5.746	5.746	pCi/g	MAX	n<10
	Pb-210	pCi/g	--	--	--	10.41	pCi/g	(4)	(4)

Footnote Instructions:

(1) The Statistic selected to represent the EPC values is defined by the following codes:
MAX = Maximum detected concentration

(2) Rationale codes:
n<10 = Sample size is less than 10.

(3) = Estimated Total Uranium data by summing individual uranium radionuclides in pCi/l and converting to µg/l using a geometric average activity:mass ratio of 0.9 pCi/µg (USEPA, 2001c).

(4) = Pb-210 is set equal to Ra-226

TABLE 3.8.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic (1)	Rationale (2)
Westerly Brook	Arsenic	mg/kg	--	--	5.8	5.8	mg/kg	MAX	n<10
	Cerium	mg/kg	--	--	15.1	15.1	mg/kg	MAX	n<10
	Iron	mg/kg	--	--	25800	25800	mg/kg	MAX	n<10
	Lanthanum	mg/kg	--	--	4.9	4.9	mg/kg	MAX	n<10
	Lead	mg/kg	--	--	276 (J)	276	mg/kg	MAX	n<10
	Manganese	mg/kg	--	--	207 (J)	207	mg/kg	MAX	n<10
	Neodymium	mg/kg	--	--	8.4	8.4	mg/kg	MAX	n<10
	Yttrium	mg/kg	--	--	6.4	6.4	mg/kg	MAX	n<10
	Total Uranium (3)	mg/kg	--	--	3.5232	3.5232	mg/kg	MAX	n<10
	Ra-226	pCi/g	--	--	2.833	2.833	pCi/g	MAX	n<10
	Th-228	pCi/g	--	--	0.9395	0.9395	pCi/g	MAX	n<10
	Th-230	pCi/g	--	--	1.289	1.289	pCi/g	MAX	n<10
	Th-232	pCi/g	--	--	0.7262	0.7262	pCi/g	MAX	n<10
	U-234	pCi/g	--	--	1.304	1.304	pCi/g	MAX	n<10
	U-235	pCi/g	--	--	0.1743	0.1743	pCi/g	MAX	n<10
	U-238	pCi/g	--	--	1.408	1.408	pCi/g	MAX	n<10
	Pb-210	pCi/g	--	--	--	2.833	pCi/g	(4)	(4)

Footnote Instructions:

(1) The Statistic selected to represent the EPC values is defined by the following codes:
MAX = Maximum detected concentration

(2) Rationale codes:
n<10 = Sample size is less than 10.

(3) = Estimated Total Uranium data by summing individual uranium radionuclides in pCi/l and converting to µg/l using a geometric average activity:mass ratio of 0.9 pCi/µg (USEPA, 2001c).

(4) = Pb-210 is set equal to Ra-226

TABLE 3.9.RME

EXPOSURE POINT CONCENTRATION SUMMARY

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic (1)	Rationale (2)
Saddle River	Arsenic	mg/kg	--	--	8.3	8.3	mg/kg	MAX	n<10
	Cerium	mg/kg	--	--	12.7	12.7	mg/kg	MAX	n<10
	Iron	mg/kg	--	--	17600	17600	mg/kg	MAX	n<10
	Lanthanum	mg/kg	--	--	6.7	6.7	mg/kg	MAX	n<10
	Lead	mg/kg	--	--	47.5	47.5	mg/kg	MAX	n<10
	Manganese	mg/kg	--	--	414	414	mg/kg	MAX	n<10
	Neodymium	mg/kg	--	--	6.2	6.2	mg/kg	MAX	n<10
	Yttrium	mg/kg	--	--	6.6	6.6	mg/kg	MAX	n<10
	Total Uranium (3)	mg/kg	--	--	3.2813	3.2813	mg/kg	MAX	n<10
	Ra-226	pCi/g	--	--	2.59	2.59	pCi/g	MAX	n<10
	Th-228	pCi/g	--	--	0.9583	0.9583	pCi/g	MAX	n<10
	Th-230	pCi/g	--	--	2.221	2.221	pCi/g	MAX	n<10
	Th-232	pCi/g	--	--	1.011	1.011	pCi/g	MAX	n<10
	U-234	pCi/g	--	--	1.659	1.659	pCi/g	MAX	n<10
	U-235	pCi/g	--	--	0.1767	0.1767	pCi/g	MAX	n<10
	U-238	pCi/g	--	--	1.186	1.186	pCi/g	MAX	n<10
	Pb-210	pCi/g	--	--	--	2.59	pCi/g	(4)	(4)

Footnote Instructions:

(1) The Statistic selected to represent the EPC values is defined by the following codes:
MAX = Maximum detected concentration

(2) Rationale codes:
n<10 = Sample size is less than 10.

(3) = Estimated Total Uranium data by summing individual uranium radionuclides in pCi/l and converting to µg/l using a geometric average activity:mass ratio of 0.9 pCi/µg (USEPA, 2001c).

(4) = Pb-210 is set equal to Ra-226

TABLE 3.10.RME
EXPOSURE POINT CONCENTRATION SUMMARY
REASONABLE MAXIMUM EXPOSURE
FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Point	Chemical of Potential Concern	Units	Arithmetic Mean	95% UCL (Distribution)	Maximum Concentration (Qualifier)	Exposure Point Concentration			
						Value	Units	Statistic (1)	Rationale (2)
Coles Brook	Aluminum	mg/kg	--	--	9390	9390	mg/kg	MAX	n<10
	Arsenic	mg/kg	--	--	6.7	6.7	mg/kg	MAX	n<10
	Cerium	mg/kg	--	--	30.3	30.3	mg/kg	MAX	n<10
	Iron	mg/kg	--	--	24700	24700	mg/kg	MAX	n<10
	Lanthanum	mg/kg	--	--	50.8	50.8	mg/kg	MAX	n<10
	Lead	mg/kg	--	--	304 (J)	304	mg/kg	MAX	n<10
	Manganese	mg/kg	--	--	250	250	mg/kg	MAX	n<10
	Neodymium	mg/kg	--	--	15.6	15.6	mg/kg	MAX	n<10
	Vanadium	mg/kg	--	--	63.4	63.4	mg/kg	MAX	n<10
	Yttrium	mg/kg	--	--	10.3	10.3	mg/kg	MAX	n<10
	Total Uranium (3)	mg/kg	--	--	4.392	4.392	mg/kg	MAX	n<10
	Ra-226	pCi/g	--	--	1.568	1.568	pCi/g	MAX	n<10
	Th-228	pCi/g	--	--	2.214	2.214	pCi/g	MAX	n<10
	Th-230	pCi/g	--	--	1.031	1.031	pCi/g	MAX	n<10
	Th-232	pCi/g	--	--	1.798	1.798	pCi/g	MAX	n<10
	U-234	pCi/g	--	--	2.382	2.382	pCi/g	MAX	n<10
	U-235	pCi/g	--	--	0.1246	0.1246	pCi/g	MAX	n<10
	U-238	pCi/g	--	--	1.341	1.341	pCi/g	MAX	n<10
	Pb-210	pCi/g	--	--	--	1.568	pCi/g	(4)	(4)

Footnote Instructions:

(1) The Statistic selected to represent the EPC values is defined by the following codes:
MAX = Maximum detected concentration
(2) Rationale codes:
n<10 = Sample size is less than 10.
(3) = Estimated Total Uranium data by summing individual uranium radionuclides in pCi/l and converting to µg/l using a geometric average activity:mass ratic of 0.9 pCi/µg (USEPA, 2001c).
(4) = Pb-210 is set equal to Ra-226

TABLE 4.1.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Tap Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name (1)
Ingestion	Resident	Adult	Tap	CW	Chemical Concentration in Groundwater	See Table 3	mg/l	See Table 3	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-W	Ingestion Rate of Groundwater	2	l/day	USEPA, 1991	CW x IR-W x EF x ED x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED	Exposure Duration	30/24 *	years	USEPA, 1991	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	10,950	days	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	- -	
				RCW	Radionuclide Concentration in Groundwater	See Table 3	pCi/l	See Table 3	Intake (pCi) =
				IR-W	Ingestion Rate	2	l/day	USEPA, 1991	RCW x IR-W x EF x ED
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED	Exposure Duration	24 *	years	USEPA, 1991	
		Child	Tap	CW	Chemical Concentration in Groundwater	See Table 3	mg/l	See Table 3	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-W	Ingestion Rate of Groundwater	1	l/day	USEPA, 1991	CW x IR-W x EF x ED x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED	Exposure Duration	6	years	USEPA, 1991	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	- -	
				RCW	Radionuclide Concentration in Groundwater	See Table 3	pCi/l	USEPA, 1991	Intake (pCi) =
				IR-W	Ingestion Rate	1	l/day	USEPA, 1991	RCW x IR-W x EF x ED
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED	Exposure Duration	6	years	USEPA, 1991	

TABLE 4.1.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Tap Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name (1)
Dermal	Resident	Adult	Tap	CW	Chemical Concentration in Groundwater	See Table 3	mg/l	See Table 3	Dermally Absorbed Dose (DAD) (mg/kg-day) =
				AF1	Apportionment Factor 1 (for VOCs)	--	0.6	Schaum, 1992	DAevent x EV x ED x EF x SA x 1/BW x 1/AT
				DAevent	Absorbed dose per event	Chemical-specific	mg/cm^2-event	USEPA, 1997a	where for organic chemicals,
				FA	Fraction Absorbed Water	Chemical-specific	--	USEPA, 2001d	Absorbed Dose per Event (DAevent) (mg/cm2-event) =
				Kp	Permeability Coefficient	Chemical-specific	cm/hour	USEPA, 2001d	If t-event < t*, then: DAevent = 2FA x Kp x CW x AF1(VOCs only) CF x SQRT{(6 x tau-event x t-event)/pi}
				SA	Skin Surface Area Available for Contact	18,000	cm2	USEPA, 2001d	or
				tau-event	Lag time per event	Chemical-specific	hours/event	USEPA, 2001d	If t-event > t*, then: DAevent = FA x Kp x CW x AF1(VOCs only) x {(t-event/(1 x B)) + 2 x tau-event x ((1 + (3 x B) + (3 x B x B))/(1 + B)2)}
				t-event	Event Duration	0.25	hours/event	USEPA, 2003b	
				t*	Time to reach steady-state = 2.4 x tau-event	Chemical-specific	hours	USEPA, 2001d	and where for inorganic compounds,
				B	Ratio of permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis	Chemical-specific	--	USEPA, 2001d	DAevent = Kp x CW x CF x t-event
				EV	Event Frequency	1	events/day	USEPA, 2001d	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED	Exposure Duration	30/24 *	years	USEPA, 2001d	
				CF	Volumetric Conversion Factor for Water	0.001	l/cm^3	--	
				BW	Body Weight	70	kg	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	10,950	days	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	- -	

TABLE 4.1.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Tap Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name (1)
		Child	Tap	CW	Chemical Concentration in Groundwater	See Table 3	mg/l	See Table 3	Dermally Absorbed Dose (DAD) (mg/kg-day) =
				AF1	Apportionment Factor 1 (for VOCs)	--	0.6	Schaum, 1992	DAevent x EV x ED x EF x SA x 1/BW x 1/AT
				DAevent	Absorbed dose per event	Chemical-specific	mg/cm^2-event	USEPA, 2001d	where for organic chemicals,
				FA	Fraction Absorbed Water	Chemical-specific	--	USEPA, 2001d	Absorbed Dose per Event (DAevent) (mg/cm2-event) =
				Kp	Permeability Coefficient	Chemical-specific	cm/hour	USEPA, 2001d	If t-event < t*, then: DAevent = 2FA x Kp x CW x CF x SQRT{(6 x tau-event x t-event)/pi}
				SA	Skin Surface Area Available for Contact	6,600	cm^2	USEPA, 2001d	or
				tau-event	Lag time per event	Chemical-specific	hours/event	USEPA, 2001d	B)2)}
				t-event	Event Duration	0.45	hours/event	USEPA, 2003b	
				t*	Time to reach steady-state = 2.4 x tau-event	Chemical-specific	hours	USEPA, 2001d	and where for inorganic compounds,
				B	Ratio of permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis	Chemical-specific	--	USEPA, 2001d	DAevent = Kp x CW x CF x t-event
				EV	Event Frequency	1	events/day	USEPA, 2001d	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED	Exposure Duration	6	years	USEPA, 2001d	
				CF	Volumetric Conversion Factor for Water	0.001	l/cm^3	--	
				BW	Body Weight	15	kg	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	- -	

Footnote Instructions:

(1) Information regarding modeled intake development can be found in Section 2.3.4, Estimates of Constituent Intake and Appendix E.

* = Cancer risks for adult residents are computed as six years at the child's rate of exposure and 24 years at the adult's rate of exposure (USEPA, 1991).

Sources:

Schaum, 1992: Schaum, J., K. Hoang, R. Kinerson, and J. Moya, 1992. Estimating Dermal and Inhalation Exposure to Volatile Chemicals in Domestic Water. California Environmental Protection Agency, Sacramento, CA. April 2, 1992.
USEPA, 1989: Risk Assessment Guidance for Superfund. Vol. I: Human Health Evaluation Manual (Part A). Interim Final. EPA/540/1? 89/002. Washington, DC: Office of Emergency and Remedial Response.
USEPA, 1991: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER. Directive 9285.6-03.
USEPA, 1997a: Exposure Factors Handbook. EPA/600/P-95/002Fa. Office of Health and Environemntal Assessment, Washington, DC.
USEPA, 2001d: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. Review Draft - For Public Comment. Office of Emergency and Remedial Response. EPA/540/R/99/005. OSWER 9285.7-02EP. PB99-963312. September 2001.
USEPA, 2003b: Personal communication with Region II.

TABLE 4.1.1.CT
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY
FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Tap Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name (1)
Ingestion	Resident	Adult	Tap	CW	Chemical Concentration in Groundwater	See Table 3	mg/l	See Table 3	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-W	Ingestion Rate of Groundwater	1	l/day	USEPA, 1997a	CW x IR-W x EF x ED x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED	Exposure Duration	9	years	USEPA, 1997a	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	- -	
				RCW	Radionuclide Concentration in Groundwater	See Table 3	pCi/l	See Table 3	Intake (pCi) =
				IR-W	Ingestion Rate	1	l/day	USEPA, 1997a	RCW x IR-W x EF x ED
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED	Exposure Duration	9	years	USEPA, 1997a	
		Child	Tap	CW	Chemical Concentration in Groundwater	See Table 3	mg/l	See Table 3	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-W	Ingestion Rate of Groundwater	0.5	l/day	USEPA, 1997a	CW x IR-W x EF x ED x 1/BW x 1/AT
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED	Exposure Duration	6	years	USEPA, 1991	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	USEPA, 1991	
				AT-C	Averaging Time (Cancer)	25,550	days	- -	
				RCW	Radionuclide Concentration in Groundwater	See Table 3	pCi/l	USEPA, 1991	Intake (pCi) =
				IR-W	Ingestion Rate	0.5	l/day	USEPA, 1997a	RCW x IR-W x EF x ED
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED	Exposure Duration	6	years	USEPA, 1991	

TABLE 4.1.1.CT
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY
FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Tap Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name (1)
Dermal	Resident	Adult	Tap	CW	Chemical Concentration in Groundwater	See Table 3	mg/l	See Table 3	Dermally Absorbed Dose (DAD) (mg/kg-day) =
				AF1	Apportionment Factor 1 (for VOCs)	--	0.6	Schaum, 1992	DAevent x EV x ED x EF x SA x 1/BW x 1/AT
				DAevent	Absorbed dose per event	Chemical-specific	mg/cm^2-event	USEPA, 1997a	where for organic chemicals,
				FA	Fraction Absorbed Water	Chemical-specific	--	USEPA, 2001d	Absorbed Dose per Event (DAevent) (mg/cm2-event) =
				Kp	Permeability Coefficient	Chemical-specific	cm/hour	USEPA, 2001	If t-event < t*, then: DAevent = 2FA x Kp x CW x CF x SQRT{(6 x tau-event x t-event)/pi}
				SA	Skin Surface Area Available for Contact	18,000	cm^2	USEPA, 2001d	or
				tau-event	Lag time per event	Chemical-specific	hours/event	USEPA, 2001d	If t-event > t*, then: DAevent = FA x Kp x CW x AF1(VOCs only) x {(t-event/(1 x B)) + 2 x tau-event x ((1 + (3 x B) + (3 x B x B))/(1 + B)2)}
				t-event	Event Duration	0.11	hours/event	(2)	
				t*	Time to reach steady-state = 2.4 x tau-event	Chemical-specific	hours	USEPA, 2001d	and where for inorganic compounds,
				B	Ratio of permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis	Chemical-specific	--	USEPA, 2001d	DAevent = Kp x CW x CF x t-event
				EV	Event Frequency	1	events/day	USEPA, 2001d	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED	Exposure Duration	9	years	USEPA, 2001d	
				CF	Volumetric Conversion Factor for Water	0.001	l/cm^3	--	
				BW	Body Weight	70	kg	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	- -	

TABLE 4.1.1.CT

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Tap Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name (1)
		Child	Tap	CW	Chemical Concentration in Groundwater	See Table 3	mg/l	See Table 3	Dermally Absorbed Dose (DAD) (mg/kg-day) =
				AF1	Apportionment Factor 1 (for VOCs)	--	0.6	Schaum, 1992	DAevent x EV x ED x EF x SA x 1/BW x 1/AT
				DAevent	Absorbed dose per event	Chemical-specific	mg/cm^2-event	USEPA, 2001d	where for organic chemicals,
				FA	Fraction Absorbed Water	Chemical-specific	--	USEPA, 2001d	Absorbed Dose per Event (DAevent) (mg/cm2-event) =
				Kp	Permeability Coefficient	Chemical-specific	cm/hour	USEPA, 2001d	If t-event < t*, then: DAevent = 2FA x Kp x CW x AF1(VOCs only) CF x SQRT{(6 x tau-event x t-event)/pi}
				SA	Skin Surface Area Available for Contact	6,600	cm^2	USEPA, 2001d	or
				tau-event	Lag time per event	Chemical-specific	hours/event	USEPA, 2001d	If t-event > t*, then: DAevent = FA x Kp x CW x AF1(VOCs only) x {(t-event/(1 x B)) + 2 x tau-event x ((1 + (3 x B) + (3 x B x B))/(1 + B)2)}
				t-event	Event Duration	0.15	hours/event	(2)	
				t*	Time to reach steady-state = 2.4 x tau-event	Chemical-specific	hours	USEPA, 2001d	and where for inorganic compounds,
				B	Ratio of permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis	Chemical-specific	--	USEPA, 2001d	DAevent = Kp x CW x CF x t-event
				EV	Event Frequency	1	events/day	USEPA, 2001d	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED	Exposure Duration	6	years	USEPA, 2001d	
				CF	Volumetric Conversion Factor for Water	0.001	l/cm^3	--	
				BW	Body Weight	15	kg	USEPA, 1991	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	- -	

Footnote Instructions:

(1) Information regarding modeled intake development can be found in Section 2.3.4, Estimates of Constituent Intake and Appendix E.

(2) Professional judgment

Sources:

Schaum, 1992: Schaum, J., K. Hoang, R. Kinerson, and J. Moya, 1992. Estimating Dermal and Inhalation Exposure to Volatile Chemicals in Domestic Water. California Environmental Protection Agency, Sacramento, CA. April 2, 1992.

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol. I: Human Health Evaluation Manual (Part A). Interim Final. EPA/540/1? 89/002. Washington, DC: Office of Emergency and Remedial Response.

USEPA, 1991: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER. Directive 9285.6-03.

USEPA, 1997a: Exposure Factors Handbook. EPA/600/P-95/002Fa. Office of Health and Environemntal Assessment, Washington, DC.

USEPA, 2001d: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. Review Draft - For Public Comment. Office of Emergency and Remedial Response. EPA/540/R/99/005. OSWER 9285.7-02EP. PB99-963312. September 2001.

TABLE 4.2.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Indoor Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name (1)
Inhalation	Resident	Adult	Shower	CA	Chemical Concentration in Air	See Appendix D	mg/m^3	See Appendix D	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR_i	Inhalation Rate of Air	0.83	m^3/hour	USEPA, 1991	CA x IR_i x ET x EF x ED x 1/BW x 1/AT
				ET	Exposure Time	0.58	hours/day	USEPA, 2001d	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED	Exposure Duration	30/24 *	years	USEPA, 1991	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	10,950	days	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	- -	
		Child	Shower	CA	Chemical Concentration in Air	See Appendix D	mg/m^3	See Appendix D	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR_i	Inhalation Rate of Air	0.3	m^3/hour	USEPA, 1997a	CA x IR_i x ET x EF x ED x 1/BW x 1/AT
				ET	Exposure Time	1.0	hours/day	USEPA, 2001d	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED	Exposure Duration	6	years	USEPA, 1991	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	- -	

Footnote Instructions:

(1) Information regarding modeled intake development can be found in Section 2.3.4, Estimates of Constituent Intake and Appendix D.

* = Cancer risks for adult residents are computed as six years at the child's rate of exposure and 24 years at the adult's rate of exposure (USEPA, 1991).

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol. I: Human Health Evaluation Manual (Part A). Interim Final. EPA/540/1? 89/002. Washington, DC: Office of Emergency and Remedial Resp

USEPA, 1991: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER. Directive 9285

USEPA, 1997a: Exposure Factors Handbook. Vol. 1: General Factors. Office of Research and Development. EPA/600/P-95/002Fa. August 1997.

USEPA, 2001: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Derma USEPA, 1997a
Office of Emergency and Remedial Response. EPA/540/R/99/005. OSWER 9285.7-02EP. PB99-963312. September 2001.

TABLE 4.2.1.CT

VALUES USED FOR DAILY INTAKE CALCULATIONS

CENTRAL TENDENCY

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Indoor Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name (1)
Inhalation	Resident	Adult	Shower	CA	Chemical Concentration in Air	See Appendix D	mg/m^3	See Appendix D	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR_i	Inhalation Rate of Air	0.83	m^3/hour	USEPA, 1991	CA x IR_i x ET x EF x ED x 1/BW x 1/AT
				ET	Exposure Time	0.25	hours/day	(2)	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED	Exposure Duration	9	years	USEPA, 2001d	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	3,285	days	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	- -	
		Child	Shower	CA	Chemical Concentration in Air	See Appendix D	mg/m^3	See Appendix D	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR_i	Inhalation Rate of Air	0.3	m^3/hour	USEPA, 1997a	CA x IR_i x ET x EF x ED x 1/BW x 1/AT
				ET	Exposure Time	0.33	hours/day	(2)	
				EF	Exposure Frequency	350	days/year	USEPA, 1991	
				ED	Exposure Duration	6	years	USEPA, 1991	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	- -	

Footnote Instructions:

(1) Information regarding modeled intake development can be found in Section 2.3.4, Estimates of Constituent Intake and Appendix D.

(2) Professional judgment

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol. I: Human Health Evaluation Manual (Part A). Interim Final. EPA/540/1? 89/002. Washington, DC: Office of Emergency and Remedial Res

USEPA, 1991: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER. Directive 928

USEPA, 1997a: Exposure Factors Handbook. EPA/600/P-95/002Fa. Office of Health and Environemntal Assessment, Washington, DC.

USEPA, 2001: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. Review Draft - For Public Comm Office of Emergency and Remedial Response. EPA/540/R/99/005. OSWER 9285.7-02EP. PB99-963312. September 2001. USEPA, 1997a

TABLE 4.3.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Tap Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name (1)
Ingestion	Worker	Adult	Tap	CW	Chemical Concentration in Groundwater	See Table 3	mg/l	See Table 3	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-W	Ingestion Rate of Groundwater	1	l/day	USEPA, 1991	CW x IR-W x EF x ED x 1/BW x 1/AT
				EF	Exposure Frequency	250	days/year	USEPA, 1991	
				ED	Exposure Duration	25	years	USEPA, 1991	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	- -	
				RCW	Radionuclide Concentration in Groundwater	See Table 3	pCi/l	See Table 3	Intake (pCi) =
				IR-W	Ingestion Rate	1	l/day	USEPA, 1991	RCW x IR-W x EF x ED
				EF	Exposure Frequency	250	days/year	USEPA, 1991	
				ED	Exposure Duration	25	years	USEPA, 1991	
Dermal	Worker	Adult	Tap	CW	Chemical Concentration in Groundwater	See Table 3	mg/l	See Table 3	Dermally Absorbed Dose (DAD) (mg/kg-day) =
				DAevent	Absorbed dose per event	Chemical-specific	mg/cm^2-event	USEPA, 2001d	DAevent x EV x ED x EF x SA x 1/BW x 1/AT
				FA	Fraction Absorbed Water	Chemical-specific	--	USEPA, 2001d	where for organic chemicals,
				Kp	Permeability Coefficient	Chemical-specific	cm/hour	USEPA, 2001d	Absorbed Dose per Event (DAevent) (mg/cm2-event) =
				SA	Skin Surface Area Available for Contact	2,479	cm^2	USEPA, 2001d	If t-event < t*, then: DAevent = 2FA x Kp x CW x CF x SQRT{(6 x tau-event x t-event)/pi}
				tau-event	Lag time per event	Chemical-specific	hours/event	USEPA, 2001d	or
				t-event	Event Duration	0.25	hours/event	(2)	If t-event > t*, then: DAevent = FA x Kp x CW x {(t-event/(1 x B)) + 2 x tau-event x ((1 + (3 x B) + (3 x B x B))/(1 + B)2)}
				t*	Time to reach steady-state = 2.4 x tau-event	Chemical-specific	hours	USEPA, 2001d	
				B	Ratio of permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis	Chemical-specific	--	USEPA, 2001d	and where for inorganic compounds,
				EV	Event Frequency	1	events/day	USEPA, 2001d	DAevent = Kp x CW x CF x t-event
				EF	Exposure Frequency	250	days/year	USEPA, 1991	
				ED	Exposure Duration	25	years	USEPA, 1991	
				CF	Volumetric Conversion Factor for Water	0.001	l/cm^3	--	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	- -	

Footnote Instructions:
(1) Information regarding modeled intake development can be found in Section 2.3.4, Estimates of Constituent Intake and Appendix E.
(2) Professional judgment

Sources:
USEPA, 1989: Risk Assessment Guidance for Superfund. Vol. I: Human Health Evaluation Manual (Part A). Interim Final. EPA/540/1? 89/002. Washington, DC: Office of Emergency and Remedial Response.
USEPA, 1991: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER. Directive 9285.6-03.
USEPA, 2001d: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. Review Draft - For Public Comment. Office of Emergency and Remedial Response. EPA/540/R/99/005. OSWER 9285.7-02EP. PB99-963312. September 2001.

TABLE 4.3.1.CT
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY
FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Tap Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name (1)
Ingestion	Worker	Adult	Tap	CW	Chemical Concentration in Groundwater	See Table 3	mg/l	See Table 3	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR-W	Ingestion Rate of Groundwater	1	l/day	USEPA, 1991	CW x IR-W x EF x ED x 1/BW x 1/AT
				EF	Exposure Frequency	250	days/year	USEPA, 1997a	
				ED	Exposure Duration	6.6	years	USEPA, 1997a	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,409	days	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	- -	
				RCW	Radionuclide Concentration in Groundwater	See Table 3	pCi/l	See Table 3	Intake (pCi) =
				IR-W	Ingestion Rate	1	l/day	USEPA, 1991	RCW x IR-W x EF x ED
				EF	Exposure Frequency	250	days/year	USEPA, 1991	
				ED	Exposure Duration	6.6	years	USEPA, 1997a	
Dermal	Worker	Adult	Tap	CW	Chemical Concentration in Groundwater	See Table 3	mg/l	See Table 3	Dermally Absorbed Dose (DAD) (mg/kg-day) =
				DAevent	Absorbed dose per event	Chemical-specific	mg/cm^2-event	USEPA, 2001d	DAevent x EV x ED x EF x SA x 1/BW x 1/AT
				FA	Fraction Absorbed Water	Chemical-specific	--	USEPA, 2001d	where for organic chemicals,
				Kp	Permeability Coefficient	Chemical-specific	cm/hour	USEPA, 2001d	Absorbed Dose per Event (DAevent) (mg/cm2-event) =
				SA	Skin Surface Area Available for Contact	2,479	cm^2	USEPA, 2001d	If t-event < t*, then: DAevent = 2FA x Kp x CW x CF x SQRT{(6 x tau-event x t-event)/pi}
				tau-event	Lag time per event	Chemical-specific	hours/event	USEPA, 2001d	or
				t-event	Event Duration	0.11	hours/event	(2)	If t-event > t*, then: DAevent = FA x Kp x CW x {(t-event/(1 x B)) + 2 x tau-event x ((1 + (3
				t*	Time to reach steady-state = 2.4 x tau-event	Chemical-specific	hours	USEPA, 2001d	x B) + (3 x B x B))/(1 + B)2)}
				B	Ratio of permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis	Chemical-specific	--	USEPA, 2001d	and where for inorganic compounds,
				EV	Event Frequency	1	events/day	USEPA, 2001d	DAevent = Kp x CW x CF x t-event
				EF	Exposure Frequency	250	days/year	USEPA, 1991	
				ED	Exposure Duration	6.6	years	USEPA, 1997a	
				CF	Volumetric Conversion Factor for Water	0.001	l/cm^3	--	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	2,409	days	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	- -	

Footnote Instructions:
(1) Information regarding modeled intake development can be found in Section 2.3.4, Estimates of Constituent Intake and Appendix E.
(2) Professional judgment

Sources:
USEPA, 1989: Risk Assessment Guidance for Superfund. Vol. I: Human Health Evaluation Manual (Part A). Interim Final. EPA/540/1? 89/002. Washington, DC: Office of Emergency and Remedial Response.
USEPA, 1991: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER. Directive 9285.6-03.
USEPA, 1997a: Exposure Factors Handbook. EPA/600/P-95/002Fa. Office of Health and Environemntal Assessment, Washington, DC.
USEPA, 2001d: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. Review Draft - For Public Comment. Office of Emergency and Remedial Response. EPA/540/R/99/005. OSWER 9285.7-02EP. PB99-963312. September 2001.

TABLE 4.4.RME

VALUES USED FOR DAILY INTAKE CALCULATIONS

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name (1)
Dermal	Construction/Utility Worker	Adult	Top of Groundwater Table	CW	Chemical Concentration in Groundwater	See Table 3	mg/l	See Table 3	Dermally Absorbed Dose (DAD) (mg/kg-day) =
				DAevent	Absorbed dose per event	Chemical-specific	mg/cm^2-event	USEPA, 2001d	DAevent x EV x ED x EF x SA x 1/BW x 1/AT
				FA	Fraction Absorbed Water	Chemical-specific	--	USEPA, 1997a	where for organic chemicals,
				Kp	Permeability Coefficient	Chemical-specific	cm/hour	USEPA, 2001d	Absorbed Dose per Event (DAevent) (mg/cm2-event) =
				SA	Skin Surface Area Available for Contact	2,077	cm^2	USEPA, 2001d	If t-event < t*, then: DAevent = 2FA x Kp x CW x CF x SQRT{(6 x tau-event x t-event)/pi}
				tau-event	Lag time per event	Chemical-specific	hours/event	USEPA, 2001d	or
				t-event	Event Duration	8	hours/event	USEPA, 2001d	If t-event > t*, then: DAevent = FA x Kp x CW x {(t-event/(1 x B)) + 2 x tau-event x ((1 + (3 x B) + (3 x B x B))/(1 + B)2)}
				t*	Time to reach steady-state = 2.4 x tau-event	Chemical-specific	hours	USEPA, 2001d	
				B	Ratio of permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis	Chemical-specific	--	USEPA, 2001d	and where for inorganic compounds,
				EV	Event Frequency	1	events/day	USEPA, 2001d	DAevent = Kp x CW x CF x t-event
				EF	Exposure Frequency	180	days/year	(2)	
				ED	Exposure Duration	1	years	(2)	
				CF	Volumetric Conversion Factor for Water	0.001	l/cm^3	--	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT-N	Averaging Time (Non-Cancer)	365	days	(2)	
				AT-C	Averaging Time (Cancer)	25,550	days	- -	

Footnote Instructions:

(1) Information regarding modeled intake development can be found in Section 2.3.4, Estimates of Constituent Intake and Appendix E.

(2): Professional judgment

Sources:

USEPA, 1989: Risk Assessment Guidance for Superfund. Vol. I: Human Health Evaluation Manual (Part A). Interim Final. EPA/540/1? 89/002. Washington, DC: Office of Emergency and Remedial Response.
USEPA, 1997a: Exposure Factors Handbook. Vol. 1: General Factors. Office of Research and Development. EPA/600/P-95/002Fa. August 1997.
USEPA, 2001d: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. Review Draft - For Public Comment. Office of Emergency and Remedial Response. EPA/540/R/99/005. OSWER 9285.7-02EP. PB99-963312. September 2001.

TABLE 4.4.1.CT
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY
FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Groundwater

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name (1)
Dermal	Construction/Utility Worker	Adult	Top of Groundwater Table	CW	Chemical Concentration in Groundwater	See Table 3	mg/l	See Table 3	Dermally Absorbed Dose (DAD) (mg/kg-day) =
				DAevent	Absorbed dose per event	Chemical-specific	mg/cm^2-event	USEPA, 2001d	DAevent x EV x ED x EF x SA x 1/BW x 1/AT
				FA	Fraction Absorbed Water	Chemical-specific	--	USEPA, 1997a	where for organic chemicals,
				Kp	Permeability Coefficient	Chemical-specific	cm/hour	USEPA, 2001d	Absorbed Dose per Event (DAevent) (mg/cm2-event) =
				SA	Skin Surface Area Available for Contact	2,077	cm^2	USEPA, 2001d	If t-event < t*, then: DAevent = 2FA x Kp x CW x CF x SQRT{(6 x tau-event x t-event)/pi}
				tau-event	Lag time per event	Chemical-specific	hours/event	USEPA, 2001d	or
				t-event	Event Duration	4	hours/event	(2)	If t-event > t*, then: DAevent = FA x Kp x CW x {(t-event/(1 + B)) + 2 x tau-event x ((1 +
				t*	Time to reach steady-state = 2.4 x tau-event	Chemical-specific	hours	USEPA, 2001d	(3 x B) + (3 x B x B))/(1 + B)2)}
				B	Ratio of permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis	Chemical-specific	--	USEPA, 2001d	and where for inorganic compounds,
				EV	Event Frequency	1	events/day	USEPA, 2001d	DAevent = Kp x CW x CF x t-event
				EF	Exposure Frequency	90	days/year	(2)	
				ED	Exposure Duration	1	years	(2)	
				CF	Volumetric Conversion Factor for Water	0.001	l/cm^3	--	
				BW	Body Weight	70	kg	USEPA, 1989a	
				AT-N	Averaging Time (Non-Cancer)	365	days	(2)	
				AT-C	Averaging Time (Cancer)	25,550	days	- -	

Footnote Instructions:
(1) Information regarding modeled intake development can be found in Section 2.3.4, Estimates of Constituent Intake and Appendix E.
(2): Professional judgment

Sources:

USEPA, 1989a: Risk Assessment Guidance for Superfund. Vol. I: Human Health Evaluation Manual (Part A). Interim Final. EPA/540/189/002. Washington, DC: Office of Emergency and Remedial Response.
USEPA, 1997a: Exposure Factors Handbook. Vol. 1: General Factors. Office of Research and Development. EPA/600/P-95/002Fa. August 1997.
USEPA, 2001d: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. Review Draft - For Public Comment Office of Emergency and Remedial Response. EPA/540/R/99/005. OSWER 9285.7-02EP. PB99-963312. September 2001.

TABLE 4.5.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name (1)
Inhalation	Construction/Utility Worker	Adult	Ambient Air	CA	Chemical Concentration in Air	See Appendix A	mg/m^3	See Appendix A	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR_i	Inhalation Rate of Air	2.3	m^3/hour	USEPA, 1991	CA x IR_i x ET x EF x ED x 1/BW x 1/AT
				ET	Exposure Time	8	hours/day	USEPA, 1997a	
				EF	Exposure Frequency	180	days/year	(2)	
				ED	Exposure Duration	1	years	(2)	
				BW	Body Weight	70	kg	USEPA, 1989a	
				AT-N	Averaging Time (Non-Cancer)	365	days	(2)	
				AT-C	Averaging Time (Cancer)	25,550	days	- -	

Footnote Instructions:
(1) Information regarding modeled intake development can be found in Section 2.3.4, Estimates of Constituent Intake and Appendix D
(2): Professional judgment

Sources:
USEPA, 1989a: Risk Assessment Guidance for Superfund. Vol. I: Human Health Evaluation Manual (Part A). Interim Final. EPA/540/189/002. Washington, DC: Office of Emergency and Remedial Response.
USEPA, 1991: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER. Directive 9285.6-03
USEPA, 1997a: Exposure Factors Handbook. Vol. 1: General Factors. Office of Research and Development. EPA/600/P-95/002Fa. August 1997

TABLE 4.5.1.CT
VALUES USED FOR DAILY INTAKE CALCULATIONS
CENTRAL TENDENCY
FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Groundwater
Exposure Medium: Air

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name (1)
Inhalation	Construction/Utility Worker	Adult	Ambient Air	CA	Chemical Concentration in Air	See Appendix A	mg/m^3	See Appendix A	Chronic Daily Intake (CDI) (mg/kg-day) =
				IR_i	Inhalation Rate of Air	2.3	m^3/hour	USEPA, 1991	CA x IR_i x ET x EF x ED x 1/BW x 1/AT
				ET	Exposure Time	8	hours/day	USEPA, 1997a	
				EF	Exposure Frequency	90	days/year	(2)	
				ED	Exposure Duration	1	years	(2)	
				BW	Body Weight	70	kg	USEPA, 1989a	
				AT-N	Averaging Time (Non-Cancer)	365	days	(2)	
				AT-C	Averaging Time (Cancer)	25,550	days	- -	

Footnote Instructions:
(1) Information regarding modeled intake development can be found in Section 2.3.4, Estimates of Constituent Intake and Appendix D
(2): Professional judgment

Sources:
USEPA, 1989a: Risk Assessment Guidance for Superfund. Vol. I: Human Health Evaluation Manual (Part A). Interim Final. EPA/540/189/002. Washington, DC: Office of Emergency and Remedial Response.
USEPA, 1991: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER. Directive 9285.6-03
USEPA, 1997a: Exposure Factors Handbook. Vol. 1: General Factors. Office of Research and Development. EPA/600/P-95/002Fa. August 1997

TABLE 4.6.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name (1)
Dermal	Recreationist	Adolescent	Westerly Brook, Coles Brook, and Saddle River	CSW	Chemical Concentration in Surface Water	See Table 3	mg/l	See Table 3	Dermally Absorbed Dose (mg/kg-day) =
				DAevent	Absorbed dose per event	Chemical-specific	mg/cm^2-event	USEPA, 2001d	(CW x DAevent x EV x ED x EF x SA)/(BW x AT)
				FA	Fraction Absorbed Water	Chemical-specific	--	USEPA, 1997a	where for organic chemicals,
				Kp	Permeability Coefficient	Chemical-specific	cm/hour	USEPA, 2001d	Absorbed Dose per Event (DAevent) (mg/cm2-event) =
				SA	Skin Surface Area Available for Contact	3,880	cm^2	USEPA, 1997a	If t-event < t*, then: DAevent = 2FA x Kp x CW x CF x SQRT{(6 x tau-event x t-event)/pi}
				tau-event	Lag time per event	Chemical-specific	hours/event	USEPA, 2001d	or
				t-event	Event Duration	2	hours/event	USEPA, 2001d	If t-event > t*, then: DAevent = FA x Kp x CW x {(t-event/(1 + B)) + 2 x tau-event x ((1 + (3 x B) + (3 x B x B))/(1 + B)2)}
				t*	Time to reach steady-state = 2.4 x tau-event	Chemical-specific	hours	USEPA, 2001d	
				B	Ratio of permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis	Chemical-specific	--	USEPA, 2001d	and where for inorganic compounds,
				EV	Event Frequency	1	events/day	USEPA, 2001d	DAevent = Kp x CW x CF x t-event
				EF	Exposure Frequency	50	days/year	(2)	
				ED	Exposure Duration	6	years	USEPA, 2001d	
				CF	Volumetric Conversion Factor for Water	0.001	l/cm^3	--	
				BW	Body Weight	55.7	kg	USEPA, 1997a	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	- -	

Footnote Instructions:
(1) Information regarding modeled intake development can be found in Section 2.3.4, Estimates of Constituent Intake and Appendix E.
(2): Professional judgment

Sources:

USEPA, 1997a: Exposure Factors Handbook. Vol. 1: General Factors. Office of Research and Development. EPA/600/P-95/002Fa. August 1997.
USEPA, 2001d: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. Review Draft - For Public Comment. Office of Emergency and Remedial Response. EPA/540/R/99/005. OSWER 9285.7-02EP. PB99-963312. September 2001.

TABLE 4.7.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
FUSRAP AYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Surface Water
Exposure Medium: Surface Water

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name (1)
Dermal	Municipal Worker	Adult	Lodi Brook and Westerly Brook	CSW	Chemical Concentration in Surface Water	See Table 3	mg/l	See Table 3	Dermally Absorbed Dose (mg/kg-day) =
				DAevent	Absorbed dose per event	Chemical-specific	mg/cm^2-event	USEPA, 2001d	(CW x DAevent x EV x ED x EF x SA)/(BW x AT)
				FA	Fraction Absorbed Water	Chemical-specific	--	USEPA, 1997a	where for organic chemicals,
				SA	Skin Surface Area Available for Contact	2,077	cm^2	USEPA, 2001d	Absorbed Dose per Event (DAevent) (mg/cm2-event) =
				Kp	Permeability Coefficient	Chemical-specific	cm/hour	USEPA, 2001d	If t-event < t*, then: DAevent = 2FA x Kp x CW x CF x SQRT{(6 x tau-event x t-event)/pi}
				tau-event	Lag time per event	Chemical-specific	hours/event	USEPA, 2001d	or
				t-event	Event Duration	8	hours/event	USEPA, 2001d	If t-event > t*, then: DAevent = FA x Kp x CW x {(t-event/(1 + B)) + 2 x tau-event x ((1 + (3 x B) + (3 x B x B))/(1 + B)2)}
				t*	Time to reach steady-state = 2.4 x tau-event	Chemical-specific	hours	USEPA, 2001d	
				B	Ratio of permeability coefficient of a compound through the stratum corneum relative to its permeability coefficient across the viable epidermis	Chemical-specific	--	USEPA, 2001d	and where for inorganic compounds,
				EV	Event Frequency	1	events/day	USEPA, 2001d	DAevent = Kp x CW x CF x t-event
				EF	Exposure Frequency	4	days/year	(2)	
				ED	Exposure Duration	25	years	USEPA, 1991	
				CF	Volumetric Conversion Factor for Water	0.001	l/cm^3	--	
				BW	Body Weight	70	kg	USEPA, 1989a	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	- -	

Footnote Instructions:
(1) Information regarding modeled intake development can be found in Section 2.3.4, Estimates of Constituent Intake and Appendix E.
(2): Professional judgment

Sources:
USEPA, 1989a: Risk Assessment Guidance for Superfund Vol. I: Human Health Evaluation Manual(Part A). Interim Final EPA/540/189/002. Washington, DC: Office of Emergency and Remedial Response
USEPA, 1991: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER. Directive 9285.6-03.
USEPA, 1997a: Exposure Factors Handbook. Vol. 1: General Factors. Office of Research and Development. EPA/600/P-95/002Fa. August 1997.
USEPA, 2001d: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. Review Draft - For Public Comment. Office of Emergency and Remedial Response. EPA/540/R/99/005. OSWER 9285.7-02EP. PB99-963312. September 2001.

TABLE 4.8.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name (1)
Ingestion	Recreationist	Adolescent	Westerly Brook, Coles Brook, and Saddle River	CS	Chemical Concentration in Sediment	See Table 3	mg/kg	See Table 3	Chronic Daily Intake (CDI) (mg/kg-day) =
				CF1	Conversion Factor 1	1.00E-06	kg/mg	--	CS x CF1 x IR-S x FI x EF x ED x 1/BW x 1/AT
				IR-S	Ingestion Rate of Sediment	100	mg/day	USEPA, 1997a	
				FI	Fraction Ingested	1	- -	(2)	
				EF	Exposure Frequency	50	days/year	(2)	
				ED	Exposure Duration	6	years	USEPA, 2001d	
				BW	Body Weight	55.7	kg	USEPA, 1997a	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	- -	
				RCS	Radionuclide Concentration in Sediment	See Table 3	pCi/g	See Table 3	Intake (pCi) =
				CF2	Conversion Factor 2	1.00E-03	g/mg	--	RCS x CF2 x IR-S x FI x EF xED
				IR-S	Ingestion Rate of Sediment	100	mg/day	USEPA, 1997a	
				FI	Fraction Ingested	1	- -	(2)	
				EF	Exposure Frequency	50	days/year	(2)	
				ED	Exposure Duration	6	years	USEPA, 2001d	
Dermal	Recreationist	Adolescent	Westerly Brook, Coles Brook, and Saddle River	CS	Chemical Concentration in Sediment	See Table 3	mg/kg	See Table 3	Dermally Absorbed Dose (DAD) (mg/kg-day) =
				DAevent	Absorbed dose per event	Chemical-specific	mg/cm^2-event	USEPA, 2001d	DAevent x EF x ED x EV x SA x 1/BW x 1/AT
				CF	Conversion Factor	1.00E-06	kg/mg	--	where:
				SA	Skin Surface Area Available for Contact	3,880	cm^2/event	USEPA, 2001d	Absorbed Dose per Event (DAevent) (mg/cm2-event) =
				AF	Soil to Skin Adherence Factor	0.2	mg/cm^2-event	USEPA, 2001d	CS x CF x AF x ABS-d
				ABS-d	Dermal Absorption Factor	Chemical-specific	unitless	USEPA, 2001d	
				EV	Event Frequency	1	events/day	USEPA, 2001d	
				EF	Exposure Frequency	50	days/year	(2)	
				ED	Exposure Duration	6	years	(2)	
				BW	Body Weight	55.7	kg	USEPA, 1997a	
				AT-N	Averaging Time (Non-Cancer)	2,190	days	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	- -	
External (Radiation)	Recreationist	Adolescent	Westerly Brook, Coles Brook, and Saddle River	RCS	Radionuclide Concentration in Soil	See Table 3	pCi/g	See Table 3	Exposure (pCi-year/g) =
				ET	Exposure Time	2	hours/day	(2)	RCS x ET x EF x (Fo x GSFo) x ED x CF1
				EF	Exposure Frequency	50	days/year	(2)	
				Fo	Fraction Outdoors	1	- -	(2)	
				GSFo	Gamma Shielding Factor Outdoors	1	- -	USEPA, 1989a	
				ED	Exposure Duration	6	years	(2)	
				CF1	Conversion Factor 1	1.14E-04	year/hours	- -	

Footnote Instructions:
(1) Information regarding modeled intake development can be found in Section 2.3.4, Estimates of Constituent Intake and Appendix E.
(2): Professional judgment

Sources:
USEPA, 1989a: Risk Assessment Guidance for SuperfundVol. I: Human Health Evaluation Manual(Part A). Interim Final. EPA/540/189/002. Washington, DC: Office of Emergency and Remedial Response
USEPA, 1997a: Exposure Factors Handbook. Vol. 1: General Factors. Office of Research and Development. EPA/600/P-95/002Fa. August 1997.
USEPA, 2001d: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. Review Draft - For Public Comment. Office of Emergency and Remedial Response. EPA/540/R/99/005. OSWER 9285.7-02EP. PB99-963312. September 2001.

TABLE 4.9.RME
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Medium: Sediment
Exposure Medium: Sediment

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/ Model Name (1)
Ingestion	Municipal Worker	Adult	Lodi Brook and Westerly Brook	CS	Chemical Concentration in Sediment	See Table 3	mg/kg	See Table 3	Chronic Daily Intake (CDI) (mg/kg-day) =
				CF1	Conversion Factor 1	1.00E-06	kg/mg	--	CS x CF1 x IR-S x FI x EF x ED x 1/BW x 1/AT
				IR-S	Ingestion Rate of Sediment	330	mg/day	USEPA, 2001e	
				FI	Fraction Ingested	1	- -	(2)	
				EF	Exposure Frequency	4	days/year	(2)	
				ED	Exposure Duration	25	years	USEPA, 1991	
				BW	Body Weight	70	kg	USEPA, 1989a	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	- -	
				AT-C	Averaging Time (Cancer)	25,550	days	- -	
				RCS	Radionuclide Concentration in Sediment	See Table 3	pCi/g	See Table 3	Intake (pCi) =
				CF2	Conversion Factor 2	1.00E-03	g/mg	--	RCS x CF2 x IR-S x FI x EF xED
				IR-S	Ingestion Rate of Sediment	330	mg/day	USEPA, 1991	
				FI	Fraction Ingested	1	- -	(2)	
				EF	Exposure Frequency	4	days/year	(2)	
				ED	Exposure Duration	25	years	USEPA, 1991	
Dermal	Municipal Worker	Adult	Lodi Brook and Westerly Brook	CS	Chemical Concentration in Sediment	See Table 3	mg/kg	See Table 3	Dermally Absorbed Dose (DAD) (mg/kg-day) =
				DAevent	Absorbed dose per event	Chemical-specific	mg/cm^2-event	USEPA, 2001d	DAevent x EF x ED x EV x SA x 1/BW x 1/AT
				CF	Conversion Factor	1.00E-06	kg/mg	--	where:
				SA	Skin Surface Area Available for Contact	2,077	cm^2/event	USEPA, 2001d	Absorbed Dose per Event (DAevent) (mg/cm2-event) =
				AF	Soil to Skin Adherence Factor	0.242	mg/cm^2-event	USEPA, 2001d	CS x CF x AF x ABS-d
				ABS-d	Dermal Absorption Factor	Chemical-specific	unitless	USEPA, 2001d	
				EV	Event Frequency	1	events/day	USEPA, 2001d	
				EF	Exposure Frequency	4	days/year	(2)	
				ED	Exposure Duration	25	years	USEPA, 1991	
				BW	Body Weight	70	kg	USEPA, 1989a	
				AT-N	Averaging Time (Non-Cancer)	9,125	days	--	
				AT-C	Averaging Time (Cancer)	25,550	days	- -	
External (Radiation)	Municipal Worker	Adult	Lodi Brook and Westerly Brook	RCS	Radionuclide Concentration in Soil	See Table 3	pCi/g	See Table 3	Exposure (pCi-year/g) =
				ET	Exposure Time	2	hours/day	(2)	RCS x ET x EF x (Fo x GSFo) x ED x CF1
				EF	Exposure Frequency	4	days/year	(2)	
				Fo	Fraction Outdoors	1	unitless	(2)	
				GSFo	Gamma Shielding Factor Outdoors	1	unitless	USEPA, 1989a	
				ED	Exposure Duration	25	years	USEPA, 1991	
				CF1	Conversion Factor 1	1.14E-04	year/hours	- -	

Footnote Instructions:
(1) Information regarding modeled intake development can be found in Section 2.3.4, Estimates of Constituent Intake and Appendix E.
(2): Professional judgment.

Sources:
USEPA, 1989a: Risk Assessment Guidance for Superfund Vol. I: Human Health Evaluation Manual(Part A). Interim Final. EPA/540/189/002. Washington, DC: Office of Emergency and Remedial Response
USEPA, 1991: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual - Supplemental Guidance, Standard Default Exposure Factors. Interim Final. OSWER. Directive 9285.6-03.
USEPA, 2001d: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. Review Draft - For Public Comment. Office of Emergency and Remedial Response. EPA/540/R/99/005. OSWER 9285.7-02EP. PB99-963312. September 2001.
USEPA, 2001e: Supplemental Guidance For Developing Soil Screening Levels For Superfund Sites. Peer Review Draft. OSWER 9355.4-24. Office of Solid Waste and Emergency Response, Washington, DC. March 2001.

TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

FUSRAP MAYWOOD SUPERFUND SITE

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
		Value	Units		Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Acetone	Chronic	3E-01	mg/kg-day	1	3E-01	mg/kg-day	Nephropathy and anemia	3,000	NCEA	08/00/2001
Benzene	Chronic	4E-03	mg/kg-day	1	4E-03	mg/kg-day	Lymphocyte count	300	IRIS	6/26/2003
Bromodichloromethane	Chronic	2E-02	mg/kg-day	1	1E-01	mg/kg-day	Renal cytomegaly	1,000	IRIS	6/26/2003
2-Butanone	Chronic	6E-01	mg/kg-day	1	1E+00	mg/kg-day	Birth weight	3,000	IRIS	6/26/2003
Carbon disulfide	Chronic	1E-01	mg/kg-day	1	2E+00	mg/kg-day	Fetal toxicity	100	IRIS	6/26/2003
Chlorobenzene	Chronic	2E-02	mg/kg-day	1	3E+00	mg/kg-day	Liver	1,000	IRIS	6/26/2003
Chloroform	Chronic	1E-02	mg/kg-day	1	1E-02	mg/kg-day	Liver	1,000	IRIS	6/26/2003
Chloromethane	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
2-Chlorotoluene	Chronic	2E-02	mg/kg-day	1	2E-02	mg/kg-day	Body weight	1,000	IRIS	6/26/2003
4-Chlorotoluene	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
1,1-Dichloroethane	Chronic	NA	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
1,2-Dichloroethane	Chronic	2E-02	mg/kg-day	1	2E-02	mg/kg-day	Kidney wieight	3,000	NCEA	10/00/2002
1,1-Dichloroethene	Chronic	5E-02	mg/kg-day	1	5E-02	mg/kg-day	Liver	100	IRIS	6/26/2003
1,2-Dichloroethene (total)	Chronic	2E-02	mg/kg-day	1	2E-02	mg/kg-day	Increased serum alkaline phosphatase	1,000	IRIS	6/26/2003
1,2-Dichloropropane	Chronic	4E-03	mg/kg-day	1	4E-03	mg/kg-day	Hyperplasia of nasal mucosa	300	IRIS	6/26/2003
Ethylbenzene	Chronic	1E-01	mg/kg-day	1	1E-01	mg/kg-day	Liver/Kidney	1,000	IRIS	6/26/2003
2-Hexanone	Chronic	4E-02	mg/kg-day	1	4E-02	mg/kg-day	Neurological effects	10,000	NCEA	6/24/1993
4-Methyl-2-pentanone	Chronic	3E-02	mg/kg-day	1	3E-02	mg/kg-day	Kidney wieight	10,000	NCEA	5/20/1994
Methylene chloride	Chronic	6E-02	mg/kg-day	1	6E-02	mg/kg-day	Liver	100	IRIS	6/26/2003
Styrene	Chronic	2E-01	mg/kg-day	1	2E-01	mg/kg-day	Blood/Liver	1,000	IRIS	6/26/2003
Tetrachloroethene	Chronic	1E-02	mg/kg-day	1	1E-02	mg/kg-day	Liver	1,000	IRIS	6/26/2003
Toluene	Chronic	2E-01	mg/kg-day	1	2E-01	mg/kg-day	Liver/Kidney	1,000	IRIS	6/26/2003
1,1,1-Trichloroethane	Chronic	NA	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
1,1,2-Trichloroethane	Chronic	4E-03	mg/kg-day	1	4E-03	mg/kg-day	Blood	1,000	IRIS	6/26/2003
Trichloroethene	Chronic	3E-04	mg/kg-day	1	3E-04	mg/kg-day	Liver, kidney, development	3,000	NCEA	08/00/2001
Vinyl chloride	Chronic	3E-03	mg/kg-day	1	3E-03	mg/kg-day	Liver	30	IRIS	6/26/2003
Xylenes (total)	Chronic	2E-01	mg/kg-day	1	2E-01	mg/kg-day	Body weight/mortality	1,000	IRIS	6/26/2003
Aluminum	Chronic	1E+00	mg/kg-day	1	1E+00	mg/kg-day	Neural toxicity	100	NCEA	7/26/2001
Antimony	Chronic	4E-04	mg/kg-day	0.15	2.7E-03	mg/kg-day	Blood	1,000	IRIS	6/26/2003
Arsenic	Chronic	3E-04	mg/kg-day	1	3E-04	mg/kg-day	Skin	3	IRIS	6/26/2003
Barium	Chronic	7E-02	mg/kg-day	0.07	1E+00	mg/kg-day	NOAEL	3	IRIS	6/26/2003
Beryllium	Chronic	2E-03	mg/kg-day	0.007	1.4E-05	mg/kg-day	Small intestine	300	IRIS	6/26/2003
Boron	Chronic	9E-02	mg/kg-day	1	9E-02	mg/kg-day	Testes	100	IRIS	6/26/2003
Cadmium (water)	Chronic	5E-04	mg/kg-day	0.05	2.5E-05	mg/kg-day	Kidney	10	IRIS	6/26/2003
Cadmium (diet)	Chronic	1E-03	mg/kg-day	0.025	3E-05	mg/kg-day	Kidney	10	IRIS	6/26/2003
Cerium	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NCEA	8/31/1998

TABLE 5.1

NON-CANCER TOXICITY DATA -- ORAL/DERMAL

FUSRAP MAYWOOD SUPERFUND SITE

Chemical of Potential Concern	Chronic/ Subchronic	Oral RfD		Oral to Dermal Adjustment Factor (1)	Adjusted Dermal RfD		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
		Value	Units		Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Chromium VI	Chronic	3E-03	mg/kg-day	0.025	8E-05	mg/kg-day	NOAEL	900	IRIS	6/26/2003
Chromium (III), insoluble salts	Chronic	1.5E+00	mg/kg-day	0.013	2.0E-02	mg/kg-day	NOAEL	1,000	IRIS	6/26/2003
Cobalt	Chronic	2E-02	mg/kg-day	1	2E-02	mg/kg-day	Hematological effects	0	NCEA	1/15/2002
Copper	Chronic	4E-02	mg/kg-day	1	4E-02	mg/kg-day	Gastroinestinal distress	2	NCEA	4/29/1997
Dysprosium	Chronic	1E-01	mg/kg-day	1	1E-01	mg/kg-day	LD50	-	NCEA	10/29/1998
Iron	Chronic	3E-01	mg/kg-day	1	3E-01	mg/kg-day	Chronic iron overload	1	NCEA	11/14/2001
Lanthanum	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NCEA	9/11/1998
Lead	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	-	IRIS	6/26/2003
Lithium	Chronic	2E-02	mg/kg-day	1	2E-02	mg/kg-day	Kidney effect	100	NCEA	11/23/1992
Manganese (sediment)	Chronic	5.6E-03	mg/kg-day	0.04	2E-04	mg/kg-day	CNS	1 (3 for non-diet)	IRIS	6/26/2003
Manganese (water)	Chronic	1.4E-01	mg/kg-day	0.04	6E-03	mg/kg-day	CNS	1 (3 for non-diet)	IRIS	6/26/2003
Mercury (2)	Chronic	3E-04	mg/kg-day	0.07	2E-05	N/A	Immune system	1,000	IRIS	6/26/2003
Neodymium	Chronic	1E-01	mg/kg-day	1	1E-01	mg/kg-day	LD50	-	NCEA	10/29/1998
Nickel (soluble salts)	Chronic	2E-02	mg/kg-day	0.04	8E-04	mg/kg-day	Body weights	300	IRIS	6/26/2003
Selenium	Chronic	5E-03	mg/kg-day	1	5E-03	mg/kg-day	Hair/nail loss (selenosis)	3	IRIS	6/26/2003
Silver	Chronic	5E-03	mg/kg-day	0.04	2E-04	mg/kg-day	Skin (argyria)	3	IRIS	6/26/2003
Thallium	Chronic	8E-05	mg/kg-day	1	8E-05	mg/kg-day	NOAEL	3,000	IRIS	6/26/2003
Vanadium	Chronic	7E-03	mg/kg-day	0.026	2E-04	mg/kg-day	N/A	100	IRIS	6/26/2003
Yttrium	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
Zinc	Chronic	3E-01	mg/kg-day	1	3E-01	mg/kg-day	Blood	3	IRIS	6/26/2003
U-234 (Uranium, soluble salts)	Chronic	3E-03	mg/kg-day	1	3E-03	mg/kg-day	Body weight; kidney	1,000	IRIS	6/26/2003
U-235 (Uranium, soluble salts)	Chronic	3E-03	mg/kg-day	1	3E-03	mg/kg-day	Body weight; kidney	1,000	IRIS	6/26/2003
U-238 (Uranium, soluble salts)	Chronic	3E-03	mg/kg-day	1	3E-03	mg/kg-day	Body weight; kidney	1,000	IRIS	6/26/2003

Footnotes:

(1) USEPA, 2001d: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. Review Draft - For Public Comment. Office of Emergency and Remedial Response. EPA/540/R/99/005. OSWER 9285.7-02EP. PB99-963312. September 2001.

(2) The RfD for mercuric chloride is used as a surrogate.

TABLE 5.2

NON-CANCER TOXICITY DATA -- INHALATION

FUSRAP MAYWOOD SUPERFUND SITE

Chemical of Potential Concern	Chronic/ Subchronic	Inhalation RfC		Adjusted Inhalation RfD		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
		Value	Units	Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Acetone	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	NCEA	08/00/2001
Benzene	Chronic	3E-02	mg/m3	9E-03	mg/kg-day	Lymphocyte count	300	IRIS	6/26/2003
Bromodichloromethane	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
2-Butanone	Chronic	1E+00	mg/m3	3E-01	mg/kg-day	Birth weight	3,000	IRIS	6/26/2003
Carbon disulfide	Chronic	7E-01	mg/m3	2E-01	mg/kg-day	Peripheral nervous system	30	IRIS	6/26/2003
Chlorobenzene	Chronic	6E-02	mg/m3	2E-02	mg/kg-day	Hepatocellular hypertrophy	1,000	NCEA	9/18/1998
Chloroform	Chronic	5E-02	mg/m3	1E-02	mg/kg-day	NOAEL	100	NCEA	1/22/2003
Chloromethane	Chronic	9E-02	mg/m3	3E-02	mg/kg-day	Brain	1,000	IRIS	6/26/2003
2-Chlorotoluene	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
4-Chlorotoluene	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
1,1-Dichloroethane	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	NCEA	7/17/1998
1,2-Dichloroethane	Chronic	5E-03	mg/m3	1E-03	mg/kg-day	GI tract, liver, gall bladder	3,000	NCEA	4/5/1993
1,1-Dichloroethene	Chronic	2E-01	mg/m^3	6E-02	mg/kg-day	Liver	30	IRIS	6/26/2003
1,2-Dichloroethene (total)*	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	NCEA	9/24/2002
1,2-Dichloropropane	Chronic	4E-03	mg/m3	1E-03	mg/kg-day	Nasal mucosa	300	IRIS	6/26/2003
Ethylbenzene	Chronic	1E+00	mg/m^3	N/A	N/A	Developmental toxicity	300	IRIS	6/26/2003
2-Hexanone	Chronic	5E-03	mg/m3	1E-03	mg/kg-day	Neurological effects	10,000	NCEA	6/24/1993
4-Methyl-2-pentanone	Chronic	3E+00	mg/m3	9E-01	mg/kg-day	Fetal body weight/skeletal	300	IRIS	6/26/2003
Methylene chloride	Chronic	NA	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
Styrene	Chronic	1E+00	mg/m3	3E-01	mg/kg-day	CNS	30	IRIS	6/26/2003
Tetrachloroethene	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
Toluene	Chronic	4E-01	mg/m^3	1E-01	mg/kg-day	Neurological effects	300	IRIS	6/26/2003
1,1,1-Trichloroethane	Chronic	2E+00	mg/m3	6E-01	mg/kg-day	Neurotoxicity	90	NCEA	8/4/1999
1,1,2-Trichloroethane	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
Trichloroethene	Chronic	4E-02	mg/m3	1E-02	mg/kg-day	CNS, liver, endocrine	1,000	NCEA	08/00/2001
Vinyl chloride	Chronic	1E-01	mg/m^3	3E-02	mg/kg-day	Liver	30	IRIS	6/26/2003
Xylenes (total)	Chronic	1E-01	mg/m3	3E-02	mg/kg-day	Motor coordination	300	IRIS	6/26/2003
Aluminum	Chronic	5E-03	mg/m3	1E-03	mg/kg-day	Psychomotor/cognitive impariment	300	NCEA	7/26/2001
Antimony	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	NCEA	3/24/1992
Arsenic	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
Barium	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
Beryllium	Chronic	2E-02	mg/m^3	6E-03	mg/kg-day	Sensitization	10	IRIS	6/26/2003
Boron	Chronic	2E-02	mg/m^3	6E-03	mg/kg-day	Respiratory irritation	N/A	HEAST	07/00/1997
Cadmium	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
Cerium	Chronic	2E-04	mg/m3	6E-05	mg/kg-day	Pulmonary effects	3,000	NCEA	11/1/2002
Chromium VI (particulates)	Chronic	1E-04	mg/m^3	3E-05	mg/kg-day	Lung	300	IRIS	6/26/2003

TABLE 5.2

NON-CANCER TOXICITY DATA -- INHALATION

FUSRAP MAYWOOD SUPERFUND SITE

Chemical of Potential Concern	Chronic/ Subchronic	Inhalation RfC		Adjusted Inhalation RfD		Primary Target Organ(s)	Combined Uncertainty/Modifying Factors	RfD:Target Organ(s)	
		Value	Units	Value	Units			Source(s)	Date(s) (MM/DD/YYYY)
Chromium (III), insoluble salts	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
Cobalt	Chronic	2E-05	mg/m3	6E-06	mg/kg-day	Lung function	100	NCEA	1/15/2002
Copper	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	NCEA	8/11/1993
Dysprosium	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	NCEA	10/29/1998
Iron	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	NCEA	11/14/2001
Lanthanum	Chronic	N/A	N/A	1	N/A	N/A	N/A	NCEA	9/11/1998
Lead	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
Lithium	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	NCEA	10/2/1992
Manganese	Chronic	2E-02	mg/kg-day	6E-03	mg/kg-day	Kidney effect	100	NCEA	11/23/1992
Mercury (elemental)	Chronic	3E-04	mg/m^3	9E-05	mg/kg-day	Hand tremor; memory	30	IRIS	6/26/2003
Neodymium	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	NCEA	10/29/1998
Nickel	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
Selenium	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
Silver	Chronic	1E-05	mg/m3	3E-06	mg/kg-day	Argyrosis	1,000	NCEA	6/30/1994
Thallium	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
Vanadium	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
Yttrium	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
Zinc	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
U-234 (Uranium, soluble salts)	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-235 (Uranium, soluble salts)	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-238 (Uranium, soluble salts)	Chronic	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Footnotes:

(1) USEPA, 2001d: Risk Assessment Guidance for Superfund. Vol. 1: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim. Review Draft - For Public Comment.

TABLE 6.1

CANCER TOXICITY DATA -- ORAL/DERMAL

FUSRAP MAYWOOD SUPERFUND SITE

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor	Adjusted Dermal Cancer Slope Factor (1)	Units	Weight of Evidence/ Cancer Guideline Description	Source Target Organ	Date (2) (MM/DD/YYYY)
Acetone	N/A	N/A	N/A	N/A	D	IRIS	6/26/2003
Benzene	1.5E-2 to 5.5E-2	1	1.5E-2 to 5.5E-2	$(mg/kg\text{-}day)^{-1}$	A	IRIS	6/26/2003
Bromodichloromethane	6.2E-02	1	6.2E-02	(mg/kg-day)-1	B2	IRIS	6/26/2003
2-Butanone	N/A	N/A	N/A	N/A	D	IRIS	6/26/2003
Carbon disulfide	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
Chlorobenzene	N/A	N/A	N/A	N/A	D	IRIS	6/26/2003
Chloroform	N/A	N/A	N/A	N/A	B2	IRIS	6/26/2003
Chloromethane	N/A	N/A	N/A	N/A	D	IRIS	6/26/2003
2-Chlorotoluene	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
4-Chlorotoluene	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
1,1-Dichloroethane	N/A	N/A	N/A	N/A	C	NCEA	7/17/1998
1,2-Dichloroethane	9.1E-02	1	9.1E-02	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	6/26/2003
1,1-Dichloroethene	N/A	N/A	N/A	N/A	C	IRIS	6/26/2003
1,2-Dichloroethene (total) (Note 1)	N/A	N/A	N/A	N/A	D	NCEA	9/24/2002
1,2-Dichloropropane	NA	N/A	N/A	N/A	N/A	IRIS	6/26/2003
Ethylbenzene	N/A	N/A	N/A	N/A	D	IRIS	6/26/2003
2-Hexanone	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
4-Methyl-2-pentanone	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
Methylene chloride	7.5E-03	1	7.5E-03	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	6/26/2003
Styrene	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
Tetrachloroethene	NA	N/A	N/A	N/A	N/A	IRIS	6/26/2003
Toluene	N/A	N/A	N/A	N/A	D	IRIS	6/26/2003
1,1,1-Trichloroethane	N/A	N/A	N/A	N/A	D	IRIS	6/26/2003
1,1,2-Trichloroethane	5.7E-02	1	5.7E-02	(mg/kg-day)-1	C	IRIS	6/26/2003
Trichloroethene	2.0E-2 to 4.0E-1	1	2.0E-2 to 4.0E-1	(mg/kg-day)-1	Highly likely in humans	NCEA	08/00/2001
Vinyl chloride	1.4E+00 (Note 2)	1	1.4E+00	$(mg/kg\text{-}day)^{-1}$	A	IRIS	6/26/2003
Xylenes (total)	N/A	N/A	N/A	N/A	NA	IRIS	6/26/2003
Aluminum	N/A	N/A	N/A	N/A	D	NCEA	7/26/2001
Antimony	N/A	N/A	N/A	N/A	D	NCEA	3/24/1992
Arsenic	1.5E+00	1	1.5E+00	$(mg/kg\text{-}day)^{-1}$	A	IRIS	6/26/2003
Barium	N/A	N/A	N/A	N/A	D	IRIS	6/26/2003
Beryllium	N/A	N/A	N/A	N/A	B1	IRIS	6/26/2003
Boron	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
Cadmium	N/A	N/A	N/A	N/A	B1	IRIS	6/26/2003
Cerium	N/A	N/A	N/A	N/A	D	NCEA	8/31/1998
Chromium VI	N/A	N/A	N/A	N/A	D	IRIS	6/26/2003
Chromium (III), insoluble salts	N/A	N/A	N/A	N/A	D	IRIS	6/26/2003
Cobalt	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
Copper	N/A	N/A	N/A	N/A	D	IRIS	6/26/2003
Dysprosium	N/A	N/A	N/A	N/A	D	NCEA	10/29/1998
Iron	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
Lanthanum	N/A	N/A	N/A	N/A	D	NCEA	9/11/1998
Lead	N/A	N/A	N/A	N/A	B2	IRIS	6/26/2003
Lithium	N/A	N/A	N/A	N/A	N/A	NCEA	N/A
Manganese	N/A	N/A	N/A	N/A	N/A	IRIS	D
Mercury (elemental)	N/A	N/A	N/A	N/A	D	IRIS	6/26/2003
Neodymium	N/A	N/A	N/A	N/A	D	NCEA	10/29/1998
Nickel (refinery dust)	N/A	N/A	N/A	N/A	A	IRIS	6/26/2003

TABLE 6.1

CANCER TOXICITY DATA -- ORAL/DERMAL

FUSRAP MAYWOOD SUPERFUND SITE

Chemical of Potential Concern	Oral Cancer Slope Factor	Oral to Dermal Adjustment Factor	Adjusted Dermal Cancer Slope Factor (1)	Units	Weight of Evidence/ Cancer Guideline Description	Source Target Organ	Date (2) (MM/DD/YYYY)
Selenium	N/A	N/A	N/A	N/A	D	IRIS	6/26/2003
Silver	N/A	N/A	N/A	N/A	D	IRIS	6/26/2003
Thallium	N/A	N/A	N/A	N/A	D	IRIS	6/26/2003
Vanadium	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
Yttrium	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
Zinc	N/A	N/A	N/A	N/A	D	IRIS	6/26/2003
Radium 226 + D (water ingestion)	3.86E-10	N/A	N/A	Risk/pCi	A	HEAST	4/16/2001
Radium 228 + D (water ingestion)	1.04E-09	N/A	N/A	Risk/pCi	A	HEAST	4/16/2001
Thorium 228 + D (water ingestion)	3.00E-10	N/A	N/A	Risk/pCi	A	HEAST	4/16/2001
Thorium 230 (water ingestion)	9.10E-11	N/A	N/A	Risk/pCi	A	HEAST	4/16/2001
Thorium 232 (water ingestion)	1.01E-10	N/A	N/A	Risk/pCi	A	HEAST	4/16/2001
Uranium 234 (water ingestion)	7.07E-11	N/A	N/A	Risk/pCi	A	HEAST	4/16/2001
Uranium 235 + D (water ingestion)	7.18E-11	N/A	N/A	Risk/pCi	A	HEAST	4/16/2001
Uranium 238 + D (water ingestion)	8.71E-11	N/A	N/A	Risk/pCi	A	HEAST	4/16/2001
Lead 210 + D (water ingestion)	1.27E-09	N/A	N/A	Risk/pCi	A	HEAST	4/16/2001
Radium 226 + D (soil ingestion)	7.30E-10	N/A	N/A	Risk/pCi	A	HEAST	4/16/2001
Radium 228 + D (soil ingestion)	2.29E-09	N/A	N/A	Risk/pCi	A	HEAST	4/16/2001
Thorium 228 + D (soil ingestion)	8.09E-10	N/A	N/A	Risk/pCi	A	HEAST	4/16/2001
Thorium 230 (soil ingestion)	2.02E-10	N/A	N/A	Risk/pCi	A	HEAST	4/16/2001
Thorium 232 (soil ingestion)	2.31E-10	N/A	N/A	Risk/pCi	A	HEAST	4/16/2001
Uranium 234 (soil ingestion)	1.57E-10	N/A	N/A	Risk/pCi	A	HEAST	4/16/2001
Uranium 235 + D (soil ingestion)	1.63E-10	N/A	N/A	Risk/pCi	A	HEAST	4/16/2001
Uranium 238 + D (soil ingestion)	2.10E-10	N/A	N/A	Risk/pCi	A	HEAST	4/16/2001
Lead 210 + D (soil ingestion)	2.66E-09	N/A	N/A	Risk/pCi	A	HEAST	4/16/2001

IRIS = Integrated Risk Information System

HEAST= Health Effects Assessment Summary Tables

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 carcinogen

D - Not classifiable as a human carcinogen

E - Evidence of noncarcinogenicity

(1) Provide equation for derivation in text.

(2) For IRIS values, provide the date IRIS was searched.

For HEAST values, provide the date of HEAST.

For NCEA values, provide the date of article provided by NCEA.

Note 1: For cis-1,2-Dichloroethene

Note 2: For continuous lifetime exposure from birth

TABLE 6.2

CANCER TOXICITY DATA -- INHALATION

FUSRAP MAYWOOD SUPERFUND SITE

Chemical of Potential Concern	Unit Risk	Units	Adjustment	Inhalation Cancer Slope Factor	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (1) (MM/DD/YYYY)
Acetone	N/A	N/A	N/A	N/A	N/A	D	IRIS	6/26/2003
Benzene	2.2E-06 to 7.8E-06	$(ug/m^3)^{-1}$	3,500	7.7E-03; 2.7E-02	$(mg/kg\text{-}day)^{-1}$	A	IRIS	6/26/2003
Bromodichloromethane	N/A	N/A	N/A	N/A	N/A	B2	IRIS	6/26/2003
2-Butanone	N/A	N/A	N/A	N/A	N/A	D	IRIS	6/26/2003
Carbon disulfide	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
Chlorobenzene	N/A	N/A	N/A	N/A	N/A	D	IRIS	6/26/2003
Chloroform	2.3E-05	$(ug/m^3)^{-1}$	3,500	8.1E-02	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	6/26/2003
Chloromethane	N/A	N/A	N/A	N/A	N/A	D	IRIS	6/26/2003
2-Chlorotoluene	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
4-Chlorotoluene	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
1,1-Dichloroethane	N/A	N/A	N/A	N/A	N/A	C	NCEA	7/17/1998
1,2-Dichloroethane	2.6E-05	$(ug/m^3)^{-1}$	3,500	9.1E-02	$(mg/kg\text{-}day)^{-1}$	B2	IRIS	6/26/2003
1,1-Dichloroethene	N/A	N/A	N/A	N/A	N/A	C	IRIS	6/26/2003
1,2-Dichloroethene (total) (Note 1)	N/A	N/A	N/A	N/A	N/A	D	NCEA	9/24/2002
1,2-Dichloropropane	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
Ethylbenzene	N/A	N/A	N/A	N/A	N/A	D	IRIS	6/26/2003
2-Hexanone	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
4-Methyl-2-pentanone	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
Methylene chloride	4.7E-07	(ug/m3)-1	3,500	1.6E-03	(mg/kg/day)-1	B2	IRIS	6/26/2003
Styrene	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
Tetrachloroethene	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
Toluene	N/A	N/A	N/A	N/A	N/A	D	IRIS	6/26/2003
1,1,1-Trichloroethane	N/A	N/A	N/A	N/A	N/A	D	IRIS	6/26/2003
1,1,2-Trichloroethane	1.6E-05	(ug/m3)-1	3,500	5.6E-02	(mg/kg/day)-1	C	IRIS	6/26/2003
Trichloroethene	N/A	N/A	N/A	2.0E-2 to 4.0E-1	(mg/kg/day)-1	Highly likely in humans	NCEA	08/00/2001
Vinyl chloride	8.8E-06 (Note 2)	$(ug/m^3)^{-1}$	3,500	3.1E-02	$(mg/kg\text{-}day)^{-1}$	A	IRIS	6/26/2003
Xylenes (total)	N/A	N/A	N/A	N/A	N/A	NA	IRIS	6/26/2003
Aluminum	N/A	N/A	N/A	N/A	N/A	D	NCEA	7/26/2001
Antimony	N/A	N/A	N/A	N/A	N/A	D	NCEA	3/24/1992
Arsenic	4.3E-03	$(ug/m^3)^{-1}$	3,500	1.5E+01	$(mg/kg\text{-}day)^{-1}$	A	IRIS	6/26/2003
Barium	N/A	N/A	N/A	N/A	N/A	D	IRIS	6/26/2003
Beryllium	2.4E-03	$(ug/m^3)^{-1}$	3,500	8.4E+00	$(mg/kg\text{-}day)^{-1}$	B1	IRIS	6/26/2003
Boron	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
Cadmium	1.8E-03	$(ug/m^3)^{-1}$	3,500	6.3E+00	$(mg/kg\text{-}day)^{-1}$	B1	IRIS	6/26/2003
Cerium	N/A	N/A	N/A	N/A	N/A	D	NCEA	4/8/2002
Chromium VI	1.2E-02	$(ug/m^3)^{-1}$	3,500	4.2E+01	$(mg/kg\text{-}day)^{-1}$	A	IRIS	6/26/2003
Chromium (III), insoluble salts	N/A	N/A	N/A	N/A	N/A	D	IRIS	6/26/2003
Cobalt	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
Copper	N/A	N/A	N/A	N/A	N/A	D	IRIS	6/26/2003
Dysprosium	N/A	N/A	N/A	N/A	N/A	D	NCEA	10/29/1998
Iron	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
Lanthanum	N/A	N/A	N/A	N/A	N/A	D	NCEA	9/11/1998
Lead	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
Lithium	N/A	N/A	N/A	N/A	N/A	D	NCEA	10/7/1992
Manganese	N/A	N/A	N/A	N/A	N/A	D	IRIS	6/26/2003

TABLE 6.2
CANCER TOXICITY DATA -- INHALATION
FUSRAP MAYWOOD SUPERFUND SITE

Chemical of Potential Concern	Unit Risk	Units	Adjustment	Inhalation Cancer Slope Factor	Units	Weight of Evidence/ Cancer Guideline Description	Source	Date (1) (MM/DD/YYYY)
Mercury (elemental)	N/A	N/A	N/A	N/A	N/A	D	IRIS	6/26/2003
Neodymium	N/A	N/A	N/A	N/A	N/A	D	NCEA	10/29/1998
Nickel (refinery dust)	2.4E-04	$(ug/m^3)^{-1}$	3,500	8.4E-01	$(mg/kg\text{-}day)^{-1}$	A	IRIS	6/26/2003
Selenium	N/A	N/A	N/A	N/A	N/A	D	IRIS	6/26/2003
Silver	N/A	N/A	N/A	N/A	N/A	D	IRIS	6/26/2003
Thallium	N/A	N/A	N/A	N/A	N/A	D	IRIS	6/26/2003
Vanadium	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
Yttrium	N/A	N/A	N/A	N/A	N/A	N/A	IRIS	6/26/2003
Zinc	N/A	N/A	N/A	N/A	N/A	D	IRIS	6/26/2003
Ra-226	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Ra-228	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Th-228	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Th-230	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Th-232	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-234 (Uranium, soluble salts)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-235 (Uranium, soluble salts)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
U-238 (Uranium, soluble salts)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Total Uranium	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

IRIS = Integrated Risk Information System
HEAST= Health Effects Assessment Summary Tables

Weight of Evidence:
Known/Likely
Cannot be Determined
Not Likely

(1) For IRIS values, provide the date IRIS was searched.
For HEAST values, provide the date of HEAST.
For NCEA values, provide the date of the article provided by NCEA.

Note 1: For cis-1,2-Dichloroethene
Note 2: For continuous lifetime exposure from birth

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 carcinogen
D - Not classifiable as a human carcinogen
E - Evidence of noncarcinogenicity

TABLE 6.4

CANCER TOXICITY DATA -- EXTERNAL (RADIATION)

FUSRAP MAYWOOD SUPERFUND SITE

Chemical of Potential Concern	Cancer Slope Factor		Source(s)	Date(s) (MM/DD/YYYY)
	Value	Units		
Radium 226 + D	8.49E-06	Risk/year per pCi/g	HEAST	4/16/2001
Radium 228 + D	4.53E-06	Risk/year per pCi/g	HEAST	4/16/2001
Thorium 228 + D	7.76E-06	Risk/year per pCi/g	HEAST	4/16/2001
Thorium 230	8.19E-10	Risk/year per pCi/g	HEAST	4/16/2001
Thorium 232	3.42E-10	Risk/year per pCi/g	HEAST	4/16/2001
Uranium 234	2.52E-10	Risk/year per pCi/g	HEAST	4/16/2001
Uranium 235 + D	5.43E-07	Risk/year per pCi/g	HEAST	4/16/2001
Uranium 238 + D	1.14E-07	Risk/year per pCi/g	HEAST	4/16/2001
Lead 210 + D	4.21E-09	Risk/year per pCi/g	HEAST	4/16/2001

HEAST= Health Effects Assessment Summary Tables

TABLE 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route		Chemical of Potential Concern	EPC		Cancer Risk Calculations (1)					Non-Cancer Hazard Calculations				
						Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
								Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Tap Water	Tap Water	Ingestion	67641	Acetone	9.15E-02	mg/l	8.6E-04	mg/kg-day	N/A	N/A	--	2.5E-03	mg/kg-day	3.0E-01	mg/kg-day	8E-03
				71432	Benzene	7.38E-01	mg/l	6.9E-03	mg/kg-day	5.5E-02	(mg/kg-day)-1	6E-04	2.0E-02	mg/kg-day	4.0E-03	mg/kg-day	5E+00
				108907	Chlorobenzene	3.01E-03	mg/l	2.8E-05	mg/kg-day	N/A	N/A	--	8.3E-05	mg/kg-day	2.0E-02	mg/kg-day	4E-03
				67663	Chloroform	2.70E-03	mg/l	2.5E-05	mg/kg-day	N/A	N/A	--	7.4E-05	mg/kg-day	1.0E-02	mg/kg-day	7E-03
				95498	2-Chlorotoluene	1.42E+00	mg/l	1.3E-02	mg/kg-day	N/A	N/A	--	3.9E-02	mg/kg-day	2.0E-02	mg/kg-day	2E+00
				106434	4-Chlorotoluene	7.64E-01	mg/l	7.2E-03	mg/kg-day	N/A	N/A	--	2.1E-02	mg/kg-day	N/A	N/A	--
				107062	1,2-Dichloroethane	6.90E-04	mg/l	6.5E-06	mg/kg-day	9.1E-02	(mg/kg-day)-1	9E-07	1.9E-05	mg/kg-day	2.0E-02	mg/kg-day	9E-04
				540590	1,2-Dichloroethene (total)	1.00E-02	mg/l	9.4E-05	mg/kg-day	N/A	N/A	--	2.8E-04	mg/kg-day	2.0E-02	mg/kg-day	1E-02
				100414	Ethylbenzene	7.60E-02	mg/l	7.1E-04	mg/kg-day	N/A	N/A	--	2.1E-03	mg/kg-day	1.0E-01	mg/kg-day	2E-02
				108101	4-Methyl-2-pentanone	1.12E-02	mg/l	1.0E-04	mg/kg-day	N/A	N/A	--	3.1E-04	mg/kg-day	3.0E-02	mg/kg-day	1E-02
				127184	Tetrachloroethene	3.87E-03	mg/l	3.6E-05	mg/kg-day	N/A	N/A	--	1.1E-04	mg/kg-day	1.0E-02	mg/kg-day	1E-02
				108883	Toluene	9.60E-02	mg/l	9.0E-04	mg/kg-day	N/A	N/A	--	2.6E-03	mg/kg-day	2.0E-01	mg/kg-day	1E-02
				79016	Trichloroethene	2.91E-03	mg/l	2.7E-05	mg/kg-day	4.0E-01	(mg/kg-day)-1	2E-05	8.0E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-01
				75014	Vinyl Chloride	1.66E-02	mg/l	1.6E-04	mg/kg-day	1.4E+00	(mg/kg-day)-1	3E-04	4.5E-04	mg/kg-day	3.0E-03	mg/kg-day	2E-01
				1330207	Xylenes (total)	3.16E-01	mg/l	3.0E-03	mg/kg-day	N/A	N/A	--	8.7E-03	mg/kg-day	2.0E-01	mg/kg-day	4E-02
				7429905	Aluminum	3.57E-01	mg/l	3.4E-03	mg/kg-day	N/A	N/A	--	9.8E-03	mg/kg-day	1.0E+00	mg/kg-day	1E-02
				7440360	Antimony	1.21E-03	mg/l	1.1E-05	mg/kg-day	N/A	N/A	--	3.3E-05	mg/kg-day	4.0E-04	mg/kg-day	8E-02
				7440382	Arsenic	1.91E-01	mg/l	1.8E-03	mg/kg-day	1.5E+00	(mg/kg-day)-1	4E-03	5.2E-03	mg/kg-day	3.0E-04	mg/kg-day	2E+01
				7440393	Barium	7.68E-01	mg/l	7.2E-03	mg/kg-day	N/A	N/A	--	2.1E-02	mg/kg-day	7.0E-02	mg/kg-day	3E-01
				7440428	Boron	3.91E-01	mg/l	3.7E-03	mg/kg-day	N/A	N/A	--	1.1E-02	mg/kg-day	9.0E-02	mg/kg-day	1E-01
				7440439	Cadmium	1.07E-03	mg/l	1.0E-05	mg/kg-day	N/A	N/A	--	2.9E-05	mg/kg-day	5.0E-04	mg/kg-day	6E-02
				7440451	Cerium	3.28E-02	mg/l	3.1E-04	mg/kg-day	N/A	N/A	--	9.0E-04	mg/kg-day	N/A	N/A	--
				7439896	Iron	7.32E+01	mg/l	6.9E-01	mg/kg-day	N/A	N/A	--	2.0E+00	mg/kg-day	3.0E-01	mg/kg-day	7E+00
				7439910	Lanthanum	2.83E-02	mg/l	2.7E-04	mg/kg-day	N/A	N/A	--	7.8E-04	mg/kg-day	N/A	N/A	--
				7439921	Lead	3.72E-03	mg/l	3.5E-05	mg/kg-day	N/A	N/A	--	1.0E-04	mg/kg-day	N/A	N/A	--
				7439932	Lithium	4.70E+00	mg/l	4.4E-02	mg/kg-day	N/A	N/A	--	1.3E-01	mg/kg-day	2.0E-02	mg/kg-day	6E+00
				7439965	Manganese	6.65E+00	mg/l	6.2E-02	mg/kg-day	N/A	N/A	--	1.8E-01	mg/kg-day	1.4E-01	mg/kg-day	1E+00
				7440008	Neodymium	1.65E-02	mg/l	1.5E-04	mg/kg-day	N/A	N/A	--	4.5E-04	mg/kg-day	1.0E-01	mg/kg-day	5E-03
				7440020	Nickel	2.54E-02	mg/l	2.4E-04	mg/kg-day	N/A	N/A	--	7.0E-04	mg/kg-day	2.0E-02	mg/kg-day	3E-02
				7440224	Silver	6.20E-04	mg/l	5.8E-06	mg/kg-day	N/A	N/A	--	1.7E-05	mg/kg-day	5.0E-03	mg/kg-day	3E-03
				7440655	Yttrium	3.17E-03	mg/l	3.0E-05	mg/kg-day	N/A	N/A	--	8.7E-05	mg/kg-day	N/A	N/A	--
				7440666	Zinc	4.81E-01	mg/l	4.5E-03	mg/kg-day	N/A	N/A	--	1.3E-02	mg/kg-day	3.0E-01	mg/kg-day	4E-02
				13966295	Total Uranium	3.22E-03	mg/l	3.0E-05	mg/kg-day	N/A	N/A	--	8.8E-05	mg/kg-day	3.0E-03	mg/kg-day	3E-02
			Exp. Route Total									5E-03					4E+01

TABLE 7.1.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route		Chemical of Potential Concern	EPC		Cancer Risk Calculations (1)					Non-Cancer Hazard Calculations				
						Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
								Value	Units	Value	Units		Value	Units	Value	Units	
			Dermal	108907	Chlorobenzene	3.01E-03	mg/l	4.0E-06	mg/kg-day	N/A	N/A	--	1.2E-05	mg/kg-day	3.1E+00	mg/kg-day	4E-06
				95498	2-Chlorotoluene	1.42E+00	mg/l	4.2E-03	mg/kg-day	N/A	N/A	--	1.2E-02	mg/kg-day	2.0E-02	mg/kg-day	6E-01
				106434	4-Chlorotoluene	7.64E-01	mg/l	2.3E-03	mg/kg-day	N/A	N/A	--	6.6E-03	mg/kg-day	N/A	N/A	--
				100414	Ethylbenzene	7.60E-02	mg/l	1.7E-04	mg/kg-day	N/A	N/A	--	5.0E-04	mg/kg-day	1.0E-01	mg/kg-day	5E-03
				127184	Tetrachloroethene	3.87E-03	mg/l	8.6E-06	mg/kg-day	N/A	N/A	--	2.5E-05	mg/kg-day	1.0E-02	mg/kg-day	3E-03
				108883	Toluene	9.60E-02	mg/l	1.2E-04	mg/kg-day	N/A	N/A	--	3.6E-04	mg/kg-day	2.0E-01	mg/kg-day	2E-03
				79016	Trichloroethene	2.91E-03	mg/l	1.8E-06	mg/kg-day	4.0E-01	(mg/kg-day)-1	1E-06	5.3E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
				1330207	Xylenes (total)	3.16E-01	mg/l	7.6E-04	mg/kg-day	N/A	N/A	--	2.2E-03	mg/kg-day	2.0E-01	mg/kg-day	1E-02
				7439910	Lanthanum	2.83E-02	mg/l	6.0E-07	mg/kg-day	N/A	N/A	--	1.7E-06	mg/kg-day	N/A	N/A	--
				7440008	Neodymium	1.65E-02	mg/l	3.5E-07	mg/kg-day	N/A	N/A	--	1.0E-06	mg/kg-day	1.0E-01	mg/kg-day	1E-05
				7440655	Yttrium	3.17E-03	mg/l	6.7E-08	mg/kg-day	N/A	N/A	--	2.0E-07	mg/kg-day	N/A	N/A	--
				7440666	Zinc	4.81E-01	mg/l	6.1E-06	mg/kg-day	N/A	N/A	--	1.8E-05	mg/kg-day	3.0E-01	mg/kg-day	6E-05
				13966295	Total Uranium	3.22E-03	mg/l	6.8E-08	mg/kg-day	N/A	N/A	--	2.0E-07	mg/kg-day	3.0E-03	mg/kg-day	7E-05
			Exp. Route Total									1E-06					7E-01
		Shower/Bathroom Air	Inhalation	67641	Acetone	2.65E-01	mg/m^3	6.0E-04	mg/kg-day	N/A	N/A	--	1.7E-03	mg/kg-day	N/A	N/A	--
				71432	Benzene	2.85E+00	mg/m^3	6.4E-03	mg/kg-day	2.7E-02	(mg/kg-day)-1	4E-04	1.9E-02	mg/kg-day	9E-03	mg/kg-day	2E+00
				108907	Chlorobenzene	1.07E-02	mg/m^3	2.4E-05	mg/kg-day	N/A	N/A	--	7.1E-05	mg/kg-day	2E-02	mg/kg-day	4E-03
				67663	Chloroform	1.05E-02	mg/m^3	2.4E-05	mg/kg-day	8.1E-02	(mg/kg-day)-1	4E-06	7.0E-05	mg/kg-day	1E-02	mg/kg-day	5E-03
				95498	2-Chlorotoluene	5.03E+00	mg/m^3	1.1E-02	mg/kg-day	N/A	N/A	--	3.3E-02	mg/kg-day	N/A	N/A	--
				106434	4-Chlorotoluene	2.70E+00	mg/m^3	6.1E-03	mg/kg-day	N/A	N/A	--	1.8E-02	mg/kg-day	N/A	N/A	--
				107062	1,2-Dichloroethane	2.65E-03	mg/m^3	6.0E-06	mg/kg-day	9.1E-02	(mg/kg-day)-1	1E-06	1.7E-05	mg/kg-day	1E-03	mg/kg-day	1E-02
				540590	1,2-Dichloroethene (total)	4.25E-02	mg/m^3	9.6E-05	mg/kg-day	N/A	N/A	--	2.8E-04	mg/kg-day	N/A	N/A	--
				100414	Ethylbenzene	2.52E-01	mg/m^3	5.7E-04	mg/kg-day	N/A	N/A	--	1.7E-03	mg/kg-day	N/A	N/A	--
				108101	4-Methyl-2-pentanone	3.23E-02	mg/m^3	7.3E-05	mg/kg-day	N/A	N/A	--	2.1E-04	mg/kg-day	9E-01	mg/kg-day	2E-04
				127184	Tetrachloroethene	1.33E-02	mg/m^3	3.0E-05	mg/kg-day	N/A	N/A	--	8.8E-05	mg/kg-day	N/A	N/A	--
				108883	Toluene	3.40E-01	mg/m^3	7.7E-04	mg/kg-day	N/A	N/A	--	2.2E-03	mg/kg-day	1E-01	mg/kg-day	2E-02
				79016	Trichloroethene	1.07E-02	mg/m^3	2.4E-05	mg/kg-day	4.0E-01	(mg/kg/day)-1	2E-05	7.0E-05	mg/kg-day	1E-02	mg/kg-day	6E-03
				75014	Vinyl Chloride	1.60E-02	mg/m^3	3.6E-05	mg/kg-day	3.1E-02	(mg/kg-day)-1	3E-06	1.1E-04	mg/kg-day	3E-02	mg/kg-day	4E-03
				1330207	Xylenes (total)	1.18E+00	mg/m^3	2.7E-03	mg/kg-day	N/A	N/A	--	7.8E-03	mg/kg-day	3E-02	mg/kg-day	3E-01
			Exp. Route Total									4E-04					3E+00
		Exposure Point Total (water ingestion)										5E-03					4E+01
		Exposure Point Total (shower scenario)										4E-04					3E+00
	Exposure Medium Total											6E-03					4E+01
Medium Total												6E-03					4E+01
										Total of Receptor Risks Across All Media		6E-03	Total of Receptor Hazards Across All Media				4E+01

TABLE 7.1.1.CT

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route		Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
						Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
								Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Tap Water	Tap Water	Ingestion	67641	Acetone	9.15E-02	mg/l	1.6E-04	mg/kg-day	N/A	N/A	--	1.3E-03	mg/kg-day	3.0E-01	mg/kg-day	4E-03
				71432	Benzene	7.38E-01	mg/l	1.3E-03	mg/kg-day	5.5E-02	(mg/kg-day)-1	7E-05	1.0E-02	mg/kg-day	4.0E-03	mg/kg-day	3E+00
				108907	Chlorobenzene	3.01E-03	mg/l	5.3E-06	mg/kg-day	N/A	N/A	--	4.1E-05	mg/kg-day	2.0E-02	mg/kg-day	2E-03
				67663	Chloroform	2.70E-03	mg/l	4.8E-06	mg/kg-day	N/A	N/A	--	3.7E-05	mg/kg-day	1.0E-02	mg/kg-day	4E-03
				95498	2-Chlorotoluene	1.42E+00	mg/l	2.5E-03	mg/kg-day	N/A	N/A	--	2.0E-02	mg/kg-day	2.0E-02	mg/kg-day	1E+00
				106434	4-Chlorotoluene	7.64E-01	mg/l	1.3E-03	mg/kg-day	N/A	N/A	--	1.0E-02	mg/kg-day	N/A	N/A	--
				107062	1,2-Dichloroethane	6.90E-04	mg/l	1.2E-06	mg/kg-day	9.1E-02	(mg/kg-day)-1	1E-07	9.5E-06	mg/kg-day	2.0E-02	mg/kg-day	5E-04
				540590	1,2-Dichloroethene (total)	1.00E-02	mg/l	1.8E-05	mg/kg-day	N/A	N/A	--	1.4E-04	mg/kg-day	2.0E-02	mg/kg-day	7E-03
				100414	Ethylbenzene	7.60E-02	mg/l	1.3E-04	mg/kg-day	N/A	N/A	--	1.0E-03	mg/kg-day	1.0E-01	mg/kg-day	1E-02
				108101	4-Methyl-2-pentanone	1.12E-02	mg/l	2.0E-05	mg/kg-day	N/A	N/A	--	1.5E-04	mg/kg-day	3.0E-02	mg/kg-day	5E-03
				127184	Tetrachloroethene	3.87E-03	mg/l	6.8E-06	mg/kg-day	N/A	N/A	--	5.3E-05	mg/kg-day	1.0E-02	mg/kg-day	5E-03
				108883	Toluene	9.60E-02	mg/l	1.7E-04	mg/kg-day	N/A	N/A	--	1.3E-03	mg/kg-day	2.0E-01	mg/kg-day	7E-03
				79016	Trichloroethene	2.91E-03	mg/l	5.1E-06	mg/kg-day	4.0E-01	(mg/kg-day)-1	2E-06	4.0E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
				75014	Vinyl Chloride	1.66E-02	mg/l	2.9E-05	mg/kg-day	1.4E+00	(mg/kg-day)-1	4E-05	2.3E-04	mg/kg-day	3.0E-03	mg/kg-day	8E-02
				1330207	Xylenes (total)	3.16E-01	mg/l	5.6E-04	mg/kg-day	N/A	N/A	--	4.3E-03	mg/kg-day	2.0E-01	mg/kg-day	2E-02
				7429905	Aluminum	3.57E-01	mg/l	6.3E-04	mg/kg-day	N/A	N/A	--	4.9E-03	mg/kg-day	1.0E+00	mg/kg-day	5E-03
				7440360	Antimony	1.21E-03	mg/l	2.1E-06	mg/kg-day	N/A	N/A	--	1.7E-05	mg/kg-day	4.0E-04	mg/kg-day	4E-02
				7440382	Arsenic	1.91E-01	mg/l	3.4E-04	mg/kg-day	1.5E+00	(mg/kg-day)-1	5E-04	2.6E-03	mg/kg-day	3.0E-04	mg/kg-day	9E+00
				7440393	Barium	7.68E-01	mg/l	1.4E-03	mg/kg-day	N/A	N/A	--	1.1E-02	mg/kg-day	7.0E-02	mg/kg-day	2E-01
				7440428	Boron	3.91E-01	mg/l	6.9E-04	mg/kg-day	N/A	N/A	--	5.4E-03	mg/kg-day	9.0E-02	mg/kg-day	6E-02
				7440439	Cadmium	1.07E-03	mg/l	1.9E-06	mg/kg-day	N/A	N/A	--	1.5E-05	mg/kg-day	5.0E-04	mg/kg-day	3E-02
				7440451	Cerium	3.28E-02	mg/l	5.8E-05	mg/kg-day	N/A	N/A	--	4.5E-04	mg/kg-day	N/A	N/A	--
				7439896	Iron	7.32E+01	mg/l	1.3E-01	mg/kg-day	N/A	N/A	--	1.0E+00	mg/kg-day	3.0E-01	mg/kg-day	3E+00
				7439910	Lanthanum	2.83E-02	mg/l	5.0E-05	mg/kg-day	N/A	N/A	--	3.9E-04	mg/kg-day	N/A	N/A	--
				7439921	Lead	3.72E-03	mg/l	6.6E-06	mg/kg-day	N/A	N/A	--	5.1E-05	mg/kg-day	N/A	N/A	--
				7439932	Lithium	4.70E+00	mg/l	8.3E-03	mg/kg-day	N/A	N/A	--	6.4E-02	mg/kg-day	2.0E-02	mg/kg-day	3E+00
				7439965	Manganese	6.65E+00	mg/l	1.2E-02	mg/kg-day	N/A	N/A	--	9.1E-02	mg/kg-day	1.4E-01	mg/kg-day	7E-01
				7440008	Neodymium	1.65E-02	mg/l	2.9E-05	mg/kg-day	N/A	N/A	--	2.3E-04	mg/kg-day	1.0E-01	mg/kg-day	2E-03
				7440020	Nickel	2.54E-02	mg/l	4.5E-05	mg/kg-day	N/A	N/A	--	3.5E-04	mg/kg-day	2.0E-02	mg/kg-day	2E-02
				7440224	Silver	6.20E-04	mg/l	1.1E-06	mg/kg-day	N/A	N/A	--	8.5E-06	mg/kg-day	5.0E-03	mg/kg-day	2E-03
				7440655	Yttrium	3.17E-03	mg/l	5.6E-06	mg/kg-day	N/A	N/A	--	4.3E-05	mg/kg-day	N/A	N/A	--
				7440666	Zinc	4.81E-01	mg/l	8.5E-04	mg/kg-day	N/A	N/A	--	6.6E-03	mg/kg-day	3.0E-01	mg/kg-day	2E-02
				13966295	Total Uranium	3.22E-03	mg/l	5.7E-06	mg/kg-day	N/A	N/A	--	4.4E-05	mg/kg-day	3.0E-03	mg/kg-day	1E-02
			Exp. Route Total									6E-04					2E+01

TABLE 7.1.1.CT

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route		Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
						Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
								Value	Units	Value	Units		Value	Units	Value	Units	
			Dermal	108907	Chlorobenzene	3.01E-03	mg/l	1.0E-06	mg/kg-day	N/A	N/A	--	7.8E-06	mg/kg-day	3.1E+00	mg/kg-day	3E-06
				95498	2-Chlorotoluene	1.42E+00	mg/l	1.0E-03	mg/kg-day	N/A	N/A	--	8.2E-03	mg/kg-day	2.0E-02	mg/kg-day	4E-01
				106434	4-Chlorotoluene	7.64E-01	mg/l	5.6E-04	mg/kg-day	N/A	N/A	--	4.4E-03	mg/kg-day	N/A	N/A	--
				100414	Ethylbenzene	7.60E-02	mg/l	4.2E-05	mg/kg-day	N/A	N/A	--	3.3E-04	mg/kg-day	1.0E-01	mg/kg-day	3E-03
				127184	Tetrachloroethene	3.87E-03	mg/l	2.1E-06	mg/kg-day	N/A	N/A	--	1.7E-05	mg/kg-day	1.0E-02	mg/kg-day	2E-03
				108883	Toluene	9.60E-02	mg/l	3.1E-05	mg/kg-day	N/A	N/A	--	2.4E-04	mg/kg-day	2.0E-01	mg/kg-day	1E-03
				79016	Trichloroethene	2.91E-03	mg/l	4.5E-07	mg/kg-day	4.0E-01	(mg/kg-day)-1	2E-07	3.5E-06	mg/kg-day	3.0E-04	mg/kg-day	1E-02
				1330207	Xylenes (total)	3.16E-01	mg/l	1.9E-04	mg/kg-day	N/A	N/A	--	1.5E-03	mg/kg-day	2.0E-01	mg/kg-day	7E-03
				7439910	Lanthanum	2.83E-02	mg/l	9.9E-08	mg/kg-day	N/A	N/A	--	7.7E-07	mg/kg-day	N/A	N/A	--
				7440008	Neodymium	1.65E-02	mg/l	5.8E-08	mg/kg-day	N/A	N/A	--	4.5E-07	mg/kg-day	1.0E-01	mg/kg-day	4E-06
				7440655	Yttrium	3.17E-03	mg/l	1.1E-08	mg/kg-day	N/A	N/A	--	8.6E-08	mg/kg-day	N/A	N/A	--
				7440666	Zinc	4.81E-01	mg/l	1.0E-06	mg/kg-day	N/A	N/A	--	7.8E-06	mg/kg-day	3.0E-01	mg/kg-day	3E-05
				13966295	Total Uranium	3.22E-03	mg/l	1.1E-08	mg/kg-day	N/A	N/A	--	8.7E-08	mg/kg-day	3.0E-03	mg/kg-day	3E-05
			Exp. Route Total									2E-07					4E-01
		Shower/Bathroom Air	Inhalation	67641	Acetone	1.16E-01	mg/m^3	4.2E-05	mg/kg-day	N/A	N/A	--	9.9E-05	mg/kg-day	N/A	N/A	--
				71432	Benzene	1.25E+00	mg/m^3	4.6E-04	mg/kg-day	2.7E-02	(mg/kg-day)-1	1E-05	1.1E-03	mg/kg-day	9E-03	mg/kg-day	1E-01
				108907	Chlorobenzene	4.68E-03	mg/m^3	1.7E-06	mg/kg-day	N/A	N/A	--	4.0E-06	mg/kg-day	2E-02	mg/kg-day	2E-04
				67663	Chloroform	4.61E-03	mg/m^3	1.7E-06	mg/kg-day	8.1E-02	(mg/kg-day)-1	1E-07	3.9E-06	mg/kg-day	1E-02	mg/kg-day	3E-04
				95498	2-Chlorotoluene	2.20E+00	mg/m^3	8.0E-04	mg/kg-day	N/A	N/A	--	1.9E-03	mg/kg-day	N/A	N/A	--
				106434	4-Chlorotoluene	1.18E+00	mg/m^3	4.3E-04	mg/kg-day	N/A	N/A	--	1.0E-03	mg/kg-day	N/A	N/A	--
				107062	1,2-Dichloroethane	1.16E-03	mg/m^3	4.2E-07	mg/kg-day	9.1E-02	(mg/kg-day)-1	4E-08	9.9E-07	mg/kg-day	1E-03	mg/kg-day	7E-04
				540590	1,2-Dichloroethene (total)	1.86E-02	mg/m^3	6.8E-06	mg/kg-day	N/A	N/A	--	1.6E-05	mg/kg-day	N/A	N/A	--
				100414	Ethylbenzene	1.10E-01	mg/m^3	4.0E-05	mg/kg-day	N/A	N/A	--	9.4E-05	mg/kg-day	N/A	N/A	--
				108101	4-Methyl-2-pentanone	1.41E-02	mg/m^3	5.2E-06	mg/kg-day	N/A	N/A	--	1.2E-05	mg/kg-day	9E-01	mg/kg-day	1E-05
				127184	Tetrachloroethene	5.81E-03	mg/m^3	2.1E-06	mg/kg-day	N/A	N/A	--	5.0E-06	mg/kg-day	N/A	N/A	--
				108883	Toluene	1.49E-01	mg/m^3	5.4E-05	mg/kg-day	N/A	N/A	--	1.3E-04	mg/kg-day	1E-01	mg/kg-day	1E-03
				79016	Trichloroethene	4.67E-03	mg/m^3	1.7E-06	mg/kg-day	4.0E-01	(mg/kg/day)-1	7E-07	4.0E-06	mg/kg-day	1E-02	mg/kg-day	3E-04
				75014	Vinyl Chloride	7.00E-03	mg/m^3	2.6E-06	mg/kg-day	3.1E-02	(mg/kg-day)-1	8E-08	6.0E-06	mg/kg-day	3E-02	mg/kg-day	2E-04
				1330207	Xylenes (total)	5.17E-01	mg/m^3	1.9E-04	mg/kg-day	N/A	N/A	--	4.4E-04	mg/kg-day	3E-02	mg/kg-day	2E-02
			Exp. Route Total									1E-05					1E-01
		Exposure Point Total (water ingestion)										6E-04					2E+01
		Exposure Point Total (shower scenario)										1E-05					6E-01
	Exposure Medium Total											6E-04					2E+01
Medium Total												6E-04					2E+01
											Total of Receptor Risks Across All Media	6E-04	Total of Receptor Hazards Across All Media				2E+01

