ATTACHMENT 10B

THERMAL TREATMENT UNIT
HUMAN HEALTH RISK ASSESSMENT

Contents

ENVIRONMENTAL PERFORMANCE STANDARDS AND HUMAN HEALTH AND ECOLOGICAL RISK ASSESSMENTS

1.0 General

Hill Air Force Base (HAFB) has been carrying out Open Burn/Open Denotation (OB/OD) operations at the Utah Test and Training Range (UTTR)-North (EPA ID No. UT 0570090001) Thermal Treatment Unit (TTU) under a Resource Conservation and Recovery Act (RCRA) Part B permit issued by Utah Department of Environmental Quality (UDEQ). A human health risk assessment submitted in support of the original permit request indicated that the OB/OD operations will not cause undue harm to the potential onsite and offsite receptors. This risk assessment must be reviewed annually (Section II.F.2) and updated if needed. The risk assessment addresses risks for four distinct exposure scenarios or pathways. These are the groundwater exposure pathway (Section 2.0), the surface water exposure pathway (Section 3.0), the surface soil exposure pathway (Section 4.0), and the air exposure pathway (Section 5.0).

Sections 2.0 and 3.0 discuss the lack of potential exposure through the groundwater and surface water pathways and do not contain chemical-specific risk analysis for these exposure scenarios. Section 3.0 discusses the potential risks for soil ingestion, inhalation, and dermal adsorption to an industrial worker. The industrial worker is a full-time career person involved in the handling of soils displaced during detonations and in the preparation of the area for the next operation. The industrial worker was not evaluated in the original permit. Rather, a resident and a construction worker involved in a hypothetical residential development onsite were evaluated.

Given the unlikelihood that the site will ever be developed, the residential development scenario is not realistic; therefore, the assessment of risks to these hypothetical receptors is not appropriate at this time and has not been included. On the other hand, the grading and preparation of the OB/OD area by an industrial worker are real ongoing activities. Therefore, an assessment that the industrial TTU worker is not put at an unacceptable risk is appropriate and is required by Section III.G.1 of the Part B permit. Soil data from sampling events in 1989, 1991, 2002, and 2004 have been included in this revision.

Section 5.0 discusses the air exposure pathway and analyzes inhalation risks to (1) an Explosive Ordnance Disposal (EOD) person monitoring the OB/OD operations onsite, (2) to a resident at the nearby community of Oasis, and (3) to a recreational boater on the Great Salt Lake. These receptors remain the same as in the original permit, but chemical information has been updated and chemical-specific risks have been recalculated.

1.1 Current Evaluation

This human health risk assessment was originally completed and incorporated into the TTU Permit in 2005. Biennial evaluations of the risk assessment were conducted in 2007, 2009, and 2011. The 2011 Human Health Risk Screen Evaluation is attached as Appendix G. It summarizes the findings of the previous evaluations and incorporates new sampling data acquired since the initial risk assessment was conducted.

2.0 Groundwater Pathway [40 CFR 264.601(a) and R315-8-16]

2.1 Performance Standards

The environmental performance standard for protection of groundwater calls for the prevention of any releases that may adversely affect human health or the environment due to migration of waste constituents in the groundwater or subsurface environments. Specific items to be considered include:

- The volume and chemical characteristics of the waste in the unit
- The hydrogeologic and geologic characteristics of the unit and surrounding area
- The existing quality of groundwater
- The quantity and direction of groundwater flow
- The proximity to and withdrawal rates of current and potential groundwater users
- The patterns of land use in the region
- The potential for deposition or migration of waste constituents into the subsurface, physical structures, and the root zone of food chain crops and other vegetation
- The potential for health risks caused by human exposure to waste constituents
- The potential for damage to domestic animals, wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents

2.2 Required Programs

Utah regulations require groundwater monitoring and reporting at all hazardous waste management facilities unless a waiver is granted. The groundwater monitoring program consists of detection monitoring, compliance monitoring, and monitoring during and after corrective actions. Detection monitoring at the TTU is conducted on a semiannual basis.

2.3 Site-Specific Conditions

Groundwater and geologic conditions beneath the TTU facility were investigated in 1991 through monitoring wells TTU-1 and TTU-2 (see Figure 1). Boreholes for the wells revealed extensive thicknesses of unsaturated, low-permeability soils. Groundwater in an unnamed aquifer occurs at depths ranging from 450 feet (ft) near the southwest corner of the facility to 650 ft beneath the ridge at Sedal Pass above the TTU. Based on groundwater levels in the upgradient and downgradient monitoring wells, depth to groundwater beneath the three OB/OD units is estimated to be greater than 585 ft.

Groundwater samples collected from the wells at TTU-1 and TTU-2 since 1994 were analyzed for energetics and metals. Table 1 shows the detected analytes. Samples were also collected from Well G, just outside the southeast corner of the TTU and adjacent to Landfill 5 (see Figure 1). No sampling protocol is available for past sampling practices.

Analytical results to date show seven metals (calcium, iron, magnesium, manganese, potassium, sodium, and zinc) were present in most groundwater samples taken from both wells (see Table 1). Each is commonly found in area soils. One energetic (nitrobenzene) was detected in

one sample taken from one monitoring well (TTU-1) in 1996. Energetics were also detected in samples taken in 1996 (including TNT, HMX, and PETN) and 2000 (TNT). The 2000 detection was attributed to laboratory contamination and the 1995 and 1996 detections were attributed to sample contamination in the field. Samples taken in December 2004 also showed the presence of perchlorate at levels less than 1 part per billion (ppb). This finding did not appear to be the result of laboratory or field contamination, but because perchlorate was also found at similar concentrations at Landfill 5, the possibility of naturally occurring perchlorate is being investigated. All analyses included equipment blanks and matrix spikes (MS) and were completed by environmental laboratories certified by the State of Utah.

The information in Table 1 suggests that groundwater contamination resulting from OB/OD activities at the TTU is not likely to have occurred. Further investigation of the perchlorate observations in 2004 is needed to determine the source of the perchlorate, but current perchlorate concentrations do not present a potential risk. Groundwater contamination from this facility is unlikely because:

- Groundwater occurs at greater than 400 to 600 ft below the ground surface (bgs)
- The average annual precipitation is generally low (i.e., approximately 6 in/year)
- The potential for evapotranspiration is high
- The soil deposits exhibit low permeability characteristics

The U.S. Geological Survey (USGS) well records for two nearby wells (within 7 miles) are shown in Table 2. Current groundwater users withdraw water through three of these wells. Two of the wells are pumped to supply Oasis with water; the third is used intermittently for stock watering by non-resident sheepherders. The fourth well, which lies east of the TTU, is owned by the Air Force and is not currently used.

As shown in Table 2, groundwater in the area contains moderate to high concentrations of chloride and sodium, which limits its usefulness for many applications. According to Price (1970), the groundwater in the Sink Valley Hydrologic Basin is unsuitable for irrigation, but there is sufficient groundwater locally to support some industrial development for which the chemical quality of water is not a limiting factor. However, the groundwater throughout the area is too highly mineralized for any industry that requires water with a total dissolved solids (TDS) concentration less than 2,000 milligrams per liter (mg/L). Low TDS water for industries or for domestic supplies must be transported into the area, as was done at the railroad camp at Lakeside, or pumped from the groundwater sources and demineralized, as is done at the support compound of Oasis.

As discussed in Attachment 1 of the hazardous waste operating permit, the amount of groundwater recharged due to infiltration is slight. Groundwater recharge in the vicinity of the TTU enters the groundwater system only along the margins of the adjacent mountains where coarser-grained sediments are present.

2.4 Assessment of Potential Health Risks

Analytical results demonstrate that groundwater beneath the TTU has likely not been impacted by OB/OD activities. This, coupled with the following facts, make it extremely unlikely anyone would be at risk because of TTU activities by drinking from the same groundwater source that lies beneath the TTU.

- The area receives less than 6 inches of precipitation per year; the soil and rock beneath the TTU have low vertical permeabilities; and groundwater is more than 400 ft bgs
- All wells in the vicinity have low specific yields; before any groundwater can be considered potable, it must be treated to remove impurities

3.0 Surface Water [40 CFR 264.601(b) and R315-8-16]

3.1 Performance Standards

The environmental performance standard for surface water calls for the prevention of any releases that may have adverse effects on human health or the environment due to migration of waste constituents in surface water or in wetlands. Considerations include:

- The volume and physical and chemical characteristics of the waste in the unit
- The effectiveness and reliability of containing, confining, and collecting systems and structures and preventing migration
- The hydrologic characteristics of the unit and surrounding area, including the topography and land around the unit
- The patterns of precipitation in the region
- The quantity and quality and direction of groundwater flow
- The proximity of the unit to surface waters
- The current and potential uses of nearby surface waters and any other water quality standards established for those surface waters
- The existing quality of surface waters and surface soils, including other sources of contamination
- Patterns of land use in the region
- The potential for health risks caused by human exposure to waste constituents
- The potential for damage to domestic animals, wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents

3.2 Required Programs

The *Draft Final Open Burning/Open Detonation Permitting Guidelines* (EPA, 2002) requires sampling of surface waters and wetlands within and contiguous to the OB/OD units.

3.3 Site-Specific Conditions

There are no permanent surface water bodies within the confines of the TTU or in the surrounding area. However, as shown in Figure 1, there is an erosional dry wash located topographically below the TTU subunits. Surface water is present in the dry wash infrequently during major storm events. Annual precipitation in and around the TTU is generally less than 6 inches per year. The only additional water input to the site is from localized dust control operations. Because the TTU subunits are located near the top of the precipitation catchment basin, there is little potential for surface water runoff collecting in the subunits. The natural topography directs the flow away from active portions of the TTU.

The closest surface water body to the TTU is the Great Salt Lake, which lies approximately 3 miles eastward. Because the TTU is located on the west side of the Lakeside Mountain Range, surface water runoff from the TTU facility is directed to the west, away from the Great Salt Lake, into the Sink Valley, which is a closed, internally drained basin.

For these reasons, surface water resources in the vicinity will not be affected by OB/OD operations at the TTU. In addition, there are no known surface water pathways from the TTU subunits to any human or environmental receptors.

3.4 Assessment of Potential Health Risks

The surface water pathway is incomplete since there are no surface water bodies into which contaminants could migrate. Therefore, there is no potential for health risks from this pathway.

4.0 Surface Soil [40 CFR 264.601(b) and R315-8-16]

4.1 Performance Standards

The environmental performance standard for soil calls for the prevention of any releases that may have adverse effects on the health of a career industrial worker.

4.2 Required Programs

The *Draft Final Open Burning/Open Detonation Permitting Guidelines* (EPA, 2002), requires sampling of surface soil within and contiguous to the OB/OD units' area of impact.

4.3 Surface Soil Data

Information regarding the chemical nature of surface soils obtained through two soil sampling programs conducted at the TTU in 1989 and 1991 was presented in support of the 1997 risk assessment. That information does not change and can be found in the original permit. Two additional soil sampling rounds have been conducted at the TTU (in 2002 and 2004) that were not included in the risk assessment when the permit was finalized in 2003. These data have been verified and validated according to the Air Force Center for Environmental Excellence (AFCEE) data quality assessment and validation guidelines. Data from all four sampling events have been used in this revised risk assessment.

4.3.1 Chemicals of Concern

Appendix A presents the descriptive statistics for the soil samples. The total number of samples, number of detects and other concentration-related statistics are presented in the appendix. The sampling locations are indicated on Figure 1.

The United States Environmental Protection Agency (EPA) considers analytes detected at a minimum frequency of 5 percent as potential chemicals of concern (COC); however, HAFB has considered any detected analyte as a COC regardless of the detection frequency and carried it forward in the risk assessment. The surface soil COCs are presented in Table 3.

4.3.2 Exposure Point Concentrations

The exposure point concentration (EPC) is a statistical concentration for the exposure area in which the receptor performs his/her work. It was assumed that the worker had an equal probability of exposure to soils anywhere in the TTU sampling area; therefore, data from all locations were grouped together.

The derivation of the EPC requires specific treatment of the undetected results. While the detected values were considered as reported, following the EPA's guidelines the undetected results were considered potential detects at one-half the reported detection limits. The resulting values were then subjected to data distribution tests using the EPA's ProUCL software (EPA, 2004). The software then calculates a distribution-specific upper limit around the mean concentration (UCL). Table 4 presents the results of the data distribution tests and the UCLs. Finally, the EPC to be used in the risk assessment was selected between the maximum detected concentration and the UCL based on the detection frequency. When the data consist primarily of the treated values (i.e., one-half the detection limit), the calculated UCLs are of little utility. Therefore, in cases where the detection frequency was less than 20 percent, the maximum detection concentrations were used as the EPC instead of the UCL.

4.3.3 Background Evaluation

Most of the metals detected in the TTU samples also occur naturally. In risk characterization, it is important to distinguish metals that may be attributable to the OB/OD operations from those not originating from the operations. If the site sample concentration for a metal is not statistically distinguishable from the natural concentration, it could be concluded that TTU operations have not affected the area soils with respect to that metal; therefore, that metals can be excluded from risk characterization.

Through several background characterization studies, the soils surrounding the TTU have been adequately characterized. Four sets of background data were available for the TTU. Three sets (1997, 1998, and 2000 data) are reported by URS (2001), and another set that includes two additional background locations to the west of the TTU were sampled in 2004 and are reported here. These background data represent two soil formations that exist in the UTTR-North area (which includes the TTU): the combined amtoft, skumpah, and timpie-tooele soil formations and the playa-salt air soil formation.

However, the background data have not been fully evaluated with respect to the natural concentration ranges and their potential relationship to the TTU soil data. In this revised risk assessment, the HAFB has opted to include the metals detected in the TTU soils in the forward risk calculations. In the future, the HAFB may elect to perform a statistical comparison of the background data and the TTU soils data to exclude the naturally-occurring metals, if the TTU risks are found to be dominated by metals not attributable to the TTU OB/OD operations.

Additional relevant background data have been compiled by the USGS (Schacklette and Boerngen, 1984). The USGS data consist of samples collected throughout United States and the data capture the geological variations within and across the country. A subset of the data pertaining to the sample collected in Utah was used in a qualitative comparison with the site data. Again, no metals were excluded from forward risk calculations as a result of the qualitative comparisons.

4.4 Assessment of Potential Health Risks

A risk assessment was conducted to determine whether the detected constituents in surface soils present a significant potential threat to the industrial worker.

4.4.1 Exposure and Intake Parameters

The same person was assumed to work at the TTU for a period of 25 years. The exposure and intake parameters for the industrial worker are presented in Table 5. The parameters are in accordance with the EPA's *Risk Assessment Guidelines for Superfund* (1991). It was assumed that the worker would spend 250 days/year for 25 years, breath 20 m^3 of air during work hours and incidentally ingest 100 mg of soil in the conduct of the work. Inhalation of air-borne particulates and dermal absorption through exposed skin were considered in addition to soil ingestion.

The EPA's soil screening guidance (EPA, 2001a, as amended) was used in deriving the Utah-specific particulate emission factor (PEF) for the inhalation risk assessment. The skin adherence factor, skin absorption factors, and gastrointestinal absorption factors were obtained from the EPA's dermal risk assessment guidance *(*EPA, 2001b).

4.4.2 Toxicity Factors

The EPA's Integrated Risk Information System (IRIS), Provisional Peer-Reviewed Toxicity Values (PPRTV) and Health Effects Assessment Summary Tables (HEAST) were researched for the most current slope factors (SF) for carcinogenic chemicals and reference doses (RfD) for the non-carcinogenic chemicals. As a conservative measure, the oral toxicity factors were adapted without correction as inhalation toxicity factors where specific inhalation toxicity factors were not available. The oral toxicity factors were also adapted for dermal absorption risk assessment with corrections for administered-to-absorbed doses. Oral toxicity is based on the administered dose; however, the organ effects take place on the absorbed basis. The ingested or administered dose of a chemical is not entirely absorbed in the gastrointestinal tract. In the dermal guidance, the EPA has provided the gastrointestinal (GI) factors for specific chemicals to be applied to the oral toxicity factors for their use as dermal toxicity factors because the dermal dose is already considered to be adsorbed.

The toxicity factors for the chemicals detected in the surface soil are presented in Table 6. A more complete list of chemicals, toxicity factors, dermal toxicity factors, and GI absorption factors is presented in Appendix B.

4.4.3 Risk-based Concentrations

The risk-based soil concentrations (RBC) were individually calculated for the oral, dermal, and inhalation pathways using the exposure and intake parameters for the industrial worker, and the toxicity factors. The RBCs are the threshold concentrations that equate to an excess lifetime cancer risk (ELCR) of 1E-06 or the hazard index (HI) of 1. The RBCs for the individual pathways were then inverse-summed to provide a combined carcinogenic or non-carcinogenic RBC that accounts for the cumulative risks from the three pathways. The RBC calculation equations are as follows:

Carcinogenic Oral RBC

$$\text{RBC (mg/Kg)} = \frac{\text{TR\_SI*ATc\_SI*BW\_SI*365days/year}}{\text{EF\_SI*ED\_SI*SFo*0.000001*IRs\_SI}}$$

where

TR_SI	=	Target Risk (1×10^{-6})
ATc_SI	=	Carcinogenic averaging time (70 yrs)
BW_SI	=	Body weight (70 Kg)
EF_SI	=	Exposure frequency (250 days/yr)
ED_SI	=	Exposure duration (25 yr)
SFo	=	Oral slope factor (Kg-day/mg)
IRs_SI	=	Soil ingestion rate (100 mg/day)
0.000001	=	Conversion factor (Kg/mg)

Carcinogenic Dermal RBC

$$\text{RBC (mg/Kg)} = \frac{\text{TR\_SI*ATc\_SI*BW\_SI*365days/year}}{\text{EF\_SI*ED\_SI*SFo/GI\_Factor*0.000001*SA\_SI*AF\_SI*ABS}}$$

where

TR_SI	=	Target Risk (1×10^{-6})
ATc_SI	=	Carcinogenic averaging time (70 yrs)
BW_SI	=	Body weight (70 Kg)
EF_SI	=	Exposure frequency (250 days/yr)
ED_SI	=	Exposure duration (25 yr)
SFo	=	Oral slope factor (Kg-day/mg)
GI_Factor	=	Gastro-intestinal absorption factor (chemical-specific)
SA_SI	=	Skin surface area, (3300 cm^2)
AF_SI	=	Skin adherence factor (0.2 mg/cm^2)
ABS	=	Skin absorption factor (chemical-specific)
0.000001	=	Conversion factor (Kg/mg)

Carcinogenic Inhalation RBC

$$\text{RBC (mg/Kg)} = \frac{\text{TR\_SI*BW\_SI*ATc\_SI*365days/year}}{\text{EF\_SI*ED\_SI*SFi*IRa\_SI/PEF\_SI}}$$

where

TR_SI	=	Target Risk (1×10^{-6})
ATc_SI	=	Carcinogenic averaging time (70 yrs)
BW_SI	=	Body weight (70 Kg)
EF_SI	=	Exposure frequency (250 days/yr)
ED_SI	=	Exposure duration (25 yr)

SFi = Inhalation slope factor (Kg-day/mg)
IRa_SI = Air inhalation rate (20 M^3/day)
PEF_SI = Particulate emission factor (5.11 x 10^7 M^3/Kg)

Non-carcinogenic Oral RBC

$$RBC\ (mg/Kg) = \frac{THI\_SI*ATn\_SI*BW\_SI*365days/year}{EF\_SI*ED\_SI/RfDo*0.000001*IRs\_SI}$$

where

THI_SI = Target hazard index (1)
ATn_SI = Non-carcinogenic averaging time (25 yrs)
BW_SI = Body weight (70 Kg)
EF_SI = Exposure frequency (250 days/yr)
ED_SI = Exposure duration (25 yr)
RfDo = Oral reference dose (mg/Kg-day)
IRs_SI = Soil ingestion rate (100 mg/day)
0.000001 = Conversion factor (Kg/mg)

Non-carcinogenic Dermal RBC

$$RBC\ (mg/Kg) = \frac{THI\_SI*ATn\_SI*BW\_SI*365days/year}{EF\_SI*ED\_SI/RfDo*GI\_Factor*0.000001*SA\_SI*AF\_SI*ABS}$$

where

THI_SI = Target hazard index (1)
ATn_SI = Non-carcinogenic averaging time (25 yrs)
BW_SI = Body weight (70 Kg)
EF_SI = Exposure frequency (250 days/yr)
ED_SI = Exposure duration (25 yr)
RfDo = Oral reference dose (mg/Kg-day)
GI_ Factor = Gastro-intestinal absorption factor (chemical-specific)
SA_SI = Skin surface area, (3300 cm^2)
AF_SI = Skin adherence factor (0.2 mg/cm^2)
ABS = Skin absorption factor (chemical-specific)
0.000001 = Conversion factor (Kg/mg)

Non-carcinogenic Inhalation RBC

$$RBC\ (mg/Kg) = \frac{THI\_SI*BW\_SI*ATn\_SI*365days/year}{EF\_SI*ED\_SI/RfDi*IRa\_SI/PEF\_SI}$$

where

THI_SI	=	Target hazard index (1)
ATn_SI	=	Carcinogenic averaging time (70 yrs)
BW_SI	=	Body weight (70 Kg)
EF_SI	=	Exposure frequency (250 days/yr)
ED_SI	=	Exposure duration (25 yr)
RfDi	=	Inhalation reference dose (mg/Kg-day)
IRa_SI	=	Air inhalation rate (20 M^3/day)
PEF_SI	=	Particulate emission factor (5.11 x 10^7 M^3/Kg)

Appendix C presents the risk-based concentrations (RBC) for a comprehensive list of chemicals including the COCs.

4.4.4 Risk Characterization

The risks for each COC were calculated using the chemical-specific EPCs and RBCs as follows:

$$ELCR = EPC/RBC \times 10^{-6}$$

$$HI = EPC/RBC$$

The carcinogenic risks were then added for all chemicals for the total carcinogenic and non-carcinogenic risks to the industrial worker. The total risks are provided in Table 7.

Table 7 indicates a cumulative ELCR of 5E-06 (roughly, 5 incidences per million) and a cumulative HI of 0.7. Both of these risk estimates are within the general risk acceptance limits. Depending on the site specifics, an ELCR up to 1E-4 (1 incidence per 10,000) can be accepted. The HI acceptance limit is generally 1.

Table 7 also indicates that practically all of the carcinogenic risk arises from arsenic. Arsenic is not known to be a major component of the OB/OD items. Its presence is likely attributable to the native soil. The arsenic UCL of 7.7 mg/Kg is comparable to the background UCL for the Western US soils. The USGS background soils data (Schacklette and Boerngen, 1984) indicate that the 37 soil samples collected throughout Utah averaged 8 mg/Kg in concentration with a UCL of 10.7 mg/Kg. Therefore, the carcinogenic risk from arsenic is most likely naturally occurring. The cumulative ELCR drops to 7E-08 if arsenic is excluded.

Approximately 45 percent of the noncarcinogenic risk arises from manganese, and other metals that have concentration and distribution characteristics similar to the USGS statewide data. If these metals are eliminated, the cumulative HI reduces to 0.4.

For information purposes, the USGS background data for arsenic and manganese, and their descriptive statistics are presented in Tables 8 and 9, respectively.

The risk assessment assumed exposure for 250 days/year for 25 years for the same person, which is likely to be overly conservative. The adoption of oral toxicity factors for dermal and inhalation risks also adds to conservatism in the risk estimates. Despite these conservative measures, the estimated risks to the industrial worker are not significant.

5.0 Air [40 CFR 264.601(c) and R315-8-6]

5.1 Performance Standards

The environmental performance standard for the protection of the air pathway requires the prevention of any release that may have adverse effects on human health or the environment due to migration of waste constituents in the air. Specific items to be considered include:

- The volume and physical and chemical characteristics of the waste in the unit, including its potential for the emission and dispersal of gases, aerosols, and particulates
- The effectiveness and reliability of systems and structures to reduce or prevent emissions of hazardous constituents to the air
- The operating characteristics of the unit
- The atmospheric, meteorological, and topographic characteristics of the unit and surrounding area
- The existing quality of the air, including other sources of contamination and their cumulative impact on the air
- The potential for health risks caused by human exposure to waste constituents
- The potential for damage to domestic animals, wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents

5.2 Receptors

The air pathway entails inhalation risks to (1) an EOD person monitoring the OB/OD operations onsite, (2) to a resident at the nearby community of Oasis, and (3) to a recreational boater on the Great Salt Lake. These receptors remain the same as in the original permit.

5.3 Emission Characterization

As a source of air pollutants, OB/OD units must operate in accordance with specifications provided in the state-issued hazardous waste permit. All OB/OD units must be in compliance with National Ambient Air Quality Standards (NAAQS) and the Utah Division of Air Quality (UDAQ) standards, as demonstrated by the use of state-approved air dispersion modeling protocol. In addition, OB/OD facilities must evaluate whether air emissions pose a risk to human health or the environment.

The air modeling exercise was completed as part of the 1997 permit application. The EPA's INPUFF model was used to estimate the air concentrations; hence, risks for three specific receptors. The air modeling does not need to be re-done, unless the OB/OD operations have changed significantly in terms of the types and quantities of material being destroyed or the emissions. The OB/OD is carried out as on-demand batch operation, depending on the needs of the time. However, an analysis of the materials destroyed over a period of 10 years indicated that regardless of the items being destroyed (i.e., a rocket motor or missile engine), the explosives and propellants types and quantities have remained relatively unchanged (Hill Air Force Base,

2005). From year to year, the detonation of C-4 missile motors has comprised from 60 to 85 percent of the net amount of explosives and propellants destroyed. Further, there is no new information in the Munitions Items Disposition Action System (MIDAS) to warrant a revision of the modeling or a change in the emissions.

Therefore, the emissions and emission factors presented in Tables 8, 9, and 10 of the 1997 permit are still considered representative of the current operations and have been used in the risk characterization.

5.3.1 Dioxin and Furan Emissions

As part of this 2005 risk assessment revision and as a requirement of Section II.F.2.c, HAFB also investigated the potential for formation of dioxins and furans from the OB/OD operations, including the burning of dunnage and diesel fuel. Dioxin/furan emissions from OB/OD treatment have been characterized in several tests, including the 1992 "Bang Box" studies that were conducted to characterize emissions from propellant burning operations (U.S. Army, 1992). The tests found that the burning of composite propellant did not produce detectable levels of the most toxic 2,3,7,8-tetrachlorodibenzodioxin, but did produce trace amounts of the less toxic 2,3,7,8-tetrachlorodibenzofuran and measurable amounts of the chlorinated derivatives hepta- and octachlorodibenzo-p-dioxin. Emission factors related with these compounds were reported at 5.3×10^{-12} g/g and 30×10^{-12} g/g, respectively, which are an order of magnitude lower than the emission factor considered in the analysis below.

Another attempt to characterize dioxin furan emissions from OB/OD activities, specifically from diesel fuel and dunnage, was reported in EPA, 1998. A 1995 Bang Box study collected data from the burning of a dunnage surrogate containing Styrofoam, pasteboard, and wood soaked in diesel fuel (87.5 percent cellulose and 12.5 percent plastic/diesel fuel by weight). The test produced no detectable furan emissions. Octachlorodibenzo-p-dioxin (OCDD) was detected in one of the three test burns, but the emission factor was not considered reliable because the chemical was not present in the other two tests, the background emission factor accounted for 70 percent of the corrected emission factor, and the uncorrected emission factor was only 30 percent larger than the emission factor calculated from the minimum quantitation limit emission factor (2.1 E-10 g/g). An emission factor of 1E-11 g/g was included in the resulting OB/OD emission factor database for dunnage and diesel fuel. An emission factor for furan of 4.0E-8 g/g for the burning of a simulated ammonium perchlorate manufacturing waste (65 percent aluminized AP, 20 percent plastic, 11 percent paper/wood/cloth, and 4 percent diesel) was also included.

With respect to open detonations, from the reaction kinetics perspective, it appears highly unlikely that dioxins/furans will form from these operations. Detonations do not provide favorable conditions for dioxin and furan formation, which include low temperatures (250-400 °C) and long residence times (seconds) (EPA, 1998). This is supported by the lack of detectable emissions from detonation tests during the Bang Box studies (EPA, 1998). The detonation of the M43A2 flare was the only detonation test that produced measurable dioxin levels that were included in the OB/OD emission factor database.

Considering the available data and the types of munitions treated at the TTU, the potential for dioxin/furan production and exposure is low. The primary areas where dunnage and diesel fuel would be burned are at operational Site 1 and the burn pan. Scrap propellant burns at Site 1 do contain dunnage including wooden and cardboard containers and some plastic packaging, but the

percentage of these materials in comparison to the mass of propellant is generally much less than the 31 percent used in the 1995 Bang Box study (EPA, 1998), and these burns are conducted infrequently (usually once each month). The use of dunnage and diesel fuel at Site 1 is very rare and only allowed if a solid waste burn variance is obtained from the Solid and Hazardous Waste Control Board (Section III.D.1.a.iii). Section III.D.3 of the permit allows for the use of 50 gallons of diesel fuel to be added to munitions and dunnage during operation of the burn pan. However, the burn pan has not been used in the past several years, and as of this revision (2005), there are no plans to use it in the foreseeable future.

If the burn pan were to be used on a frequent basis, then the emission factor for dunnage reported in EPA, 1998 may be applicable. This emission factor is also the one applied for diesel and dunnage in the current Open Burn/Open Detonation Model (OBODM) (Bjorkland et al., 1998). As discussed above, the reported emission factor is for OCDD, the only compound of the dioxins/furans class detected in the diesel and dunnage test. Its emission rate is estimated at 1E-11 g/g (10 picograms/gram of diesel and dunnage).

Although, the dioxins/furans were not specifically modeled in the 1997 TTU risk assessment, a reasonable estimate of dioxin/furan risks can be made with a comparative analysis of the OBODM emission rates and toxicity factors for a known compound such as benzene and those for OCDD. The diesel and dunnage emission rate of 1E-11 g/g for OCDD is seven orders-of-magnitude lower than that for benzene (1E-4 g/g). On the other hand, OCDD is three orders-of-magnitude more toxic than benzene (inhalation toxicity factor for benzene is 0.027 Kg-day/mg compared to the factor of 15 Kg-day/mg for OCDD, based on 2,3,7,8-TCDD toxicity of 150000 Kg-day/mg and the World Health Organization Toxicity Equivalent factor of 0.0001). See Appendix B for the inhalation slope factors. Therefore, the risk from potential dioxin/furan emissions from diesel and dunnage would be four orders-of-magnitude lower than the risk from benzene.

As discussed later, the inhalation risk from benzene is in the 1E-10 to 1E-9 range. This would put the dioxin/furan risk from diesel dunnage in the 1E-14 to 1E-13 range. The margin of safety (a minimum seven orders-of-magnitude below the risk acceptance level) is large enough to conclude that dioxin/furan emissions would not pose a risk concern to the three receptors if the burn pan were to be used on a frequent basis.

5.4 Assessment of Potential Health Risks

The results of the 1997 INPUFF air dispersion modeling were used in the inhalation risk characterization. The toxicity factors were updated to the most recent values available.

5.4.1 Exposure and Intake Parameters

The exposure and intake parameters for the air receptors are included in Table 5. These parameters are the same as in the 1997 assessment. The EOD person was assumed to be exposed to the emissions during the conduct of the OB/OD operations. The Oasis resident was assumed to spend at least five days/week at the Oasis compound, while the recreational boater was assumed to spend 2 full days on the lake every week. All receptors were assumed to be adults weighing 70 kilograms.

5.4.2 Toxicity Factors

The EPA's IRIS, PPRTV, and HEAST data sources were researched for the most current carcinogenic slope factors and non-carcinogenic reference doses. The specific inhalation toxicity factors were generally not available for the constituents in the air emissions. In such cases, the oral toxicity factors were used as inhalation toxicity factors.

Table 10 presents the air constituents and the toxicity values. Both the original 1997 and the recent 2005 values are provided for a comparison. The changes in the toxicity factors are further highlighted in Table 11 (new toxicity factors) and Table 12 (changes in the toxicity factors). The 2005 toxicity factors were used in the risk calculations.

5.4.3 Risk-based Concentrations

The RBCs were calculated for the inhalation pathway using the exposure and intake parameters for the three receptors, and the toxicity factors. The RBCs are the threshold concentrations that equate to an ELCR of 1E-06 or the HI of 1. The RBC calculation equations are as follows:

EOD Personnel - Carcinogenic Inhalation RBC

$$RBC\ (mg/M^3) = \frac{TR\_EOD * BW\_EOD * ATc\_EOD * 365}{EF\_EOD\_Air * ED\_EOD\_Air * SFi * IRa\_EOD\_Air}$$

where

TR_EOD = Target Risk (1×10^{-6})
ATc_EOD = Carcinogenic averaging time (70 yrs)
BW_EOD = Body weight (70 Kg)
EF_EOD_Air = Exposure frequency (250 days/yr)
ED_EOD_Air = Exposure duration (20 yr)

SFi = Inhalation slope factor (mg/Kg-day)
IRa_EOD_Air = Air inhalation rate (0.0216 M^3/day)

EOD Personnel - Non-carcinogenic Inhalation RBC

$$RBC\ (mg/M^3) = \frac{THI\_EOD * BW\_EOD * ATn\_EOD * 365}{EF\_EOD\_Air * ED\_EOD\_Air / RfDi * IRa\_EOD\_Air}$$

where

THI_EOD = Target hazard index (1)
ATn_EOD = Non-carcinogenic averaging time (20 yrs)
BW_EOD = Body weight (70 Kg)
EF_EOD_Air = Exposure frequency (250 days/yr)
ED_EOD = Exposure duration (20 yr)
RfDi = Inhalation reference dose (mg/Kg-day)
IRa_EOD_Air = Air inhalation rate (0.0216 M^3/day)

Boater - Carcinogenic Inhalation RBC

$$RBC\ (mg/M^3) = \frac{TR\_REC*BW\_REC*ATc\_REC*365}{EF\_REC\_Air*ED\_REC\_Air*SFi*IRa\_REC\_Air}$$

where

TR_REC	=	Target Risk (1×10^{-6})
ATc_REC	=	Carcinogenic averaging time (70 yrs)
BW_REC	=	Body weight (70 Kg)
EF_REC_Air	=	Exposure frequency (104 days/yr)
ED_REC_Air	=	Exposure duration (20 yr)
SFi	=	Inhalation slope factor (mg/Kg-day)
IRa_REC_Air	=	Air inhalation rate (0.96 M^3/day)

Boater - Non-carcinogenic Inhalation RBC

$$RBC\ (mg/M^3) = \frac{THI\_REC*BW\_REC*ATn\_REC*365}{EF\_REC\_Air*ED\_REC\_Air/RfDi*IRa\_REC\_Air}$$

where

THI_REC	=	Target hazard index (1)
ATn_REC	=	Non-carcinogenic averaging time (20 yrs)
BW_REC	=	Body weight (70 Kg)
EF_REC_Air	=	Exposure frequency (104 days/yr)
ED_REC	=	Exposure duration (20 yr)
RfDi	=	Inhalation reference dose (mg/Kg-day)
IRa_REC_Air	=	Air inhalation rate (0.96 M^3/day)

Oasis Resident - Carcinogenic Inhalation RBC

$$RBC\ (mg/M^3) = \frac{TR\_RES*BW\_RES*ATc\_RES*365}{EF\_RES\_Air*ED\_RES\_Air*SFi*IRa\_RES\_Air}$$

where

TR_RES	=	Target Risk (1×10^{-6})
ATc_RES	=	Carcinogenic averaging time (70 yrs)
BW_RES	=	Body weight (70 Kg)
EF_RES_Air	=	Exposure frequency (250 days/yr)
ED_RES	=	Exposure duration (30 yr)
SFi	=	Inhalation slope factor (mg/Kg-day)
IRa_RES_Air	=	Air inhalation rate (1.38 M^3/day)

Oasis Resident - Non-carcinogenic Inhalation RBC

$$RBC\ (mg/M^3) = \frac{THI\_RES*BW\_RES*ATn\_RES*365}{EF\_RES\_Air*ED\_RES\_Air/RfDi*IRa\_RES\_Air}$$

where

THI_RES	=	Target hazard index (1)
ATn_RES	=	Non-carcinogenic averaging time (20 yrs)
BW_RES	=	Body weight (70 Kg)
EF_RES_Air	=	Exposure frequency (250 days/yr)
ED_RES	=	Exposure duration (20 yr)
RfDi	=	Inhalation reference dose (mg/Kg-day)
IRa_RES_Air	=	Air inhalation rate (0.0216 M^3/day)

Appendices D, E, and F present a comprehensive list of RBCs for the three receptors.

5.4.4 Risk Characterization

The risks for each COC were calculated using the chemical-specific emission rates and RBCs as follows:

$$ELCR = EPC/RBC \times 10^{-6}$$

$$HI = EPC/RBC$$

The individual chemical risks were then added for each receptor. The total risks are provided in Tables 13, 14, and 15 for the EOD personnel, boater and the Oasis resident, respectively. These tables relate to the Tables 8, 9, and 10 in the original permit.

The tables indicate that the estimated risks are well within the general risk acceptance range of $1x10^{-6}$ to $1x10^{-4}$ cancer incidence rate or HI of 1 (EPA, 1991). Updates in the toxicity values, availability of new values and adoption of oral toxicity values for inhalation across the board make the current risk estimates somewhat higher than the previously estimated risks; nonetheless, the risks are acceptable. The EOD person has the highest risk potential out of the three receptors evaluated. An ELCR of 6E-6 and HI of 0.12 are predicted for the EOD personnel. The risks for the boater (ELCR = 3E-6 and HI = 0.06) and the resident (ELCR = 3E-6 and HI= 0.03) are lower than the estimates for the EOD person.