TABLE 7.2.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route		Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
						Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
								Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Tap Water	Tap Water	Ingestion	67641	Acetone	9.15E-02	mg/l	5.0E-04	mg/kg-day	N/A	N/A	--	5.9E-03	mg/kg-day	3.0E-01	mg/kg-day	2E-02
				71432	Benzene	7.38E-01	mg/l	4.0E-03	mg/kg-day	5.5E-02	(mg/kg-day)-1	2E-04	4.7E-02	mg/kg-day	4.0E-03	mg/kg-day	1E+01
				108907	Chlorobenzene	3.01E-03	mg/l	1.7E-05	mg/kg-day	N/A	N/A	--	1.9E-04	mg/kg-day	2.0E-02	mg/kg-day	1E-02
				67663	Chloroform	2.70E-03	mg/l	1.5E-05	mg/kg-day	N/A	N/A	--	1.7E-04	mg/kg-day	1.0E-02	mg/kg-day	2E-02
				95498	2-Chlorotoluene	1.42E+00	mg/l	7.8E-03	mg/kg-day	N/A	N/A	--	9.1E-02	mg/kg-day	2.0E-02	mg/kg-day	5E+00
				106434	4-Chlorotoluene	7.64E-01	mg/l	4.2E-03	mg/kg-day	N/A	N/A	--	4.9E-02	mg/kg-day	N/A	N/A	--
				107062	1,2-Dichloroethane	6.90E-04	mg/l	3.8E-06	mg/kg-day	9.1E-02	(mg/kg-day)-1	3E-07	4.4E-05	mg/kg-day	2.0E-02	mg/kg-day	2E-03
				540590	1,2-Dichloroethene (total)	1.00E-02	mg/l	5.5E-05	mg/kg-day	N/A	N/A	--	6.4E-04	mg/kg-day	2.0E-02	mg/kg-day	3E-02
				100414	Ethylbenzene	7.60E-02	mg/l	4.2E-04	mg/kg-day	N/A	N/A	--	4.9E-03	mg/kg-day	1.0E-01	mg/kg-day	5E-02
				108101	4-Methyl-2-pentanone	1.12E-02	mg/l	6.1E-05	mg/kg-day	N/A	N/A	--	7.1E-04	mg/kg-day	3.0E-02	mg/kg-day	2E-02
				127184	Tetrachloroethene	3.87E-03	mg/l	2.1E-05	mg/kg-day	N/A	N/A	--	2.5E-04	mg/kg-day	1.0E-02	mg/kg-day	2E-02
				108883	Toluene	9.60E-02	mg/l	5.3E-04	mg/kg-day	N/A	N/A	--	6.1E-03	mg/kg-day	2.0E-01	mg/kg-day	3E-02
				79016	Trichloroethene	2.91E-03	mg/l	1.6E-05	mg/kg-day	4.0E-01	(mg/kg-day)-1	6E-06	1.9E-04	mg/kg-day	3.0E-04	mg/kg-day	6E-01
				75014	Vinyl Chloride	1.66E-02	mg/l	9.1E-05	mg/kg-day	1.4E+00	(mg/kg-day)-1	1E-04	1.1E-03	mg/kg-day	3.0E-03	mg/kg-day	4E-01
				1330207	Xylenes (total)	3.16E-01	mg/l	1.7E-03	mg/kg-day	N/A	N/A	--	2.0E-02	mg/kg-day	2.0E-01	mg/kg-day	1E-01
				7429905	Aluminum	3.57E-01	mg/l	2.0E-03	mg/kg-day	N/A	N/A	--	2.3E-02	mg/kg-day	1.0E+00	mg/kg-day	2E-02
				7440360	Antimony	1.21E-03	mg/l	6.6E-06	mg/kg-day	N/A	N/A	--	7.7E-05	mg/kg-day	4.0E-04	mg/kg-day	2E-01
				7440382	Arsenic	1.91E-01	mg/l	1.0E-03	mg/kg-day	1.5E+00	(mg/kg-day)-1	2E-03	1.2E-02	mg/kg-day	3.0E-04	mg/kg-day	4E+01
				7440393	Barium	7.68E-01	mg/l	4.2E-03	mg/kg-day	N/A	N/A	--	4.9E-02	mg/kg-day	7.0E-02	mg/kg-day	7E-01
				7440428	Boron	3.91E-01	mg/l	2.1E-03	mg/kg-day	N/A	N/A	--	2.5E-02	mg/kg-day	9.0E-02	mg/kg-day	3E-01
				7440439	Cadmium	1.07E-03	mg/l	5.9E-06	mg/kg-day	N/A	N/A	--	6.9E-05	mg/kg-day	5.0E-04	mg/kg-day	1E-01
				7440451	Cerium	3.28E-02	mg/l	1.8E-04	mg/kg-day	N/A	N/A	--	2.1E-03	mg/kg-day	N/A	N/A	--
				7439896	Iron	7.32E+01	mg/l	4.0E-01	mg/kg-day	N/A	N/A	--	4.7E+00	mg/kg-day	3.0E-01	mg/kg-day	2E+01
				7439910	Lanthanum	2.83E-02	mg/l	1.6E-04	mg/kg-day	N/A	N/A	--	1.8E-03	mg/kg-day	N/A	N/A	--
				7439921	Lead	3.72E-03	mg/l	2.0E-05	mg/kg-day	N/A	N/A	--	2.4E-04	mg/kg-day	N/A	N/A	--
				7439932	Lithium	4.70E+00	mg/l	2.6E-02	mg/kg-day	N/A	N/A	--	3.0E-01	mg/kg-day	2.0E-02	mg/kg-day	2E+01
				7439965	Manganese	6.65E+00	mg/l	3.6E-02	mg/kg-day	N/A	N/A	--	4.3E-01	mg/kg-day	1.4E-01	mg/kg-day	3E+00
				7440008	Neodymium	1.65E-02	mg/l	9.0E-05	mg/kg-day	N/A	N/A	--	1.1E-03	mg/kg-day	1.0E-01	mg/kg-day	1E-02
				7440020	Nickel	2.54E-02	mg/l	1.4E-04	mg/kg-day	N/A	N/A	--	1.6E-03	mg/kg-day	2.0E-02	mg/kg-day	8E-02
				7440224	Silver	6.20E-04	mg/l	3.4E-06	mg/kg-day	N/A	N/A	--	4.0E-05	mg/kg-day	5.0E-03	mg/kg-day	8E-03
				7440655	Yttrium	3.17E-03	mg/l	1.7E-05	mg/kg-day	N/A	N/A	--	2.0E-04	mg/kg-day	N/A	N/A	--
				7440666	Zinc	4.81E-01	mg/l	2.6E-03	mg/kg-day	N/A	N/A	--	3.1E-02	mg/kg-day	3.0E-01	mg/kg-day	1E-01
				13966295	Total Uranium	3.22E-03	mg/l	1.8E-05	mg/kg-day	N/A	N/A	--	2.1E-04	mg/kg-day	3.0E-03	mg/kg-day	7E-02
			Exp. Route Total									2E-03					9E+01

TABLE 7.2.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route		Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
						Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
								Value	Units	Value	Units		Value	Units	Value	Units	
			Dermal	108907	Chlorobenzene	3.01E-03	mg/l	2.3E-06	mg/kg-day	N/A	N/A	--	2.7E-05	mg/kg-day	3.1E+00	mg/kg-day	9E-06
				95498	2-Chlorotoluene	1.42E+00	mg/l	2.4E-03	mg/kg-day	N/A	N/A	--	2.8E-02	mg/kg-day	2.0E-02	mg/kg-day	1E+00
				106434	4-Chlorotoluene	7.64E-01	mg/l	1.3E-03	mg/kg-day	N/A	N/A	--	1.5E-02	mg/kg-day	N/A	N/A	--
				100414	Ethylbenzene	7.60E-02	mg/l	9.8E-05	mg/kg-day	N/A	N/A	--	1.1E-03	mg/kg-day	1.0E-01	mg/kg-day	1E-02
				127184	Tetrachloroethene	3.87E-03	mg/l	4.9E-06	mg/kg-day	N/A	N/A	--	5.8E-05	mg/kg-day	1.0E-02	mg/kg-day	6E-03
				108883	Toluene	9.60E-02	mg/l	7.1E-05	mg/kg-day	N/A	N/A	--	8.3E-04	mg/kg-day	2.0E-01	mg/kg-day	4E-03
				79016	Trichloroethene	2.91E-03	mg/l	1.0E-06	mg/kg-day	4.0E-01	(mg/kg-day)-1	4E-07	1.2E-05	mg/kg-day	3.0E-04	mg/kg-day	4E-02
				1330207	Xylenes (total)	3.16E-01	mg/l	4.4E-04	mg/kg-day	N/A	N/A	--	5.1E-03	mg/kg-day	2.0E-01	mg/kg-day	3E-02
				7440439	Cadmium	1.07E-03	mg/l	5.8E-09	mg/kg-day	N/A	N/A	--	6.8E-08	mg/kg-day	2.5E-05	mg/kg-day	3E-03
				7440451	Cerium	3.28E-02	mg/l	1.8E-07	mg/kg-day	N/A	N/A	--	2.1E-06	mg/kg-day	N/A	N/A	--
				7439910	Lanthanum	2.83E-02	mg/l	1.5E-07	mg/kg-day	N/A	N/A	--	1.8E-06	mg/kg-day	N/A	N/A	--
				7440008	Neodymium	1.65E-02	mg/l	8.9E-08	mg/kg-day	N/A	N/A	--	1.0E-06	mg/kg-day	1.0E-01	mg/kg-day	1E-05
				7440655	Yttrium	3.17E-03	mg/l	1.7E-08	mg/kg-day	N/A	N/A	--	2.0E-07	mg/kg-day	N/A	N/A	--
				7440666	Zinc	4.81E-01	mg/l	1.6E-06	mg/kg-day	N/A	N/A	--	1.8E-05	mg/kg-day	3.0E-01	mg/kg-day	6E-05
				13966295	Total Uranium	1.15E-03	mg/l	6.2E-09	mg/kg-day	N/A	N/A	--	7.3E-08	mg/kg-day	3.0E-03	mg/kg-day	2E-05
			Exp. Route Total									4E-07					2E+00
		Shower/Bathroom Air	Inhalation	67641	Acetone	4.71E-01	mg/m^3	7.7E-04	mg/kg-day	N/A	N/A	--	9.0E-03	mg/kg-day	N/A	N/A	--
				71432	Benzene	5.07E+00	mg/m^3	8.3E-03	mg/kg-day	2.7E-02	(mg/kg-day)-1	2E-04	9.7E-02	mg/kg-day	9E-03	mg/kg-day	1E+01
				108907	Chlorobenzene	1.90E-02	mg/m^3	3.1E-05	mg/kg-day	N/A	N/A	--	3.6E-04	mg/kg-day	2E-02	mg/kg-day	2E-02
				67663	Chloroform	1.87E-02	mg/m^3	3.1E-05	mg/kg-day	8.1E-02	(mg/kg-day)-1	2E-06	3.6E-04	mg/kg-day	1E-02	mg/kg-day	3E-02
				95498	2-Chlorotoluene	8.95E+00	mg/m^3	1.5E-02	mg/kg-day	N/A	N/A	--	1.7E-01	mg/kg-day	N/A	N/A	--
				106434	4-Chlorotoluene	4.80E+00	mg/m^3	7.9E-03	mg/kg-day	N/A	N/A	--	9.2E-02	mg/kg-day	N/A	N/A	--
				107062	1,2-Dichloroethane	4.71E-03	mg/m^3	7.7E-06	mg/kg-day	9.1E-02	(mg/kg-day)-1	7E-07	9.0E-05	mg/kg-day	1E-03	mg/kg-day	6E-02
				540590	1,2-Dichloroethene (total)	7.56E-02	mg/m^3	1.2E-04	mg/kg-day	N/A	N/A	--	1.5E-03	mg/kg-day	N/A	N/A	--
				100414	Ethylbenzene	4.48E-01	mg/m^3	7.4E-04	mg/kg-day	N/A	N/A	--	8.6E-03	mg/kg-day	N/A	N/A	--
				108101	4-Methyl-2-pentanone	5.74E-02	mg/m^3	9.4E-05	mg/kg-day	N/A	N/A	--	1.1E-03	mg/kg-day	9E-01	mg/kg-day	1E-03
				127184	Tetrachloroethene	2.36E-02	mg/m^3	3.9E-05	mg/kg-day	N/A	N/A	--	4.5E-04	mg/kg-day	N/A	N/A	--
				108883	Toluene	6.04E-01	mg/m^3	9.9E-04	mg/kg-day	N/A	N/A	--	1.2E-02	mg/kg-day	1E-01	mg/kg-day	1E-01
				79016	Trichloroethene	1.90E-02	mg/m^3	3.1E-05	mg/kg-day	4.0E-01	(mg/kg/day)-1	1E-05	3.6E-04	mg/kg-day	1E-02	mg/kg-day	3E-02
				75014	Vinyl Chloride	2.85E-02	mg/m^3	4.7E-05	mg/kg-day	3.1E-02	(mg/kg-day)-1	1E-06	5.5E-04	mg/kg-day	3E-02	mg/kg-day	2E-02
				1330207	Xylenes (total)	2.10E+00	mg/m^3	3.5E-03	mg/kg-day	N/A	N/A	--	4.0E-02	mg/kg-day	3E-02	mg/kg-day	1E+00
			Exp. Route Total									2E-04					1E+01
		Exposure Point Total (water ingestion)										2E-03					9E+01
		Exposure Point Total (shower scenario)										2E-04					1E+01
	Exposure Medium Total											2E-03					1E+02
Medium Total												2E-03					1E+02
										Total of Receptor Risks Across All Media		2E-03		Total of Receptor Hazards Across All Media			1E+02

TABLE 7.2.1.CT

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route		Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
						Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
								Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Tap Water	Tap Water	Ingestion	67641	Acetone	9.15E-02	mg/l	2.5E-04	mg/kg-day	N/A	N/A	--	2.9E-03	mg/kg-day	3.0E-01	mg/kg-day	1E-02
				71432	Benzene	7.38E-01	mg/l	2.0E-03	mg/kg-day	5.5E-02	(mg/kg-day)-1	1E-04	2.4E-02	mg/kg-day	4.0E-03	mg/kg-day	6E+00
				108907	Chlorobenzene	3.01E-03	mg/l	8.3E-06	mg/kg-day	N/A	N/A	--	9.6E-05	mg/kg-day	2.0E-02	mg/kg-day	5E-03
				67663	Chloroform	2.70E-03	mg/l	7.4E-06	mg/kg-day	N/A	N/A	--	8.6E-05	mg/kg-day	1.0E-02	mg/kg-day	9E-03
				95498	2-Chlorotoluene	1.42E+00	mg/l	3.9E-03	mg/kg-day	N/A	N/A	--	4.6E-02	mg/kg-day	2.0E-02	mg/kg-day	2E+00
				106434	4-Chlorotoluene	7.64E-01	mg/l	2.1E-03	mg/kg-day	N/A	N/A	--	2.4E-02	mg/kg-day	N/A	N/A	--
				107062	1,2-Dichloroethane	6.90E-04	mg/l	1.9E-06	mg/kg-day	9.1E-02	(mg/kg-day)-1	2E-07	2.2E-05	mg/kg-day	2.0E-02	mg/kg-day	1E-03
				540590	1,2-Dichloroethene (total)	1.00E-02	mg/l	2.8E-05	mg/kg-day	N/A	N/A	--	3.2E-04	mg/kg-day	2.0E-02	mg/kg-day	2E-02
				100414	Ethylbenzene	7.60E-02	mg/l	2.1E-04	mg/kg-day	N/A	N/A	--	2.4E-03	mg/kg-day	1.0E-01	mg/kg-day	2E-02
				108101	4-Methyl-2-pentanone	1.12E-02	mg/l	3.1E-05	mg/kg-day	N/A	N/A	--	3.6E-04	mg/kg-day	3.0E-02	mg/kg-day	1E-02
				127184	Tetrachloroethene	3.87E-03	mg/l	1.1E-05	mg/kg-day	N/A	N/A	--	1.2E-04	mg/kg-day	1.0E-02	mg/kg-day	1E-02
				108883	Toluene	9.60E-02	mg/l	2.6E-04	mg/kg-day	N/A	N/A	--	3.1E-03	mg/kg-day	2.0E-01	mg/kg-day	2E-02
				79016	Trichloroethene	2.91E-03	mg/l	8.0E-06	mg/kg-day	4.0E-01	(mg/kg-day)-1	3E-06	9.3E-05	mg/kg-day	3.0E-04	mg/kg-day	3E-01
				75014	Vinyl Chloride	1.66E-02	mg/l	4.5E-05	mg/kg-day	1.4E+00	(mg/kg-day)-1	6E-05	5.3E-04	mg/kg-day	3.0E-03	mg/kg-day	2E-01
				1330207	Xylenes (total)	3.16E-01	mg/l	8.7E-04	mg/kg-day	N/A	N/A	--	1.0E-02	mg/kg-day	2.0E-01	mg/kg-day	5E-02
				7429905	Aluminum	3.57E-01	mg/l	9.8E-04	mg/kg-day	N/A	N/A	--	1.1E-02	mg/kg-day	1.0E+00	mg/kg-day	1E-02
				7440360	Antimony	1.21E-03	mg/l	3.3E-06	mg/kg-day	N/A	N/A	--	3.9E-05	mg/kg-day	4.0E-04	mg/kg-day	1E-01
				7440382	Arsenic	1.91E-01	mg/l	5.2E-04	mg/kg-day	1.5E+00	(mg/kg-day)-1	8E-04	6.1E-03	mg/kg-day	3.0E-04	mg/kg-day	2E+01
				7440393	Barium	7.68E-01	mg/l	2.1E-03	mg/kg-day	N/A	N/A	--	2.5E-02	mg/kg-day	7.0E-02	mg/kg-day	4E-01
				7440428	Boron	3.91E-01	mg/l	1.1E-03	mg/kg-day	N/A	N/A	--	1.2E-02	mg/kg-day	9.0E-02	mg/kg-day	1E-01
				7440439	Cadmium	1.07E-03	mg/l	2.9E-06	mg/kg-day	N/A	N/A	--	3.4E-05	mg/kg-day	5.0E-04	mg/kg-day	7E-02
				7440451	Cerium	3.28E-02	mg/l	9.0E-05	mg/kg-day	N/A	N/A	--	1.0E-03	mg/kg-day	N/A	N/A	--
				7439896	Iron	7.32E+01	mg/l	2.0E-01	mg/kg-day	N/A	N/A	--	2.3E+00	mg/kg-day	3.0E-01	mg/kg-day	8E+00
				7439910	Lanthanum	2.83E-02	mg/l	7.8E-05	mg/kg-day	N/A	N/A	--	9.1E-04	mg/kg-day	N/A	N/A	--
				7439921	Lead	3.72E-03	mg/l	1.0E-05	mg/kg-day	N/A	N/A	--	1.2E-04	mg/kg-day	N/A	N/A	--
				7439932	Lithium	4.70E+00	mg/l	1.3E-02	mg/kg-day	N/A	N/A	--	1.5E-01	mg/kg-day	2.0E-02	mg/kg-day	8E+00
				7439965	Manganese	6.65E+00	mg/l	1.8E-02	mg/kg-day	N/A	N/A	--	2.1E-01	mg/kg-day	1.4E-01	mg/kg-day	2E+00
				7440008	Neodymium	1.65E-02	mg/l	4.5E-05	mg/kg-day	N/A	N/A	--	5.3E-04	mg/kg-day	1.0E-01	mg/kg-day	5E-03
				7440020	Nickel	2.54E-02	mg/l	7.0E-05	mg/kg-day	N/A	N/A	--	8.1E-04	mg/kg-day	2.0E-02	mg/kg-day	4E-02
				7440224	Silver	6.20E-04	mg/l	1.7E-06	mg/kg-day	N/A	N/A	--	2.0E-05	mg/kg-day	5.0E-03	mg/kg-day	4E-03
				7440655	Yttrium	3.17E-03	mg/l	8.7E-06	mg/kg-day	N/A	N/A	--	1.0E-04	mg/kg-day	N/A	N/A	--
				7440666	Zinc	4.81E-01	mg/l	1.3E-03	mg/kg-day	N/A	N/A	--	1.5E-02	mg/kg-day	3.0E-01	mg/kg-day	5E-02
				13966295	Total Uranium	3.22E-03	mg/l	8.8E-06	mg/kg-day	N/A	N/A	--	1.0E-04	mg/kg-day	3.0E-03	mg/kg-day	3E-02
			Exp. Route Total									1E-03					5E+01

TABLE 7.2.1.CT

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route		Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
						Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
								Value	Units	Value	Units		Value	Units	Value	Units	
			Dermal	108907	Chlorobenzene	3.01E-03	mg/l	1.3E-06	mg/kg-day	N/A	N/A	--	1.6E-05	mg/kg-day	3.1E+00	mg/kg-day	5E-06
				95498	2-Chlorotoluene	1.42E+00	mg/l	1.4E-03	mg/kg-day	N/A	N/A	--	1.6E-02	mg/kg-day	2.0E-02	mg/kg-day	8E-01
				106434	4-Chlorotoluene	7.64E-01	mg/l	7.5E-04	mg/kg-day	N/A	N/A	--	8.8E-03	mg/kg-day	N/A	N/A	--
				100414	Ethylbenzene	7.60E-02	mg/l	5.6E-05	mg/kg-day	N/A	N/A	--	6.6E-04	mg/kg-day	1.0E-01	mg/kg-day	7E-03
				127184	Tetrachloroethene	3.87E-03	mg/l	2.9E-06	mg/kg-day	N/A	N/A	--	3.3E-05	mg/kg-day	1.0E-02	mg/kg-day	3E-03
				108883	Toluene	9.60E-02	mg/l	4.1E-05	mg/kg-day	N/A	N/A	--	4.8E-04	mg/kg-day	2.0E-01	mg/kg-day	2E-03
				79016	Trichloroethene	2.91E-03	mg/l	6.0E-07	mg/kg-day	4.0E-01	(mg/kg-day)-1	2E-07	7.0E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
				1330207	Xylenes (total)	3.16E-01	mg/l	2.5E-04	mg/kg-day	N/A	N/A	--	3.0E-03	mg/kg-day	2.0E-01	mg/kg-day	1E-02
				7440439	Cadmium	1.07E-03	mg/l	5.8E-09	mg/kg-day	N/A	N/A	--	6.8E-08	mg/kg-day	2.5E-05	mg/kg-day	3E-03
				7440451	Cerium	3.28E-02	mg/l	1.8E-07	mg/kg-day	N/A	N/A	--	2.1E-06	mg/kg-day	N/A	N/A	--
				7439910	Lanthanum	2.83E-02	mg/l	1.5E-07	mg/kg-day	N/A	N/A	--	1.8E-06	mg/kg-day	N/A	N/A	--
				7440008	Neodymium	1.65E-02	mg/l	8.9E-08	mg/kg-day	N/A	N/A	--	1.0E-06	mg/kg-day	1.0E-01	mg/kg-day	1E-05
				7440655	Yttrium	3.17E-03	mg/l	1.7E-08	mg/kg-day	N/A	N/A	--	2.0E-07	mg/kg-day	N/A	N/A	--
				7440666	Zinc	4.81E-01	mg/l	1.6E-06	mg/kg-day	N/A	N/A	--	1.8E-05	mg/kg-day	3.0E-01	mg/kg-day	6E-05
				13966295	Total Uranium	1.15E-03	mg/l	6.2E-09	mg/kg-day	N/A	N/A	--	7.3E-08	mg/kg-day	3.0E-03	mg/kg-day	2E-05
			Exp. Route Total									2E-07					9E-01
		Shower/Bathroom Air	Inhalation	67641	Acetone	1.57E-01	mg/m^3	8.5E-05	mg/kg-day	N/A	N/A	--	9.9E-04	mg/kg-day	N/A	N/A	--
				71432	Benzene	1.68E+00	mg/m^3	9.1E-04	mg/kg-day	2.7E-02	(mg/kg-day)-1	2E-05	1.1E-02	mg/kg-day	9E-03	mg/kg-day	1E+00
				108907	Chlorobenzene	6.33E-03	mg/m^3	3.4E-06	mg/kg-day	N/A	N/A	--	4.0E-05	mg/kg-day	2E-02	mg/kg-day	2E-03
				67663	Chloroform	6.23E-03	mg/m^3	3.4E-06	mg/kg-day	8.1E-02	(mg/kg-day)-1	3E-07	3.9E-05	mg/kg-day	1E-02	mg/kg-day	3E-03
				95498	2-Chlorotoluene	2.97E+00	mg/m^3	1.6E-03	mg/kg-day	N/A	N/A	--	1.9E-02	mg/kg-day	N/A	N/A	--
				106434	4-Chlorotoluene	1.60E+00	mg/m^3	8.7E-04	mg/kg-day	N/A	N/A	--	1.0E-02	mg/kg-day	N/A	N/A	--
				107062	1,2-Dichloroethane	1.56E-03	mg/m^3	8.5E-07	mg/kg-day	9.1E-02	(mg/kg-day)-1	8E-08	9.9E-06	mg/kg-day	1E-03	mg/kg-day	7E-03
				540590	1,2-Dichloroethene (total)	2.51E-02	mg/m^3	1.4E-05	mg/kg-day	N/A	N/A	--	1.6E-04	mg/kg-day	N/A	N/A	--
				100414	Ethylbenzene	1.49E-01	mg/m^3	8.1E-05	mg/kg-day	N/A	N/A	--	9.4E-04	mg/kg-day	N/A	N/A	--
				108101	4-Methyl-2-pentanone	1.91E-02	mg/m^3	1.0E-05	mg/kg-day	N/A	N/A	--	1.2E-04	mg/kg-day	9E-01	mg/kg-day	1E-04
				127184	Tetrachloroethene	7.84E-03	mg/m^3	4.3E-06	mg/kg-day	N/A	N/A	--	5.0E-05	mg/kg-day	N/A	N/A	--
				108883	Toluene	2.01E-01	mg/m^3	1.1E-04	mg/kg-day	N/A	N/A	--	1.3E-03	mg/kg-day	1E-01	mg/kg-day	1E-02
				79016	Trichloroethene	6.31E-03	mg/m^3	3.4E-06	mg/kg-day	4.0E-01	(mg/kg/day)-1	1E-06	4.0E-05	mg/kg-day	1E-02	mg/kg-day	3E-03
				75014	Vinyl Chloride	9.46E-03	mg/m^3	5.1E-06	mg/kg-day	3.1E-02	(mg/kg-day)-1	2E-07	6.0E-05	mg/kg-day	3E-02	mg/kg-day	2E-03
				1330207	Xylenes (total)	6.99E-01	mg/m^3	3.8E-04	mg/kg-day	N/A	N/A	--	4.4E-03	mg/kg-day	3E-02	mg/kg-day	2E-01
			Exp. Route Total									3E-05					1E+00
		Exposure Point Total (water ingestion)										1E-03					5E+01
		Exposure Point Total (shower scenario)										3E-05					2E+00
	Exposure Medium Total											1E-03					5E+01
Medium Total												1E-03					5E+01
								Total of Receptor Risks Across All Media				1E-03	Total of Receptor Hazards Across All Media				5E+01

TABLE 7.3.RME
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
REASONABLE MAXIMUM EXPOSURE
FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route		Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
						Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
								Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Tap Water	Tap Water	Ingestion	67641	Acetone	9.15E-02	mg/l	3.2E-04	mg/kg-day	N/A	N/A	--	9.0E-04	mg/kg-day	3.0E-01	mg/kg-day	3E-03
				71432	Benzene	7.38E-01	mg/l	2.6E-03	mg/kg-day	5.5E-02	(mg/kg-day)-1	1E-04	7.2E-03	mg/kg-day	4.0E-03	mg/kg-day	2E+00
				108907	Chlorobenzene	3.01E-03	mg/l	1.1E-05	mg/kg-day	N/A	N/A	--	2.9E-05	mg/kg-day	2.0E-02	mg/kg-day	1E-03
				67663	Chloroform	2.70E-03	mg/l	9.4E-06	mg/kg-day	N/A	N/A	--	2.6E-05	mg/kg-day	1.0E-02	mg/kg-day	3E-03
				95498	2-Chlorotoluene	1.42E+00	mg/l	5.0E-03	mg/kg-day	N/A	N/A	--	1.4E-02	mg/kg-day	2.0E-02	mg/kg-day	7E-01
				106434	4-Chlorotoluene	7.64E-01	mg/l	2.7E-03	mg/kg-day	N/A	N/A	--	7.5E-03	mg/kg-day	N/A	N/A	--
				107062	1,2-Dichloroethane	6.90E-04	mg/l	2.4E-06	mg/kg-day	9.1E-02	(mg/kg-day)-1	2E-07	6.8E-06	mg/kg-day	2.0E-02	mg/kg-day	3E-04
				540590	1,2-Dichloroethene (total)	1.00E-02	mg/l	3.5E-05	mg/kg-day	N/A	N/A	--	9.8E-05	mg/kg-day	2.0E-02	mg/kg-day	5E-03
				100414	Ethylbenzene	7.60E-02	mg/l	2.7E-04	mg/kg-day	N/A	N/A	--	7.4E-04	mg/kg-day	1.0E-01	mg/kg-day	7E-03
				108101	4-Methyl-2-pentanone	1.12E-02	mg/l	3.9E-05	mg/kg-day	N/A	N/A	--	1.1E-04	mg/kg-day	3.0E-02	mg/kg-day	4E-03
				127184	Tetrachloroethene	3.87E-03	mg/l	1.4E-05	mg/kg-day	N/A	N/A	--	3.8E-05	mg/kg-day	1.0E-02	mg/kg-day	4E-03
				108883	Toluene	9.60E-02	mg/l	3.4E-04	mg/kg-day	N/A	N/A	--	9.4E-04	mg/kg-day	2.0E-01	mg/kg-day	5E-03
				79016	Trichloroethene	2.91E-03	mg/l	1.0E-05	mg/kg-day	4.0E-01	(mg/kg-day)-1	4E-06	2.8E-05	mg/kg-day	3.0E-04	mg/kg-day	9E-02
				75014	Vinyl Chloride	1.66E-02	mg/l	5.8E-05	mg/kg-day	1.4E+00	(mg/kg-day)-1	8E-05	1.6E-04	mg/kg-day	3.0E-03	mg/kg-day	5E-02
				1330207	Xylenes (total)	3.16E-01	mg/l	1.1E-03	mg/kg-day	N/A	N/A	--	3.1E-03	mg/kg-day	2.0E-01	mg/kg-day	2E-02
				7429905	Aluminum	3.57E-01	mg/l	1.2E-03	mg/kg-day	N/A	N/A	--	3.5E-03	mg/kg-day	1.0E+00	mg/kg-day	3E-03
				7440360	Antimony	1.21E-03	mg/l	4.2E-06	mg/kg-day	N/A	N/A	--	1.2E-05	mg/kg-day	4.0E-04	mg/kg-day	3E-02
				7440382	Arsenic	1.91E-01	mg/l	6.7E-04	mg/kg-day	1.5E+00	(mg/kg-day)-1	1E-03	1.9E-03	mg/kg-day	3.0E-04	mg/kg-day	6E+00
				7440393	Barium	7.68E-01	mg/l	2.7E-03	mg/kg-day	N/A	N/A	--	7.5E-03	mg/kg-day	7.0E-02	mg/kg-day	1E-01
				7440428	Boron	3.91E-01	mg/l	1.4E-03	mg/kg-day	N/A	N/A	--	3.8E-03	mg/kg-day	9.0E-02	mg/kg-day	4E-02
				7440439	Cadmium	1.07E-03	mg/l	3.8E-06	mg/kg-day	N/A	N/A	--	1.1E-05	mg/kg-day	5.0E-04	mg/kg-day	2E-02
				7440451	Cerium	3.28E-02	mg/l	1.1E-04	mg/kg-day	N/A	N/A	--	3.2E-04	mg/kg-day	N/A	N/A	--
				7439896	Iron	7.32E+01	mg/l	2.6E-01	mg/kg-day	N/A	N/A	--	7.2E-01	mg/kg-day	3.0E-01	mg/kg-day	2E+00
				7439910	Lanthanum	2.83E-02	mg/l	9.9E-05	mg/kg-day	N/A	N/A	--	2.8E-04	mg/kg-day	N/A	N/A	--
				7439921	Lead	3.72E-03	mg/l	1.3E-05	mg/kg-day	N/A	N/A	--	3.6E-05	mg/kg-day	N/A	N/A	--
				7439932	Lithium	4.70E+00	mg/l	1.6E-02	mg/kg-day	N/A	N/A	--	4.6E-02	mg/kg-day	2.0E-02	mg/kg-day	2E+00
				7439965	Manganese	6.65E+00	mg/l	2.3E-02	mg/kg-day	N/A	N/A	--	6.5E-02	mg/kg-day	1.4E-01	mg/kg-day	5E-01
				7440008	Neodymium	1.65E-02	mg/l	5.8E-05	mg/kg-day	N/A	N/A	--	1.6E-04	mg/kg-day	1.0E-01	mg/kg-day	2E-03
				7440020	Nickel	2.54E-02	mg/l	8.9E-05	mg/kg-day	N/A	N/A	--	2.5E-04	mg/kg-day	2.0E-02	mg/kg-day	1E-02
				7440224	Silver	6.20E-04	mg/l	2.2E-06	mg/kg-day	N/A	N/A	--	6.1E-06	mg/kg-day	5.0E-03	mg/kg-day	1E-03
				7440655	Yttrium	3.17E-03	mg/l	1.1E-05	mg/kg-day	N/A	N/A	--	3.1E-05	mg/kg-day	N/A	N/A	--
				7440666	Zinc	4.81E-01	mg/l	1.7E-03	mg/kg-day	N/A	N/A	--	4.7E-03	mg/kg-day	3.0E-01	mg/kg-day	2E-02
				13966295	Total Uranium	3.22E-03	mg/l	1.1E-05	mg/kg-day	N/A	N/A	--	3.2E-05	mg/kg-day	3.0E-03	mg/kg-day	1E-02
			Exp. Route Total									1E-03					1E+01
			Dermal	95498	2-Chlorotoluene	1.42E+00	mg/l	7.2E-04	mg/kg-day	N/A	N/A	--	2.0E-03	mg/kg-day	2.0E-02	mg/kg-day	1E-01
				106434	4-Chlorotoluene	7.64E-01	mg/l	3.9E-04	mg/kg-day	N/A	N/A	--	1.1E-03	mg/kg-day	N/A	N/A	--
				100414	Ethylbenzene	7.60E-02	mg/l	2.9E-05	mg/kg-day	N/A	N/A	--	8.1E-05	mg/kg-day	1.0E-01	mg/kg-day	8E-04
				127184	Tetrachloroethene	3.87E-03	mg/l	1.5E-06	mg/kg-day	N/A	N/A	--	4.1E-06	mg/kg-day	1.0E-02	mg/kg-day	4E-04
				1330207	Xylenes (total)	3.16E-01	mg/l	1.3E-04	mg/kg-day	N/A	N/A	--	3.7E-04	mg/kg-day	2.0E-01	mg/kg-day	2E-03
				7439910	Lanthanum	2.83E-02	mg/l	6.1E-08	mg/kg-day	N/A	N/A	--	1.7E-07	mg/kg-day	N/A	N/A	--
				7440008	Neodymium	1.65E-02	mg/l	3.6E-08	mg/kg-day	N/A	N/A	--	1.0E-07	mg/kg-day	1.0E-01	mg/kg-day	1E-06
				7440655	Yttrium	3.17E-03	mg/l	6.9E-09	mg/kg-day	N/A	N/A	--	1.9E-08	mg/kg-day	N/A	N/A	--
				7440666	Zinc	4.81E-01	mg/l	6.3E-07	mg/kg-day	N/A	N/A	--	1.8E-06	mg/kg-day	3.0E-01	mg/kg-day	6E-06
				13966295	Total Uranium	1.15E-03	mg/l	2.5E-09	mg/kg-day	N/A	N/A	--	7.0E-09	mg/kg-day	3.0E-03	mg/kg-day	2E-06
			Exp. Route Total									--					1E-01
		Exposure Point Total										1E-03					1E+01
	Exposure Medium Total											1E-03					1E+01
Medium Total												1E-03					1E+01
								Total of Receptor Risks Across All Media				1E-03	Total of Receptor Hazards Across All Media				1E+01

TABLE 7.3.1.CT
CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS
CENTRAL TENDENCY
FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route		Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
						Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
								Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Tap Water	Tap Water	Ingestion	67641	Acetone	9.15E-02	mg/l	8.4E-05	mg/kg-day	N/A	N/A	--	9.0E-04	mg/kg-day	3.0E-01	mg/kg-day	3E-03
				71432	Benzene	7.38E-01	mg/l	6.8E-04	mg/kg-day	5.5E-02	(mg/kg-day)-1	4E-05	7.2E-03	mg/kg-day	4.0E-03	mg/kg-day	2E+00
				108907	Chlorobenzene	3.01E-03	mg/l	2.8E-06	mg/kg-day	N/A	N/A	--	2.9E-05	mg/kg-day	2.0E-02	mg/kg-day	1E-03
				67663	Chloroform	2.70E-03	mg/l	2.5E-06	mg/kg-day	N/A	N/A	--	2.6E-05	mg/kg-day	1.0E-02	mg/kg-day	3E-03
				95498	2-Chlorotoluene	1.42E+00	mg/l	1.3E-03	mg/kg-day	N/A	N/A	--	1.4E-02	mg/kg-day	2.0E-02	mg/kg-day	7E-01
				106434	4-Chlorotoluene	7.64E-01	mg/l	7.0E-04	mg/kg-day	N/A	N/A	--	7.5E-03	mg/kg-day	N/A	N/A	--
				107062	1,2-Dichloroethane	6.90E-04	mg/l	6.4E-07	mg/kg-day	9.1E-02	(mg/kg-day)-1	6E-08	6.8E-06	mg/kg-day	2.0E-02	mg/kg-day	3E-04
				540590	1,2-Dichloroethene (total)	1.00E-02	mg/l	9.3E-06	mg/kg-day	N/A	N/A	--	9.8E-05	mg/kg-day	2.0E-02	mg/kg-day	5E-03
				100414	Ethylbenzene	7.60E-02	mg/l	7.0E-05	mg/kg-day	N/A	N/A	--	7.4E-04	mg/kg-day	1.0E-01	mg/kg-day	7E-03
				108101	4-Methyl-2-pentanone	1.12E-02	mg/l	1.0E-05	mg/kg-day	N/A	N/A	--	1.1E-04	mg/kg-day	3.0E-02	mg/kg-day	4E-03
				127184	Tetrachloroethene	3.87E-03	mg/l	3.6E-06	mg/kg-day	N/A	N/A	--	3.8E-05	mg/kg-day	1.0E-02	mg/kg-day	4E-03
				108883	Toluene	9.60E-02	mg/l	8.9E-05	mg/kg-day	N/A	N/A	--	9.4E-04	mg/kg-day	2.0E-01	mg/kg-day	5E-03
				79016	Trichloroethene	2.91E-03	mg/l	2.7E-06	mg/kg-day	4.0E-01	(mg/kg-day)-1	1E-06	2.8E-05	mg/kg-day	3.0E-04	mg/kg-day	9E-02
				75014	Vinyl Chloride	1.66E-02	mg/l	1.5E-05	mg/kg-day	1.4E+00	(mg/kg-day)-1	2E-05	1.6E-04	mg/kg-day	3.0E-03	mg/kg-day	5E-02
				1330207	Xylenes (total)	3.16E-01	mg/l	2.9E-04	mg/kg-day	N/A	N/A	--	3.1E-03	mg/kg-day	2.0E-01	mg/kg-day	2E-02
				7429905	Aluminum	3.57E-01	mg/l	3.3E-04	mg/kg-day	N/A	N/A	--	3.5E-03	mg/kg-day	1.0E+00	mg/kg-day	3E-03
				7440360	Antimony	1.21E-03	mg/l	1.1E-06	mg/kg-day	N/A	N/A	--	1.2E-05	mg/kg-day	4.0E-04	mg/kg-day	3E-02
				7440382	Arsenic	1.91E-01	mg/l	1.8E-04	mg/kg-day	1.5E+00	(mg/kg-day)-1	3E-04	1.9E-03	mg/kg-day	3.0E-04	mg/kg-day	6E+00
				7440393	Barium	7.68E-01	mg/l	7.1E-04	mg/kg-day	N/A	N/A	--	7.5E-03	mg/kg-day	7.0E-02	mg/kg-day	1E-01
				7440428	Boron	3.91E-01	mg/l	3.6E-04	mg/kg-day	N/A	N/A	--	3.8E-03	mg/kg-day	9.0E-02	mg/kg-day	4E-02
				7440439	Cadmium	1.07E-03	mg/l	9.9E-07	mg/kg-day	N/A	N/A	--	1.1E-05	mg/kg-day	5.0E-04	mg/kg-day	2E-02
				7440451	Cerium	3.28E-02	mg/l	3.0E-05	mg/kg-day	N/A	N/A	--	3.2E-04	mg/kg-day	N/A	N/A	--
				7439896	Iron	7.32E+01	mg/l	6.8E-02	mg/kg-day	N/A	N/A	--	7.2E-01	mg/kg-day	3.0E-01	mg/kg-day	2E+00
				7439910	Lanthanum	2.83E-02	mg/l	2.6E-05	mg/kg-day	N/A	N/A	--	2.8E-04	mg/kg-day	N/A	N/A	--
				7439921	Lead	3.72E-03	mg/l	3.4E-06	mg/kg-day	N/A	N/A	--	3.6E-05	mg/kg-day	N/A	N/A	--
				7439932	Lithium	4.70E+00	mg/l	4.3E-03	mg/kg-day	N/A	N/A	--	4.6E-02	mg/kg-day	2.0E-02	mg/kg-day	2E+00
				7439965	Manganese	6.65E+00	mg/l	6.1E-03	mg/kg-day	N/A	N/A	--	6.5E-02	mg/kg-day	1.4E-01	mg/kg-day	5E-01
				7440008	Neodymium	1.65E-02	mg/l	1.5E-05	mg/kg-day	N/A	N/A	--	1.6E-04	mg/kg-day	1.0E-01	mg/kg-day	2E-03
				7440020	Nickel	2.54E-02	mg/l	2.3E-05	mg/kg-day	N/A	N/A	--	2.5E-04	mg/kg-day	2.0E-02	mg/kg-day	1E-02
				7440224	Silver	6.20E-04	mg/l	5.7E-07	mg/kg-day	N/A	N/A	--	6.1E-06	mg/kg-day	5.0E-03	mg/kg-day	1E-03
				7440655	Yttrium	3.17E-03	mg/l	2.9E-06	mg/kg-day	N/A	N/A	--	3.1E-05	mg/kg-day	N/A	N/A	--
				7440666	Zinc	4.81E-01	mg/l	4.4E-04	mg/kg-day	N/A	N/A	--	4.7E-03	mg/kg-day	3.0E-01	mg/kg-day	2E-02
				13966295	Total Uranium	3.22E-03	mg/l	3.0E-06	mg/kg-day	N/A	N/A	--	3.2E-05	mg/kg-day	3.0E-03	mg/kg-day	1E-02
			Exp. Route Total									3E-04					1E+01
			Dermal	95498	2-Chlorotoluene	1.42E+00	mg/l	1.3E-04	mg/kg-day	N/A	N/A	--	1.3E-03	mg/kg-day	2.0E-02	mg/kg-day	7E-02
				106434	4-Chlorotoluene	7.64E-01	mg/l	6.8E-05	mg/kg-day	N/A	N/A	--	7.2E-04	mg/kg-day	N/A	N/A	--
				100414	Ethylbenzene	7.60E-02	mg/l	5.1E-06	mg/kg-day	N/A	N/A	--	5.4E-05	mg/kg-day	1.0E-01	mg/kg-day	5E-04
				127184	Tetrachloroethene	3.87E-03	mg/l	2.6E-07	mg/kg-day	N/A	N/A	--	2.7E-06	mg/kg-day	1.0E-02	mg/kg-day	3E-04
				1330207	Xylenes (total)	3.16E-01	mg/l	2.3E-05	mg/kg-day	N/A	N/A	--	2.4E-04	mg/kg-day	2.0E-01	mg/kg-day	1E-03
				7439910	Lanthanum	2.83E-02	mg/l	7.1E-09	mg/kg-day	N/A	N/A	--	7.6E-08	mg/kg-day	N/A	N/A	--
				7440008	Neodymium	1.65E-02	mg/l	4.1E-09	mg/kg-day	N/A	N/A	--	4.4E-08	mg/kg-day	1.0E-01	mg/kg-day	4E-07
				7440655	Yttrium	3.17E-03	mg/l	8.0E-10	mg/kg-day	N/A	N/A	--	8.4E-09	mg/kg-day	N/A	N/A	--
				7440666	Zinc	4.81E-01	mg/l	7.3E-08	mg/kg-day	N/A	N/A	--	7.7E-07	mg/kg-day	3.0E-01	mg/kg-day	3E-06
				13966295	Total Uranium	1.15E-03	mg/l	2.9E-10	mg/kg-day	N/A	N/A	--	3.1E-09	mg/kg-day	3.0E-03	mg/kg-day	1E-06
			Exp. Route Total									--					7E-02
		Exposure Point Total										3E-04					1E+01
	Exposure Medium Total											3E-04					1E+01
Medium Total												3E-04					1E+01
										Total of Receptor Risks Across All Media		3E-04		Total of Receptor Hazards Across All Media			1E+01

TABLE 7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route		Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
						Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
								Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Excavation	Dermal	67641	Acetone	9.15E-02	mg/l	6.6E-07	mg/kg-day	N/A	N/A	--	4.6E-05	mg/kg-day	3.0E-01	mg/kg-day	2E-04
				71432	Benzene	7.38E-01	mg/l	1.5E-04	mg/kg-day	5.5E-02	(mg/kg-day)-1	8E-06	1.1E-02	mg/kg-day	4.0E-03	mg/kg-day	3E+00
				108907	Chlorobenzene	3.01E-03	mg/l	1.2E-06	mg/kg-day	N/A	N/A	--	8.2E-05	mg/kg-day	3.1E+00	mg/kg-day	3E-05
				67663	Chloroform	2.70E-03	mg/l	2.7E-07	mg/kg-day	N/A	N/A	--	1.9E-05	mg/kg-day	1.0E-02	mg/kg-day	2E-03
				95498	2-Chlorotoluene	1.42E+00	mg/l	1.1E-03	mg/kg-day	N/A	N/A	--	7.4E-02	mg/kg-day	2.0E-02	mg/kg-day	4E+00
				106434	4-Chlorotoluene	7.64E-01	mg/l	5.7E-04	mg/kg-day	N/A	N/A	--	4.0E-02	mg/kg-day	N/A	N/A	--
				107062	1,2-Dichloroethane	6.90E-04	mg/l	4.2E-08	mg/kg-day	9.1E-02	(mg/kg-day)-1	4E-09	2.9E-06	mg/kg-day	2.0E-02	mg/kg-day	1E-04
				540590	1,2-Dichloroethene (total)	1.00E-02	mg/l	1.1E-06	mg/kg-day	N/A	N/A	--	7.7E-05	mg/kg-day	2.0E-02	mg/kg-day	4E-03
				100414	Ethylbenzene	7.60E-02	mg/l	4.8E-05	mg/kg-day	N/A	N/A	--	3.4E-03	mg/kg-day	1.0E-01	mg/kg-day	3E-02
				108101	4-Methyl-2-pentanone	1.12E-02	mg/l	4.3E-07	mg/kg-day	N/A	N/A	--	3.0E-05	mg/kg-day	3.0E-02	mg/kg-day	1E-03
				127184	Tetrachloroethene	3.87E-03	mg/l	1.9E-06	mg/kg-day	N/A	N/A	--	1.4E-04	mg/kg-day	1.0E-02	mg/kg-day	1E-02
				108883	Toluene	9.60E-02	mg/l	4.0E-05	mg/kg-day	N/A	N/A	--	2.8E-03	mg/kg-day	2.0E-01	mg/kg-day	1E-02
				79016	Trichloroethene	2.91E-03	mg/l	5.0E-07	mg/kg-day	4.0E-01	(mg/kg-day)-1	2E-07	3.5E-05	mg/kg-day	3.0E-04	mg/kg-day	1E-01
				75014	Vinyl Chloride	1.66E-02	mg/l	1.3E-06	mg/kg-day	1.4E+00	(mg/kg-day)-1	2E-06	9.1E-05	mg/kg-day	3.0E-03	mg/kg-day	3E-02
				1330207	Xylenes (total)	3.16E-01	mg/l	2.1E-04	mg/kg-day	N/A	N/A	--	1.5E-02	mg/kg-day	2.0E-01	mg/kg-day	8E-02
				7429905	Aluminum	3.57E-01	mg/l	4.8E-06	mg/kg-day	N/A	N/A	--	3.3E-04	mg/kg-day	1.0E+00	mg/kg-day	3E-04
				7440360	Antimony	1.21E-03	mg/l	1.6E-08	mg/kg-day	N/A	N/A	--	1.1E-06	mg/kg-day	2.7E-03	mg/kg-day	4E-04
				7440382	Arsenic	1.91E-01	mg/l	2.6E-06	mg/kg-day	1.5E+00	(mg/kg-day)-1	4E-06	1.8E-04	mg/kg-day	3.0E-04	mg/kg-day	6E-01
				7440393	Barium	7.68E-01	mg/l	1.0E-05	mg/kg-day	N/A	N/A	--	7.2E-04	mg/kg-day	1.0E+00	mg/kg-day	7E-04
				7440428	Boron	3.91E-01	mg/l	5.2E-06	mg/kg-day	N/A	N/A	--	3.7E-04	mg/kg-day	9.0E-02	mg/kg-day	4E-03
				7440439	Cadmium	1.07E-03	mg/l	1.4E-08	mg/kg-day	N/A	N/A	--	1.0E-06	mg/kg-day	2.5E-05	mg/kg-day	4E-02
				7440451	Cerium	3.28E-02	mg/l	4.4E-07	mg/kg-day	N/A	N/A	--	3.1E-05	mg/kg-day	N/A	N/A	--
				7439896	Iron	7.32E+01	mg/l	9.8E-04	mg/kg-day	N/A	N/A	--	6.9E-02	mg/kg-day	3.0E-01	mg/kg-day	2E-01
				7439910	Lanthanum	2.83E-02	mg/l	3.8E-07	mg/kg-day	N/A	N/A	--	2.7E-05	mg/kg-day	N/A	N/A	--
				7439921	Lead	3.72E-03	mg/l	5.0E-08	mg/kg-day	N/A	N/A	--	3.5E-06	mg/kg-day	N/A	N/A	--
				7439932	Lithium	4.70E+00	mg/l	6.3E-05	mg/kg-day	N/A	N/A	--	4.4E-03	mg/kg-day	2.0E-02	mg/kg-day	2E-01
				7439965	Manganese	6.65E+00	mg/l	8.9E-05	mg/kg-day	N/A	N/A	--	6.2E-03	mg/kg-day	5.6E-03	mg/kg-day	1E+00
				7440008	Neodymium	1.65E-02	mg/l	2.2E-07	mg/kg-day	N/A	N/A	--	1.5E-05	mg/kg-day	1.0E-01	mg/kg-day	2E-04
				7440020	Nickel	2.54E-02	mg/l	6.8E-08	mg/kg-day	N/A	N/A	--	4.8E-06	mg/kg-day	8.0E-04	mg/kg-day	6E-03
				7440224	Silver	6.20E-04	mg/l	5.0E-09	mg/kg-day	N/A	N/A	--	3.5E-07	mg/kg-day	2.0E-04	mg/kg-day	2E-03
				7440655	Yttrium	3.17E-03	mg/l	4.2E-08	mg/kg-day	N/A	N/A	--	3.0E-06	mg/kg-day	N/A	N/A	--
				7440666	Zinc	4.81E-01	mg/l	3.9E-06	mg/kg-day	N/A	N/A	--	2.7E-04	mg/kg-day	3.0E-01	mg/kg-day	9E-04
				13966295	Total Uranium	3.22E-03	mg/l	4.3E-08	mg/kg-day	N/A	N/A	--	3.0E-06	mg/kg-day	3.0E-03	mg/kg-day	1E-03
			Exp. Route Total									1E-05					9E+00

TABLE 7.4.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route		Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
						Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
								Value	Units	Value	Units		Value	Units	Value	Units	
		Outdoor Air	Inhalation	67641	Acetone	1.36E-02	mg/m^3	2.5E-05	mg/kg-day	N/A	N/A	--	1.8E-03	mg/kg-day	N/A	N/A	--
				71432	Benzene	2.40E-01	mg/m^3	4.4E-04	mg/kg-day	2.7E-02	(mg/kg-day)-1	1E-05	3.1E-02	mg/kg-day	9E-03	mg/kg-day	4E+00
				108907	Chlorobenzene	8.11E-04	mg/m^3	1.5E-06	mg/kg-day	N/A	N/A	--	1.1E-04	mg/kg-day	1.7E-02	mg/kg-day	6E-03
				67663	Chloroform	7.08E-04	mg/m^3	1.3E-06	mg/kg-day	8.1E-02	(mg/kg-day)-1	1E-07	9.2E-05	mg/kg-day	1.4E-02	mg/kg-day	6E-03
				95498	2-Chlorotoluene	3.62E-01	mg/m^3	6.7E-04	mg/kg-day	N/A	N/A	--	4.7E-02	mg/kg-day	N/A	N/A	--
				106434	4-Chlorotoluene	1.94E-01	mg/m^3	3.6E-04	mg/kg-day	N/A	N/A	--	2.5E-02	mg/kg-day	N/A	N/A	--
				107062	1,2-Dichloroethane	1.92E-04	mg/m^3	3.6E-07	mg/kg-day	9.1E-02	(mg/kg-day)-1	3E-08	2.5E-05	mg/kg-day	1.4E-03	mg/kg-day	2E-02
				540590	1,2-Dichloroethene (total)	2.93E-03	mg/m^3	5.4E-06	mg/kg-day	N/A	N/A	--	3.8E-04	mg/kg-day	N/A	N/A	--
				100414	Ethylbenzene	2.13E-02	mg/m^3	3.9E-05	mg/kg-day	N/A	N/A	--	2.8E-03	mg/kg-day	N/A	N/A	--
				108101	4-Methyl-2-pentanone	2.30E-03	mg/m^3	4.3E-06	mg/kg-day	N/A	N/A	--	3.0E-04	mg/kg-day	8.6E-01	mg/kg-day	3E-04
				127184	Tetrachloroethene	8.70E-04	mg/m^3	1.6E-06	mg/kg-day	N/A	N/A	--	1.1E-04	mg/kg-day	N/A	N/A	--
				108883	Toluene	2.88E-02	mg/m^3	5.3E-05	mg/kg-day	N/A	N/A	--	3.7E-03	mg/kg-day	1.1E-01	mg/kg-day	3E-02
				79016	Trichloroethene	7.33E-04	mg/m^3	1.4E-06	mg/kg-day	4.0E-01	(mg/kg/day)-1	5E-07	9.5E-05	mg/kg-day	1.1E-02	mg/kg-day	8E-03
				75014	Vinyl Chloride	6.09E-03	mg/m^3	1.1E-05	mg/kg-day	3.1E-02	(mg/kg-day)-1	3E-07	7.9E-04	mg/kg-day	2.9E-02	mg/kg-day	3E-02
				1330207	Xylenes (total)	8.85E-02	mg/m^3	1.6E-04	mg/kg-day	N/A	N/A	--	1.1E-02	mg/kg-day	2.9E-02	mg/kg-day	4E-01
			Exp. Route Total									1E-05					4E+00
		Exposure Point Total										3E-05					1E+01
	Exposure Medium Total											3E-05					1E+01
Medium Total												3E-05					1E+01
											Total of Receptor Risks Across All Media	3E-05	Total of Receptor Hazards Across All Media				1E+01