On a chemical-specific basis, cadmium is the major risk contributor (~90 percent of the carcinogenic risk and ~50 percent of the non-carcinogenic risk). Although cadmium was modeled as potential emission from the OB/OD operations, the actual soil data surrounding the test area do not indicate elevated levels of cadmium. Further, cadmium is not known to be a significant component of the OB/OD items. It is likely that the air risk estimates may be exaggerated.

Based on the evaluations of the soil data and the air emissions, it appears that continuation of the OB/OD operations will not cause undue harm to the workers and the citizen population in the vicinity of the TTU.

6.0 References

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Tables

TABLE 1
TTU Groundwater Monitoring Well Sampling Results
Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

			METALS[b] (mg/L)						
DATE	**WELL**	**ENERGETICS (ug/L)**	**CALCIUM**	**IRON**	**MAGNESIUM**	**MANGANESE**	**POTASSIUM**	**SODIUM**	**ZINC**
3-Feb-1994			59.0	0.085	24.5	0.023	36.4	314.0	ND
	TTU-1	ND	1116.0	0.200	58.8	0.017	36.1	371.0	ND
11-Apr-1994	TTU-1	ND	61.8	ND	23.4	ND	31.2	ND	ND
	TTU-2	ND	115.0	ND	57.9	ND	33.4	355.0	ND
26-Jul-1994	TTU-1	ND	56.9	0.075	24.7	ND	39.1	318.0	ND
	TTU-2	ND	112.0	ND	61.2	ND	37.3	367.0	ND
18-Oct-1994	TTU-1	ND	68.3	ND	27.5	ND	38.5	319.0	ND
	TTU-2	ND	116.0	ND	61.2	ND	36.2	366.0	ND
3-Mar-1995	TTU-1	Nitrobenzene 0.25	61.1	ND	26.2	ND	37.4	320.0	ND
	TTU-2	N	119.0	ND	61.3	ND	36.2	371.0	ND
28-Apr-1995	TTU-1	N	58.7	0.120	24.6	ND	36.4	309.0	0.019
	TTU-2	ND	115.0	ND	61.0	ND	36.1	367.0	ND
27-Jul-1995 [d]	TTU-1	-	-	-	-	-	-	-	-
	TTU-2	-	-	-	-	-	-	-	-
23-Oct-1995	TTU-1	ND	58.5	ND	24.6	ND	36.1	307.0	0.010
	TTU-2[e]	ND	107.0	ND	54.6	ND	31.9	325.0	0.230
4-Apr-1996	TTU-1[e]	ND	54.4	ND	23.0	ND	33.9	282.0	0.014
	TTU-2[e]	ND	105.0	ND	54.9	ND	32.5	330.0	0.160
Jul-1996	TTU-1	ND	63.0	-	27.0	-	38.0	320.0	-
	TTU-2	*	120.0	-	61.0	-	36.0	360.0	-
Oct-1996	TTU-1	ND	Pump problems	-	Pump problems	-	Pump problems	Pump problems	Pump problems
	TTU-2	*	120.0	-	64.0	-	37.0	380.0	65.000
12-Jan-1997	TTU-1[e]	ND	61.8	ND	26.2	ND	37.1	322.0	ND
	TTU-2[e]	ND	119.0	ND	61.3	ND	35.6	371.0	0.330
26-Apr-1997	TTU-1[e]	ND	62.1	ND	25.7	ND	36.5	304.0	0.084
	TTU-2[e]	ND	108.0	ND	57.7	ND	33.8	335.0	0.014
21-Oct-1997	TTU-1	ND	64.6	0.086	26.1	0.01	36.1	296.0	0.064
	TTU-2	ND	113.0	ND	58.1	ND	35.7	342.0	0.011
Apr-1998	TTU-1	ND	68.0	-	28.0		37.0	310.0	22 (J)
	TTU-2	ND	110.0	-	60.0		35.0	360.0	34.000
Oct-1998	TTU-1	ND	62.0	-	26.0		36.0	300.0	29.000
	TTU-2	ND	110.0	-	61.0		35.0	360.0	27.000
15-Apr-1999	TTU-1	ND	66.9	ND	27.6	0.003	35.5	302.0	0.019
	TTU-2	ND	106.0	0.047	59.3	0.004	33.8	345.0	0.023
20-Oct-1999	TTU-1	ND	63.3	0.164	27.2	0.0029	35.2	309.0	0.0657
	TTU-2	ND	109.0	0.043	59.9	0.0016	34.0	359.0	0.078
5-Apr-2000	TTU-1	TNT [f]	63.9	0.018	27.7	ND	36.9	315.0	0.017
	TTU-2	TNT [f]	108.0	0.032	60.5	0.003	35.0	358.0	0.0061
17-Oct-2000	TTU-1	ND	58.1	68.600	26.2	0.0017	35.8	304.0	0.0077
	TTU-2	ND	115.0	0.029	63.7	0.0032	35.9	375.0	ND
18-Apr-2001	TTU-1	ND	66.6	0.026	27.6	ND	35.4	295.0	0.056
	TTU-2	ND	102.0	0.014	55.0	ND	31.6	323.0	0.12
22-Oct-2001	TTU-1	ND	63.7	0.020	28.6	0.0028	36.6	314.0	0.027
	TTU-2	ND	110.0	ND	61.1	0.0023	34.8	364.0	0.072
18-Apr-2002	TTU-1	ND	62.2	ND	27.0	0.0034	34.0	301.0	0.041
	TTU-2	ND	110.0	ND	59.9	0.0026	32.9	353.0	0.018
28-Oct-2002	TTU-1	ND	59.0	ND	26.0	0.0041	35.0	300.0	0.031
	TTU-2	ND	110.0	0.039	58.0	0.0047	34.0	350.0	0.022
1-May-2003	TTU-1	ND	63.0	ND	30.0	0.0021	41.0	320.0	0.015
	TTU-2	ND	120.0	0.042	64.0	0.0035	40.0	380.0	0.014
21-Dec-2004	TTU-1	Perchlorate 0.6230 ug/l	-	0.019	-	-	-	-	0.00361
	TTU-2	Perchlorate 0.5020 ug/l	-	0.039	-	-	-	-	0.00421

Notes:

[a] Picric acid; nitroglycerine; PETN; nitro guanidine; nitrobenzene; 2,4-DNT; 2,6-DNT; 2,4,6-TNT; RDX; HMX; 2-amino-4,6-DNT.

[b] Aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury,

[c] High level in the equipment blank suggests this value may be biased high.

[d] TTU-1 and TTU-2 not sampled.

[e] Sampled for dissolved metals.

[f] TNT was also detected in the method blank indicating that the laboratory was the source of the compound.

*Several energetic compounds were detected in well TTU-2 in July 1996. These included 4-Amino-2,6-dinitortoluene, HMX, nitroguanadine, and TNT. PETN was also detected in well TTU-2 in October 1996. Because of the high concentrations found (1,510 ug/L HMX in July 1996), and lack of detection in later sampling, it is believed that these samples were contaminated in the field.

TABLE 2
Chemical Analysis of Pre-Treatment Water from UTTR-North Production Wells
Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Test	EPA Method	Well No. 1 (mg/L)	Well No. 2 (mg/L)
Sodium	200.7	2797.87	1901.23
Antimony	204.2	0.08	0.008
Arsenic	206.2	0.11	0.076
Barium	200.7	<0.100	<0.100
Beryllium	210.2	<0.001	<0.001
Cadmium	213.2	0.001	0.001
Calcium	200.7	60.4	32
Chromium	200.7	<0.050	<0.050
Magnesium	200.7	117	76
Hardness	—	631	395.5
Iron	200.7	0.389	0.215
Manganese	200.7	<0.050	<0.050
Mercury	295.2	<0.001	<0.001
Nickel	200.7	<0.050	<0.050
Potassium	200.7	80	63
Selenium	270.2	1.005	0.788
Silver	200.7	<0.005	<0.005
Thallium	279.2	<0.002	<0.002
Zinc	200.7	0.09	0.177
Lead	239.2	0.01	0.06
Copper	200.7	<0.020	<0.020
Oil and Grease	413	0.3	0.3
Nitrate	353.2	8.4	2.6
Nitrite	353.2	<0.200	<0.020
Cyanide	335.3	0.005	<0.005
Chloride	325.2	3480	4400
Fluoride	380.76	4.8	6
Sulfate	300.1	540	660

Source: Armstrong Laboratory, Brooks AFB, TX, Reports of Analysis, May-Sep 1993.

TABLE 3
Chemicals of Concern in Surface Soil
Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Analyte	CASNo	Units	Total Samples	Total Detects
1,2,3-Trichlorobenzene	87-61-6	mg/Kg	22	1
1,2,4-Trichlorobenzene	120-82-1	mg/Kg	27	1
1,2-Dichlorobenzene	95-50-1	mg/Kg	27	1
1,3-Dichlorobenzene	541-73-1	mg/Kg	27	1
1,4-Dichlorobenzene	106-46-7	mg/Kg	27	1
2,4-Dinitrotoluene	121-14-2	mg/Kg	47	1
2-Butanone	78-93-3	mg/Kg	22	4
2-Methylnaphthalene	91-57-6	mg/Kg	27	3
Acetone	67-64-1	mg/Kg	27	9
Aluminum	7429-90-5	mg/Kg	47	47
Anthracene	120-12-7	mg/Kg	27	1
Antimony	7440-36-0	mg/Kg	27	22
Arsenic	7440-38-2	mg/Kg	47	27
Barium	7440-39-3	mg/Kg	47	47
Benzene	71-43-2	mg/Kg	22	3
Beryllium	7440-41-7	mg/Kg	47	23
bis(2-ethylhexyl)phthalate	117-81-7	mg/Kg	27	5
Cadmium	7440-43-9	mg/Kg	47	21
Calcium	7440-70-2	mg/Kg	42	42
Chloride		mg/Kg	42	30
Chromium	7440-47-3	mg/Kg	47	47
Cobalt	7440-48-4	mg/Kg	27	22
Copper	7440-50-8	mg/Kg	47	41
Dibenzofuran	132-64-9	mg/Kg	27	3
Ethylbenzene	100-41-4	mg/Kg	22	1
Fluoranthene	206-44-0	mg/Kg	27	1
Fluorene	86-73-7	mg/Kg	27	3
Iron	7439-89-6	mg/Kg	42	42
Lead	7439-92-1	mg/Kg	47	40
m,p-Xylenes	1330-20-7	mg/Kg	22	1
Magnesium	7439-95-4	mg/Kg	42	42
Manganese	7439-96-5	mg/Kg	47	47
Mercury	7439-97-6	mg/Kg	47	13
Methylene chloride	75-09-2	mg/Kg	22	1
Molybdenum	7439-98-7	mg/Kg	22	20
Naphthalene	91-20-3	mg/Kg	27	6
Nickel	7440-02-0	mg/Kg	47	47
Nitrate	14797-55-8	mg/Kg	47	43
Nitroguanidine	556-88-7	mg/Kg	42	2
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	2691-41-0	mg/Kg	42	13
o-Xylene	95-47-6	mg/Kg	22	3
Perchlorate	7601-90-3	mg/Kg	22	11
Phenanthrene	85-01-8	mg/Kg	27	4
Phosphorus	7723-14-0	mg/Kg	20	20
Picric acid	88-89-1	mg/Kg	42	3
Potassium	7440-09-7	mg/Kg	42	42
Silver	7440-22-4	mg/Kg	47	4
Sodium	7440-23-5	mg/Kg	42	42
Strontium	7440-24-6	mg/Kg	22	22
Styrene	100-42-5	mg/Kg	21	2
Sulfate		mg/Kg	42	23
Thallium	7440-28-0	mg/Kg	47	26
Toluene	108-88-3	mg/Kg	22	5
Total petroleum hydrocarbons		mg/Kg	5	5
Vanadium	7440-62-2	mg/Kg	27	27
Zinc	7440-66-6	mg/Kg	47	47
Zinc	7440-66-6	mg/Kg	50	50

TABLE 4
Data Distribution, Upper Confidence Limits and Exposure Point Concentrations for Surface Soil
Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Scenario	Analyte	Units	Number of Samples	Number of Detects	Detection Frequency	Maximum Detect	Data Distribution[a]	95UCL	Exposure Point Concentration (EPC)[b]	EPC Basis[c]
SS_Ind_Std	1,2,3-Trichlorobenzene	mg/Kg	22	1	4.5%	0.003	NON-PARAMETRIC	7.25E-04	0.003	Max
SS_Ind_Std	1,2,4-Trichlorobenzene	mg/Kg	28	1	3.7%	0.003	NON-PARAMETRIC	2.02	0.003	Max
SS_Ind_Std	1,2-Dichlorobenzene	mg/Kg	28	1	3.7%	0.001	NON-PARAMETRIC	2.01	0.001	Max
SS_Ind_Std	1,3-Dichlorobenzene	mg/Kg	28	1	3.7%	0.002	NON-PARAMETRIC	2.01	0.002	Max
SS_Ind_Std	1,4-Dichlorobenzene	mg/Kg	28	1	3.7%	0.003	NON-PARAMETRIC	2.01	0.003	Max
SS_Ind_Std	2,4-Dinitrotoluene	mg/Kg	48	1	2.1%	2.00	NON-PARAMETRIC	4.70	2.00	Max
SS_Ind_Std	2-Butanone	mg/Kg	22	4	18.2%	0.016	NON-PARAMETRIC	0.008	0.016	Max
SS_Ind_Std	2-Methylnaphthalene	mg/Kg	28	3	11.1%	170	NON-PARAMETRIC	97.0	170	Max
SS_Ind_Std	Acetone	mg/Kg	28	9	33.3%	24.0	NON-PARAMETRIC	11.5	11.5	UCL
SS_Ind_Std	Aluminum	mg/Kg	48	47	100.0%	54,000	GAMMA	14,575	14,575	UCL
SS_Ind_Std	Anthracene	mg/Kg	28	1	3.7%	3.60	NON-PARAMETRIC	4.79	3.60	Max
SS_Ind_Std	Antimony	mg/Kg	28	22	81.5%	167	NON-PARAMETRIC	67.0	67.0	UCL
SS_Ind_Std	Arsenic	mg/Kg	48	27	57.4%	41.3	NON-PARAMETRIC	7.75	7.75	UCL
SS_Ind_Std	Barium	mg/Kg	48	47	100.0%	640	NON-PARAMETRIC	224	224	UCL
SS_Ind_Std	Benzene	mg/Kg	22	3	13.6%	0.004	NON-PARAMETRIC	0.002	0.004	Max
SS_Ind_Std	Beryllium	mg/Kg	48	23	48.9%	0.720	NON-PARAMETRIC	0.567	0.567	UCL
SS_Ind_Std	Bis(2-ethylhexyl)phthalate	mg/Kg	28	5	18.5%	1.50	NON-PARAMETRIC	4.27	1.50	Max
SS_Ind_Std	Cadmium	mg/Kg	48	21	44.7%	32.0	NON-PARAMETRIC	7.80	7.80	UCL
SS_Ind_Std	Calcium	mg/Kg	42	42	100.0%	1.56E+06	NON-PARAMETRIC	387,630	387,630	UCL
SS_Ind_Std	Chloride	mg/Kg	42	30	71.4%	120,000	NON-PARAMETRIC	1.07E+06	1.07E+06	UCL
SS_Ind_Std	Chromium	mg/Kg	48	47	100.0%	55.3	GAMMA	16.0	16.0	UCL
SS_Ind_Std	Cobalt	mg/Kg	28	22	81.5%	4.90	NORMAL	3.13	3.13	UCL
SS_Ind_Std	Copper	mg/Kg	48	41	87.2%	18,000	NON-PARAMETRIC	4,155	4,155	UCL
SS_Ind_Std	Dibenzofuran	mg/Kg	28	3	11.1%	12.0	NON-PARAMETRIC	6.66	12.0	Max
SS_Ind_Std	Ethylbenzene	mg/Kg	22	1	4.5%	0.001	NON-PARAMETRIC	5.63E-04	0.001	Max
SS_Ind_Std	Fluoranthene	mg/Kg	28	1	3.7%	0.144	NON-PARAMETRIC	7.42	0.144	Max
SS_Ind_Std	Fluorene	mg/Kg	28	3	11.1%	33.0	NON-PARAMETRIC	18.5	33.0	Max
SS_Ind_Std	Iron	mg/Kg	42	42	100.0%	15,000	GAMMA	11,423	11,423	UCL
SS_Ind_Std	Lead	mg/Kg	48	40	85.1%	48,000	NON-PARAMETRIC	11,009	11,009	UCL
SS_Ind_Std	m,p-Xylene	mg/Kg	10	1	10.0%	0.002	NON-PARAMETRIC	9.65E-04	0.002	Max
SS_Ind_Std	Magnesium	mg/Kg	42	42	100.0%	24,300	GAMMA	17,809	17,809	UCL
SS_Ind_Std	Manganese	mg/Kg	48	47	100.0%	519	GAMMA	350	350	UCL
SS_Ind_Std	Mercury	mg/Kg	48	13	27.7%	0.070	NON-PARAMETRIC	0.032	0.032	UCL
SS_Ind_Std	Methylene chloride	mg/Kg	22	1	4.5%	0.003	NON-PARAMETRIC	0.001	0.003	Max
SS_Ind_Std	Molybdenum	mg/Kg	22	20	90.9%	17.0	NON-PARAMETRIC	4.93	4.93	UCL
SS_Ind_Std	Naphthalene	mg/Kg	28	6	22.2%	53.0	NON-PARAMETRIC	9.95	9.95	UCL
SS_Ind_Std	Nickel	mg/Kg	48	47	100.0%	41.3	NON-PARAMETRIC	12.7	12.7	UCL
SS_Ind_Std	Nitrate	mg/Kg	48	43	91.5%	22.8	NON-PARAMETRIC	12.8	12.8	UCL
SS_Ind_Std	Nitroguanidine	mg/Kg	42	2	4.8%	0.300	NON-PARAMETRIC	0.501	0.300	Max
SS_Ind_Std	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	mg/Kg	42	13	31.0%	25.0	NON-PARAMETRIC	8.12	8.12	UCL
SS_Ind_Std	o-Xylene	mg/Kg	22	3	13.6%	0.003	NON-PARAMETRIC	0.001	0.003	Max
SS_Ind_Std	Perchlorate	mg/Kg	22	11	50.0%	4.50	NON-PARAMETRIC	2.73	2.73	UCL
SS_Ind_Std	Phenanthrene	mg/Kg	28	4	14.8%	92.0	NON-PARAMETRIC	49.1	92.0	Max
SS_Ind_Std	Phosphorus	mg/Kg	20	20	100.0%	990	NORMAL	722	722	UCL
SS_Ind_Std	Picric acid	mg/Kg	42	3	7.1%	0.500	NON-PARAMETRIC	0.248	0.500	Max

TABLE 4
Data Distribution, Upper Confidence Limits and Exposure Point Concentrations for Surface Soil
Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Scenario	Analyte	Units	Number of Samples	Number of Detects	Detection Frequency	Maximum Detect	Data Distribution[a]	95UCL	Exposure Point Concentration (EPC)[b]	EPC Basis[c]
SS_Ind_Std	Potassium	mg/Kg	42	42	100.0%	490,000	NON-PARAMETRIC	66,223	66,223	UCL
SS_Ind_Std	Silver	mg/Kg	48	4	8.5%	4.00	NON-PARAMETRIC	1.01	4.00	Max
SS_Ind_Std	Sodium	mg/Kg	42	42	100.0%	2,020	GAMMA	1,047	1,047	UCL
SS_Ind_Std	Strontium	mg/Kg	22	22	100.0%	484	NORMAL	377	377	UCL
SS_Ind_Std	Styrene	mg/Kg	22	2	9.5%	0.003	NON-PARAMETRIC	0.001	0.003	Max
SS_Ind_Std	Sulfate	mg/Kg	42	23	54.8%	3,060	NON-PARAMETRIC	989	989	UCL
SS_Ind_Std	Thallium	mg/Kg	48	26	55.3%	0.550	NON-PARAMETRIC	2.80	2.80	UCL
SS_Ind_Std	Toluene	mg/Kg	22	5	22.7%	0.019	NON-PARAMETRIC	0.014	0.014	UCL
SS_Ind_Std	Total petroleum hydrocarbons	mg/Kg	6	5	100.0%	47,000	GAMMA	328,216	328,216	UCL
SS_Ind_Std	Vanadium	mg/Kg	28	27	100.0%	25.7	NORMAL	17.8	17.8	UCL
SS_Ind_Std	Zinc	mg/Kg	48	47	100.0%	2,300	NON-PARAMETRIC	337	337	UCL

[a] Data distribution determined with EPA's ProUCL software, 2005.

[b] EPC = Exposure Point concentration. It is the maximum detect if the detection frequncy is less than 20%, otherwise it the 95 percent upper confidence limit from ProUCL.

[c] EPC Basis: Max = maximum detected, UCL = 95UCL from ProUCL.

TABLE 5
Intake and Exposure Parameters
Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Intake and Exposure Parameter	Units	Surface Soil Industrial Worker Value	Air Emissions Resident Value	Air Emissions EOD Worker Value	Air Emissions Boater Value
Target Excess Lifetime Cancer Risk (TR)	--	1.00E-06	1.00E-06	1.00E-06	1.00E-06
Target Hazard Index (THI)	--	1	1	1	1
Body Weight Adult (BW)	Kg	70	70	70	70
Body Weight Child (BWc)	Kg	--	15	--	NA
Averaging Time, Cancer (ATc)	yrs	70	70	70	70
Averaging Time, Non-Cancer (ATn) - For Air Emissions Only	yrs	NA	30	20	20
Averaging Time, Non-Cancer (ATn) - Adult	yrs	25	24	NA	NA
Averaging Time, Non-Cancer - Child (Atn-c)	yrs	--	6	NA	NA
Exposure Frequency (EF) - For Air Emissions Only	days/yr	NA	250	250	104
Exposure Frequency (EF)	days/yr	250	350	NA	NA
Exposure Duration (ED) - For Air Emissions Only	yrs	NA	30	20	20
Exposure Duration (ED) - Adult	yrs	25	24		NA
Exposure Duration - Child (ED-c)	yrs	--	6	--	NA
Soil Ingestion Rate - Adult (IRs)	mg/day	100	100		NA
Soil Ingestion Rate (IRs) - age adjusted	mg-yr/Kg-day		114	--	NA
Soil Ingestion Rate - Child (IRs-c)	mg/day	--	200	--	NA
Air Inhalation Rate - Adult (IRa) - For Air Emissions only	M^3/day	NA	1.38	0.0216	0.96
Air Inhalation Rate - Adult (IRa)	M^3/day	20	20	NA	NA
Air Inhalation Rate (IRa) - age adjusted	M^3-yr/Kg-day	--	10.9	--	NA
Air Inhalation Rate - Child (IRa-c)	M^3/day	--	10	--	NA
Particulate Emission Factor (PEF)	M^3/Kg	5.11E+07	1.17E+09		NA
Volatilization Factor, Soil (VF)	M^3/Kg	chem-spec	chem-spec	chem-spec	chem-spec
Skin Surface Area - Adult (SA)	cm^2/day	3300	5700	NA	NA
Skin Surface Area/adherence Factor(SA) - age adjusted	mg-yr/Kg-Event	--	361	--	NA
Skin Surface Area - Child (SA)	cm^2/day	--	2800	--	NA
Adherence Factor Adult (AF)	mg/cm^2/event	0.2	0.07	NA	NA
Event Frequency, EV	--	1	1	NA	NA
Adherence Factor Child (AF)	mg/cm^2	--	0.2	--	NA
Absorption Factor, Metals (ABSm)	--	chem-spec	chem-spec	chem-spec	chem-spec
Absorption Factor, SVOA (ABSs)	--	0.1	0.1	NA	NA
Absorption Factor, VOA (ABSv)	--	chem-spec	chem-spec	chem-spec	chem-spec

TABLE 6
Toxicity Factors for Chemicals Detected in Surface Soil
Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Chemical	CASNo	2005_SFo (Kg-day/mg)	2005_SFi (Kg-day/mg)	2005_RfDo (mg/Kg-day)	2005_RfDi (mg/Kg-day)
1,2,3-Trichlorobenzene	87-61-6				
1,2,4-Trichlorobenzene	120-82-1			0.0100	0.0010
1,2-Dichlorobenzene	95-50-1			0.0900	0.0400
1,3-Dichlorobenzene	541-73-1			0.0030	0.0030
1,4-Dichlorobenzene	106-46-7	0.0240	0.0220	0.0300	0.2290
2,4-Dinitrotoluene	121-14-2			0.0020	0.0020
2-Butanone	78-93-3			0.6000	1.4000
2-Methylnaphthalene	91-57-6			0.0040	0.0040
Acetone	67-64-1			0.9000	0.9000
Aluminum	7429-90-5			1.0000	0.0010
Anthracene	120-12-7			0.3000	0.3000
Antimony	7440-36-0			0.0004	0.0004
Arsenic	7440-38-2	1.5000	15.1000	0.0003	0.0003
Barium	7440-39-3			0.0700	0.0001
Benzene	71-43-2	0.0550	0.0270	0.0040	0.0086
Beryllium	7440-41-7		8.4000	0.0020	0.0000
bis(2-ethylhexyl)phthalate	117-81-7	0.0140	0.0140	0.0200	0.0200
Cadmium	7440-43-9		6.3000	0.0010	0.0001
Calcium	7440-70-2				
Chloride					
Chromium	7440-47-3			1.5000	1.5000
Cobalt	7440-48-4		9.8000	0.0200	0.0000
Copper	7440-50-8			0.0400	0.0400
Dibenzofuran	132-64-9			0.0020	0.0020
Di-n-octylphthalate	117-84-0			0.0400	0.0400
Ethylbenzene	100-41-4			0.1000	0.2900
Fluoranthene	206-44-0			0.0400	0.0400
Fluorene	86-73-7			0.0400	0.0400
Iron	7439-89-6			0.3000	0.3000
Lead	7439-92-1				
m,p-Xylenes	1330-20-7			0.2000	0.0300
Magnesium	7439-95-4				
Manganese	7439-96-5			0.1400	0.0000
Mercury	7439-97-6				0.0001
Methylene chloride	75-09-2	0.0075	0.0017	0.0600	0.3000
Molybdenum	7439-98-7			0.0050	0.0050
Naphthalene	7440-02-0			0.0200	0.0200
Nitrate	14797-55-8			1.6000	1.6000
Nitroguanidine	556-88-7			0.1000	0.1000
n-Nitrosodiphenylamine	91-20-3			0.0200	0.0009
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	2691-41-0			0.0500	0.0500
o-Xylene	95-47-6			0.2000	0.0300
Perchlorate	7601-90-3			0.0007	0.0007
Phenanthrene	85-01-8				
Phosphorus	7723-14-0			0.00002	0.00002
Picric acid	88-89-1				
Potassium	7440-09-7				
Silver	7440-22-4			0.0050	0.0050
Sodium	7440-23-5				
Strontium	7440-24-6			0.6000	0.6000
Styrene	100-42-5			0.2000	0.2860
Sulfate					
Thallium	7440-28-0			0.0001	0.0001
Toluene	108-88-3			0.2000	0.1140
Total petroleum hydrocarbons					
Vanadium	7440-62-2			0.0010	0.0010
Zinc	7440-66-6			0.3000	0.3000

Sfo = Oral slope Factor, Sfi = Inhalation Slope Factor, RfDo = Oral Reference dose, RfDi - Inhalation Reference Dose
Source: EPA Integreted Risk Information System (IRIS), May 2005.

TABLE 7
Summary of Human Health Risks from Surface Soils - Industrial Worker Scenario
Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Scenario	Analyte	Units	Exposure Point Concentration (EPC)[a]	Carcinogenic RBC[b]	ELCR[c]	% ELCR	Non-carcinogenic RBC[b]	HI[d]	% HI
SS_Ind_Std	1,2,4-Trichlorobenzene	mg/Kg	0.003				9,835	3.25E-07	0.0%
SS_Ind_Std	1,2-Dichlorobenzene	mg/Kg	0.001				91,177	1.54E-08	0.0%
SS_Ind_Std	1,3-Dichlorobenzene	mg/Kg	0.002				3,054	6.22E-07	0.0%
SS_Ind_Std	1,4-Dichlorobenzene	mg/Kg	0.003	119	3.E-11	0.0%	30,644	1.01E-07	0.0%
SS_Ind_Std	2,4-Dinitrotoluene	mg/Kg	2.00				2,036	9.82E-04	0.1%
SS_Ind_Std	2-Butanone	mg/Kg	0.016				612,173	2.60E-08	0.0%
SS_Ind_Std	2-Methylnaphthalene	mg/Kg	170				2,196	0.077	11.5%
SS_Ind_Std	Acetone	mg/Kg	11.5				916,214	1.25E-05	0.0%
SS_Ind_Std	**Aluminum**	mg/Kg	14,575				207,982	0.070	10.4%
SS_Ind_Std	Anthracene	mg/Kg	3.60				164,669	2.19E-05	0.0%
SS_Ind_Std	Antimony	mg/Kg	67.0				407	0.165	24.5%
SS_Ind_Std	**Arsenic**	mg/Kg	7.75	1.54	5.E-06	97.6%	255	0.030	4.5%
SS_Ind_Std	**Barium**	mg/Kg	224				24,194	0.009	1.4%
SS_Ind_Std	Benzene	mg/Kg	0.004	51.9	8.E-11	0.0%	4,081	1.00E-06	0.0%
SS_Ind_Std	**Beryllium**	mg/Kg	0.567	87.0	7.E-09	0.1%	861	6.59E-04	0.1%
SS_Ind_Std	bis(2-ethylhexyl)phthalate	mg/Kg	1.50	204	7.E-09	0.1%	20,360	7.37E-05	0.0%
SS_Ind_Std	Cadmium	mg/Kg	7.80	116	7.E-08	1.3%	956	0.008	1.2%
SS_Ind_Std	**Chromium**	mg/Kg	16.0				1.53E+06	1.05E-05	0.0%
SS_Ind_Std	**Cobalt**	mg/Kg	3.13	74.6	4.E-08	0.8%	1,387	0.002	0.3%
SS_Ind_Std	Copper	mg/Kg	4,155				40,721	0.102	15.2%
SS_Ind_Std	Dibenzofuran	mg/Kg	12.0				2,036	0.006	0.9%
SS_Ind_Std	Ethylbenzene	mg/Kg	0.001				102,062	1.27E-08	0.0%
SS_Ind_Std	Fluoranthene	mg/Kg	0.144				21,956	6.56E-06	0.0%
SS_Ind_Std	Fluorene	mg/Kg	33.0				21,956	0.002	0.2%
SS_Ind_Std	**Iron**	mg/Kg	11,423				305,405	0.037	5.6%
SS_Ind_Std	m,p-Xylenes	mg/Kg	0.002				199,202	1.00E-08	0.0%
SS_Ind_Std	**Manganese**	mg/Kg	350				3,639	0.096	14.3%
SS_Ind_Std	**Mercury**	mg/Kg	0.032				22,456	1.42E-06	0.0%
SS_Ind_Std	Methylene chloride	mg/Kg	0.003	381	8.E-12	0.0%	61,272	5.22E-08	0.0%
SS_Ind_Std	Molybdenum	mg/Kg	4.93				5,090	9.69E-04	0.1%
SS_Ind_Std	Naphthalene	mg/Kg	9.95				20,360	0.000	0.1%
SS_Ind_Std	**Nickel**	mg/Kg	12.7				20,360	6.23E-04	0.1%
SS_Ind_Std	Nitrate	mg/Kg	12.8				1.63E+06	7.84E-06	0.0%
SS_Ind_Std	Nitroguanidine	mg/Kg	0.300				61,421	4.88E-06	0.0%
SS_Ind_Std	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	mg/Kg	8.12				30,711	2.64E-04	0.0%
SS_Ind_Std	o-Xylene	mg/Kg	0.003				199,202	1.36E-08	0.0%

TABLE 7

Summary of Human Health Risks from Surface Soils - Industrial Worker Scenario

Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Scenario	Analyte	Units	Exposure Point Concentration (EPC)[a]	Carcinogenic RBC[b]	ELCR[c]	% ELCR	Non-carcinogenic RBC[b]	HI[d]	% HI
SS_Ind_Std	Perchlorate	mg/Kg	2.73				713	3.83E-03	0.6%
SS_Ind_Std	Silver	mg/Kg	4.00				5,090	7.86E-04	0.1%
SS_Ind_Std	**Strontium**	mg/Kg	377				610,809	6.18E-04	0.1%
SS_Ind_Std	Styrene	mg/Kg	0.003				203,842	1.28E-08	0.0%
SS_Ind_Std	**Thallium**	mg/Kg	2.80				71.3	0.039	5.9%
SS_Ind_Std	Toluene	mg/Kg	0.014				203,006	7.00E-08	0.0%
SS_Ind_Std	**Vanadium**	mg/Kg	17.8				1,018	0.017	2.6%
SS_Ind_Std	Zinc	mg/Kg	337				305,405	0.001	0.2%
				Total Risk	**5.E-06**	**100%**		**0.7**	**100.0%**
				Total Risk Without Background Metals[e]	**7.E-08**			**0.4**	

[a] EPC = Exposure Point concentration. It is the maximum detect if the detection frequncy is less than 20%, otherwise it is the 95 percent upper confidence limit from ProUCL.

[b] RBC = Risk-based concentration. Equates to a carcinogenic risk of 1E-06 or hazard index of 1.

[c] ELCR = Excess Life-time Cancer Risk.

[d] HI = Hazard Index.

[e] The **bolded** and right-indented analytes are most likely attributable to the background.

TABLE 8

USGS Background Surface Soil Data for Selected Metals

Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

State	County	Collection Date	Arsenic	Manganese
UT	San Juan	1-May-62		300
UT	Iron	1-Feb-67	7.5	150
UT	Washington	1-Feb-67	7.6	500
UT	Box Elder	1-Aug-65	5.3	700
UT	Box Elder	1-Aug-65	4	1000
UT	Salt Lake	1-Aug-65	19	1000
UT	Wasatch	1-Aug-65	3.9	300
UT	Duchesne	1-Aug-65	7.5	500
UT	Washington	1-Feb-67	5.4	150
UT	Garfield	1-Jun-71	3.377	500
UT	Grand	1-Sep-64	12	150
UT	Emery	1-May-62		200
UT	Millard	1-Sep-72	4.748	500
UT	Millard	1-Aug-62		200
UT	Millard	1-Aug-62		500
UT	Millard	1-Aug-62		700
UT	Sevier	1-Aug-62		700
UT	Wayne	1-Aug-62		500
UT	Wayne	1-Aug-62		200
UT	Millard	1-Aug-64	7.1	200
UT	Rich	1-Aug-64	6.4	150
UT	Uintah	1-Aug-64	6.3	150
UT	Grand	1-May-62		200
UT	Carbon	1-Sep-73	2.907	200
UT	Tooele	1-Jul-66	6.2	300
UT	Tooele	1-Jul-66	9.3	700
UT	Salt Lake	1-Jul-66	7	300
UT	Morgan	1-Jun-65	8.9	300
UT	Wasatch	1-Jun-65	4.1	700
UT	Wasatch	1-Jun-65	5	300
UT	Duchesne	1-Jun-65	6.5	300
UT	Kane	1-Jul-64		300
UT	Millard	1-Sep-74	3.797	200
UT	Millard	1-Sep-72	4.403	200
UT	Emery	1-Sep-73	6.734	200
UT	Millard	1-Sep-72	2.734	200
UT	Utah	1-Sep-73	11.95	500
UT	Emery	1-May-73	20.23	300
UT	Kane	1-Feb-73	3.662	300
UT	Garfield	1-Feb-73	19.26	200
UT	Garfield	1-Feb-73	3.574	700
UT	Sevier	1-Feb-73	1.489	500
UT	Grand	1-Sep-72	5.906	200
UT	Emery	1-Sep-72	7.581	500
UT	Sevier	1-Sep-72	4.386	100
UT	Summit	1-Jul-68	48	300
UT	San Juan	1-Oct-73	1.857	200

Units: mg/Kg

Data Source: Shacklette and Boerngen, 1984

TABLE 9

Descriptive Statistics for Selected Metals in Utah Background Surface Soils

Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Statistic	Arsenic	Manganese
Mean	7.99	371
Standard Error	1.33	32.9
Median	6.20	300
Mode	7.50	200
Standard Deviation	8.11	226
Sample Variance	65.8	50,951
Kurtosis	16.6	0.743
Skewness	3.70	1.16
Range	46.5	900
Minimum	1.49	100
Maximum	48.0	1,000
Sum	296	17,450
Count	37	47
Confidence Level (95.0%)	2.71	66.3
95UCL	10.7	438

Data Source: Shacklette and Boerngen, 1984.

TABLE 10
Updated Toxicity Factors for Air Emissions
Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Chemical	Permit_Chemical	CASNo	1997_SFi (Kg-day/mg)	2005_SFi (Kg-day/mg)	1997_RfDi (mg/Kg-day)	2005_RfDi (mg/Kg-day)
1,1,1-Trichloroethane	Methyl chloroform	71-55-6				0.6300
1,1,2,2-Tetrachloroethane	1,1,2,2-Tetrachoroethane	79-34-5	0.2000	0.2000		**0.0600**
1,1,2-Trichloro-1,2,2-trifluoroethane	Freon113	76-13-1				8.6000
1,1-Dichloroethene	Vinylidene chloride	75-35-4				0.0600
1,2,4-Trimethylbenzene	1,2,4-Trimethylbenzene	95-63-6				0.0017
1,3,5-Trimethylbenzene	1,3,5-Trimethylbenzene	108-67-8				0.0017
1,3-Butadiene	1,3-Butadiene	106-99-0	1.8000	*0.1000*		0.0006
2-Nitrodiphenylamine	2-Nitrodiphenylamine	119-75-5				
2,4,6-Trinitrotoluene	2,4,6-TNT	118-96-7	0.0300	**0.0300**	0.0005	**0.0005**
2,6-Dinitrotoluene	2,4-DNT	606-20-2	0.6800	[a]	0.0020	***0.0010***
Allyl chloride	Allyl chloride	107-05-1			0.0010	*0.0003*
Aluminum	Aluminum	7429-90-5				0.0010
Antimony	Antimony	7440-36-0			0.0004	**0.0004**
Barium	Barium	7440-39-3			0.0005	*0.0001*
Benzene	Benzene	71-43-2	0.0290	*0.0270*		0.0086
Benzo(a)anthracene	Benzo(a)anthracene	56-55-3	7.3000	**0.7300**		
Benzo(a)pyrene	Benzo(a)pyrene	50-32-8	7.3000	*3.1000*		
bis(2-ethylhexyl)phthalate	bis(2-ethylhexyl)phthalate	117-81-7	0.0140	**0.0140**	0.0200	**0.0200**
Bromomethane	Methyl Bromide	74-83-9				0.0014
Butylbenzylphthalate	Butylbenzylphthalate	85-68-7		**0.0019**	0.2000	**0.2000**
Cadmium	Cadmium	7440-43-9		6.3000	0.0010	*0.0001*
Calcium	Calcium	7440-70-2				
Carbon tetrachloride	Carbon tetrachloride	56-23-5	0.0530	0.0530		0.0500
Chloroethane	Ethyl chloride	75-00-3		**0.0029**	10.0000	*2.9000*
Chloromethane	Methyl chloride	74-87-3				0.0260
Chromium	Chromium	7440-47-3			0.0050	***1.5000***
Chrysene	Chrysene	218-01-9		**0.0073**		
Copper	Copper	7440-50-8				0.0400
Dichlorodifluoromethane	Freon12	75-71-8				0.0500
Diethylphthalate	Diethylphthalate	84-66-2			0.8000	**0.8000**
Dimethylphthalate	Dimethylphthalate	131-11-3			10.0000	**10.0000**
Di-n-butylphthalate	Di-n-butylphthalate	84-74-2			0.1000	**0.1000**
Di-n-octylphthalate	Di-n-octylphthalate	117-84-0				**0.0400**
Ethylbenzene	Ethylbenzene	100-41-4			1.0000	*0.2900*
p-Ethyltoluene	p-Ethyltoluene	100-41-4				
Fluoranthene	Fluoranthene	206-44-0			0.0400	**0.0400**
Fluorene	Fluorene	86-73-7			0.0400	**0.0400**
Hexachlorobenzene	Hexachlorobenzene	118-74-1		1.6000	0.0008	**0.0008**
Hexahydro-1,3,5-trinitro-1,3,5-triazine	Hexahydro-1,3,5…(RDX)	121-82-4	0.1100	**0.1100**	0.0030	**0.0030**
Lead	Lead	7439-92-1				
m,p-Xylenes	m,p-Xylene	1330-20-7				0.0300
Mercury	Mercury	7439-97-6			0.0003	*0.0001*
Methane	Methane					
Methylene chloride	Dichloromethane	75-09-2		0.0017		0.3000
Naphthalene	Naphthalene	91-20-3				0.0009
Nickel	Nickel	7440-02-0			0.0200	**0.0200**
Nitroglycerin	Nitroglycerine	55-63-0		**0.0140**		
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	Octahydro-1,3,5,7…(HMX)	2691-41-0			0.0500	**0.0500**
o-Xylene	o-Xylene	95-47-6				0.0300
Pentaerythritol tetranitrate	Pentaerythritol tetranitrate (PETN)	78-11-5	0.1100	**0.1100**[b]	0.0030	**0.003**[b]
Phenanthrene	Phenanthrene	85-01-8				
Phenol	Phenol	108-95-2			0.6000	***0.3000***
Potassium	Potassium	7440-09-7				
Pyrene	Pyrene	129-00-0			0.0300	**0.0300**
Sodium	Sodium	7440-23-5				
Styrene	Styrene	100-42-5				0.2860
Titanium	Titanium	7440-32-6				0.0086
Toluene	Toluene	108-88-3				0.1140
Trichlorofluoromethane	Freon11	75-69-4				0.2000
Vinyl Chloride	Vinyl chloride	75-01-4	0.3000	***0.0150***		0.0280
Zinc	Zinc	7440-66-6			0.3000	**0.3000**

SFi = Carcinogenic Inhalation Slope Factor, RfDi = Non-carcinogenic Inhalation Reference dose.

Bolded values denote route-to-route extrapolation of oral toxicity to inhalation pathway, italicized values denote a change from the 1997 Permit values, the boxed values are new.

[a] Toxcity values do not exist in the latest EPA peer-reviewed sources.
[b] Toxcity values for PETN derived from RDX.
Source: EPA Integreted Risk Information System (IRIS), May 2005.

TABLE 11
New Toxicity Factors for Air Emissions
Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Chemical	Permit_Chemical	CASNo	1997_SFi (Kg-day/mg)	2005_SFi (Kg-day/mg)	1997_RfDi (mg/Kg-day)	2005_RfDi (mg/Kg-day)
1,1,1-Trichloroethane	Methyl chloroform	71-55-6				**0.6300**
1,1,2,2-Tetrachloroethane	1,1,2,2-Tetrachoroethane	79-34-5	0.2000	0.2000		**0.0600**
1,1,2-Trichloro-1,2,2-trifluoroethane	Freon113	76-13-1				**8.6000**
1,1-Dichloroethene	Vinylidene chloride	75-35-4				**0.0600**
1,2,4-Trimethylbenzene	1,2,4-Trimethylbenzene	95-63-6				**0.0017**
1,3,5-Trimethylbenzene	1,3,5-Trimethylbenzene	108-67-8				**0.0017**
1,3-Butadiene	1,3-Butadiene	106-99-0	1.8000	0.1000		**0.0006**
2-Nitrodiphenylamine	2-Nitrodiphenylamine	119-75-5				
Aluminum	Aluminum	7429-90-5				**0.0010**
Benzene	Benzene	71-43-2	0.0290	0.0270		**0.0086**
Bromomethane	Methyl Bromide	74-83-9				**0.0014**
Butylbenzylphthalate	Butylbenzylphthalate	85-68-7		**0.0019**	0.2000	0.2000
Cadmium	Cadmium	7440-43-9		**6.3000**	0.0010	0.0001
Calcium	Calcium	7440-70-2				
Carbon tetrachloride	Carbon tetrachloride	56-23-5	0.0530	0.0530		**0.0500**
Chloroethane	Ethyl chloride	75-00-3		**0.0029**	10.0000	2.9000
Chloromethane	Methyl chloride	74-87-3				**0.0260**
Chrysene	Chrysene	218-01-9		**0.0073**		
Copper	Copper	7440-50-8				**0.0400**
Dichlorodifluoromethane	Freon12	75-71-8				**0.0500**
Di-n-octylphthalate	Di-n-octylphthalate	117-84-0				**0.0400**
p-Ethyltoluene	p-Ethyltoluene	100-41-4				
Hexachlorobenzene	Hexachlorobenzene	118-74-1		**1.6000**	0.0008	0.0008
Lead	Lead	7439-92-1				
m,p-Xylenes	m,p-Xylene	1330-20-7				**0.0300**
Methane	Methane					
Methylene chloride	Dichloromethane	75-09-2		**0.0017**		**0.3000**
Naphthalene	Naphthalene	91-20-3				**0.0009**
Nitroglycerin	Nitroglycerine	55-63-0		**0.0140**		
o-Xylene	o-Xylene	95-47-6				**0.0300**
Phenanthrene	Phenanthrene	85-01-8				
Potassium	Potassium	7440-09-7				
Sodium	Sodium	7440-23-5				
Styrene	Styrene	100-42-5				**0.2860**
Titanium	Titanium	7440-32-6				**0.0086**
Toluene	Toluene	108-88-3				**0.1140**
Trichlorofluoromethane	Freon11	75-69-4				**0.2000**
Vinyl Chloride	Vinyl chloride	75-01-4	0.3000	0.0150		**0.0280**

SFi = Carcinogenic Inhalation Slope Factor, RfDi = Non-carcinogenic Inhalation Reference dose.
Bolded values denote new toxicity values since the permit.
Source: EPA Integreted Risk Information System (IRIS), May 2005.

TABLE 12

Changes in Toxicity Factors for Air Emissions

Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Chemical	Permit_Chemical	CASNo	1997_SFi (Kg-day/mg)	2005_SFi (Kg-day/mg)	1997_RfDi (mg/Kg-day)	2005_RfDi (mg/Kg-day)
1,3-Butadiene	1,3-Butadiene	106-99-0	1.8000	**0.1000**		0.0006
2,6-Dinitrotoluene	2,4-DNT	606-20-2	0.6800	*	0.0020	**0.0010**
Allyl chloride	Allyl chloride	107-05-1			0.0010	**0.0003**
Barium	Barium	7440-39-3			0.0005	**0.0001**
Benzene	Benzene	71-43-2	0.0290	**0.0270**		0.0086
Benzo(a)pyrene	Benzo(a)pyrene	50-32-8	7.3000	**3.1000**		
Cadmium	Cadmium	7440-43-9		6.3000	0.0010	**0.0001**
Chloroethane	Ethyl chloride	75-00-3		0.0029	10.0000	**2.9000**
Chromium	Chromium	7440-47-3			0.0050	**1.5000**
Ethylbenzene	Ethylbenzene	100-41-4			1.0000	**0.2900**
Mercury	Mercury	7439-97-6			0.0003	**0.0001**
Phenol	Phenol	108-95-2			0.6000	**0.3000**
Vinyl Chloride	Vinyl chloride	75-01-4	0.3000	**0.0150**		0.0280

SFi = Carcinogenic Inhalation Slope Factor, RfDi = Non-carcinogenic Inhalation Reference dose.

Bolded values denote a change in the toxicity values since the permit.

* Toxcity values do not exist in the latest EPA peer-reviewed sources.

Source: EPA Integreted Risk Information System (IRIS), May 2005.

TABLE 13

Estimating Risk to EOD Personnel on Bug Knoll (Permit Table 8)

Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Scenario	Chemical	Permit Chemical Name	CASNo	EPC (mg/M^3)	1997 ELCR	2005 ELCR	2005 ELCR%	1997 HI	2005 HI	2005 HI%
Air_EOD	1,1,1-Trichloroethane	Methyl chloroform	71-55-6	1.32E-04					4.E-08	0.00%
Air_EOD	1,1,2,2-Tetrachloroethane	1,1,2,2-Tetrachoroethae	79-34-5	1.38E-04	2.E-09	2.E-09	0.03%		5.E-07	0.00%
Air_EOD	1,1,2-Trichloro-1,2,2-trifluoroethane	Freon113	76-13-1	5.43E-06					1.E-10	0.00%
Air_EOD	1,1-Dichloroethene	Vinylidene chloride	75-35-4	3.40E-05					1.E-07	0.00%
Air_EOD	1,2,4-Trimethylbenzene	1,2,4-Trimethylbenzene	95-63-6	3.04E-04					4.E-05	0.03%
Air_EOD	1,3,5-Trimethylbenzene	1,3,5-Trimethylbenzene	108-67-8	3.87E-06					5.E-07	0.00%
Air_EOD	1,3-Butadiene	1,3-Butadiene	106-99-0	2.38E-04	3.E-08	1.E-09	0.02%		9.E-05	0.07%
Air_EOD	2,4,6-Trinitrotoluene	2,4,6-TNT	118-96-7	3.89E-05	7.E-11	7.E-11	0.00%	2.E-05	2.E-05	0.01%
Air_EOD	2,6-Dinitrotoluene	2,4-DNT	606-20-2	1.17E-05	5.E-10			1.E-06	2.E-06	0.00%
Air_EOD	2-Nitrodiphenylamine	2-Nitrodiphenylamine	119-75-5	1.82E-06						
Air_EOD	Allyl chloride	Allyl chloride	107-05-1	2.30E-04				5.E-05	2.E-04	0.14%
Air_EOD	Aluminum	Aluminum	7429-90-5	2.38E-01				0.E+00	5.E-02	41.85%
Air_EOD	Antimony	Antimony	7440-36-0	1.49E-03				8.E-04	8.E-04	0.65%
Air_EOD	Barium	Barium	7440-39-3	4.11E-03				2.E-03	6.E-03	5.16%
Air_EOD	Benzene	Benzene	71-43-2	7.90E-04	1.E-09	1.E-09	0.02%		2.E-05	0.02%
Air_EOD	Benzo(a)anthracene	Benzo(a)anthracene	56-55-3	5.98E-07	3.E-10	3.E-11	0.00%			
Air_EOD	Benzo(a)pyrene	Benzo(a)pyrene	50-32-8	7.76E-06	3.E-09	1.E-09	0.02%			
Air_EOD	bis(2-ethylhexyl)phthalate	bis(2-ethylhexyl)phthalate	117-81-7	6.24E-05	5.E-11	5.E-11	0.00%	7.E-07	7.E-07	0.00%
Air_EOD	Bromomethane	Methyl Bromide	74-83-9	6.54E-05					1.E-05	0.01%
Air_EOD	Butylbenzylphthalate	Butylbenzylphthalate	85-68-7	4.26E-06		5.E-13	0.00%	5.E-09	5.E-09	0.00%
Air_EOD	Cadmium	Cadmium	7440-43-9	1.52E-02	6.E-06	6.E-06	91.26%	3.E-03	6.E-02	46.89%
Air_EOD	Calcium	Calcium	7440-70-2	2.58E-02						
Air_EOD	Carbon tetrachloride	Carbon tetrachloride	56-23-5	8.30E-06	3.E-11	3.E-11	0.00%		4.E-08	0.00%
Air_EOD	Chloroethane	Ethyl chloride	75-00-3	2.46E-05		4.E-12	0.00%	5.E-10	2.E-09	0.00%
Air_EOD	Chloromethane	Methyl chloride	74-87-3	3.44E-05					3.E-07	0.00%
Air_EOD	Chromium	Chromium	7440-47-3	1.06E-03				4.E-05	1.E-07	0.00%
Air_EOD	Chrysene	Chrysene	218-01-9	5.73E-07		3.E-13	0.00%			
Air_EOD	Copper	Copper	7440-50-8	4.88E-02					3.E-04	0.21%
Air_EOD	Dichlorodifluoromethane	Freon12	75-71-8	1.24E-05					5.E-08	0.00%
Air_EOD	Diethylphthalate	Diethylphthalate	84-66-2	1.03E-02				3.E-06	3.E-06	0.00%
Air_EOD	Dimethylphthalate	Dimethylphthalate	131-11-3	1.29E-07				3.E-12	3.E-12	0.00%
Air_EOD	Di-n-butylphthalate	Di-n-butylphthalate	84-74-2	2.73E-04				6.E-07	6.E-07	0.00%
Air_EOD	Di-n-octylphthalate	Di-n-octylphthalate	117-84-0	1.48E-05					8.E-08	0.00%
Air_EOD	Ethylbenzene	Ethylbenzene	100-41-4	2.52E-05				5.E-09	2.E-08	0.00%
Air_EOD	Fluoranthene	Fluoranthene	206-44-0	2.05E-06				1.E-08	1.E-08	0.00%
Air_EOD	Fluorene	Fluorene	86-73-7	2.58E-07				1.E-09	1.E-09	0.00%
Air_EOD	Hexachlorobenzene	Hexachlorobenzene	118-74-1	2.13E-05	2.E-09	2.E-09	0.03%	6.E-06	6.E-06	0.00%
Air_EOD	Hexahydro-1,3,5-trinitro-1,3,5-triazine	Hexahydro-1,3,5…(RDX)	121-82-4	7.63E-02	5.E-07	5.E-07	8.00%	5.E-03	5.E-03	4.47%
Air_EOD	Lead	Lead	7439-92-1	2.13E-02						
Air_EOD	m,p-Xylenes	m,p-Xylene	1330-20-7	1.90E-05					1.E-07	0.00%
Air_EOD	Mercury	Mercury	7439-97-6	1.94E-06				1.E-06	5.E-06	0.00%

TABLE 13

Estimating Risk to EOD Personnel on Bug Knoll (Permit Table 8)

Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Scenario	Chemical	Permit Chemical Name	CASNo	EPC (mg/M^3)	1997 ELCR	2005 ELCR	2005 ELCR%	1997 HI	2005 HI	2005 HI%
Air_EOD	Methane	Methane		3.17E-03						
Air_EOD	Methylene chloride	Dichloromethane	75-09-2	3.39E-03		3.E-10	0.01%		2.E-06	0.00%
Air_EOD	Naphthalene	Naphthalene	91-20-3	8.98E-06					2.E-06	0.00%
Air_EOD	Nickel	Nickel	7440-02-0	6.82E-03				7.E-05	7.E-05	0.06%
Air_EOD	Nitroglycerin	Nitroglycerine	55-63-0	1.71E-05		1.E-11	0.00%			
Air_EOD	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	Octahydro-1,3,5,7…(HMX)	2691-41-0	5.81E-03				2.E-05	2.E-05	0.02%
Air_EOD	o-Xylene	o-Xylene	95-47-6	9.18E-06					6.E-08	0.00%
Air_EOD	Pentaerythritoltetranitrate	Pentaerythritol tetranitrate (PETN)	78-11-5	5.81E-03	4.E-08	4.E-08	0.61%	4.E-04	4.E-04	0.34%
Air_EOD	p-Ethyltoluene	p-Ethyltoluene	622-96-8	9.99E-06						
Air_EOD	Phenanthrene	Phenanthrene	85-01-8	1.59E-06						
Air_EOD	Phenol	Phenol	108-95-2	1.08E-05				4.E-09	8.E-09	0.00%
Air_EOD	Potassium	Potassium	7440-09-7	2.89E-01						
Air_EOD	Pyrene	Pyrene	129-00-0	8.17E-06				6.E-08	6.E-08	0.00%
Air_EOD	Sodium	Sodium	7440-23-5	1.26E-02						
Air_EOD	Styrene	Styrene	100-42-5	1.98E-04					1.E-07	0.00%
Air_EOD	Titanium	Titanium	7440-32-6	6.17E-04					2.E-05	0.01%
Air_EOD	Toluene	Toluene	108-88-3	1.99E-04					4.E-07	0.00%
Air_EOD	Trichlorofluoromethane	Freon11	75-69-4	1.95E-05					2.E-08	0.00%
Air_EOD	Vinyl Chloride	Vinyl chloride	75-01-4	1.67E-05	4.E-09	2.E-11	0.00%		1.E-07	0.00%
Air_EOD	Zinc	Zinc	7440-66-6	4.43E-02				3.E-05	3.E-05	0.03%
Total					**6.E-06**	**6.E-06**	**100%**	**1.E-02**	**1.E-01**	**100%**

TABLE 14

Estimating Risk to Boater on the Great Salt Lake (Permit Table 9)

Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Scenario	Chemical	Permit Chemical Name	CASNo	EPC (mg/M^3)	1997 ELCR	2005 ELCR	2005 ELCR%	1997 HI	2005 HI	2005 HI%
Air_Rec	1,1,1-Trichloroethane	Methyl chloroform	71-55-6	1.74E-06					1.E-08	0.00%
Air_Rec	1,1,2,2-Tetrachloroethane	1,1,2,2-Tetrachoroethae	79-34-5	1.82E-06		4.E-10	0.01%		1.E-07	0.00%
Air_Rec	1,1,2-Trichloro-1,2,2-trifluoroethane	Freon113	76-13-1	7.13E-08					3.E-11	0.00%
Air_Rec	1,1-Dichloroethene	Vinylidene chloride	75-35-4	4.47E-07					3.E-08	0.00%
Air_Rec	1,2,4-Trimethylbenzene	1,2,4-Trimethylbenzene	95-63-6	3.99E-06					9.E-06	0.02%
Air_Rec	1,3,5-Trimethylbenzene	1,3,5-Trimethylbenzene	108-67-8	5.09E-08					1.E-07	0.00%
Air_Rec	1,3-Butadiene	1,3-Butadiene	106-99-0	3.12E-06	6.E-09	3.E-10	0.01%	0.E+00	2.E-05	0.04%
Air_Rec	2,4,6-Trinitrotoluene	2,4,6-TNT	118-96-7	5.11E-07	2.E-11	2.E-11	0.00%	4.E-06	4.E-06	0.01%
Air_Rec	2,6-Dinitrotoluene	2,4-DNT	606-20-2	1.54E-07	1.E-10			3.E-07	6.E-07	0.00%
Air_Rec	2-Nitrodiphenylamine	2-Nitrodiphenylamine	119-75-5	2.39E-08						
Air_Rec	Allyl chloride	Allyl chloride	107-05-1	3.02E-06				1.E-05	4.E-05	0.07%
Air_Rec	Aluminum	Aluminum	7429-90-5	3.12E-03					1.E-02	20.98%
Air_Rec	Antimony	Antimony	7440-36-0	1.96E-05				2.E-04	2.E-04	0.33%
Air_Rec	Barium	Barium	7440-39-3	5.40E-05				4.E-04	2.E-03	2.59%
Air_Rec	Benzene	Benzene	71-43-2	1.04E-05	3.E-10	3.E-10	0.01%	1.E-11	5.E-06	0.01%
Air_Rec	Benzo(a)anthracene	Benzo(a)anthracene	56-55-3	7.85E-09	6.E-11	6.E-12	0.00%			
Air_Rec	Benzo(a)pyrene	Benzo(a)pyrene	50-32-8	1.02E-07	8.E-10	4.E-10	0.01%			
Air_Rec	bis(2-ethylhexyl)phthalate	bis(2-ethylhexyl)phthalate	117-81-7	8.20E-07	1.E-11	1.E-11	0.00%	2.E-07	2.E-07	0.00%
Air_Rec	Bromomethane	Methyl Bromide	74-83-9	8.59E-07					2.E-06	0.00%
Air_Rec	Butylbenzylphthalate	Butylbenzylphthalate	85-68-7	5.59E-08		1.E-13	0.00%	1.E-09	1.E-09	0.00%
Air_Rec	Cadmium	Cadmium	7440-43-9	1.99E-04	1.E-06	1.E-06	45.77%	8.E-04	1.E-02	23.48%
Air_Rec	Calcium	Calcium	7440-70-2	3.39E-04						
Air_Rec	Carbon tetrachloride	Carbon tetrachloride	56-23-5	1.09E-07	6.E-12	6.E-12	0.00%		9.E-09	0.00%
Air_Rec	Chloroethane	Ethyl chloride	75-00-3	3.23E-07		1.E-12	0.00%	1.E-10	4.E-10	0.00%
Air_Rec	Chloromethane	Methyl chloride	74-87-3	4.51E-07					7.E-08	0.00%
Air_Rec	Chromium	Chromium	7440-47-3	1.39E-05				1.E-05	4.E-08	0.00%
Air_Rec	Chrysene	Chrysene	218-01-9	7.52E-09		6.E-14	0.00%			
Air_Rec	Copper	Copper	7440-50-8	6.41E-04					6.E-05	0.11%
Air_Rec	Dichlorodifluoromethane	Freon12	75-71-8	1.63E-07					1.E-08	0.00%
Air_Rec	Diethylphthalate	Diethylphthalate	84-66-2	1.35E-04				1.E-09	7.E-07	0.00%
Air_Rec	Dimethylphthalate	Dimethylphthalate	131-11-3	1.69E-09				5.E-08	7.E-13	0.00%
Air_Rec	Di-n-butylphthalate	Di-n-butylphthalate	84-74-2	3.58E-06				3.E-10	1.E-07	0.00%
Air_Rec	Di-n-octylphthalate	Di-n-octylphthalate	117-84-0	1.95E-07					2.E-08	0.00%
Air_Rec	Ethylbenzene	Ethylbenzene	100-41-4	3.31E-07				1.E-09	4.E-09	0.00%
Air_Rec	Fluoranthene	Fluoranthene	206-44-0	2.69E-08				2.E-10	3.E-09	0.00%
Air_Rec	Fluorene	Fluorene	86-73-7	3.39E-09				3.E-09	3.E-10	0.00%
Air_Rec	Hexachlorobenzene	Hexachlorobenzene	118-74-1	2.80E-07	2.E-10	5.E-10	0.02%	5.E-07	1.E-06	0.00%
Air_Rec	Hexahydro-1,3,5-trinitro-1,3,5-triazine	Hexahydro-1,3,5…(RDX)	121-82-4	1.00E-03	4.E-13	1.E-07	4.02%	4.E-09	1.E-03	2.24%
Air_Rec	Lead	Lead	7439-92-1	2.80E-04						
Air_Rec	m,p-Xylenes	m,p-Xylene	1330-20-7	2.49E-07					3.E-08	0.00%

TABLE 14

Estimating Risk to Boater on the Great Salt Lake (Permit Table 9)

Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Scenario	Chemical	Permit Chemical Name	CASNo	EPC (mg/M^3)	1997 ELCR	2005 ELCR	2005 ELCR%	1997 HI	2005 HI	2005 HI%
Air_Rec	Mercury	Mercury	7439-97-6	2.55E-08				3.E-07	1.E-06	0.00%
Air_Rec	Methane	Methane		4.17E-05	1.E-06	2.E-06	49.85%		3.E-02	49.88%
Air_Rec	Methylene chloride	Dichloromethane	75-09-2	4.46E-05		8.E-11	0.00%		6.E-07	0.00%
Air_Rec	Naphthalene	Naphthalene	91-20-3	1.18E-07					5.E-07	0.00%
Air_Rec	Nickel	Nickel	7440-02-0	8.95E-05				2.E-05	2.E-05	0.03%
Air_Rec	Nitroglycerin	Nitroglycerine	55-63-0	2.24E-07		4.E-12	0.00%			
Air_Rec	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	Octahydro-1,3,5,7…(HMX)	2691-41-0	7.63E-05				2.E-08	6.E-06	0.01%
Air_Rec	o-Xylene	o-Xylene	95-47-6	1.21E-07					2.E-08	0.00%
Air_Rec	Pentaerythritoltetranitrate	Pentaerythritol tetranitrate (PETN)	78-11-5	7.63E-05	9.E-09	9.E-09	0.31%	1.E-04	1.E-04	0.17%
Air_Rec	p-Ethyltoluene	p-Ethyltoluene	622-96-8	1.31E-07						
Air_Rec	Phenanthrene	Phenanthrene	85-01-8	2.08E-08						
Air_Rec	Phenol	Phenol	108-95-2	1.42E-07				1.E-10	2.E-09	0.00%
Air_Rec	Potassium	Potassium	7440-09-7	3.79E-03						
Air_Rec	Pyrene	Pyrene	129-00-0	1.07E-07				2.E-08	1.E-08	0.00%
Air_Rec	Sodium	Sodium	7440-23-5	1.65E-04						
Air_Rec	Styrene	Styrene	100-42-5	2.61E-06					4.E-08	0.00%
Air_Rec	Titanium	Titanium	7440-32-6	8.10E-06					4.E-06	0.01%
Air_Rec	Toluene	Toluene	108-88-3	2.62E-06					9.E-08	0.00%
Air_Rec	Trichlorofluoromethane	Freon11	75-69-4	2.56E-07					5.E-09	0.00%
Air_Rec	Vinyl Chloride	Vinyl chloride	75-01-4	2.20E-07	7.E-11	4.E-12	0.00%		3.E-08	0.00%
Air_Rec	Zinc	Zinc	7440-66-6	5.82E-04					**8.E-06**	**0.01%**
Total					**3.E-06**	**3.E-06**	**100%**	**2.E-03**	**6.E-02**	**100%**

TABLE 15
Estimating Risk to Oasis Resident (Permit Table 10)
Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Scenario	Chemical	Permit Chemical Name	CASNo	EPC (mg/M^3)	1997 ELCR	2005 ELCR	2005 ELCR%	1997 HI	2005 HI	2005 HI%
Air_Res	1,1,1-Trichloroethane	Methyl chloroform	71-55-6	5.52E-07					1.E-08	0.00%
Air_Res	1,1,2,2-Tetrachloroethane	1,1,2,2-Tetrachoroethae	79-34-5	5.78E-07	7.E-10	7.E-10	0.03%		1.E-07	0.00%
Air_Res	1,1,2-Trichloro-1,2,2-trifluoroethane	Freon113	76-13-1	2.27E-08					4.E-11	0.00%
Air_Res	1,1-Dichloroethene	Vinylidene chloride	75-35-4	1.42E-07					3.E-08	0.00%
Air_Res	1,2,4-Trimethylbenzene	1,2,4-Trimethylbenzene	95-63-6	1.27E-06					1.E-05	0.03%
Air_Res	1,3,5-Trimethylbenzene	1,3,5-Trimethylbenzene	108-67-8	1.62E-08					1.E-07	0.00%
Air_Res	1,3-Butadiene	1,3-Butadiene	106-99-0	9.92E-07	1.E-08	6.E-10	0.02%		2.E-05	0.07%
Air_Res	2,4,6-Trinitrotoluene	2,4,6-TNT	118-96-7	1.63E-07	3.E-11	3.E-11	0.00%	4.E-06	4.E-06	0.01%
Air_Res	2,6-Dinitrotoluene	2,4-DNT	606-20-2	4.90E-08	2.E-10			3.E-07	7.E-07	0.00%
Air_Res	2-Nitrodiphenylamine	2-Nitrodiphenylamine	119-75-5	7.61E-09						
Air_Res	Allyl chloride	Allyl chloride	107-05-1	9.61E-07				1.E-05	5.E-05	0.14%
Air_Res	Aluminum	Aluminum	7429-90-5	9.92E-04					1.E-02	41.82%
Air_Res	Antimony	Antimony	7440-36-0	6.23E-06				2.E-04	2.E-04	0.66%
Air_Res	Barium	Barium	7440-39-3	1.72E-05				5.E-04	2.E-03	5.18%
Air_Res	Benzene	Benzene	71-43-2	3.30E-06	6.E-10	5.E-10	0.02%		5.E-06	0.02%
Air_Res	Benzo(a)anthracene	Benzo(a)anthracene	56-55-3	2.50E-09	1.E-10	1.E-11	0.00%			
Air_Res	Benzo(a)pyrene	Benzo(a)pyrene	50-32-8	3.24E-08	1.E-09	6.E-10	0.02%			
Air_Res	bis(2-ethylhexyl)phthalate	bis(2-ethylhexyl)phthalate	117-81-7	5.22E-11	9.E-14	4.E-15	0.00%	1.E-14	4.E-11	0.00%
Air_Res	Bromomethane	Methyl Bromide	74-83-9	2.73E-07					3.E-06	0.01%
Air_Res	Butylbenzylphthalate	Butylbenzylphthalate	85-68-7	1.78E-08		2.E-13	0.00%	1.E-09	1.E-09	0.00%
Air_Res	Cadmium	Cadmium	7440-43-9	6.34E-05	2.E-06	2.E-06	91.26%	9.E-04	2.E-02	46.89%
Air_Res	Calcium	Calcium	7440-70-2	1.08E-04						
Air_Res	Carbon tetrachloride	Carbon tetrachloride	56-23-5	3.47E-08	1.E-11	1.E-11	0.00%		9.E-09	0.00%
Air_Res	Chloroethane	Ethyl chloride	75-00-3	1.03E-07		2.E-12	0.00%	1.E-10	5.E-10	0.00%
Air_Res	Chloromethane	Methyl chloride	74-87-3	1.43E-07					7.E-08	0.00%
Air_Res	Chromium	Chromium	7440-47-3	4.42E-06				1.E-05	4.E-08	0.00%
Air_Res	Chrysene	Chrysene	218-01-9	2.39E-09		1.E-13	0.00%			
Air_Res	Copper	Copper	7440-50-8	2.04E-04					7.E-05	0.22%
Air_Res	Dichlorodifluoromethane	Freon12	75-71-8	5.19E-08					1.E-08	0.00%
Air_Res	Diethylphthalate	Diethylphthalate	84-66-2	4.28E-05				7.E-07	7.E-07	0.00%
Air_Res	Dimethylphthalate	Dimethylphthalate	131-11-3	5.38E-10					7.E-13	0.00%
Air_Res	Di-n-butylphthalate	Di-n-butylphthalate	84-74-2	1.14E-06				2.E-07	2.E-07	0.00%
Air_Res	Di-n-octylphthalate	Di-n-octylphthalate	117-84-0	6.20E-08					2.E-08	0.00%
Air_Res	Ethylbenzene	Ethylbenzene	100-41-4	1.05E-07				2.E-09	5.E-09	0.00%
Air_Res	Fluoranthene	Fluoranthene	206-44-0	8.57E-09				3.E-09	3.E-09	0.00%
Air_Res	Fluorene	Fluorene	86-73-7	1.08E-09				4.E-10	4.E-10	0.00%
Air_Res	Hexachlorobenzene	Hexachlorobenzene	118-74-1	8.90E-08	8.E-10	8.E-10	0.03%	2.E-06	2.E-06	0.00%
Air_Res	Hexahydro-1,3,5-trinitro-1,3,5-triazine	Hexahydro-1,3,5…(RDX)	121-82-4	3.18E-04	2.E-07	2.E-07	7.99%	1.E-03	1.E-03	4.47%
Air_Res	Lead	Lead	7439-92-1	8.90E-05						
Air_Res	m,p-Xylenes	m,p-Xylene	1330-20-7	7.92E-08					4.E-08	0.00%
Air_Res	Mercury	Mercury	7439-97-6	8.12E-09				4.E-07	1.E-06	0.00%
Air_Res	Methane	Methane		1.32E-05						
Air_Res	Methylene chloride	Dichloromethane	75-09-2	1.42E-05		1.E-10	0.01%		6.E-07	0.00%
Air_Res	Naphthalene	Naphthalene	91-20-3	3.75E-08					6.E-07	0.00%
Air_Res	Nickel	Nickel	7440-02-0	2.85E-05				2.E-05	2.E-05	0.06%
Air_Res	Nitroglycerin	Nitroglycerine	55-63-0	7.13E-08		6.E-12	0.00%			
Air_Res	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	Octahydro-1,3,5,7…(HMX)	2691-41-0	2.43E-05				7.E-06	7.E-06	0.02%
Air_Res	o-Xylene	o-Xylene	95-47-6	3.83E-08					2.E-08	0.00%
Air_Res	Pentaerythritoltetranitrate	Pentaerythritol tetranitrate (PETN)	78-11-5	2.43E-05	2.E-08	2.E-08	0.61%	1.E-04	1.E-04	0.34%
Air_Res	p-Ethyltoluene	p-Ethyltoluene	622-96-8	4.17E-08						
Air_Res	Phenanthrene	Phenanthrene	85-01-8	6.62E-09						
Air_Res	Phenol	Phenol	108-95-2	4.51E-08				1.E-09	2.E-09	0.00%
Air_Res	Potassium	Potassium	7440-09-7	1.21E-03						
Air_Res	Pyrene	Pyrene	129-00-0	3.41E-08				2.E-08	2.E-08	0.00%
Air_Res	Sodium	Sodium	7440-23-5	5.24E-05						
Air_Res	Styrene	Styrene	100-42-5	8.28E-07					4.E-08	0.00%
Air_Res	Titanium	Titanium	7440-32-6	2.58E-06					4.E-06	0.01%
Air_Res	Toluene	Toluene	108-88-3	8.34E-07					1.E-07	0.00%
Air_Res	Trichlorofluoromethane	Freon11	75-69-4	8.14E-08					5.E-09	0.00%
Air_Res	Vinyl Chloride	Vinyl chloride	75-01-4	6.99E-08	1.E-10	6.E-12	0.00%		3.E-08	0.00%
Air_Res	Zinc	Zinc	7440-66-6	1.85E-04				8.E-06	8.E-06	0.03%
Total					**2.E-06**	**3.E-06**	**100%**	**3.E-03**	**3.E-02**	**100%**