TABLE 7.4.1.CT

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route		Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
						Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
								Value	Units	Value	Units		Value	Units	Value	Units	
Groundwater	Groundwater	Excavation	Dermal	67641	Acetone	9.15E-02	mg/l	8.7E-08	mg/kg-day	N/A	N/A	--	6.1E-06	mg/kg-day	3.0E-01	mg/kg-day	2E-05
				71432	Benzene	7.38E-01	mg/l	2.0E-05	mg/kg-day	5.5E-02	(mg/kg-day)-1	1E-06	1.4E-03	mg/kg-day	4.0E-03	mg/kg-day	4E-01
				108907	Chlorobenzene	3.01E-03	mg/l	1.6E-07	mg/kg-day	N/A	N/A	--	1.1E-05	mg/kg-day	3.1E+00	mg/kg-day	4E-06
				67663	Chloroform	2.70E-03	mg/l	3.8E-08	mg/kg-day	N/A	N/A	--	2.6E-06	mg/kg-day	1.0E-02	mg/kg-day	3E-04
				95498	2-Chlorotoluene	1.42E+00	mg/l	1.6E-04	mg/kg-day	N/A	N/A	--	1.1E-02	mg/kg-day	2.0E-02	mg/kg-day	5E-01
				106434	4-Chlorotoluene	7.64E-01	mg/l	8.3E-05	mg/kg-day	N/A	N/A	--	5.8E-03	mg/kg-day	N/A	N/A	--
				107062	1,2-Dichloroethane	6.90E-04	mg/l	5.7E-09	mg/kg-day	9.1E-02	(mg/kg-day)-1	5E-10	4.0E-07	mg/kg-day	2.0E-02	mg/kg-day	2E-05
				540590	1,2-Dichloroethene (total)	1.00E-02	mg/l	1.5E-07	mg/kg-day	N/A	N/A	--	1.1E-05	mg/kg-day	2.0E-02	mg/kg-day	5E-04
				100414	Ethylbenzene	7.60E-02	mg/l	6.8E-06	mg/kg-day	N/A	N/A	--	4.8E-04	mg/kg-day	1.0E-01	mg/kg-day	5E-03
				108101	4-Methyl-2-pentanone	1.12E-02	mg/l	5.9E-08	mg/kg-day	N/A	N/A	--	4.1E-06	mg/kg-day	3.0E-02	mg/kg-day	1E-04
				127184	Tetrachloroethene	3.87E-03	mg/l	3.0E-07	mg/kg-day	N/A	N/A	--	2.1E-05	mg/kg-day	1.0E-02	mg/kg-day	2E-03
				108883	Toluene	9.60E-02	mg/l	5.4E-06	mg/kg-day	N/A	N/A	--	3.8E-04	mg/kg-day	2.0E-01	mg/kg-day	2E-03
				79016	Trichloroethene	2.91E-03	mg/l	7.1E-08	mg/kg-day	4.0E-01	(mg/kg-day)-1	3E-08	5.0E-06	mg/kg-day	3.0E-04	mg/kg-day	2E-02
				75014	Vinyl Chloride	1.66E-02	mg/l	1.7E-07	mg/kg-day	1.4E+00	(mg/kg-day)-1	2E-07	1.2E-05	mg/kg-day	3.0E-03	mg/kg-day	4E-03
				1330207	Xylenes (total)	3.16E-01	mg/l	3.0E-05	mg/kg-day	N/A	N/A	--	2.1E-03	mg/kg-day	2.0E-01	mg/kg-day	1E-02
				7429905	Aluminum	3.57E-01	mg/l	6.0E-07	mg/kg-day	N/A	N/A	--	4.2E-05	mg/kg-day	1.0E+00	mg/kg-day	4E-05
				7440360	Antimony	1.21E-03	mg/l	2.0E-09	mg/kg-day	N/A	N/A	--	1.4E-07	mg/kg-day	2.7E-03	mg/kg-day	5E-05
				7440382	Arsenic	1.91E-01	mg/l	3.2E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	5E-07	2.2E-05	mg/kg-day	3.0E-04	mg/kg-day	7E-02
				7440393	Barium	7.68E-01	mg/l	1.3E-06	mg/kg-day	N/A	N/A	--	9.0E-05	mg/kg-day	1.0E+00	mg/kg-day	9E-05
				7440428	Boron	3.91E-01	mg/l	6.5E-07	mg/kg-day	N/A	N/A	--	4.6E-05	mg/kg-day	9.0E-02	mg/kg-day	5E-04
				7440439	Cadmium	1.07E-03	mg/l	1.8E-09	mg/kg-day	N/A	N/A	--	1.3E-07	mg/kg-day	2.5E-05	mg/kg-day	5E-03
				7440451	Cerium	3.28E-02	mg/l	5.5E-08	mg/kg-day	N/A	N/A	--	3.8E-06	mg/kg-day	N/A	N/A	--
				7439896	Iron	7.32E+01	mg/l	1.2E-04	mg/kg-day	N/A	N/A	--	8.6E-03	mg/kg-day	3.0E-01	mg/kg-day	3E-02
				7439910	Lanthanum	2.83E-02	mg/l	4.7E-08	mg/kg-day	N/A	N/A	--	3.3E-06	mg/kg-day	N/A	N/A	--
				7439921	Lead	3.72E-03	mg/l	6.2E-09	mg/kg-day	N/A	N/A	--	4.4E-07	mg/kg-day	N/A	N/A	--
				7439932	Lithium	4.70E+00	mg/l	7.9E-06	mg/kg-day	N/A	N/A	--	5.5E-04	mg/kg-day	2.0E-02	mg/kg-day	3E-02
				7439965	Manganese	6.65E+00	mg/l	1.1E-05	mg/kg-day	N/A	N/A	--	7.8E-04	mg/kg-day	5.6E-03	mg/kg-day	1E-01
				7440008	Neodymium	1.65E-02	mg/l	2.8E-08	mg/kg-day	N/A	N/A	--	1.9E-06	mg/kg-day	1.0E-01	mg/kg-day	2E-05
				7440020	Nickel	2.54E-02	mg/l	8.5E-09	mg/kg-day	N/A	N/A	--	5.9E-07	mg/kg-day	8.0E-04	mg/kg-day	7E-04
				7440224	Silver	6.20E-04	mg/l	6.2E-10	mg/kg-day	N/A	N/A	--	4.4E-08	mg/kg-day	2.0E-04	mg/kg-day	2E-04
				7440655	Yttrium	3.17E-03	mg/l	5.3E-09	mg/kg-day	N/A	N/A	--	3.7E-07	mg/kg-day	N/A	N/A	--
				7440666	Zinc	4.81E-01	mg/l	4.8E-07	mg/kg-day	N/A	N/A	--	3.4E-05	mg/kg-day	3.0E-01	mg/kg-day	1E-04
				13966295	Total Uranium	3.22E-03	mg/l	5.4E-09	mg/kg-day	N/A	N/A	--	3.8E-07	mg/kg-day	3.0E-03	mg/kg-day	1E-04
			Exp. Route Total									2E-06					1E+00

TABLE 7.4.1.CT

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

CENTRAL TENDENCY

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route		Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
						Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
								Value	Units	Value	Units		Value	Units	Value	Units	
		Outdoor Air	Inhalation	67641	Acetone	1.36E-02	mg/m^3	1.3E-05	mg/kg-day	N/A	N/A	--	8.8E-04	mg/kg-day	N/A	N/A	--
				71432	Benzene	2.40E-01	mg/m^3	2.2E-04	mg/kg-day	2.7E-02	(mg/kg-day)-1	6E-06	1.6E-02	mg/kg-day	9E-03	mg/kg-day	2E+00
				108907	Chlorobenzene	8.11E-04	mg/m^3	7.5E-07	mg/kg-day	N/A	N/A	--	5.3E-05	mg/kg-day	1.7E-02	mg/kg-day	3E-03
				67663	Chloroform	7.08E-04	mg/m^3	6.6E-07	mg/kg-day	8.1E-02	(mg/kg-day)-1	5E-08	4.6E-05	mg/kg-day	1.4E-02	mg/kg-day	3E-03
				95498	2-Chlorotoluene	3.62E-01	mg/m^3	3.4E-04	mg/kg-day	N/A	N/A	--	2.3E-02	mg/kg-day	N/A	N/A	--
				106434	4-Chlorotoluene	1.94E-01	mg/m^3	1.8E-04	mg/kg-day	N/A	N/A	--	1.3E-02	mg/kg-day	N/A	N/A	--
				107062	1,2-Dichloroethane	1.92E-04	mg/m^3	1.8E-07	mg/kg-day	9.1E-02	(mg/kg-day)-1	2E-08	1.2E-05	mg/kg-day	1.4E-03	mg/kg-day	9E-03
				540590	1,2-Dichloroethene (total)	2.93E-03	mg/m^3	2.7E-06	mg/kg-day	N/A	N/A	--	1.9E-04	mg/kg-day	N/A	N/A	--
				100414	Ethylbenzene	2.13E-02	mg/m^3	2.0E-05	mg/kg-day	N/A	N/A	--	1.4E-03	mg/kg-day	N/A	N/A	--
				108101	4-Methyl-2-pentanone	2.30E-03	mg/m^3	2.1E-06	mg/kg-day	N/A	N/A	--	1.5E-04	mg/kg-day	8.6E-01	mg/kg-day	2E-04
				127184	Tetrachloroethene	8.70E-04	mg/m^3	8.1E-07	mg/kg-day	N/A	N/A	--	5.6E-05	mg/kg-day	N/A	N/A	--
				108883	Toluene	2.88E-02	mg/m^3	2.7E-05	mg/kg-day	N/A	N/A	--	1.9E-03	mg/kg-day	1.1E-01	mg/kg-day	2E-02
				79016	Trichloroethene	7.33E-04	mg/m^3	6.8E-07	mg/kg-day	4.0E-01	(mg/kg/day)-1	3E-07	4.7E-05	mg/kg-day	1.1E-02	mg/kg-day	4E-03
				75014	Vinyl Chloride	6.09E-03	mg/m^3	5.6E-06	mg/kg-day	3.1E-02	(mg/kg-day)-1	2E-07	3.9E-04	mg/kg-day	2.9E-02	mg/kg-day	1E-02
				1330207	Xylenes (total)	8.85E-02	mg/m^3	8.2E-05	mg/kg-day	N/A	N/A	--	5.7E-03	mg/kg-day	2.9E-02	mg/kg-day	2E-01
			Exp. Route Total									7E-06					2E+00
		Exposure Point Total										8E-06					3E+00
	Exposure Medium Total											8E-06					3E+00
Medium Total												8E-06					3E+00
								Total of Receptor Risks Across All Media				8E-06	Total of Receptor Hazards Across All Media				3E+00

TABLE 7.5.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Recreationist
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route		Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
						Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
								Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Westerly Brook	Dermal	7429905	Aluminum	2.55E-01	mg/l	4.2E-07	mg/kg-day	N/A	N/A	--	4.9E-06	mg/kg-day	1.0E+00	mg/kg-day	5E-06
				7440382	Arsenic	4.87E-02	mg/l	8.0E-08	mg/kg-day	1.5E+00	(mg/kg-day)-1	1E-07	9.3E-07	mg/kg-day	3.0E-04	mg/kg-day	3E-03
				7440393	Barium	2.42E-01	mg/l	4.0E-07	mg/kg-day	N/A	N/A	--	4.6E-06	mg/kg-day	1.0E+00	mg/kg-day	5E-06
				7440428	Boron	2.18E-01	mg/l	3.6E-07	mg/kg-day	N/A	N/A	--	4.2E-06	mg/kg-day	9.0E-02	mg/kg-day	5E-05
				7440439	Cadmium	5.40E-04	mg/l	8.8E-10	mg/kg-day	N/A	N/A	--	1.0E-08	mg/kg-day	2.5E-05	mg/kg-day	4E-04
				7440473	Chromium, Total	4.90E-03	mg/l	8.0E-09	mg/kg-day	N/A	N/A	--	9.4E-08	mg/kg-day	2.0E-02	mg/kg-day	5E-06
				7440484	Cobalt	1.80E-03	mg/l	5.9E-09	mg/kg-day	N/A	N/A	--	6.9E-08	mg/kg-day	2.0E-02	mg/kg-day	3E-06
				7440508	Copper	4.90E-03	mg/l	8.0E-09	mg/kg-day	N/A	N/A	--	9.4E-08	mg/kg-day	4.0E-02	mg/kg-day	2E-06
				7439896	Iron	3.46E+00	mg/l	5.7E-06	mg/kg-day	N/A	N/A	--	6.6E-05	mg/kg-day	3.0E-01	mg/kg-day	2E-04
				7439910	Lanthanum	3.53E-02	mg/l	5.8E-08	mg/kg-day	N/A	N/A	--	6.7E-07	mg/kg-day	N/A	N/A	--
				7439921	Lead	5.40E-03	mg/l	8.8E-09	mg/kg-day	N/A	N/A	--	1.0E-07	mg/kg-day	N/A	N/A	--
				7439932	Lithium	6.42E-01	mg/l	1.1E-06	mg/kg-day	N/A	N/A	--	1.2E-05	mg/kg-day	2.0E-02	mg/kg-day	6E-04
				7439965	Manganese	3.73E+00	mg/l	6.1E-06	mg/kg-day	N/A	N/A	--	7.1E-05	mg/kg-day	5.6E-03	mg/kg-day	1E-02
				7439976	Mercury	1.20E-04	mg/l	2.0E-10	mg/kg-day	N/A	N/A	--	2.3E-09	mg/kg-day	2.1E-05	N/A	1E-04
				7440020	Nickel	7.90E-03	mg/l	2.6E-09	mg/kg-day	N/A	N/A	--	3.0E-08	mg/kg-day	8.0E-04	mg/kg-day	4E-05
				7440224	Silver	5.94E-02	mg/l	5.8E-08	mg/kg-day	N/A	N/A	--	6.8E-07	mg/kg-day	2.0E-04	mg/kg-day	3E-03
				7440280	Thallium	6.10E-03	mg/l	1.0E-08	mg/kg-day	N/A	N/A	--	1.2E-07	mg/kg-day	8.0E-05	mg/kg-day	1E-03
				7440622	Vanadium	3.30E-03	mg/l	5.4E-09	mg/kg-day	N/A	N/A	--	6.3E-08	mg/kg-day	1.8E-04	mg/kg-day	3E-04
				7440666	Zinc	1.86E-01	mg/l	1.8E-07	mg/kg-day	N/A	N/A	--	2.1E-06	mg/kg-day	3.0E-01	mg/kg-day	7E-06
				13966295	Total Uranium	1.20E-03	mg/l	2.0E-09	mg/kg-day	N/A	Risk/pCi	--	2.3E-08	mg/kg-day	3.0E-03	mg/kg-day	8E-06
			Exp. Route Total									1E-07					2E-02
	Exposure Medium Total											1E-07					2E-02
Medium Total												1E-07					2E-02
Sediment	Sediment	Westerly Brook	Ingestion	7440382	Arsenic	5.80E+00	mg/kg	1.2E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	2E-07	1.4E-06	mg/kg-day	3.0E-04	mg/kg-day	5E-03
				7440451	Cerium	1.51E+01	mg/kg	3.2E-07	mg/kg-day	N/A	N/A	--	3.7E-06	mg/kg-day	N/A	N/A	--
				7439896	Iron	2.58E+04	mg/kg	5.4E-04	mg/kg-day	N/A	N/A	--	6.3E-03	mg/kg-day	3.0E-01	mg/kg-day	2E-02
				7439910	Lanthanum	4.90E+00	mg/kg	1.0E-07	mg/kg-day	N/A	N/A	--	1.2E-06	mg/kg-day	N/A	N/A	--
				7439921	Lead	2.76E+02	mg/kg	5.8E-06	mg/kg-day	N/A	N/A	--	6.8E-05	mg/kg-day	N/A	N/A	--
				7439965	Manganese	2.07E+02	mg/kg	4.4E-06	mg/kg-day	N/A	N/A	--	5.1E-05	mg/kg-day	5.6E-03	mg/kg-day	9E-03
				7440008	Neodymium	8.40E+00	mg/kg	1.8E-07	mg/kg-day	N/A	N/A	--	2.1E-06	mg/kg-day	1.0E-01	mg/kg-day	2E-05
				7440655	Yttrium	6.40E+00	mg/kg	1.3E-07	mg/kg-day	N/A	N/A	--	1.6E-06	mg/kg-day	N/A	N/A	--
				13966295	Total Uranium	3.52E+00	mg/kg	7.4E-08	mg/kg-day	N/A	N/A	--	8.7E-07	mg/kg-day	3.0E-03	mg/kg-day	3E-04
			Exp. Route Total									2E-07					3.5E-02
			Dermal	7440382	Arsenic	5.80E+00	mg/kg	2.8E-08	mg/kg-day	1.5E+00	(mg/kg-day)-1	4E-08	3.3E-07	mg/kg-day	3.0E-04	mg/kg-day	1E-03
			Exp. Route Total									4E-08					1E-03
		Exposure Point Total										3E-07					6E-02
	Exposure Medium Total											2E-07					4E-02
Medium Total												2E-07					4E-02
								Total of Receptor Risks Across All Media				3E-07	Total of Receptor Hazards Across All Media				6E-02

TABLE 7.6.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Recreationist
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route		Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
						Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
								Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Saddle River	Dermal	7429905	Aluminum	6.78E-02	mg/l	1.1E-07	mg/kg-day	N/A	N/A	--	1.3E-06	mg/kg-day	1.0E+00	mg/kg-day	1E-06
				7440382	Arsenic	8.80E-03	mg/l	1.4E-08	mg/kg-day	1.5E+00	(mg/kg-day)-1	2E-08	1.7E-07	mg/kg-day	3.0E-04	mg/kg-day	6E-04
				7440393	Barium	1.25E-01	mg/l	2.0E-07	mg/kg-day	N/A	N/A	--	2.4E-06	mg/kg-day	1.0E+00	mg/kg-day	2E-06
				7440428	Boron	2.09E-01	mg/l	3.4E-07	mg/kg-day	N/A	N/A	--	4.0E-06	mg/kg-day	9.0E-02	mg/kg-day	4E-05
				7440473	Chromium, Total	1.10E-03	mg/l	1.8E-09	mg/kg-day	N/A	N/A	--	2.1E-08	mg/kg-day	2.0E-02	mg/kg-day	1E-06
				7440508	Copper	1.13E-02	mg/l	1.8E-08	mg/kg-day	N/A	N/A	--	2.2E-07	mg/kg-day	4.0E-02	mg/kg-day	5E-06
				7439896	Iron	3.17E-01	mg/l	5.2E-07	mg/kg-day	N/A	N/A	--	6.0E-06	mg/kg-day	3.0E-01	mg/kg-day	2E-05
				7439921	Lead	1.08E-02	mg/l	1.8E-08	mg/kg-day	N/A	N/A	--	2.1E-07	mg/kg-day	N/A	N/A	--
				7439932	Lithium	6.31E-01	mg/l	1.0E-06	mg/kg-day	N/A	N/A	--	1.2E-05	mg/kg-day	2.0E-02	mg/kg-day	6E-04
				7439965	Manganese	1.73E-01	mg/l	2.8E-07	mg/kg-day	N/A	N/A	--	3.3E-06	mg/kg-day	5.6E-03	mg/kg-day	6E-04
				7440020	Nickel	2.20E-03	mg/l	7.2E-10	mg/kg-day	N/A	N/A	--	8.4E-09	mg/kg-day	8.0E-04	mg/kg-day	1E-05
				7440224	Silver	1.40E-03	mg/l	1.4E-09	mg/kg-day	N/A	N/A	--	1.6E-08	mg/kg-day	2.0E-04	mg/kg-day	8E-05
				7440622	Vanadium	1.50E-03	mg/l	2.5E-09	mg/kg-day	N/A	N/A	--	2.9E-08	mg/kg-day	1.8E-04	mg/kg-day	2E-04
				7440666	Zinc	2.32E-02	mg/l	2.3E-08	mg/kg-day	N/A	N/A	--	2.7E-07	mg/kg-day	3.0E-01	mg/kg-day	9E-07
				13966295	Total Uranium	1.23E-03	mg/l	2.0E-09	mg/kg-day	N/A	Risk/pCi	--	2.4E-08	mg/kg-day	3.0E-03	mg/kg-day	8E-06
			Exp. Route Total									2E-08					2E-03
	Exposure Medium Total											2E-08					2E-03
Medium Total												2E-08					2E-03
Sediment	Sediment	Saddle River	Ingestion	7440382	Arsenic	8.30E+00	mg/kg	1.7E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	3E-07	2.0E-06	mg/kg-day	3.0E-04	mg/kg-day	7E-03
				7440451	Cerium	1.27E+01	mg/kg	2.7E-07	mg/kg-day	N/A	N/A	--	3.1E-06	mg/kg-day	N/A	N/A	--
				7439896	Iron	1.76E+04	mg/kg	3.7E-04	mg/kg-day	N/A	N/A	--	4.3E-03	mg/kg-day	3.0E-01	mg/kg-day	1E-02
				7439910	Lanthanum	6.70E+00	mg/kg	1.4E-07	mg/kg-day	N/A	N/A	--	1.6E-06	mg/kg-day	N/A	N/A	--
				7439921	Lead	4.75E+01	mg/kg	1.0E-06	mg/kg-day	N/A	N/A	--	1.2E-05	mg/kg-day	N/A	N/A	--
				7439965	Manganese	4.14E+02	mg/kg	8.7E-06	mg/kg-day	N/A	N/A	--	1.0E-04	mg/kg-day	5.6E-03	mg/kg-day	2E-02
				7440008	Neodymium	6.20E+00	mg/kg	1.3E-07	mg/kg-day	N/A	N/A	--	1.5E-06	mg/kg-day	1.0E-01	mg/kg-day	2E-05
				7440655	Yttrium	6.60E+00	mg/kg	1.4E-07	mg/kg-day	N/A	N/A	--	1.6E-06	mg/kg-day	N/A	N/A	--
				13966295	Total Uranium	3.28E+00	mg/kg	6.9E-08	mg/kg-day	N/A	N/A	--	8.1E-07	mg/kg-day	3.0E-03	mg/kg-day	3E-04
			Exp. Route Total									3E-07					4E-02
			Dermal	7440382	Arsenic	8.30E+00	mg/kg	4.1E-08	mg/kg-day	1.5E+00	(mg/kg-day)-1	6E-08	4.8E-07	mg/kg-day	3.0E-04	mg/kg-day	2E-03
			Exp. Route Total									6E-08					2E-03
		Exposure Point Total										3E-07					4E-02
	Exposure Medium Total											3E-07					4E-02
Medium Total												3E-07					4E-02
										Total of Receptor Risks Across All Media		3E-07		Total of Receptor Hazards Across All Media			4E-02

TABLE 7.7.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Recreationist
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route		Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
						Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
								Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Coles Brook	Dermal	7429905	Aluminum	4.73E-02	mg/l	7.7E-08	mg/kg-day	N/A	N/A	--	9.0E-07	mg/kg-day	1.0E+00	mg/kg-day	9E-07
				7440393	Barium	1.52E-01	mg/l	2.5E-07	mg/kg-day	N/A	N/A	--	2.9E-06	mg/kg-day	1.0E+00	mg/kg-day	3E-06
				7440428	Boron	5.44E-02	mg/l	8.9E-08	mg/kg-day	N/A	N/A	--	1.0E-06	mg/kg-day	9.0E-02	mg/kg-day	1E-05
				7440484	Cobalt	9.20E-04	mg/l	3.0E-09	mg/kg-day	N/A	N/A	--	3.5E-08	mg/kg-day	2.0E-02	mg/kg-day	2E-06
				7440508	Copper	6.10E-03	mg/l	1.0E-08	mg/kg-day	N/A	N/A	--	1.2E-07	mg/kg-day	4.0E-02	mg/kg-day	3E-06
				7429916	Dysprosium	5.00E-03	mg/l	8.2E-09	mg/kg-day	N/A	N/A	--	9.5E-08	mg/kg-day	1.0E-01	mg/kg-day	1E-06
				7439896	Iron	9.27E-01	mg/l	1.5E-06	mg/kg-day	N/A	N/A	--	1.8E-05	mg/kg-day	3.0E-01	mg/kg-day	6E-05
				7439932	Lithium	7.70E-03	mg/l	1.3E-08	mg/kg-day	N/A	N/A	--	1.5E-07	mg/kg-day	2.0E-02	mg/kg-day	7E-06
				7439965	Manganese	2.86E-01	mg/l	4.7E-07	mg/kg-day	N/A	N/A	--	5.5E-06	mg/kg-day	5.6E-03	mg/kg-day	1E-03
				7440020	Nickel	1.20E-03	mg/l	3.9E-10	mg/kg-day	N/A	N/A	--	4.6E-09	mg/kg-day	8.0E-04	mg/kg-day	6E-06
				7440666	Zinc	6.20E-03	mg/l	6.1E-09	mg/kg-day	N/A	N/A	--	7.1E-08	mg/kg-day	3.0E-01	mg/kg-day	2E-07
				13966295	Total Uranium	4.11E-03	mg/l	6.7E-09	mg/kg-day	N/A	N/A	--	7.8E-08	mg/kg-day	3.0E-03	mg/kg-day	3E-05
			Exp. Route Total									--					1E-03
	Exposure Medium Total																1E-03
Medium Total																	1E-03
Sediment	Sediment	Coles Brook	Ingestion	7429905	Aluminum	9.39E+03	mg/kg	2.0E-04	mg/kg-day	N/A	N/A	--	2.3E-03	mg/kg-day	1.0E+00	mg/kg-day	2E-03
				7440382	Arsenic	6.70E+00	mg/kg	1.4E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	2E-07	1.6E-06	mg/kg-day	3.0E-04	mg/kg-day	5E-03
				7440451	Cerium	3.03E+01	mg/kg	6.4E-07	mg/kg-day	N/A	N/A	--	7.5E-06	mg/kg-day	N/A	N/A	--
				7439896	Iron	2.47E+04	mg/kg	5.2E-04	mg/kg-day	N/A	N/A	--	6.1E-03	mg/kg-day	3.0E-01	mg/kg-day	2E-02
				7439910	Lanthanum	5.08E+01	mg/kg	1.1E-06	mg/kg-day	N/A	N/A	--	1.2E-05	mg/kg-day	N/A	N/A	--
				7439921	Lead	3.04E+02	mg/kg	6.4E-06	mg/kg-day	N/A	N/A	--	7.5E-05	mg/kg-day	N/A	N/A	--
				7439932	Manganese	2.50E+02	mg/kg	5.3E-06	mg/kg-day	N/A	N/A	--	6.1E-05	mg/kg-day	5.6E-03	mg/kg-day	1E-02
				7440008	Neodymium	1.56E+01	mg/kg	3.3E-07	mg/kg-day	N/A	N/A	--	3.8E-06	mg/kg-day	1.0E-01	mg/kg-day	4E-05
				7440622	Vanadium	6.34E+01	mg/kg	1.3E-06	mg/kg-day	N/A	N/A	--	1.6E-05	mg/kg-day	7.0E-03	mg/kg-day	2E-03
				7440655	Yttrium	1.03E+01	mg/kg	2.2E-07	mg/kg-day	N/A	N/A	--	2.5E-06	mg/kg-day	N/A	N/A	--
				13966295	Total Uranium	4.39E+00	mg/kg	9.3E-08	mg/kg-day	N/A	N/A	--	1.1E-06	mg/kg-day	3.0E-03	mg/kg-day	4E-04
			Exp. Route Total									2E-07					4E-02
			Dermal	7440382	Arsenic	6.70E+00	mg/kg	3.3E-08	mg/kg-day	1.5E+00	(mg/kg-day)-1	5E-08	3.8E-07	mg/kg-day	3.0E-04	mg/kg-day	1E-03
			Exp. Route Total									5E-08					1E-03
		Exposure Point Total										3E-07					4E-02
	Exposure Medium Total											3E-07					4E-02
Medium Total												3E-07					4E-02
								Total of Receptor Risks Across All Media				3E-07	Total of Receptor Hazards Across All Media				4E-02

TABLE 7.8.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Municipal Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route		Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
						Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
								Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Lodi Brook	Dermal	7429905	Aluminum	9.73E-02	mg/l	9.0E-08	mg/kg-day	N/A	N/A	--	2.5E-07	mg/kg-day	1.0E+00	mg/kg-day	3E-07
				7440382	Arsenic	9.70E-03	mg/l	9.0E-09	mg/kg-day	1.5E+00	(mg/kg-day)-1	1E-08	2.5E-08	mg/kg-day	3.0E-04	mg/kg-day	8E-05
				7440393	Barium	1.04E-01	mg/l	9.7E-08	mg/kg-day	N/A	N/A	--	2.7E-07	mg/kg-day	1.0E+00	mg/kg-day	3E-07
				7440417	Beryllium	9.00E-05	mg/l	8.4E-11	mg/kg-day	N/A	N/A	--	2.3E-10	mg/kg-day	1.4E-05	mg/kg-day	2E-05
				7440428	Boron	1.76E-01	mg/l	1.6E-07	mg/kg-day	N/A	N/A	--	4.6E-07	mg/kg-day	9.0E-02	mg/kg-day	5E-06
				7440473	Chromium, Total	2.20E-03	mg/l	2.0E-09	mg/kg-day	N/A	N/A	--	5.7E-09	mg/kg-day	2.0E-02	mg/kg-day	3E-07
				7440484	Cobalt	1.60E-03	mg/l	3.0E-09	mg/kg-day	N/A	N/A	--	8.3E-09	mg/kg-day	2.0E-02	mg/kg-day	4E-07
				7440508	Copper	2.37E-02	mg/l	2.2E-08	mg/kg-day	N/A	N/A	--	6.2E-08	mg/kg-day	4.0E-02	mg/kg-day	2E-06
				7439896	Iron	1.16E+00	mg/l	1.1E-06	mg/kg-day	N/A	N/A	--	3.0E-06	mg/kg-day	3.0E-01	mg/kg-day	1E-05
				7439910	Lanthanum	3.84E-02	mg/l	3.6E-08	mg/kg-day	N/A	N/A	--	1.0E-07	mg/kg-day	N/A	N/A	--
				7439921	Lead	7.70E-03	mg/l	7.2E-09	mg/kg-day	N/A	N/A	--	2.0E-08	mg/kg-day	N/A	N/A	--
				7439932	Lithium	9.46E-02	mg/l	8.8E-08	mg/kg-day	N/A	N/A	--	2.5E-07	mg/kg-day	2.0E-02	mg/kg-day	1E-05
				7439965	Manganese	4.34E-01	mg/l	4.0E-07	mg/kg-day	N/A	N/A	--	1.1E-06	mg/kg-day	5.6E-03	mg/kg-day	2E-04
				7440020	Nickel	3.20E-03	mg/l	5.9E-10	mg/kg-day	N/A	N/A	--	1.7E-09	mg/kg-day	8.0E-04	mg/kg-day	2E-06
				7440224	Silver	1.30E-03	mg/l	7.2E-10	mg/kg-day	N/A	N/A	--	2.0E-09	mg/kg-day	2.0E-04	mg/kg-day	1E-05
				7440280	Thallium	4.30E-03	mg/l	4.0E-09	mg/kg-day	N/A	N/A	--	1.1E-08	mg/kg-day	8.0E-05	mg/kg-day	1E-04
				7440622	Vanadium	3.00E-03	mg/l	2.8E-09	mg/kg-day	N/A	N/A	--	7.8E-09	mg/kg-day	1.8E-04	mg/kg-day	4E-05
				7440666	Zinc	3.95E-02	mg/l	2.2E-08	mg/kg-day	N/A	N/A	--	6.2E-08	mg/kg-day	3.0E-01	mg/kg-day	2E-07
				13966295	Total Uranium	2.85E-03	mg/l	2.7E-09	mg/kg-day	N/A	N/A	--	7.4E-09	mg/kg-day	3.0E-03	mg/kg-day	2E-06
			Exp. Route Total									1E-08					5E-04
	Exposure Medium Total											1E-08					5E-04
Medium Total												1E-08					5E-04
Sediment	Sediment	Lodi Brook	Ingestion	7440360	Antimony	4.80E+00	mg/kg	8.9E-08	mg/kg-day	N/A	N/A	--	2.5E-07	mg/kg-day	4.0E-04	mg/kg-day	6E-04
				7440382	Arsenic	3.05E+01	mg/kg	5.6E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	8E-07	1.6E-06	mg/kg-day	3.0E-04	mg/kg-day	5E-03
				7440451	Cerium	7.58E+02	mg/kg	1.4E-05	mg/kg-day	N/A	N/A	--	3.9E-05	mg/kg-day	N/A	N/A	--
				7439896	Iron	3.73E+04	mg/kg	6.9E-04	mg/kg-day	N/A	N/A	--	1.9E-03	mg/kg-day	3.0E-01	mg/kg-day	6E-03
				7439910	Lanthanum	3.55E+02	mg/kg	6.6E-06	mg/kg-day	N/A	N/A	--	1.8E-05	mg/kg-day	N/A	N/A	--
				7439921	Lead	4.27E+02	mg/kg	7.9E-06	mg/kg-day	N/A	N/A	--	2.2E-05	mg/kg-day	N/A	N/A	--
				7439965	Manganese	5.80E+02	mg/kg	1.1E-05	mg/kg-day	N/A	N/A	--	3.0E-05	mg/kg-day	5.6E-03	mg/kg-day	5E-03
				7440008	Neodymium	3.01E+02	mg/kg	5.6E-06	mg/kg-day	N/A	N/A	--	1.6E-05	mg/kg-day	1.0E-01	mg/kg-day	2E-04
				7440655	Yttrium	1.10E+01	mg/kg	2.0E-07	mg/kg-day	N/A	N/A	--	5.7E-07	mg/kg-day	N/A	N/A	--
				13966295	Total Uranium	1.36E+01	mg/kg	2.5E-07	mg/kg-day	N/A	N/A	--	7.0E-07	mg/kg-day	3.0E-03	mg/kg-day	2E-04
			Exp. Route Total									8E-07					2E-02
			Dermal	7440382	Arsenic	3.05E+01	mg/kg	2.6E-14	mg/kg-day	1.5E+00	(mg/kg-day)-1	4E-14	7.2E-14	mg/kg-day	3.0E-04	mg/kg-day	2E-10
			Exp. Route Total									4E-14					2E-10
		Exposure Point Total										9E-07					2E-02
	Exposure Medium Total											8E-07					2E-02
Medium Total												8E-07					2E-02
								Total of Receptor Risks Across All Media				1E-08	Total of Receptor Hazards Across All Media				5E-04

TABLE 7.9.RME

CALCULATION OF CHEMICAL CANCER RISKS AND NON-CANCER HAZARDS

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Municipal Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route		Chemical of Potential Concern	EPC		Cancer Risk Calculations					Non-Cancer Hazard Calculations				
						Value	Units	Intake/Exposure Concentration		CSF/Unit Risk		Cancer Risk	Intake/Exposure Concentration		RfD/RfC		Hazard Quotient
								Value	Units	Value	Units		Value	Units	Value	Units	
Surface Water	Surface Water	Westerly Brook	Dermal	7429905	Aluminum	2.55E-01	mg/l	2.4E-07	mg/kg-day	N/A	N/A	--	6.6E-07	mg/kg-day	1.0E+00	mg/kg-day	7E-07
				7440382	Arsenic	4.87E-02	mg/l	4.5E-08	mg/kg-day	1.5E+00	(mg/kg-day)-1	7E-08	1.3E-07	mg/kg-day	3.0E-04	mg/kg-day	4E-04
				7440393	Barium	2.42E-01	mg/l	2.2E-07	mg/kg-day	N/A	N/A	--	6.3E-07	mg/kg-day	1.0E+00	mg/kg-day	6E-07
				7440428	Boron	2.18E-01	mg/l	2.0E-07	mg/kg-day	N/A	N/A	--	5.7E-07	mg/kg-day	9.0E-02	mg/kg-day	6E-06
				7440439	Cadmium	5.40E-04	mg/l	5.0E-10	mg/kg-day	N/A	N/A	--	1.4E-09	mg/kg-day	2.5E-05	mg/kg-day	6E-05
				7440473	Chromium, Total	4.90E-03	mg/l	4.6E-09	mg/kg-day	N/A	N/A	--	1.3E-08	mg/kg-day	2.0E-02	mg/kg-day	7E-07
				7440484	Cobalt	1.80E-03	mg/l	3.3E-09	mg/kg-day	N/A	N/A	--	9.4E-09	mg/kg-day	2.0E-02	mg/kg-day	5E-07
				7440508	Copper	4.90E-03	mg/l	4.6E-09	mg/kg-day	N/A	N/A	--	1.3E-08	mg/kg-day	4.0E-02	mg/kg-day	3E-07
				7439896	Iron	3.46E+00	mg/l	3.2E-06	mg/kg-day	N/A	N/A	--	9.0E-06	mg/kg-day	3.0E-01	mg/kg-day	3E-05
				7439910	Lanthanum	3.53E-02	mg/l	3.3E-08	mg/kg-day	N/A	N/A	--	9.2E-08	mg/kg-day	N/A	N/A	--
				7439921	Lead	5.40E-03	mg/l	5.0E-09	mg/kg-day	N/A	N/A	--	1.4E-08	mg/kg-day	N/A	N/A	--
				7439932	Lithium	6.42E-01	mg/l	6.0E-07	mg/kg-day	N/A	N/A	--	1.7E-06	mg/kg-day	2.0E-02	mg/kg-day	8E-05
				7439965	Manganese	3.73E+00	mg/l	3.5E-06	mg/kg-day	N/A	N/A	--	9.7E-06	mg/kg-day	5.6E-03	mg/kg-day	2E-03
				7439976	Mercury	1.20E-04	mg/l	1.1E-10	mg/kg-day	N/A	N/A	--	3.1E-10	mg/kg-day	2.1E-05	N/A	1E-05
				7440020	Nickel	7.90E-03	mg/l	1.5E-09	mg/kg-day	N/A	N/A	--	4.1E-09	mg/kg-day	8.0E-04	mg/kg-day	5E-06
				7440224	Silver	5.94E-02	mg/l	3.3E-08	mg/kg-day	N/A	N/A	--	9.3E-08	mg/kg-day	2.0E-04	mg/kg-day	5E-04
				7440280	Thallium	6.10E-03	mg/l	5.7E-09	mg/kg-day	N/A	N/A	--	1.6E-08	mg/kg-day	8.0E-05	mg/kg-day	2E-04
				7440622	Vanadium	3.30E-03	mg/l	3.1E-09	mg/kg-day	N/A	N/A	--	8.6E-09	mg/kg-day	1.8E-04	mg/kg-day	5E-05
				7440666	Zinc	1.86E-01	mg/l	1.0E-07	mg/kg-day	N/A	N/A	--	2.9E-07	mg/kg-day	3.0E-01	mg/kg-day	1E-06
				13966295	Total Uranium	2.68E-03	mg/l	2.5E-09	mg/kg-day	N/A	Risk/pCi	--	7.0E-09	mg/kg-day	3.0E-03	mg/kg-day	2E-06
			Exp. Route Total									7E-08					3E-03
	Exposure Medium Total											7E-08					3E-03
Medium Total												7E-08					3E-03
Sediment	Sediment	Westerly Brook	Ingestion	7440382	Arsenic	5.80E+00	mg/kg	1.1E-07	mg/kg-day	1.5E+00	(mg/kg-day)-1	2E-07	3.0E-07	mg/kg-day	3.0E-04	mg/kg-day	1E-03
				7440451	Cerium	1.51E+01	mg/kg	2.8E-07	mg/kg-day	N/A	N/A	--	7.8E-07	mg/kg-day	N/A	N/A	--
				7439896	Iron	2.58E+04	mg/kg	4.8E-04	mg/kg-day	N/A	N/A	--	1.3E-03	mg/kg-day	3.0E-01	mg/kg-day	4E-03
				7439910	Lanthanum	4.90E+00	mg/kg	9.0E-08	mg/kg-day	N/A	N/A	--	2.5E-07	mg/kg-day	N/A	N/A	--
				7439921	Lead	2.76E+02	mg/kg	5.1E-06	mg/kg-day	N/A	N/A	--	1.4E-05	mg/kg-day	N/A	N/A	--
				7439965	Manganese	2.07E+02	mg/kg	3.8E-06	mg/kg-day	N/A	N/A	--	1.1E-05	mg/kg-day	5.6E-03	mg/kg-day	2E-03
				7440008	Neodymium	8.40E+00	mg/kg	1.5E-07	mg/kg-day	N/A	N/A	--	4.3E-07	mg/kg-day	1.0E-01	mg/kg-day	4E-06
				7440655	Yttrium	6.40E+00	mg/kg	1.2E-07	mg/kg-day	N/A	N/A	--	3.3E-07	mg/kg-day	N/A	N/A	--
				13966295	Total Uranium	3.52E+00	mg/kg	6.5E-08	mg/kg-day	N/A	N/A	--	1.8E-07	mg/kg-day	3.0E-03	mg/kg-day	6E-05
			Exp. Route Total									2E-07					7.4E-03
			Dermal	7440382	Arsenic	5.80E+00	mg/kg	4.9E-15	mg/kg-day	1.5E+00	(mg/kg-day)-1	7E-15	1.4E-14	mg/kg-day	3.0E-04	mg/kg-day	5E-11
			Exp. Route Total									7E-15					5E-11
		Exposure Point Total										2E-07					1E-02
	Exposure Medium Total											2E-07					7E-03
Medium Total												2E-07					7E-03
								Total of Receptor Risks Across All Media				2E-07	Total of Receptor Hazards Across All Media				1E-02

TABLE 8.1.RME

CALCULATION OF RADIATION CANCER RISKS

Reasonable Maximum Exposure

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Radionuclide of Potential Concern	EPC (1)		Risk Calculation Approach	Cancer Risk Calculations				
					Value	Units		Intake/Activity		CSF (2)		Cancer Risk
								Value	Units	Value	Units	
Groundwater	Tap Water	Tap Water	Ingestion	Radium 226 + D	5.56E-01	pCi/l	USEPA RAGS	9.3E+03	pCi	3.86E-10	Risk/pCi	4E-06
				Radium 228 + D	1.46E+00	pCi/l	USEPA RAGS	2.5E+04	pCi	1.04E-09	Risk/pCi	3E-05
				Thorium 228 + D	8.72E-01	pCi/l	USEPA RAGS	1.5E+04	pCi	3.00E-10	Risk/pCi	4E-06
				Thorium 230	8.41E-01	pCi/l	USEPA RAGS	1.4E+04	pCi	9.10E-11	Risk/pCi	1E-06
				Thorium 232	4.88E-01	pCi/l	USEPA RAGS	8.2E+03	pCi	1.01E-10	Risk/pCi	8E-07
				Uranium 234	1.56E+00	pCi/l	USEPA RAGS	2.6E+04	pCi	7.07E-11	Risk/pCi	2E-06
				Uranium 235 + D	4.30E-01	pCi/l	USEPA RAGS	7.2E+03	pCi	7.18E-11	Risk/pCi	5E-07
				Uranium 238 + D	1.15E+00	pCi/l	USEPA RAGS	1.9E+04	pCi	8.71E-11	Risk/pCi	2E-06
				Lead 210 + D	5.56E-01	pCi/l	USEPA RAGS	9.3E+03	pCi	1.27E-09	Risk/pCi	1E-05
			Exp. Route Total									4E-05
		Exposure Point Total										4E-05
	Exposure Medium Total											4E-05
Medium Total												4E-05

(1) EPCs are for parent only and do not contain radiological daughter products

(2) CSFs include consider radiological daughter products

Total of Receptor Risks Across All Media: 4E-05

TABLE 8.1.1.CT

CALCULATION OF RADIATION CANCER RISKS

CENTRAL TENDENCY

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Radionuclide of Potential Concern	EPC (1)		Risk Calculation Approach	Cancer Risk Calculations				
					Value	Units		Intake/Activity		CSF (2)		Cancer Risk
								Value	Units	Value	Units	
Groundwater	Tap Water	Tap Water	Ingestion	Radium 226 + D	5.56E-01	pCi/l	USEPA RAGS	1.8E+03	pCi	3.86E-10	Risk/pCi	7E-07
				Radium 228 + D	1.46E+00	pCi/l	USEPA RAGS	4.6E+03	pCi	1.04E-09	Risk/pCi	5E-06
				Thorium 228 + D	8.72E-01	pCi/l	USEPA RAGS	2.7E+03	pCi	3.00E-10	Risk/pCi	8E-07
				Thorium 230	8.41E-01	pCi/l	USEPA RAGS	2.7E+03	pCi	9.10E-11	Risk/pCi	2E-07
				Thorium 232	4.88E-01	pCi/l	USEPA RAGS	1.5E+03	pCi	1.01E-10	Risk/pCi	2E-07
				Uranium 234	1.56E+00	pCi/l	USEPA RAGS	4.9E+03	pCi	7.07E-11	Risk/pCi	3E-07
				Uranium 235 + D	4.30E-01	pCi/l	USEPA RAGS	1.4E+03	pCi	7.18E-11	Risk/pCi	1E-07
				Uranium 238 + D	1.15E+00	pCi/l	USEPA RAGS	3.6E+03	pCi	8.71E-11	Risk/pCi	3E-07
				Lead 210 + D	5.56E-01	pCi/l	USEPA RAGS	1.8E+03	pCi	1.27E-09	Risk/pCi	2E-06
			Exp. Route Total									1E-05
		Exposure Point Total										1E-05
	Exposure Medium Total											1E-05
Medium Total												1E-05

(1) EPCs are for parent only and do not contain radiological daughter products

(2) CSFs include consider radiological daughter products

Total of Receptor Risks Across All Media: 1E-05

TABLE 8.2.RME

CALCULATION OF RADIATION CANCER RISKS

Reasonable Maximum Exposure

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Radionuclide of Potential Concern	EPC (1)		Risk Calculation Approach	Cancer Risk Calculations				
					Value	Units		Intake/Activity		CSF (2)		Cancer Risk
								Value	Units	Value	Units	
Groundwater	Tap Water	Tap Water	Ingestion	Radium 226 + D	5.56E-01	pCi/g	USEPA RAGS	1.2E+03	pCi	3.86E-10	Risk/pCi	5E-07
				Radium 228 + D	1.46E+00	pCi/l	USEPA RAGS	3.1E+03	pCi	1.04E-09	Risk/pCi	3E-06
				Thorium 228 + D	8.72E-01	pCi/l	USEPA RAGS	1.8E+03	pCi	3.00E-10	Risk/pCi	5E-07
				Thorium 230	8.41E-01	pCi/l	USEPA RAGS	1.8E+03	pCi	9.10E-11	Risk/pCi	2E-07
				Thorium 232	4.88E-01	pCi/l	USEPA RAGS	1.0E+03	pCi	1.01E-10	Risk/pCi	1E-07
				Uranium 234	1.56E+00	pCi/l	USEPA RAGS	3.3E+03	pCi	7.07E-11	Risk/pCi	2E-07
				Uranium 235 + D	4.30E-01	pCi/l	USEPA RAGS	9.0E+02	pCi	7.18E-11	Risk/pCi	6E-08
				Uranium 238 + D	1.15E+00	pCi/l	USEPA RAGS	2.4E+03	pCi	8.71E-11	Risk/pCi	2E-07
				Lead 210 + D	5.56E-01	pCi/l	USEPA RAGS	1.2E+03	pCi	1.27E-09	Risk/pCi	1E-06
			Exp. Route Total									6E-06
		Exposure Point Total										6E-06
	Exposure Medium Total											6E-06
Medium Total												6E-06

(1) EPCs are for parent only and do not contain radiological daughter products

(2) CSFs include consider radiological daughter products

Total of Receptor Risks Across All Media: 6E-06

TABLE 8.2.1.CT

CALCULATION OF RADIATION CANCER RISKS

CENTRAL TENDENCY

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Radionuclide of Potential Concern	EPC (1)		Risk Calculation Approach	Cancer Risk Calculations				
								Intake/Activity		CSF (2)		Cancer Risk
					Value	Units		Value	Units	Value	Units	
Groundwater	Tap Water	Tap Water	Ingestion	Radium 226 + D	5.56E-01	pCi/g	USEPA RAGS	5.8E+02	pCi	3.86E-10	Risk/pCi	2E-07
				Radium 228 + D	1.46E+00	pCi/l	USEPA RAGS	1.5E+03	pCi	1.04E-09	Risk/pCi	2E-06
				Thorium 228 + D	8.72E-01	pCi/l	USEPA RAGS	9.2E+02	pCi	3.00E-10	Risk/pCi	3E-07
				Thorium 230	8.41E-01	pCi/l	USEPA RAGS	8.8E+02	pCi	9.10E-11	Risk/pCi	8E-08
				Thorium 232	4.88E-01	pCi/l	USEPA RAGS	5.1E+02	pCi	1.01E-10	Risk/pCi	5E-08
				Uranium 234	1.56E+00	pCi/l	USEPA RAGS	1.6E+03	pCi	7.07E-11	Risk/pCi	1E-07
				Uranium 235 + D	4.30E-01	pCi/l	USEPA RAGS	4.5E+02	pCi	7.18E-11	Risk/pCi	3E-08
				Uranium 238 + D	1.15E+00	pCi/l	USEPA RAGS	1.2E+03	pCi	8.71E-11	Risk/pCi	1E-07
				Lead 210 + D	5.56E-01	pCi/l	USEPA RAGS	5.8E+02	pCi	1.27E-09	Risk/pCi	7E-07
			Exp. Route Total									3E-06
		Exposure Point Total										3E-06
	Exposure Medium Total											3E-06
Medium Total												3E-06

(1) EPCs are for parent only and do not contain radiological daughter products

(2) CSFs include consider radiological daughter products

Total of Receptor Risks Across All Media: 3E-06

TABLE 8.3.RME

CALCULATION OF RADIATION CANCER RISKS

Reasonable Maximum Exposure

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Radionuclide of Potential Concern	EPC (1)		Risk Calculation Approach	Cancer Risk Calculations				
					Value	Units		Intake/Activity		CSF (2)		Cancer Risk
								Value	Units	Value	Units	
Groundwater	Tap Water	Tap Water	Ingestion	Radium 226 + D	5.56E-01	pCi/l	USEPA RAGS	3.5E+03	pCi	3.86E-10	Risk/pCi	1E-06
				Radium 228 + D	1.46E+00	pCi/l	USEPA RAGS	9.1E+03	pCi	1.04E-09	Risk/pCi	9E-06
				Thorium 228 + D	8.72E-01	pCi/l	USEPA RAGS	5.4E+03	pCi	3.00E-10	Risk/pCi	2E-06
				Thorium 230	8.41E-01	pCi/l	USEPA RAGS	5.3E+03	pCi	9.10E-11	Risk/pCi	5E-07
				Thorium 232	4.88E-01	pCi/l	USEPA RAGS	3.1E+03	pCi	1.01E-10	Risk/pCi	3E-07
				Uranium 234	1.56E+00	pCi/l	USEPA RAGS	9.7E+03	pCi	7.07E-11	Risk/pCi	7E-07
				Uranium 235 + D	4.30E-01	pCi/l	USEPA RAGS	2.7E+03	pCi	7.18E-11	Risk/pCi	2E-07
				Uranium 238 + D	1.15E+00	pCi/l	USEPA RAGS	7.2E+03	pCi	8.71E-11	Risk/pCi	6E-07
				Lead 210 + D	5.56E-01	pCi/l	USEPA RAGS	3.5E+03	pCi	1.27E-09	Risk/pCi	4E-06
			Exp. Route Total									2E-05
		Exposure Point Total										2E-05
	Exposure Medium Total											2E-05
Medium Total												2E-05

(1) EPCs are for parent only and do not contain radiological daughter products

(2) CSFs include consider radiological daughter products

Total of Receptor Risks Across All Media: 2E-05

TABLE 8.3.1.CT

CALCULATION OF RADIATION CANCER RISKS

CENTRAL TENDENCY

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Radionuclide of Potential Concern	EPC (1)		Risk Calculation Approach	Cancer Risk Calculations				
					Value	Units		Intake/Activity		CSF (2)		Cancer Risk
								Value	Units	Value	Units	
Groundwater	Tap Water	Tap Water	Ingestion	Radium 226 + D	5.56E-01	pCi/l	USEPA RAGS	9.2E+02	pCi	3.86E-10	Risk/pCi	4E-07
				Radium 228 + D	1.46E+00	pCi/l	USEPA RAGS	2.4E+03	pCi	1.04E-09	Risk/pCi	3E-06
				Thorium 228 + D	8.72E-01	pCi/l	USEPA RAGS	1.4E+03	pCi	3.00E-10	Risk/pCi	4E-07
				Thorium 230	8.41E-01	pCi/l	USEPA RAGS	1.4E+03	pCi	9.10E-11	Risk/pCi	1E-07
				Thorium 232	4.88E-01	pCi/l	USEPA RAGS	8.1E+02	pCi	1.01E-10	Risk/pCi	8E-08
				Uranium 234	1.56E+00	pCi/l	USEPA RAGS	2.6E+03	pCi	7.07E-11	Risk/pCi	2E-07
				Uranium 235 + D	4.30E-01	pCi/l	USEPA RAGS	7.1E+02	pCi	7.18E-11	Risk/pCi	5E-08
				Uranium 238 + D	1.15E+00	pCi/l	USEPA RAGS	1.9E+03	pCi	8.71E-11	Risk/pCi	2E-07
				Lead 210 + D	5.56E-01	pCi/l	USEPA RAGS	9.2E+02	pCi	1.27E-09	Risk/pCi	1E-06
			Exp. Route Total									5E-06
		Exposure Point Total										5E-06
	Exposure Medium Total											5E-06
Medium Total												5E-06

(1) EPCs are for parent only and do not contain radiological daughter products

(2) CSFs include consider radiological daughter products

Total of Receptor Risks Across All Media: 5E-06

TABLE 8.4.RME

CALCULATION OF RADIATION CANCER RISKS

Reasonable Maximum Exposure

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Recreationist
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Radionuclide of Potential Concern	EPC (1)		Risk Calculation Approach	Cancer Risk Calculations				
					Value	Units		Intake/Activity		CSF (2)		Cancer Risk
								Value	Units	Value	Units	
Sediment	Sediment	Westerly Brook	Ingestion	Radium 226 + D	2.83E+00	pCi/g	USEPA RAGS	8.5E+01	pCi	7.30E-10	Risk/pCi	6E-08
				Thorium 228 + D	9.40E-01	pCi/g	USEPA RAGS	2.8E+01	pCi	8.09E-10	Risk/pCi	2E-08
				Thorium 230	1.29E+00	pCi/g	USEPA RAGS	3.9E+01	pCi	2.02E-10	Risk/pCi	8E-09
				Thorium 232	7.26E-01	pCi/g	USEPA RAGS	2.2E+01	pCi	2.31E-10	Risk/pCi	5E-09
				Uranium 234	1.30E+00	pCi/g	USEPA RAGS	3.9E+01	pCi	1.57E-10	Risk/pCi	6E-09
				Uranium 235 + D	1.74E-01	pCi/g	USEPA RAGS	5.2E+00	pCi	1.63E-10	Risk/pCi	9E-10
				Uranium 238 + D	1.41E+00	pCi/g	USEPA RAGS	4.2E+01	pCi	2.10E-10	Risk/pCi	9E-09
				Lead 210 + D	2.83E+00	pCi/g	USEPA RAGS	8.5E+01	pCi	2.66E-09	Risk/pCi	2E-07
			Exp. Route Total									3E-07
			External Radiation	Radium 226 + D	2.83E+00	pCi/g	USEPA RAGS	1.9E-01	pCi/g-year	8.5E-06	Risk/year per pCi/g	2E-06
				Thorium 228 + D	9.40E-01	pCi/g	USEPA RAGS	6.4E-02	pCi/g-year	7.8E-06	Risk/year per pCi/g	5E-07
				Thorium 230	1.29E+00	pCi/g	USEPA RAGS	8.8E-02	pCi/g-year	8.2E-10	Risk/year per pCi/g	7E-11
				Thorium 232	7.26E-01	pCi/g	USEPA RAGS	5.0E-02	pCi/g-year	3.4E-10	Risk/year per pCi/g	2E-11
				Uranium 234	1.30E+00	pCi/g	USEPA RAGS	8.9E-02	pCi/g-year	2.5E-10	Risk/year per pCi/g	2E-11
				Uranium 235 + D	1.74E-01	pCi/g	USEPA RAGS	1.2E-02	pCi/g-year	5.4E-07	Risk/year per pCi/g	6E-09
				Uranium 238 + D	1.41E+00	pCi/g	USEPA RAGS	9.6E-02	pCi/g-year	1.1E-07	Risk/year per pCi/g	1E-08
				Lead 210 + D	2.83E+00	pCi/g	USEPA RAGS	1.9E-01	pCi/g-year	4.2E-09	Risk/year per pCi/g	8E-10
			Exp. Route Total									2E-06
		Exposure Point Total										3E-06
	Exposure Medium Total											3E-06
Medium Total												3E-06