Figure

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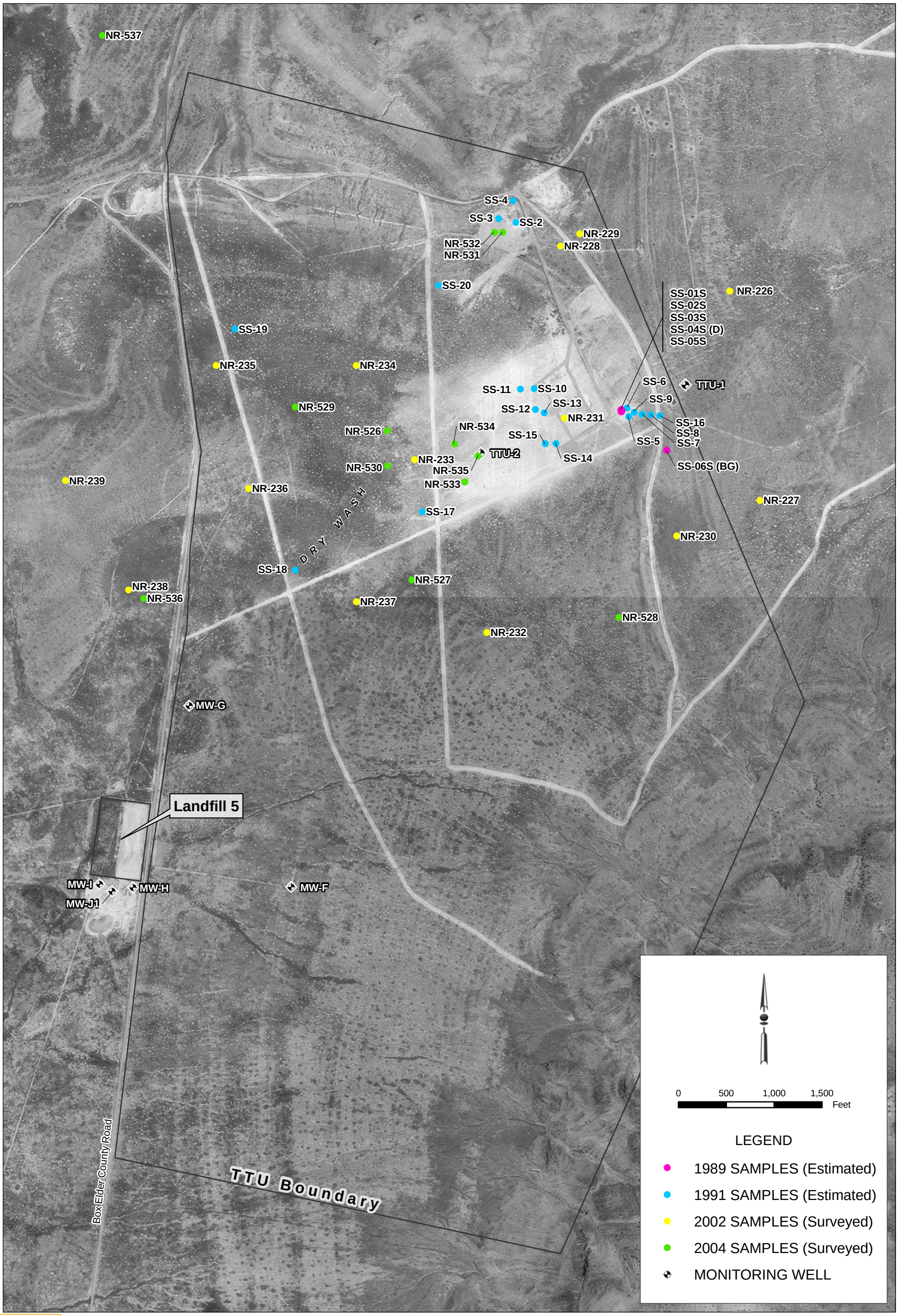

FIGURE 1
TTU SITE MAP
2005 HUMAN HEALTH RISK ASSESSMENT
HILL AIR FORCE BASE, UTAH

APPENDIX A

Descriptive Statistics for Surface Soil Samples

Appendix A

Descriptive Statistics for Surface Soil Samples

Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Analyte	CASNo	Units	Total Samples	Total Detects	Detection Frequency	Maximum Detect	Minimum Detect	Average Detect	Mean[a]	Standard Deviation	Variance
1,1,1,2-Tetrachloroethane	630-20-6	mg/Kg	21						4.28E-04	1.35E-04	1.81E-08
1,1,1-Trichloroethane	71-55-6	mg/Kg	21						4.76E-04	8.02E-05	6.43E-09
1,1,2,2-Tetrachloroethane	79-34-5	mg/Kg	21						5.37E-04	9.16E-05	8.39E-09
1,1,2-Trichloroethane	79-00-5	mg/Kg	21						4.65E-04	9.53E-05	9.08E-09
1,1-Dichloroethane	75-34-3	mg/Kg	21						3.72E-04	6.05E-05	3.66E-09
1,1-Dichloroethene	75-35-4	mg/Kg	21						5.69E-04	3.39E-04	1.15E-07
1,2,3-Trichlorobenzene	87-61-6	mg/Kg	22	1	4.5%	0.003	0.003	0.003	5.38E-04	5.11E-04	2.62E-07
1,2,3-Trichloropropane	96-18-4	mg/Kg	21						5.70E-04	1.79E-04	3.20E-08
1,2,4-Trichlorobenzene	120-82-1	mg/Kg	27	1	3.7%	0.003	0.003	0.003	0.904	2.78	7.72
1,2-Dibromo-3-chloropropane	96-12-8	mg/Kg	21						0.002	5.50E-04	3.03E-07
1,2-Dibromoethane	106-93-4	mg/Kg	21						5.00E-04	1.58E-04	2.49E-08
1,2-Dichlorobenzene	95-50-1	mg/Kg	27	1	3.7%	0.001	0.001	0.001	0.904	2.78	7.73
1,2-Dichloroethane	107-06-2	mg/Kg	21						4.50E-04	9.81E-05	9.62E-09
1,2-Dichloropropane	78-87-5	mg/Kg	21						4.04E-04	7.13E-05	5.09E-09
1,3,5-Trinitrobenzene	99-35-4	mg/Kg	22						0.058	0.047	0.002
1,3-Dichlorobenzene	541-73-1	mg/Kg	27	1	3.7%	0.002	0.002	0.002	0.904	2.78	7.72
1,3-Dinitrobenzene	99-65-0	mg/Kg	22						0.050	0.030	8.92E-04
1,4-Dichlorobenzene	106-46-7	mg/Kg	27	1	3.7%	0.003	0.003	0.003	0.904	2.78	7.72
2,4,5-Trichlorophenol	95-95-4	mg/Kg	27						4.43	13.3	176
2,4,6-Trichlorophenol	88-06-2	mg/Kg	27						0.942	2.77	7.65
2,4,6-Trinitrophenyl-methylnitramine	479-45-8	mg/Kg	22						0.136	0.091	0.008
2,4,6-Trinitrotoluene	118-96-7	mg/Kg	32						0.962	0.706	0.498
2,4,6-Trinitrotolunene	118-96-7	mg/Kg	10						0.025	0.002	4.79E-06
2,4-Dichlorophenol	120-83-2	mg/Kg	27						0.946	2.77	7.65
2,4-Dimethylphenol	105-67-9	mg/Kg	27						0.945	2.77	7.65
2,4-Dinitrophenol	51-28-5	mg/Kg	27						4.44	13.3	176
2,4-Dinitrotoluene	121-14-2	mg/Kg	47	1	2.1%	2.00	2.00	2.00	0.931	2.09	4.36
2,6-Dinitrotoluene	606-20-2	mg/Kg	47						1.19	2.09	4.37
2-Amino-4,6-dinitrotoluene	1321-12-6	mg/Kg	30						1.04	0.667	0.445
2-Butanone	78-93-3	mg/Kg	22	4	18.2%	0.016	0.004	0.011	0.004	0.004	1.41E-05
2-Chloroethylvinylether	110-75-8	mg/Kg	12						0.005	0.001	1.12E-06
2-Chloronapthalene	91-58-7	mg/Kg	27						0.942	2.77	7.65
2-Chlorophenol	95-57-8	mg/Kg	27						0.941	2.77	7.66
2-Hexanone	591-78-6	mg/Kg	21						0.003	6.90E-04	4.76E-07
2-Methylnaphthalene	91-57-6	mg/Kg	27	3	11.1%	170	18.0	88.3	9.87	35.4	1,251
2-Methylphenol	95-48-7	mg/Kg	27						0.942	2.77	7.65
2-Nitroaniline	88-74-4	mg/Kg	27						4.44	13.3	176
2-Nitrophenol	88-75-5	mg/Kg	27						0.940	2.77	7.66
2-Nitrotoluene	88-72-2	mg/Kg	22						0.082	0.054	0.003
3,3'-Dichlorobenzidine	91-94-1	mg/Kg	27						1.87	5.53	30.6
3-Nitroaniline	99-09-2	mg/Kg	27						4.57	13.2	175
3-Nitrotoluene	99-08-1	mg/Kg	22						0.096	0.050	0.003
4,6-Dinitro-2-methylphenol	534-52-1	mg/Kg	27						4.43	13.3	176
4-Amino-2,6-Dinitrotoluene	1321-12-6	mg/Kg	10						0.088	0.007	5.49E-05
4-Bromophenylphenylether	101-55-3	mg/Kg	27						0.945	2.77	7.65
4-Chloro-3-methylphenol	59-50-7	mg/Kg	27						0.946	2.77	7.65
4-Chloroaniline	106-47-8	mg/Kg	27						1.09	2.72	7.39

Appendix A
Descriptive Statistics for Surface Soil Samples
Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Analyte	CASNo	Units	Total Samples	Total Detects	Detection Frequency	Maximum Detect	Minimum Detect	Average Detect	Mean[a]	Standard Deviation	Variance
4-Chlorophenylphenylether	7005-72-3	mg/Kg	27						0.943	2.77	7.65
4-Methyl-2-pentanone	108-10-1	mg/Kg	21						0.003	4.92E-04	2.42E-07
4-Methylphenol	106-44-5	mg/Kg	27						0.944	2.77	7.65
4-Nitroaniline	100-01-6	mg/Kg	27						4.43	13.3	176
4-Nitrophenol	100-02-7	mg/Kg	27						4.43	13.3	176
4-Nitrotoluene	99-99-0	mg/Kg	22						0.122	0.065	0.004
Acenaphthene	83-32-9	mg/Kg	10						0.036	0.003	9.05E-06
Acenaphthylene	208-96-8	mg/Kg	27						0.942	2.77	7.65
Acetone	67-64-1	mg/Kg	27	9	33.3%	24.0	0.004	4.13	1.39	5.00	25.0
Aluminum	7429-90-5	mg/Kg	47	47	100.0%	54,000	5,390	13,321	13,321	6,997	4.90E+07
Anthracene	120-12-7	mg/Kg	27	1	3.7%	3.60	3.60	3.60	0.685	2.08	4.35
Antimony	7440-36-0	mg/Kg	27	22	81.5%	167	0.120	10.1	8.39	31.9	1,017
Arsenic	7440-38-2	mg/Kg	47	27	57.4%	41.3	1.90	7.51	6.44	5.40	29.2
Barium	7440-39-3	mg/Kg	47	47	100.0%	640	110	208	208	73.0	5,326
Benz(a)anthracene	56-55-3	mg/Kg	10						0.033	0.003	7.43E-06
Benzene	71-43-2	mg/Kg	22	3	13.6%	0.004	0.001	0.003	7.03E-04	9.05E-04	8.20E-07
Benzo(a)anthracene	56-55-3	mg/Kg	17						1.48	3.41	11.6
Benzo(a)pyrene	50-32-8	mg/Kg	27						0.943	2.77	7.65
Benzo(b)fluoranthene	205-99-2	mg/Kg	27						0.956	2.76	7.63
Benzo(g,h,i)perylene	191-24-2	mg/Kg	27						0.942	2.77	7.65
Benzo(k)fluoranthene	207-08-9	mg/Kg	27						0.952	2.76	7.64
Benzoic acid	65-85-0	mg/Kg	27						4.44	13.3	176
Benzyl alcohol	100-51-6	mg/Kg	27						0.945	2.77	7.65
Beryllium	7440-41-7	mg/Kg	47	23	48.9%	0.720	0.280	0.518	0.473	0.154	0.024
Bis(2-chloroethoxy)methane	111-91-1	mg/Kg	22						0.056	0.016	2.49E-04
Bis(2-chloroethyl)ether	111-44-4	mg/Kg	27						0.944	2.77	7.65
Bis(2-chloroisopropyl)ether	108-60-1	mg/Kg	27						0.943	2.77	7.65
bis(2-ethylhexyl)phthalate	117-81-7	mg/Kg	27	5	18.5%	1.50	0.083	0.661	0.170	0.348	0.121
Bromodichloromethane	75-27-4	mg/Kg	21						4.16E-04	8.92E-05	7.95E-09
Bromoform	75-25-2	mg/Kg	21						3.80E-04	1.63E-04	2.65E-08
Bromomethane	74-83-9	mg/Kg	21						6.83E-04	1.11E-04	1.23E-08
Butylbenzylphthalate	85-68-7	mg/Kg	27						0.948	2.76	7.64
Cadmium	7440-43-9	mg/Kg	47	21	44.7%	32.0	0.270	2.36	1.27	4.61	21.2
Calcium	7440-70-2	mg/Kg	42	42	100.0%	1.56E+06	15,400	188,148	188,148	296,587	8.80E+10
Carbon disulfide	75-15-0	mg/Kg	21						5.15E-04	1.09E-04	1.18E-08
Carbon tetrachloride	56-23-5	mg/Kg	21						4.70E-04	7.42E-05	5.51E-09
Chloride		mg/Kg	42	30	71.4%	120,000	0.100	4,082	2,916	18,509	3.43E+08
Chlorobenzene	108-90-7	mg/Kg	21						4.45E-04	8.38E-05	7.02E-09
Chloroethane	75-00-3	mg/Kg	21						5.40E-04	1.84E-04	3.40E-08
Chloroform	67-66-3	mg/Kg	21						4.13E-04	8.98E-05	8.07E-09
Chloromethane	74-87-3	mg/Kg	21						5.46E-04	1.61E-04	2.59E-08
Chromium	7440-47-3	mg/Kg	47	47	100.0%	55.3	6.50	14.5	14.5	7.82	61.2
Chrysene	218-01-9	mg/Kg	27						0.943	2.77	7.65
cis-1,2-Dichloroethene	156-59-2	mg/Kg	21						4.49E-04	1.18E-04	1.40E-08
cis-1,3-Dichloropropene	10061-01-5	mg/Kg	21						4.15E-04	1.11E-04	1.23E-08
Cobalt	7440-48-4	mg/Kg	27	22	81.5%	4.90	1.00	2.90	2.79	1.14	1.29
Copper	7440-50-8	mg/Kg	47	41	87.2%	18,000	6.00	498	438	2,622	6.87E+06

Appendix A
Descriptive Statistics for Surface Soil Samples
Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Analyte	CASNo	Units	Total Samples	Total Detects	Detection Frequency	Maximum Detect	Minimum Detect	Average Detect	Mean[a]	Standard Deviation	Variance
Dibenz(a,h)anthracene	53-70-3	mg/Kg	27						0.947	2.76	7.64
Dibenzofuran	132-64-9	mg/Kg	27	3	11.1%	12.0	0.640	5.95	0.714	2.46	6.07
Dibromochloromethane	124-48-1	mg/Kg	21						4.18E-04	1.39E-04	1.94E-08
Dibromomethane	74-95-3	mg/Kg	21						3.98E-04	1.40E-04	1.96E-08
Dichlorodifluoromethane	75-71-8	mg/Kg	21						4.87E-04	9.62E-05	9.25E-09
Diethylphthalate	84-66-2	mg/Kg	27						0.952	2.76	7.64
Dimethylphthalate	131-11-3	mg/Kg	27						0.943	2.77	7.65
Di-n-butylphthalate	84-74-2	mg/Kg	27						0.949	2.76	7.64
Di-n-octylphthalate	117-84-0	mg/Kg	27						0.937	2.77	7.66
Ethylbenzene	100-41-4	mg/Kg	22	1	4.5%	0.001	0.001	0.001	4.89E-04	2.00E-04	4.00E-08
Fluoranthene	206-44-0	mg/Kg	27	1	3.7%	0.144	0.144	0.144	0.944	2.77	7.65
Fluorene	86-73-7	mg/Kg	27	3	11.1%	33.0	1.70	17.6	2.01	7.09	50.3
Hexachlorobenzene	118-74-1	mg/Kg	27						0.945	2.77	7.65
Hexachlorobutadiene	87-68-3	mg/Kg	26						0.939	2.83	8.00
Hexachlorocyclopentadiene	77-47-4	mg/Kg	27						0.998	2.75	7.56
Hexachloroethane	67-72-1	mg/Kg	27						0.944	2.77	7.65
Hexahydro-1,3,5-trinitro-1,3,5-triazine	121-82-4	mg/Kg	42						0.748	0.726	0.528
Indeno(1,2,3-cd)pyrene	193-39-5	mg/Kg	27						0.948	2.76	7.64
Iron	7439-89-6	mg/Kg	42	42	100.0%	15,000	4,510	10,606	10,606	2,787	7.77E+06
Isophorone	78-59-1	mg/Kg	27						0.945	2.77	7.65
Lead	7439-92-1	mg/Kg	47	40	85.1%	48,000	2.80	1,267	1,089	6,995	4.89E+07
m,p-Xylene	1330-20-7	mg/Kg	10	1	10.0%	0.002	0.002	0.002	6.95E-04	4.66E-04	2.17E-07
m,p-Xylenes	1330-20-7	mg/Kg	12						0.001	1.76E-04	3.11E-08
Magnesium	7439-95-4	mg/Kg	42	42	100.0%	24,300	9,700	16,695	16,695	4,004	1.60E+07
Manganese	7439-96-5	mg/Kg	47	47	100.0%	519	120	321	321	114	12,945
Mercury	7439-97-6	mg/Kg	47	13	27.7%	0.070	0.005	0.017	0.022	0.015	2.16E-04
Methylene chloride	75-09-2	mg/Kg	22	1	4.5%	0.003	0.003	0.003	8.78E-04	6.32E-04	3.99E-07
Molybdenum	7439-98-7	mg/Kg	22	20	90.9%	17.0	0.600	1.89	1.73	3.45	11.9
Naphthalene	91-20-3	mg/Kg	27	6	22.2%	53.0	6.00E-04	13.3	2.97	10.9	120
Nickel	7440-02-0	mg/Kg	47	47	100.0%	41.3	6.80	11.4	11.4	5.86	34.3
Nitrate	14797-55-8	mg/Kg	47	43	91.5%	22.8	0.004	4.64	4.33	5.97	35.6
Nitrobenzene	98-95-3	mg/Kg	47						1.18	2.10	4.40
Nitroglycerin	55-63-0	mg/Kg	41						0.238	0.054	0.003
Nitroguanidine	556-88-7	mg/Kg	42	2	4.8%	0.300	0.100	0.200	0.179	0.210	0.044
n-Nitroso-di-n-propylamine	621-64-7	mg/Kg	27						0.943	2.77	7.65
N-Nitrosodiphenylamine	86-30-6	mg/Kg	27						0.944	2.77	7.65
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	2691-41-0	mg/Kg	42	13	31.0%	25.0	0.230	4.36	1.91	4.04	16.4
o-Xylene	95-47-6	mg/Kg	22	3	13.6%	0.003	8.00E-04	0.002	5.91E-04	6.30E-04	3.97E-07
Pentachlorophenol	87-86-5	mg/Kg	27						4.41	13.3	176
Pentaerythritoltetranitrate	78-11-5	mg/Kg	30						0.433	0.097	0.009
Perchlorate	7601-90-3	mg/Kg	22	11	50.0%	4.50	0.016	0.833	0.422	1.09	1.18
pH			20						7.98	0.376	0.142
Phenanthrene	85-01-8	mg/Kg	27	4	14.8%	92.0	0.380	38.1	5.68	19.9	395
Phenol	108-95-2	mg/Kg	27						0.947	2.77	7.65
Phosphorus	7723-14-0	mg/Kg	20	20	100.0%	990	450	656	656	171	29,173
Picric acid	88-89-1	mg/Kg	42	3	7.1%	0.500	0.400	0.433	0.091	0.102	0.010

APPENDIX B

Toxicity and Dermal Absorption Factors

Appendix B
Toxicity and Dermal Absorption Factors
Toxicity Factors
Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Yellow-highlighted inhalation toxicity factors adapted from the oral factors. Blue highlights from IRIS.

Chemical	StdCAS	Group	SFo (Kg-day/mg)	SFi (Kg-day/mg)	RfDo (mg/Kg-day)	RfDi (mg/Kg-day)	ABS	GI Factor
ACETALDEHYDE	75-07-0	V		7.7E-03		2.57E-03		1.00
ACETOCHLOR	34256-82-1	SV			2E-02	2E-02		1.00
ACETONE	67-64-1	V			9.00E-01	9.00E-01		1.00
ACETONITRILE	75-05-8	V				1.7E-02		1.00
ACETOPHENONE	98-86-2	V			1.00E-01	1.00E-01		1.00
ACROLEIN	107-02-8	V			5.00E-04	5.70E-06		1.00
ACRYLAMIDE	79-06-1	SV	4.50E+00	4.50E+00	2.00E-04	2.00E-04		1.00
ACRYLONITRILE	107-13-1	V	5.40E-01	2.40E-01	1.00E-03	5.70E-04		1.00
ALACHLOR	15972-60-8	SV	8.00E-02	8.00E-02	1.00E-02	1.00E-02		1.00
ALAR	1596-84-5	SV			1.50E-01	1.50E-01		1.00
ALDICARB	116-06-3	SV			1.00E-03	1.00E-03		1.00
ALDICARB SULFONE	1646-88-4	SV			1.00E-03	1.00E-03		1.00
ALDRIN	309-00-2	SV	1.70E+01	1.70E+01	3.00E-05	3.00E-05		1.00
ALLYL CHLORIDE	107-05-1	SV				2.86E-04		1.00
ALUMINUM	7429-90-5	M			1.00E+00	1.00E-03		1.00
AMINODINITROTOLUENES	NA	SV			2.00E-03	2.00E-03		1.00
AMMONIA	7664-41-7	V				2.86E-02		1.00
ANILINE	62-53-3	SV	5.70E-03	5.70E-03	7.00E-03	2.90E-04		1.00
ANTIMONY	7440-36-0	M			4.00E-04	4.00E-04		0.15
ANTIMONY TRIOXIDE	1309-64-4	M			4.00E-04	5.70E-05		1.00
ARSENIC	7440-38-2	M	1.50E+00	1.51E+01	3.00E-04	3.00E-04	0.03	1.00
ARSINE	7784-42-1	V				1.40E-05		1.00
ASSURE	76578-14-8	SV			9.00E-03	9.00E-03		1.00
ATRAZINE	1912-24-9	SV	2.20E-01	2.20E-01	3.50E-02	3.50E-02		1.00
BARIUM	7440-39-3	M			7.00E-02	1.40E-04		0.07
BAYGON	114-26-1	SV			4.00E-03	4.00E-03		1.00
BAYTHROID	68359-37-5	SV			2.50E-02	2.50E-02		1.00
BENTAZON	25057-89-0	SV			3.00E-02	3.00E-02	0.13	1.00
BENZALDEHYDE	100-52-7	SV			1.00E-01	1.00E-01		1.00
BENZENE	71-43-2	V	5.5E-02	2.7E-02	4.00E-03	8.6E-03		1.00
BENZENETHIOL	108-98-5	V			1.00E-05	1.00E-05		1.00
BENZIDINE	92-87-5	SV	2.30E+02	2.30E+02	3.00E-03	3.00E-03		1.00
BENZOIC ACID	65-85-0	SV			4.00E+00	4.00E+00		1.00
BENZYL ALCOHOL	100-51-6	SV			3.00E-01	3.00E-01		1.00
BENZYL CHLORIDE	100-44-7	V	0.17	0.17	2.00E-03	2.00E-03		1.00
BERYLLIUM	7440-41-7	M		8.40E+00	2.00E-03	5.7E-06		0.01
BIPHENYL	92-52-4	V			5.00E-02	5.00E-02		1.00
BIS(2-CHLOROETHYL)ETHER	111-44-4	V	1.10E+00	1.10E+00				1.00
BIS(2-CHLOROISOPROPYL)ETHER	108-60-1	V	7.00E-02	3.50E-02	4.00E-02	4.00E-02		1.00
BIS(CHLOROMETHYL)ETHER	542-88-1	V	2.20E+02	2.20E+02				1.00
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	SV	1.40E-02	1.40E-02	2.00E-02	2.00E-02		1.00
BORON	7440-42-8	M			2.00E-01	5.70E-03		1.00
BROMOBENZENE	108-86-1	V			2.00E-02	3.00E-03		1.00
BROMODICHLOROMETHANE	75-27-4	V	6.20E-02	6.20E-02	2.00E-02	2.00E-02		1.00
BROMOETHENE	593-60-2	V		1.10E-01		8.6E-04		1.00
BROMOFORM	75-25-2	SV	7.90E-03	3.90E-03	2.00E-02	2.00E-02		1.00
BROMOMETHANE	74-83-9	V			1.40E-03	1.40E-03		1.00
BROMOPHOS	2104-96-3	SV			5.00E-03	5.00E-03		1.00
1,3-BUTADIENE	106-99-0	V		1.00E-01		5.7E-04		1.00
1-BUTANOL	71-36-3	SV			1.00E-01	1.00E-01		1.00
BUTYLBENZYLPHTHALATE	85-68-7	SV	1.9E-03	1.9E-03	2.00E-01	2.00E-01		1.00
CADMIUM-FOOD	7440-43-9	M		6.30E+00	1.00E-03	5.7E-05	0.001	0.03
CAPROLACTAM	105-60-2	SV			5.00E-01	5.00E-01		1.00
CARBARYL	63-25-2	SV			1.00E-01	1.00E-01		1.00
CARBON DISULFIDE	75-15-0	V			1.00E-01	2.00E-01		1.00
CARBON TETRACHLORIDE	56-23-5	V	1.30E-01	5.30E-02	7.00E-04	5.00E-02		1.00
CARBOSULFAN	55285-14-8	SV			1.00E-02	1.00E-02		1.00
CHLORAL HYDRATE	302-17-0	SV			1.00E-01	1.00E-01		1.00
CHLORANIL	118-75-2	SV	4.00E-01	4.00E-01				1.00
CHLORDANE	57-74-9	SV	3.5E-01	3.5E-01	5.00E-04	2.00E-04	0.04	1.00
CHLORINE	7782-50-5	V			1.00E-01	5.7E-05		1.00
CHLORINE DIOXIDE	10049-04-4	V			3.00E-02	5.70E-05		1.00
CHLOROACETIC ACID	79-11-8	SV			2.00E-03	2.00E-03		1.00
4-CHLOROANILINE	106-47-8	SV	5.4E-02	5.4E-02	4.00E-03	4.00E-03		1.00
CHLOROBENZENE	108-90-7	V			2.00E-02	1.7E-02		1.00
2-CHLORO-1,3-BUTADIENE	126-99-8	V			2.00E-02	2.00E-03		1.00
1-CHLORO-1,1-DIFLUOROETHANE	75-68-3	V				1.40E+01		1.00
CHLORODIFLUOROMETHANE	75-45-6	V				1.40E+01		1.00
CHLOROETHANE	75-00-3	V	2.90E-03	2.90E-03	4.00E-01	2.90E+00		1.00
CHLOROFORM	67-66-3	V		8.10E-02	1.00E-02	1.4E-02		1.00
CHLOROMETHANE	74-87-3	V				2.6E-02		1.00
4-CHLORO-2-METHYLANILINE	95-69-2	SV	5.80E-01	5.80E-01				1.00
BETA-CHLORONAPHTHALENE	91-58-7	V			8.00E-02	8.00E-02		1.00
O-CHLORONITROBENZENE	88-73-3	V	9.7E-03	9.7E-03	1.00E-03	2.00E-05		1.00
P-CHLORONITROBENZENE	100-00-5	V	6.7E-03	6.7E-03	1.00E-03	1.7E-04		1.00
2-CHLOROPHENOL	95-57-8	V			5.00E-03	5.00E-03		1.00

Yellow-highlighted inhalation toxicity factors adapted from the oral factors. Blue highlights from IRIS.

Chemical	StdCAS	Group	SFo (Kg-day/mg)	SFi (Kg-day/mg)	RfDo (mg/Kg-day)	RfDi (mg/Kg-day)	ABS	GI Factor
2-CHLOROPROPANE	75-29-6	V				2.90E-02		1.00
O-CHLOROTOLUENE	95-49-8	V			2.00E-02	2.00E-02		1.00
CHLORPYRIFOS	2921-88-2	SV			3.00E-03	3.00E-03		1.00
CHLORPYRIFOS-METHYL	5598-13-0	SV			1.00E-02	1.00E-02		1.00
CHROMIUM	7440-47-3	M			1.50E+00	1.50E+00		1.00
CHROMIUM III	16065-83-1	M			1.50E+00	1.50E+00		0.01
CHROMIUM VI	18540-29-9	M		4.10E+01	3.00E-03	3.00E-05		0.03
COBALT	7440-48-4	M		9.8	2.00E-02	5.7E-06		1.00
COKE OVEN EMISSIONS (COAL TAR)	8007-45-2	SV		2.2				1.00
COPPER	7440-50-8	M			4.00E-02	4.00E-02		1.00
CUMENE	98-82-8	V			1.00E-01	1.10E-01		1.00
CYANIDE (FREE)	57-12-5	M			2.00E-02	2.00E-02		1.00
CALCIUM CYANIDE	592-01-8	M			4E-02	4E-02		1.00
COPPER CYANIDE	544-92-3	M			5.00E-03	5.00E-03		1.00
CYANOGEN	460-19-5	V			4.00E-02	4.00E-02		1.00
HYDROGEN CYANIDE	74-90-8	V			2.00E-02	8.60E-04		1.00
POTASSIUM CYANIDE	151-50-8	M			5.00E-02	5.00E-02		1.00
POTASSIUM SILVER CYANIDE	506-61-6	M			2.00E-01	2.00E-01		1.00
SILVER CYANIDE	506-64-9	M			1.00E-01	1.00E-01		1.00
SODIUM CYANIDE	143-33-9	M			4.00E-02	4.00E-02		1.00
THIOCYANATE	NA	M			1.00E-04	1.00E-04		1.00
ZINC CYANIDE	557-21-1	M			5.00E-02	5.00E-02		1.00
CYCLOHEXANE	110-82-7	V				1.70E+00		1.00
CYCLOHEXANONE	108-94-1	SV			5.00E+00	5.00E+00		1.00
CYHALOTHRIN/KARATE	68085-85-8	SV			5.00E-03	5.00E-03		1.00
CYPERMETHRIN	52315-07-8	SV			1.00E-02	1.00E-02		1.00
DACTHAL	1861-32-1	SV			1.00E-02	1.00E-02		1.00
DALAPON	75-99-0	SV			3.00E-02	3.00E-02		1.00
DDD	72-54-8	SV	2.40E-01	2.40E-01	2.00E-03	2.00E-03		1.00
DDE	72-55-9	SV	3.40E-01	3.40E-01				1.00
DDT	50-29-3	SV	3.40E-01	3.40E-01	5.00E-04	5.00E-04	0.03	1.00
DIAZINON	333-41-5	SV			9.00E-04	9.00E-04		1.00
DIBENZOFURAN	132-64-9	V			2.00E-03	2.00E-03		1.00
1,4-DIBROMOBENZENE	106-37-6	SV			1.00E-02	1.00E-02		1.00
DIBROMOCHLOROMETHANE	124-48-1	V	8.40E-02	8.40E-02	2.00E-02	2.00E-02		1.00
1,2-DIBROMO-3-CHLOROPROPANE	96-12-8	V	1.40E+00	2.40E-03		5.70E-05		1.00
1,2-DIBROMOETHANE	106-93-4	V	2.00E+00	2.00E+00	9.00E-03	2.6E-03		1.00
DIBUTYLPHTHALATE	84-74-2	SV			1.00E-01	1.00E-01		1.00
DICAMBA	1918-00-9	SV			3.00E-02	3.00E-02		1.00
1,2-DICHLOROBENZENE	95-50-1	V			9.00E-02	4.00E-02		1.00
1,3-DICHLOROBENZENE	541-73-1	V			3.00E-03	3.00E-03		1.00
1,4-DICHLOROBENZENE	106-46-7	V	2.40E-02	2.2E-02	3.00E-02	2.29E-01		1.00
3,3'-DICHLOROBENZIDINE	91-94-1	SV	4.50E-01	4.50E-01				1.00
DICHLORODIFLUOROMETHANE	75-71-8	V			2.00E-01	5.00E-02		1.00
1,1-DICHLOROETHANE	75-34-3	V			2.00E-01	1.40E-01		1.00
1,2-DICHLOROETHANE	107-06-2	V	9.10E-02	9.10E-02	2.00E-02	7.00E-01		1.00
1,1-DICHLOROETHENE	75-35-4	V			5.00E-02	6.00E-02		1.00
CIS-1,2-DICHLOROETHENE	156-59-2	V			1.00E-02	1.00E-02		1.00
TRANS-1,2-DICHLOROETHENE	156-60-5	V			2.00E-02	1.7E-02		1.00
TOTAL 1,2-DICHLOROETHENE	540-59-0	V			9.00E-03	9.00E-03		1.00
2,4-DICHLOROPHENOL	120-83-2	SV			3.00E-03	3.00E-03		1.00
2,4-D	94-75-7	SV			1.00E-02	1.00E-02	0.05	1.00
4-(2,4-DICHLOROPHENOXY)BUTYRIC ACID	94-82-6	SV			8E-03	8E-03		1.00
1,2-DICHLOROPROPANE	78-87-5	V	6.80E-02	6.80E-02		1.14E-03		1.00
1,3-DICHLOROPROPANE	142-28-9	V			2.00E-02	2.00E-02		1.00
2,3-DICHLOROPROPANOL	616-23-9	SV			3.00E-03	3.00E-03		1.00
1,3-DICHLOROPROPENE	542-75-6	V	1.00E-01	1.00E-02	3.00E-02	5.71E-03		1.00
DICHLORVOS	62-73-7	SV	0.29	0.29	5E-04	1.43E-04		1.00
DIELDRIN	60-57-1	SV	1.60E+01	1.60E+01	5.00E-05	5.00E-05		1.00
DIESEL EMISSIONS	NA	SV				1.40E-03		1.00
DIETHYLPHTHALATE	84-66-2	SV			8.00E-01	8.00E-01		1.00
DIETHYLENE GLYCOL, MONOBUTYL ETHER	112-34-5	SV			1.00E-02	5.70E-03		1.00
DIETHYLENE GLYCOL, MONOETHYL ETHER	111-90-0	SV			6.00E-02	8.6E-04		1.00
DI(2-ETHYLHEXYL)ADIPATE	103-23-1	SV	1.20E-03	1.20E-03	6.00E-01	6.00E-01		1.00
DIETHYLSTILBESTROL	56-53-1	SV	4.70E+03	4.70E+03				1.00
DIFENZOQUAT (AVENGE)	43222-48-6	SV			8.00E-02	8.00E-02		1.00
1,1-DIFLUOROETHANE	75-37-6	V				1.10E+01		1.00
DIISOPROPYL METHYLPHOSPHONATE (DIMP)	1445-75-6	SV			8.00E-02	8.00E-02		1.00

Yellow-highlighted inhalation toxicity factors adapted from the oral factors. Blue highlights from IRIS.

Chemical	StdCAS	Group	SFo (Kg-day/mg)	SFi (Kg-day/mg)	RfDo (mg/Kg-day)	RfDi (mg/Kg-day)	ABS	GI Factor
3,3'-DIMETHOXYBENZIDINE	119-90-4	SV	1.40E-02	1.40E-02				1.00
N,N-DIMETHYLANILINE	121-69-7	SV			2.00E-03	2.00E-03		1.00
3,3'-DIMETHYLBENZIDINE	119-93-7	SV	2.30E+00	2.30E+00				1.00
2,4-DIMETHYLPHENOL	105-67-9	SV			2.00E-02	2.00E-02		1.00
2,6-DIMETHYLPHENOL	576-26-1	SV			6.00E-04	6.00E-04		1.00
3,4-DIMETHYLPHENOL	95-65-8	SV			1.00E-03	1.00E-03		1.00
DIMETHYLPHTHALATE	131-11-3	SV			1.00E+01	1.00E+01		1.00
1,2-DINITROBENZENE	528-29-0	SV			1.00E-04	1.00E-04		1.00
1,3-DINITROBENZENE	99-65-0	SV			1.00E-04	1.00E-04		1.00
1,4-DINITROBENZENE	100-25-4	SV			1.00E-04	1.00E-04		1.00
4,6-DINITRO-O-CYCLOHEXYL PHENOL	131-89-5	SV			2.00E-03	2.00E-03		1.00
4,6-DINITRO-2-METHYLPHENOL	534-52-1	SV			1.00E-04	1.00E-04		1.00
2,4-DINITROPHENOL	51-28-5	SV			2.00E-03	2.00E-03		1.00
DINITROTOLUENE MIX	NA	SV	6.80E-01	6.80E-01				1.00
2,4-DINITROTOLUENE	121-14-2	SV			2.00E-03	2.00E-03		1.00
2,6-DINITROTOLUENE	606-20-2	SV			1.00E-03	1.00E-03		1.00
DINOSEB	88-85-7	SV			1.00E-03	1.00E-03		1.00
DIOCTYLPHTHALATE	117-84-0	SV			4.00E-02	4.00E-02		1.00
1,4-DIOXANE	123-91-1	SV	1.10E-02	1.10E-02				1.00
DIPHENYLAMINE	122-39-4	SV			2.50E-02	2.50E-02		1.00
1,2-DIPHENYLHYDRAZINE	122-66-7	SV	8.00E-01	8.00E-01				1.00
DIQUAT	85-00-7	SV			2.20E-03	2.20E-03		1.00
DISULFOTON	298-04-4	SV			4.00E-05	4.00E-05		1.00
1,4-DITHIANE	505-29-3	SV			1.00E-02	1.00E-02		1.00
DIURON	330-54-1	SV			2.00E-03	2.00E-03		1.00
ENDOSULFAN	115-29-7	SV			6.00E-03	6.00E-03		1.00
ENDRIN	72-20-8	SV			3.00E-04	3.00E-04		1.00
EPICHLOROHYDRIN	106-89-8	V	9.90E-03	4.20E-03	2.00E-03	2.86E-04		1.00
ETHION	563-12-2	SV			5.00E-04	5.00E-04	0.1	1.00
ETHYL ACETATE	141-78-6	V			9.00E-01	9.00E-01		1.00
ETHYLBENZENE	100-41-4	V			1.00E-01	2.90E-01		1.00
ETHYLENE DIAMINE	107-15-3	SV			9.00E-02	9.00E-02	0.1	1.00
ETHYLENE GLYCOL	107-21-1	SV			2.00E+00	2.00E+00	0.1	1.00
ETHYLENE GLYCOL, MONOBUTYL ETHER	111-76-2	SV			5.00E-01	3.70E+00	0.1	1.00
ETHYLENE OXIDE	75-21-8	V	1.00E+00	3.50E-01				1.00
ETHYL ETHER	60-29-7	V			2.00E-01	2.00E-01		1.00
FENAMIPHOS	22224-92-6	SV			2.50E-04	2.50E-04	0.1	1.00
FLUOMETURON	2164-17-2	SV			1.30E-02	1.30E-02	0.1	1.00
FLUORINE	7782-41-4	M			6.00E-02	6.00E-02		1.00
FOMESAFEN	72178-02-0	SV	1.90E-01	1.90E-01			0.1	1.00
FONOFOS	944-22-9	SV			2.00E-03	2.00E-03	0.1	1.00
FORMALDEHYDE	50-00-0	SV		4.50E-02	2.00E-01	2.00E-01	0.1	1.00
FURAN	110-00-9	V			1.00E-03	1.00E-03		1.00
FURFURAL	98-01-1	SV			3.00E-03	1.00E-02	0.1	1.00
GLYPHOSATE	1071-83-6	SV			1.00E-01	1.00E-01	0.1	1.00
HEPTACHLOR	76-44-8	SV	4.50E+00	4.50E+00	5.00E-04	5.00E-04	0.1	1.00
HEPTACHLOR EPOXIDE	1024-57-3	SV	9.10E+00	9.10E+00	1.30E-05	1.30E-05	0.1	1.00
HEXABROMOBENZENE	87-82-1	SV			2.00E-03	2.00E-03	0.1	1.00
HEXACHLOROBENZENE	118-74-1	SV	1.60E+00	1.60E+00	8.00E-04	8.00E-04	0.1	1.00
HEXACHLOROBUTADIENE	87-68-3	SV	7.80E-02	7.80E-02	2.00E-04	2.00E-04	0.1	1.00
ALPHA-HCH	319-84-6	SV	6.30E+00	6.30E+00			0.1	1.00
BETA-HCH	319-85-7	SV	1.80E+00	1.80E+00			0.1	1.00
GAMMA-HCH (LINDANE)	58-89-9	SV	1.30E+00	1.30E+00	3.00E-04	3.00E-04	0.04	1.00
TECHNICAL HCH	608-73-1	SV	1.80E+00	1.80E+00			0.1	1.00
HEXACHLOROCYCLOPENTADIENE	77-47-4	SV			6.00E-03	5.7E-05	0.1	1.00
HEXACHLORODIBENZODIOXIN MIX	19408-74-3	SV	6.20E+03	4.55E+03			0.1	1.00
HEXACHLOROETHANE	67-72-1	SV	1.40E-02	1.40E-02	1.00E-03	1.00E-03	0.1	1.00
HEXACHLOROPHENE	70-30-4	SV			3.00E-04	3.00E-04	0.1	1.00
1,6-HEXAMETHYLENE DIISOCYANATE	822-06-0	SV				2.90E-06	0.1	1.00
HEXANE	110-54-3	V			1.10E+01	5.71E-02		1.00
HMX	2691-41-0	SV			5.00E-02	5.00E-02	0.1	1.00
HYDRAZINE	302-01-2	V	3.00E+00	1.70E+01				1.00
HYDROGEN CHLORIDE	7647-01-0	V				5.70E-03		1.00
HYDROGEN SULFIDE	7783-06-4	V			3.00E-03	5.7E-04		1.00
HYDROQUINONE	123-31-9	SV	5.6E-02	5.6E-02	4.00E-02	4.00E-02	0.1	1.00
IRON	7439-89-6	M			3.00E-01	3.00E-01		1.00
ISOBUTANOL	78-83-1	V			3.00E-01	3.00E-01		1.00
ISOPHORONE	78-59-1	SV	9.50E-04	9.50E-04	2.00E-01	2.00E-01	0.1	1.00
TETRAETHYLLEAD	78-00-2	V			1.00E-07	1.00E-07		1.00
KEPONE	143-50-0	SV	8.00E+00	8.00E+00	2.00E-04	2.00E-04	0.1	1.00
LITHIUM	7439-93-2	M			2.00E-02	2.00E-02		1.00
MALATHION	121-75-5	SV			2.00E-02	2.00E-02	0.1	1.00

Yellow-highlighted inhalation toxicity factors adapted from the oral factors. Blue highlights from IRIS.

Chemical	StdCAS	Group	SFo (Kg-day/mg)	SFi (Kg-day/mg)	RfDo (mg/Kg-day)	RfDi (mg/Kg-day)	ABS	GI Factor
MALEIC ANHYDRIDE	108-31-6	SV			1.00E-01	1.00E-01	0.1	1.00
MANGANESE-FOOD	7439-96-5	M			1.40E-01	1.43E-05		0.04
MEPHOSFOLAN	950-10-7	SV			9.00E-05	9.00E-05	0.1	1.00
MEPIQUAT CHLORIDE	24307-26-4	SV			3.00E-02	3.00E-02	0.1	1.00
MERCURIC CHLORIDE	7487-94-7	M			3.00E-04	3.00E-04		0.07
MERCURY (elemental)	7439-97-6	M				8.60E-05		1.00
METHYLMERCURY	22967-92-6	V			1.00E-04	1.00E-04		1.00
METHANOL	67-56-1	V			5.00E-01	5.00E-01		1.00
METHIDATHION	950-37-8	SV			1.00E-03	1.00E-03	0.1	1.00
METHOXYCHLOR	72-43-5	SV			5.00E-03	5.00E-03	0.1	1.00
METHYL ACETATE	79-20-9	V			1.00E+00	1.00E+00		1.00
METHYL ACRYLATE	96-33-3	V			3.00E-02	3.00E-02		1.00
2-METHYLANILINE	95-53-4	SV	2.40E-01	2.40E-01			0.1	1.00
4-(2-METHYL-4-CHLOROPHENOXY) BUTYRIC ACID	94-81-5	SV			1.00E-02	1.00E-02	0.1	1.00
2-METHYL-4-CHLOROPHENOXYACETIC ACID (MCPA)	94-74-6	SV			5.00E-04	5.00E-04	0.1	1.00
2-(2-METHYL-4-CHLOROPHENOXY)PROPIONIC ACID (MCPP)	93-65-2	SV			1.00E-03	1.00E-03	0.1	1.00
METHYLCYCLOHEXANE	108-87-2	V				8.60E-01		1.00
METHYLENE BROMIDE	74-95-3	V			1.00E-02	1.00E-02		1.00
METHYLENE CHLORIDE	75-09-2	V	7.50E-03	1.65E-03	6.00E-02	3.00E-01		1.00
4,4'-METHYLENE BIS(2-CHLOROANILINE)	101-14-4	SV	1.30E-01	1.30E-01	7.00E-04	7.00E-04	0.1	1.00
4,4'-METHYLENE BIS(N,N'-DIMETHYL)ANILINE	101-61-1	SV	4.60E-02	4.60E-02			0.1	1.00
4,4'-METHYLENEDIPHENYL ISOCYANATE	101-68-8	SV				1.7E-04	0.1	1.00
METHYL ETHYL KETONE (2-BUTANONE)	78-93-3	V			6.00E-01	1.40E+00		1.00
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	108-10-1	V				8.60E-01		1.00
METHYL METHACRYLATE	80-62-6	V			1.40E+00	2.00E-01		1.00
METHYL PARATHION	298-00-0	SV			2.50E-04	2.50E-04	0.1	1.00
2-METHYLPHENOL	95-48-7	SV			5.00E-02	5.00E-02	0.1	1.00
3-METHYLPHENOL	108-39-4	SV			5.00E-02	5.00E-02	0.1	1.00
4-METHYLPHENOL	106-44-5	SV			5.00E-03	5.00E-03	0.1	1.00
METHYLSTYRENE MIX	25013-15-4	V			6.00E-03	1.00E-02		1.00
ALPHA-METHYLSTYRENE	98-83-9	V			7.00E-02	7.00E-02		1.00
METHYL TERT-BUTYL ETHER	1634-04-4	V	4.00E-03	4.00E-03		8.57E-01		1.00
METOLACHLOR (DUAL)	51218-45-2	SV			1.50E-01	1.50E-01	0.1	1.00
MIREX	2385-85-5	SV			2.00E-04	2.00E-04	0.1	1.00
MOLYBDENUM	7439-98-7	M			5E-03	5E-03		1.00
MONOCHLORAMINE	10599-90-3	SV			1E-01	1.00E-01	0.1	1.00
NALED	300-76-5	SV			2E-03	2E-03	0.1	1.00
NICKEL REFINERY DUST	NA	M		8.4E-01				1.00
NICKEL	7440-02-0	M			2.00E-02	2.00E-02		1.00
NITRATE	14797-55-8	M			1.60E+00	1.60E+00		1.00
NITRITE	14797-65-0	M			1.00E-01	1.00E-01		1.00
2-NITROANILINE	88-74-4	SV			3.00E-03	3.00E-05	0.1	1.00
3-NITROANILINE	99-09-2	SV	2.00E-02	2.00E-02	3.00E-04	3.00E-04	0.1	1.00
4-NITROANILINE	100-01-6	SV	2.00E-02	2.00E-02	3.00E-03	1.00E-03	0.1	1.00
NITROBENZENE	98-95-3	V			5.00E-04	6.00E-04		1.00
NITROGLYCERIN	55-63-0	SV	1.4E-02	1.4E-02			0.1	1.00
NITROGUANIDINE	556-88-7	SV			1.00E-01	1.00E-01	0.1	1.00
2-NITROPROPANE	79-46-9	V		9.40E+00		5.70E-03		1.00
N-NITROSO-DI-N-BUTYLAMINE	924-16-3	V	5.40E+00	5.60E+00				1.00
N-NITROSODIETHANOLAMINE	1116-54-7	SV	2.80E+00	2.80E+00			0.1	1.00
N-NITROSODIETHYLAMINE	55-18-5	SV	1.50E+02	1.50E+02			0.1	1.00
N-NITROSODIMETHYLAMINE	62-75-9	SV	5.10E+01	5.10E+01	8.00E-06	8.00E-06	0.1	1.00
N-NITROSODIPHENYLAMINE	86-30-6	SV	4.90E-03	4.90E-03	2.00E-02	2.00E-02	0.1	1.00
N-NITROSODIPROPYLAMINE	621-64-7	SV	7.00E+00	7.00E+00			0.1	1.00
N-NITROSO-N-METHYLETHYLAMINE	10595-95-6	SV	2.20E+01	2.20E+01			0.1	1.00
N-NITROSOPYRROLIDINE	930-55-2	SV	2.10E+00	2.10E+00			0.1	1.00
M-NITROTOLUENE	99-08-1	V			2.00E-02	2.00E-02		1.00
O-NITROTOLUENE	88-72-2	V	2.30E-01	2.30E-01	1.00E-02	1.00E-02		1.00
P-NITROTOLUENE	99-99-0	V	1.7E-02	1.7E-02	1.00E-02	1.00E-02		1.00
NUSTAR	85509-19-9	SV			7.00E-04	7.00E-04	0.1	1.00
ORYZALIN	19044-88-3	SV			5.00E-02	5.00E-02	0.1	1.00
OXADIAZON	19666-30-9	SV			5.00E-03	5.00E-03	0.1	1.00
OXAMYL	23135-22-0	SV			2.50E-02	2.50E-02	0.1	1.00
OXYFLUORFEN	42874-03-3	SV			3.00E-03	3.00E-03	0.1	1.00
PARAQUAT DICHLORIDE	1910-42-5	SV			4.50E-03	4.50E-03	0.1	1.00
PARATHION	56-38-2	SV			6.00E-03	6.00E-03	0.1	1.00
PENTACHLOROBENZENE	608-93-5	SV			8.00E-04	8.00E-04	0.1	1.00
PENTACHLORONITROBENZENE	82-68-8	SV	2.60E-01	2.60E-01	3.00E-03	3.00E-03	0.1	1.00
PENTACHLOROPHENOL	87-86-5	SV	1.20E-01	1.20E-01	3.00E-02	3.00E-02	0.25	1.00
Pentaerythritoltetranitrate	78-11-5	SV	1.10E-01	1.10E-01	3.00E-03	3.00E-03	0.1	1.00
PERCHLORATE	7601-90-3	M			7.00E-04	7.00E-04		1.00
PERMETHRIN	52645-53-1	SV			5.00E-02	5.00E-02	0.1	1.00

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PHENOL	108-95-2	SV			3.00E-01	3.00E-01	0.1	1.00
M-PHENYLENEDIAMINE	108-45-2	SV			6.00E-03	6.00E-03	0.1	1.00
O-PHENYLENEDIAMINE	95-54-5	SV	4.70E-02	4.70E-02			0.1	1.00
P-PHENYLENEDIAMINE	106-50-3	SV			1.90E-01	1.90E-01	0.1	1.00
PHOSPHINE	7803-51-2	SV			3.00E-04	8.60E-05	0.1	1.00
PHOSPHORIC ACID	7664-38-2	M				2.90E-03		1.00
PHOSPHORUS (WHITE)	7723-14-0	M			2.00E-05	2.00E-05		1.00
PHTHALIC ANHYDRIDE	85-44-9	SV			2.00E+00	3.43E-02	0.1	1.00
POLYBROMINATED BIPHENYLS	NA	SV	8.90E+00	8.90E+00	7.00E-06	7.00E-06	0.1	1.00
POLYCHLORINATED BIPHENYLS	1336-36-3	SV	2.00E+00	2.00E+00			0.14	1.00
AROCLOR-1016	12674-11-2	SV	7.00E-02	7.00E-02	7.00E-05	7.00E-05	0.14	1.00
AROCLOR-1221	11104-28-2	SV	2.00E+00	2.00E+00			0.14	1.00
AROCLOR-1232	11141-16-5	SV	2.00E+00	2.00E+00			0.14	1.00
AROCLOR-1242	53469-21-9	SV	2.00E+00	2.00E+00			0.14	1.00
AROCLOR-1248	12672-29-6	SV	2.00E+00	2.00E+00			0.14	1.00
AROCLOR-1254	11097-69-1	SV	2.00E+00	2.00E+00	2.00E-05	2.00E-05	0.14	1.00
AROCLOR-1260	11096-82-5	SV	2.00E+00	2.00E+00			0.14	1.00
POLYCHLORINATED TERPHENYLS	61788-33-8	SV	4.50E+00	4.50E+00			0.1	1.00
POLYNUCLEAR AROMATIC HYDROCARBONS:	NA	SV					0.1	1.00
ACENAPHTHENE	83-32-9	V			6.00E-02	6.00E-02	0.13	1.00
ANTHRACENE	120-12-7	V			3.00E-01	3.00E-01	0.13	1.00
BENZ[A]ANTHRACENE	56-55-3	SV	7.30E-01	7.30E-01			0.13	1.00
BENZO[B]FLUORANTHENE	205-99-2	SV	7.30E-01	7.30E-01			0.13	1.00
BENZO[K]FLUORANTHENE	207-08-9	SV	7.30E-02	7.30E-02			0.13	1.00
BENZO[A]PYRENE	50-32-8	SV	7.30E+00	3.10E+00			0.13	1.00
CARBAZOLE	86-74-8	SV	2.00E-02	2.00E-02			0.13	1.00
CHRYSENE	218-01-9	SV	7.30E-03	7.30E-03			0.13	1.00
DIBENZ[A,H]ANTHRACENE	53-70-3	SV	7.30E+00	7.30E+00			0.13	1.00
FLUORANTHENE	206-44-0	SV			4.00E-02	4.00E-02	0.13	1.00
FLUORENE	86-73-7	V			4.00E-02	4.00E-02	0.13	1.00
INDENO[1,2,3-C,D]PYRENE	193-39-5	SV	7.30E-01	7.30E-01			0.13	1.00
2-METHYLNAPHTHALENE	91-57-6	V			4.00E-03	4.00E-03	0.13	1.00
NAPHTHALENE	91-20-3	V			2.00E-02	9.00E-04	0.13	1.00
PYRENE	129-00-0	V			3.00E-02	3.00E-02	0.13	1.00
PROMETON	1610-18-0	SV			1.50E-02	1.50E-02	0.1	1.00
PROMETRYN	7287-19-6	SV			4.00E-03	4.00E-03	0.1	1.00
PROPACHLOR	1918-16-7	SV			1.30E-02	1.30E-02	0.1	1.00
PROPARGITE	2312-35-8	SV			2.00E-02	2.00E-02	0.1	1.00
PROPYLENE GLYCOL	57-55-6	SV			5.00E-01	8.6E-04	0.1	1.00
PROPYLENE GLYCOL, MONOETHYL ETHER	52125-53-8	SV			7.00E-01	7.00E-01	0.1	1.00
PROPYLENE GLYCOL, MONOMETHYL ETHER	107-98-2	SV			7.00E-01	5.70E-01	0.1	1.00
PURSUIT	81335-77-5	SV			2.50E-01	2.50E-01	0.1	1.00
PYRIDINE	110-86-1	SV			1.00E-03	1.00E-03	0.1	1.00
QUINOLINE	91-22-5	SV	3.00E+00	3.00E+00			0.1	1.00
RDX	121-82-4	SV	1.10E-01	1.10E-01	3.00E-03	3.00E-03	0.1	1.00
RESMETHRIN	10453-86-8	SV			3.00E-02	3.00E-02	0.1	1.00
ROTENONE	83-79-4	SV			4.00E-03	4.00E-03	0.1	1.00
SELENIUM	7782-49-2	M			5.00E-03	5.00E-03		1.00
SILVER	7440-22-4	M			5.00E-03	5.00E-03		0.04
SIMAZINE	122-34-9	SV	1.20E-01	1.20E-01	5.00E-03	5.00E-03	0.1	1.00
SODIUM DIETHYLDITHIOCARBAMATE	148-18-5	SV	2.70E-01	2.70E-01	3.00E-02	3.00E-02	0.1	1.00
STRONTIUM, STABLE	7440-24-6	M			6.00E-01	6.00E-01		1.00
STRYCHNINE	57-24-9	SV			3.00E-04	3.00E-04	0.1	1.00
STYRENE	100-42-5	V			2.00E-01	2.86E-01		1.00
2,3,7,8-TETRACHLORODIBENZODIOXIN	1746-01-6	SV	1.50E+05	1.50E+05			0.03	1.00
1,2,4,5-TETRACHLOROBENZENE	95-94-3	SV			3.00E-04	3.00E-04	0.1	1.00
1,1,1,2-TETRACHLOROETHANE	630-20-6	V	2.60E-02	2.60E-02	3.00E-02	3.00E-02		1.00
1,1,2,2-TETRACHLOROETHANE	79-34-5	V	2.00E-01	2.00E-01	6.00E-02	6.00E-02		1.00
TETRACHLOROETHENE	127-18-4	V	5.4E-01	2.00E-02	1.00E-02	1.4E-01		1.00
2,3,4,6-TETRACHLOROPHENOL	58-90-2	SV			3.00E-02	3.00E-02	0.1	1.00
P,A,A,A-TETRACHLOROTOLUENE	5216-25-1	SV	2.00E+01	2.00E+01			0.1	1.00
1,1,1,2-TETRAFLUOROETHANE	811-97-2	V				2.29E+01		1.00
TETRAHYDROFURAN	109-99-9	SV	7.6E-03	6.8E-03	2.00E-01	8.6E-02	0.1	1.00
TETRYL	479-45-8	SV			4.00E-03	4.00E-03	0.1	1.00
THALLIUM	7440-28-0	M			7.00E-05	7.00E-05		1.00
THALLIUM ACETATE	563-68-8	M			9.00E-05	9.00E-05		1.00
THALLIUM CARBONATE	6533-73-9	M			8.00E-05	8.00E-05		1.00
THALLIUM CHLORIDE	7791-12-0	M			8.00E-05	8.00E-05		1.00
THALLIUM NITRATE	10102-45-1	M			9.00E-05	9.00E-05		1.00
THALLIUM SULFATE (2:1)	7446-18-6	M			8.00E-05	8.00E-05		1.00
THIOBENCARB	28249-77-6	SV			1.00E-02	1.00E-02	0.1	1.00
TIN	7440-31-5	M			6.00E-01	6.00E-01		1.00

Yellow-highlighted inhalation toxicity factors adapted from the oral factors. Blue highlights from IRIS.

Chemical	StdCAS	Group	SFo (Kg-day/mg)	SFi (Kg-day/mg)	RfDo (mg/Kg-day)	RfDi (mg/Kg-day)	ABS	GI Factor
TITANIUM	7440-32-6	M			4.00E+00	8.60E-03		1.00
TITANIUM DIOXIDE	13463-67-7	M			4.00E+00	8.60E-03		1.00
TOLUENE	108-88-3	V			2.00E-01	1.14E-01		1.00
TOLUENE-2,4-DIAMINE	95-80-7	SV	3.20E+00	3.20E+00			0.1	1.00
TOLUENE-2,5-DIAMINE	95-70-5	SV			6.00E-01	6.00E-01	0.1	1.00
TOLUENE-2,6-DIAMINE	823-40-5	SV			2.00E-01	2.00E-01	0.1	1.00
P-TOLUIDINE	106-49-0	SV	1.90E-01	1.90E-01			0.1	1.00
TOXAPHENE	8001-35-2	SV	1.10E+00	1.10E+00			0.1	1.00
1,2,4-TRIBROMOBENZENE	615-54-3	SV			5.00E-03	5.00E-03	0.1	1.00
TRIBUTYLTIN OXIDE	56-35-9	SV			3.00E-04	3.00E-04	0.1	1.00
2,4,6-TRICHLOROANILINE	634-93-5	SV	3.40E-02	3.40E-02			0.1	1.00
1,2,4-TRICHLOROBENZENE	120-82-1	V			1.00E-02	1.00E-03		1.00
1,1,1-TRICHLOROETHANE	71-55-6	V			2.80E-01	6.30E-01		1.00
1,1,2-TRICHLOROETHANE	79-00-5	V	5.70E-02	5.60E-02	4.00E-03	4.00E-03		1.00
TRICHLOROETHENE	79-01-6	V	4.00E-01	4.00E-01	3.00E-04	1.00E-02		1.00
TRICHLOROFLUOROMETHANE	75-69-4	V			3.00E-01	2.00E-01		1.00
2,4,5-TRICHLOROPHENOL	95-95-4	SV			1.00E-01	1.00E-01	0.1	1.00
2,4,6-TRICHLOROPHENOL	88-06-2	SV	1.10E-02	1.00E-02			0.1	1.00
2,4,5-T	93-76-5	SV			1.00E-02	1.00E-02	0.1	1.00
2-(2,4,5-TRICHLOROPHENOXY)PROPIONIC ACID	93-72-1	SV			8.00E-03	8.00E-03	0.1	1.00
1,1,2-TRICHLOROPROPANE	598-77-6	V			5.00E-03	5.00E-03		1.00
1,2,3-TRICHLOROPROPANE	96-18-4	V	2.00E+00	2.00E+00	6.00E-03	1.4E-03		1.00
1,2,3-TRICHLOROPROPENE	96-19-5	V			1.00E-02	3.00E-04		1.00
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	76-13-1	V			3.00E+01	8.60E+00		1.00
1,2,4-TRIMETHYLBENZENE	95-63-6	V			5.00E-02	1.70E-03		1.00
1,3,5-TRIMETHYLBENZENE	108-67-8	V			5.00E-02	1.70E-03		1.00
1,3,5-TRINITROBENZENE	99-35-4	SV			3.00E-02	3.00E-02	0.1	1.00
2,4,6-TRINITROTOLUENE	118-96-7	SV	3.00E-02	3.00E-02	5.00E-04	5.00E-04	0.1	1.00
URANIUM (SOLUBLE SALTS; from IRIS)	7440-61-1	M			3.00E-03	3.00E-03		1.00
URANIUM (SOLUBLE SALTS; provisional)	7440-61-1	M			2.00E-04	2.00E-04		1.00
VANADIUM	7440-62-2	M			1.00E-03	1.00E-03		0.03
VINCLOZOLIN	50471-44-8	SV			2.50E-02	2.50E-02	0.1	1.00
VINYL ACETATE	108-05-4	V			1.00E+00	5.71E-02		1.00
VINYL CHLORIDE: adult (see cover memos)	75-01-4	V	7.20E-01	1.5E-02	3.00E-03	2.8E-02		1.00
WARFARIN	81-81-2	SV			3.00E-04	3.00E-04	0.1	1.00
O-XYLENE	95-47-6	V			2.00E-01	3.00E-02		1.00
M,P-XYLENES	1330-20-7	V			2.00E-01	3.00E-02		1.00
XYLENES	1330-20-7	V			2.00E-01	3.00E-02		1.00
ZINC	7440-66-6	M			3.00E-01	3.00E-01		1.00
ZINEB	12122-67-7	SV			5E-02	5E-02	0.1	1.00

APPENDIX C

Risk-Based Soil Concentrations for the Industrial Worker

Appendix C
Risk-based Soil Concentrations for the Industrial Worker
Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

			Carcinogenic Risk-based Concentration (mg/Kg)				Non-carcinogenic Risk-based Concentration (mg/Kg)					
Chemical	**CAS No.**	**Group**	**Oral**	**Dermal**	**Inhalation**	**Combined**	**Oral**	**Dermal**	**Inhalation**	**Combined**	**Final**	**Basis**
ACETALDEHYDE	75-07-0	V			1.90E+05	1.90E+05			6.71E+05	6.71E+05	1.90E+05	C
ACETOCHLOR	34256-82-1	SV					2.04E+04		5.22E+06	2.04E+04	2.04E+04	NC
ACETONE	67-64-1	V					9.20E+05		2.35E+08	9.16E+05	9.16E+05	NC
ACETONITRILE	75-05-8	V							4.44E+06	4.44E+06	4.44E+06	NC
ACETOPHENONE	98-86-2	V					1.02E+05		2.61E+07	1.02E+05	1.02E+05	NC
ACROLEIN	107-02-8	V					5.11E+02		1.49E+03	3.80E+02	3.80E+02	NC
ACRYLAMIDE	79-06-1	SV	6.36E-01		3.25E+02	6.35E-01	2.04E+02		5.22E+04	2.04E+02	6.35E-01	C
ACRYLONITRILE	107-13-1	V	5.30E+00		6.09E+03	5.29E+00	1.02E+03		1.49E+05	1.02E+03	5.29E+00	C
ALACHLOR	15972-60-8	SV	3.58E+01		1.83E+04	3.57E+01	1.02E+04		2.61E+06	1.02E+04	3.57E+01	C
ALAR	1596-84-5	SV					1.53E+05		3.92E+07	1.53E+05	1.53E+05	NC
ALDICARB	116-06-3	SV					1.02E+03		2.61E+05	1.02E+03	1.02E+03	NC
ALDICARB SULFONE	1646-88-4	SV					1.02E+03		2.61E+05	1.02E+03	1.02E+03	NC
ALDRIN	309-00-2	SV	1.68E-01		8.60E+01	1.68E-01	3.07E+01		7.83E+03	3.05E+01	1.68E-01	C
ALLYL CHLORIDE	107-05-1	V							7.46E+04	7.46E+04	7.46E+04	NC
ALUMINUM	7429-90-5	M					1.02E+06		2.61E+05	2.08E+05	2.08E+05	NC
AMINODINITROTOLUENES	NA	SV					2.04E+03		5.22E+05	2.04E+03	2.04E+03	NC
AMMONIA	7664-41-7	V							7.47E+06	7.47E+06	7.47E+06	NC
ANILINE	62-53-3	SV	5.02E+02		2.57E+05	5.01E+02	7.15E+03		7.57E+04	6.54E+03	5.01E+02	C
ANTIMONY	7440-36-0	M					4.09E+02		1.04E+05	4.07E+02	4.07E+02	NC
ANTIMONY TRIOXIDE	1309-64-4	M					4.09E+02		1.49E+04	3.98E+02	3.98E+02	NC
ARSENIC	7440-38-2	M	1.91E+00	9.64E+00	9.68E+01	1.57E+00	3.07E+02	1.55E+03	7.83E+04	2.55E+02	1.57E+00	C
ARSINE	7784-42-1	V							3.66E+03	3.66E+03	3.66E+03	NC
ASSURE	76578-14-8	SV					9.20E+03		2.35E+06	9.16E+03	9.16E+03	NC
ATRAZINE	1912-24-9	SV	1.30E+01		6.65E+03	1.30E+01	3.58E+04		9.14E+06	3.56E+04	1.30E+01	C
BARIUM	7440-39-3	M					7.15E+04		3.66E+04	2.42E+04	2.42E+04	NC
BAYGON	114-26-1	SV					4.09E+03		1.04E+06	4.07E+03	4.07E+03	NC
BAYTHROID	68359-37-5	SV					2.56E+04		6.53E+06	2.55E+04	2.55E+04	NC
BENTAZON	25057-89-0	SV					3.07E+04	3.57E+04	7.83E+06	1.65E+04	1.65E+04	NC
BENZALDEHYDE	100-52-7	SV					1.02E+05		2.61E+07	1.02E+05	1.02E+05	NC
BENZENE	71-43-2	V	5.20E+01		5.42E+04	5.20E+01	4.09E+03		2.25E+06	4.08E+03	5.20E+01	C
BENZENETHIOL	108-98-5	V					1.02E+01		2.61E+03	1.02E+01	1.02E+01	NC
BENZIDINE	92-87-5	SV	1.24E-02		6.36E+00	1.24E-02	3.07E+03		7.83E+05	3.05E+03	1.24E-02	C
BENZOIC ACID	65-85-0	SV					4.09E+06		1.04E+09	4.07E+06	4.07E+06	NC
BENZYL ALCOHOL	100-51-6	SV					3.07E+05		7.83E+07	3.05E+05	3.05E+05	NC
BENZYL CHLORIDE	100-44-7	V	1.68E+01		8.60E+03	1.68E+01	2.04E+03		5.22E+05	2.04E+03	1.68E+01	C
BERYLLIUM	7440-41-7	M			1.74E+02	1.74E+02	2.04E+03		1.49E+03	8.61E+02	1.74E+02	C
BIPHENYL	92-52-4	V					5.11E+04		1.31E+07	5.09E+04	5.09E+04	NC
BIS(2-CHLOROETHYL)ETHER	111-44-4	V	2.60E+00		1.33E+03	2.60E+00					2.60E+00	C
BIS(2-CHLOROISOPROPYL)ETHER	108-60-1	V	4.09E+01		4.18E+04	4.08E+01	4.09E+04		1.04E+07	4.07E+04	4.08E+01	C
BIS(CHLOROMETHYL)ETHER	542-88-1	V	1.30E-02		6.65E+00	1.30E-02					1.30E-02	C
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	SV	2.04E+02		1.04E+05	2.04E+02	2.04E+04		5.22E+06	2.04E+04	2.04E+02	C
BORON	7440-42-8	M					2.04E+05		1.49E+06	1.80E+05	1.80E+05	NC
BROMOBENZENE	108-86-1	V					2.04E+04		7.83E+05	1.99E+04	1.99E+04	NC
BROMODICHLOROMETHANE	75-27-4	V	4.62E+01		2.36E+04	4.61E+01	2.04E+04		5.22E+06	2.04E+04	4.61E+01	C
BROMOETHENE	593-60-2	V			1.33E+04	1.33E+04			2.25E+05	2.25E+05	1.33E+04	C
BROMOFORM	75-25-2	SV	3.62E+02		3.75E+05	3.62E+02	2.04E+04		5.22E+06	2.04E+04	3.62E+02	C
BROMOMETHANE	74-83-9	V					1.43E+03		3.66E+05	1.43E+03	1.43E+03	NC
BROMOPHOS	2104-96-3	SV					5.11E+03		1.31E+06	5.09E+03	5.09E+03	NC
1,3-BUTADIENE	106-99-0	V			1.46E+04	1.46E+04			1.49E+05	1.49E+05	1.46E+04	C
1-BUTANOL	71-36-3	SV					1.02E+05		2.61E+07	1.02E+05	1.02E+05	NC
BUTYLBENZYLPHTHALATE	85-68-7	SV	1.51E+03		7.70E+05	1.50E+03	2.04E+05		5.22E+07	2.04E+05	1.50E+03	C
CADMIUM-FOOD	7440-43-9	M			2.32E+02	2.32E+02	1.02E+03	6.19E+06	1.49E+04	9.56E+02	2.32E+02	C
CAPROLACTAM	105-60-2	SV					5.11E+05		1.31E+08	5.09E+05	5.09E+05	NC
CARBARYL	63-25-2	SV					1.02E+05		2.61E+07	1.02E+05	1.02E+05	NC

Appendix C
Risk-based Soil Concentrations for the Industrial Worker
Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

			Carcinogenic Risk-based Concentration (mg/Kg)				Non-carcinogenic Risk-based Concentration (mg/Kg)					
Chemical	**CAS No.**	**Group**	**Oral**	**Dermal**	**Inhalation**	**Combined**	**Oral**	**Dermal**	**Inhalation**	**Combined**	**Final**	**Basis**
CARBON DISULFIDE	75-15-0	V					1.02E+05		5.22E+07	1.02E+05	1.02E+05	NC
CARBON TETRACHLORIDE	56-23-5	V	2.20E+01		2.76E+04	2.20E+01	7.15E+02		1.31E+07	7.15E+02	2.20E+01	C
CARBOSULFAN	55285-14-8	SV					1.02E+04		2.61E+06	1.02E+04	1.02E+04	NC
CHLORAL HYDRATE	302-17-0	SV					1.02E+05		2.61E+07	1.02E+05	1.02E+05	NC
CHLORANIL	118-75-2	SV	7.15E+00		3.66E+03	7.14E+00					7.14E+00	C
CHLORDANE	57-74-9	SV	8.18E+00	3.10E+01	4.18E+03	6.46E+00	5.11E+02	1.94E+03	5.22E+04	4.01E+02	6.46E+00	C
CHLORINE	7782-50-5	V					1.02E+05		1.49E+04	1.30E+04	1.30E+04	NC
CHLORINE DIOXIDE	10049-04-4	V					3.07E+04		1.49E+04	1.00E+04	1.00E+04	NC
CHLOROACETIC ACID	79-11-8	SV					2.04E+03		5.22E+05	2.04E+03	2.04E+03	NC
4-CHLOROANILINE	106-47-8	SV	5.30E+01		2.71E+04	5.29E+01	4.09E+03		1.04E+06	4.07E+03	5.29E+01	C
CHLOROBENZENE	108-90-7	V					2.04E+04		4.44E+06	2.03E+04	2.03E+04	NC
2-CHLORO-1,3-BUTADIENE	126-99-8	V					2.04E+04		5.22E+05	1.97E+04	1.97E+04	NC
1-CHLORO-1,1-DIFLUOROETHANE	75-68-3	V							3.66E+09	3.66E+09	3.66E+09	NC
CHLORODIFLUOROMETHANE	75-45-6	V							3.66E+09	3.66E+09	3.66E+09	NC
CHLOROETHANE	75-00-3	V	9.87E+02		5.04E+05	9.85E+02	4.09E+05		7.57E+08	4.09E+05	9.85E+02	C
CHLOROFORM	67-66-3	V			1.81E+04	1.81E+04	1.02E+04		3.66E+06	1.02E+04	1.02E+04	NC
CHLOROMETHANE	74-87-3	V							6.79E+06	6.79E+06	6.79E+06	NC
4-CHLORO-2-METHYLANILINE	95-69-2	SV	4.93E+00		2.52E+03	4.92E+00					4.92E+00	C
BETA-CHLORONAPHTHALENE	91-58-7	V					8.18E+04		2.09E+07	8.14E+04	8.14E+04	NC
O-CHLORONITROBENZENE	88-73-3	V	2.95E+02		1.51E+05	2.94E+02	1.02E+03		5.22E+03	8.55E+02	2.94E+02	C
P-CHLORONITROBENZENE	100-00-5	V	4.27E+02		2.18E+05	4.26E+02	1.02E+03		4.44E+04	9.99E+02	4.26E+02	C
2-CHLOROPHENOL	95-57-8	V					5.11E+03		1.31E+06	5.09E+03	5.09E+03	NC
2-CHLOROPROPANE	75-29-6	V							7.57E+06	7.57E+06	7.57E+06	NC
O-CHLOROTOLUENE	95-49-8	V					2.04E+04		5.22E+06	2.04E+04	2.04E+04	NC
CHLORPYRIFOS	2921-88-2	SV					3.07E+03		7.83E+05	3.05E+03	3.05E+03	NC
CHLORPYRIFOS-METHYL	5598-13-0	SV					1.02E+04		2.61E+06	1.02E+04	1.02E+04	NC
CHROMIUM	7440-47-3	M					1.53E+06		3.92E+08	1.53E+06	1.53E+06	NC
CHROMIUM III	16065-83-1	M					1.53E+06		3.92E+08	1.53E+06	1.53E+06	NC
CHROMIUM VI	18540-29-9	M			3.57E+01	3.57E+01	3.07E+03		7.83E+03	2.20E+03	3.57E+01	C
COBALT	7440-48-4	M			1.49E+02	1.49E+02	2.04E+04		1.49E+03	1.39E+03	1.49E+02	C
COKE OVEN EMISSIONS (COAL TAR)	8007-45-2	SV			6.65E+02	6.65E+02					6.65E+02	C
COPPER	7440-50-8	M					4.09E+04		1.04E+07	4.07E+04	4.07E+04	NC
CUMENE	98-82-8	V					1.02E+05		2.87E+07	1.02E+05	1.02E+05	NC
CYANIDE (FREE)	57-12-5	M					2.04E+04		5.22E+06	2.04E+04	2.04E+04	NC
CALCIUM CYANIDE	592-01-8	M					4.09E+04		1.04E+07	4.07E+04	4.07E+04	NC
COPPER CYANIDE	544-92-3	M					5.11E+03		1.31E+06	5.09E+03	5.09E+03	NC
CYANOGEN	460-19-5	V					4.09E+04		1.04E+07	4.07E+04	4.07E+04	NC
HYDROGEN CYANIDE	74-90-8	V					2.04E+04		2.25E+05	1.87E+04	1.87E+04	NC
POTASSIUM CYANIDE	151-50-8	M					5.11E+04		1.31E+07	5.09E+04	5.09E+04	NC
POTASSIUM SILVER CYANIDE	506-61-6	M					2.04E+05		5.22E+07	2.04E+05	2.04E+05	NC
SILVER CYANIDE	506-64-9	M					1.02E+05		2.61E+07	1.02E+05	1.02E+05	NC
SODIUM CYANIDE	143-33-9	M					4.09E+04		1.04E+07	4.07E+04	4.07E+04	NC
THIOCYANATE	NA	M					1.02E+02		2.61E+04	1.02E+02	1.02E+02	NC
ZINC CYANIDE	557-21-1	M					5.11E+04		1.31E+07	5.09E+04	5.09E+04	NC
CYCLOHEXANE	110-82-7	V							4.44E+08	4.44E+08	4.44E+08	NC
CYCLOHEXANONE	108-94-1	SV					5.11E+06		1.31E+09	5.09E+06	5.09E+06	NC
CYHALOTHRIN/KARATE	68085-85-8	SV					5.11E+03		1.31E+06	5.09E+03	5.09E+03	NC
CYPERMETHRIN	52315-07-8	SV					1.02E+04		2.61E+06	1.02E+04	1.02E+04	NC
DACTHAL	1861-32-1	SV					1.02E+04		2.61E+06	1.02E+04	1.02E+04	NC
DALAPON	75-99-0	SV					3.07E+04		7.83E+06	3.05E+04	3.05E+04	NC
DDD	72-54-8	SV	1.19E+01		6.09E+03	1.19E+01	2.04E+03		5.22E+05	2.04E+03	1.19E+01	C
DDE	72-55-9	SV	8.42E+00		4.30E+03	8.40E+00					8.40E+00	C
DDT	50-29-3	SV	8.42E+00	4.25E+01	4.30E+03	7.01E+00	5.11E+02	2.58E+03	1.31E+05	4.25E+02	7.01E+00	C
DIAZINON	333-41-5	SV					9.20E+02		2.35E+05	9.16E+02	9.16E+02	NC