(1) EPCs are for parent only and do not contain radiological daughter products

(2) CSFs include consider radiological daughter products

Total of Receptor Risks Across All Media: 3E-06

TABLE 8.5.RME

CALCULATION OF RADIATION CANCER RISKS

Reasonable Maximum Exposure

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Recreationist
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Radionuclide of Potential Concern	EPC (1)		Risk Calculation Approach	Cancer Risk Calculations				
								Intake/Activity		CSF (2)		Cancer Risk
					Value	Units		Value	Units	Value	Units	
Sediment	Sediment	Saddle River	Ingestion	Radium 226 + D	2.59E+00	pCi/g	USEPA RAGS	7.8E+01	pCi	7.30E-10	Risk/pCi	6E-08
				Thorium 228 + D	9.58E-01	pCi/g	USEPA RAGS	2.9E+01	pCi	8.09E-10	Risk/pCi	2E-08
				Thorium 230	2.22E+00	pCi/g	USEPA RAGS	6.7E+01	pCi	2.02E-10	Risk/pCi	1E-08
				Thorium 232	1.01E+00	pCi/g	USEPA RAGS	3.0E+01	pCi	2.31E-10	Risk/pCi	7E-09
				Uranium 234	1.66E+00	pCi/g	USEPA RAGS	5.0E+01	pCi	1.57E-10	Risk/pCi	8E-09
				Uranium 235 + D	1.77E-01	pCi/g	USEPA RAGS	5.3E+00	pCi	1.63E-10	Risk/pCi	9E-10
				Uranium 238 + D	1.19E+00	pCi/g	USEPA RAGS	3.6E+01	pCi	2.10E-10	Risk/pCi	7E-09
				Lead 210 + D	2.59E+00	pCi/g	USEPA RAGS	7.8E+01	pCi	2.66E-09	Risk/pCi	2E-07
			Exp. Route Total									3E-07
			External Radiation	Radium 226 + D	2.59E+00	pCi/g	USEPA RAGS	1.8E-01	pCi/g-year	8.5E-06	Risk/year per pCi/g	2E-06
				Thorium 228 + D	9.58E-01	pCi/g	USEPA RAGS	6.6E-02	pCi/g-year	7.8E-06	Risk/year per pCi/g	5E-07
				Thorium 230	2.22E+00	pCi/g	USEPA RAGS	1.5E-01	pCi/g-year	8.2E-10	Risk/year per pCi/g	1E-10
				Thorium 232	1.01E+00	pCi/g	USEPA RAGS	6.9E-02	pCi/g-year	3.4E-10	Risk/year per pCi/g	2E-11
				Uranium 234	1.66E+00	pCi/g	USEPA RAGS	1.1E-01	pCi/g-year	2.5E-10	Risk/year per pCi/g	3E-11
				Uranium 235 + D	1.77E-01	pCi/g	USEPA RAGS	1.2E-02	pCi/g-year	5.4E-07	Risk/year per pCi/g	7E-09
				Uranium 238 + D	1.19E+00	pCi/g	USEPA RAGS	8.1E-02	pCi/g-year	1.1E-07	Risk/year per pCi/g	9E-09
				Lead 210 + D	2.59E+00	pCi/g	USEPA RAGS	1.8E-01	pCi/g-year	4.2E-09	Risk/year per pCi/g	7E-10
			Exp. Route Total									2E-06
		Exposure Point Total										2E-06
	Exposure Medium Total											2E-06
Medium Total												2E-06

(1) EPCs are for parent only and do not contain radiological daughter products

(2) CSFs include consider radiological daughter products

Total of Receptor Risks Across All Media: 2E-06

TABLE 8.6.RME

CALCULATION OF RADIATION CANCER RISKS

Reasonable Maximum Exposure

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Recreationist
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Radionuclide of Potential Concern	EPC (1)		Risk Calculation Approach	Cancer Risk Calculations				
					Value	Units		Intake/Activity		CSF (2)		Cancer Risk
								Value	Units	Value	Units	
Sediment	Sediment	Coles Brook	Ingestion	Radium 226 + D	1.57E+00	pCi/g	USEPA RAGS	4.7E+01	pCi	7.30E-10	Risk/pCi	3E-08
				Thorium 228 + D	2.21E+00	pCi/g	USEPA RAGS	6.6E+01	pCi	8.09E-10	Risk/pCi	5E-08
				Thorium 230	1.03E+00	pCi/g	USEPA RAGS	3.1E+01	pCi	2.02E-10	Risk/pCi	6E-09
				Thorium 232	1.80E+00	pCi/g	USEPA RAGS	5.4E+01	pCi	2.31E-10	Risk/pCi	1E-08
				Uranium 234	2.38E+00	pCi/g	USEPA RAGS	7.1E+01	pCi	1.57E-10	Risk/pCi	1E-08
				Uranium 235 + D	1.25E-01	pCi/g	USEPA RAGS	3.7E+00	pCi	1.63E-10	Risk/pCi	6E-10
				Uranium 238 + D	1.34E+00	pCi/g	USEPA RAGS	4.0E+01	pCi	2.10E-10	Risk/pCi	8E-09
				Lead 210 + D	1.57E+00	pCi/g	USEPA RAGS	4.7E+01	pCi	2.66E-09	Risk/pCi	1E-07
			Exp. Route Total									3E-07
			External Radiation	Radium 226 + D	1.57E+00	pCi/g	USEPA RAGS	1.1E-01	pCi/g-year	8.5E-06	Risk/year per pCi/g	9E-07
				Thorium 228 + D	2.21E+00	pCi/g	USEPA RAGS	1.5E-01	pCi/g-year	7.8E-06	Risk/year per pCi/g	1E-06
				Thorium 230	1.03E+00	pCi/g	USEPA RAGS	7.1E-02	pCi/g-year	8.2E-10	Risk/year per pCi/g	6E-11
				Thorium 232	1.80E+00	pCi/g	USEPA RAGS	1.2E-01	pCi/g-year	3.4E-10	Risk/year per pCi/g	4E-11
				Uranium 234	2.38E+00	pCi/g	USEPA RAGS	1.6E-01	pCi/g-year	2.5E-10	Risk/year per pCi/g	4E-11
				Uranium 235 + D	1.25E-01	pCi/g	USEPA RAGS	8.5E-03	pCi/g-year	5.4E-07	Risk/year per pCi/g	5E-09
				Uranium 238 + D	1.34E+00	pCi/g	USEPA RAGS	9.2E-02	pCi/g-year	1.1E-07	Risk/year per pCi/g	1E-08
				Lead 210 + D	1.57E+00	pCi/g	USEPA RAGS	1.1E-01	pCi/g-year	4.2E-09	Risk/year per pCi/g	5E-10
			Exp. Route Total									2E-06
		Exposure Point Total										2E-06
	Exposure Medium Total											2E-06
Medium Total												2E-06

(1) EPCs are for parent only and do not contain radiological daughter products

(2) CSFs include consider radiological daughter products

Total of Receptor Risks Across All Media: 2E-06

TABLE 8.7.RME

CALCULATION OF RADIATION CANCER RISKS

Reasonable Maximum Exposure

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Municipal Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Radionuclide of Potential Concern	EPC (1)		Risk Calculation Approach	Cancer Risk Calculations				
					Value	Units		Intake/Activity		CSF (2)		Cancer Risk
								Value	Units	Value	Units	
Sediment	Sediment	Lodi Brook	Ingestion	Radium 226 + D	1.04E+01	pCi/g	USEPA RAGS	3.4E+02	pCi	7.30E-10	Risk/pCi	3E-07
				Thorium 228 + D	2.36E+01	pCi/g	USEPA RAGS	7.8E+02	pCi	8.09E-10	Risk/pCi	6E-07
				Thorium 230	4.48E+00	pCi/g	USEPA RAGS	1.5E+02	pCi	2.02E-10	Risk/pCi	3E-08
				Thorium 232	2.15E+01	pCi/g	USEPA RAGS	7.1E+02	pCi	2.31E-10	Risk/pCi	2E-07
				Uranium 234	6.22E+00	pCi/g	USEPA RAGS	2.1E+02	pCi	1.57E-10	Risk/pCi	3E-08
				Uranium 235 + D	2.73E-01	pCi/g	USEPA RAGS	9.0E+00	pCi	1.63E-10	Risk/pCi	1E-09
				Uranium 238 + D	5.75E+00	pCi/g	USEPA RAGS	1.9E+02	pCi	2.10E-10	Risk/pCi	4E-08
				Lead 210 + D	1.04E+01	pCi/g	USEPA RAGS	3.4E+02	pCi	2.66E-09	Risk/pCi	9E-07
			Exp. Route Total									2E-06
			External Radiation	Radium 226 + D	1.04E+01	pCi/g	USEPA RAGS	2.4E-01	pCi/g-year	8.5E-06	Risk/year per pCi/g	2E-06
				Thorium 228 + D	2.36E+01	pCi/g	USEPA RAGS	5.4E-01	pCi/g-year	7.8E-06	Risk/year per pCi/g	4E-06
				Thorium 230	4.48E+00	pCi/g	USEPA RAGS	1.0E-01	pCi/g-year	8.2E-10	Risk/year per pCi/g	8E-11
				Thorium 232	2.15E+01	pCi/g	USEPA RAGS	4.9E-01	pCi/g-year	3.4E-10	Risk/year per pCi/g	2E-10
				Uranium 234	6.22E+00	pCi/g	USEPA RAGS	1.4E-01	pCi/g-year	2.5E-10	Risk/year per pCi/g	4E-11
				Uranium 235 + D	2.73E-01	pCi/g	USEPA RAGS	6.2E-03	pCi/g-year	5.4E-07	Risk/year per pCi/g	3E-09
				Uranium 238 + D	5.75E+00	pCi/g	USEPA RAGS	1.3E-01	pCi/g-year	1.1E-07	Risk/year per pCi/g	1E-08
				Lead 210 + D	1.04E+01	pCi/g	USEPA RAGS	2.4E-01	pCi/g-year	4.2E-09	Risk/year per pCi/g	1E-09
			Exp. Route Total									6E-06
		Exposure Point Total										8E-06
	Exposure Medium Total											8E-06
Medium Total												8E-06

(1) EPCs are for parent only and do not contain radiological daughter products

(2) CSFs include consider radiological daughter products

Total of Receptor Risks Across All Media: 8E-06

TABLE 8.8.RME

CALCULATION OF RADIATION CANCER RISKS

Reasonable Maximum Exposure

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Municipal Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Radionuclide of Potential Concern	EPC (1)		Risk Calculation Approach	Cancer Risk Calculations				
					Value	Units		Intake/Activity		CSF (2)		Cancer Risk
								Value	Units	Value	Units	
Sediment	Sediment	Westerly Brook	Ingestion	Radium 226 + D	2.83E+00	pCi/g	USEPA RAGS	9.3E+01	pCi	7.30E-10	Risk/pCi	7E-08
				Thorium 228 + D	9.40E-01	pCi/g	USEPA RAGS	3.1E+01	pCi	8.09E-10	Risk/pCi	3E-08
				Thorium 230	1.29E+00	pCi/g	USEPA RAGS	4.3E+01	pCi	2.02E-10	Risk/pCi	9E-09
				Thorium 232	7.26E-01	pCi/g	USEPA RAGS	2.4E+01	pCi	2.31E-10	Risk/pCi	6E-09
				Uranium 234	1.30E+00	pCi/g	USEPA RAGS	4.3E+01	pCi	1.57E-10	Risk/pCi	7E-09
				Uranium 235 + D	1.74E-01	pCi/g	USEPA RAGS	5.8E+00	pCi	1.63E-10	Risk/pCi	9E-10
				Uranium 238 + D	1.41E+00	pCi/g	USEPA RAGS	4.6E+01	pCi	2.10E-10	Risk/pCi	1E-08
				Lead 210 + D	2.83E+00	pCi/g	USEPA RAGS	9.3E+01	pCi	2.66E-09	Risk/pCi	2E-07
			Exp. Route Total									4E-07
			External Radiation	Radium 226 + D	2.83E+00	pCi/g	USEPA RAGS	6.5E-02	pCi/g-year	8.5E-06	Risk/year per pCi/g	5E-07
				Thorium 228 + D	9.40E-01	pCi/g	USEPA RAGS	2.1E-02	pCi/g-year	7.8E-06	Risk/year per pCi/g	2E-07
				Thorium 230	1.29E+00	pCi/g	USEPA RAGS	2.9E-02	pCi/g-year	8.2E-10	Risk/year per pCi/g	2E-11
				Thorium 232	7.26E-01	pCi/g	USEPA RAGS	1.7E-02	pCi/g-year	3.4E-10	Risk/year per pCi/g	6E-12
				Uranium 234	1.30E+00	pCi/g	USEPA RAGS	3.0E-02	pCi/g-year	2.5E-10	Risk/year per pCi/g	7E-12
				Uranium 235 + D	1.74E-01	pCi/g	USEPA RAGS	4.0E-03	pCi/g-year	5.4E-07	Risk/year per pCi/g	2E-09
				Uranium 238 + D	1.41E+00	pCi/g	USEPA RAGS	3.2E-02	pCi/g-year	1.1E-07	Risk/year per pCi/g	4E-09
				Lead 210 + D	2.83E+00	pCi/g	USEPA RAGS	6.5E-02	pCi/g-year	4.2E-09	Risk/year per pCi/g	3E-10
			Exp. Route Total									7E-07
		Exposure Point Total										1E-06
	Exposure Medium Total											1E-06
Medium Total												1E-06

(1) EPCs are for parent only and do not contain radiological daughter products

(2) CSFs include consider radiological daughter products

Total of Receptor Risks Across All Media: 1E-06

TABLE 9.1.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
Groundwater	Tap Water	Tap	Acetone	--	--	--			Nephropathy and anemia	8E-03	--	--	8E-03
			Benzene	6E-04	4E-04	--		1E-03	Immune	5E+00	2E+00	--	7E+00
			Chlorobenzene	--	--	--			Liver	4E-03	4E-03	4E-06	8E-03
			Chloroform	--	4E-06	--		4E-06	Liver	7E-03	5E-03	--	1E-02
			2-Chlorotoluene	--	--	--			Body Weight	2E+00	--	6E-01	3E+00
			4-Chlorotoluene	--	--	--			--	--	--	--	
			1,2-Dichloroethane	9E-07	1E-06	--		2E-06	--	9E-04	1E-02	--	1E-02
			1,2-Dichloroethene (total)	--	--	--			Hematological	1E-02	--	--	1E-02
			Ethylbenzene	--	--	--			Liver/Kidney	2E-02	--	5E-03	3E-02
			4-Methyl-2-pentanone	--	--	--			Kidney	1E-02	2E-04	--	1E-02
			Tetrachloroethene	--	--	--			Liver	1E-02	--	3E-03	1E-02
			Toluene	--	--	--			Liver/Kidney	1E-02	2E-02	2E-03	3E-02
			Trichloroethene	2E-05	2E-05	1E-06		4E-05	Liver, Kidney, development	3E-01	6E-03	2E-02	3E-01
			Vinyl Chloride	3E-04	3E-06	--		3E-04	Liver	2E-01	4E-03	--	2E-01
			Xylenes (total)	--	--	--			Body weight, mortality	4E-02	3E-01	1E-02	3E-01
			Aluminum	--	--	--			Neural toxicity	1E-02	--	--	1E-02
			Antimony	--	--	--			Blood	8E-02	--	--	8E-02
			Arsenic	4E-03	--	--		4E-03	Skin	2E+01	--	--	2E+01
			Barium	--	--	--			NOAEL	3E-01	--	--	3E-01
			Boron	--	--	--			Testes	1E-01	--	--	1E-01
			Cadmium	--	--	--			Kidney	6E-02	--	--	6E-02
			Cerium	--	--	--			--	--	--	--	
			Iron	--	--	--			Chronic iron overload	7E+00	--	--	7E+00
			Lanthanum	--	--	--			--	--	--	--	
			Lead	--	--	--			--	--	--	--	
			Lithium	--	--	--			Kidney	6E+00	--	--	6E+00
			Manganese	--	--	--			CNS	1E+00	--	--	1E+00
			Neodymium	--	--	--			LD50	5E-03	--	1E-05	5E-03
			Nickel	--	--	--			Body weight	3E-02	--	--	3E-02
			Silver	--	--	--			Skin	3E-03	--	--	3E-03
			Yttrium	--	--	--			--	--	--	--	
			Zinc	--	--	--			Blood	4E-02	--	6E-05	4E-02
			Total Uranium	--	--	--			Body weight, Kidney	3E-02	--	7E-05	3E-02
			Chemical Total	5E-03	1E-06	4E-04		6E-03		4E+01	3E+00	7E-01	4E+01

TABLE 9.1.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
			Radium 226 + D	4E-06	--	--	--	4E-06					
			Radium 228 + D	3E-05	--	--	--	3E-05					
			Thorium 228 + D	4E-06	--	--	--	4E-06					
			Thorium 230	1E-06	--	--	--	1E-06					
			Thorium 232	8E-07	--	--	--	8E-07					
			Uranium 234	2E-06	--	--	--	2E-06					
			Uranium 235 + D	5E-07	--	--	--	5E-07					
			Uranium 238 + D	2E-06	--	--	--	2E-06					
			Lead 238 + D	1E-05	--	--	--	1E-05					
			Radionuclide Total	5E-05				5E-05					
		Exposure Point Total											4E+01
	Exposure Medium Total							6E-03					4E+01
Medium Total								6E-03					4E+01
Receptor Total							Receptor Risk Total	6E-03				Receptor HI Total	4E+01

Total Liver effects HI Across All Media =	5E-01
Total Kidney effects HI Across All Media =	7E+00
Total Hematological effects HI Across All Media =	1E-01
Total Hematological effects HI Across All Media =	2E+01
Total Neurological effects HI Across All Media =	1E+00
Total Developmental effects HI Across All Media =	7E-01
Total Immune System effects HI Across All Media =	7E+00
Total Skin effects HI Across All Media =	2E+01
Total Reproductive effects HI Across All Media =	1E-01

TABLE 9.1.1.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
Groundwater	Tap Water	Tap	Acetone	--	--	--			Nephropathy and anemia	4E-03	--	--	4E-03
			Benzene	7E-05	1E-05	--		8E-05	Immune	3E+00	1E-01	--	3E+00
			Chlorobenzene	--	--	--			Liver	2E-03	2E-04	3E-06	2E-03
			Chloroform	--	1E-07	--		1E-07	Liver	4E-03	3E-04	--	4E-03
			2-Chlorotoluene	--	--	--			Body Weight	1E+00	--	4E-01	1E+00
			4-Chlorotoluene	--	--	--			--	--	--	--	
			1,2-Dichloroethane	1E-07	4E-08	--		1E-07	--	5E-04	7E-04	--	1E-03
			1,2-Dichloroethene (total)	--	--	--			Hematological	7E-03	--	--	7E-03
			Ethylbenzene	--	--	--			Liver/Kidney	1E-02	--	3E-03	1E-02
			4-Methyl-2-pentanone	--	--	--			Kidney	5E-03	1E-05	--	5E-03
			Tetrachloroethene	--	--	--			Liver	5E-03	--	2E-03	7E-03
			Toluene	--	--	--			Liver/Kidney	7E-03	1E-03	1E-03	9E-03
			Trichloroethene	2E-06	7E-07	2E-07		3E-06	Liver, Kidney, development	1E-01	3E-04	1E-02	1E-01
			Vinyl Chloride	4E-05	8E-08	--		4E-05	Liver	8E-02	2E-04	--	8E-02
			Xylenes (total)	--	--	--			Body weight, mortality	2E-02	2E-02	7E-03	4E-02
			Aluminum	--	--	--			Neural toxicity	5E-03	--	--	5E-03
			Antimony	--	--	--			Blood	4E-02	--	--	4E-02
			Arsenic	5E-04	--	--		5E-04	Skin	9E+00	--	--	9E+00
			Barium	--	--	--			NOAEL	2E-01	--	--	2E-01
			Boron	--	--	--			Testes	6E-02	--	--	6E-02
			Cadmium	--	--	--			Kidney	3E-02	--	--	3E-02
			Cerium	--	--	--			--	--	--	--	
			Iron	--	--	--			Chronic iron overload	3E+00	--	--	3E+00
			Lanthanum	--	--	--			--	--	--	--	
			Lead	--	--	--			--	--	--	--	
			Lithium	--	--	--			Kidney	3E+00	--	--	3E+00
			Manganese	--	--	--			CNS	7E-01	--	--	7E-01
			Neodymium	--	--	--			LD50	2E-03	--	4E-06	2E-03
			Nickel	--	--	--			Body weight	2E-02	--	--	2E-02
			Silver	--	--	--			Skin	2E-03	--	--	2E-03
			Yttrium	--	--	--			--	--	--	--	
			Zinc	--	--	--			Blood	2E-02	--	3E-05	2E-02
			Total Uranium	--	--	--			Body weight, Kidney	1E-02	--	3E-05	1E-02
			Chemical Total	6E-04	2E-07	1E-05		6E-04		2E+01	1E-01	4E-01	2E+01

TABLE 9.1.1.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
			Radium 226 + D	7E-07	--	--	--	7E-07					
			Radium 228 + D	5E-06	--	--	--	5E-06					
			Thorium 228 + D	8E-07	--	--	--	8E-07					
			Thorium 230	2E-07	--	--	--	2E-07					
			Thorium 232	2E-07	--	--	--	2E-07					
			Uranium 234	3E-07	--	--	--	3E-07					
			Uranium 235 + D	1E-07	--	--	--	1E-07					
			Uranium 238 + D	3E-07	--	--	--	3E-07					
			Lead 238 + D	2E-06	--	--	--	2E-06					
			Radionuclide Total	1E-05				1E-05					
		Exposure Point Total						6E-04					2E+01
	Exposure Medium Total							6E-04					2E+01
Medium Total								6E-04					2E+01
Receptor Total							Receptor Risk Total	6E-04				Receptor HI Total	2E+01

Total Liver effects HI Across All Media =	3E-01
Total Kidney effects HI Across All Media =	3E+00
Total Hematological effects HI Across All Media =	7E-02
Total Hematological effects HI Across All Media =	1E+01
Total Neurological effects HI Across All Media =	7E-01
Total Developmental effects HI Across All Media =	2E-01
Total Immune System effects HI Across All Media =	3E+00
Total Skin effects HI Across All Media =	9E+00
Total Reproductive effects HI Across All Media =	6E-02

TABLE 9.2.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
Groundwater	Tap Water	Tap	Acetone	--	--	--			Nephropathy and anemia	2E-02	--	--	2E-02
			Benzene	2E-04	2E-04	--		4E-04	Immune	1E+01	1E+01	--	2E+01
			Chlorobenzene	--	--	--			Liver	1E-02	2E-02	9E-06	3E-02
			Chloroform	--	2E-06	--		2E-06	Liver	2E-02	3E-02	--	4E-02
			2-Chlorotoluene	--	--	--			Body Weight	5E+00	--	1E+00	6E+00
			4-Chlorotoluene	--	--	--			--	--	--	--	
			1,2-Dichloroethane	3E-07	7E-07	--		1E-06	--	2E-03	6E-02	--	7E-02
			1,2-Dichloroethene (total)	--	--	--			Hemopoetic	3E-02	--	--	3E-02
			Ethylbenzene	--	--	--			Liver/Kidney	5E-02	--	1E-02	6E-02
			4-Methyl-2-pentanone	--	--	--			Kidney	2E-02	1E-03	--	3E-02
			Tetrachloroethene	--	--	--			Liver	2E-02	--	6E-03	3E-02
			Toluene	--	--	--			Liver/Kidney	3E-02	1E-01	4E-03	1E-01
			Trichloroethene	6E-06	1E-05	4E-07		2E-05	Liver, Kidney, development	6E-01	3E-02	4E-02	7E-01
			Vinyl Chloride	1E-04	1E-06	--		1E-04	Liver	4E-01	2E-02	--	4E-01
			Xylenes (total)	--	--	--			Body weight, mortality	1E-01	1E+00	3E-02	2E+00
			Aluminum	--	--	--			Neural toxicity	2E-02	--	--	2E-02
			Antimony	--	--	--			Blood	2E-01	--	--	2E-01
			Arsenic	2E-03	--	--		2E-03	Skin	4E+01	--	--	4E+01
			Barium	--	--	--			NOAEL	7E-01	--	--	7E-01
			Boron	--	--	--			Testes	3E-01	--	--	3E-01
			Cadmium	--	--	--			Kidney	1E-01	--	3E-03	1E-01
			Cerium	--	--	--			--	--	--	--	
			Iron	--	--	--			Chronic iron overload	2E+01	--	--	2E+01
			Lanthanum	--	--	--			--	--	--	--	
			Lead	--	--	--			--	--	--	--	
			Lithium	--	--	--			Kidney	2E+01	--	--	2E+01
			Manganese	--	--	--			CNS	3E+00	--	--	3E+00
			Neodymium	--	--	--			LD50	1E-02	--	1E-05	1E-02
			Nickel	--	--	--			Body weight	8E-02	--	--	8E-02
			Silver	--	--	--			Skin	8E-03	--	--	8E-03
			Yttrium	--	--	--			--	--	--	--	
			Zinc	--	--	--			Blood	1E-01	--	6E-05	1E-01
			Total Uranium	--	--	--			Body weight, Kidney	7E-02	--	2E-05	7E-02
			Chemical Total	2E-03	4E-07	4E-07		2E-03		9E+01	1E+01	2E+00	1E+02

TABLE 9.2.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
			Radium 226 + D	5E-07	--	--	--	5E-07					
			Radium 228 + D	3E-06	--	--	--	3E-06					
			Thorium 228 + D	5E-07	--	--	--	5E-07					
			Thorium 230	2E-07	--	--	--	2E-07					
			Thorium 232	1E-07	--	--	--	1E-07					
			Uranium 234	2E-07	--	--	--	2E-07					
			Uranium 235 + D	6E-08	--	--	--	6E-08					
			Uranium 238 + D	2E-07	--	--	--	2E-07					
			Lead 238 + D	1E-06	--	--	--	1E-06					
			Radionuclide Total	6E-06				6E-06					
		Exposure Point Total						2E-03					1E+02
	Exposure Medium Total							2E-03					1E+02
Medium Total								2E-03					1E+02
Receptor Total							Receptor Risk Total	2E-03				Receptor HI Total	1E+02

Total Liver effects HI Across All Media =	1E+00
Total Kidney effects HI Across All Media =	2E+01
Total Hematological effects HI Across All Media =	3E-01
Total Hematological effects HI Across All Media =	6E+01
Total Neurological effects HI Across All Media =	3E+00
Total Developmental effects HI Across All Media =	2E+00
Total Immune System effects HI Across All Media =	2E+01
Total Skin effects HI Across All Media =	4E+01
Total Reproductive effects HI Across All Media =	3E-01

TABLE 9.2.1.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
Groundwater	Tap Water	Tap	Acetone	--	--	--			Nephropathy and anemia	1E-02	--	--	1E-02
			Benzene	1E-04	2E-05	--		1E-04	Immune	6E+00	1E+00	--	7E+00
			Chlorobenzene	--	--	--			Liver	5E-03	2E-03	5E-06	7E-03
			Chloroform	--	3E-07	--		3E-07	Liver	9E-03	3E-03	--	1E-02
			2-Chlorotoluene	--	--	--			Body Weight	2E+00	--	8E-01	3E+00
			4-Chlorotoluene	--	--	--			--	--	--	--	
			1,2-Dichloroethane	2E-07	8E-08	--		2E-07	--	1E-03	7E-03	--	8E-03
			1,2-Dichloroethene (total)	--	--	--			Hemopoetic	2E-02	--	--	2E-02
			Ethylbenzene	--	--	--			Liver/Kidney	2E-02	--	7E-03	3E-02
			4-Methyl-2-pentanone	--	--	--			Kidney	1E-02	1E-04	--	1E-02
			Tetrachloroethene	--	--	--			Liver	1E-02	--	3E-03	2E-02
			Toluene	--	--	--			Liver/Kidney	2E-02	1E-02	2E-03	3E-02
			Trichloroethene	3E-06	1E-06	2E-07		5E-06	Liver, Kidney, development	3E-01	3E-03	2E-02	3E-01
			Vinyl Chloride	6E-05	2E-07	--		6E-05	Liver	2E-01	2E-03	--	2E-01
			Xylenes (total)	--	--	--			Body weight, mortality	5E-02	2E-01	1E-02	2E-01
			Aluminum	--	--	--			Neural toxicity	1E-02	--	--	1E-02
			Antimony	--	--	--			Blood	1E-01	--	--	1E-01
			Arsenic	8E-04	--	--		8E-04	Skin	2E+01	--	--	2E+01
			Barium	--	--	--			NOAEL	4E-01	--	--	4E-01
			Boron	--	--	--			Testes	1E-01	--	--	1E-01
			Cadmium	--	--	--			Kidney	7E-02	--	3E-03	7E-02
			Cerium	--	--	--			--	--	--	--	
			Iron	--	--	--			Chronic iron overload	8E+00	--	--	8E+00
			Lanthanum	--	--	--			--	--	--	--	
			Lead	--	--	--			--	--	--	--	
			Lithium	--	--	--			Kidney	8E+00	--	--	8E+00
			Manganese	--	--	--			CNS	2E+00	--	--	2E+00
			Neodymium	--	--	--			LD50	5E-03	--	1E-05	5E-03
			Nickel	--	--	--			Body weight	4E-02	--	--	4E-02
			Silver	--	--	--			Skin	4E-03	--	--	4E-03
			Yttrium	--	--	--			--	--	--	--	
			Zinc	--	--	--			Blood	5E-02	--	6E-05	5E-02
			Total Uranium	--	--	--			Body weight, Kidney	3E-02	--	2E-05	3E-02
			Chemical Total	1E-03	2E-07	2E-07		1E-03		5E+01	1E+00	9E-01	5E+01

TABLE 9.2.1.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
			Radium 226 + D	2E-07	--	--	--	2E-07					
			Radium 228 + D	2E-06	--	--	--	2E-06					
			Thorium 228 + D	3E-07	--	--	--	3E-07					
			Thorium 230	8E-08	--	--	--	8E-08					
			Thorium 232	5E-08	--	--	--	5E-08					
			Uranium 234	1E-07	--	--	--	1E-07					
			Uranium 235 + D	3E-08	--	--	--	3E-08					
			Uranium 238 + D	1E-07	--	--	--	1E-07					
			Lead 238 + D	7E-07	--	--	--	7E-07					
			Radionuclide Total	3E-06				3E-06					
		Exposure Point Total						1E-03					5E+01
	Exposure Medium Total							1E-03					5E+01
Medium Total								1E-03					5E+01
Receptor Total							Receptor Risk Total	1E-03				Receptor HI Total	5E+01

Total Liver effects HI Across All Media =	6E-01
Total Kidney effects HI Across All Media =	8E+00
Total Hematological effects HI Across All Media =	2E-01
Total Hematological effects HI Across All Media =	3E+01
Total Neurological effects HI Across All Media =	2E+00
Total Developmental effects HI Across All Media =	6E-01
Total Immune System effects HI Across All Media =	7E+00
Total Skin effects HI Across All Media =	2E+01
Total Reproductive effects HI Across All Media =	1E-01

TABLE 9.3.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
Groundwater	Tap Water	Tap	Acetone	--	--	--			Nephropathy and anemia	3E-03	--	--	3E-03
			Benzene	1E-04	--	--		1E-04	Immune	2E+00	--	--	2E+00
			Chlorobenzene	--	--	--			Liver	1E-03	--	--	1E-03
			Chloroform	--	--	--			Liver	3E-03	--	--	3E-03
			2-Chlorotoluene	--	--	--			Body Weight	7E-01	--	1E-01	8E-01
			4-Chlorotoluene	--	--	--			--	--	--	--	
			1,2-Dichloroethane	2E-07	--	--		2E-07	--	3E-04	--	--	3E-04
			1,2-Dichloroethene (total)	--	--	--			Hemopoetic	5E-03	--	--	5E-03
			Ethylbenzene	--	--	--			Liver/Kidney	7E-03	--	8E-04	8E-03
			4-Methyl-2-pentanone	--	--	--			Kidney	4E-03	--	--	4E-03
			Tetrachloroethene	--	--	--			Liver	4E-03	--	4E-04	4E-03
			Toluene	--	--	--			Liver/Kidney	5E-03	--	--	5E-03
			Trichloroethene	4E-06	--	--		4E-06	Liver, Kidney, development	9E-02	--	--	9E-02
			Vinyl Chloride	8E-05	--	--		8E-05	Liver	5E-02	--	--	5E-02
			Xylenes (total)	--	--	--			Body weight, mortality	2E-02	--	2E-03	2E-02
			Aluminum	--	--	--			Neural toxicity	3E-03	--	--	3E-03
			Antimony	--	--	--			Blood	3E-02	--	--	3E-02
			Arsenic	1E-03	--	--		1E-03	Skin	6E+00	--	--	6E+00
			Barium	--	--	--			NOAEL	1E-01	--	--	1E-01
			Boron	--	--	--			Testes	4E-02	--	--	4E-02
			Cadmium	--	--	--			Kidney	2E-02	--	--	2E-02
			Cerium	--	--	--			--	--	--	--	
			Iron	--	--	--			Chronic iron overload	2E+00	--	--	2E+00
			Lanthanum	--	--	--			--	--	--	--	
			Lead	--	--	--			--	--	--	--	
			Lithium	--	--	--			Kidney	2E+00	--	--	2E+00
			Manganese	--	--	--			CNS	5E-01	--	--	5E-01
			Neodymium	--	--	--			LD50	2E-03	--	1E-06	2E-03
			Nickel	--	--	--			Body weight	1E-02	--	--	1E-02
			Silver	--	--	--			Skin	1E-03	--	--	1E-03
			Yttrium	--	--	--			--	--	--	--	
			Zinc	--	--	--			Blood	2E-02	--	6E-06	2E-02
			Total Uranium	--	--	--			Body weight, Kidney	1E-02	--	2E-06	1E-02
			Chemical Total	1E-03	--	--		1E-03		1E+01	0E+00	1E-01	1E+01

TABLE 9.3.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
			Radium 226 + D	1E-06	--	--	--	1E-06					
			Radium 228 + D	9E-06	--	--	--	9E-06					
			Thorium 228 + D	2E-06	--	--	--	2E-06					
			Thorium 230	5E-07	--	--	--	5E-07					
			Thorium 232	3E-07	--	--	--	3E-07					
			Uranium 234	7E-07	--	--	--	7E-07					
			Uranium 235 + D	2E-07	--	--	--	2E-07					
			Uranium 238 + D	6E-07	--	--	--	6E-07					
			Lead 238 + D	4E-06	--	--	--	4E-06					
			Radionuclide Total	2E-05				2E-05					
		Exposure Point Total						1E-03					1E+01
	Exposure Medium Total							1E-03					1E+01
Medium Total								1E-03					1E+01
Receptor Total							Receptor Risk Total	1E-03				Receptor HI Total	1E+01

Total Liver effects HI Across All Media =	2E-01
Total Kidney effects HI Across All Media =	2E+00
Total Hematological effects HI Across All Media =	5E-02
Total Hematological effects HI Across All Media =	8E+00
Total Neurological effects HI Across All Media =	5E-01
Total Developmental effects HI Across All Media =	1E-01
Total Immune System effects HI Across All Media =	2E+00
Total Skin effects HI Across All Media =	6E+00
Total Reproductive effects HI Across All Media =	4E-02

TABLE 9.3.1.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
Groundwater	Tap Water	Tap	Acetone	--	--	--			Nephropathy and anemia	3E-03	--	--	3E-03
			Benzene	4E-05	--	--		4E-05	Immune	2E+00	--	--	2E+00
			Chlorobenzene	--	--	--			Liver	1E-03	--	--	1E-03
			Chloroform	--	--	--			Liver	3E-03	--	--	3E-03
			2-Chlorotoluene	--	--	--			Body Weight	7E-01	--	7E-02	8E-01
			4-Chlorotoluene	--	--	--			--	--	--	--	
			1,2-Dichloroethane	6E-08	--	--		6E-08	--	3E-04	--	--	3E-04
			1,2-Dichloroethene (total)	--	--	--			Hemopoetic	5E-03	--	--	5E-03
			Ethylbenzene	--	--	--			Liver/Kidney	7E-03	--	5E-04	8E-03
			4-Methyl-2-pentanone	--	--	--			Kidney	4E-03	--	--	4E-03
			Tetrachloroethene	--	--	--			Liver	4E-03	--	3E-04	4E-03
			Toluene	--	--	--			Liver/Kidney	5E-03	--	--	5E-03
			Trichloroethene	1E-06	--	--		1E-06	Liver, Kidney, development	9E-02	--	--	9E-02
			Vinyl Chloride	2E-05	--	--		2E-05	Liver	5E-02	--	--	5E-02
			Xylenes (total)	--	--	--			Body weight, mortality	2E-02	--	1E-03	2E-02
			Aluminum	--	--	--			Neural toxicity	3E-03	--	--	3E-03
			Antimony	--	--	--			Blood	3E-02	--	--	3E-02
			Arsenic	3E-04	--	--		3E-04	Skin	6E+00	--	--	6E+00
			Barium	--	--	--			NOAEL	1E-01	--	--	1E-01
			Boron	--	--	--			Testes	4E-02	--	--	4E-02
			Cadmium	--	--	--			Kidney	2E-02	--	--	2E-02
			Cerium	--	--	--			--	--	--	--	
			Iron	--	--	--			Chronic iron overload	2E+00	--	--	2E+00
			Lanthanum	--	--	--			--	--	--	--	
			Lead	--	--	--			--	--	--	--	
			Lithium	--	--	--			Kidney	2E+00	--	--	2E+00
			Manganese	--	--	--			CNS	5E-01	--	--	5E-01
			Neodymium	--	--	--			LD50	2E-03	--	4E-07	2E-03
			Nickel	--	--	--			Body weight	1E-02	--	--	1E-02
			Silver	--	--	--			Skin	1E-03	--	--	1E-03
			Yttrium	--	--	--			--	--	--	--	
			Zinc	--	--	--			Blood	2E-02	--	3E-06	2E-02
			Total Uranium	--	--	--			Body weight, Kidney	1E-02	--	1E-06	1E-02
			Chemical Total	3E-04	--	--		3E-04		1E+01	--	7E-02	1E+01

TABLE 9.3.1.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
		Exposure Point Total						3E-04					1E+01
	Exposure Medium Total							3E-04					1E+01
Medium Total								3E-04					1E+01
Receptor Total				Receptor Risk Total				3E-04	Receptor HI Total				1E+01

Total Liver effects HI Across All Media =	2E-01
Total Kidney effects HI Across All Media =	2E+00
Total Hematological effects HI Across All Media =	5E-02
Total Hematological effects HI Across All Media =	8E+00
Total Neurological effects HI Across All Media =	5E-01
Total Developmental effects HI Across All Media =	1E-01
Total Immune System effects HI Across All Media =	2E+00
Total Skin effects HI Across All Media =	6E+00
Total Reproductive effects HI Across All Media =	4E-02

TABLE 9.4.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
Groundwater	Groundwater	Excavation	Acetone	--	--	--			Nephropathy and anemia	--	--	2E-04	2E-04
			Benzene	--	1E-05	8E-06		2E-05	Immune	--	4E+00	3E+00	6E+00
			Chlorobenzene	--	--	--			Liver	--	6E-03	3E-05	6E-03
			Chloroform	--	1E-07	--		1E-07	Liver	--	6E-03	2E-03	8E-03
			2-Chlorotoluene	--	--	--			Body Weight	--	--	4E+00	4E+00
			4-Chlorotoluene	--	--	--			--	--	--	--	
			1,2-Dichloroethane	--	3E-08	4E-09		4E-08	--	--	2E-02	1E-04	2E-02
			1,2-Dichloroethene (total)	--	--	--			Hemopoetic	--	--	4E-03	4E-03
			Ethylbenzene	--	--	--			Liver/Kidney	--	--	3E-02	3E-02
			4-Methyl-2-pentanone	--	--	--			Kidney	--	3E-04	1E-03	1E-03
			Tetrachloroethene	--	--	--			Liver	--	--	1E-02	1E-02
			Toluene	--	--	--			Liver/Kidney	--	3E-02	1E-02	5E-02
			Trichloroethene	--	5E-07	2E-07		7E-07	Liver, Kidney, development	--	8E-03	1E-01	1E-01
			Vinyl Chloride	--	3E-07	2E-06		2E-06	Liver	--	3E-02	3E-02	6E-02
			Xylenes (total)	--	--	--			Body weight, mortality	--	4E-01	8E-02	5E-01
			Aluminum	--	--	--			Neural toxicity	--	--	3E-04	3E-04
			Antimony	--	--	--			Blood	--	--	4E-04	4E-04
			Arsenic	--	--	4E-06		4E-06	Skin	--	--	6E-01	6E-01
			Barium	--	--	--			NOAEL	--	--	7E-04	7E-04
			Boron	--	--	--			Testes	--	--	4E-03	4E-03
			Cadmium	--	--	--			Kidney	--	--	4E-02	4E-02
			Cerium	--	--	--			--	--	--	--	
			Iron	--	--	--			Chronic iron overload	--	--	2E-01	2E-01
			Lanthanum	--	--	--			--	--	--	--	
			Lead	--	--	--			--	--	--	--	
			Lithium	--	--	--			Kidney	--	--	2E-01	2E-01
			Manganese	--	--	--			CNS	--	--	1E+00	1E+00
			Neodymium	--	--	--			LD50	--	--	2E-04	2E-04
			Nickel	--	--	--			Body weight	--	--	6E-03	6E-03
			Silver	--	--	--			Skin	--	--	2E-03	2E-03
			Yttrium	--	--	--			--	--	--	--	
			Zinc	--	--	--			Blood	--	--	9E-04	9E-04
			Total Uranium	--	--	--			Body weight, Kidney	--	--	1E-03	1E-03
			Chemical Total	--	1E-05	1E-05		3E-05		--	4E+00	9E+00	1E+01

TABLE 9.4.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
		Exposure Point Total						3E-05					1E+01
	Exposure Medium Total							3E-05					1E+01
Medium Total								3E-05					1E+01
Receptor Total							Receptor Risk Total	3E-05				Receptor HI Total	1E+01

Total Liver effects HI Across All Media =	3E-01
Total Kidney effects HI Across All Media =	5E-01
Total Hematological effects HI Across All Media =	1E-03
Total Hematological effects HI Across All Media =	7E+00
Total Neurological effects HI Across All Media =	1E+00
Total Developmental effects HI Across All Media =	6E-01
Total Immune System effects HI Across All Media =	6E+00
Total Skin effects HI Across All Media =	6E-01
Total Reproductive effects HI Across All Media =	4E-03

TABLE 9.4.1.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
Groundwater	Groundwater	Excavation	Acetone	--	--	--			Nephropathy and anemia	--	--	2E-05	2E-05
			Benzene	--	6E-06	1E-06		7E-06	Immune	--	2E+00	4E-01	2E+00
			Chlorobenzene	--	--	--			Liver	--	3E-03	4E-06	3E-03
			Chloroform	--	5E-08	--		5E-08	Liver	--	3E-03	3E-04	3E-03
			2-Chlorotoluene	--	--	--			Body Weight	--	--	5E-01	5E-01
			4-Chlorotoluene	--	--	--			--	--	--	--	
			1,2-Dichloroethane	--	2E-08	5E-10		2E-08	--	--	9E-03	2E-05	9E-03
			1,2-Dichloroethene (total)	--	--	--			Hemopoetic	--	--	5E-04	5E-04
			Ethylbenzene	--	--	--			Liver/Kidney	--	--	5E-03	5E-03
			4-Methyl-2-pentanone	--	--	--			Kidney	--	2E-04	1E-04	3E-04
			Tetrachloroethene	--	--	--			Liver	--	--	2E-03	2E-03
			Toluene	--	--	--			Liver/Kidney	--	2E-02	2E-03	2E-02
			Trichloroethene	--	3E-07	3E-08		3E-07	Liver, Kidney, development	--	4E-03	2E-02	2E-02
			Vinyl Chloride	--	2E-07	2E-07		4E-07	Liver	--	1E-02	4E-03	2E-02
			Xylenes (total)	--	--	--			Body weight, mortality	--	2E-01	1E-02	2E-01
			Aluminum	--	--	--			Neural toxicity	--	--	4E-05	4E-05
			Antimony	--	--	--			Blood	--	--	5E-05	5E-05
			Arsenic	--	--	5E-07		5E-07	Skin	--	--	7E-02	7E-02
			Barium	--	--	--			NOAEL	--	--	9E-05	9E-05
			Boron	--	--	--			Testes	--	--	5E-04	5E-04
			Cadmium	--	--	--			Kidney	--	--	5E-03	5E-03
			Cerium	--	--	--			--	--	--	--	
			Iron	--	--	--			Chronic iron overload	--	--	3E-02	3E-02
			Lanthanum	--	--	--			--	--	--	--	
			Lead	--	--	--			--	--	--	--	
			Lithium	--	--	--			Kidney	--	--	3E-02	3E-02
			Manganese	--	--	--			CNS	--	--	1E-01	1E-01
			Neodymium	--	--	--			LD50	--	--	2E-05	2E-05
			Nickel	--	--	--			Body weight	--	--	7E-04	7E-04
			Silver	--	--	--			Skin	--	--	2E-04	2E-04
			Yttrium	--	--	--			--	--	--	--	
			Zinc	--	--	--			Blood	--	--	1E-04	1E-04
			Total Uranium	--	--	--			Body weight, Kidney	--	--	1E-04	1E-04
			Chemical Total	--	7E-06	2E-06		8E-06		--	2E+00	1E+00	3E+00

TABLE 9.4.1.CT

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

CENTRAL TENDENCY

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
		Exposure Point Total						8E-06					3E+00
	Exposure Medium Total							8E-06					3E+00
Medium Total								8E-06					3E+00
Receptor Total							Receptor Risk Total	8E-06				Receptor HI Total	3E+00

Total Liver effects HI Across All Media =	7E-02
Total Kidney effects HI Across All Media =	8E-02
Total Hematological effects HI Across All Media =	2E-04
Total Hematological effects HI Across All Media =	2E+00
Total Neurological effects HI Across All Media =	1E-01
Total Developmental effects HI Across All Media =	2E-01
Total Immune System effects HI Across All Media =	2E+00
Total Skin effects HI Across All Media =	7E-02
Total Reproductive effects HI Across All Media =	5E-04

TABLE 9.5.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
Surface Water	Surface Water	Weterly Brook	Aluminum	--	--	--			Neural toxicity	--	--	5E-06	5E-06
			Arsenic	--	--	1E-07		1E-07	Skin	--	--	3E-03	3E-03
			Barium	--	--	--			NOAEL	--	--	5E-06	5E-06
			Boron	--	--	--			Testes	--	--	5E-05	5E-05
			Cadmium	--	--	--			Kidney	--	--	4E-04	4E-04
			Chromium, Total	--	--	--			NOAEL	--	--	5E-06	5E-06
			Cobalt	--	--	--			Hematological effects	--	--	3E-06	3E-06
			Copper	--	--	--			Gastrointestinal distress	--	--	2E-06	2E-06
			Iron	--	--	--			Chronic iron overload	--	--	2E-04	2E-04
			Lanthanum	--	--	--			--	--	--	--	
			Lead	--	--	--			--	--	--	--	
			Lithium	--	--	--			Kidney	--	--	6E-04	6E-04
			Manganese	--	--	--			CNS	--	--	1E-02	1E-02
			Mercury	--	--	--			Immune System	--	--	1E-04	1E-04
			Nickel	--	--	--			Body weight	--	--	4E-05	4E-05
			Silver	--	--	--			Skin	--	--	3E-03	3E-03
			Thallium	--	--	--			NOAEL	--	--	1E-03	1E-03
			Vanadium	--	--	--			--	--	--	3E-04	3E-04
			Zinc	--	--	--			Blood	--	--	7E-06	7E-06
			Total Uranium	--	--	--			Body weight, kidney	--	--	8E-06	8E-06
			Chemical Total	--	--	1E-07		1E-07		--	--	2E-02	2E-02
	Exposure Medium Total							1E-07					2E-02
Sediment	Sediment	Weterly Brook	Arsenic	2E-07	--	4E-08		2E-07	Skin	5E-03	--	1E-03	6E-03
			Cerium	--	--	--			--	--	--	--	
			Iron	--	--	--			Chronic iron overload	2E-02	--	--	2E-02
			Lanthanum	--	--	--			--	--	--	--	
			Lead	--	--	--			--	--	--	--	
			Manganese	--	--	--			CNS	9E-03	--	--	9E-03
			Neodymium	--	--	--			LD50	2E-05	--	--	2E-05
			Yttrium	--	--	--			--	--	--	--	
			Total Uranium	--	--	--			Body weight, kidney	3E-04	--	--	3E-04
			Chemical Total	2E-07	--	4E-08		2E-07		4E-02	--	1E-03	4E-02

TABLE 9.5.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
			Radium 226 + D	6E-08	--	--	2E-06	2E-06					
			Thorium 228 + D	2E-08	--	--	5E-07	5E-07					
			Thorium 230	8E-09	--	--	7E-11	8E-09					
			Thorium 232	5E-09	--	--	2E-11	5E-09					
			Uranium 234	6E-09	--	--	2E-11	6E-09					
			Uranium 235 + D	9E-10	--	--	2E-11	9E-10					
			Uranium 238 + D	9E-09	--	--	6E-09	2E-08					
			Lead 238 + D	2E-07	--	--	1E-08	2E-07					
			Radionuclide Total	3E-07			2E-06	3E-06					
	Exposure Medium Total							3E-06					4E-02
Receptor Total							Receptor Risk Total	3E-06				Receptor HI Total	6E-02

Total Neurological effects HI Across All Media =	2E-02
Total Kidney effects HI Across All Media =	1E-03
Total Skin effects HI Across All Media =	1E-02
Total Hematological effects HI Across All Media =	1E-05
Total Developmental effects HI Across All Media =	3E-04
Total Immune System effects HI Across All Media =	1E-04
Total Gastrointestinal effects HI Across All Media =	2E-06
Total Reproductive effects HI Across All Media =	5E-05

TABLE 9.6.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
Surface Water	Surface Water	Saddle River	Aluminum	--	--	--			Neural toxicity	--	--	1E-06	1E-06
			Arsenic	--	--	2E-08		2E-08	Skin	--	--	6E-04	6E-04
			Barium	--	--	--			NOAEL	--	--	2E-06	2E-06
			Boron	--	--	--			Testes	--	--	4E-05	4E-05
			Chromium, Total	--	--	--			NOAEL	--	--	1E-06	1E-06
			Copper	--	--	--			Gastrointestinal distress	--	--	5E-06	5E-06
			Iron	--	--	--			Chronic iron overload	--	--	2E-05	2E-05
			Lead	--	--	--			--	--	--	--	
			Lithium	--	--	--			Kidney	--	--	6E-04	6E-04
			Manganese	--	--	--			CNS	--	--	6E-04	6E-04
			Nickel	--	--	--			Body weight	--	--	1E-05	1E-05
			Silver	--	--	--			Skin	--	--	8E-05	8E-05
			Vanadium	--	--	--			--	--	--	2E-04	2E-04
			Zinc	--	--	--			Blood	--	--	9E-07	9E-07
			Total Uranium	--	--	--			Body weight, kidney	--	--	8E-06	8E-06
			Chemical Total	--	--	2E-08		2E-08		--	--	2E-03	2E-03
	Exposure Medium Total							2E-08					2E-03
Sediment	Sediment	Saddle River	Arsenic	3E-07	--	6E-08		3E-07	Skin	7E-03	--	2E-03	8E-03
			Cerium	--	--	--			--	--	--	--	
			Iron	--	--	--			Chronic iron overload	1E-02	--	--	1E-02
			Lanthanum	--	--	--			--	--	--	--	
			Lead	--	--	--			--	--	--	--	
			Manganese	--	--	--			CNS	2E-02	--	--	2E-02
			Neodymium	--	--	--			LD50	2E-05	--	--	2E-05
			Yttrium	--	--	--			--	--	--	--	
			Total Uranium	--	--	--			Body weight, kidney	3E-04	--	--	3E-04
			Chemical Total	3E-07	--	6E-08		3E-07		4E-02	--	2E-03	4E-02

TABLE 9.6.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
			Radium 226 + D	6E-08	--	--	2E-06	2E-06					
			Thorium 228 + D	2E-08	--	--	5E-07	5E-07					
			Thorium 230	1E-08	--	--	1E-10	1E-08					
			Thorium 232	7E-09	--	--	2E-11	7E-09					
			Uranium 234	8E-09	--	--	3E-11	8E-09					
			Uranium 235 + D	9E-10	--	--	3E-11	9E-10					
			Uranium 238 + D	7E-09	--	--	7E-09	1E-08					
			Lead 238 + D	2E-07	--	--	9E-09	2E-07					
			Radionuclide Total	3E-07			2E-06	2E-06					
	Exposure Medium Total							3E-06					4E-02
Receptor Total							Receptor Risk Total	3E-06				Receptor HI Total	4E-02

Total Neurological effects HI Across All Media =	2E-02
Total Kidney effects HI Across All Media =	9E-04
Total Skin effects HI Across All Media =	9E-03
Total Hematological effects HI Across All Media =	9E-07
Total Developmental effects HI Across All Media =	3E-04
Total Gastrointestinal effects HI Across All Media =	5E-06
Total Reproductive effects HI Across All Media =	4E-05

TABLE 9.7.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
Surface Water	Surface Water	Coles Brook	Aluminum	--	--	--			Neural toxicity	--	--	9E-07	9E-07
			Barium	--	--	--			NOAEL	--	--	3E-06	3E-06
			Boron	--	--	--			Testes	--	--	1E-05	1E-05
			Cobalt	--	--	--			Hematological effects	--	--	2E-06	2E-06
			Copper	--	--	--			Gastrointestinal distress	--	--	3E-06	3E-06
			Dysprosium	--	--	--			LD50	--	--	1E-06	1E-06
			Iron	--	--	--			Chronic iron overload	--	--	6E-05	6E-05
			Lithium	--	--	--			Kidney	--	--	7E-06	7E-06
			Manganese	--	--	--			CNS	--	--	1E-03	1E-03
			Nickel	--	--	--			Body weight	--	--	6E-06	6E-06
			Zinc	--	--	--			Blood	--	--	2E-07	2E-07
			Total Uranium	--	--	--			Body weight, kidney	--	--	3E-05	3E-05
			Chemical Total	--	--	--		--		--	--	1E-03	1E-03
	Exposure Medium Total							--					1E-03
Sediment	Sediment	Coles Brook	Aluminum	--	--	--			Neural toxicity	2E-03	--	--	2E-03
			Arsenic	2E-07	--	5E-08		3E-07	Skin	5E-03	--	1E-03	7E-03
			Cerium	--	--	--			--	--	--	--	
			Iron	--	--	--			Chronic iron overload	2E-02			2E-02
			Lanthanum	--	--	--			--	--			
			Lead	--	--	--			--	--			
			Manganese	--	--	--			CNS	1E-02	--	--	1E-02
			Neodymium	--	--	--			LD50	4E-05	--	--	4E-05
			Vanadium	--	--	--			--	2E-03	--	--	2E-03
			Yttrium	--	--	--			--	--	--	--	
			Total Uranium	--	--	--			Body weight, kidney	4E-04	--	--	4E-04
			Chemical Total	2E-07	--	5E-08		3E-07		4E-02	--	1E-03	4E-02

TABLE 9.7.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
			Radium 226 + D	3E-08	--	--	9E-07	9E-07					
			Thorium 228 + D	5E-08	--	--	1E-06	1E-06					
			Thorium 230	6E-09	--	--	6E-11	6E-09					
			Thorium 232	1E-08	--	--	4E-11	1E-08					
			Uranium 234	1E-08	--	--	4E-11	1E-08					
			Uranium 235 + D	6E-10	--	--	4E-11	7E-10					
			Uranium 238 + D	8E-09	--	--	5E-09	1E-08					
			Lead 238 + D	1E-07	--	--	1E-08	1E-07					
			Radionuclide Total	3E-07			2E-06	2E-06					
	Exposure Medium Total							3E-06					4E-02
Receptor Total							Receptor Risk Total	3E-06				Receptor HI Total	4E-02

Total Neurological effects HI Across All Media =	1E-02
Total Kidney effects HI Across All Media =	4E-04
Total Skin effects HI Across All Media =	7E-03
Total Hematological effects HI Across All Media =	2E-06
Total Developmental effects HI Across All Media =	4E-04
Total Gastrointestinal effects HI Across All Media =	3E-06
Total Reproductive effects HI Across All Media =	1E-05