Appendix C
Risk-based Soil Concentrations for the Industrial Worker
Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

			Carcinogenic Risk-based Concentration (mg/Kg)				Non-carcinogenic Risk-based Concentration (mg/Kg)					
Chemical	**CAS No.**	**Group**	**Oral**	**Dermal**	**Inhalation**	**Combined**	**Oral**	**Dermal**	**Inhalation**	**Combined**	**Final**	**Basis**
DIBENZOFURAN	132-64-9	V					2.04E+03		5.22E+05	2.04E+03	2.04E+03	NC
1,4-DIBROMOBENZENE	106-37-6	SV					1.02E+04		2.61E+06	1.02E+04	1.02E+04	NC
DIBROMOCHLOROMETHANE	124-48-1	V	3.41E+01		1.74E+04	3.40E+01	2.04E+04		5.22E+06	2.04E+04	3.40E+01	C
1,2-DIBROMO-3-CHLOROPROPANE	96-12-8	V	2.04E+00		6.09E+05	2.04E+00			1.49E+04	1.49E+04	2.04E+00	C
1,2-DIBROMOETHANE	106-93-4	V	1.43E+00		7.31E+02	1.43E+00	9.20E+03		6.79E+05	9.08E+03	1.43E+00	C
DIBUTYLPHTHALATE	84-74-2	SV					1.02E+05		2.61E+07	1.02E+05	1.02E+05	NC
DICAMBA	1918-00-9	SV					3.07E+04		7.83E+06	3.05E+04	3.05E+04	NC
1,2-DICHLOROBENZENE	95-50-1	V					9.20E+04		1.04E+07	9.12E+04	9.12E+04	NC
1,3-DICHLOROBENZENE	541-73-1	V					3.07E+03		7.83E+05	3.05E+03	3.05E+03	NC
1,4-DICHLOROBENZENE	106-46-7	V	1.19E+02		6.65E+04	1.19E+02	3.07E+04		5.98E+07	3.06E+04	1.19E+02	C
3,3'-DICHLOROBENZIDINE	91-94-1	SV	6.36E+00		3.25E+03	6.35E+00					6.35E+00	C
DICHLORODIFLUOROMETHANE	75-71-8	V					2.04E+05		1.31E+07	2.01E+05	2.01E+05	NC
1,1-DICHLOROETHANE	75-34-3	V					2.04E+05		3.66E+07	2.03E+05	2.03E+05	NC
1,2-DICHLOROETHANE	107-06-2	V	3.14E+01		1.61E+04	3.14E+01	2.04E+04		1.83E+08	2.04E+04	3.14E+01	C
1,1-DICHLOROETHENE	75-35-4	V					5.11E+04		1.57E+07	5.09E+04	5.09E+04	NC
CIS-1,2-DICHLOROETHENE	156-59-2	V					1.02E+04		2.61E+06	1.02E+04	1.02E+04	NC
TRANS-1,2-DICHLOROETHENE	156-60-5	V					2.04E+04		4.44E+06	2.03E+04	2.03E+04	NC
TOTAL 1,2-DICHLOROETHENE	540-59-0	V					9.20E+03		2.35E+06	9.16E+03	9.16E+03	NC
2,4-DICHLOROPHENOL	120-83-2	SV					3.07E+03		7.83E+05	3.05E+03	3.05E+03	NC
2,4-D	94-75-7	SV					1.02E+04	3.10E+04	2.61E+06	7.66E+03	7.66E+03	NC
4-(2,4-DICHLOROPHENOXY)BUTYRIC ACID	94-82-6	SV					8.18E+03		2.09E+06	8.14E+03	8.14E+03	NC
1,2-DICHLOROPROPANE	78-87-5	V	4.21E+01		2.15E+04	4.20E+01			2.98E+05	2.98E+05	4.20E+01	C
1,3-DICHLOROPROPANE	142-28-9	V					2.04E+04		5.22E+06	2.04E+04	2.04E+04	NC
2,3-DICHLOROPROPANOL	616-23-9	SV					3.07E+03		7.83E+05	3.05E+03	3.05E+03	NC
1,3-DICHLOROPROPENE	542-75-6	V	2.86E+01		1.46E+05	2.86E+01	3.07E+04		1.49E+06	3.00E+04	2.86E+01	C
DICHLORVOS	62-73-7	SV	9.87E+00		5.04E+03	9.85E+00	5.11E+02		3.73E+04	5.04E+02	9.85E+00	C
DIELDRIN	60-57-1	SV	1.79E-01		9.14E+01	1.79E-01	5.11E+01		1.31E+04	5.09E+01	1.79E-01	C
DIESEL EMISSIONS	NA	SV							3.66E+05	3.66E+05	3.66E+05	NC
DIETHYLPHTHALATE	84-66-2	SV					8.18E+05		2.09E+08	8.14E+05	8.14E+05	NC
DIETHYLENE GLYCOL, MONOBUTYL ETHER	112-34-5	SV					1.02E+04		1.49E+06	1.02E+04	1.02E+04	NC
DIETHYLENE GLYCOL, MONOETHYL ETHER	111-90-0	SV					6.13E+04		2.25E+05	4.82E+04	4.82E+04	NC
DI(2-ETHYLHEXYL)ADIPATE	103-23-1	SV	2.38E+03		1.22E+06	2.38E+03	6.13E+05		1.57E+08	6.11E+05	2.38E+03	C
DIETHYLSTILBESTROL	56-53-1	SV	6.09E-04		3.11E-01	6.08E-04					6.08E-04	C
DIFENZOQUAT (AVENGE)	43222-48-6	SV					8.18E+04		2.09E+07	8.14E+04	8.14E+04	NC
1,1-DIFLUOROETHANE	75-37-6	V							2.87E+09	2.87E+09	2.87E+09	NC
DIISOPROPYL METHYLPHOSPHONATE (DIMP)	1445-75-6	SV					8.18E+04		2.09E+07	8.14E+04	8.14E+04	NC
3,3'-DIMETHOXYBENZIDINE	119-90-4	SV	2.04E+02		1.04E+05	2.04E+02					2.04E+02	C
N,N-DIMETHYLANILINE	121-69-7	SV					2.04E+03		5.22E+05	2.04E+03	2.04E+03	NC
3,3'-DIMETHYLBENZIDINE	119-93-7	SV	1.24E+00		6.36E+02	1.24E+00					1.24E+00	C
2,4-DIMETHYLPHENOL	105-67-9	SV					2.04E+04		5.22E+06	2.04E+04	2.04E+04	NC
2,6-DIMETHYLPHENOL	576-26-1	SV					6.13E+02		1.57E+05	6.11E+02	6.11E+02	NC
3,4-DIMETHYLPHENOL	95-65-8	SV					1.02E+03		2.61E+05	1.02E+03	1.02E+03	NC
DIMETHYLPHTHALATE	131-11-3	SV					1.02E+07		2.61E+09	1.02E+07	1.02E+07	NC
1,2-DINITROBENZENE	528-29-0	SV					1.02E+02		2.61E+04	1.02E+02	1.02E+02	NC
1,3-DINITROBENZENE	99-65-0	SV					1.02E+02		2.61E+04	1.02E+02	1.02E+02	NC
1,4-DINITROBENZENE	100-25-4	SV					1.02E+02		2.61E+04	1.02E+02	1.02E+02	NC
4,6-DINITRO-O-CYCLOHEXYL PHENOL	131-89-5	SV					2.04E+03		5.22E+05	2.04E+03	2.04E+03	NC
4,6-DINITRO-2-METHYLPHENOL	534-52-1	SV					1.02E+02		2.61E+04	1.02E+02	1.02E+02	NC
2,4-DINITROPHENOL	51-28-5	SV					2.04E+03		5.22E+05	2.04E+03	2.04E+03	NC
DINITROTOLUENE MIX	NA	SV	4.21E+00		2.15E+03	4.20E+00					4.20E+00	C
2,4-DINITROTOLUENE	121-14-2	SV					2.04E+03		5.22E+05	2.04E+03	2.04E+03	NC
2,6-DINITROTOLUENE	606-20-2	SV					1.02E+03		2.61E+05	1.02E+03	1.02E+03	NC
DINOSEB	88-85-7	SV					1.02E+03		2.61E+05	1.02E+03	1.02E+03	NC
DIOCTYLPHTHALATE	117-84-0	SV					4.09E+04		1.04E+07	4.07E+04	4.07E+04	NC

Appendix C
Risk-based Soil Concentrations for the Industrial Worker
Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

			Carcinogenic Risk-based Concentration (mg/Kg)				Non-carcinogenic Risk-based Concentration (mg/Kg)					
Chemical	**CAS No.**	**Group**	**Oral**	**Dermal**	**Inhalation**	**Combined**	**Oral**	**Dermal**	**Inhalation**	**Combined**	**Final**	**Basis**
1,4-DIOXANE	123-91-1	SV	2.60E+02		1.33E+05	2.60E+02					2.60E+02	C
DIPHENYLAMINE	122-39-4	SV					2.56E+04		6.53E+06	2.55E+04	2.55E+04	NC
1,2-DIPHENYLHYDRAZINE	122-66-7	SV	3.58E+00		1.83E+03	3.57E+00					3.57E+00	C
DIQUAT	85-00-7	SV					2.25E+03		5.74E+05	2.24E+03	2.24E+03	NC
DISULFOTON	298-04-4	SV					4.09E+01		1.04E+04	4.07E+01	4.07E+01	NC
1,4-DITHIANE	505-29-3	SV					1.02E+04		2.61E+06	1.02E+04	1.02E+04	NC
DIURON	330-54-1	SV					2.04E+03		5.22E+05	2.04E+03	2.04E+03	NC
ENDOSULFAN	115-29-7	SV					6.13E+03		1.57E+06	6.11E+03	6.11E+03	NC
ENDRIN	72-20-8	SV					3.07E+02		7.83E+04	3.05E+02	3.05E+02	NC
EPICHLOROHYDRIN	106-89-8	V	2.89E+02		3.48E+05	2.89E+02	2.04E+03		7.47E+04	1.99E+03	2.89E+02	C
ETHION	563-12-2	SV					5.11E+02	7.74E+02	1.31E+05	3.07E+02	3.07E+02	NC
ETHYL ACETATE	141-78-6	V					9.20E+05		2.35E+08	9.16E+05	9.16E+05	NC
ETHYLBENZENE	100-41-4	V					1.02E+05		7.57E+07	1.02E+05	1.02E+05	NC
ETHYLENE DIAMINE	107-15-3	SV					9.20E+04	1.39E+05	2.35E+07	5.53E+04	5.53E+04	NC
ETHYLENE GLYCOL	107-21-1	SV					2.04E+06	3.10E+06	5.22E+08	1.23E+06	1.23E+06	NC
ETHYLENE GLYCOL, MONOBUTYL ETHER	111-76-2	SV					5.11E+05	7.74E+05	9.66E+08	3.08E+05	3.08E+05	NC
ETHYLENE OXIDE	75-21-8	V	2.86E+00		4.18E+03	2.86E+00					2.86E+00	C
ETHYL ETHER	60-29-7	V					2.04E+05		5.22E+07	2.04E+05	2.04E+05	NC
FENAMIPHOS	22224-92-6	SV					2.56E+02	3.87E+02	6.53E+04	1.54E+02	1.54E+02	NC
FLUOMETURON	2164-17-2	SV					1.33E+04	2.01E+04	3.39E+06	7.98E+03	7.98E+03	NC
FLUORINE	7782-41-4	M					6.13E+04		1.57E+07	6.11E+04	6.11E+04	NC
FOMESAFEN	72178-02-0	SV	1.51E+01	2.28E+01	7.70E+03	9.06E+00					9.06E+00	C
FONOFOS	944-22-9	SV					2.04E+03	3.10E+03	5.22E+05	1.23E+03	1.23E+03	NC
FORMALDEHYDE	50-00-0	SV			3.25E+04	3.25E+04	2.04E+05	3.10E+05	5.22E+07	1.23E+05	3.25E+04	C
FURAN	110-00-9	V					1.02E+03		2.61E+05	1.02E+03	1.02E+03	NC
FURFURAL	98-01-1	SV					3.07E+03	4.65E+03	2.61E+06	1.85E+03	1.85E+03	NC
GLYPHOSATE	1071-83-6	SV					1.02E+05	1.55E+05	2.61E+07	6.14E+04	6.14E+04	NC
HEPTACHLOR	76-44-8	SV	6.36E-01	9.64E-01	3.25E+02	3.83E-01	5.11E+02	7.74E+02	1.31E+05	3.07E+02	3.83E-01	C
HEPTACHLOR EPOXIDE	1024-57-3	SV	3.14E-01	4.76E-01	1.61E+02	1.89E-01	1.33E+01	2.01E+01	3.39E+03	7.98E+00	1.89E-01	C
HEXABROMOBENZENE	87-82-1	SV					2.04E+03	3.10E+03	5.22E+05	1.23E+03	1.23E+03	NC
HEXACHLOROBENZENE	118-74-1	SV	1.79E+00	2.71E+00	9.14E+02	1.08E+00	8.18E+02	1.24E+03	2.09E+05	4.91E+02	1.08E+00	C
HEXACHLOROBUTADIENE	87-68-3	SV	3.67E+01	5.56E+01	1.87E+04	2.21E+01	2.04E+02	3.10E+02	5.22E+04	1.23E+02	2.21E+01	C
ALPHA-HCH	319-84-6	SV	4.54E-01	6.88E-01	2.32E+02	2.73E-01					2.73E-01	C
BETA-HCH	319-85-7	SV	1.59E+00	2.41E+00	8.12E+02	9.57E-01					9.57E-01	C
GAMMA-HCH (LINDANE)	58-89-9	SV	2.20E+00	8.34E+00	1.12E+03	1.74E+00	3.07E+02	1.16E+03	7.83E+04	2.42E+02	1.74E+00	C
TECHNICAL HCH	608-73-1	SV	1.59E+00	2.41E+00	8.12E+02	9.57E-01					9.57E-01	C
HEXACHLOROCYCLOPENTADIENE	77-47-4	SV					6.13E+03	9.29E+03	1.49E+04	2.96E+03	2.96E+03	NC
HEXACHLORODIBENZODIOXIN MIX	19408-74-3	SV	4.62E-04	6.99E-04	3.21E-01	2.78E-04					2.78E-04	C
HEXACHLOROETHANE	67-72-1	SV	2.04E+02	3.10E+02	1.04E+05	1.23E+02	1.02E+03	1.55E+03	2.61E+05	6.14E+02	1.23E+02	C
HEXACHLOROPHENE	70-30-4	SV					3.07E+02	4.65E+02	7.83E+04	1.84E+02	1.84E+02	NC
1,6-HEXAMETHYLENE DIISOCYANATE	822-06-0	SV							7.57E+02	7.57E+02	7.57E+02	NC
HEXANE	110-54-3	V					1.12E+07		1.49E+07	6.41E+06	6.41E+06	NC
HMX	2691-41-0	SV					5.11E+04	7.74E+04	1.31E+07	3.07E+04	3.07E+04	NC
HYDRAZINE	302-01-2	V	9.54E-01		8.60E+01	9.43E-01					9.43E-01	C
HYDROGEN CHLORIDE	7647-01-0	V							1.49E+06	1.49E+06	1.49E+06	NC
HYDROGEN SULFIDE	7783-06-4	V					3.07E+03		1.49E+05	3.00E+03	3.00E+03	NC
HYDROQUINONE	123-31-9	SV	5.11E+01	7.74E+01	2.61E+04	3.07E+01	4.09E+04	6.19E+04	1.04E+07	2.46E+04	3.07E+01	C
IRON	7439-89-6	M					3.07E+05		7.83E+07	3.05E+05	3.05E+05	NC
ISOBUTANOL	78-83-1	V					3.07E+05		7.83E+07	3.05E+05	3.05E+05	NC
ISOPHORONE	78-59-1	SV	3.01E+03	4.56E+03	1.54E+06	1.81E+03	2.04E+05	3.10E+05	5.22E+07	1.23E+05	1.81E+03	C
TETRAETHYLLEAD	78-00-2	V					1.02E-01		2.61E+01	1.02E-01	1.02E-01	NC
KEPONE	143-50-0	SV	3.58E-01	5.42E-01	1.83E+02	2.15E-01	2.04E+02	3.10E+02	5.22E+04	1.23E+02	2.15E-01	C
LITHIUM	7439-93-2	M					2.04E+04		5.22E+06	2.04E+04	2.04E+04	NC
MALATHION	121-75-5	SV					2.04E+04	3.10E+04	5.22E+06	1.23E+04	1.23E+04	NC

Appendix C
Risk-based Soil Concentrations for the Industrial Worker
Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

			Carcinogenic Risk-based Concentration (mg/Kg)				Non-carcinogenic Risk-based Concentration (mg/Kg)					
Chemical	**CAS No.**	**Group**	**Oral**	**Dermal**	**Inhalation**	**Combined**	**Oral**	**Dermal**	**Inhalation**	**Combined**	**Final**	**Basis**
MALEIC ANHYDRIDE	108-31-6	SV					1.02E+05	1.55E+05	2.61E+07	6.14E+04	6.14E+04	NC
MANGANESE-FOOD	7439-96-5	M					1.43E+05		3.73E+03	3.64E+03	3.64E+03	NC
MEPHOSFOLAN	950-10-7	SV					9.20E+01	1.39E+02	2.35E+04	5.53E+01	5.53E+01	NC
MEPIQUAT CHLORIDE	24307-26-4	SV					3.07E+04	4.65E+04	7.83E+06	1.84E+04	1.84E+04	NC
MERCURIC CHLORIDE	7487-94-7	M					3.07E+02		7.83E+04	3.05E+02	3.05E+02	NC
MERCURY (elemental)	7439-97-6	M							2.25E+04	2.25E+04	2.25E+04	NC
METHYLMERCURY	22967-92-6	V					1.02E+02		2.61E+04	1.02E+02	1.02E+02	NC
METHANOL	67-56-1	V					5.11E+05		1.31E+08	5.09E+05	5.09E+05	NC
METHIDATHION	950-37-8	SV					1.02E+03	1.55E+03	2.61E+05	6.14E+02	6.14E+02	NC
METHOXYCHLOR	72-43-5	SV					5.11E+03	7.74E+03	1.31E+06	3.07E+03	3.07E+03	NC
METHYL ACETATE	79-20-9	V					1.02E+06		2.61E+08	1.02E+06	1.02E+06	NC
METHYL ACRYLATE	96-33-3	V					3.07E+04		7.83E+06	3.05E+04	3.05E+04	NC
2-METHYLANILINE	95-53-4	SV	1.19E+01	1.81E+01	6.09E+03	7.17E+00					7.17E+00	C
4-(2-METHYL-4-CHLOROPHENOXY) BUTYRIC ACID	94-81-5	SV					1.02E+04	1.55E+04	2.61E+06	6.14E+03	6.14E+03	NC
2-METHYL-4-CHLOROPHENOXYACETIC ACID (MCPA)	94-74-6	SV					5.11E+02	7.74E+02	1.31E+05	3.07E+02	3.07E+02	NC
2-(2-METHYL-4-CHLOROPHENOXY)PROPIONIC ACID (MCPP)	93-65-2	SV					1.02E+03	1.55E+03	2.61E+05	6.14E+02	6.14E+02	NC
METHYLCYCLOHEXANE	108-87-2	V							2.25E+08	2.25E+08	2.25E+08	NC
METHYLENE BROMIDE	74-95-3	V					1.02E+04		2.61E+06	1.02E+04	1.02E+04	NC
METHYLENE CHLORIDE	75-09-2	V	3.82E+02		8.86E+05	3.81E+02	6.13E+04		7.83E+07	6.13E+04	3.81E+02	C
4,4'-METHYLENE BIS(2-CHLOROANILINE)	101-14-4	SV	2.20E+01	3.34E+01	1.12E+04	1.32E+01	7.15E+02	1.08E+03	1.83E+05	4.30E+02	1.32E+01	C
4,4'-METHYLENE BIS(N,N'-DIMETHYL)ANILINE	101-61-1	SV	6.22E+01	9.43E+01	3.18E+04	3.74E+01					3.74E+01	C
4,4'-METHYLENEDIPHENYL ISOCYANATE	101-68-8	SV							4.44E+04	4.44E+04	4.44E+04	NC
METHYL ETHYL KETONE (2-BUTANONE)	78-93-3	V					6.13E+05		3.66E+08	6.12E+05	6.12E+05	NC
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	108-10-1	V							2.25E+08	2.25E+08	2.25E+08	NC
METHYL METHACRYLATE	80-62-6	V					1.43E+06		5.22E+07	1.39E+06	1.39E+06	NC
METHYL PARATHION	298-00-0	SV					2.56E+02	3.87E+02	6.53E+04	1.54E+02	1.54E+02	NC
2-METHYLPHENOL	95-48-7	SV					5.11E+04	7.74E+04	1.31E+07	3.07E+04	3.07E+04	NC
3-METHYLPHENOL	108-39-4	SV					5.11E+04	7.74E+04	1.31E+07	3.07E+04	3.07E+04	NC
4-METHYLPHENOL	106-44-5	SV					5.11E+03	7.74E+03	1.31E+06	3.07E+03	3.07E+03	NC
METHYLSTYRENE MIX	25013-15-4	V					6.13E+03		2.61E+06	6.12E+03	6.12E+03	NC
ALPHA-METHYLSTYRENE	98-83-9	V					7.15E+04		1.83E+07	7.13E+04	7.13E+04	NC
METHYL TERT-BUTYL ETHER	1634-04-4	V	7.15E+02		3.66E+05	7.14E+02			2.24E+08	2.24E+08	7.14E+02	C
METOLACHLOR (DUAL)	51218-45-2	SV					1.53E+05	2.32E+05	3.92E+07	9.21E+04	9.21E+04	NC
MIREX	2385-85-5	SV					2.04E+02	3.10E+02	5.22E+04	1.23E+02	1.23E+02	NC
MOLYBDENUM	7439-98-7	M					5.11E+03		1.31E+06	5.09E+03	5.09E+03	NC
MONOCHLORAMINE	10599-90-3	SV					1.02E+05	1.55E+05	2.61E+07	6.14E+04	6.14E+04	NC
NALED	300-76-5	SV					2.04E+03	3.10E+03	5.22E+05	1.23E+03	1.23E+03	NC
NICKEL REFINERY DUST	NA	M			1.74E+03	1.74E+03					1.74E+03	C
NICKEL	7440-02-0	M					2.04E+04		5.22E+06	2.04E+04	2.04E+04	NC
NITRATE	14797-55-8	M					1.64E+06		4.18E+08	1.63E+06	1.63E+06	NC
NITRITE	14797-65-0	M					1.02E+05		2.61E+07	1.02E+05	1.02E+05	NC
2-NITROANILINE	88-74-4	SV					3.07E+03	4.65E+03	7.83E+03	1.49E+03	1.49E+03	NC
3-NITROANILINE	99-09-2	SV	1.43E+02	2.17E+02	7.31E+04	8.61E+01	3.07E+02	4.65E+02	7.83E+04	1.84E+02	8.61E+01	C
4-NITROANILINE	100-01-6	SV	1.43E+02	2.17E+02	7.31E+04	8.61E+01	3.07E+03	4.65E+03	2.61E+05	1.83E+03	8.61E+01	C
NITROBENZENE	98-95-3	V					5.11E+02		1.57E+05	5.09E+02	5.09E+02	NC
NITROGLYCERIN	55-63-0	SV	2.04E+02	3.10E+02	1.04E+05	1.23E+02					1.23E+02	C
NITROGUANIDINE	556-88-7	SV					1.02E+05	1.55E+05	2.61E+07	6.14E+04	6.14E+04	NC
2-NITROPROPANE	79-46-9	V			1.56E+02	1.56E+02			1.49E+06	1.49E+06	1.56E+02	C
N-NITROSO-DI-N-BUTYLAMINE	924-16-3	V	5.30E-01		2.61E+02	5.29E-01					5.29E-01	C
N-NITROSODIETHANOLAMINE	1116-54-7	SV	1.02E+00	1.55E+00	5.22E+02	6.15E-01					6.15E-01	C
N-NITROSODIETHYLAMINE	55-18-5	SV	1.91E-02	2.89E-02	9.75E+00	1.15E-02					1.15E-02	C
N-NITROSODIMETHYLAMINE	62-75-9	SV	5.61E-02	8.50E-02	2.87E+01	3.38E-02	8.18E+00	1.24E+01	2.09E+03	4.91E+00	3.38E-02	C
N-NITROSODIPHENYLAMINE	86-30-6	SV	5.84E+02	8.85E+02	2.98E+05	3.51E+02	2.04E+04	3.10E+04	5.22E+06	1.23E+04	3.51E+02	C
N-NITROSODIPROPYLAMINE	621-64-7	SV	4.09E-01	6.19E-01	2.09E+02	2.46E-01					2.46E-01	C

Appendix C
Risk-based Soil Concentrations for the Industrial Worker
Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

			Carcinogenic Risk-based Concentration (mg/Kg)				Non-carcinogenic Risk-based Concentration (mg/Kg)					
Chemical	**CAS No.**	**Group**	**Oral**	**Dermal**	**Inhalation**	**Combined**	**Oral**	**Dermal**	**Inhalation**	**Combined**	**Final**	**Basis**
N-NITROSO-N-METHYLETHYLAMINE	10595-95-6	SV	1.30E-01	1.97E-01	6.65E+01	7.83E-02					7.83E-02	C
N-NITROSOPYRROLIDINE	930-55-2	SV	1.36E+00	2.06E+00	6.96E+02	8.20E-01					8.20E-01	C
M-NITROTOLUENE	99-08-1	V					2.04E+04		5.22E+06	2.04E+04	2.04E+04	NC
O-NITROTOLUENE	88-72-2	V	1.24E+01		6.36E+03	1.24E+01	1.02E+04		2.61E+06	1.02E+04	1.24E+01	C
P-NITROTOLUENE	99-99-0	V	1.68E+02		8.60E+04	1.68E+02	1.02E+04		2.61E+06	1.02E+04	1.68E+02	C
NUSTAR	85509-19-9	SV					7.15E+02	1.08E+03	1.83E+05	4.30E+02	4.30E+02	NC
ORYZALIN	19044-88-3	SV					5.11E+04	7.74E+04	1.31E+07	3.07E+04	3.07E+04	NC
OXADIAZON	19666-30-9	SV					5.11E+03	7.74E+03	1.31E+06	3.07E+03	3.07E+03	NC
OXAMYL	23135-22-0	SV					2.56E+04	3.87E+04	6.53E+06	1.54E+04	1.54E+04	NC
OXYFLUORFEN	42874-03-3	SV					3.07E+03	4.65E+03	7.83E+05	1.84E+03	1.84E+03	NC
PARAQUAT DICHLORIDE	1910-42-5	SV					4.60E+03	6.97E+03	1.18E+06	2.76E+03	2.76E+03	NC
PARATHION	56-38-2	SV					6.13E+03	9.29E+03	1.57E+06	3.69E+03	3.69E+03	NC
PENTACHLOROBENZENE	608-93-5	SV					8.18E+02	1.24E+03	2.09E+05	4.91E+02	4.91E+02	NC
PENTACHLORONITROBENZENE	82-68-8	SV	1.10E+01	1.67E+01	5.62E+03	6.62E+00	3.07E+03	4.65E+03	7.83E+05	1.84E+03	6.62E+00	C
PENTACHLOROPHENOL	87-86-5	SV	2.38E+01	1.45E+01	1.22E+04	8.99E+00	3.07E+04	1.86E+04	7.83E+06	1.16E+04	8.99E+00	C
Pentaerythritoltetranitrate	78-11-5	SV	2.60E+01	3.94E+01	1.33E+04	1.57E+01	3.07E+03	4.65E+03	7.83E+05	1.84E+03	1.57E+01	C
PERCHLORATE	7601-90-3	M					7.15E+02		1.83E+05	7.13E+02	7.13E+02	NC
PERMETHRIN	52645-53-1	SV					5.11E+04	7.74E+04	1.31E+07	3.07E+04	3.07E+04	NC
PHENOL	108-95-2	SV					3.07E+05	4.65E+05	7.83E+07	1.84E+05	1.84E+05	NC
M-PHENYLENEDIAMINE	108-45-2	SV					6.13E+03	9.29E+03	1.57E+06	3.69E+03	3.69E+03	NC
O-PHENYLENEDIAMINE	95-54-5	SV	6.09E+01	9.23E+01	3.11E+04	3.66E+01					3.66E+01	C
P-PHENYLENEDIAMINE	106-50-3	SV					1.94E+05	2.94E+05	4.96E+07	1.17E+05	1.17E+05	NC
PHOSPHINE	7803-51-2	SV					3.07E+02	4.65E+02	2.25E+04	1.83E+02	1.83E+02	NC
PHOSPHORIC ACID	7664-38-2	M							7.57E+05	7.57E+05	7.57E+05	NC
PHOSPHORUS (WHITE)	7723-14-0	M					2.04E+01		5.22E+03	2.04E+01	2.04E+01	NC
PHTHALIC ANHYDRIDE	85-44-9	SV					2.04E+06	3.10E+06	8.96E+06	1.08E+06	1.08E+06	NC
POLYBROMINATED BIPHENYLS	NA	SV	3.22E-01	4.87E-01	1.64E+02	1.93E-01	7.15E+00	1.08E+01	1.83E+03	4.30E+00	1.93E-01	C
POLYCHLORINATED BIPHENYLS	1336-36-3	SV	1.43E+00	1.55E+00	7.31E+02	7.43E-01					7.43E-01	C
AROCLOR-1016	12674-11-2	SV	4.09E+01	4.42E+01	2.09E+04	2.12E+01	7.15E+01	7.74E+01	1.83E+04	3.71E+01	2.12E+01	C
AROCLOR-1221	11104-28-2	SV	1.43E+00	1.55E+00	7.31E+02	7.43E-01					7.43E-01	C
AROCLOR-1232	11141-16-5	SV	1.43E+00	1.55E+00	7.31E+02	7.43E-01					7.43E-01	C
AROCLOR-1242	53469-21-9	SV	1.43E+00	1.55E+00	7.31E+02	7.43E-01					7.43E-01	C
AROCLOR-1248	12672-29-6	SV	1.43E+00	1.55E+00	7.31E+02	7.43E-01					7.43E-01	C
AROCLOR-1254	11097-69-1	SV	1.43E+00	1.55E+00	7.31E+02	7.43E-01	2.04E+01	2.21E+01	5.22E+03	1.06E+01	7.43E-01	C
AROCLOR-1260	11096-82-5	SV	1.43E+00	1.55E+00	7.31E+02	7.43E-01					7.43E-01	C
POLYCHLORINATED TERPHENYLS	61788-33-8	SV	6.36E-01	9.64E-01	3.25E+02	3.83E-01					3.83E-01	C
POLYNUCLEAR AROMATIC HYDROCARBONS:	NA	SV										
ACENAPHTHENE	83-32-9	V					6.13E+04	7.15E+04	1.57E+07	3.29E+04	3.29E+04	NC
ANTHRACENE	120-12-7	V					3.07E+05	3.57E+05	7.83E+07	1.65E+05	1.65E+05	NC
BENZ[A]ANTHRACENE	56-55-3	SV	3.92E+00	4.57E+00	2.00E+03	2.11E+00					2.11E+00	C
BENZO[B]FLUORANTHENE	205-99-2	SV	3.92E+00	4.57E+00	2.00E+03	2.11E+00					2.11E+00	C
BENZO[K]FLUORANTHENE	207-08-9	SV	3.92E+01	4.57E+01	2.00E+04	2.11E+01					2.11E+01	C
BENZO[A]PYRENE	50-32-8	SV	3.92E-01	4.57E-01	4.72E+02	2.11E-01					2.11E-01	C
CARBAZOLE	86-74-8	SV	1.43E+02	1.67E+02	7.31E+04	7.69E+01					7.69E+01	C
CHRYSENE	218-01-9	SV	3.92E+02	4.57E+02	2.00E+05	2.11E+02					2.11E+02	C
DIBENZ[A,H]ANTHRACENE	53-70-3	SV	3.92E-01	4.57E-01	2.00E+02	2.11E-01					2.11E-01	C
FLUORANTHENE	206-44-0	SV					4.09E+04	4.76E+04	1.04E+07	2.20E+04	2.20E+04	NC
FLUORENE	86-73-7	V					4.09E+04	4.76E+04	1.04E+07	2.20E+04	2.20E+04	NC
INDENO[1,2,3-C,D]PYRENE	193-39-5	SV	3.92E+00	4.57E+00	2.00E+03	2.11E+00					2.11E+00	C
2-METHYLNAPHTHALENE	91-57-6	V					4.09E+03	4.76E+03	1.04E+06	2.20E+03	2.20E+03	NC
NAPHTHALENE	91-20-3	V					2.04E+04	2.38E+04	2.35E+05	1.05E+04	1.05E+04	NC
PYRENE	129-00-0	V					3.07E+04	3.57E+04	7.83E+06	1.65E+04	1.65E+04	NC
PROMETON	1610-18-0	SV					1.53E+04	2.32E+04	3.92E+06	9.21E+03	9.21E+03	NC
PROMETRYN	7287-19-6	SV					4.09E+03	6.19E+03	1.04E+06	2.46E+03	2.46E+03	NC

Appendix C
Risk-based Soil Concentrations for the Industrial Worker
Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

			Carcinogenic Risk-based Concentration (mg/Kg)				Non-carcinogenic Risk-based Concentration (mg/Kg)					
Chemical	**CAS No.**	**Group**	**Oral**	**Dermal**	**Inhalation**	**Combined**	**Oral**	**Dermal**	**Inhalation**	**Combined**	**Final**	**Basis**
PROPACHLOR	1918-16-7	SV					1.33E+04	2.01E+04	3.39E+06	7.98E+03	7.98E+03	NC
PROPARGITE	2312-35-8	SV					2.04E+04	3.10E+04	5.22E+06	1.23E+04	1.23E+04	NC
PROPYLENE GLYCOL	57-55-6	SV					5.11E+05	7.74E+05	2.25E+05	1.30E+05	1.30E+05	NC
PROPYLENE GLYCOL, MONOETHYL ETHER	52125-53-8	SV					7.15E+05	1.08E+06	1.83E+08	4.30E+05	4.30E+05	NC
PROPYLENE GLYCOL, MONOMETHYL ETHER	107-98-2	SV					7.15E+05	1.08E+06	1.49E+08	4.30E+05	4.30E+05	NC
PURSUIT	81335-77-5	SV					2.56E+05	3.87E+05	6.53E+07	1.54E+05	1.54E+05	NC
PYRIDINE	110-86-1	SV					1.02E+03	1.55E+03	2.61E+05	6.14E+02	6.14E+02	NC
QUINOLINE	91-22-5	SV	9.54E-01	1.45E+00	4.87E+02	5.74E-01					5.74E-01	C
RDX	121-82-4	SV	2.60E+01	3.94E+01	1.33E+04	1.57E+01	3.07E+03	4.65E+03	7.83E+05	1.84E+03	1.57E+01	C
RESMETHRIN	10453-86-8	SV					3.07E+04	4.65E+04	7.83E+06	1.84E+04	1.84E+04	NC
ROTENONE	83-79-4	SV					4.09E+03	6.19E+03	1.04E+06	2.46E+03	2.46E+03	NC
SELENIUM	7782-49-2	M					5.11E+03		1.31E+06	5.09E+03	5.09E+03	NC
SILVER	7440-22-4	M					5.11E+03		1.31E+06	5.09E+03	5.09E+03	NC
SIMAZINE	122-34-9	SV	2.38E+01	3.61E+01	1.22E+04	1.43E+01	5.11E+03	7.74E+03	1.31E+06	3.07E+03	1.43E+01	C
SODIUM DIETHYLDITHIOCARBAMATE	148-18-5	SV	1.06E+01	1.61E+01	5.42E+03	6.38E+00	3.07E+04	4.65E+04	7.83E+06	1.84E+04	6.38E+00	C
STRONTIUM, STABLE	7440-24-6	M					6.13E+05		1.57E+08	6.11E+05	6.11E+05	NC
STRYCHNINE	57-24-9	SV					3.07E+02	4.65E+02	7.83E+04	1.84E+02	1.84E+02	NC
STYRENE	100-42-5	V					2.04E+05		7.47E+07	2.04E+05	2.04E+05	NC
2,3,7,8-TETRACHLORODIBENZODIOXIN	1746-01-6	SV	1.91E-05	9.64E-05	9.75E-03	1.59E-05					1.59E-05	C
1,2,4,5-TETRACHLOROBENZENE	95-94-3	SV					3.07E+02	4.65E+02	7.83E+04	1.84E+02	1.84E+02	NC
1,1,1,2-TETRACHLOROETHANE	630-20-6	V	1.10E+02		5.62E+04	1.10E+02	3.07E+04		7.83E+06	3.05E+04	1.10E+02	C
1,1,2,2-TETRACHLOROETHANE	79-34-5	V	1.43E+01		7.31E+03	1.43E+01	6.13E+04		1.57E+07	6.11E+04	1.43E+01	C
TETRACHLOROETHENE	127-18-4	V	5.30E+00		7.31E+04	5.30E+00	1.02E+04		3.66E+07	1.02E+04	5.30E+00	C
2,3,4,6-TETRACHLOROPHENOL	58-90-2	SV					3.07E+04	4.65E+04	7.83E+06	1.84E+04	1.84E+04	NC
P,A,A,A-TETRACHLOROTOLUENE	5216-25-1	SV	1.43E-01	2.17E-01	7.31E+01	8.61E-02					8.61E-02	C
1,1,1,2-TETRAFLUOROETHANE	811-97-2	V							5.98E+09	5.98E+09	5.98E+09	NC
TETRAHYDROFURAN	109-99-9	SV	3.77E+02	5.70E+02	2.15E+05	2.27E+02	2.04E+05	3.10E+05	2.25E+07	1.22E+05	2.27E+02	C
TETRYL	479-45-8	SV					4.09E+03	6.19E+03	1.04E+06	2.46E+03	2.46E+03	NC
THALLIUM	7440-28-0	M					7.15E+01		1.83E+04	7.13E+01	7.13E+01	NC
THALLIUM ACETATE	563-68-8	M					9.20E+01		2.35E+04	9.16E+01	9.16E+01	NC
THALLIUM CARBONATE	6533-73-9	M					8.18E+01		2.09E+04	8.14E+01	8.14E+01	NC
THALLIUM CHLORIDE	7791-12-0	M					8.18E+01		2.09E+04	8.14E+01	8.14E+01	NC
THALLIUM NITRATE	10102-45-1	M					9.20E+01		2.35E+04	9.16E+01	9.16E+01	NC
THALLIUM SULFATE (2:1)	7446-18-6	M					8.18E+01		2.09E+04	8.14E+01	8.14E+01	NC
THIOBENCARB	28249-77-6	SV					1.02E+04	1.55E+04	2.61E+06	6.14E+03	6.14E+03	NC
TIN	7440-31-5	M					6.13E+05		1.57E+08	6.11E+05	6.11E+05	NC
TITANIUM	7440-32-6	M					4.09E+06		2.25E+06	1.45E+06	1.45E+06	NC
TITANIUM DIOXIDE	13463-67-7	M					4.09E+06		2.25E+06	1.45E+06	1.45E+06	NC
TOLUENE	108-88-3	V					2.04E+05		2.98E+07	2.03E+05	2.03E+05	NC
TOLUENE-2,4-DIAMINE	95-80-7	SV	8.94E-01	1.35E+00	4.57E+02	5.38E-01					5.38E-01	C
TOLUENE-2,5-DIAMINE	95-70-5	SV					6.13E+05	9.29E+05	1.57E+08	3.69E+05	3.69E+05	NC
TOLUENE-2,6-DIAMINE	823-40-5	SV					2.04E+05	3.10E+05	5.22E+07	1.23E+05	1.23E+05	NC
P-TOLUIDINE	106-49-0	SV	1.51E+01	2.28E+01	7.70E+03	9.06E+00					9.06E+00	C
TOXAPHENE	8001-35-2	SV	2.60E+00	3.94E+00	1.33E+03	1.57E+00					1.57E+00	C
1,2,4-TRIBROMOBENZENE	615-54-3	SV					5.11E+03	7.74E+03	1.31E+06	3.07E+03	3.07E+03	NC
TRIBUTYLTIN OXIDE	56-35-9	SV					3.07E+02	4.65E+02	7.83E+04	1.84E+02	1.84E+02	NC
2,4,6-TRICHLOROANILINE	634-93-5	SV	8.42E+01	1.28E+02	4.30E+04	5.06E+01					5.06E+01	C
1,2,4-TRICHLOROBENZENE	120-82-1	V					1.02E+04		2.61E+05	9.84E+03	9.84E+03	NC
1,1,1-TRICHLOROETHANE	71-55-6	V					2.86E+05		1.65E+08	2.86E+05	2.86E+05	NC
1,1,2-TRICHLOROETHANE	79-00-5	V	5.02E+01		2.61E+04	5.01E+01	4.09E+03		1.04E+06	4.07E+03	5.01E+01	C
TRICHLOROETHENE	79-01-6	V	7.15E+00		3.66E+03	7.14E+00	3.07E+02		2.61E+06	3.07E+02	7.14E+00	C
TRICHLOROFLUOROMETHANE	75-69-4	V					3.07E+05		5.22E+07	3.05E+05	3.05E+05	NC
2,4,5-TRICHLOROPHENOL	95-95-4	SV					1.02E+05	1.55E+05	2.61E+07	6.14E+04	6.14E+04	NC
2,4,6-TRICHLOROPHENOL	88-06-2	SV	2.60E+02	3.94E+02	1.46E+05	1.57E+02					1.57E+02	C

Appendix C
Risk-based Soil Concentrations for the Industrial Worker
Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

			Carcinogenic Risk-based Concentration (mg/Kg)				Non-carcinogenic Risk-based Concentration (mg/Kg)					
Chemical	**CAS No.**	**Group**	**Oral**	**Dermal**	**Inhalation**	**Combined**	**Oral**	**Dermal**	**Inhalation**	**Combined**	**Final**	**Basis**
2,4,5-T	93-76-5	SV					1.02E+04	1.55E+04	2.61E+06	6.14E+03	6.14E+03	NC
2-(2,4,5-TRICHLOROPHENOXY)PROPIONIC ACID	93-72-1	SV					8.18E+03	1.24E+04	2.09E+06	4.91E+03	4.91E+03	NC
1,1,2-TRICHLOROPROPANE	598-77-6	V					5.11E+03		1.31E+06	5.09E+03	5.09E+03	NC
1,2,3-TRICHLOROPROPANE	96-18-4	V	1.43E+00		7.31E+02	1.43E+00	6.13E+03		3.66E+05	6.03E+03	1.43E+00	C
1,2,3-TRICHLOROPROPENE	96-19-5	V					1.02E+04		7.83E+04	9.04E+03	9.04E+03	NC
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	76-13-1	V					3.07E+07		2.25E+09	3.02E+07	3.02E+07	NC
1,2,4-TRIMETHYLBENZENE	95-63-6	V					5.11E+04		4.44E+05	4.58E+04	4.58E+04	NC
1,3,5-TRIMETHYLBENZENE	108-67-8	V					5.11E+04		4.44E+05	4.58E+04	4.58E+04	NC
1,3,5-TRINITROBENZENE	99-35-4	SV					3.07E+04	4.65E+04	7.83E+06	1.84E+04	1.84E+04	NC
2,4,6-TRINITROTOLUENE	118-96-7	SV	9.54E+01	1.45E+02	4.87E+04	5.74E+01	5.11E+02	7.74E+02	1.31E+05	3.07E+02	5.74E+01	C
URANIUM (SOLUBLE SALTS; from IRIS)	7440-61-1	M					3.07E+03		7.83E+05	3.05E+03	3.05E+03	NC
URANIUM (SOLUBLE SALTS; provisional)	7440-61-1	M					2.04E+02		5.22E+04	2.04E+02	2.04E+02	NC
VANADIUM	7440-62-2	M					1.02E+03		2.61E+05	1.02E+03	1.02E+03	NC
VINCLOZOLIN	50471-44-8	SV					2.56E+04	3.87E+04	6.53E+06	1.54E+04	1.54E+04	NC
VINYL ACETATE	108-05-4	V					1.02E+06		1.49E+07	9.56E+05	9.56E+05	NC
VINYL CHLORIDE: adult (see cover memos)	75-01-4	V	3.97E+00		9.75E+04	3.97E+00	3.07E+03		7.31E+06	3.06E+03	3.97E+00	C
WARFARIN	81-81-2	SV					3.07E+02	4.65E+02	7.83E+04	1.84E+02	1.84E+02	NC
O-XYLENE	95-47-6	V					2.04E+05		7.83E+06	1.99E+05	1.99E+05	NC
M,P-XYLENES	1330-20-7	V					2.04E+05		7.83E+06	1.99E+05	1.99E+05	NC
XYLENES	1330-20-7	V					2.04E+05		7.83E+06	1.99E+05	1.99E+05	NC
ZINC	7440-66-6	M					3.07E+05		7.83E+07	3.05E+05	3.05E+05	NC
ZINEB	12122-67-7	SV					5.11E+04	7.74E+04	1.31E+07	3.07E+04	3.07E+04	NC

APPENDIX D

Risk-Based Air Concentrations for the EOD Personnel

Appendix D

Risk-based Air Concentrations for the EOD Personnel

Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Chemical	CAS No.	Group	Carcinogenic Risk-Based Concentration (mg/M^3) Inhalation	Non-carcinogenic Risk-Based Concentration (mg/M^3) Inhalation	Final Risk-Based Concentration (mg/M^3) Final	Final Risk-Based Concentration (mg/M^3) Basis
ACETALDEHYDE	75-07-0	V	2.15E+00	1.22E+01	2.15E+00	C
ACETOCHLOR	34256-82-1	SV		9.46E+01	9.46E+01	NC
ACETONE	67-64-1	V		4.26E+03	4.26E+03	NC
ACETONITRILE	75-05-8	V		8.04E+01	8.04E+01	NC
ACETOPHENONE	98-86-2	V		4.73E+02	4.73E+02	NC
ACROLEIN	107-02-8	V		2.70E-02	2.70E-02	NC
ACRYLAMIDE	79-06-1	SV	3.68E-03	9.46E-01	3.68E-03	C
ACRYLONITRILE	107-13-1	V	6.90E-02	2.70E+00	6.90E-02	C
ALACHLOR	15972-60-8	SV	2.07E-01	4.73E+01	2.07E-01	C
ALAR	1596-84-5	SV		7.10E+02	7.10E+02	NC
ALDICARB	116-06-3	SV		4.73E+00	4.73E+00	NC
ALDICARB SULFONE	1646-88-4	SV		4.73E+00	4.73E+00	NC
ALDRIN	309-00-2	SV	9.74E-04	1.42E-01	9.74E-04	C
ALLYL CHLORIDE	107-05-1	V		1.35E+00	1.35E+00	NC
ALUMINUM	7429-90-5	M		4.73E+00	4.73E+00	NC
AMINODINITROTOLUENES	NA	SV		9.46E+00	9.46E+00	NC
AMMONIA	7664-41-7	V		1.35E+02	1.35E+02	NC
ANILINE	62-53-3	SV	2.91E+00	1.37E+00	1.37E+00	NC
ANTIMONY	7440-36-0	M		1.89E+00	1.89E+00	NC
ANTIMONY TRIOXIDE	1309-64-4	M		2.70E-01	2.70E-01	NC
ARSENIC	7440-38-2	M	1.10E-03	1.42E+00	1.10E-03	C
ARSINE	7784-42-1	V		6.62E-02	6.62E-02	NC
ASSURE	76578-14-8	SV		4.26E+01	4.26E+01	NC
ATRAZINE	1912-24-9	SV	7.53E-02	1.66E+02	7.53E-02	C
BARIUM	7440-39-3	M		6.62E-01	6.62E-01	NC
BAYGON	114-26-1	SV		1.89E+01	1.89E+01	NC
BAYTHROID	68359-37-5	SV		1.18E+02	1.18E+02	NC
BENTAZON	25057-89-0	SV		1.42E+02	1.42E+02	NC
BENZALDEHYDE	100-52-7	SV		4.73E+02	4.73E+02	NC
BENZENE	71-43-2	V	6.13E-01	4.07E+01	6.13E-01	C
BENZENETHIOL	108-98-5	V		4.73E-02	4.73E-02	NC
BENZIDINE	92-87-5	SV	7.20E-05	1.42E+01	7.20E-05	C
BENZOIC ACID	65-85-0	SV		1.89E+04	1.89E+04	NC
BENZYL ALCOHOL	100-51-6	SV		1.42E+03	1.42E+03	NC
BENZYL CHLORIDE	100-44-7	V	9.74E-02	9.46E+00	9.74E-02	C
BERYLLIUM	7440-41-7	M	1.97E-03	2.70E-02	1.97E-03	C
BIPHENYL	92-52-4	V		2.37E+02	2.37E+02	NC
BIS(2-CHLOROETHYL)ETHER	111-44-4	V	1.51E-02		1.51E-02	C
BIS(2-CHLOROISOPROPYL)ETHER	108-60-1	V	4.73E-01	1.89E+02	4.73E-01	C
BIS(CHLOROMETHYL)ETHER	542-88-1	V	7.53E-05		7.53E-05	C
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	SV	1.18E+00	9.46E+01	1.18E+00	C
BORON	7440-42-8	M		2.70E+01	2.70E+01	NC
BROMOBENZENE	108-86-1	V		1.42E+01	1.42E+01	NC
BROMODICHLOROMETHANE	75-27-4	V	2.67E-01	9.46E+01	2.67E-01	C
BROMOETHENE	593-60-2	V	1.51E-01	4.07E+00	1.51E-01	C
BROMOFORM	75-25-2	SV	4.25E+00	9.46E+01	4.25E+00	C
BROMOMETHANE	74-83-9	V		6.62E+00	6.62E+00	NC
BROMOPHOS	2104-96-3	SV		2.37E+01	2.37E+01	NC
1,3-BUTADIENE	106-99-0	V	1.66E-01	2.70E+00	1.66E-01	C
1-BUTANOL	71-36-3	SV		4.73E+02	4.73E+02	NC
BUTYLBENZYLPHTHALATE	85-68-7	SV	8.72E+00	9.46E+02	8.72E+00	C
CADMIUM-FOOD	7440-43-9	M	2.63E-03	2.70E-01	2.63E-03	C
CAPROLACTAM	105-60-2	SV		2.37E+03	2.37E+03	NC
CARBARYL	63-25-2	SV		4.73E+02	4.73E+02	NC
CARBON DISULFIDE	75-15-0	V		9.46E+02	9.46E+02	NC
CARBON TETRACHLORIDE	56-23-5	V	3.12E-01	2.37E+02	3.12E-01	C
CARBOSULFAN	55285-14-8	SV		4.73E+01	4.73E+01	NC
CHLORAL HYDRATE	302-17-0	SV		4.73E+02	4.73E+02	NC
CHLORANIL	118-75-2	SV	4.14E-02		4.14E-02	C

Appendix D

Risk-based Air Concentrations for the EOD Personnel

Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Chemical	CAS No.	Group	Carcinogenic Risk-Based Concentration (mg/M^3) Inhalation	Non-carcinogenic Risk-Based Concentration (mg/M^3) Inhalation	Final Risk-Based Concentration (mg/M^3) Final	Final Risk-Based Concentration (mg/M^3) Basis
CHLORDANE	57-74-9	SV	4.73E-02	9.46E-01	4.73E-02	C
CHLORINE	7782-50-5	V		2.70E-01	2.70E-01	NC
CHLORINE DIOXIDE	10049-04-4	V		2.70E-01	2.70E-01	NC
CHLOROACETIC ACID	79-11-8	SV		9.46E+00	9.46E+00	NC
4-CHLOROANILINE	106-47-8	SV	3.07E-01	1.89E+01	3.07E-01	C
CHLOROBENZENE	108-90-7	V		8.04E+01	8.04E+01	NC
2-CHLORO-1,3-BUTADIENE	126-99-8	V		9.46E+00	9.46E+00	NC
1-CHLORO-1,1-DIFLUOROETHANE	75-68-3	V		6.62E+04	6.62E+04	NC
CHLORODIFLUOROMETHANE	75-45-6	V		6.62E+04	6.62E+04	NC
CHLOROETHANE	75-00-3	V	5.71E+00	1.37E+04	5.71E+00	C
CHLOROFORM	67-66-3	V	2.04E-01	6.62E+01	2.04E-01	C
CHLOROMETHANE	74-87-3	V		1.23E+02	1.23E+02	NC
4-CHLORO-2-METHYLANILINE	95-69-2	SV	2.86E-02		2.86E-02	C
BETA-CHLORONAPHTHALENE	91-58-7	V		3.79E+02	3.79E+02	NC
O-CHLORONITROBENZENE	88-73-3	V	1.71E+00	9.46E-02	9.46E-02	NC
P-CHLORONITROBENZENE	100-00-5	V	2.47E+00	8.04E-01	8.04E-01	NC
2-CHLOROPHENOL	95-57-8	V		2.37E+01	2.37E+01	NC
2-CHLOROPROPANE	75-29-6	V		1.37E+02	1.37E+02	NC
O-CHLOROTOLUENE	95-49-8	V		9.46E+01	9.46E+01	NC
CHLORPYRIFOS	2921-88-2	SV		1.42E+01	1.42E+01	NC
CHLORPYRIFOS-METHYL	5598-13-0	SV		4.73E+01	4.73E+01	NC
CHROMIUM	7440-47-3	M		7.10E+03	7.10E+03	NC
CHROMIUM III	16065-83-1	M		7.10E+03	7.10E+03	NC
CHROMIUM VI	18540-29-9	M	4.04E-04	1.42E-01	4.04E-04	C
COBALT	7440-48-4	M	1.69E-03	2.70E-02	1.69E-03	C
COKE OVEN EMISSIONS (COAL TAR)	8007-45-2	SV	7.53E-03		7.53E-03	C
COPPER	7440-50-8	M		1.89E+02	1.89E+02	NC
CUMENE	98-82-8	V		5.20E+02	5.20E+02	NC
CYANIDE (FREE)	57-12-5	M		9.46E+01	9.46E+01	NC
CALCIUM CYANIDE	592-01-8	M		1.89E+02	1.89E+02	NC
COPPER CYANIDE	544-92-3	M		2.37E+01	2.37E+01	NC
CYANOGEN	460-19-5	V		1.89E+02	1.89E+02	NC
HYDROGEN CYANIDE	74-90-8	V		4.07E+00	4.07E+00	NC
POTASSIUM CYANIDE	151-50-8	M		2.37E+02	2.37E+02	NC
POTASSIUM SILVER CYANIDE	506-61-6	M		9.46E+02	9.46E+02	NC
SILVER CYANIDE	506-64-9	M		4.73E+02	4.73E+02	NC
SODIUM CYANIDE	143-33-9	M		1.89E+02	1.89E+02	NC
THIOCYANATE	NA	M		4.73E-01	4.73E-01	NC
ZINC CYANIDE	557-21-1	M		2.37E+02	2.37E+02	NC
CYCLOHEXANE	110-82-7	V		8.04E+03	8.04E+03	NC
CYCLOHEXANONE	108-94-1	SV		2.37E+04	2.37E+04	NC
CYHALOTHRIN/KARATE	68085-85-8	SV		2.37E+01	2.37E+01	NC
CYPERMETHRIN	52315-07-8	SV		4.73E+01	4.73E+01	NC
DACTHAL	1861-32-1	SV		4.73E+01	4.73E+01	NC
DALAPON	75-99-0	SV		1.42E+02	1.42E+02	NC
DDD	72-54-8	SV	6.90E-02	9.46E+00	6.90E-02	C
DDE	72-55-9	SV	4.87E-02		4.87E-02	C
DDT	50-29-3	SV	4.87E-02	2.37E+00	4.87E-02	C
DIAZINON	333-41-5	SV		4.26E+00	4.26E+00	NC
DIBENZOFURAN	132-64-9	V		9.46E+00	9.46E+00	NC
1,4-DIBROMOBENZENE	106-37-6	SV		4.73E+01	4.73E+01	NC
DIBROMOCHLOROMETHANE	124-48-1	V	1.97E-01	9.46E+01	1.97E-01	C
1,2-DIBROMO-3-CHLOROPROPANE	96-12-8	V	6.90E+00	2.70E-01	2.70E-01	NC
1,2-DIBROMOETHANE	106-93-4	V	8.28E-03	1.23E+01	8.28E-03	C
DIBUTYLPHTHALATE	84-74-2	SV		4.73E+02	4.73E+02	NC
DICAMBA	1918-00-9	SV		1.42E+02	1.42E+02	NC
1,2-DICHLOROBENZENE	95-50-1	V		1.89E+02	1.89E+02	NC
1,3-DICHLOROBENZENE	541-73-1	V		1.42E+01	1.42E+01	NC
1,4-DICHLOROBENZENE	106-46-7	V	7.53E-01	1.08E+03	7.53E-01	C

Appendix D

Risk-based Air Concentrations for the EOD Personnel

Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Chemical	CAS No.	Group	Carcinogenic Risk-Based Concentration (mg/M^3) Inhalation	Non-carcinogenic Risk-Based Concentration (mg/M^3) Inhalation	Final Risk-Based Concentration (mg/M^3) Final	Final Risk-Based Concentration (mg/M^3) Basis
3,3'-DICHLOROBENZIDINE	91-94-1	SV	3.68E-02		3.68E-02	C
DICHLORODIFLUOROMETHANE	75-71-8	V		2.37E+02	2.37E+02	NC
1,1-DICHLOROETHANE	75-34-3	V		6.62E+02	6.62E+02	NC
1,2-DICHLOROETHANE	107-06-2	V	1.82E-01	3.31E+03	1.82E-01	C
1,1-DICHLOROETHENE	75-35-4	V		2.84E+02	2.84E+02	NC
CIS-1,2-DICHLOROETHENE	156-59-2	V		4.73E+01	4.73E+01	NC
TRANS-1,2-DICHLOROETHENE	156-60-5	V		8.04E+01	8.04E+01	NC
TOTAL 1,2-DICHLOROETHENE	540-59-0	V		4.26E+01	4.26E+01	NC
2,4-DICHLOROPHENOL	120-83-2	SV		1.42E+01	1.42E+01	NC
2,4-D	94-75-7	SV		4.73E+01	4.73E+01	NC
4-(2,4-DICHLOROPHENOXY)BUTYRIC ACID	94-82-6	SV		3.79E+01	3.79E+01	NC
1,2-DICHLOROPROPANE	78-87-5	V	2.44E-01	5.39E+00	2.44E-01	C
1,3-DICHLOROPROPANE	142-28-9	V		9.46E+01	9.46E+01	NC
2,3-DICHLOROPROPANOL	616-23-9	SV		1.42E+01	1.42E+01	NC
1,3-DICHLOROPROPENE	542-75-6	V	1.66E+00	2.70E+01	1.66E+00	C
DICHLORVOS	62-73-7	SV	5.71E-02	6.77E-01	5.71E-02	C
DIELDRIN	60-57-1	SV	1.04E-03	2.37E-01	1.04E-03	C
DIESEL EMISSIONS	NA	SV		6.62E+00	6.62E+00	NC
DIETHYLPHTHALATE	84-66-2	SV		3.79E+03	3.79E+03	NC
DIETHYLENE GLYCOL, MONOBUTYL ETHER	112-34-5	SV		2.70E+01	2.70E+01	NC
DIETHYLENE GLYCOL, MONOETHYL ETHER	111-90-0	SV		4.07E+00	4.07E+00	NC
DI(2-ETHYLHEXYL)ADIPATE	103-23-1	SV	1.38E+01	2.84E+03	1.38E+01	C
DIETHYLSTILBESTROL	56-53-1	SV	3.52E-06		3.52E-06	C
DIFENZOQUAT (AVENGE)	43222-48-6	SV		3.79E+02	3.79E+02	NC
1,1-DIFLUOROETHANE	75-37-6	V		5.20E+04	5.20E+04	NC
DIISOPROPYL METHYLPHOSPHONATE (DIMP)	1445-75-6	SV		3.79E+02	3.79E+02	NC
3,3'-DIMETHOXYBENZIDINE	119-90-4	SV	1.18E+00		1.18E+00	C
N,N-DIMETHYLANILINE	121-69-7	SV		9.46E+00	9.46E+00	NC
3,3'-DIMETHYLBENZIDINE	119-93-7	SV	7.20E-03		7.20E-03	C
2,4-DIMETHYLPHENOL	105-67-9	SV		9.46E+01	9.46E+01	NC
2,6-DIMETHYLPHENOL	576-26-1	SV		2.84E+00	2.84E+00	NC
3,4-DIMETHYLPHENOL	95-65-8	SV		4.73E+00	4.73E+00	NC
DIMETHYLPHTHALATE	131-11-3	SV		4.73E+04	4.73E+04	NC
1,2-DINITROBENZENE	528-29-0	SV		4.73E-01	4.73E-01	NC
1,3-DINITROBENZENE	99-65-0	SV		4.73E-01	4.73E-01	NC
1,4-DINITROBENZENE	100-25-4	SV		4.73E-01	4.73E-01	NC
4,6-DINITRO-O-CYCLOHEXYL PHENOL	131-89-5	SV		9.46E+00	9.46E+00	NC
4,6-DINITRO-2-METHYLPHENOL	534-52-1	SV		4.73E-01	4.73E-01	NC
2,4-DINITROPHENOL	51-28-5	SV		9.46E+00	9.46E+00	NC
DINITROTOLUENE MIX	NA	SV	2.44E-02		2.44E-02	C
2,4-DINITROTOLUENE	121-14-2	SV		9.46E+00	9.46E+00	NC
2,6-DINITROTOLUENE	606-20-2	SV		4.73E+00	4.73E+00	NC
DINOSEB	88-85-7	SV		4.73E+00	4.73E+00	NC
DIOCTYLPHTHALATE	117-84-0	SV		1.89E+02	1.89E+02	NC
1,4-DIOXANE	123-91-1	SV	1.51E+00		1.51E+00	C
DIPHENYLAMINE	122-39-4	SV		1.18E+02	1.18E+02	NC
1,2-DIPHENYLHYDRAZINE	122-66-7	SV	2.07E-02		2.07E-02	C
DIQUAT	85-00-7	SV		1.04E+01	1.04E+01	NC
DISULFOTON	298-04-4	SV		1.89E-01	1.89E-01	NC
1,4-DITHIANE	505-29-3	SV		4.73E+01	4.73E+01	NC
DIURON	330-54-1	SV		9.46E+00	9.46E+00	NC
ENDOSULFAN	115-29-7	SV		2.84E+01	2.84E+01	NC
ENDRIN	72-20-8	SV		1.42E+00	1.42E+00	NC
EPICHLOROHYDRIN	106-89-8	V	3.94E+00	1.35E+00	1.35E+00	NC
ETHION	563-12-2	SV		2.37E+00	2.37E+00	NC
ETHYL ACETATE	141-78-6	V		4.26E+03	4.26E+03	NC
ETHYLBENZENE	100-41-4	V		1.37E+03	1.37E+03	NC
ETHYLENE DIAMINE	107-15-3	SV		4.26E+02	4.26E+02	NC
ETHYLENE GLYCOL	107-21-1	SV		9.46E+03	9.46E+03	NC

Appendix D

Risk-based Air Concentrations for the EOD Personnel

Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Chemical	CAS No.	Group	Carcinogenic Risk-Based Concentration (mg/M^3) Inhalation	Non-carcinogenic Risk-Based Concentration (mg/M^3) Inhalation	Final Risk-Based Concentration (mg/M^3) Final	Final Risk-Based Concentration (mg/M^3) Basis
ETHYLENE GLYCOL, MONOBUTYL ETHER	111-76-2	SV		1.75E+04	1.75E+04	NC
ETHYLENE OXIDE	75-21-8	V	4.73E-02		4.73E-02	C
ETHYL ETHER	60-29-7	V		9.46E+02	9.46E+02	NC
FENAMIPHOS	22224-92-6	SV		1.18E+00	1.18E+00	NC
FLUOMETURON	2164-17-2	SV		6.15E+01	6.15E+01	NC
FLUORINE	7782-41-4	M		2.84E+02	2.84E+02	NC
FOMESAFEN	72178-02-0	SV	8.72E-02		8.72E-02	C
FONOFOS	944-22-9	SV		9.46E+00	9.46E+00	NC
FORMALDEHYDE	50-00-0	SV	3.68E-01	9.46E+02	3.68E-01	C
FURAN	110-00-9	V		4.73E+00	4.73E+00	NC
FURFURAL	98-01-1	SV		4.73E+01	4.73E+01	NC
GLYPHOSATE	1071-83-6	SV		4.73E+02	4.73E+02	NC
HEPTACHLOR	76-44-8	SV	3.68E-03	2.37E+00	3.68E-03	C
HEPTACHLOR EPOXIDE	1024-57-3	SV	1.82E-03	6.15E-02	1.82E-03	C
HEXABROMOBENZENE	87-82-1	SV		9.46E+00	9.46E+00	NC
HEXACHLOROBENZENE	118-74-1	SV	1.04E-02	3.79E+00	1.04E-02	C
HEXACHLOROBUTADIENE	87-68-3	SV	2.12E-01	9.46E-01	2.12E-01	C
ALPHA-HCH	319-84-6	SV	2.63E-03		2.63E-03	C
BETA-HCH	319-85-7	SV	9.20E-03		9.20E-03	C
GAMMA-HCH (LINDANE)	58-89-9	SV	1.27E-02	1.42E+00	1.27E-02	C
TECHNICAL HCH	608-73-1	SV	9.20E-03		9.20E-03	C
HEXACHLOROCYCLOPENTADIENE	77-47-4	SV		2.70E-01	2.70E-01	NC
HEXACHLORODIBENZODIOXIN MIX	19408-74-3	SV	3.64E-06		3.64E-06	C
HEXACHLOROETHANE	67-72-1	SV	1.18E+00	4.73E+00	1.18E+00	C
HEXACHLOROPHENE	70-30-4	SV		1.42E+00	1.42E+00	NC
1,6-HEXAMETHYLENE DIISOCYANATE	822-06-0	SV		1.37E-02	1.37E-02	NC
HEXANE	110-54-3	V		2.70E+02	2.70E+02	NC
HMX	2691-41-0	SV		2.37E+02	2.37E+02	NC
HYDRAZINE	302-01-2	V	9.74E-04		9.74E-04	C
HYDROGEN CHLORIDE	7647-01-0	V		2.70E+01	2.70E+01	NC
HYDROGEN SULFIDE	7783-06-4	V		2.70E+00	2.70E+00	NC
HYDROQUINONE	123-31-9	SV	2.96E-01	1.89E+02	2.96E-01	C
IRON	7439-89-6	M		1.42E+03	1.42E+03	NC
ISOBUTANOL	78-83-1	V		1.42E+03	1.42E+03	NC
ISOPHORONE	78-59-1	SV	1.74E+01	9.46E+02	1.74E+01	C
TETRAETHYLLEAD	78-00-2	V		4.73E-04	4.73E-04	NC
KEPONE	143-50-0	SV	2.07E-03	9.46E-01	2.07E-03	C
LITHIUM	7439-93-2	M		9.46E+01	9.46E+01	NC
MALATHION	121-75-5	SV		9.46E+01	9.46E+01	NC
MALEIC ANHYDRIDE	108-31-6	SV		4.73E+02	4.73E+02	NC
MANGANESE-FOOD	7439-96-5	M		6.77E-02	6.77E-02	NC
MEPHOSFOLAN	950-10-7	SV		4.26E-01	4.26E-01	NC
MEPIQUAT CHLORIDE	24307-26-4	SV		1.42E+02	1.42E+02	NC
MERCURIC CHLORIDE	7487-94-7	M		1.42E+00	1.42E+00	NC
MERCURY (elemental)	7439-97-6	M		4.07E-01	4.07E-01	NC
METHYLMERCURY	22967-92-6	V		4.73E-01	4.73E-01	NC
METHANOL	67-56-1	V		2.37E+03	2.37E+03	NC
METHIDATHION	950-37-8	SV		4.73E+00	4.73E+00	NC
METHOXYCHLOR	72-43-5	SV		2.37E+01	2.37E+01	NC
METHYL ACETATE	79-20-9	V		4.73E+03	4.73E+03	NC
METHYL ACRYLATE	96-33-3	V		1.42E+02	1.42E+02	NC
2-METHYLANILINE	95-53-4	SV	6.90E-02		6.90E-02	C
4-(2-METHYL-4-CHLOROPHENOXY) BUTYRIC ACID	94-81-5	SV		4.73E+01	4.73E+01	NC
2-METHYL-4-CHLOROPHENOXYACETIC ACID (MCPA)	94-74-6	SV		2.37E+00	2.37E+00	NC
2-(2-METHYL-4-CHLOROPHENOXY)PROPIONIC ACID (MCPP)	93-65-2	SV		4.73E+00	4.73E+00	NC
METHYLCYCLOHEXANE	108-87-2	V		4.07E+03	4.07E+03	NC
METHYLENE BROMIDE	74-95-3	V		4.73E+01	4.73E+01	NC
METHYLENE CHLORIDE	75-09-2	V	1.00E+01	1.42E+03	1.00E+01	C
4,4'-METHYLENE BIS(2-CHLOROANILINE)	101-14-4	SV	1.27E-01	3.31E+00	1.27E-01	C

Appendix D

Risk-based Air Concentrations for the EOD Personnel

Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Chemical	CAS No.	Group	Carcinogenic Risk-Based Concentration (mg/M^3) Inhalation	Non-carcinogenic Risk-Based Concentration (mg/M^3) Inhalation	Final Risk-Based Concentration (mg/M^3) Final	Final Risk-Based Concentration (mg/M^3) Basis
4,4'-METHYLENE BIS(N,N'-DIMETHYL)ANILINE	101-61-1	SV	3.60E-01		3.60E-01	C
4,4'-METHYLENEDIPHENYL ISOCYANATE	101-68-8	SV		8.04E-01	8.04E-01	NC
METHYL ETHYL KETONE (2-BUTANONE)	78-93-3	V		6.62E+03	6.62E+03	NC
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	108-10-1	V		4.07E+03	4.07E+03	NC
METHYL METHACRYLATE	80-62-6	V		9.46E+02	9.46E+02	NC
METHYL PARATHION	298-00-0	SV		1.18E+00	1.18E+00	NC
2-METHYLPHENOL	95-48-7	SV		2.37E+02	2.37E+02	NC
3-METHYLPHENOL	108-39-4	SV		2.37E+02	2.37E+02	NC
4-METHYLPHENOL	106-44-5	SV		2.37E+01	2.37E+01	NC
METHYLSTYRENE MIX	25013-15-4	V		4.73E+01	4.73E+01	NC
ALPHA-METHYLSTYRENE	98-83-9	V		3.31E+02	3.31E+02	NC
METHYL TERT-BUTYL ETHER	1634-04-4	V	4.14E+00	4.05E+03	4.14E+00	C
METOLACHLOR (DUAL)	51218-45-2	SV		7.10E+02	7.10E+02	NC
MIREX	2385-85-5	SV		9.46E-01	9.46E-01	NC
MOLYBDENUM	7439-98-7	M		2.37E+01	2.37E+01	NC
MONOCHLORAMINE	10599-90-3	SV		4.73E+02	4.73E+02	NC
NALED	300-76-5	SV		9.46E+00	9.46E+00	NC
NICKEL REFINERY DUST	NA	M	1.97E-02		1.97E-02	C
NICKEL	7440-02-0	M		9.46E+01	9.46E+01	NC
NITRATE	14797-55-8	M		7.57E+03	7.57E+03	NC
NITRITE	14797-65-0	M		4.73E+02	4.73E+02	NC
2-NITROANILINE	88-74-4	SV		1.42E-01	1.42E-01	NC
3-NITROANILINE	99-09-2	SV	8.28E-01	1.42E+00	8.28E-01	C
4-NITROANILINE	100-01-6	SV	8.28E-01	4.73E+00	8.28E-01	C
NITROBENZENE	98-95-3	V		2.84E+00	2.84E+00	NC
NITROGLYCERIN	55-63-0	SV	1.18E+00		1.18E+00	C
NITROGUANIDINE	556-88-7	SV		4.73E+02	4.73E+02	NC
2-NITROPROPANE	79-46-9	V	1.76E-03	2.70E+01	1.76E-03	C
N-NITROSO-DI-N-BUTYLAMINE	924-16-3	V	2.96E-03		2.96E-03	C
N-NITROSODIETHANOLAMINE	1116-54-7	SV	5.91E-03		5.91E-03	C
N-NITROSODIETHYLAMINE	55-18-5	SV	1.10E-04		1.10E-04	C
N-NITROSODIMETHYLAMINE	62-75-9	SV	3.25E-04	3.79E-02	3.25E-04	C
N-NITROSODIPHENYLAMINE	86-30-6	SV	3.38E+00	9.46E+01	3.38E+00	C
N-NITROSODIPROPYLAMINE	621-64-7	SV	2.37E-03		2.37E-03	C
N-NITROSO-N-METHYLETHYLAMINE	10595-95-6	SV	7.53E-04		7.53E-04	C
N-NITROSOPYRROLIDINE	930-55-2	SV	7.89E-03		7.89E-03	C
M-NITROTOLUENE	99-08-1	V		9.46E+01	9.46E+01	NC
O-NITROTOLUENE	88-72-2	V	7.20E-02	4.73E+01	7.20E-02	C
P-NITROTOLUENE	99-99-0	V	9.74E-01	4.73E+01	9.74E-01	C
NUSTAR	85509-19-9	SV		3.31E+00	3.31E+00	NC
ORYZALIN	19044-88-3	SV		2.37E+02	2.37E+02	NC
OXADIAZON	19666-30-9	SV		2.37E+01	2.37E+01	NC
OXAMYL	23135-22-0	SV		1.18E+02	1.18E+02	NC
OXYFLUORFEN	42874-03-3	SV		1.42E+01	1.42E+01	NC
PARAQUAT DICHLORIDE	1910-42-5	SV		2.13E+01	2.13E+01	NC
PARATHION	56-38-2	SV		2.84E+01	2.84E+01	NC
PENTACHLOROBENZENE	608-93-5	SV		3.79E+00	3.79E+00	NC
PENTACHLORONITROBENZENE	82-68-8	SV	6.37E-02	1.42E+01	6.37E-02	C
PENTACHLOROPHENOL	87-86-5	SV	1.38E-01	1.42E+02	1.38E-01	C
Pentaerythritoltetranitrate	78-11-5	SV	1.51E-01	1.42E+01	1.51E-01	C
PERCHLORATE	7601-90-3	M		3.31E+00	3.31E+00	NC
PERMETHRIN	52645-53-1	SV		2.37E+02	2.37E+02	NC
PHENOL	108-95-2	SV		1.42E+03	1.42E+03	NC
M-PHENYLENEDIAMINE	108-45-2	SV		2.84E+01	2.84E+01	NC
O-PHENYLENEDIAMINE	95-54-5	SV	3.52E-01		3.52E-01	C
P-PHENYLENEDIAMINE	106-50-3	SV		8.99E+02	8.99E+02	NC
PHOSPHINE	7803-51-2	SV		4.07E-01	4.07E-01	NC
PHOSPHORIC ACID	7664-38-2	M		1.37E+01	1.37E+01	NC
PHOSPHORUS (WHITE)	7723-14-0	M		9.46E-02	9.46E-02	NC