TABLE 9.8.RME
SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs
REASONABLE MAXIMUM EXPOSURE
FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Municipal Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
Surface Water	Surface Water	Lodi Brook	Aluminum	--	--	--			Neural toxicity	--	--	3E-07	3E-07
			Arsenic	--	--	1E-08		1E-08	Skin	--	--	8E-05	8E-05
			Barium	--	--	--			NOAEL	--	--	3E-07	3E-07
			Beryllium	--	--	--			Small intestine	--	--	2E-05	2E-05
			Boron	--	--	--			Testes	--	--	5E-06	5E-06
			Chromium, Total	--	--	--			NOAEL	--	--	3E-07	3E-07
			Cobalt	--	--	--			Hematological effects	--	--	4E-07	4E-07
			Copper	--	--	--			Gastroinestinal distress	--	--	2E-06	2E-06
			Iron	--	--	--			Chronic iron overload	--	--	1E-05	1E-05
			Lanthanum	--	--	--			N/A	--	--	--	
			Lead	--	--	--			N/A	--	--	--	
			Lithium	--	--	--			Kidney effect	--	--	1E-05	1E-05
			Manganese	--	--	--			CNS	--	--	2E-04	2E-04
			Nickel	--	--	--			Body weights	--	--	2E-06	2E-06
			Silver	--	--	--			Skin	--	--	1E-05	1E-05
			Thallium	--	--	--			NOAEL	--	--	1E-04	1E-04
			Vanadium	--	--	--			--	--	--	4E-05	4E-05
			Zinc	--	--	--			Blood	--	--	2E-07	2E-07
			Total Uranium	--	--	--			Body weight, kidney	--	--	2E-06	2E-06
			Chemical Total	--	--	--		--		--	--	5E-04	5E-04
	Exposure Medium Total							--					5E-04
Sediment	Sediment	Lodi Brook	Antimony	--	--	--			Blood	6E-04	--	--	6E-04
			Arsenic	8E-07	--	4E-14		8E-07	Skin	5E-03	--	2E-10	5E-03
			Cerium	--	--	--			--	--	--	--	
			Iron	--	--	--			Chronic iron overload	6E-03			
			Lanthanum	--	--	--			--	--			
			Lead	--	--	--			--	--			
			Manganese	--	--	--			CNS	5E-03	--	--	5E-03
			Neodymium	--	--	--			LD50	2E-04	--	--	2E-04
			Yttrium	--	--	--			--	--	--	--	
			Total Uranium	--	--	--			Body weight, kidney	2E-04	--	--	2E-04
			Chemical Total	8E-07	--	4E-14		8E-07		2E-02	--	2E-10	1E-02

TABLE 9.8.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Municipal Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
			Radium 226 + D	3E-07	--	--	2E-06	2E-06					
			Thorium 228 + D	6E-07	--	--	4E-06	5E-06					
			Thorium 230	3E-08	--	--	8E-11	3E-08					
			Thorium 232	2E-07	--	--	2E-10	2E-07					
			Uranium 234	3E-08	--	--	4E-11	3E-08					
			Uranium 235 + D	1E-09	--	--	4E-11	2E-09					
			Uranium 238 + D	4E-08	--	--	3E-09	4E-08					
			Lead 238 + D	9E-07	--	--	1E-08	9E-07					
			Radionuclide Total	2E-06			6E-06	8E-06					
	Exposure Medium Total							9E-06					1E-02
Receptor Total							Receptor Risk Total	9E-06				Receptor HI Total	1E-02

Total Neurological effects HI Across All Media =	6E-03
Total Kidney effects HI Across All Media =	2E-04
Total Skin effects HI Across All Media =	5E-03
Total Hematological effects HI Across All Media =	6E-04
Total Developmental effects HI Across All Media =	2E-04
Total Gastrointestinal effects HI Across All Media =	2E-05
Total Reproductive effects HI Across All Media =	5E-06

TABLE 9.9.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Municipal Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
Surface Water	Surface Water	Westerly Brook	Aluminum	--	--	--			Neural toxicity	--	--	7E-07	7E-07
			Arsenic	--	--	7E-08		7E-08	Skin	--	--	4E-04	4E-04
			Barium	--	--	--			NOAEL	--	--	6E-07	6E-07
			Boron	--	--	--			Testes	--	--	6E-06	6E-06
			Cadmium	--	--	--			Kidney	--	--	6E-05	6E-05
			Chromium, Total	--	--	--			NOAEL	--	--	7E-07	7E-07
			Cobalt	--	--	--			Hematological effects	--	--	5E-07	5E-07
			Copper	--	--	--			Gastrointestinal distress	--	--	3E-07	3E-07
			Iron	--	--	--			Chronic iron overload	--	--	3E-05	3E-05
			Lanthanum	--	--	--			--	--	--	--	
			Lead	--	--	--			--	--	--	--	
			Lithium	--	--	--			Kidney	--	--	8E-05	8E-05
			Manganese	--	--	--			CNS	--	--	2E-03	2E-03
			Mercury	--	--	--			Immune System	--	--	1E-05	1E-05
			Nickel	--	--	--			Body weight	--	--	5E-06	5E-06
			Silver	--	--	--			Skin	--	--	5E-04	5E-04
			Thallium	--	--	--			NOAEL	--	--	2E-04	2E-04
			Vanadium	--	--	--			--	--	--	5E-05	5E-05
			Zinc	--	--	--			Blood	--	--	1E-06	1E-06
			Total Uranium	--	--	--			Body weight, kidney	--	--	2E-06	2E-06
			Chemical Total	--	--	--		--		--	--	3E-03	3E-03
	Exposure Medium Total							--					3E-03
Sediment	Sediment	Westerly Brook	Arsenic	2E-07	--	7E-15		2E-07	Skin	1E-03	--	5E-11	1E-03
			Cerium	--	--	--			--	--	--	--	
			Iron	--	--	--			Chronic iron overload	4E-03	--	--	4E-03
			Lanthanum	--	--	--			--	--	--	--	
			Lead	--	--	--			--	--	--	--	
			Manganese	--	--	--			CNS	2E-03	--	--	2E-03
			Neodymium	--	--	--			LD50	4E-06	--	--	4E-06
			Yttrium	--	--	--			--	--	--	--	
			Total Uranium	--	--	--			Body weight, kidney	6E-05	--	--	6E-05
			Chemical Total	2E-07	--	7E-15		2E-07		7E-03	--	5E-11	7E-03

TABLE 9.9.RME

SUMMARY OF RECEPTOR RISKS AND HAZARDS FOR COPCs

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Municipal Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
			Radium 226 + D	7E-08	--	--	5E-07	6E-07					
			Thorium 228 + D	3E-08	--	--	2E-07	2E-07					
			Thorium 230	9E-09	--	--	2E-11	9E-09					
			Thorium 232	6E-09	--	--	6E-12	6E-09					
			Uranium 234	7E-09	--	--	7E-12	7E-09					
			Uranium 235 + D	9E-10	--	--	7E-12	9E-10					
			Uranium 238 + D	1E-08	--	--	2E-09	1E-08					
			Lead 238 + D	2E-07	--	--	4E-09	3E-07					
			Radionuclide Total	4E-07			7E-07	1E-06					
	Exposure Medium Total							1E-06					7E-03
Receptor Total							Receptor Risk Total	1E-06				Receptor HI Total	1E-02

Total Neurological effects HI Across All Media =	2E-03
Total Kidney effects HI Across All Media =	2E-04
Total Skin effects HI Across All Media =	2E-03
Total Hematological effects HI Across All Media =	1E-06
Total Developmental effects HI Across All Media =	7E-05
Total Immune System effects HI Across All Media =	1E-05
Total Gastrointestinal effects HI Across All Media =	3E-07
Total Reproductive effects HI Across All Media =	6E-06

TABLE 10.1.RME

RISK SUMMARY

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
			Benzene	6E-04	4E-04	--		1E-03	Immune	5E+00	2E+00	--	7E+00
			2-Chlorotoluene	--	--	--			Body Weight	2E+00	--	6E-01	3E+00
			Vinyl Chloride	3E-04	3E-06	--		3E-04	--	--	--	--	--
			Arsenic	4E-03	--	--		4E-03	Skin	2E+01	--	--	2E+01
			Iron	--	--	--			Chronic iron overload	7E+00	--	--	7E+00
			Lithium	--	--	--			Kidney	6E+00	--	--	6E+00
			Chemical Total	5E-03	--	4E-04		6E-03		4E+01	2E+00	6E-01	4E+01
		Exposure Point Total						6E-03					4E+01
	Exposure Medium Total							6E-03					4E+01
Medium Total								6E-03					4E+01
Receptor Total							Receptor Risk Total	6E-03				Receptor HI Total	4E+01

Total Kidney effects HI Across All Media =	6E+00
Total Developmental effects HI Across All Media =	3E+00

TABLE 10.1.1.CT

RISK SUMMARY

CENTRAL TENDENCY

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
			Benzene	7E-05	--	1E-05		8E-05	Immune	3E+00	1E-01	--	3E+00
			2-Chlorotoluene	--	--	--			Body Weight	1E+00	--	4E-01	1E+00
			Vinyl Chloride	4E-05	--	8E-08		4E-05					
			Arsenic	5E-04	--	--		5E-04	Skin	9E+00	--	--	9E+00
			Iron	--	--	--			Chronic iron overload	3E+00	--	--	3E+00
			Lithium	--	--	--			Kidney	3E+00	--	--	3E+00
			Chemical Total	6E-04	--	1E-05		6E-04		2E+01	1E-01	4E-01	2E+01
		Exposure Point Total						6E-04					2E+01
	Exposure Medium Total							6E-04					2E+01
Medium Total								6E-04					2E+01
Receptor Total							Receptor Risk Total	6E-04				Receptor HI Total	2E+01

Total Kidney effects HI Across All Media =	3E+00
Total Developmental effects HI Across All Media =	1E+00
Total Skin effects HI Across All Media =	9E+00

TABLE 10.2.RME

RISK SUMMARY

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
			Benzene	2E-04	2E-04	--		4E-04	Immune	1E+01	1E+01	--	2E+01
			2-Chlorotoluene	--	--	--			Body Weight	5E+00	--	1E+00	6E+00
			Vinyl Chloride	1E-04	1E-06	--		1E-04	--	--	--	--	--
			Xylenes (total)	--	--	--			Body weight, mortality	1E-01	1E+00	3E-02	2E+00
			Arsenic	2E-03	--	--		2E-03	Skin	4E+01	--	--	4E+01
			Iron	--	--	--			Chronic iron overload	2E+01	--	--	2E+01
			Lithium	--	--	--			Kidney	2E+01	--	--	2E+01
			Manganese	--	--	--			CNS	3E+00	--	--	3E+00
			Chemical Total	2E-03	--	2E-04		2E-03		9E+01	3E+00	1E+00	1E+02
		Exposure Point Total						2E-03					1E+02
	Exposure Medium Total							2E-03					1E+02
Medium Total								2E-03					1E+02
Receptor Total							Receptor Risk Total	2E-03				Receptor HI Total	1E+02

Total Kidney effects HI Across All Media =	2E+01
Total Neurological effects HI Across All Media =	3E+00

TABLE 10.2.1.CT
RISK SUMMARY
CENTRAL TENDENCY
FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
			Benzene	1E-04	--	2E-05		1E-04	Immune	6E+00	9E-01	--	7E+00
			2-Chlorotoluene	--	--	--			Body Weight	2E+00	--	8E-01	3E+00
			Vinyl Chloride	6E-05	--	2E-07		6E-05					
			Xylenes (total)	--	--	--			Body weight, mortality	5E-02	2E-01	1E-02	2E-01
			Arsenic	8E-04	--	--		8E-04	Skin	2E+01	--	--	2E+01
			Iron	--	--	--			Chronic iron overload	8E+00	--	--	8E+00
			Lithium	--	--	--			Kidney	8E+00	--	--	8E+00
			Manganese	--	--	--			CNS	2E+00	--	--	2E+00
			Chemical Total	1E-03	--	2E-05		1E-03		5E+01	1E+00	8E-01	5E+01
		Exposure Point Total						1E-03					5E+01
	Exposure Medium Total							1E-03					5E+01
Medium Total								1E-03					5E+01
Receptor Total							Receptor Risk Total	1E-03				Receptor HI Total	5E+01

Total Kidney effects HI Across All Media =	8E+00
Total Neurological effects HI Across All Media =	2E+00

TABLE 10.3.RME

RISK SUMMARY

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
			Benzene	1E-04	--	--		1E-04	Immune	2E+00	--	--	2E+00
			Arsenic	1E-03	--	--		1E-03	Skin	6E+00	--	--	6E+00
			Iron	--	--	--			Chronic iron overload	2E+00	--	--	2E+00
			Lithium	--	--	--			Kidney	2E+00	--	--	2E+00
			Chemical Total	1E-03	--	--		1E-03		1E+01	--	--	1E+01
		Exposure Point Total						1E-03					1E+01
	Exposure Medium Total							1E-03					1E+01
Medium Total								1E-03					1E+01
Receptor Total							Receptor Risk Total	1E-03				Receptor HI Total	1E+01

Total Kidney effects HI Across All Media =	2E+00
Total Skin effects HI Across All Media =	6E+00
Total Immune System effects HI Across All Media =	2E+00

TABLE 10.3.1.CT

RISK SUMMARY

CENTRAL TENDENCY

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
			Benzene	4E-05	--	--		4E-05	Immune	2E+00	--	--	2E+00
			Arsenic	3E-04	--	--		3E-04	Skin	6E+00	--	--	6E+00
			Iron	--	--	--			Chronic iron overload	2E+00	--	--	2E+00
			Lithium	--	--	--			Kidney	2E+00	--	--	2E+00
			Chemical Total	3E-04	--	--		3E-04		1E+01	--	--	1E+01
		Exposure Point Total						3E-04					1E+01
	Exposure Medium Total							3E-04					1E+01
Medium Total								3E-04					1E+01
Receptor Total							Receptor Risk Total	3E-04				Receptor HI Total	1E+01

Total Kidney effects HI Across All Media =	2E+00
Total Skin effects HI Across All Media =	6E+00
Total Immune System effects HI Across All Media =	2E+00

TABLE 10.4.RME

RISK SUMMARY

REASONABLE MAXIMUM EXPOSURE

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
			Benzene	--	--	--			Immune	--	4E+00	3E+00	6E+00
			2-Chlorotoluene	--	--	--			Body Weight	--	--	4E+00	4E+00
			Chemical Total	--	--	--		--		--	4E+00	6E+00	1E+01
		Exposure Point Total											1E+01
	Exposure Medium Total												1E+01
Medium Total													1E+01
Receptor Total							Receptor Risk Total					Receptor HI Total	1E+01

Total Developmental effects HI Across All Media =	4E+00
Total Immune System effects HI Across All Media =	6E+00

TABLE 10.4.1.CT

RISK SUMMARY

CENTRAL TENDENCY

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Construction/Utility Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Chemical of Potential Concern	Carcinogenic Risk					Non-Carcinogenic Hazard Quotient				
				Ingestion	Inhalation	Dermal	External	Exposure	Primary	Ingestion	Inhalation	Dermal	Exposure
			Benzene	--	--	--			Immune	--	4E+00	3E+00	6E+00
			2-Chlorotoluene	--	--	--			Body Weight	--	--	4E+00	4E+00
			Chemical Total	--	--	--		--		--	4E+00	6E+00	1E+01
		Exposure Point Total											1E+01
	Exposure Medium Total												1E+01
Medium Total													1E+01
Receptor Total							Receptor Risk Total					Receptor HI Total	1E+01

Total Developmental effects HI Across All Media = 4E+00

Total Immune System effects HI Across All Media = 6E+00

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RAGS PART D

Data Useability Worksheet

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DATA USEABILITY WORKSHEET
Site: FUSRAP Maywood Superfund Site
Media: Groundwater, Surface Water, and Sediment

Activity	Comment
Field Sampling	
Discuss sampling problems and field conditions that affect data useability.	None. With the exception of rejected data, all data are considered useable for the risk assessment.
Are samples representative of receptor exposure for this medium (e.g. sample depth, grab vs. composite, filtered vs. unfiltered, low flow, etc.)?	Overburden and bedrock groundwater, surface water, and sediment samples were grab samples. Groundwater samples were collected using low flow techniques. Only unfiltered groundwater and surface water samples were used in the baseline risk assessment. Background was not adequately characterized (i.e., no upgradeint monitoring wells or upstream surface water/sediment locations were sampled) so the possibility exists that risk estimates for the naturally-occurring constituents (i.e., inorganic chemicals and radionuclides) may be overstated.
Assess the effect of field QC results on data useability.	Quality assurance/quality control (QA/QC) is discussed in Section 4.12 of the Draft Groundwater Remedial Investigation (GWRI) Report (USACE, 2003). Section 4.12 references tables that contain the results of the various QC samples collected, except for the USACE split sample results, which were not available for incorporation into the Draft GWRI Report. The GWRI Quality Control Summary Report (QCSR) (Appendix S of the Draft GWRI Report) discusses the specific QC field results. While rinseate and field blank contamination resulted in the qualification of some data, the data are regarded as useable for quantitative risk assessment.
Summarize the effect of field sampling issues on the risk assessment, if applicable.	The results of the various QC field samples are described in the GWRI QCSR. Except rejected data, all data are considered useable.
Analytical Techniques	
Were the analytical methods appropriate for quantitative risk assessment?	Yes.

DATA USEABILITY WORKSHEET
Site: FUSRAP Maywood Superfund Site
Media: Groundwater, Surface Water, and Sediment

Activity	Comment
Were detection limits adequate?	The sample detection limits for a number of constituents in groundwater were greater than the screening toxicity values used to select constituents of potential concern (COPCs). While most of these constituents were selected as COPCs, a few were not selected (i.e., bromodichloromethane, 2-butanone, 1,2-dichloropropane, methylene chloride, 1,1-2-trichloroethane, thallium, and vanadium. These constituents are not related to the FMSS and a number of them were detected with low frequency. The exclusion of these constituents as COPC should not have a significant impact on the quantitative risk assessment.
Summarize the effect of analytical technique issues on the risk assessment, if applicable.	There should be no adverse effects on the risk assessment from analytical techniques used.
Data Quality Objectives	
Precision - How were duplicates handled?	For validation, duplicates were handled in accordance with USACE guidance as described in the GWRI QCSR. The treatment of duplicates for quantitative risk assessment is described in Section 2.2, Data Evaluation, of this Draft Baseline Risk Assessment.
Accuracy – How were split samples handled?	Split samples were sent to the USACE's designated QA laboratory. USACE evaluates the split sample results as a measure of inter-laboratory precision.
Representativeness - Indicate any problems associated with data representativeness (e.g., trip blank or rinsate blank contamination, chain of custody problems, etc.).	Rinseate and trip blank contamination, as well as chain of custody problems, were rare for chemical analysis. Details of blank contamination and chain of custody concerns are described in the GWRI QCSR. Low-level activity of radionuclides was not uncommon for equipment rinseates. These activities were typically within the range of the method blanks.
Completeness - Indicate any problems associated with data completeness (e.g., incorrect sample analysis, incomplete sample records, problems with field procedures, etc.).	The completeness criterion of 95% was met for all analytes with the following exceptions: copper, boron, acetone, methyl ethyl ketone, 1,2-dichloroethene, and 2, 2'-oxybis(1-chloropropane). These analytes had greater than 5% of the data rejected. None of these anaytes are constituents of concern at the FMSS. Rejected data are presented in Tables 5 and 6 of the QCSR.

DATA USEABILITY WORKSHEET
Site: FUSRAP Maywood Superfund Site
Media: Groundwater, Surface Water, and Sediment

Activity	Comment
Comparability - Indicate any problems associated with data comparability.	The results for the split samples sent to the USACE were not made available so comparability was not addressed in the Draft GWRI Report.
Were the DQOs specified in the QAPP satisfied?	Yes, the DQOs were satisfied, with the exception of completeness for the analytes noted above.
Summarize the effect of DQO issues on the risk assessment, if applicable.	There should be no adverse effects on the risk assessment because most DQOs were satisfied, and the analytes for which DQOs were not satisfied are not constituents of concern at the FMSS.
Data Validation and Interpretation	
What are the data validation requirements?	See earlier response under the DQO section of this Worksheet, which identified the data validation guidelines that were followed.
What method or guidance was used to validate the data?	See earlier response under the DQO section of this Worksheet.
Was the data validation method consistent with guidance? Discuss any discrepancies.	Yes, the data validation method was consistent with the USACE guidance for both chemical and radiological parameters.
Were all data qualifiers defined? Discuss those which were not.	Yes, all data qualifiers were defined.
Which qualifiers represent useable data?	With the exception of rejected data, all data are considered useable.
Which qualifiers represent unuseable data?	R, rejected or unuseable.
How are tentatively identified compounds handled?	Tentatively identified compounds were not provided in laboratory data packages.
Summarize the effect of data validation and interpretation issues on the risk assessment, if applicable.	There were no adverse effects on the risk assessment from data validation and interpretation issues. As indicated in Section 4.12.7 of the GWRI Report, less than 5% of the radiological data were rejected and, with the following exceptions, less than 5% of the chemical data were rejected: acetone, 1,2-dicloroethene, methyl ethyl ketone, 2,2'-oxybis(1-chloropropane), boron, and copper. All data qualified as estimated were used at the reported concentration.

DATA USEABILITY WORKSHEET
Site: FUSRAP Maywood Superfund Site
Media: Groundwater, Surface Water, and Sediment

Activity	Comment
Additional notes:	None.

References:

U.S. Army Corps of Engineers, 2003. Draft Groundwater Remedial Investigation Report. June 2003. Prepared for the USACE – Kansas City District, Formerly Utilized Sites Remedial Action Program, by Stone & Webster, Inc.

APPENDIX B

GROUNDWATER REMEDIAL INVESTIGATION DATA REMOVED FROM THE BASELINE RISK ASSESSMENT DATABASE

Lodi Wells and Scanel Well

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LODI SHALLOW AND DEEP WELL CLUSTER DATA (MW-14, MW-15, MW-16, MW-17, MW-18)
OCCURRENCE, DISTRIBUTION, AND COMPARISON TO PRGs
FUSRAP MAYWOOD SUPERFUND SITE

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Location of Maximum Concentration	Detection Frequency	Concentration Used for Screening (1)	Screening Toxicity Value (N/C) (2)	
Tap Water	7429-90-5	Aluminum	21.80	607	µg/l	MW-17S	6/10	607	3,650	nc
	7440-38-2	Arsenic	2.60	4.2	µg/l	MW-15D	3/10	4	0.045	ca
	7440-39-3	Barium	37.20	453	µg/l	MW-18D	10/10	453	255	nc
	7440-41-7	Beryllium	0.10	0.22	µg/l	MW-17S	5/10	0.22	7	nc
	7440-42-8	Boron	20.4	109.5	µg/l	MW-14D	10/10	110	730	nc
	7440-70-2	Calcium	20800.0	112000	µg/l	MW-15D	10/10	112,000	NA	
	7440-45-1	Cerium	51.6	51.6	µg/l	MW-17D	1/10	52	NA	
	7440-47-3	Chromium, Total	0.76	24.3	µg/l	MW-18S	4/10	24	5,475	nc
	7440-48-4	Cobalt	0.72	11.40	µg/l	MW-15S	3/10	11	73	nc
	7440-50-8	Copper	0.77	1.82	µg/l	MW-14D	7/10	2	146	nc
	7429-91-6	Dysprosium	3.20	5.20	µg/l	MW-15S	2/10	5	730	nc
	7439-89-6	Iron	126.00	12500	µg/l	MW-16D	10/10	12,500	1,095	nc
	7439-93-2	Lithium	0.82	739.5	µg/l	MW-14D	10/10	740	73	nc
	7439-95-4	Magnesium	3300.0	64200	µg/l	MW-15D	10/10	64,200	NA	
	7439-96-5	Manganese	18.6	608	µg/l	MW-15S	10/10	608	88	nc
	7440-02-0	Nickel	1.30	18.3	µg/l	MW-18S	6/10	18	73	nc
	7740-09-7	Potassium	975	9,030	µg/l	MW-14D	10/10	9,030	NA	
	7782-49-2	Selenium	2.32	2.32	µg/l	MW-14D	1/10	2	18	nc
	7440-23-5	Sodium	19700.00	51,500	µg/l	MW-16S	10/10	51,500	NA	
	7440-28-0	Thallium	3.1	3.10	µg/l	MW-15D	1/10	3.10	0.24	nc
	7440-62-2	Vanadium	0.80	2.60	µg/l	MW-15D	6/10	2.60	26	nc
	7440-65-5	Yttrium	2.00	4.3	µg/l	MW-15S	2/10	4.30	NA	
	7440-66-6	Zinc	4.87	33.4	µg/l	MW-16D	2/10	33	1,095	nc
	7440-61-0	Total Uranium (3)	0.56	3.78	µg/l	MW-14D	10/10	3.78	0.73	
	13982-63-3	Ra-226	0.17	0.64	pCi/l	MW-15D	8/9	0.64	8.16E-04	
	14274-82-9	Th-228	0.43	0.46	pCi/l	MW-18D	2/10	0.46	1.59E-01	
	14269-63-7	Th-230	0.53	2.00	pCi/l	MW-18D	6/10	2.00	5.23E-01	
	7440-29-1	Th-232	0.46	0.46	pCi/l	MW-18D	1/9	0.46	4.71E-01	
	13966-29-5	U-234	0.53	2.89	pCi/l	MW-14D	7/7	2.89	6.74E-01	
	15117-96-1	U-235	0.51	0.51	pCi/l	MW-18D	1/9	0.51	6.63E-01	
	Q1567	U-238	0.34	0.63	pCi/l	MW-18D	3/6	0.63	5.47E-01	

Footnote Instructions:

(1) The maximum detected concentration is used for screening.

(2) For chemical consituents, the USEPA Region IX Preliminary Remediation Goals (PRGs) for tap water (USEPA, 2002c) updated October 1, 2002 were used. For radionuclides, the USEPA Preliminary Remediation Goals for Radionuclides from http://www.epa.gov/superfund/resources/radiation/index.htm current as of March 2001 were used (USEPA, 2001b).

nc = PRG based on noncarcinogenic effects
ca = PRG based on carcinogenic effects
ca* (where: nc < 100X ca)
NA = Not Available
N/A = Not Applicable

SCANEL SHALLOW WELL DATA (MW-21S)
OCCURRENCE, DISTRIBUTION, AND COMPARISON TO PRGs
FUSRAP MAYWOOD SUPERFUND SITE

Exposure Point	CAS Number	Chemical	Minimum Concentration	Maximum Concentration	Units	Detection Frequency	Concentration Used for Screening (1)	Screening Toxicity Value (N/C) (2)
	67-66-3	Chloroform	0.10	0.1	µg/l	1/1	0.10	0.62 ca/nc
	540-59-0	1,2-Dichloroethene (total)	0.70	0.7	µg/l	1/1	1	6.1 nc (for cis)
	127-18-4	Tetrachloroethene	0.40	0.4	µg/l	1/1	0.40	0.66 ca
	79-01-6	Trichloroethene	0.20	0.2	µg/l	1/1	0.20	0.03 ca
	7440-39-3	Barium	192.00	192	µg/l	1/1	192	255 nc
	7440-42-8	Boron	84	84.1	µg/l	1/1	84	730 nc
	7440-70-2	Calcium	79700.0	79700	µg/l	1/1	79,700	NA
	7440-45-1	Cerium	36.8	36.8	µg/l	1/1	37	NA
	7440-50-8	Copper	2.70	2.7	µg/l	1/1	3	146 nc
	7439-89-6	Iron	1880.00	1880	µg/l	1/1	1,880	1,095 nc
	7439-93-2	Lithium	23.60	23.6	µg/l	1/1	24	73 nc
	7439-95-4	Magnesium	19600.0	19600	µg/l	1/1	19,600	NA
	7439-96-5	Manganese	1270.0	1270	µg/l	1/1	1,270	88 nc
	7440-02-0	Nickel	3.80	3.8	µg/l	1/1	4	73 nc
	7740-09-7	Potassium	14700	14,700	µg/l	1/1	14,700	NA
	7440-23-5	Sodium	274000.00	274,000	µg/l	1/1	274,000	NA
	7440-62-2	Vanadium	2.10	2.10	µg/l	1/1	2.10	26 nc
	7440-61-0	Total Uranium (3)	14.57	14.57	µg/l	1/2	14.57	0.73
	13966-29-5	U-234	12.57	12.57	pCi/l	1/1	12.57	6.74E-01

Footnote Instructions:

(1) The maximum detected concentration is used for screening.

(2) For chemical consituents, the USEPA Region IX Preliminary Remediation Goals (PRGs) for tap water (USEPA, 2002c) updated October 1, 2002 were used.
For radionuclides, the USEPA Preliminary Remediation Goals for Radionuclides from http://www.epa.gov/superfund/resources/radiation/index.htm current as of March 2001 were used (USEPA, 2001b).

nc = PRG based on noncarcinogenic effects
ca = PRG based on carcinogenic effects
ca* (where: nc < 100X ca)
NA = Not Available
N/A = Not Applicable

APPENDIX C

GROUNDWATER REMEDIAL INVESTIGATION DATA REMOVED FROM THE BASELINE RISK ASSESSMENT DATABASE

Dixo Company Data

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DATA FROM SELECT MONITORING WELLS REMOVED FROM THE DATABASE
FUSRAP MAYWOOD SUPERFUND SITE

Chemical	**Concentration (µg/L)**	**Well ID**
1,2-Dichloroethene (total)	28 (32 in Fig 5-9)	MW-7S
1,2-Dichloroethene (total)	10	B38W14S
1,2-Dichloroethene (total)	270	MW-8D
1,2-Dichloroethene (total)	190	MW-7D
1,2-Dichloroethene (total)	50	B38W14D
1,2-Dichloroethene (total)	55	B39W15D
1,1-Dichloroethene	3	MW-19DD
1,1-Dichloroethene	4	B38W14D
1,1-Dichloroethene	2	B39W15D
Tetrachloroethene	200	MW-7S
Tetrachloroethene	6	B38W14S
Tetrachloroethene	5	MW-2S
Tetrachloroethene	80	MW8D
Tetrachloroethene	1200	MW-7D
Tetrachloroethene	9	MW-1D
Tetrachloroethene	300	B38W14D
Tetrachloroethene	150	B39W15D
Tetrachloroethene	37	MW-2D
Tetrachloroethene	9	MW-4D
Tetrachloroethene	1	MW-5D
Tetrachloroethene	22	MW-6D
Trichloroethene	65	MW-7S
Trichloroethene	5	B38W14S
Trichloroethene	1	MW-2S
Trichloroethene	15	MW8D
Trichloroethene	380	MW-7D
Trichloroethene	2	MW-1D
Trichloroethene	82	B38W14D
Trichloroethene	30 (31 in Fig 5-19)	B39W15D
Trichloroethene	2	MW-2D
Trichloroethene	2	MW-6D
Vinyl Chloride	2	MW8D

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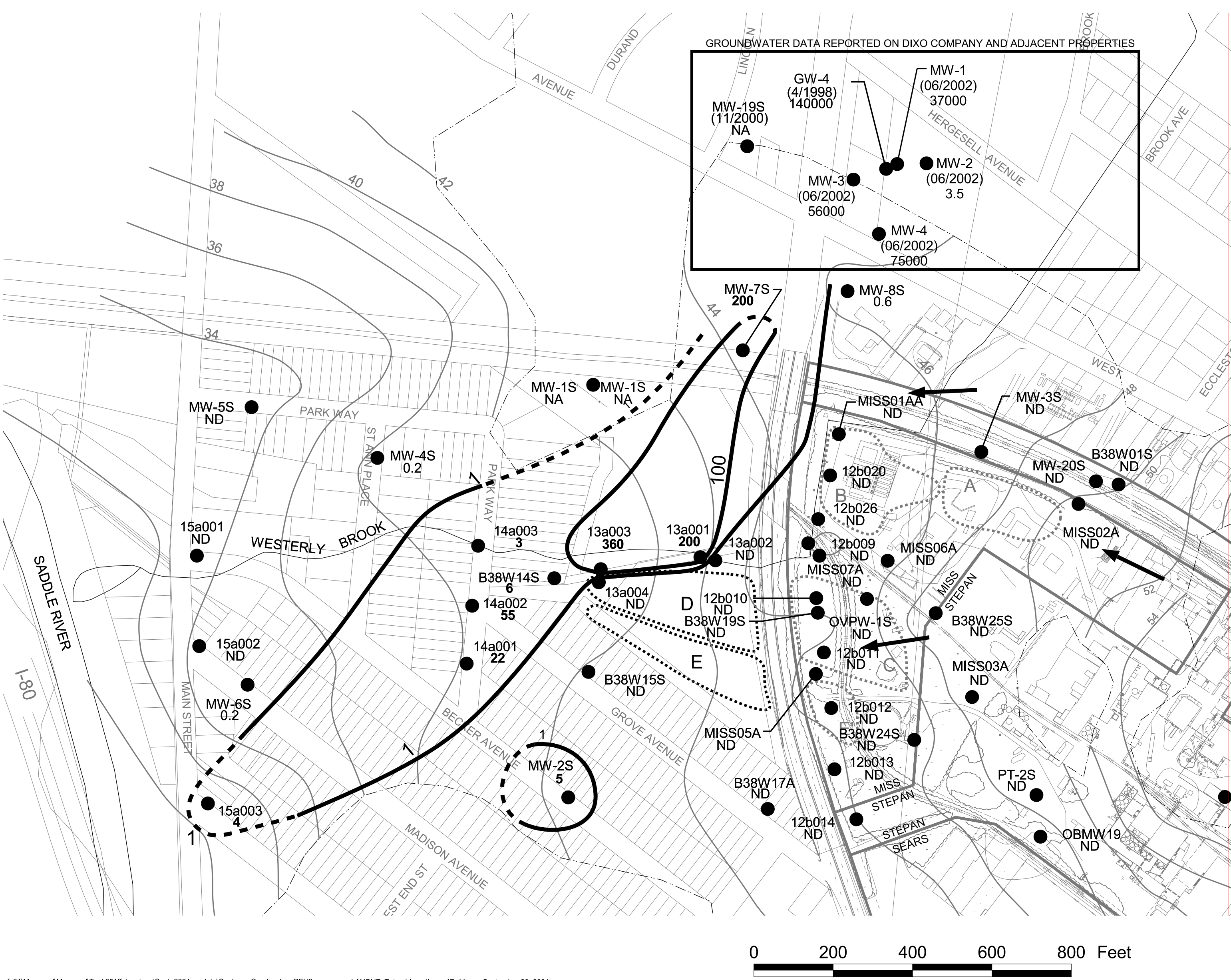


LEGEND:

- MW-8S 0.60 — WELL IDENTIFICATION WITH TETRACHLOROETHENE CONCENTRATION
- 10 — LINE OF EQUAL TETRACHLOROETHENE CONCENTRATION
- 10 — DASHED WHERE INFERRED
- 42 — EQUIPOTENTIAL CONTOUR
- GROUNDWATER FLOW DIRECTION
- A — FORMER RETENTION POND
- D — FORMER RETENTION POND - REMEDIATED
- NRC BURIAL PIT
- ND — NON-DETECT
- NA — NOT ANALYZED

BOLD CONCENTRATION DENOTES EXCEEDANCE OF NJDEP MCL OF 1 ug/L

RESULTS IN MICROGRAMS PER LITER (ug/L)
FEDERAL MCL = 5
NJDEP = 1

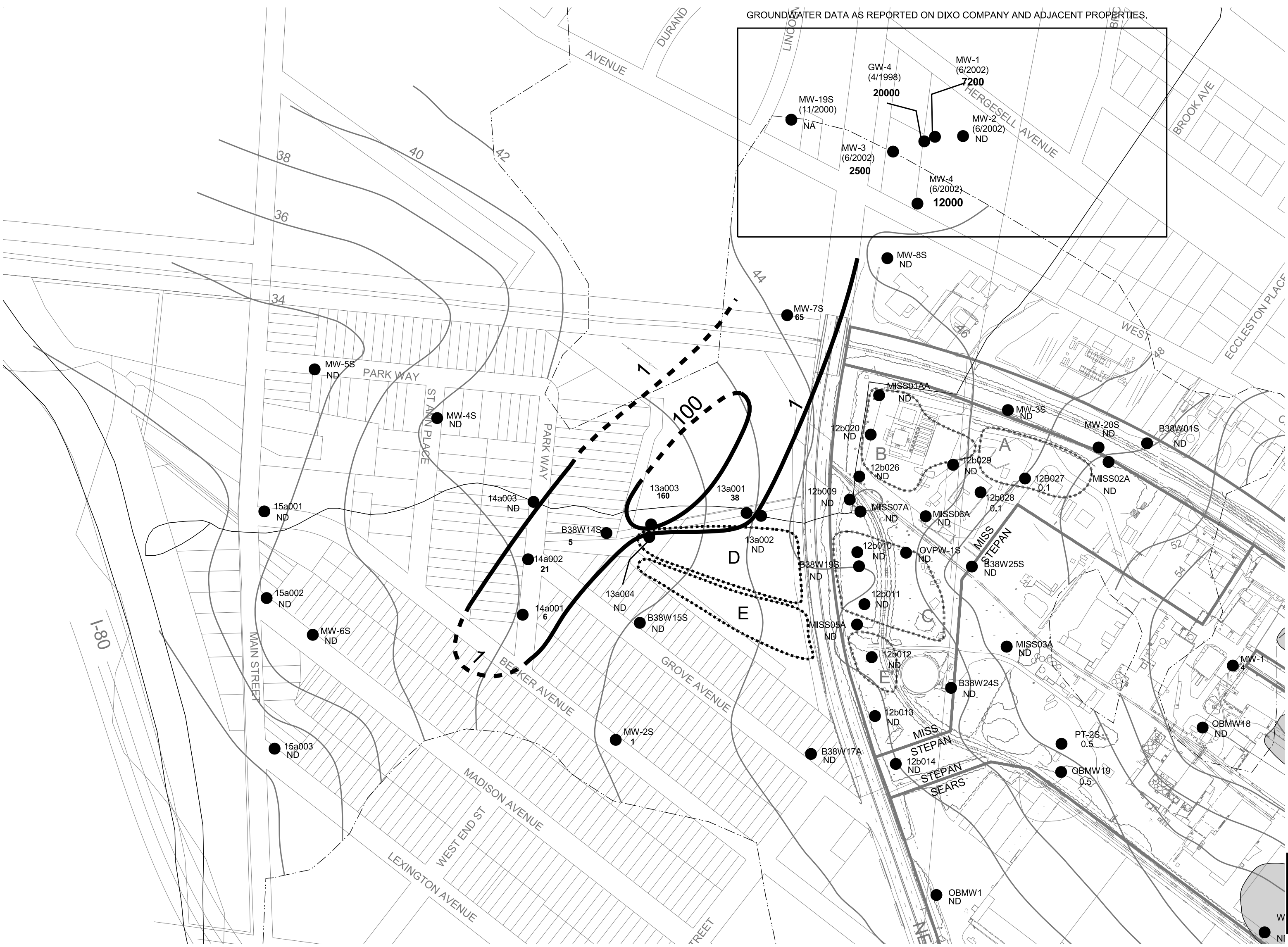
NOTE:
GEOPROBE BORING GW-4 WAS ADVANCED IN 1998 BY DEP. LOCATION APPROXIMATE.

DATA FROM SAMPLES MW-1 THROUGH MW-4 ON THE DIXO COMPANY PROPERTY WERE OBTAINED ON JUNE 17, 2002 AS PART OF THEIR RI DATED JULY 31, 2002.

FIGURE 5-7
TETRACHLOROETHENE RESULTS FOR OVERBURDEN WELL GROUNDWATER SAMPLES (2000 - 2001)

US Army Corps of Engineers
FUSRAP
Maywood Superfund Site

\\Bosfs01\Maywood\Maywood\Task0510\drawings\Sept_2004_update\Contours-Overburden_REV3.apr LAYOUT: Tetrachloroethene 17x11 September 20, 2004



LEGEND:

- MW-20D 0.1 — WITH TRICHLOROETHENE CONCENTRATION WELL IDENTIFICATION
- 5 — LINE OF EQUAL TRICHLOROETHENE CONCENTRATION
- 5 — DASHED WHERE INFERRED
- 42 — EQUIPOTENTIAL CONTOUR
- GROUNDWATER FLOW DIRECTION
- A — FORMER RETENTION POND
- D — FORMER RETENTION POND - REMEDIATED
- ND — NON-DETECT

BOLD CONCENTRATION DENOTES EXCEEDANCE OF NJDEP MCL OF 1 ug/L

RESULTS IN PARTS PER BILLION (ug/L)

FEDERAL MCL = 5
NJDEP MCL = 1

NOTE:
GEOPROBE BORING GW-4 WAS ADVANCED IN 1998 BY DEP. LOCATION APPROXIMATE.

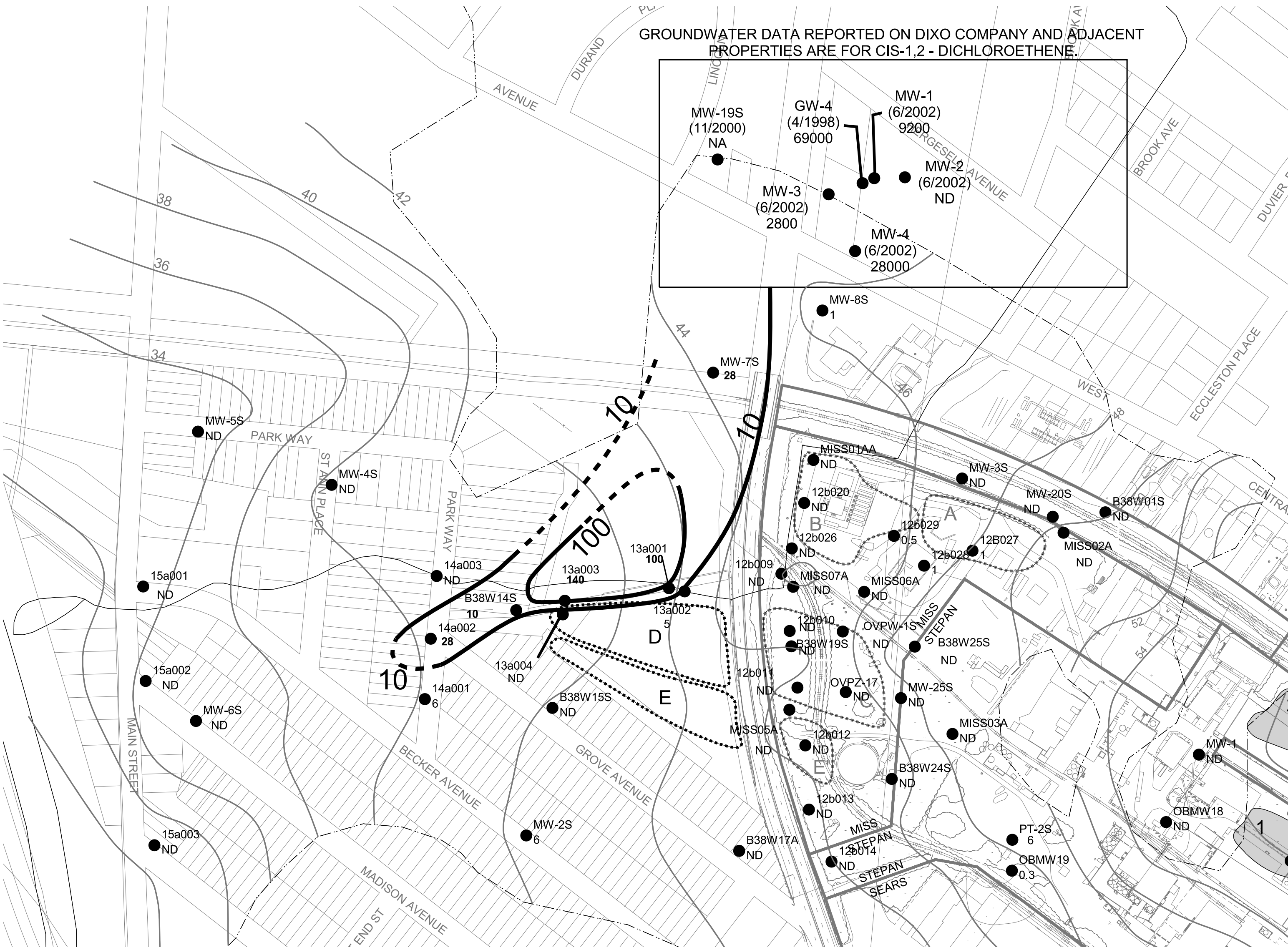
DATA FROM SAMPLES MW-1 THROUGH MW-4 ON THE DIXO COMPANY PROPERTY WERE OBTAINED ON JUNE 17, 2002 AS PART OF THEIR RI DATED JULY 31, 2002.

FIGURE 5-8
TRICHLOROETHENE RESULTS FOR OVERBURDEN WELL GROUNDWATER SAMPLES
(2000 - 2002)

70 0 70 140 Feet

US Army Corps of Engineers
FUSRAP Maywood Superfund Site
Shaw Shaw Environmental, Inc

\\Bosfs01\Maywood\Maywood\Task0510\drawings\Sept_2004_update\Contours-Overburden_rev3.apr LAYOUT: Trichloroethene17x11 November 3, 2004



LEGEND:

- ● MW-20D 0.1 — WELL IDENTIFICATION WITH DICHLOROETHYLENE CONCENTRATION
- 10 — LINE OF EQUAL DICHLOROETHYLENE CONCENTRATION
- 10 (dashed) — DASHED WHERE INFERRED
- 42 — EQUIPOTENTIAL CONTOUR
- GROUNDWATER FLOW DIRECTION
- A — FORMER RETENTION POND
- D — FORMER RETENTION POND - REMEDIATED
- NRC BURIAL PIT
- ND — NON-DETECT
- NA — NOT ANALYZED

BOLD CONCENTRATION DENOTES EXCEEDANCE OF NJGWQC OF 10 ug/L FOR 1,2-DICHLOROETHANE (CIS)

RESULTS IN MICROGRAMS PER LITER (ug/L)
FEDERAL MCL = 70 FOR 1,2-DICHLOROETHENE (CIS)
FEDERAL MCL = 100 FOR 1,2-DICHLOROETHENE (TRANS)
NJDEP GWQC = 10 FOR 1,2-DICHLOROETHENE (CIS)

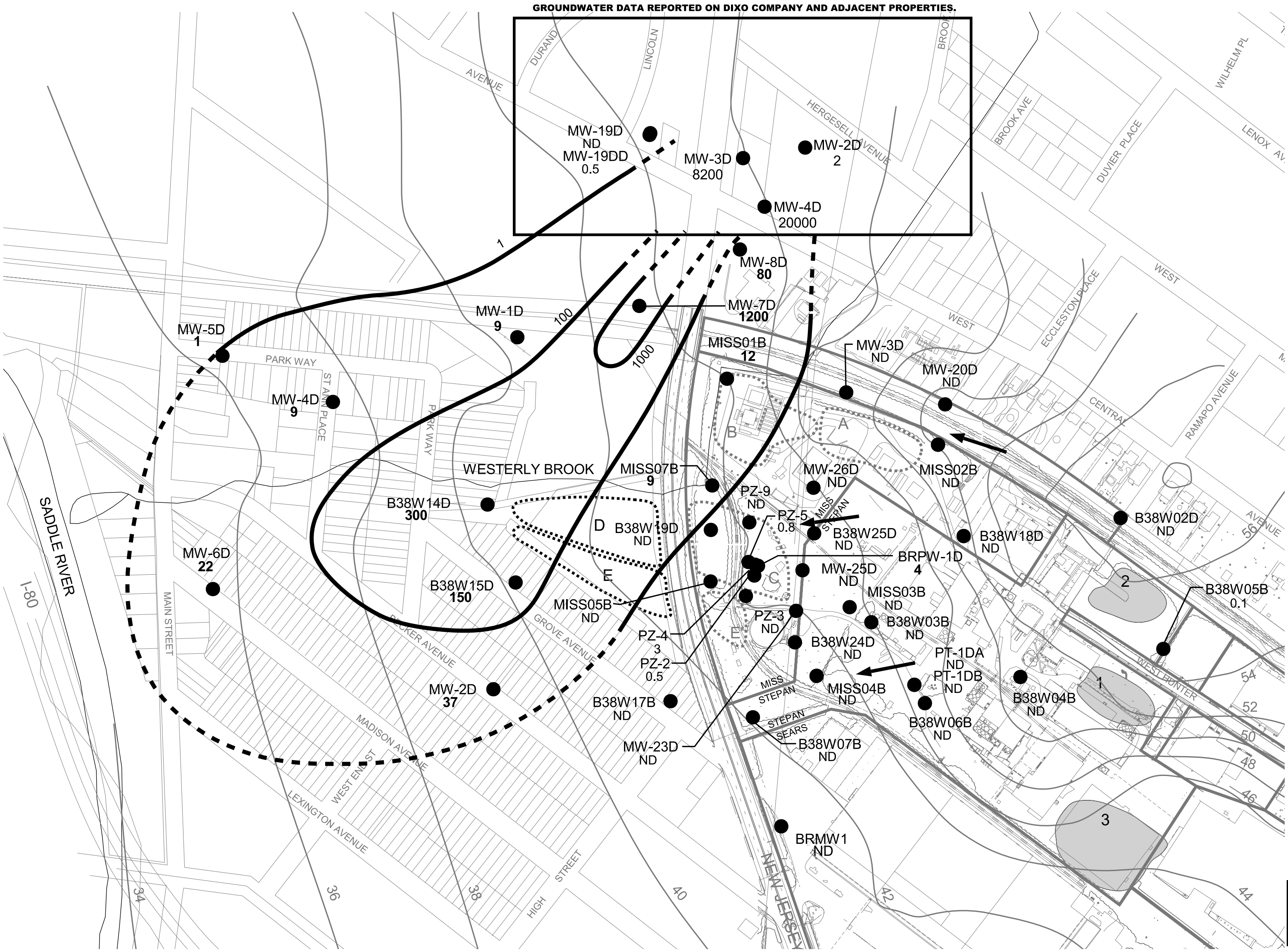
NOTE:
GEOPROBE BORING GW-4 WAS ADVANCED IN 1998 BY DEP. LOCATION APPROXIMATE.

DATA FROM SAMPLES MW-1 THROUGH MW-4 ON THE DIXO COMPANY PROPERTY WERE OBTAINED ON JUNE 17, 2002 AS PART OF THEIR RI DATED JULY 31, 2002.

FIGURE 5-9
1,2-DCE (TOTAL) RESULTS FOR OVERBURDEN WELL GROUNDWATER SAMPLES
(2000 - 2002)

US Army Corps of Engineers
FUSRAP
Maywood Superfund Site

\\Bosfs01\Maywood\Maywood\Task0510\drawings\Sept_2004_update\Contours-Overburden_rev3.apr LAYOUT: DCE 17x11 November 3, 2004



LEGEND:

- MW-8D 80 — WELL IDENTIFICATION WITH TETRACHLOROETHENE CONCENTRATION
- 1 — LINE OF EQUAL TETRACHLOROETHENE CONCENTRATION
- 1 — DASHED WHERE INFERRED
- 42 — EQUIPOTENTIAL CONTOUR
- GROUNDWATER FLOW DIRECTION
- A — FORMER RETENTION POND
- D — FORMER RETENTION POND - REMEDIATED
- NRC BURIAL PIT
- ND — NON-DETECT
- NA — NOT ANALYZED

BOLD CONCENTRATION DENOTES EXCEEDANCE OF STATE MCL OF 1 ug/L

RESULTS IN MICROGRAMS PER LITER (ug/L)
FEDERAL MCL = 5
NJDEP MCL = 1

NOTE:
DATA FROM SAMPLES MW-2D THROUGH MW-4D ON THE DIXO COMPANY PROPERTY WERE OBTAINED ON JUNE 17, 2002.

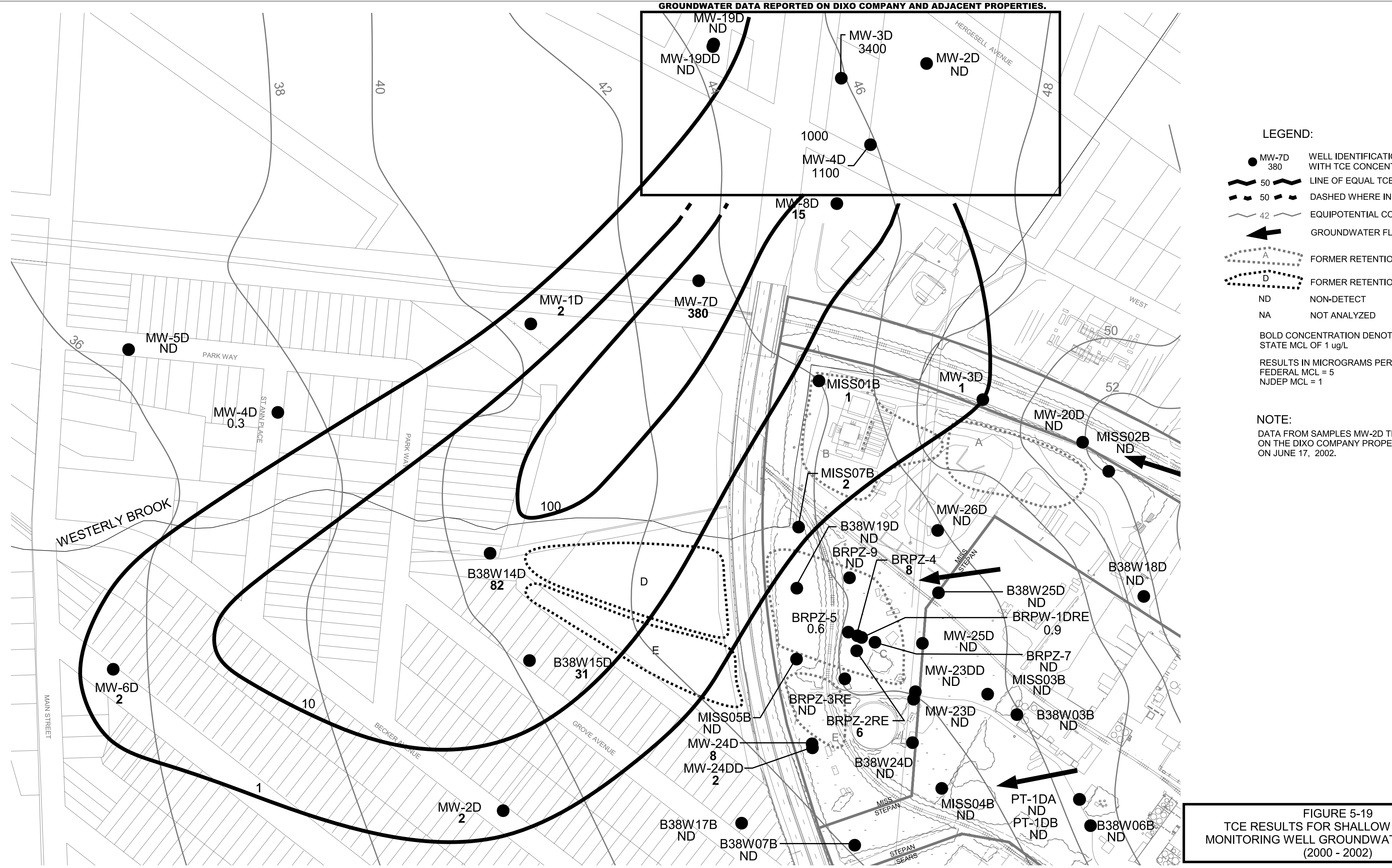
Note: The location and status of the vicinity properties shown on this map are for general reference only. The USACE is reviewing historical archives to confirm the accuracy of the property locations and status depicted on the map. If you have specific questions about a particular property, please contact the USACE Public Information Center at 75A West Pleasant Avenue, Maywood, New Jersey or call 201-843-7466. Or, visit the FUSRAP Maywood Chemical Company Superfund Site website at <www.fusrapmaywood.com>.

150 0 150 300 Feet

FIGURE 5-18
TETRACHLOROETHENE RESULTS FOR SHALLOW BEDROCK MONITORING WELL GROUNDWATER SAMPLES
(2000 - 2002)

US Army Corps of Engineers
FUSRAP Maywood Superfund Site
Shaw Stone & Webster, Inc.

\\Bosfs01\Maywood\Maywood\Task0510\drawings\Contours-Bedrock.apr LAYOUT: pce-bedrock-17x11 04 April 2003



LEGEND:

- MW-7D 380 — WELL IDENTIFICATION WITH TCE CONCENTRATION
- 50 — LINE OF EQUAL TCE CONCENTRATION
- 50 — DASHED WHERE INFERRED
- 42 — EQUIPOTENTIAL CONTOUR
- GROUNDWATER FLOW DIRECTION
- A — FORMER RETENTION POND
- D — FORMER RETENTION POND - REMEDIATED
- ND — NON-DETECT
- NA — NOT ANALYZED

BOLD CONCENTRATION DENOTES EXCEEDANCE OF STATE MCL OF 1 ug/L

RESULTS IN MICROGRAMS PER LITER (ug/L)
FEDERAL MCL = 5
NJDEP MCL = 1

NOTE:
DATA FROM SAMPLES MW-2D THROUGH MW-4D ON THE DIXO COMPANY PROPERTY WERE OBTAINED ON JUNE 17, 2002.

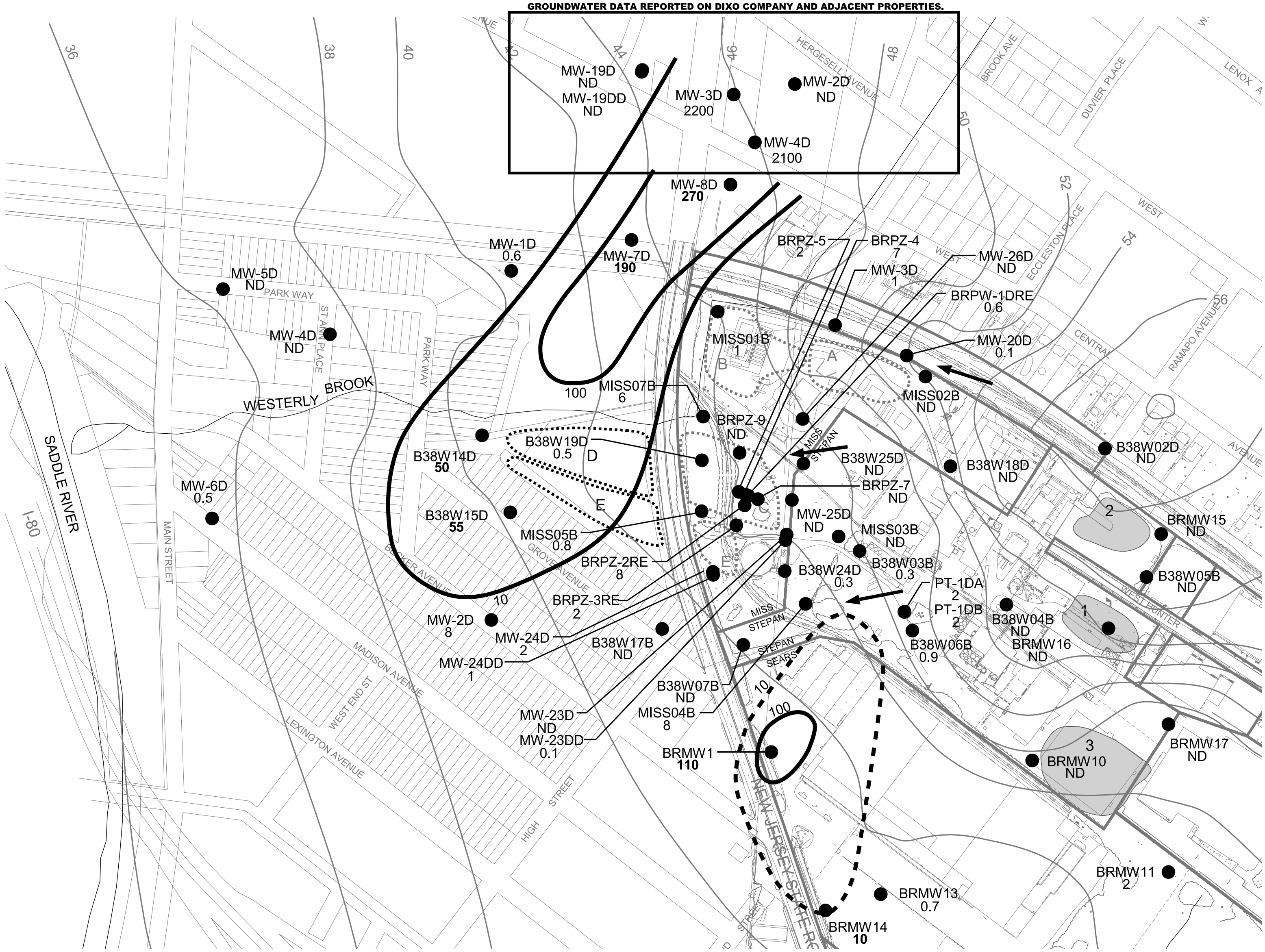
Note: The location and status of the vicinity properties shown on this map are for general reference only. The USACE is reviewing historical archives to confirm the accuracy of the property locations and status depicted on the map. If you have specific questions about a particular property, please contact the USACE Public Information Center at 75A West Pleasant Avenue, Maywood, New Jersey or call 201-843-7466. Or, visit the FUSRAP Maywood Chemical Company Superfund Site website at <www.fusrapmaywood.com>.

FIGURE 5-19
TCE RESULTS FOR SHALLOW BEDROCK MONITORING WELL GROUNDWATER SAMPLES
(2000 - 2002)

US Army Corps of Engineers
FUSRAP Maywood Superfund Site
Shaw Stone & Webster, Inc.

\\Bosfs01\Maywood\Maywood\Task0510\drawings\Contours-Bedrock.apr LAYOUT: TCE-Bedrock-17x11 04 April 2003

GROUNDWATER DATA REPORTED ON DIXO COMPANY AND ADJACENT PROPERTIES.



LEGEND:

- ● MW-20D 0.1 — WELL IDENTIFICATION WITH 1,2-DICHLOROETHENE (TOTAL) CONCENTRATION
- 10 — LINE OF EQUAL 1,2-DICHLOROETHENE (TOTAL) CONCENTRATION
- 10 (dashed) — DASHED WHERE INFERRED
- 42 — EQUIPOTENTIAL CONTOUR
- GROUNDWATER FLOW DIRECTION
- A — FORMER RETENTION POND
- D — FORMER RETENTION POND - REMEDIATED
- NRC BURIAL PIT
- ND — NON-DETECT
- NA — NOT ANALYZED

BOLD CONCENTRATION DENOTES EXCEEDANCE OF 1,2-DICHLOROETHENE (CIS) STANDARDS OF 10 ug/L. RESULTS ARE FOR 1,2-DICHLOROETHENE (TOTAL).

RESULTS IN MICROGRAMS PER LITER (ug/L)
FEDERAL MCL = 70 FOR 1,2-DICHLOROETHENE (CIS)
FEDERAL MCL = 100 FOR 1,2-DICHLOROETHENE (TRANS)
NJDEP GWQC = 10 FOR 1,2-DICHLOROETHENE (CIS)

NOTE:
DATA FROM SAMPLES MW-2D THROUGH MW-4D ON THE DIXO COMPANY PROPERTY WERE OBTAINED ON JUNE 17, 2002.

FIGURE 5-20
TOTAL 1,2-DICHLOROETHENE RESULTS FOR BEDROCK WELL GROUNDWATER SAMPLES
(2000 - 2002)

US Army Corps of Engineers
FUSRAP Maywood Superfund Site
Shaw Stone & Webster, Inc.

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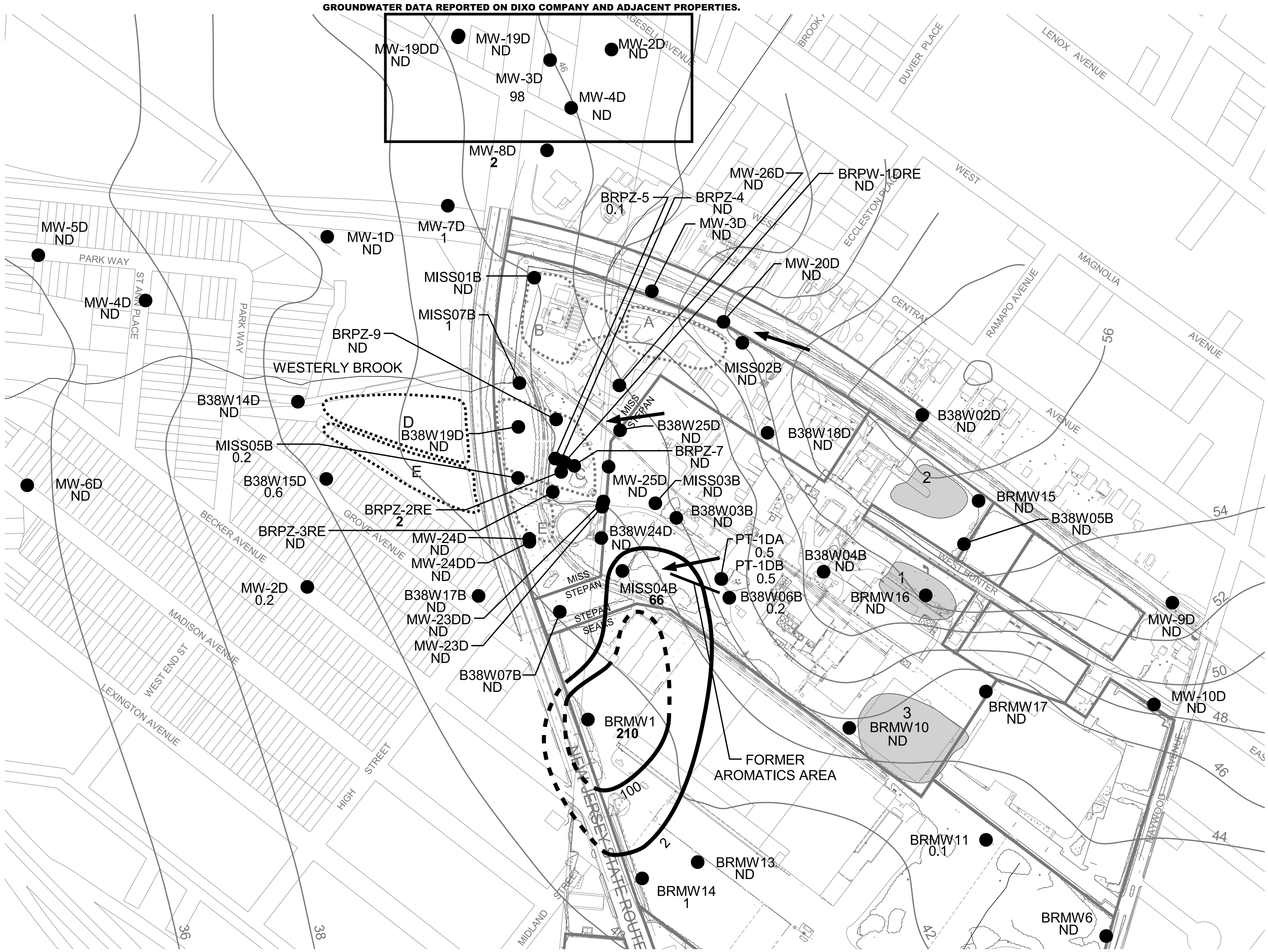

LEGEND:

● BRMW11 0.10	WELL IDENTIFICATION WITH VINYL CHLORIDE CONCENTRATION
2	LINE OF EQUAL VINYL CHLORIDE CONCENTRATION
2	DASHED WHERE INFERRED
42	EQUIPOTENTIAL CONTOUR
	GROUNDWATER FLOW DIRECTION
A	FORMER RETENTION POND
D	FORMER RETENTION POND - REMEDIATED
	NRC BURIAL PIT
ND	NON-DETECT
NA	NOT ANALYZED

RESULTS IN MICROGRAMS PER LITER (ug/L)
FEDERAL/STATE MCL = 2

BOLD CONCENTRATION DENOTES EXCEEDANCE OF FEDERAL/STATE MCL OF 2 ug/L

NOTE:
DATA FROM SAMPLES MW-2D THROUGH MW-4D ON THE DIXO COMPANY PROPERTY WERE OBTAINED ON JUNE 17, 2002.

FIGURE 5-21
VINYL CHLORIDE RESULTS FOR SHALLOW BEDROCK WELL GROUNDWATER SAMPLES
(2000 - 2002)

US Army Corps of Engineers
FUSRAP Maywood Superfund Site
Shaw Stone & Webster, Inc.

\\Bosfs01\Maywood\Maywood\Task0510\drawings\Contours-Bedrock.apr LAYOUT: VC-Bedrock-17X11 7 April 2003

APPENDIX D

FATE AND TRANSPORT MODELING
VOLATILIZATION PATHWAYS

Shower Scenario
Excavation Scenario

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VOLATILE CHEMICAL RELEASE TO INDOOR AIR DURING SHOWERING

The concentrations of volatile COPCs in bathroom air during and after showering were estimated using an approach, "the Schaum model", recommended by the USEPA, Region II. The Schaum model (Schaum et al., 1992) is a realistic yet simple model that treats the bathroom as one compartment and yields air concentrations averaged over the time of the actual shower and the time spent in the bathroom subsequent to the shower. It is assumed that the chemicals volatilize at a constant rate, instantly mix uniformly with the bathroom air, and that ventilation with clean air does not occur. This implies that the chemical concentrations in the air increase linearly from zero to a maximum at the end of the shower and then remain constant during the time an individual spends in the bathroom immediately after the shower.

The average concentration of a volatile chemical in the shower air over a period of t_s hours (for $t_s > 0$) was estimated from the following equation:

$$C_a = \frac{\left(\frac{C_{a,max}}{2} \times t_1\right) + \left(C_{a,max} \times t_2\right)}{\left(t_1 + t_2\right)}$$

where:

- C_a = The concentration of a volatile chemical in the bathroom air over a duration of t_s hours, mg/m^3
- C_{amax} = The maximum concentration of a volatile chemical in the bathroom air, mg/m^3
- t_1 = The time of shower, hr
- t_2 = The time after shower, hr
- t_s = The time in the bathroom during (t_1) and after (t_2) the shower, hr

and where:

$$C_{a,max} = \frac{C_w \times f \times F_w \times t_1}{V_a}$$

where:

- C_{amax} = The maximum volatile chemical concentration in the bathroom air, mg/m^3
- C_w = The water concentration, mg/L
- f = The fraction volatilized, unitless
- F_w = The water flow rate (500 L/hr)
- V_a = The bathroom volume (16 m^3)

The fraction volatilized value is the mass fraction of the chemical in water that volatilizes over the course of the shower. It is a chemical-specific value which is not easily predicted. The volatilization rates depend on properties such as Henry's Law constant and molecular weight. Volatilization fractions ranging from 0.5 to 0.9 have been reported in studies using trichloroethene. As such, the volatilization fraction for trichlorethene (0.6) was assumed to be representative of all other volatiles (i.e., chemicals with Henry's constants which are similar or greater). However, this range of values for fraction volatilized would not be applicable to less volatile chemicals. McKone (1989) has suggested an approach where the volatilization fraction for an untested chemical can be predicted from a tested chemical (trichloroethene will be used here) using a ratio of their overall mass transfer coefficients:

$$f_i = \frac{f_j \left[\left(\frac{2.5}{D_w^{0.67}} \right) + \left(\frac{RT}{D_a^{0.67}} \times H \right) \right]_j}{\left(\frac{2.5}{D_w^{0.67}} \right) + \left(\frac{RT}{D_a^{0.67}} \times H \right)_i}$$

where:

f_i	= The volatilization fraction for chemical i
f_j	= The volatilization fraction for chemical j
D_a	= The diffusion coefficient in air, m^2/sec
D_w	= The diffusion coefficient in water, m^2/sec
R	= The gas constant, atm-m^3/mol-K
H	= Henry's law constant, atm-m^3/mol-K
T	= Temperature, K

The Schaum model input parameters and resulting concentrations in shower/bathroom air are shown in Table D-1 for the adult and child residents, both reasonable maximum exposure (RME) and central tendency (CT) estimates.

References

Schaum, J., K. Hoang, R. Kinerson, and J. Moya. 1992. Estimating Dermal and Inhalation Exposure to Volatile Chemicals in Domestic Water. California Environmental Protection Agency. Sacramento, CA.

McKone, T.E. 1989. "Household exposure models," Toxicology Letters, 49: 321-339.

TABLE D-1
INDOOR SHOWER MODEL SCENARIO
ADULT RESIDENT
FUSRAP MAYWOOD SUPERFUND SITE

Chemical	Concentration in Air C_a (mg/m^3)	Concentration in Water C_w (mg/L)	Henry's Law Constant H (unitless)	Henry's Law Constant H ($atm\text{-}m^3/mol$)	Diffusion Coefficient in Water D_w (m^2/sec)	Diffusion Coefficient in Air D_a (m^2/sec)	Fraction Volatilized f (unitless)	Flow Rate of Shower F_w (L/hr)	Time of Shower t_1 (hours)	Time after Shower t_2 (hours)	Bathroom Volume V_a (m^3)	Max Chemical Concentration in Bathroom Air $C_{a,max}$ (mg/m^3)
Acetone	2.65E-01	9.15E-02	1.62E-03	3.95E-05	1.14E-05	1.24E-01	4.72E-01	500	0.25	0.33	16	3.38E-01
Benzene	2.85E+00	7.38E-01	2.27E-01	5.54E-03	9.80E-06	8.80E-02	6.30E-01	500	0.25	0.33	16	3.63E+00
Chlorobenzene	1.07E-02	3.01E-03	1.27E-01	3.10E-03	8.70E-06	7.30E-02	5.79E-01	500	0.25	0.33	16	1.36E-02
Chloroform	1.05E-02	2.70E-03	1.50E-01	3.66E-03	1.00E-05	1.04E-01	6.37E-01	500	0.25	0.33	16	1.34E-02
2-Chlorotoluene	5.03E+00	1.42E+00	1.46E-01	3.56E-03	8.65E-06	5.50E-02	5.77E-01	500	0.25	0.33	16	6.42E+00
4-Chlorotoluene[1]	2.70E+00	7.64E-01	1.46E-01	3.56E-03	8.65E-06	5.50E-02	5.77E-01	500	0.25	0.33	16	3.44E+00
1,2-Dichloroethane	2.65E-03	6.90E-04	4.82E-02	1.18E-03	9.90E-06	1.04E-01	6.26E-01	500	0.25	0.33	16	3.37E-03
1,2-Dichloroethene (total)[2]	4.25E-02	1.00E-02	1.67E-01	4.07E-03	1.13E-05	7.36E-02	6.91E-01	500	0.25	0.33	16	5.42E-02
Ethylbenzene	2.52E-01	7.60E-02	3.22E-01	7.85E-03	7.80E-06	7.50E-02	5.41E-01	500	0.25	0.33	16	3.21E-01
4-Methyl-2-pentanone	3.23E-02	1.12E-02	5.64E-03	1.38E-04	7.80E-06	7.50E-02	4.72E-01	500	0.25	0.33	16	4.11E-02
Tetrachloroethane	1.33E-02	3.87E-03	7.24E-01	1.77E-02	8.20E-06	7.20E-02	5.60E-01	500	0.25	0.33	16	1.69E-02
Toluene	3.40E-01	9.60E-02	2.71E-01	6.61E-03	8.60E-06	8.70E-02	5.77E-01	500	0.25	0.33	16	4.33E-01
Trichloroethene	1.07E-02	2.91E-03	4.03E-01	9.83E-03	9.10E-06	7.90E-02	6.00E-01	500	0.25	0.33	16	1.36E-02
Vinyl chloride	1.60E-02	1.66E-02	1.14E+00	2.78E-02	1.23E-06	1.06E-01	1.57E-01	500	0.25	0.33	16	2.04E-02
Xylenes (total)	1.18E+00	3.16E-01	2.71E-01	6.61E-03	9.34E-06	7.14E-02	6.10E-01	500	0.25	0.33	16	1.51E+00

Note: Chemical-specific properties (i.e., Henry's Law Constant, etc.) were obtained from the U.S. Department of Energy's Risk Information System web site (http://risk.lsd.ornl.gov).

1 = The Diffusion Coefficients (water and air) for 2-Chlorotoluene are used for 4-Chlorotoluene.
2 = The Diffusion Coefficients (water and air) for cis-1,2-Dichloroethene are used for 1,2-Dichloroethene (total).

TABLE D-1 (continued)
INDOOR SHOWER MODEL SCENARIO
ADULT RESIDENT - CENTRAL TENDENCY
FUSRAP MAYWOOD SUPERFUND SITE

Chemical	Concentration in Air C_a (mg/m^3)	Concentration in Water C_w (mg/L)	Henry's Law Constant H (unitless)	Henry's Law Constant H ($atm\text{-}m^3/mol$)	Diffusion Coefficient in Water D_w (m^2/sec)	Diffusion Coefficient in Air D_a (m^2/sec)	Fraction Volatilized f (unitless)	Flow Rate of Shower F_w (L/hr)	Time of Shower t_1 (hours)	Time after Shower t_2 (hours)	Bathroom Volume V_a (m^3)	Max Chemical Concentration in Bathroom Air $C_{a,max}$ (mg/m^3)
Acetone	1.16E-01	9.15E-02	1.62E-03	3.95E-05	1.14E-05	1.24E-01	4.72E-01	500	0.11	0.14	16	1.49E-01
Benzene	1.25E+00	7.38E-01	2.27E-01	5.54E-03	9.80E-06	8.80E-02	6.30E-01	500	0.11	0.14	16	1.60E+00
Chlorobenzene	4.68E-03	3.01E-03	1.27E-01	3.10E-03	8.70E-06	7.30E-02	5.79E-01	500	0.11	0.14	16	6.00E-03
Chloroform	4.61E-03	2.70E-03	1.50E-01	3.66E-03	1.00E-05	1.04E-01	6.37E-01	500	0.11	0.14	16	5.91E-03
2-Chlorotoluene	2.20E+00	1.42E+00	1.46E-01	3.56E-03	8.65E-06	5.50E-02	5.77E-01	500	0.11	0.14	16	2.82E+00
4-Chlorotoluene[1]	1.18E+00	7.64E-01	1.46E-01	3.56E-03	8.65E-06	5.50E-02	5.77E-01	500	0.11	0.14	16	1.52E+00
1,2-Dichloroethane	1.16E-03	6.90E-04	4.82E-02	1.18E-03	9.90E-06	1.04E-01	6.26E-01	500	0.11	0.14	16	1.48E-03
1,2-Dichloroethene (total)[2]	1.86E-02	1.00E-02	1.67E-01	4.07E-03	1.13E-05	7.36E-02	6.91E-01	500	0.11	0.14	16	2.39E-02
Ethylbenzene	1.10E-01	7.60E-02	3.22E-01	7.85E-03	7.80E-06	7.50E-02	5.41E-01	500	0.11	0.14	16	1.41E-01
4-Methyl-2-pentanone	1.41E-02	1.12E-02	5.64E-03	1.38E-04	7.80E-06	7.50E-02	4.72E-01	500	0.11	0.14	16	1.81E-02
Tetrachloroethane	5.81E-03	3.87E-03	7.24E-01	1.77E-02	8.20E-06	7.20E-02	5.60E-01	500	0.11	0.14	16	7.44E-03
Toluene	1.49E-01	9.60E-02	2.71E-01	6.61E-03	8.60E-06	8.70E-02	5.77E-01	500	0.11	0.14	16	1.91E-01
Trichloroethene	4.67E-03	2.91E-03	4.03E-01	9.83E-03	9.10E-06	7.90E-02	6.00E-01	500	0.11	0.14	16	5.99E-03
Vinyl chloride	7.00E-03	1.66E-02	1.14E+00	2.78E-02	1.23E-06	1.06E-01	1.57E-01	500	0.11	0.14	16	8.98E-03
Xylenes (total)	5.17E-01	3.16E-01	2.71E-01	6.61E-03	9.34E-06	7.14E-02	6.10E-01	500	0.11	0.14	16	6.63E-01

Note: Chemical-specific properties (i.e., Henry's Law constant, etc.) were obtained from the U.S. Department of Energy's Risk Information System web site (http://risk.lsd.ornl.gov).

1 = The Diffusion Coefficients (water and air) for 2-Chlorotoluene are used for 4-Chlorotoluene.
2 = The Diffusion Coefficients (water and air) for cis-1,2-Dichloroethene are used for 1,2-Dichloroethene (total).

TABLE D-1 (continued)
INDOOR SHOWER MODEL SCENARIO
CHILD RESIDENT
FUSRAP MAYWOOD SUPERFUND SITE

Chemical	Concentration in Air C_a (mg/m^3)	Concentration in Water C_w (mg/L)	Henry's Law Constant H (unitless)	Henry's Law Constant H (atm-m^3/mol)	Diffusion Coefficient in Water D_w (m^2/sec)	Diffusion Coefficient in Air D_a (m^2/sec)	Fraction Volatilized f (unitless)	Flow Rate of Shower F_w (L/hr)	Time of Shower t_1 (hours)	Time after Shower t_2 (hours)	Bathroom Volume V_a (m^3)	Max Chemical Concentration in Bathroom Air $C_{a,max}$ (mg/m^3)
Acetone	4.71E-01	9.15E-02	1.62E-03	3.95E-05	1.14E-05	1.24E-01	4.72E-01	500	0.45	0.55	16	6.08E-01
Benzene	5.07E+00	7.38E-01	2.27E-01	5.54E-03	9.80E-06	8.80E-02	6.30E-01	500	0.45	0.55	16	6.54E+00
Chlorobenzene	1.90E-02	3.01E-03	1.27E-01	3.10E-03	8.70E-06	7.30E-02	5.79E-01	500	0.45	0.55	16	2.46E-02
Chloroform	1.87E-02	2.70E-03	1.50E-01	3.66E-03	1.00E-05	1.04E-01	6.37E-01	500	0.45	0.55	16	2.42E-02
2-Chlorotoluene	8.95E+00	1.42E+00	1.46E-01	3.56E-03	8.65E-06	5.50E-02	5.77E-01	500	0.45	0.55	16	1.15E+01
4-Chlorotoluene[1]	4.80E+00	7.64E-01	1.46E-01	3.56E-03	8.65E-06	5.50E-02	5.77E-01	500	0.45	0.55	16	6.20E+00
1,2-Dichloroethane	4.71E-03	6.90E-04	4.82E-02	1.18E-03	9.90E-06	1.04E-01	6.26E-01	500	0.45	0.55	16	6.07E-03
1,2-Dichloroethene (total)[2]	7.56E-02	1.00E-02	1.67E-01	4.07E-03	1.13E-05	7.36E-02	6.91E-01	500	0.45	0.55	16	9.76E-02
Ethylbenzene	4.48E-01	7.60E-02	3.22E-01	7.85E-03	7.80E-06	7.50E-02	5.41E-01	500	0.45	0.55	16	5.78E-01
4-Methyl-2-pentanone	5.74E-02	1.12E-02	5.64E-03	1.38E-04	7.80E-06	7.50E-02	4.72E-01	500	0.45	0.55	16	7.40E-02
Tetrachloroethane	2.36E-02	3.87E-03	7.24E-01	1.77E-02	8.20E-06	7.20E-02	5.60E-01	500	0.45	0.55	16	3.05E-02
Toluene	6.04E-01	9.60E-02	2.71E-01	6.61E-03	8.60E-06	8.70E-02	5.77E-01	500	0.45	0.55	16	7.80E-01
Trichloroethene	1.90E-02	2.91E-03	4.03E-01	9.83E-03	9.10E-06	7.90E-02	6.00E-01	500	0.45	0.55	16	2.45E-02
Vinyl chloride	2.85E-02	1.66E-02	1.14E+00	2.78E-02	1.23E-06	1.06E-01	1.57E-01	500	0.45	0.55	16	3.67E-02
Xylenes (total)	2.10E+00	3.16E-01	2.71E-01	6.61E-03	9.34E-06	7.14E-02	6.10E-01	500	0.45	0.55	16	2.71E+00

Note: Chemical-specific properties (i.e., Henry's Law Constant, etc.) were obtained from the U.S. Department of Energy's Risk Information System web site (http://risk.lsd.ornl.gov).

1 = The Diffusion Coefficients (water and air) for 2-Chlorotoluene are used for 4-Chlorotoluene.
2 = The Diffusion Coefficients (water and air) for cis-1,2-Dichloroethene are used for 1,2-Dichloroethene (total).

TABLE D-1 (continued)
INDOOR SHOWER MODEL SCENARIO
CHILD RESIDENT - CENTRAL TENDENCY
FUSRAP MAYWOOD SUPERFUND SITE

Chemical	Concentration in Air C_a (mg/m^3)	Concentration in Water C_w (mg/L)	Henry's Law Constant H (unitless)	Henry's Law Constant H (atm-m^3/mol)	Diffusion Coefficient in Water D_w (m^2/sec)	Diffusion Coefficient in Air D_a (m^2/sec)	Fraction Volatilized f (unitless)	Flow Rate of Shower F_w (L/hr)	Time of Shower t_1 (hours)	Time after Shower t_2 (hours)	Bathroom Volume V_a (m^3)	Max Chemical Concentration in Bathroom Air $C_{a,max}$ (mg/m^3)
Acetone	1.57E-01	9.15E-02	1.62E-03	3.95E-05	1.14E-05	1.24E-01	4.72E-01	500	0.15	0.18	16	2.03E-01
Benzene	1.68E+00	7.38E-01	2.27E-01	5.54E-03	9.80E-06	8.80E-02	6.30E-01	500	0.15	0.18	16	2.18E+00
Chlorobenzene	6.33E-03	3.01E-03	1.27E-01	3.10E-03	8.70E-06	7.30E-02	5.79E-01	500	0.15	0.18	16	8.19E-03
Chloroform	6.23E-03	2.70E-03	1.50E-01	3.66E-03	1.00E-05	1.04E-01	6.37E-01	500	0.15	0.18	16	8.06E-03
2-Chlorotoluene	2.97E+00	1.42E+00	1.46E-01	3.56E-03	8.65E-06	5.50E-02	5.77E-01	500	0.15	0.18	16	3.85E+00
4-Chlorotoluene[1]	1.60E+00	7.64E-01	1.46E-01	3.56E-03	8.65E-06	5.50E-02	5.77E-01	500	0.15	0.18	16	2.07E+00
1,2-Dichloroethane	1.56E-03	6.90E-04	4.82E-02	1.18E-03	9.90E-06	1.04E-01	6.26E-01	500	0.15	0.18	16	2.02E-03
1,2-Dichloroethene (total)[2]	2.51E-02	1.00E-02	1.67E-01	4.07E-03	1.13E-05	7.36E-02	6.91E-01	500	0.15	0.18	16	3.25E-02
Ethylbenzene	1.49E-01	7.60E-02	3.22E-01	7.85E-03	7.80E-06	7.50E-02	5.41E-01	500	0.15	0.18	16	1.93E-01
4-Methyl-2-pentanone	1.91E-02	1.12E-02	5.64E-03	1.38E-04	7.80E-06	7.50E-02	4.72E-01	500	0.15	0.18	16	2.47E-02
Tetrachloroethane	7.84E-03	3.87E-03	7.24E-01	1.77E-02	8.20E-06	7.20E-02	5.60E-01	500	0.15	0.18	16	1.02E-02
Toluene	2.01E-01	9.60E-02	2.71E-01	6.61E-03	8.60E-06	8.70E-02	5.77E-01	500	0.15	0.18	16	2.60E-01
Trichloroethene	6.31E-03	2.91E-03	4.03E-01	9.83E-03	9.10E-06	7.90E-02	6.00E-01	500	0.15	0.18	16	8.17E-03
Vinyl chloride	9.46E-03	1.66E-02	1.14E+00	2.78E-02	1.23E-06	1.06E-01	1.57E-01	500	0.15	0.18	16	1.22E-02
Xylenes (total)	6.99E-01	3.16E-01	2.71E-01	6.61E-03	9.34E-06	7.14E-02	6.10E-01	500	0.15	0.18	16	9.04E-01

Note: Chemical-specific properties (i.e., Henry's Law Constant, etc.) were obtained from the U.S. Department of Energy's Risk Information System web site (http://risk.lsd.ornl.gov).

1 = The Diffusion Coefficients (water and air) for 2-Chlorotoluene are used for 4-Chlorotoluene.
2 = The Diffusion Coefficients (water and air) for cis-1,2-Dichloroethene are used for 1,2-Dichloroethene (total).

VOLATILE CHEMICAL RELEASE TO OUTDOOR AIR DURING CONSTRUCTION

The methodology to evaluate the potential exposure of construction/utility workers to the COPCs emitted from groundwater that might infiltrate an excavation during construction activities is described below. The modeling required the estimation of emission fluxes of the COPCs and the resulting COPCs concentrations in the outdoor air at the excavation.

The analysis is based on a 1.5 m wide x 5.0 m long x 3.0 m deep excavation and the assumption that groundwater infiltrates the bottom of the excavation. Water level data collected during the second phase of the GWRI indicated that the water table was encountered as shallow as 0.9 feet below ground surface (bgs) and as deep as 24.49 feet bgs; the average depth to groundwater was about 10 feet bgs. Seasonal fluctuations (minimum/maximum of 13 quarterly rounds) of overburden wells ranged from 1 to 6.86 feet throughout the year.

Table D-2 provides definitions of and values for parameters used in the outdoor air pathway analysis.

Emission Fluxes

The following equation (USEPA, 1995a) was used to estimate emission fluxes (in g/sec-m^2) of volatile COPCs from groundwater that has infiltrated an excavation:

$$F_i = K_i \times C_{Li} \times CF1$$

where:

F_i	= Maximum emission flux of constituent i (g/sec-m^2)
K_i	= Overall mass transfer coefficient of constituent i (cm/sec)
C_{Li}	= Liquid-phase concentration of constituent i (g/cm^3)
CF1	= Conversion factor (1E+04 cm^2/m^2)

and where:

$$\frac{1}{K_i} = \left(\frac{1}{k_{i,L}}\right) + \left(\frac{R \times T_s}{H_i \times k_{i,G}}\right)$$

where:

K_i	= Overall mass transfer coefficient of constituent i (cm/sec)
$k_{i,L}$	= Liquid-phase mass transfer coefficient of constituent i (cm/sec)
R	= Ideal gas constant (8.2E-05 atm-m^3/mole-°K)
T_s	= System temperature (°K)
H_i	= Henry's Law constant of constituent i (atm-m^3/mole)
$k_{i,G}$	= Gas-phase mass transfer coefficient of constituent i (cm/sec)

and where:

$$k_{i,L} = \left(\frac{MW_{O_2}}{MW_i}\right)^{0.5} \times \left(\frac{T_s}{298K}\right) \times k_L, O_2$$

where:

$k_{i,L}$	= Liquid-phase mass transfer coefficient of constituent i (cm/sec)
MW_{O_2}	= Molecular weight of oxygen (32.0 g/mol)
MW_i	= Molecular weight of constituent i (g/mol)
T_s	= System temperature (°K)
k_L, O_2	= Liquid-phase mass transfer coefficient of oxygen at 25^{o}C (0.002 cm/sec)

and where:

$$k_{i,G} = \left(\frac{MW_{H_2O}}{MW_i}\right)^{0.335} \times \left(\frac{T_s}{298K}\right)^{1.005} \times k_G, H_2O$$

where:

$k_{i,G}$	= Gas-phase mass transfer coefficient of constituent i (cm/sec)
MW_{H_2O}	= Molecular weight of water (18.0 g/mol)
MW_i	= Molecular weight of constituent i (g/mol)
T_s	= System temperature (°K)
k_G, H_20	= Gas-phase mass transfer coefficient of water vapor at 25^{o}C (0.833 cm/sec)

The values for the variables used in the above equations are provided in Table D-2.

Air Concentrations

Outdoor air concentrations of the emitted volatile COPCs were determined using the USEPA-approved Point, Area and Line source (PAL2.1) model, version 89272, (USEPA, 1992) assuming that the excavation represents an area source of emissions. PAL2.1 has the capability of determining impacts above area sources, as well as downwind of a source. PAL2.1 is a multi-purpose model that can be used to estimate dispersion for point, area and line sources using Gaussian-plume steady-state assumptions. User-specified meteorological options allow for input of site-specific conditions that are representative of the site being modeled.

For this analysis, the source was modeled as a 1.5-m x 5.0-m flat area source. Nine receptors were used in the analysis (eight receptors were placed along the edge of the excavation with one at each of the four corners, and one at the center of each side). In addition, one receptor was placed over the center of the excavation. All receptors were modeled at a height of 1.8 m to simulate the height of a worker. The meteorological data consisted of an array of 54 meteorological conditions used in the USEPA-approved screening level model, SCREEN3 (USEPA, 1995b). These conditions represent 54 combinations of stability classes (1 to 6) and wind speeds (1 m/s to 20 m/s) that routinely occur in the atmosphere. The wind directions were set so that the wind blows directly toward each of the receptors. Model options selected for the analysis included a typical anemometer height of 6.1 meters, a mixing height of 5000 m, and an average temperature of 293°K. The wind was assumed to be constant below a height of 10 meters (as fixed by PAL2.1). Land use was classified as urban. The emission rate of the area source was set at 1 g/s-m^2. Output was in the form of g/m^3 per g/m^2-s.

Results

The modeling analysis predicated maximum 1-hour average unitized impact of 0.1302 g/m^3 per g/s-m^2. The maximum 1-hour average volatile COPC concentrations (in mg/m^3) in the outdoor air at the excavation was calculated from the following equation:

$$C = [\text{one - hour unitized impact in g/m}^3 \text{ per g/sec - m}^2] \times [\text{emission flux in g/sec - m}^2] \times [1000 \text{ mg/g}]$$

References

U.S. Environmental Protection Agency. 1995a. Guideline for Predictive Baseline Emissions Estimation for Superfund Sites. Interim Final. EPA-451/R-96-001. Office of Air Quality Planning and Standards, Research Triangle Park, N.C.

U.S. Environmental Protection Agency. 1995b. SCREEN3 Model and Users Guide. EPA-454/B-95-004. U.S. Environmental Protection Agency, Research Triangle Park, NC.

U.S. Environmental Protection Agency. 1992. PAL2.1: A Gaussian-Plume Algorithm for Point, Area, and Line Sources. Version 89272.

TABLE D-2
CONSTRUCTION/UTILITY WORKER

Objective: Determination of outdoor volatile chemical concentrations associated with the excavation of 1.5 m-wide x 5.0 m-long x 3.0 m-deep trench. Assumes that trench intercepts groundwater.

CHEMICAL OF POTENTIAL CONCERN	$C_{i,GW}$ GROUNDWATER CONCENTRATION mg/L	C_L GROUNDWATER CONCENTRATION g/m^3	H' HENRY'S LAW CONSTANT atm-m^3/mole	MW_i MOLECULAR WEIGHT g/mol	k_{iL} LIQUID-PHASE MASS TRANSFER COEFFICIENT cm/s	k_{iG} GAS-PAHSE MASS TRANSFER COEFFICIENT cm/s	K_i OVERALL MASS TRANSFER COEFFICIENT cm/s	EF_{GW} GROUNDWATER EMISSION FLUX g/s-m^2	$C_{OUTDOOR,\ GROUNDWATER}$ OUTDOOR AIR CONCENTRATION mg/m^3
Acetone	9.15E+01	9.15E-05	3.95E-05	5.81E+01	1.42E-03	5.39E-01	5.55E-04	5.08E-04	1.36E-02
Benzene	7.38E+02	7.38E-04	5.54E-03	7.81E+01	1.23E-03	4.88E-01	1.21E-03	8.97E-03	2.40E-01
Chlorobenzene	3.01E+00	3.01E-06	3.10E-03	1.13E+02	1.02E-03	4.32E-01	1.00E-03	3.03E-05	8.11E-04
Chloroform	2.70E+00	2.70E-06	3.66E-03	1.19E+02	9.93E-04	4.24E-01	9.78E-04	2.64E-05	7.08E-04
2-Chlorotoluene	1.42E+03	1.42E-03	3.56E-03	1.27E+02	9.64E-04	4.15E-01	9.49E-04	1.35E-02	3.62E-01
4-Chlorotoluene[1]	7.64E+02	7.64E-04	3.56E-03	1.27E+02	9.64E-04	4.15E-01	9.49E-04	7.25E-03	1.94E-01
1,2-Dichloroethane	6.90E-01	6.90E-07	1.18E-03	9.90E+01	1.09E-03	4.51E-01	1.04E-03	7.18E-06	1.92E-04
1,2-Dichloroethene (total)[2]	1.00E+01	1.00E-05	4.07E-03	9.69E+01	1.10E-03	4.54E-01	1.09E-03	1.09E-04	2.93E-03
Ethylbenzene	7.60E+01	7.60E-05	7.85E-03	1.06E+02	1.05E-03	4.41E-01	1.05E-03	7.95E-04	2.13E-02
4-Methyl-2-pentanone	1.12E+01	1.12E-05	1.38E-04	1.00E+02	1.08E-03	4.49E-01	7.68E-04	8.58E-05	2.30E-03
Tetrachloroethane	3.87E+00	3.87E-06	1.77E-02	1.66E+02	8.42E-04	3.79E-01	8.40E-04	3.25E-05	8.70E-04
Toluene	9.60E+01	9.60E-05	6.61E-03	9.21E+01	1.13E-03	4.62E-01	1.12E-03	1.08E-03	2.88E-02
Trichloroethene	2.91E+00	2.91E-06	9.83E-03	1.31E+02	9.46E-04	4.10E-01	9.41E-04	2.73E-05	7.33E-04
Vinyl chloride	1.66E+01	1.66E-05	2.78E-02	6.25E+01	1.37E-03	5.26E-01	1.37E-03	2.27E-04	6.09E-03
Xylenes (total)	3.16E+02	3.16E-04	6.61E-03	1.06E+02	1.05E-03	4.41E-01	1.04E-03	3.30E-03	8.85E-02

Note: Chemical-specific properties (i.e., vapor pressure, henry's law constant, etc.) were obtained from the U.S. Department of Energy's Risk Information System web site (http://risk.lsd.ornl.gov)..

1 = The Diffusion Coefficients (water and air) and molecular weight for 2-Chlorotoluene are used for 4-Chlorotoluene.
2 = The Diffusion Coefficients (water and air) for cis-1,2-Dichloroethene are used for 1,2-Dichloroethene (total).

Parameters	Value	Source
(1) Maximum 1-hour unitized impact (g/m^3 per g/m^{2}s) =	2.68E-02	Predicted
(2) Molecular weight of oxygen (MW_{O2}, g/mol) =	32	Default
(3) System temperature (T_s, degrees K) =	285.65	Default
(4) Liquid mass phase transfer of oxygen at 25^{o}C (k_L,O_2, cm/sec) =	0.002	Default
(5) Molecular weight of water (MW_{H2O}, g/mol) =	18	Default
(6) Gas phase mass transfer of water vapor at 25^{o}C (k_G, H_2O, cm/sec) =	0.833	Default
(7) Ideal gas constant (R, atm-m3/mole-K) =	8.20E-05	Default

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APPENDIX E

EXPOSURE ASSESSMENT MODELING

Dermal Exposure

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Dermal Worksheet
Intermediate Variables for Calculating D_A(event)

Chemical of Potential Concern	Medium	Dermal Absorption Fraction (soil)	FA	Kp		T(event)		Tau		T*		B
			Value	Value	Units	Value	Units	Value	Units	Value	Units	Value
Chlorobenzene	Groundwater	N/A	1	2.82E-02	cm/hr	0.25	hr/event	0.46	hr	1.09	hr	0.12
2-Chlorotoluene	Groundwater	N/A	1	5.72E-02	cm/hr	0.25	hr/event	0.55	hr	1.31	hr	0.25
4-Chlorotoluene	Groundwater	N/A	1	5.72E-02	cm/hr	0.25	hr/event	0.55	hr	1.31	hr	0.25
Ethylbenzene	Groundwater	N/A	1	4.93E-02	cm/hr	0.25	hr/event	0.42	hr	1.01	hr	0.20
Tetrachloroethene	Groundwater	N/A	1	3.34E-02	cm/hr	0.25	hr/event	0.91	hr	2.18	hr	0.17
Toluene	Groundwater	N/A	1	3.11E-02	cm/hr	0.25	hr/event	0.35	hr	0.84	hr	0.11
Trichloroethene	Groundwater	N/A	1	1.16E-02	cm/hr	0.25	hr/event	0.58	hr	1.39	hr	0.05
Xylenes (total)	Groundwater	N/A	1	5.32E-02	cm/hr	0.25	hr/event	0.42	hr	1.01	hr	0.21
Lanthanum	Groundwater	N/A	N/A	1.00E-03	cm/hr	0.25	hr/event	N/A	N/A	N/A	N/A	N/A
Neodymium	Groundwater	N/A	N/A	1.00E-03	cm/hr	0.25	hr/event	N/A	N/A	N/A	N/A	N/A
Yttrium	Groundwater	N/A	N/A	1.00E-03	cm/hr	0.25	hr/event	N/A	N/A	N/A	N/A	N/A
Zinc	Groundwater	N/A	N/A	6.00E-04	cm/hr	0.25	hr/event	N/A	N/A	N/A	N/A	N/A
Total Uranium	Groundwater	N/A	N/A	1.00E-03	cm/hr	0.25	hr/event	N/A	N/A	N/A	N/A	N/A

FA = Fraction Absorbed Water
Kp = Dermal Permeability Coefficient of Compound in Water
N/A = Not Applicable

T(event) = Event Duration
Tau = Lag Time

T* = Time to Reach Steady-State
B = Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis

Current/Future - Adult Resident (Central Tendency)

Dermal Worksheet
Intermediate Variables for Calculating D_A(event)

Chemical of Potential Concern	Medium	Dermal Absorption Fraction (soil)	FA	Kp		T(event)		Tau		T*		B
			Value	Value	Units	Value	Units	Value	Units	Value	Units	Value
Chlorobenzene	Groundwater	N/A	1	2.82E-02	cm/hr	0.11	hr/event	0.46	hr	1.09	hr	0.12
2-Chlorotoluene	Groundwater	N/A	1	5.72E-02	cm/hr	0.11	hr/event	0.55	hr	1.31	hr	0.25
4-Chlorotoluene	Groundwater	N/A	1	5.72E-02	cm/hr	0.11	hr/event	0.55	hr	1.31	hr	0.25
Ethylbenzene	Groundwater	N/A	1	4.93E-02	cm/hr	0.11	hr/event	0.42	hr	1.01	hr	0.20
Tetrachloroethene	Groundwater	N/A	1	3.34E-02	cm/hr	0.11	hr/event	0.91	hr	2.18	hr	0.17
Toluene	Groundwater	N/A	1	3.11E-02	cm/hr	0.11	hr/event	0.35	hr	0.84	hr	0.11
Trichloroethene	Groundwater	N/A	1	1.16E-02	cm/hr	0.11	hr/event	0.58	hr	1.39	hr	0.05
Xylenes (total)	Groundwater	N/A	1	5.32E-02	cm/hr	0.11	hr/event	0.42	hr	1.01	hr	0.21
Lanthanum	Groundwater	N/A	N/A	1.00E-03	cm/hr	0.11	hr/event	N/A	N/A	N/A	N/A	N/A
Neodymium	Groundwater	N/A	N/A	1.00E-03	cm/hr	0.11	hr/event	N/A	N/A	N/A	N/A	N/A
Yttrium	Groundwater	N/A	N/A	1.00E-03	cm/hr	0.11	hr/event	N/A	N/A	N/A	N/A	N/A
Zinc	Groundwater	N/A	N/A	6.00E-04	cm/hr	0.11	hr/event	N/A	N/A	N/A	N/A	N/A
Total Uranium	Groundwater	N/A	N/A	1.00E-03	cm/hr	0.11	hr/event	N/A	N/A	N/A	N/A	N/A

FA = Fraction Absorbed Water
Kp = Dermal Permeability Coefficient of Compound in Water
N/A = Not Applicable

T(event) = Event Duration
Tau = Lag Time

T* = Time to Reach Steady-State
B = Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis

Dermal Worksheet
Intermediate Variables for Calculating D_A(event)

Chemical of Potential Concern	Medium	Dermal Absorption Fraction (soil)	FA	Kp		T(event)		Tau		T*		B
			Value	Value	Units	Value	Units	Value	Units	Value	Units	Value
Chlorobenzene	Groundwater	N/A	1	2.82E-02	cm/hr	0.45	hr/event	0.46	hr	1.09	hr	0.12
2-Chlorotoluene	Groundwater	N/A	1	5.72E-02	cm/hr	0.45	hr/event	0.55	hr	1.31	hr	0.25
4-Chlorotoluene	Groundwater	N/A	1	5.72E-02	cm/hr	0.45	hr/event	0.55	hr	1.31	hr	0.25
Ethylbenzene	Groundwater	N/A	1	4.93E-02	cm/hr	0.45	hr/event	0.42	hr	1.01	hr	0.20
Tetrachloroethene	Groundwater	N/A	1	3.34E-02	cm/hr	0.45	hr/event	0.91	hr	2.18	hr	0.17
Toluene	Groundwater	N/A	1	3.11E-02	cm/hr	0.45	hr/event	0.35	hr	0.84	hr	0.11
Trichloroethene	Groundwater	N/A	1	1.16E-02	cm/hr	0.45	hr/event	0.58	hr	1.39	hr	0.05
Xylenes (total)	Groundwater	N/A	1	5.32E-02	cm/hr	0.45	hr/event	0.42	hr	1.01	hr	0.21
Cadmium	Groundwater	N/A	N/A	1.00E-03	cm/hr	0.45	hr/event	N/A	N/A	N/A	N/A	N/A
Cerium	Groundwater	N/A	N/A	1.00E-03	cm/hr	0.45	hr/event	N/A	N/A	N/A	N/A	N/A
Lanthanum	Groundwater	N/A	N/A	1.00E-03	cm/hr	0.45	hr/event	N/A	N/A	N/A	N/A	N/A
Neodymium	Groundwater	N/A	N/A	1.00E-03	cm/hr	0.45	hr/event	N/A	N/A	N/A	N/A	N/A
Yttrium	Groundwater	N/A	N/A	1.00E-03	cm/hr	0.45	hr/event	N/A	N/A	N/A	N/A	N/A
Zinc	Groundwater	N/A	N/A	6.00E-04	cm/hr	0.45	hr/event	N/A	N/A	N/A	N/A	N/A
Total Uranium	Groundwater	N/A	N/A	1.00E-03	cm/hr	0.45	hr/event	N/A	N/A	N/A	N/A	N/A

FA = Fraction Absorbed Water
Kp = Dermal Permeability Coefficient of Compound in Water
N/A = Not Applicable

T(event) = Event Duration
Tau = Lag Time

T* = Time to Reach Steady-State
B = Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis

Current/Future - Child Resident (Central Tendency)

Dermal Worksheet
Intermediate Variables for Calculating D_A(event)

Chemical of Potential Concern	Medium	Dermal Absorption Fraction (soil)	FA	Kp		T(event)		Tau		T*		B
			Value	Value	Units	Value	Units	Value	Units	Value	Units	Value
Chlorobenzene	Groundwater	N/A	1	2.82E-02	cm/hr	0.15	hr/event	0.46	hr	1.09	hr	0.12
2-Chlorotoluene	Groundwater	N/A	1	5.72E-02	cm/hr	0.15	hr/event	0.55	hr	1.31	hr	0.25
4-Chlorotoluene	Groundwater	N/A	1	5.72E-02	cm/hr	0.15	hr/event	0.55	hr	1.31	hr	0.25
Ethylbenzene	Groundwater	N/A	1	4.93E-02	cm/hr	0.15	hr/event	0.42	hr	1.01	hr	0.20
Tetrachloroethene	Groundwater	N/A	1	3.34E-02	cm/hr	0.15	hr/event	0.91	hr	2.18	hr	0.17
Toluene	Groundwater	N/A	1	3.11E-02	cm/hr	0.15	hr/event	0.35	hr	0.84	hr	0.11
Trichloroethene	Groundwater	N/A	1	1.16E-02	cm/hr	0.15	hr/event	0.58	hr	1.39	hr	0.05
Xylenes (total)	Groundwater	N/A	1	5.32E-02	cm/hr	0.15	hr/event	0.42	hr	1.01	hr	0.21
Cadmium	Groundwater	N/A	N/A	1.00E-03	cm/hr	0.15	hr/event	N/A	N/A	N/A	N/A	N/A
Cerium	Groundwater	N/A	N/A	1.00E-03	cm/hr	0.15	hr/event	N/A	N/A	N/A	N/A	N/A
Lanthanum	Groundwater	N/A	N/A	1.00E-03	cm/hr	0.15	hr/event	N/A	N/A	N/A	N/A	N/A
Neodymium	Groundwater	N/A	N/A	1.00E-03	cm/hr	0.15	hr/event	N/A	N/A	N/A	N/A	N/A
Yttrium	Groundwater	N/A	N/A	1.00E-03	cm/hr	0.15	hr/event	N/A	N/A	N/A	N/A	N/A
Zinc	Groundwater	N/A	N/A	6.00E-04	cm/hr	0.15	hr/event	N/A	N/A	N/A	N/A	N/A
Total Uranium	Groundwater	N/A	N/A	1.00E-03	cm/hr	0.15	hr/event	N/A	N/A	N/A	N/A	N/A

FA = Fraction Absorbed Water
Kp = Dermal Permeability Coefficient of Compound in Water
N/A = Not Applicable

T(event) = Event Duration
Tau = Lag Time

T* = Time to Reach Steady-State
B = Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis

Dermal Worksheet
Intermediate Variables for Calculating D_A(event)

Chemical of Potential Concern	Medium	Dermal Absorption Fraction (soil)	FA	Kp		T(event)		Tau		T*		B
			Value	Value	Units	Value	Units	Value	Units	Value	Units	Value
2-Chlorotoluene	Groundwater	N/A	1	5.72E-02	cm/hr	0.25	hr/event	0.55	hr	1.31	hr	0.25
4-Chlorotoluene	Groundwater	N/A	1	5.72E-02	cm/hr	0.25	hr/event	0.55	hr	1.31	hr	0.25
Ethylbenzene	Groundwater	N/A	1	4.93E-02	cm/hr	0.25	hr/event	0.42	hr	1.01	hr	0.20
Tetrachloroethene	Groundwater	N/A	1	3.34E-02	cm/hr	0.25	hr/event	0.91	hr	2.18	hr	0.17
Xylenes (total)	Groundwater	N/A	1	5.32E-02	cm/hr	0.25	hr/event	0.42	hr	1.01	hr	0.21
Lanthanum	Groundwater	N/A	N/A	1.00E-03	cm/hr	0.25	hr/event	N/A	N/A	N/A	N/A	N/A
Neodymium	Groundwater	N/A	N/A	1.00E-03	cm/hr	0.25	hr/event	N/A	N/A	N/A	N/A	N/A
Yttrium	Groundwater	N/A	N/A	1.00E-03	cm/hr	0.25	hr/event	N/A	N/A	N/A	N/A	N/A
Zinc	Groundwater	N/A	N/A	6.00E-04	cm/hr	0.25	hr/event	N/A	N/A	N/A	N/A	N/A
Total Uranium	Groundwater	N/A	N/A	1.00E-03	cm/hr	0.25	hr/event	N/A	N/A	N/A	N/A	N/A

FA = Fraction Absorbed Water
Kp = Dermal Permeability Coefficient of Compound in Water
N/A = Not Applicable

T(event) = Event Duration
Tau = Lag Time

T* = Time to Reach Steady-State
B = Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis

Current/Future - Worker (Central Tendency)

Dermal Worksheet
Intermediate Variables for Calculating D_A(event)

Chemical of Potential Concern	Medium	Dermal Absorption Fraction (soil)	FA	Kp		T(event)		Tau		T*		B
			Value	Value	Units	Value	Units	Value	Units	Value	Units	Value
2-Chlorotoluene	Groundwater	N/A	1	5.72E-02	cm/hr	0.11	hr/event	0.55	hr	1.31	hr	0.25
4-Chlorotoluene	Groundwater	N/A	1	5.72E-02	cm/hr	0.11	hr/event	0.55	hr	1.31	hr	0.25
Ethylbenzene	Groundwater	N/A	1	4.93E-02	cm/hr	0.11	hr/event	0.42	hr	1.01	hr	0.20
Tetrachloroethene	Groundwater	N/A	1	3.34E-02	cm/hr	0.11	hr/event	0.91	hr	2.18	hr	0.17
Xylenes (total)	Groundwater	N/A	1	5.32E-02	cm/hr	0.11	hr/event	0.42	hr	1.01	hr	0.21
Lanthanum	Groundwater	N/A	N/A	1.00E-03	cm/hr	0.11	hr/event	N/A	N/A	N/A	N/A	N/A
Neodymium	Groundwater	N/A	N/A	1.00E-03	cm/hr	0.11	hr/event	N/A	N/A	N/A	N/A	N/A
Yttrium	Groundwater	N/A	N/A	1.00E-03	cm/hr	0.11	hr/event	N/A	N/A	N/A	N/A	N/A
Zinc	Groundwater	N/A	N/A	6.00E-04	cm/hr	0.11	hr/event	N/A	N/A	N/A	N/A	N/A
Total Uranium	Groundwater	N/A	N/A	1.00E-03	cm/hr	0.11	hr/event	N/A	N/A	N/A	N/A	N/A

FA = Fraction Absorbed Water
Kp = Dermal Permeability Coefficient of Compound in Water
N/A = Not Applicable
T(event) = Event Duration
Tau = Lag Time
T* = Time to Reach Steady-State
B = Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis

Dermal Worksheet
Intermediate Variables for Calculating D_A(event)

Chemical of Potential Concern	Medium	Dermal Absorption Fraction (soil)	FA	Kp		T(event)		Tau		T*		B
			Value	Value	Units	Value	Units	Value	Units	Value	Units	Value
Acetone	Groundwater	N/A	1	5.10E-04	cm/hr	8	hr/event	0.23	hr	0.54	hr	0.002
Benzene	Groundwater	N/A	1	1.00E-03	cm/hr	8	hr/event	0.29	hr	0.7	hr	0.1
Chlorobenzene	Groundwater	N/A	1	2.80E-02	cm/hr	8	hr/event	0.46	hr	1.09	hr	0.1
Chloroform	Groundwater	N/A	1	6.80E-03	cm/hr	8	hr/event	0.5	hr	1.19	hr	0.03
2-Chlorotoluene	Groundwater	N/A	1	5.70E-02	cm/hr	8	hr/event	0.55	hr	1.31	hr	0.2
4-Chlorotoluene	Groundwater	N/A	1	5.70E-02	cm/hr	8	hr/event	0.55	hr	1.31	hr	0.2
1,2-Dichloroethane	Groundwater	N/A	1	4.20E-03	cm/hr	8	hr/event	0.38	hr	0.92	hr	0.02
1,2-Dichloroethene (total)	Groundwater	N/A	1	7.70E-03	cm/hr	8	hr/event	0.37	hr	0.89	hr	0.03
Ethylbenzene	Groundwater	N/A	1	4.90E-02	cm/hr	8	hr/event	0.42	hr	1.01	hr	0.2
4-Methyl-2-pentanone	Groundwater	N/A	1	2.70E-03	cm/hr	8	hr/event	0.39	hr	0.93	hr	0.01
Tetrachloroethene	Groundwater	N/A	1	3.30E-02	cm/hr	8	hr/event	0.91	hr	2.18	hr	0.2
Toluene	Groundwater	N/A	1	3.10E-02	cm/hr	8	hr/event	0.35	hr	0.84	hr	0.1
Trichloroethene	Groundwater	N/A	1	1.20E-02	cm/hr	8	hr/event	0.58	hr	1.39	hr	0.1
Vinyl chloride	Groundwater	N/A	1	5.60E-03	cm/hr	8	hr/event	0.24	hr	0.57	hr	0.02
Xylenes (total)	Groundwater	N/A	1	5.30E-02	cm/hr	8	hr/event	0.42	hr	1.01	hr	0.2
Aluminum	Groundwater	N/A	N/A	1.00E-03	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Antimony	Groundwater	N/A	N/A	1.00E-03	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Arsenic	Groundwater	N/A	N/A	1.00E-03	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Barium	Groundwater	N/A	N/A	1.00E-03	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Boron	Groundwater	N/A	N/A	1.00E-03	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Cadmium	Groundwater	N/A	N/A	1.00E-03	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Cerium	Groundwater	N/A	N/A	1.00E-03	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Iron	Groundwater	N/A	N/A	1.00E-03	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Lanthanum	Groundwater	N/A	N/A	1.00E-03	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A

Dermal Worksheet
Intermediate Variables for Calculating D_A(event)

Chemical of Potential Concern	Medium	Dermal Absorption Fraction (soil)	FA	Kp		T(event)		Tau		T*		B
			Value	Value	Units	Value	Units	Value	Units	Value	Units	Value
Lead	Groundwater	N/A	N/A	1.00E-03	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Lithium	Groundwater	N/A	N/A	1.00E-03	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Manganese	Groundwater	N/A	N/A	1.00E-03	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Neodymium	Groundwater	N/A	N/A	1.00E-03	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Nickel	Groundwater	N/A	N/A	2.00E-04	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Silver	Groundwater	N/A	N/A	6.00E-04	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Yttrium	Groundwater	N/A	N/A	1.00E-03	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Zinc	Groundwater	N/A	N/A	6.00E-04	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Total Uranium	Groundwater	N/A	N/A	1.00E-03	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A

FA = Fraction Absorbed Water
Kp = Dermal Permeability Coefficient of Compound in Water
N/A = Not Applicable

T(event) = Event Duration
Tau = Lag Time

T* = Time to Reach Steady-State
B = Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis

Current/Future Construction/Utility Worker (Central Tendency)

Dermal Worksheet
Intermediate Variables for Calculating D_A(event)

Chemical of Potential Concern	Medium	Dermal Absorption Fraction (soil)	FA	Kp		T(event)		Tau		T*		B
			Value	Value	Units	Value	Units	Value	Units	Value	Units	Value
Acetone	Groundwater	N/A	1	5.12E-04	cm/hr	4	hr/event	0.23	hr	0.54	hr	0.002
Benzene	Groundwater	N/A	1	1.49E-02	cm/hr	4	hr/event	0.29	hr	0.70	hr	0.05
Chlorobenzene	Groundwater	N/A	1	2.82E-02	cm/hr	4	hr/event	0.46	hr	1.09	hr	0.12
Chloroform	Groundwater	N/A	1	6.83E-03	cm/hr	4	hr/event	0.50	hr	1.19	hr	0.03
2-Chlorotoluene	Groundwater	N/A	1	5.72E-02	cm/hr	4	hr/event	0.55	hr	1.31	hr	0.25
4-Chlorotoluene	Groundwater	N/A	1	5.72E-02	cm/hr	4	hr/event	0.55	hr	1.31	hr	0.25
1,2-Dichloroethane	Groundwater	N/A	1	4.20E-03	cm/hr	4	hr/event	0.38	hr	0.92	hr	0.02
1,2-Dichloroethene (total)	Groundwater	N/A	1	7.71E-03	cm/hr	4	hr/event	0.37	hr	0.89	hr	0.03
Ethylbenzene	Groundwater	N/A	1	4.93E-02	cm/hr	4	hr/event	0.42	hr	1.01	hr	0.20
4-Methyl-2-pentanone	Groundwater	N/A	1	2.66E-03	cm/hr	4	hr/event	0.39	hr	0.93	hr	0.01
Tetrachloroethene	Groundwater	N/A	1	3.34E-02	cm/hr	4	hr/event	0.91	hr	2.18	hr	0.17
Toluene	Groundwater	N/A	1	3.11E-02	cm/hr	4	hr/event	0.35	hr	0.84	hr	0.11
Trichloroethene	Groundwater	N/A	1	1.16E-02	cm/hr	4	hr/event	0.58	hr	1.39	hr	0.05
Vinyl chloride	Groundwater	N/A	1	5.60E-03	cm/hr	4	hr/event	0.24	hr	0.57	hr	0.02
Xylenes (total)	Groundwater	N/A	1	5.32E-02	cm/hr	4	hr/event	0.42	hr	1.01	hr	0.21
Aluminum	Groundwater	N/A	N/A	1.00E-03	cm/hr	4	hr/event	N/A	N/A	N/A	N/A	N/A
Antimony	Groundwater	N/A	N/A	1.00E-03	cm/hr	4	hr/event	N/A	N/A	N/A	N/A	N/A
Arsenic	Groundwater	N/A	N/A	1.00E-03	cm/hr	4	hr/event	N/A	N/A	N/A	N/A	N/A
Barium	Groundwater	N/A	N/A	1.00E-03	cm/hr	4	hr/event	N/A	N/A	N/A	N/A	N/A
Boron	Groundwater	N/A	N/A	1.00E-03	cm/hr	4	hr/event	N/A	N/A	N/A	N/A	N/A
Cadmium	Groundwater	N/A	N/A	1.00E-03	cm/hr	4	hr/event	N/A	N/A	N/A	N/A	N/A

Current/Future Construction/Utility Worker (Central Tendency)

Cerium	Groundwater	N/A	N/A	1.00E-03	cm/hr	4	hr/event	N/A	N/A	N/A	N/A	N/A
Iron	Groundwater	N/A	N/A	1.00E-03	cm/hr	4	hr/event	N/A	N/A	N/A	N/A	N/A
Lanthanum	Groundwater	N/A	N/A	1.00E-03	cm/hr	4	hr/event	N/A	N/A	N/A	N/A	N/A
Lead	Groundwater	N/A	N/A	1.00E-03	cm/hr	4	hr/event	N/A	N/A	N/A	N/A	N/A
Lithium	Groundwater	N/A	N/A	1.00E-03	cm/hr	4	hr/event	N/A	N/A	N/A	N/A	N/A
Manganese	Groundwater	N/A	N/A	1.00E-03	cm/hr	4	hr/event	N/A	N/A	N/A	N/A	N/A
Neodymium	Groundwater	N/A	N/A	1.00E-03	cm/hr	4	hr/event	N/A	N/A	N/A	N/A	N/A
Nickel	Groundwater	N/A	N/A	2.00E-04	cm/hr	4	hr/event	N/A	N/A	N/A	N/A	N/A
Silver	Groundwater	N/A	N/A	6.00E-04	cm/hr	4	hr/event	N/A	N/A	N/A	N/A	N/A
Yttrium	Groundwater	N/A	N/A	1.00E-03	cm/hr	4	hr/event	N/A	N/A	N/A	N/A	N/A
Zinc	Groundwater	N/A	N/A	6.00E-04	cm/hr	4	hr/event	N/A	N/A	N/A	N/A	N/A
Total Uranium	Groundwater	N/A	N/A	1.00E-03	cm/hr	4	hr/event	N/A	N/A	N/A	N/A	N/A

FA = Fraction Absorbed Water
Kp = Dermal Permeability Coefficient of Compound in Water
N/A = Not Applicable

T(event) = Event Duration
Tau = Lag Time

T* = Time to Reach Steady-State
B = Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis

Current/Future - Adolescent Recreationist

Dermal Worksheet
Intermediate Variables for Calculating D_A(event)

Chemical of Potential Concern	Medium	Dermal Absorption Fraction (soil)	FA	Kp		T(event)		Tau		T*		B
			Value	Value	Units	Value	Units	Value	Units	Value	Units	Value
Aluminum	Surface Water	N/A	N/A	1.00E-03	cm/hr	2	hr/event	N/A	N/A	N/A	N/A	N/A
Arsenic	Surface Water	N/A	N/A	1.00E-03	cm/hr	2	hr/event	N/A	N/A	N/A	N/A	N/A
Barium	Surface Water	N/A	N/A	1.00E-03	cm/hr	2	hr/event	N/A	N/A	N/A	N/A	N/A
Boron	Surface Water	N/A	N/A	1.00E-03	cm/hr	2	hr/event	N/A	N/A	N/A	N/A	N/A
Cadmium	Surface Water	N/A	N/A	1.00E-03	cm/hr	2	hr/event	N/A	N/A	N/A	N/A	N/A
Chromium, Total	Surface Water	N/A	N/A	1.00E-03	cm/hr	2	hr/event	N/A	N/A	N/A	N/A	N/A
Cobalt	Surface Water	N/A	N/A	2.00E-03	cm/hr	2	hr/event	N/A	N/A	N/A	N/A	N/A
Copper	Surface Water	N/A	N/A	1.00E-03	cm/hr	2	hr/event	N/A	N/A	N/A	N/A	N/A
Dysprosium	Surface Water	N/A	N/A	1.00E-03	cm/hr	2	hr/event	N/A	N/A	N/A	N/A	N/A
Iron	Surface Water	N/A	N/A	1.00E-03	cm/hr	2	hr/event	N/A	N/A	N/A	N/A	N/A
Lanthanum	Surface Water	N/A	N/A	1.00E-03	cm/hr	2	hr/event	N/A	N/A	N/A	N/A	N/A
Lead	Surface Water	N/A	N/A	1.00E-03	cm/hr	2	hr/event	N/A	N/A	N/A	N/A	N/A
Lithium	Surface Water	N/A	N/A	1.00E-03	cm/hr	2	hr/event	N/A	N/A	N/A	N/A	N/A
Manganese	Surface Water	N/A	N/A	1.00E-03	cm/hr	2	hr/event	N/A	N/A	N/A	N/A	N/A
Mercury	Surface Water	N/A	N/A	1.00E-03	cm/hr	2	hr/event	N/A	N/A	N/A	N/A	N/A
Nickel	Surface Water	N/A	N/A	2.00E-04	cm/hr	2	hr/event	N/A	N/A	N/A	N/A	N/A
Silver	Surface Water	N/A	N/A	6.00E-04	cm/hr	2	hr/event	N/A	N/A	N/A	N/A	N/A
Thallium	Surface Water	N/A	N/A	1.00E-03	cm/hr	2	hr/event	N/A	N/A	N/A	N/A	N/A
Vanadium	Surface Water	N/A	N/A	1.00E-03	cm/hr	2	hr/event	N/A	N/A	N/A	N/A	N/A
Zinc	Surface Water	N/A	N/A	6.00E-04	cm/hr	2	hr/event	N/A	N/A	N/A	N/A	N/A
Total Uranium	Surface Water	N/A	N/A	1.00E-03	cm/hr	2	hr/event	N/A	N/A	N/A	N/A	N/A

FA = Fraction Absorbed Water
Kp = Dermal Permeability Coefficient of Compound in Water
N/A = Not Applicable

T(event) = Event Duration
Tau = Lag Time

T* = Time to Reach Steady-State
B = Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis

Dermal Worksheet
Intermediate Variables for Calculating D_A(event)

Chemical of Potential Concern	Medium	Dermal Absorption Fraction (soil)	FA	Kp		T(event)		Tau		T*		B
			Value	Value	Units	Value	Units	Value	Units	Value	Units	Value
Aluminum	Surface Water	N/A	N/A	1.00E-03	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Arsenic	Surface Water	N/A	N/A	1.00E-03	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Barium	Surface Water	N/A	N/A	1.00E-03	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Beryllium	Surface Water	N/A	N/A	1.00E-03	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Boron	Surface Water	N/A	N/A	1.00E-03	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Cadmium	Surface Water	N/A	N/A	1.00E-03	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Chromium, Total	Surface Water	N/A	N/A	1.00E-03	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Cobalt	Surface Water	N/A	N/A	2.00E-03	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Copper	Surface Water	N/A	N/A	1.00E-03	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Iron	Surface Water	N/A	N/A	1.00E-03	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Lanthanum	Surface Water	N/A	N/A	1.00E-03	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Lead	Surface Water	N/A	N/A	1.00E-03	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Lithium	Surface Water	N/A	N/A	1.00E-03	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Manganese	Surface Water	N/A	N/A	1.00E-03	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Mercury	Surface Water	N/A	N/A	1.00E-03	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Nickel	Surface Water	N/A	N/A	2.00E-04	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Silver	Surface Water	N/A	N/A	6.00E-04	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Thallium	Surface Water	N/A	N/A	1.00E-03	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Vanadium	Surface Water	N/A	N/A	1.00E-03	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Zinc	Surface Water	N/A	N/A	6.00E-04	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A
Total Uranium	Surface Water	N/A	N/A	1.00E-03	cm/hr	8	hr/event	N/A	N/A	N/A	N/A	N/A

FA = Fraction Absorbed Water
Kp = Dermal Permeability Coefficient of Compound in Water
N/A = Not Applicable
T(event) = Event Duration
Tau = Lag Time
T* = Time to Reach Steady-State
B = Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis

Current/Future - Adolescent Recreationist

Dermal Worksheet
Intermediate Variables for Calculating D_A(event)

Chemical of Potential Concern	Medium	Dermal Absorption Fraction (soil)	FA	Kp		T(event)		AF		ABS-d		B
			Value	Value	Units	Value	Units	Value	Units	Value	Units	Value
Arsenic	Sediment	N/A	N/A	1.00E-03	cm/hr	2	hr/event	0.2	mg/(cm^2-event)	0.03	unitless	N/A

FA = Fraction Absorbed Water
Kp = Dermal Permeability Coefficient of Compound in Water
N/A = Not Applicable

T(event) = Event Duration
AF = Soil to Skin Adherence Factor
ABS-d = Dermal Absorption Factor

B = Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis

Current/Future - Municipal Worker

Dermal Worksheet
Intermediate Variables for Calculating D_A(event)

Chemical of Potential Concern	Medium	Dermal Absorption Fraction (soil)	FA	Kp		T(event)		AF		ABS-d		B
			Value	Value	Units	Value	Units	Value	Units	Value	Units	Value
Arsenic	Sediment	N/A	N/A	1.00E-03	cm/hr	2	hr/event	0.2	mg/(cm^2-event)	0.03	unitless	N/A

FA = Fraction Absorbed Water
Kp = Dermal Permeability Coefficient of Compound in Water
N/A = Not Applicable
T(event) = Event Duration
AF = Soil to Skin Adherence Factor
ABS-d = Dermal Absorption Factor
B = Dimensionless Ratio of the Permeability Coefficient of a Compound Through the Stratum Corneum Relative to its Permeability Coefficient Across the Viable Epidermis

APPENDIX F

RADIOLOGICAL DOSE ASSESSMENT

RADIOLOGICAL DOSE ASSESSMENT

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Radionuclide of Potential Concern	EPC (1)		Risk Calculation Approach	Cancer Risk Calculations				
					Value	Units		Intake/Activity		Exposure-to-Dose Conversion Factor		Total Estimated Dose
								Value	Units	Value	Units	mrem
Groundwater	Tap Water	Tap Water	Ingestion	Radium 226 + D	5.56E-01	pCi/l	USEPA RAGS	3.9E+02	pCi	1.32E-03	mrem/pCi	5E-01
				Radium 228 + D	1.46E+00	pCi/l	USEPA RAGS	1.0E+03	pCi	1.44E-03	mrem/pCi	1E+00
				Thorium 228 + D	8.72E-01	pCi/l	USEPA RAGS	6.1E+02	pCi	3.96E-04	mrem/pCi	2E-01
				Thorium 230	8.41E-01	pCi/l	USEPA RAGS	5.9E+02	pCi	5.48E-04	mrem/pCi	3E-01
				Thorium 232	4.88E-01	pCi/l	USEPA RAGS	3.4E+02	pCi	2.73E-03	mrem/pCi	9E-01
				Uranium 234	1.56E+00	pCi/l	USEPA RAGS	1.1E+03	pCi	2.83E-04	mrem/pCi	3E-01
				Uranium 235 + D	4.30E-01	pCi/l	USEPA RAGS	3.0E+02	pCi	2.66E-04	mrem/pCi	8E-02
				Uranium 238 + D	1.15E+00	pCi/l	USEPA RAGS	8.0E+02	pCi	2.55E-04	mrem/pCi	2E-01
				Lead 210 + D	5.56E-01	pCi/l	USEPA RAGS	3.9E+02	pCi	5.37E-03	mrem/pCi	2E+00
			Exp. Route Total									4E+00
		Exposure Point Total										4E+00
	Exposure Medium Total											4E+00
Medium Total												4E+00

(1) EPCs are for parent only and do not contain radiological daughter products

(2) CSFs include consider radiological daughter products

Total of Receptor Risks Across All Media: 4E+00

RADIOLOGICAL DOSE ASSESSMENT

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Resident
Receptor Age: Child

Medium	Exposure Medium	Exposure Point	Exposure Route	Radionuclide of Potential Concern	EPC (1)		Risk Calculation Approach	Cancer Risk Calculations				
					Value	Units		Intake/Activity		Exposure-to-Dose Conversion Factor		Total Estimated Dose
								Value	Units	Value	Units	mrem
Groundwater	Tap Water	Tap Water	Ingestion	Radium 226 + D	5.56E-01	pCi/g	USEPA RAGS	1.9E+02	pCi	1.32E-03	mrem/pCi	3E-01
				Radium 228 + D	1.46E+00	pCi/l	USEPA RAGS	5.1E+02	pCi	1.44E-03	mrem/pCi	7E-01
				Thorium 228 + D	8.72E-01	pCi/l	USEPA RAGS	3.1E+02	pCi	3.96E-04	mrem/pCi	1E-01
				Thorium 230	8.41E-01	pCi/l	USEPA RAGS	2.9E+02	pCi	5.48E-04	mrem/pCi	2E-01
				Thorium 232	4.88E-01	pCi/l	USEPA RAGS	1.7E+02	pCi	2.73E-03	mrem/pCi	5E-01
				Uranium 234	1.56E+00	pCi/l	USEPA RAGS	5.4E+02	pCi	2.83E-04	mrem/pCi	2E-01
				Uranium 235 + D	4.30E-01	pCi/l	USEPA RAGS	1.5E+02	pCi	2.66E-04	mrem/pCi	4E-02
				Uranium 238 + D	1.15E+00	pCi/l	USEPA RAGS	4.0E+02	pCi	2.55E-04	mrem/pCi	2E-07
				Lead 210 + D	5.56E-01	pCi/l	USEPA RAGS	1.9E+02	pCi	5.37E-03	mrem/pCi	1E+00
			Exp. Route Total									3E+00
		Exposure Point Total										3E+00
	Exposure Medium Total											3E+00
Medium Total												3E+00

(1) EPCs are for parent only and do not contain radiological daughter products

(2) CSFs include consider radiological daughter products

Total of Receptor Risks Across All Media: 3E+00

RADIOLOGICAL DOSE ASSESSMENT

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Radionuclide of Potential Concern	EPC (1)		Risk Calculation Approach	Cancer Risk Calculations				
								Intake/Activity		Exposure-to-Dose Conversion Factor		Total Estimated Dose
					Value	Units		Value	Units	Value	Units	mrem
Groundwater	Tap Water	Tap Water	Ingestion	Radium 226 + D	5.56E-01	pCi/l	USEPA RAGS	1.4E+02	pCi	1.32E-03	mrem/pCi	2E-01
				Radium 228 + D	1.46E+00	pCi/l	USEPA RAGS	3.6E+02	pCi	1.44E-03	mrem/pCi	5E-01
				Thorium 228 + D	8.72E-01	pCi/l	USEPA RAGS	2.2E+02	pCi	3.96E-04	mrem/pCi	9E-02
				Thorium 230	8.41E-01	pCi/l	USEPA RAGS	2.1E+02	pCi	5.48E-04	mrem/pCi	1E-01
				Thorium 232	4.88E-01	pCi/l	USEPA RAGS	1.2E+02	pCi	2.73E-03	mrem/pCi	3E-01
				Uranium 234	1.56E+00	pCi/l	USEPA RAGS	3.9E+02	pCi	2.83E-04	mrem/pCi	1E-01
				Uranium 235 + D	4.30E-01	pCi/l	USEPA RAGS	1.1E+02	pCi	2.66E-04	mrem/pCi	3E-02
				Uranium 238 + D	1.15E+00	pCi/l	USEPA RAGS	2.9E+02	pCi	2.55E-04	mrem/pCi	6E-07
				Lead 210 + D	5.56E-01	pCi/l	USEPA RAGS	1.4E+02	pCi	5.37E-03	mrem/pCi	7E-01
			Exp. Route Total									2E+00
		Exposure Point Total										2E+00
	Exposure Medium Total											2E+00
Medium Total												2E+00

(1) EPCs are for parent only and do not contain radiological daughter products

(2) CSFs include consider radiological daughter products

Total of Receptor Risks Across All Media: 2E+00

RADIOLOGICAL DOSE ASSESSMENT

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Recreationist
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Radionuclide of Potential Concern	EPC (1)		Risk Calculation Approach	Cancer Risk Calculations				
								Intake/Activity		Exposure-to-Dose Conversion Factor		Total Estimated Dose
					Value	Units		Value	Units	Value	Units	mrem
Sediment	Sediment	Westerly Brook	Ingestion	Radium 226 + D	2.83E+00	pCi/g	USEPA RAGS	1.4E+01	pCi	1.32E-03	mrem/pCi	2E-02
				Thorium 228 + D	9.40E-01	pCi/g	USEPA RAGS	4.7E+00	pCi	3.96E-04	mrem/pCi	2E-03
				Thorium 230	1.29E+00	pCi/g	USEPA RAGS	6.4E+00	pCi	5.48E-04	mrem/pCi	4E-03
				Thorium 232	7.26E-01	pCi/g	USEPA RAGS	3.6E+00	pCi	2.73E-03	mrem/pCi	1E-02
				Uranium 234	1.30E+00	pCi/g	USEPA RAGS	6.5E+00	pCi	2.83E-04	mrem/pCi	2E-03
				Uranium 235 + D	1.74E-01	pCi/g	USEPA RAGS	8.7E-01	pCi	2.66E-04	mrem/pCi	2E-04
				Uranium 238 + D	1.41E+00	pCi/g	USEPA RAGS	7.0E+00	pCi	2.55E-04	mrem/pCi	9E-09
				Lead 210 + D	2.83E+00	pCi/g	USEPA RAGS	1.4E+01	pCi	5.37E-03	mrem/pCi	8E-02
			Exp. Route Total									1E-01
			External Radiation	Radium 226 + D	2.83E+00	pCi/g	USEPA RAGS	3.2E-02	pCi/g-year	7.75E-03	mrem/pCi/g-year	3E-04
				Thorium 228 + D	9.40E-01	pCi/g	USEPA RAGS	1.1E-02	pCi/g-year	2.28E-03	mrem/pCi/g-year	2E-05
				Thorium 230	1.29E+00	pCi/g	USEPA RAGS	1.5E-02	pCi/g-year	4.35E-04	mrem/pCi/g-year	6E-06
				Thorium 232	7.26E-01	pCi/g	USEPA RAGS	8.3E-03	pCi/g-year	2.17E-04	mrem/pCi/g-year	2E-06
				Uranium 234	1.30E+00	pCi/g	USEPA RAGS	1.5E-02	pCi/g-year	1.89E-04	mrem/pCi/g-year	3E-06
				Uranium 235 + D	1.74E-01	pCi/g	USEPA RAGS	2.0E-03	pCi/g-year	1.77E-01	mrem/pCi/g-year	4E-04
				Uranium 238 + D	1.41E+00	pCi/g	USEPA RAGS	1.6E-02	pCi/g-year	1.22E-04	mrem/pCi/g-year	1E-08
				Lead 210 + D	2.83E+00	pCi/g	USEPA RAGS	3.2E-02	pCi/g-year	1.54E-03	mrem/pCi/g-year	5E-05
			Exp. Route Total									7E-04
		Exposure Point Total										1E-01
	Exposure Medium Total											1E-01
Medium Total												1E-01

(1) EPCs are for parent only and do not contain radiological daughter products

(2) CSFs include consider radiological daughter products

Total of Receptor Risks Across All Media: 1E-01

RADIOLOGICAL DOSE ASSESSMENT

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Recreationist
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Radionuclide of Potential Concern	EPC (1)		Risk Calculation Approach	Cancer Risk Calculations				
								Intake/Activity		Exposure-to-Dose Conversion Factor		Total Estimated Dose
					Value	Units		Value	Units	Value	Units	mrem
Sediment	Sediment	Saddle River	Ingestion	Radium 226 + D	2.59E+00	pCi/g	USEPA RAGS	1.3E+01	pCi	1.32E-03	mrem/pCi	2E-02
				Thorium 228 + D	9.58E-01	pCi/g	USEPA RAGS	4.8E+00	pCi	3.96E-04	mrem/pCi	2E-03
				Thorium 230	2.22E+00	pCi/g	USEPA RAGS	1.1E+01	pCi	5.48E-04	mrem/pCi	6E-03
				Thorium 232	1.01E+00	pCi/g	USEPA RAGS	5.1E+00	pCi	2.73E-03	mrem/pCi	1E-02
				Uranium 234	1.66E+00	pCi/g	USEPA RAGS	8.3E+00	pCi	2.83E-04	mrem/pCi	2E-03
				Uranium 235 + D	1.77E-01	pCi/g	USEPA RAGS	8.8E-01	pCi	2.66E-04	mrem/pCi	2E-04
				Uranium 238 + D	1.19E+00	pCi/g	USEPA RAGS	5.9E+00	pCi	2.55E-04	mrem/pCi	7E-09
				Lead 210 + D	2.59E+00	pCi/g	USEPA RAGS	1.3E+01	pCi	5.37E-03	mrem/pCi	7E-02
			Exp. Route Total									1E-01
			External Radiation	Radium 226 + D	2.59E+00	pCi/g	USEPA RAGS	3.0E-02	pCi/g-year	7.75E-03	mrem/pCi/g-year	2E-04
				Thorium 228 + D	9.58E-01	pCi/g	USEPA RAGS	1.1E-02	pCi/g-year	2.28E-03	mrem/pCi/g-year	2E-05
				Thorium 230	2.22E+00	pCi/g	USEPA RAGS	2.5E-02	pCi/g-year	4.35E-04	mrem/pCi/g-year	1E-05
				Thorium 232	1.01E+00	pCi/g	USEPA RAGS	1.2E-02	pCi/g-year	2.17E-04	mrem/pCi/g-year	2E-06
				Uranium 234	1.66E+00	pCi/g	USEPA RAGS	1.9E-02	pCi/g-year	1.89E-04	mrem/pCi/g-year	4E-06
				Uranium 235 + D	1.77E-01	pCi/g	USEPA RAGS	2.0E-03	pCi/g-year	1.77E-01	mrem/pCi/g-year	4E-04
				Uranium 238 + D	1.19E+00	pCi/g	USEPA RAGS	1.4E-02	pCi/g-year	1.22E-04	mrem/pCi/g-year	9E-09
				Lead 210 + D	2.59E+00	pCi/g	USEPA RAGS	3.0E-02	pCi/g-year	1.54E-03	mrem/pCi/g-year	5E-05
			Exp. Route Total									7E-04
		Exposure Point Total										1E-01
	Exposure Medium Total											1E-01
Medium Total												1E-01

(1) EPCs are for parent only and do not contain radiological daughter products

(2) CSFs include consider radiological daughter products

Total of Receptor Risks Across All Media: 1E-01

RADIOLOGICAL DOSE ASSESSMENT

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Recreationist
Receptor Age: Adolescent

Medium	Exposure Medium	Exposure Point	Exposure Route	Radionuclide of Potential Concern	EPC (1)		Risk Calculation Approach	Cancer Risk Calculations				
					Value	Units		Intake/Activity		Exposure-to-Dose Conversion Factor		Total Estimated Dose
								Value	Units	Value	Units	mrem
Sediment	Sediment	Coles Brook	Ingestion	Radium 226 + D	1.57E+00	pCi/g	USEPA RAGS	7.8E+00	pCi	1.32E-03	mrem/pCi	1E-02
				Thorium 228 + D	2.21E+00	pCi/g	USEPA RAGS	1.1E+01	pCi	3.96E-04	mrem/pCi	4E-03
				Thorium 230	1.03E+00	pCi/g	USEPA RAGS	5.2E+00	pCi	5.48E-04	mrem/pCi	3E-03
				Thorium 232	1.80E+00	pCi/g	USEPA RAGS	9.0E+00	pCi	2.73E-03	mrem/pCi	2E-02
				Uranium 234	2.38E+00	pCi/g	USEPA RAGS	1.2E+01	pCi	2.83E-04	mrem/pCi	3E-03
				Uranium 235 + D	1.25E-01	pCi/g	USEPA RAGS	6.2E-01	pCi	2.66E-04	mrem/pCi	2E-04
				Uranium 238 + D	1.34E+00	pCi/g	USEPA RAGS	6.7E+00	pCi	2.55E-04	mrem/pCi	8E-09
				Lead 210 + D	1.57E+00	pCi/g	USEPA RAGS	7.8E+00	pCi	5.37E-03	mrem/pCi	4E-02
			Exp. Route Total									9E-02
			External Radiation	Radium 226 + D	1.57E+00	pCi/g	USEPA RAGS	1.8E-02	pCi/g-year	7.75E-03	mrem/pCi/g-year	1E-04
				Thorium 228 + D	2.21E+00	pCi/g	USEPA RAGS	2.5E-02	pCi/g-year	2.28E-03	mrem/pCi/g-year	6E-05
				Thorium 230	1.03E+00	pCi/g	USEPA RAGS	1.2E-02	pCi/g-year	4.35E-04	mrem/pCi/g-year	5E-06
				Thorium 232	1.80E+00	pCi/g	USEPA RAGS	2.0E-02	pCi/g-year	2.17E-04	mrem/pCi/g-year	4E-06
				Uranium 234	2.38E+00	pCi/g	USEPA RAGS	2.7E-02	pCi/g-year	1.89E-04	mrem/pCi/g-year	5E-06
				Uranium 235 + D	1.25E-01	pCi/g	USEPA RAGS	1.4E-03	pCi/g-year	1.77E-01	mrem/pCi/g-year	3E-04
				Uranium 238 + D	1.34E+00	pCi/g	USEPA RAGS	1.5E-02	pCi/g-year	1.22E-04	mrem/pCi/g-year	1E-08
				Lead 210 + D	1.57E+00	pCi/g	USEPA RAGS	1.8E-02	pCi/g-year	1.54E-03	mrem/pCi/g-year	3E-05
			Exp. Route Total									5E-04
		Exposure Point Total										9E-02
	Exposure Medium Total											9E-02
Medium Total												9E-02

(1) EPCs are for parent only and do not contain radiological daughter products

(2) CSFs include consider radiological daughter products

Total of Receptor Risks Across All Media: 9E-02

RADIOLOGICAL DOSE ASSESSMENT

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Municipal Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Radionuclide of Potential Concern	EPC (1)		Risk Calculation Approach	Cancer Risk Calculations				
					Value	Units		Intake/Activity		Exposure-to-Dose Conversion Factor		Total Estimated Dose
								Value	Units	Value	Units	mrem
Sediment	Sediment	Lodi Brook	Ingestion	Radium 226 + D	1.04E+01	pCi/g	USEPA RAGS	1.4E+01	pCi	1.32E-03	mrem/pCi	2E-02
				Thorium 228 + D	2.36E+01	pCi/g	USEPA RAGS	3.1E+01	pCi	3.96E-04	mrem/pCi	1E-02
				Thorium 230	4.48E+00	pCi/g	USEPA RAGS	5.9E+00	pCi	5.48E-04	mrem/pCi	3E-03
				Thorium 232	2.15E+01	pCi/g	USEPA RAGS	2.8E+01	pCi	2.73E-03	mrem/pCi	8E-02
				Uranium 234	6.22E+00	pCi/g	USEPA RAGS	8.2E+00	pCi	2.83E-04	mrem/pCi	2E-03
				Uranium 235 + D	2.73E-01	pCi/g	USEPA RAGS	3.6E-01	pCi	2.66E-04	mrem/pCi	1E-04
				Uranium 238 + D	5.75E+00	pCi/g	USEPA RAGS	7.6E+00	pCi	2.55E-04	mrem/pCi	4E-08
				Lead 210 + D	1.04E+01	pCi/g	USEPA RAGS	1.4E+01	pCi	5.37E-03	mrem/pCi	7E-02
			Exp. Route Total									2E-01
			External Radiation	Radium 226 + D	1.04E+01	pCi/g	USEPA RAGS	9.5E-03	pCi/g-year	7.75E-03	mrem/pCi/g-year	7E-05
				Thorium 228 + D	2.36E+01	pCi/g	USEPA RAGS	2.2E-02	pCi/g-year	2.28E-03	mrem/pCi/g-year	5E-05
				Thorium 230	4.48E+00	pCi/g	USEPA RAGS	4.1E-03	pCi/g-year	4.35E-04	mrem/pCi/g-year	2E-06
				Thorium 232	2.15E+01	pCi/g	USEPA RAGS	2.0E-02	pCi/g-year	2.17E-04	mrem/pCi/g-year	4E-06
				Uranium 234	6.22E+00	pCi/g	USEPA RAGS	5.7E-03	pCi/g-year	1.89E-04	mrem/pCi/g-year	1E-06
				Uranium 235 + D	2.73E-01	pCi/g	USEPA RAGS	2.5E-04	pCi/g-year	1.77E-01	mrem/pCi/g-year	4E-05
				Uranium 238 + D	5.75E+00	pCi/g	USEPA RAGS	5.2E-03	pCi/g-year	1.22E-04	mrem/pCi/g-year	1E-08
				Lead 210 + D	1.04E+01	pCi/g	USEPA RAGS	9.5E-03	pCi/g-year	1.54E-03	mrem/pCi/g-year	1E-05
			Exp. Route Total									2E-04
		Exposure Point Total										2E-01
	Exposure Medium Total											2E-01
Medium Total												2E-01

(1) EPCs are for parent only and do not contain radiological daughter products

(2) CSFs include consider radiological daughter products

Total of Receptor Risks Across All Media	2E-01

RADIOLOGICAL DOSE ASSESSMENT

FUSRAP MAYWOOD SUPERFUND SITE

Scenario Timeframe: Current/Future
Receptor Population: Municipal Worker
Receptor Age: Adult

Medium	Exposure Medium	Exposure Point	Exposure Route	Radionuclide of Potential Concern	EPC (1)		Risk Calculation Approach	Cancer Risk Calculations				
					Value	Units		Intake/Activity		Exposure-to-Dose Conversion Factor		Total Estimated Dose
								Value	Units	Value	Units	mrem
Sediment	Sediment	Westerly Brook	Ingestion	Radium 226 + D	2.83E+00	pCi/g	USEPA RAGS	3.7E+00	pCi	1.32E-03	mrem/pCi	5E-03
				Thorium 228 + D	9.40E-01	pCi/g	USEPA RAGS	1.2E+00	pCi	3.96E-04	mrem/pCi	5E-04
				Thorium 230	1.29E+00	pCi/g	USEPA RAGS	1.7E+00	pCi	5.48E-04	mrem/pCi	9E-04
				Thorium 232	7.26E-01	pCi/g	USEPA RAGS	9.6E-01	pCi	2.73E-03	mrem/pCi	3E-03
				Uranium 234	1.30E+00	pCi/g	USEPA RAGS	1.7E+00	pCi	2.83E-04	mrem/pCi	5E-04
				Uranium 235 + D	1.74E-01	pCi/g	USEPA RAGS	2.3E-01	pCi	2.66E-04	mrem/pCi	6E-05
				Uranium 238 + D	1.41E+00	pCi/g	USEPA RAGS	1.9E+00	pCi	2.55E-04	mrem/pCi	1E-08
				Lead 210 + D	2.83E+00	pCi/g	USEPA RAGS	3.7E+00	pCi	5.37E-03	mrem/pCi	2E-02
			Exp. Route Total									3E-02
			External Radiation	Radium 226 + D	2.83E+00	pCi/g	USEPA RAGS	2.6E-03	pCi/g-year	7.75E-03	mrem/pCi/g-year	2E-05
				Thorium 228 + D	9.40E-01	pCi/g	USEPA RAGS	8.6E-04	pCi/g-year	2.28E-03	mrem/pCi/g-year	2E-06
				Thorium 230	1.29E+00	pCi/g	USEPA RAGS	1.2E-03	pCi/g-year	4.35E-04	mrem/pCi/g-year	5E-07
				Thorium 232	7.26E-01	pCi/g	USEPA RAGS	6.6E-04	pCi/g-year	2.17E-04	mrem/pCi/g-year	1E-07
				Uranium 234	1.30E+00	pCi/g	USEPA RAGS	1.2E-03	pCi/g-year	1.89E-04	mrem/pCi/g-year	2E-07
				Uranium 235 + D	1.74E-01	pCi/g	USEPA RAGS	1.6E-04	pCi/g-year	1.77E-01	mrem/pCi/g-year	3E-05
				Uranium 238 + D	1.41E+00	pCi/g	USEPA RAGS	1.3E-03	pCi/g-year	1.22E-04	mrem/pCi/g-year	4E-09
				Lead 210 + D	2.83E+00	pCi/g	USEPA RAGS	2.6E-03	pCi/g-year	1.54E-03	mrem/pCi/g-year	4E-06
			Exp. Route Total									6E-05
		Exposure Point Total										3E-02
	Exposure Medium Total											3E-02
Medium Total												3E-02

(1) EPCs are for parent only and do not contain radiological daughter products

(2) CSFs include consider radiological daughter products

Total of Receptor Risks Across All Media: 3E-02

APPENDIX G

CORRESPONDENCE AND RESPONSE TO COMMENTS

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2
290 BROADWAY
NEW YORK, NY 10007-1866

May 26, 2004

Allen Roos
Project Manager
U.S. Army Corps of Engineers
New York District - CENAN-PP
26 Federal Plaza - Room 2108
New York, NY 10278-0090

Dear Mr. Roos:

Re: EPA Review of the draft *Groundwater Baseline Risk Assessment* (March 2004), Rev. 2 Formerly Utilized Sites Remedial Action Program - Maywood Chemical Superfund Site

The Environmental Protection Agency (EPA) has reviewed the *Groundwater Baseline Risk Assessment, Rev. 2* (March 2004) prepared by Malcolm Pirnie, Inc. on behalf of the U.S. Army Corps of Engineers (USACE) for the Maywood Chemical Site. Our comments are discussed below.

General

1. The risk assessment indicates that data for 1,1-dichloroethene, 1,2-dichloroethene, tetrachloroethene, trichloroethene, and vinyl chloride from certain monitoring wells located north and west of the MISS were not included in the data set for evaluation. The rationale provided is that the contamination appears to be originating from the Dixo Company property, and thus not a FUSRAP waste. EPA notes that while these contaminants may not be considered a FUSRAP waste, their presence in any areas requiring future remediation will need to be addressed in design.

Specific

1. Page ES-2: Lines 60 and 61: Please provide additional text to describe the surface water and sediment data sets. The presentation of data for groundwater in Lines 40 - 61 provides a more thorough description of that data, and should be used as a model for the surface water/sediment data.

2. Page ES-3: The information presented in the third and fifth bullets is confusing. In the third bullet, the text implies that only Lodi Brook is culverted. However, in the fifth bullet, the text states that portions of Westerly Brook are also culverted. Please revise the text in these two bullets to clearly indicate which surface water bodies are culverted and what the potential exposures to sediment may be.

3. Page 2-8, Table 2-1: The third column of the table (which is the second column under the heading, "EPA Groundwater Screening Level for Residential Receptor") should be, "THQ = 0.1".

4. Page 2-11: In the discussion of the fraction volatilized while showering, please clarify if the 0.6 factor is used for the RME or the CTE scenario.

5. Page 2-13: Please revise the first sentence on this page to clarify that arsenic is the only COPC evaluated for dermal exposure because it is the only COPC for which a chemical-specific dermal absorption factor is available.

6. Page 2-13, Line 1172: Please revised this line to read, "...to about once a week per year or twice a week during the warmer months...."

7. Page 2-13, Line 1180: Please provide a reference for the soil-to-skin adherence factor of 0.242 mg/cm^2 for the municipal worker. What population from the Dermal Guidance was considered?

8. Page 2-15, Line 1262: Please revise this line to read, "..the CDI averaged over a lifetime of 70 years...."

9. Page 2-17: In the discussion of the radiological and inorganic concentrations in groundwater detected onsite to those concentrations identified in the offsite/upgradient/background samples, please clarify if the datasets were compared statistically. If the data were not statistically evaluated to determine whether or not there is a significant difference, then the comparison between the datasets should be assessed using an appropriate statistical test. Also, please explain why data from the shallow and the deep wells were combined for this comparison. Wouldn't it be more appropriate to evaluate concentrations from the deep wells separately from those concentrations detected in the shallow wells?

10. Section 2.5.6, Page 2-20: In the discussion of COPCs without toxicity criteria, it may be helpful if the assessments indicated whether the health effects listed are from bioassays or epidemiological studies, and what the route of exposure was in the studies. This information is useful in determining the qualitative impact of potential risk from exposure to these COPCs.

11. Section 2.5.7, Page 2-22: A discussion of risk should be included with the discussion of dose. This is necessary to compare the values to the risk range in the National Contingency Plan, this would also be consistent with the presentation in the Risk Assessment prepared for the soils operable unit.

12. Page 2-24: In the "Human Exposure Modeling" section, what is the basis for grouping data sets with <15% non-detects, >15% - <75% non-detects, and >75% non-detects? Please provide a reference for this grouping. Also, please provide a reference for the information

in the third bullet on this page ("if the proportion of non-detects is high [>75%], no substitution method will work well."). It may be appropriate to evaluate the data using different statistical tests that will account for the site-specific data.

13. Page 2-25, Line 1622: Please provide a reference for the following sentence: "[i]n the dermally absorbed dose equation, K_p is the most uncertain variable, with measured values spanning an order of magnitude."

14. RAGS Part D Tables 5 and 6 Series: Please revise the toxicity values for vinyl chloride to include the values for the child only exposure and for the lifetime exposure. These values are available in the IRIS file and should be included separately in the tables for clarity. These values will also be used in the calculation of cancer risks and noncancer hazards for the populations of concern, and the appropriate text and tables will require additional revision.

Please feel free to contact me at 212 637-4433, if you have any questions or comments.

Sincerely,

A. Carpenter

Angela Carpenter, Project Manager
Federal Facilities Section

cc: D. Gaffigan, NJDEP
M. Sivak, TST

Response to USEPA Comments
Draft Final – Groundwater Baseline Risk Assessment
FUSRAP Maywood Superfund Site
April 11, 2005

The following have been prepared in response to comments, received on April 11, 2005, from the United States Environmental Protection Agency (EPA) on the Draft Final Groundwater Baseline Risk Assessment, dated October 2004, for the FUSRAP Maywood Superfund Site.

Human Health Risk Assessment

1. Minor unit oversight on page 2-21 in section 2.5.7 Radiological Dose Assessment. Radionuclide exposure-to-dose conversion, in "SvIBq" are multiplied by I .868E17 to arrive at the unit of mrem/pCi/g-year. It should have read "SvIBq-s-m^3" instead of Sv/Bq. Otherwise, the math is still applied correctly and the correct form of the mathematical relation is presented in the document tables.

   The text will be revised accordingly.

2. The overriding assessment for radionuclide COPCs in water is made by comparing concentrations in water with a derived dose limit of 15 mrem/yr. Radionuclide concentrations should be compared to EPA MCLs, which are ARARs, in addition to this dose limit. A statement that the levels were compared to the EPA MCLs and were below EPA MCLs is recommended.

   Consistent with USEPA risk assessment guidance, the evaluation of incremental cancer risk provides the overriding assessment for radiocuclide COPCs in water; the radiological dose assessment is presented as an additional line of evidence. As presented in Appendix A, Table 2.1, the individual uranium radionuclide concentrations in pCi/L were summed, converted to mass concentrations using an activity:mass ratio, and compared to the MCL for total uranium. All total uranium concentrations are less than the MCL. Concentration data for Ra 226 and Ra 228 in each monitoring well sample will be summed, and the data will be added to Appendix A, Table 2.1 and compared to the MCL for combined Ra 226 and Ra 228. The combined Ra 226 and Ra 228 concentrations exceed the MCL in two monitoring wells. Since comparison of radionuclide concentrations to the MCLs provides another line of evidence, discussion to this effect will be added to the text at the end of Section 2.5.7.

Screening Level Ecological Risk Assessment (SLERA)

1. The conclusion of the SLERA does not indicate what the next step is for the site. In accordance with the "Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments Interim Final" (ERAGS) (U.S. Environmental Protection Agency, Environmental Response Team, Edison, NJ, June 5, 1997), the scientific/management decision point reached at the end of the SLERA requires deciding if: 1) there is adequate information to conclude that ecological risks are negligible and therefore no need for remediation on the basis of ecological risk; 2) the information is not adequate to make a decision at this point, and the ecological risk

assessment process must be continued; or 3) the information indicates a potential for adverse ecological effects, and a more thorough assessment is warranted. Therefore, the appropriate decision should be clearly stated in the Discussion and Conclusions section.

The following conclusions will be added to the text and the Executive Summary:

- **There is adequate information to conclude that site-related ecological risks are negligible with respect to the radiological constituents and, therefore, there is no need for remediation on the basis of ecological risk.**

- **There is adequate information to conclude that site related ecological risks are negligible with respect to the other inorganic constituents and, therefore, there is no need for remediation on the basis of ecological risk. Some of these constituents may be derived from off-site, non-FUSRAP sources and may reflect upstream surface water/sediment quality. Currently, Lodi Brook and Westerly Brook are predominantly culverted and offer little natural habitat. Coles Brook does not appear to have been impacted by the site.**

- **There is a potential for site-related adverse ecological effects from lithium, and a more thorough assessment (e.g., environmental chemistry, fate and transport processes, etc.) may be warranted.**

2. The text on page 3-11 and Table 3-10 indicates that manganese in the surface water of Westerly Brook has a hazard quotient (HQ) of 31. However, in Table 3-16, magnesium is listed as having a HQ of 31, while no HQ value was entered for manganese. This discrepancy should be corrected.

   The discrepancy in Table 3-16 and Table ES-5 will be corrected.

3. It is noted in the Discussion and Conclusions section that an emphasis is given to those constituents with HQs of 10 or more. This method is not appropriate for a screening level ecological risk assessment. A HQ greater than one indicates that an effect threshold has been exceeded (i.e., receptor exposure to contamination exceeds known benchmarks) and there is the potential for risk to the receptor. Therefore, the contaminants with HQs exceeding one should be given the same emphasis throughout the SLERA.

   The statement regarding the emphasis given to those constituents with HQs of 10 or more will be removed from the text and the remaining text will be revised accordingly. All inorganic constituents with HQs greater than 1 are presented in Table 3-16. However, most of these constituents have not been associated with the site and their concentrations in surface water/sediment may be the result of off-site, non-FUSRAP sources and upstream surface/water sediment quality. The text and Executive Summary will be revised accordingly.

4. The chemical constituents of primary ecological concern are barium, lead, lithium, manganese, and silver (page 3-12). However, boron should also be included in this list as it has an elevated HQ. Some constituents were eliminated in the SLERA based on the lack of a benchmark. However, before these constituents can be eliminated from the SLERA, the Army Corps needs to conduct a more rigorous search to find additional

values for these constituents, or upon consultation with EPA's risk assessor(s) and BTAG team, it may be appropriate to use a substitute benchmark from a different contaminant with similar toxicological properties, as opposed to dropping these contaminants out.

Boron will be added to the list of chemical constituents of potential concern; it was inadvertently left off the list. Surface water benchmarks were available for every detected inorganic constituent. Sediment benchmarks for beryllium, boron, lithium, and four essential nutrients (calcium, magnesium, potassium, and sodium) are lacking. A search of Oak Ridge National Laboratory's (ORNL) on-line Risk Assessment Information System at http://risk.lsd.ornl.gov/index.shtml determined that there are no sediment benchmarks for these constituents from a comprehensive list of sources that includes:

ARCS NEC, PEC, and TEC benchmarks
Canadian ISQG and PEL benchmarks
Consensus PEC and TEC benchmarks
Florida DEP PEL and TEL benchmarks
NOAA ERL and ERM benchmarks
ORNL lowest chronic value daphnids EqP benchmarks, lowest chronic value fish EqP benchmarks, lowest chronic value nondaphnid invertebrates EqP benchmarks, and secondary chronic value EqP benchmarks
USEPA OSWER Ecotox Thresholds benchmarks
Ontario low sediment and severe sediment benchmarks
USEPA, Region 4 benchmarks
USEPA, Region 5 ESL benchmarks
USEPA, Region 6 freshwater and marine benchmarks
Washington MAEL and NEL benchmarks
USEPA OSWER ET benchmark identifier
USEPA, Region 6 benchmark identifier

Given the lack of sediment benchmarks for these constituents in these sources, a search of the primary scientific literature was not conducted.

5. It may be useful to include a map which illustrates the surface water and sediment sample locations along with the analyte-specific benchmark exceedances. Another helpful map may be one which provides the delineation of benzene and lithium groundwater plumes in the overburden and bedrock. The map(s) should include surface water pathways, and distinguish culverted waterways from open waterways. Additionally, the map should also indicate the known and potential locations where groundwater is seeping into the culverted waterways through cracks and joints.

   While the suggested maps may provide a more visual basis of understanding conditions in the vicinity of the site, they will not materially add to the information, evaluations, and interpretations provided in the SLERA. Maps depicting the benzene plumes in the overburden and bedrock are provided in Figures 1-4 and 1-2, respectively, of the Groundwater Remedial Investigation Report Addendum, Volume I: Report Text and Appendices (August 2003). Maps depicting the lithium plumes in the overburden and bedrock are provided in Figures 5-5 and 5-16, respectively, of the Groundwater Remedial Investigation Report, Volume III: Figures - continued (June 2003).

6. The vegetation inventory (Table 3-1) lists plants classified as facultative wetland or

upland species. As the SLERA addresses potential risk to aquatic receptors, the list should be expanded to include aquatic plant species (i.e., submerged aquatic vegetation). Additionally, the document should provide a list of the fish species known to occur in the vicinity of the study area.

Westerly Brook and Lodi Brook are predominantly culverted, prohibiting the presence of aquatic vegetation, and Coles Brook does not appear to have been impacted by the site. Typical freshwater aquatic plants present in the Saddle River might include water celery, pondweed, and water chestnut. However, it is not likely that the Saddle River has much submerged aquatic vegetation (SAV) at locations near the site, considering the depth and velocity of the river. Vegetation that provides structure and habitat for fish and other aquatic wildlife is most likely compromised of trees and shrubs that grow along the banks and are rooted below the high water mark of flood events. Even if SAV is present at certain times of the year, seasonal flooding most likely hinders population establishment. The NJDEP Division of Fish and Wildlife was contacted to provide an opinion on the potential for the presence of SAV in the Saddle River near the site, and the fisheries biologist at Lebanon Freshwater Fisheries Laboratory stated that he has not seen SAV in the Saddle River and thinks that it most likely does not exist there. Text will be added to this effect on page 3-5.

The NJDEP fisheries biologist also provided information on fish species present in the Saddle River. Results of a 1981 survey indicated that species found in the Saddle River in the vicinity of the site include carp, largemouth bass, pumpkinseed, white perch, American eel, banded killifish, and white sucker. Text will be added to this effect on page 3-5.