Appendix D

Risk-based Air Concentrations for the EOD Personnel

Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Chemical	CAS No.	Group	Carcinogenic Risk-Based Concentration (mg/M^3) Inhalation	Non-carcinogenic Risk-Based Concentration (mg/M^3) Inhalation	Final Risk-Based Concentration (mg/M^3) Final	Final Risk-Based Concentration (mg/M^3) Basis
PHTHALIC ANHYDRIDE	85-44-9	SV		1.62E+02	1.62E+02	NC
POLYBROMINATED BIPHENYLS	NA	SV	1.86E-03	3.31E-02	1.86E-03	C
POLYCHLORINATED BIPHENYLS	1336-36-3	SV	8.28E-03		8.28E-03	C
AROCLOR-1016	12674-11-2	SV	2.37E-01	3.31E-01	2.37E-01	C
AROCLOR-1221	11104-28-2	SV	8.28E-03		8.28E-03	C
AROCLOR-1232	11141-16-5	SV	8.28E-03		8.28E-03	C
AROCLOR-1242	53469-21-9	SV	8.28E-03		8.28E-03	C
AROCLOR-1248	12672-29-6	SV	8.28E-03		8.28E-03	C
AROCLOR-1254	11097-69-1	SV	8.28E-03	9.46E-02	8.28E-03	C
AROCLOR-1260	11096-82-5	SV	8.28E-03		8.28E-03	C
POLYCHLORINATED TERPHENYLS	61788-33-8	SV	3.68E-03		3.68E-03	C
POLYNUCLEAR AROMATIC HYDROCARBONS:	NA	SV				
ACENAPHTHENE	83-32-9	V		2.84E+02	2.84E+02	NC
ANTHRACENE	120-12-7	V		1.42E+03	1.42E+03	NC
BENZ[A]ANTHRACENE	56-55-3	SV	2.27E-02		2.27E-02	C
BENZO[B]FLUORANTHENE	205-99-2	SV	2.27E-02		2.27E-02	C
BENZO[K]FLUORANTHENE	207-08-9	SV	2.27E-01		2.27E-01	C
BENZO[A]PYRENE	50-32-8	SV	5.34E-03		5.34E-03	C
CARBAZOLE	86-74-8	SV	8.28E-01		8.28E-01	C
CHRYSENE	218-01-9	SV	2.27E+00		2.27E+00	C
DIBENZ[A,H]ANTHRACENE	53-70-3	SV	2.27E-03		2.27E-03	C
FLUORANTHENE	206-44-0	SV		1.89E+02	1.89E+02	NC
FLUORENE	86-73-7	V		1.89E+02	1.89E+02	NC
INDENO[1,2,3-C,D]PYRENE	193-39-5	SV	2.27E-02		2.27E-02	C
2-METHYLNAPHTHALENE	91-57-6	V		1.89E+01	1.89E+01	NC
NAPHTHALENE	91-20-3	V		4.26E+00	4.26E+00	NC
PYRENE	129-00-0	V		1.42E+02	1.42E+02	NC
PROMETON	1610-18-0	SV		7.10E+01	7.10E+01	NC
PROMETRYN	7287-19-6	SV		1.89E+01	1.89E+01	NC
PROPACHLOR	1918-16-7	SV		6.15E+01	6.15E+01	NC
PROPARGITE	2312-35-8	SV		9.46E+01	9.46E+01	NC
PROPYLENE GLYCOL	57-55-6	SV		4.07E+00	4.07E+00	NC
PROPYLENE GLYCOL, MONOETHYL ETHER	52125-53-8	SV		3.31E+03	3.31E+03	NC
PROPYLENE GLYCOL, MONOMETHYL ETHER	107-98-2	SV		2.70E+03	2.70E+03	NC
PURSUIT	81335-77-5	SV		1.18E+03	1.18E+03	NC
PYRIDINE	110-86-1	SV		4.73E+00	4.73E+00	NC
QUINOLINE	91-22-5	SV	5.52E-03		5.52E-03	C
RDX	121-82-4	SV	1.51E-01	1.42E+01	1.51E-01	C
RESMETHRIN	10453-86-8	SV		1.42E+02	1.42E+02	NC
ROTENONE	83-79-4	SV		1.89E+01	1.89E+01	NC
SELENIUM	7782-49-2	M		2.37E+01	2.37E+01	NC
SILVER	7440-22-4	M		2.37E+01	2.37E+01	NC
SIMAZINE	122-34-9	SV	1.38E-01	2.37E+01	1.38E-01	C
SODIUM DIETHYLDITHIOCARBAMATE	148-18-5	SV	6.13E-02	1.42E+02	6.13E-02	C
STRONTIUM, STABLE	7440-24-6	M		2.84E+03	2.84E+03	NC
STRYCHNINE	57-24-9	SV		1.42E+00	1.42E+00	NC
STYRENE	100-42-5	V		1.35E+03	1.35E+03	NC
2,3,7,8-TETRACHLORODIBENZODIOXIN	1746-01-6	SV	1.10E-07		1.10E-07	C
1,2,4,5-TETRACHLOROBENZENE	95-94-3	SV		1.42E+00	1.42E+00	NC
1,1,1,2-TETRACHLOROETHANE	630-20-6	V	6.37E-01	1.42E+02	6.37E-01	C
1,1,2,2-TETRACHLOROETHANE	79-34-5	V	8.28E-02	2.84E+02	8.28E-02	C
TETRACHLOROETHENE	127-18-4	V	8.28E-01	6.62E+02	8.28E-01	C
2,3,4,6-TETRACHLOROPHENOL	58-90-2	SV		1.42E+02	1.42E+02	NC
P,A,A,A-TETRACHLOROTOLUENE	5216-25-1	SV	8.28E-04		8.28E-04	C
1,1,1,2-TETRAFLUOROETHANE	811-97-2	V		1.08E+05	1.08E+05	NC
TETRAHYDROFURAN	109-99-9	SV	2.44E+00	4.07E+02	2.44E+00	C
TETRYL	479-45-8	SV		1.89E+01	1.89E+01	NC
THALLIUM	7440-28-0	M		3.31E-01	3.31E-01	NC
THALLIUM ACETATE	563-68-8	M		4.26E-01	4.26E-01	NC

Appendix D

Risk-based Air Concentrations for the EOD Personnel

Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Chemical	CAS No.	Group	Carcinogenic Risk-Based Concentration (mg/M^3) Inhalation	Non-carcinogenic Risk-Based Concentration (mg/M^3) Inhalation	Final Risk-Based Concentration (mg/M^3) Final	Final Risk-Based Concentration (mg/M^3) Basis
THALLIUM CARBONATE	6533-73-9	M		3.79E-01	3.79E-01	NC
THALLIUM CHLORIDE	7791-12-0	M		3.79E-01	3.79E-01	NC
THALLIUM NITRATE	10102-45-1	M		4.26E-01	4.26E-01	NC
THALLIUM SULFATE (2:1)	7446-18-6	M		3.79E-01	3.79E-01	NC
THIOBENCARB	28249-77-6	SV		4.73E+01	4.73E+01	NC
TIN	7440-31-5	M		2.84E+03	2.84E+03	NC
TITANIUM	7440-32-6	M		4.07E+01	4.07E+01	NC
TITANIUM DIOXIDE	13463-67-7	M		4.07E+01	4.07E+01	NC
TOLUENE	108-88-3	V		5.39E+02	5.39E+02	NC
TOLUENE-2,4-DIAMINE	95-80-7	SV	5.18E-03		5.18E-03	C
TOLUENE-2,5-DIAMINE	95-70-5	SV		2.84E+03	2.84E+03	NC
TOLUENE-2,6-DIAMINE	823-40-5	SV		9.46E+02	9.46E+02	NC
P-TOLUIDINE	106-49-0	SV	8.72E-02		8.72E-02	C
TOXAPHENE	8001-35-2	SV	1.51E-02		1.51E-02	C
1,2,4-TRIBROMOBENZENE	615-54-3	SV		2.37E+01	2.37E+01	NC
TRIBUTYLTIN OXIDE	56-35-9	SV		1.42E+00	1.42E+00	NC
2,4,6-TRICHLOROANILINE	634-93-5	SV	4.87E-01		4.87E-01	C
1,2,4-TRICHLOROBENZENE	120-82-1	V		4.73E+00	4.73E+00	NC
1,1,1-TRICHLOROETHANE	71-55-6	V		2.98E+03	2.98E+03	NC
1,1,2-TRICHLOROETHANE	79-00-5	V	2.96E-01	1.89E+01	2.96E-01	C
TRICHLOROETHENE	79-01-6	V	4.14E-02	4.73E+01	4.14E-02	C
TRICHLOROFLUOROMETHANE	75-69-4	V		9.46E+02	9.46E+02	NC
2,4,5-TRICHLOROPHENOL	95-95-4	SV		4.73E+02	4.73E+02	NC
2,4,6-TRICHLOROPHENOL	88-06-2	SV	1.66E+00		1.66E+00	C
2,4,5-T	93-76-5	SV		4.73E+01	4.73E+01	NC
2-(2,4,5-TRICHLOROPHENOXY)PROPIONIC ACID	93-72-1	SV		3.79E+01	3.79E+01	NC
1,1,2-TRICHLOROPROPANE	598-77-6	V		2.37E+01	2.37E+01	NC
1,2,3-TRICHLOROPROPANE	96-18-4	V	8.28E-03	6.62E+00	8.28E-03	C
1,2,3-TRICHLOROPROPENE	96-19-5	V		1.42E+00	1.42E+00	NC
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	76-13-1	V		4.07E+04	4.07E+04	NC
1,2,4-TRIMETHYLBENZENE	95-63-6	V		8.04E+00	8.04E+00	NC
1,3,5-TRIMETHYLBENZENE	108-67-8	V		8.04E+00	8.04E+00	NC
1,3,5-TRINITROBENZENE	99-35-4	SV		1.42E+02	1.42E+02	NC
2,4,6-TRINITROTOLUENE	118-96-7	SV	5.52E-01	2.37E+00	5.52E-01	C
URANIUM (SOLUBLE SALTS; from IRIS)	7440-61-1	M		1.42E+01	1.42E+01	NC
URANIUM (SOLUBLE SALTS; provisional)	7440-61-1	M		9.46E-01	9.46E-01	NC
VANADIUM	7440-62-2	M		4.73E+00	4.73E+00	NC
VINCLOZOLIN	50471-44-8	SV		1.18E+02	1.18E+02	NC
VINYL ACETATE	108-05-4	V		2.70E+02	2.70E+02	NC
VINYL CHLORIDE: adult (see cover memos)	75-01-4	V	1.10E+00	1.32E+02	1.10E+00	C
WARFARIN	81-81-2	SV		1.42E+00	1.42E+00	NC
O-XYLENE	95-47-6	V		1.42E+02	1.42E+02	NC
M,P-XYLENES	1330-20-7	V		1.42E+02	1.42E+02	NC
XYLENES	1330-20-7	V		1.42E+02	1.42E+02	NC
ZINC	7440-66-6	M		1.42E+03	1.42E+03	NC
ZINEB	12122-67-7	SV		2.37E+02	2.37E+02	NC

APPENDIX E

Risk-Based Air Concentrations for the Boater

Appendix E

Risk-based Air Concentrations for the Boater

Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Chemical	CAS No.	Group	Carcinogenic Risk-based Concentration (mg/M^3) Inhalation	Non-carcinogenic Risk-based Concentration (mg/M^3) Inhalation	Final Risk-based Concentration (mg/M^3) Final	Final Risk-based Concentration (mg/M^3) Basis
ACETALDEHYDE	75-07-0	V	1.16E-01	6.58E-01	1.16E-01	C
ACETOCHLOR	34256-82-1	SV		5.12E+00	5.12E+00	NC
ACETONE	67-64-1	V		2.30E+02	2.30E+02	NC
ACETONITRILE	75-05-8	V		4.35E+00	4.35E+00	NC
ACETOPHENONE	98-86-2	V		2.56E+01	2.56E+01	NC
ACROLEIN	107-02-8	V		1.46E-03	1.46E-03	NC
ACRYLAMIDE	79-06-1	SV	1.99E-04	5.12E-02	1.99E-04	C
ACRYLONITRILE	107-13-1	V	3.73E-03	1.46E-01	3.73E-03	C
ALACHLOR	15972-60-8	SV	1.12E-02	2.56E+00	1.12E-02	C
ALAR	1596-84-5	SV		3.84E+01	3.84E+01	NC
ALDICARB	116-06-3	SV		2.56E-01	2.56E-01	NC
ALDICARB SULFONE	1646-88-4	SV		2.56E-01	2.56E-01	NC
ALDRIN	309-00-2	SV	5.27E-05	7.68E-03	5.27E-05	C
ALLYL CHLORIDE	107-05-1	V		7.31E-02	7.31E-02	NC
ALUMINUM	7429-90-5	M		2.56E-01	2.56E-01	NC
AMINODINITROTOLUENES	NA	SV		5.12E-01	5.12E-01	NC
AMMONIA	7664-41-7	V		7.32E+00	7.32E+00	NC
ANILINE	62-53-3	SV	1.57E-01	7.42E-02	7.42E-02	NC
ANTIMONY	7440-36-0	M		1.02E-01	1.02E-01	NC
ANTIMONY TRIOXIDE	1309-64-4	M		1.46E-02	1.46E-02	NC
ARSENIC	7440-38-2	M	5.93E-05	7.68E-02	5.93E-05	C
ARSINE	7784-42-1	V		3.58E-03	3.58E-03	NC
ASSURE	76578-14-8	SV		2.30E+00	2.30E+00	NC
ATRAZINE	1912-24-9	SV	4.07E-03	8.96E+00	4.07E-03	C
BARIUM	7440-39-3	M		3.58E-02	3.58E-02	NC
BAYGON	114-26-1	SV		1.02E+00	1.02E+00	NC
BAYTHROID	68359-37-5	SV		6.40E+00	6.40E+00	NC
BENTAZON	25057-89-0	SV		7.68E+00	7.68E+00	NC
BENZALDEHYDE	100-52-7	SV		2.56E+01	2.56E+01	NC
BENZENE	71-43-2	V	3.32E-02	2.20E+00	3.32E-02	C
BENZENETHIOL	108-98-5	V		2.56E-03	2.56E-03	NC
BENZIDINE	92-87-5	SV	3.89E-06	7.68E-01	3.89E-06	C
BENZOIC ACID	65-85-0	SV		1.02E+03	1.02E+03	NC
BENZYL ALCOHOL	100-51-6	SV		7.68E+01	7.68E+01	NC
BENZYL CHLORIDE	100-44-7	V	5.27E-03	5.12E-01	5.27E-03	C
BERYLLIUM	7440-41-7	M	1.07E-04	1.46E-03	1.07E-04	C
BIPHENYL	92-52-4	V		1.28E+01	1.28E+01	NC
BIS(2-CHLOROETHYL)ETHER	111-44-4	V	8.14E-04		8.14E-04	C
BIS(2-CHLOROISOPROPYL)ETHER	108-60-1	V	2.56E-02	1.02E+01	2.56E-02	C
BIS(CHLOROMETHYL)ETHER	542-88-1	V	4.07E-06		4.07E-06	C
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	SV	6.40E-02	5.12E+00	6.40E-02	C
BORON	7440-42-8	M		1.46E+00	1.46E+00	NC
BROMOBENZENE	108-86-1	V		7.68E-01	7.68E-01	NC
BROMODICHLOROMETHANE	75-27-4	V	1.44E-02	5.12E+00	1.44E-02	C
BROMOETHENE	593-60-2	V	8.14E-03	2.20E-01	8.14E-03	C
BROMOFORM	75-25-2	SV	2.30E-01	5.12E+00	2.30E-01	C
BROMOMETHANE	74-83-9	V		3.58E-01	3.58E-01	NC
BROMOPHOS	2104-96-3	SV		1.28E+00	1.28E+00	NC
1,3-BUTADIENE	106-99-0	V	8.96E-03	1.46E-01	8.96E-03	C
1-BUTANOL	71-36-3	SV		2.56E+01	2.56E+01	NC
BUTYLBENZYLPHTHALATE	85-68-7	SV	4.71E-01	5.12E+01	4.71E-01	C
CADMIUM-FOOD	7440-43-9	M	1.42E-04	1.46E-02	1.42E-04	C
CAPROLACTAM	105-60-2	SV		1.28E+02	1.28E+02	NC
CARBARYL	63-25-2	SV		2.56E+01	2.56E+01	NC
CARBON DISULFIDE	75-15-0	V		5.12E+01	5.12E+01	NC
CARBON TETRACHLORIDE	56-23-5	V	1.69E-02	1.28E+01	1.69E-02	C
CARBOSULFAN	55285-14-8	SV		2.56E+00	2.56E+00	NC
CHLORAL HYDRATE	302-17-0	SV		2.56E+01	2.56E+01	NC
CHLORANIL	118-75-2	SV	2.24E-03		2.24E-03	C
CHLORDANE	57-74-9	SV	2.56E-03	5.12E-02	2.56E-03	C

Appendix E

Risk-based Air Concentrations for the Boater

Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Chemical	CAS No.	Group	Carcinogenic Risk-based Concentration (mg/M^3) Inhalation	Non-carcinogenic Risk-based Concentration (mg/M^3) Inhalation	Final Risk-based Concentration (mg/M^3) Final	Final Risk-based Concentration (mg/M^3) Basis
CHLORINE	7782-50-5	V		1.46E-02	1.46E-02	NC
CHLORINE DIOXIDE	10049-04-4	V		1.46E-02	1.46E-02	NC
CHLOROACETIC ACID	79-11-8	SV		5.12E-01	5.12E-01	NC
4-CHLOROANILINE	106-47-8	SV	1.66E-02	1.02E+00	1.66E-02	C
CHLOROBENZENE	108-90-7	V		4.35E+00	4.35E+00	NC
2-CHLORO-1,3-BUTADIENE	126-99-8	V		5.12E-01	5.12E-01	NC
1-CHLORO-1,1-DIFLUOROETHANE	75-68-3	V		3.58E+03	3.58E+03	NC
CHLORODIFLUOROMETHANE	75-45-6	V		3.58E+03	3.58E+03	NC
CHLOROETHANE	75-00-3	V	3.09E-01	7.42E+02	3.09E-01	C
CHLOROFORM	67-66-3	V	1.11E-02	3.58E+00	1.11E-02	C
CHLOROMETHANE	74-87-3	V		6.65E+00	6.65E+00	NC
4-CHLORO-2-METHYLANILINE	95-69-2	SV	1.54E-03		1.54E-03	C
BETA-CHLORONAPHTHALENE	91-58-7	V		2.05E+01	2.05E+01	NC
O-CHLORONITROBENZENE	88-73-3	V	9.23E-02	5.12E-03	5.12E-03	NC
P-CHLORONITROBENZENE	100-00-5	V	1.34E-01	4.35E-02	4.35E-02	NC
2-CHLOROPHENOL	95-57-8	V		1.28E+00	1.28E+00	NC
2-CHLOROPROPANE	75-29-6	V		7.42E+00	7.42E+00	NC
O-CHLOROTOLUENE	95-49-8	V		5.12E+00	5.12E+00	NC
CHLORPYRIFOS	2921-88-2	SV		7.68E-01	7.68E-01	NC
CHLORPYRIFOS-METHYL	5598-13-0	SV		2.56E+00	2.56E+00	NC
CHROMIUM	7440-47-3	M		3.84E+02	3.84E+02	NC
CHROMIUM III	16065-83-1	M		3.84E+02	3.84E+02	NC
CHROMIUM VI	18540-29-9	M	2.18E-05	7.68E-03	2.18E-05	C
COBALT	7440-48-4	M	9.14E-05	1.46E-03	9.14E-05	C
COKE OVEN EMISSIONS (COAL TAR)	8007-45-2	SV	4.07E-04		4.07E-04	C
COPPER	7440-50-8	M		1.02E+01	1.02E+01	NC
CUMENE	98-82-8	V		2.82E+01	2.82E+01	NC
CYANIDE (FREE)	57-12-5	M		5.12E+00	5.12E+00	NC
CALCIUM CYANIDE	592-01-8	M		1.02E+01	1.02E+01	NC
COPPER CYANIDE	544-92-3	M		1.28E+00	1.28E+00	NC
CYANOGEN	460-19-5	V		1.02E+01	1.02E+01	NC
HYDROGEN CYANIDE	74-90-8	V		2.20E-01	2.20E-01	NC
POTASSIUM CYANIDE	151-50-8	M		1.28E+01	1.28E+01	NC
POTASSIUM SILVER CYANIDE	506-61-6	M		5.12E+01	5.12E+01	NC
SILVER CYANIDE	506-64-9	M		2.56E+01	2.56E+01	NC
SODIUM CYANIDE	143-33-9	M		1.02E+01	1.02E+01	NC
THIOCYANATE	NA	M		2.56E-02	2.56E-02	NC
ZINC CYANIDE	557-21-1	M		1.28E+01	1.28E+01	NC
CYCLOHEXANE	110-82-7	V		4.35E+02	4.35E+02	NC
CYCLOHEXANONE	108-94-1	SV		1.28E+03	1.28E+03	NC
CYHALOTHRIN/KARATE	68085-85-8	SV		1.28E+00	1.28E+00	NC
CYPERMETHRIN	52315-07-8	SV		2.56E+00	2.56E+00	NC
DACTHAL	1861-32-1	SV		2.56E+00	2.56E+00	NC
DALAPON	75-99-0	SV		7.68E+00	7.68E+00	NC
DDD	72-54-8	SV	3.73E-03	5.12E-01	3.73E-03	C
DDE	72-55-9	SV	2.63E-03		2.63E-03	C
DDT	50-29-3	SV	2.63E-03	1.28E-01	2.63E-03	C
DIAZINON	333-41-5	SV		2.30E-01	2.30E-01	NC
DIBENZOFURAN	132-64-9	V		5.12E-01	5.12E-01	NC
1,4-DIBROMOBENZENE	106-37-6	SV		2.56E+00	2.56E+00	NC
DIBROMOCHLOROMETHANE	124-48-1	V	1.07E-02	5.12E+00	1.07E-02	C
1,2-DIBROMO-3-CHLOROPROPANE	96-12-8	V	3.73E-01	1.46E-02	1.46E-02	NC
1,2-DIBROMOETHANE	106-93-4	V	4.48E-04	6.65E-01	4.48E-04	C
DIBUTYLPHTHALATE	84-74-2	SV		2.56E+01	2.56E+01	NC
DICAMBA	1918-00-9	SV		7.68E+00	7.68E+00	NC
1,2-DICHLOROBENZENE	95-50-1	V		1.02E+01	1.02E+01	NC
1,3-DICHLOROBENZENE	541-73-1	V		7.68E-01	7.68E-01	NC
1,4-DICHLOROBENZENE	106-46-7	V	4.07E-02	5.86E+01	4.07E-02	C
3,3'-DICHLOROBENZIDINE	91-94-1	SV	1.99E-03		1.99E-03	C
DICHLORODIFLUOROMETHANE	75-71-8	V		1.28E+01	1.28E+01	NC

Appendix E

Risk-based Air Concentrations for the Boater

Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Chemical	CAS No.	Group	Carcinogenic Risk-based Concentration (mg/M^3) Inhalation	Non-carcinogenic Risk-based Concentration (mg/M^3) Inhalation	Final Risk-based Concentration (mg/M^3) Final	Final Risk-based Concentration (mg/M^3) Basis
1,1-DICHLOROETHANE	75-34-3	V		3.58E+01	3.58E+01	NC
1,2-DICHLOROETHANE	107-06-2	V	9.84E-03	1.79E+02	9.84E-03	C
1,1-DICHLOROETHENE	75-35-4	V		1.54E+01	1.54E+01	NC
CIS-1,2-DICHLOROETHENE	156-59-2	V		2.56E+00	2.56E+00	NC
TRANS-1,2-DICHLOROETHENE	156-60-5	V		4.35E+00	4.35E+00	NC
TOTAL 1,2-DICHLOROETHENE	540-59-0	V		2.30E+00	2.30E+00	NC
2,4-DICHLOROPHENOL	120-83-2	SV		7.68E-01	7.68E-01	NC
2,4-D	94-75-7	SV		2.56E+00	2.56E+00	NC
4-(2,4-DICHLOROPHENOXY)BUTYRIC ACID	94-82-6	SV		2.05E+00	2.05E+00	NC
1,2-DICHLOROPROPANE	78-87-5	V	1.32E-02	2.92E-01	1.32E-02	C
1,3-DICHLOROPROPANE	142-28-9	V		5.12E+00	5.12E+00	NC
2,3-DICHLOROPROPANOL	616-23-9	SV		7.68E-01	7.68E-01	NC
1,3-DICHLOROPROPENE	542-75-6	V	8.96E-02	1.46E+00	8.96E-02	C
DICHLORVOS	62-73-7	SV	3.09E-03	3.66E-02	3.09E-03	C
DIELDRIN	60-57-1	SV	5.60E-05	1.28E-02	5.60E-05	C
DIESEL EMISSIONS	NA	SV		3.58E-01	3.58E-01	NC
DIETHYLPHTHALATE	84-66-2	SV		2.05E+02	2.05E+02	NC
DIETHYLENE GLYCOL, MONOBUTYL ETHER	112-34-5	SV		1.46E+00	1.46E+00	NC
DIETHYLENE GLYCOL, MONOETHYL ETHER	111-90-0	SV		2.20E-01	2.20E-01	NC
DI(2-ETHYLHEXYL)ADIPATE	103-23-1	SV	7.46E-01	1.54E+02	7.46E-01	C
DIETHYLSTILBESTROL	56-53-1	SV	1.91E-07		1.91E-07	C
DIFENZOQUAT (AVENGE)	43222-48-6	SV		2.05E+01	2.05E+01	NC
1,1-DIFLUOROETHANE	75-37-6	V		2.82E+03	2.82E+03	NC
DIISOPROPYL METHYLPHOSPHONATE (DIMP)	1445-75-6	SV		2.05E+01	2.05E+01	NC
3,3'-DIMETHOXYBENZIDINE	119-90-4	SV	6.40E-02		6.40E-02	C
N,N-DIMETHYLANILINE	121-69-7	SV		5.12E-01	5.12E-01	NC
3,3'-DIMETHYLBENZIDINE	119-93-7	SV	3.89E-04		3.89E-04	C
2,4-DIMETHYLPHENOL	105-67-9	SV		5.12E+00	5.12E+00	NC
2,6-DIMETHYLPHENOL	576-26-1	SV		1.54E-01	1.54E-01	NC
3,4-DIMETHYLPHENOL	95-65-8	SV		2.56E-01	2.56E-01	NC
DIMETHYLPHTHALATE	131-11-3	SV		2.56E+03	2.56E+03	NC
1,2-DINITROBENZENE	528-29-0	SV		2.56E-02	2.56E-02	NC
1,3-DINITROBENZENE	99-65-0	SV		2.56E-02	2.56E-02	NC
1,4-DINITROBENZENE	100-25-4	SV		2.56E-02	2.56E-02	NC
4,6-DINITRO-O-CYCLOHEXYL PHENOL	131-89-5	SV		5.12E-01	5.12E-01	NC
4,6-DINITRO-2-METHYLPHENOL	534-52-1	SV		2.56E-02	2.56E-02	NC
2,4-DINITROPHENOL	51-28-5	SV		5.12E-01	5.12E-01	NC
DINITROTOLUENE MIX	NA	SV	1.32E-03		1.32E-03	C
2,4-DINITROTOLUENE	121-14-2	SV		5.12E-01	5.12E-01	NC
2,6-DINITROTOLUENE	606-20-2	SV		2.56E-01	2.56E-01	NC
DINOSEB	88-85-7	SV		2.56E-01	2.56E-01	NC
DIOCTYLPHTHALATE	117-84-0	SV		1.02E+01	1.02E+01	NC
1,4-DIOXANE	123-91-1	SV	8.14E-02		8.14E-02	C
DIPHENYLAMINE	122-39-4	SV		6.40E+00	6.40E+00	NC
1,2-DIPHENYLHYDRAZINE	122-66-7	SV	1.12E-03		1.12E-03	C
DIQUAT	85-00-7	SV		5.63E-01	5.63E-01	NC
DISULFOTON	298-04-4	SV		1.02E-02	1.02E-02	NC
1,4-DITHIANE	505-29-3	SV		2.56E+00	2.56E+00	NC
DIURON	330-54-1	SV		5.12E-01	5.12E-01	NC
ENDOSULFAN	115-29-7	SV		1.54E+00	1.54E+00	NC
ENDRIN	72-20-8	SV		7.68E-02	7.68E-02	NC
EPICHLOROHYDRIN	106-89-8	V	2.13E-01	7.32E-02	7.32E-02	NC
ETHION	563-12-2	SV		1.28E-01	1.28E-01	NC
ETHYL ACETATE	141-78-6	V		2.30E+02	2.30E+02	NC
ETHYLBENZENE	100-41-4	V		7.42E+01	7.42E+01	NC
ETHYLENE DIAMINE	107-15-3	SV		2.30E+01	2.30E+01	NC
ETHYLENE GLYCOL	107-21-1	SV		5.12E+02	5.12E+02	NC
ETHYLENE GLYCOL, MONOBUTYL ETHER	111-76-2	SV		9.47E+02	9.47E+02	NC
ETHYLENE OXIDE	75-21-8	V	2.56E-03		2.56E-03	C
ETHYL ETHER	60-29-7	V		5.12E+01	5.12E+01	NC

Appendix E

Risk-based Air Concentrations for the Boater

Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Chemical	CAS No.	Group	Carcinogenic Risk-based Concentration (mg/M^3) Inhalation	Non-carcinogenic Risk-based Concentration (mg/M^3) Inhalation	Final Risk-based Concentration (mg/M^3) Final	Final Risk-based Concentration (mg/M^3) Basis
FENAMIPHOS	22224-92-6	SV		6.40E-02	6.40E-02	NC
FLUOMETURON	2164-17-2	SV		3.33E+00	3.33E+00	NC
FLUORINE	7782-41-4	M		1.54E+01	1.54E+01	NC
FOMESAFEN	72178-02-0	SV	4.71E-03		4.71E-03	C
FONOFOS	944-22-9	SV		5.12E-01	5.12E-01	NC
FORMALDEHYDE	50-00-0	SV	1.99E-02	5.12E+01	1.99E-02	C
FURAN	110-00-9	V		2.56E-01	2.56E-01	NC
FURFURAL	98-01-1	SV		2.56E+00	2.56E+00	NC
GLYPHOSATE	1071-83-6	SV		2.56E+01	2.56E+01	NC
HEPTACHLOR	76-44-8	SV	1.99E-04	1.28E-01	1.99E-04	C
HEPTACHLOR EPOXIDE	1024-57-3	SV	9.84E-05	3.33E-03	9.84E-05	C
HEXABROMOBENZENE	87-82-1	SV		5.12E-01	5.12E-01	NC
HEXACHLOROBENZENE	118-74-1	SV	5.60E-04	2.05E-01	5.60E-04	C
HEXACHLOROBUTADIENE	87-68-3	SV	1.15E-02	5.12E-02	1.15E-02	C
ALPHA-HCH	319-84-6	SV	1.42E-04		1.42E-04	C
BETA-HCH	319-85-7	SV	4.98E-04		4.98E-04	C
GAMMA-HCH (LINDANE)	58-89-9	SV	6.89E-04	7.68E-02	6.89E-04	C
TECHNICAL HCH	608-73-1	SV	4.98E-04		4.98E-04	C
HEXACHLOROCYCLOPENTADIENE	77-47-4	SV		1.46E-02	1.46E-02	NC
HEXACHLORODIBENZODIOXIN MIX	19408-74-3	SV	1.97E-07		1.97E-07	C
HEXACHLOROETHANE	67-72-1	SV	6.40E-02	2.56E-01	6.40E-02	C
HEXACHLOROPHENE	70-30-4	SV		7.68E-02	7.68E-02	NC
1,6-HEXAMETHYLENE DIISOCYANATE	822-06-0	SV		7.42E-04	7.42E-04	NC
HEXANE	110-54-3	V		1.46E+01	1.46E+01	NC
HMX	2691-41-0	SV		1.28E+01	1.28E+01	NC
HYDRAZINE	302-01-2	V	5.27E-05		5.27E-05	C
HYDROGEN CHLORIDE	7647-01-0	V		1.46E+00	1.46E+00	NC
HYDROGEN SULFIDE	7783-06-4	V		1.46E-01	1.46E-01	NC
HYDROQUINONE	123-31-9	SV	1.60E-02	1.02E+01	1.60E-02	C
IRON	7439-89-6	M		7.68E+01	7.68E+01	NC
ISOBUTANOL	78-83-1	V		7.68E+01	7.68E+01	NC
ISOPHORONE	78-59-1	SV	9.43E-01	5.12E+01	9.43E-01	C
TETRAETHYLLEAD	78-00-2	V		2.56E-05	2.56E-05	NC
KEPONE	143-50-0	SV	1.12E-04	5.12E-02	1.12E-04	C
LITHIUM	7439-93-2	M		5.12E+00	5.12E+00	NC
MALATHION	121-75-5	SV		5.12E+00	5.12E+00	NC
MALEIC ANHYDRIDE	108-31-6	SV		2.56E+01	2.56E+01	NC
MANGANESE-FOOD	7439-96-5	M		3.66E-03	3.66E-03	NC
MEPHOSFOLAN	950-10-7	SV		2.30E-02	2.30E-02	NC
MEPIQUAT CHLORIDE	24307-26-4	SV		7.68E+00	7.68E+00	NC
MERCURIC CHLORIDE	7487-94-7	M		7.68E-02	7.68E-02	NC
MERCURY (elemental)	7439-97-6	M		2.20E-02	2.20E-02	NC
METHYLMERCURY	22967-92-6	V		2.56E-02	2.56E-02	NC
METHANOL	67-56-1	V		1.28E+02	1.28E+02	NC
METHIDATHION	950-37-8	SV		2.56E-01	2.56E-01	NC
METHOXYCHLOR	72-43-5	SV		1.28E+00	1.28E+00	NC
METHYL ACETATE	79-20-9	V		2.56E+02	2.56E+02	NC
METHYL ACRYLATE	96-33-3	V		7.68E+00	7.68E+00	NC
2-METHYLANILINE	95-53-4	SV	3.73E-03		3.73E-03	C
4-(2-METHYL-4-CHLOROPHENOXY) BUTYRIC ACID	94-81-5	SV		2.56E+00	2.56E+00	NC
2-METHYL-4-CHLOROPHENOXYACETIC ACID (MCPA)	94-74-6	SV		1.28E-01	1.28E-01	NC
2-(2-METHYL-4-CHLOROPHENOXY)PROPIONIC ACID (MCPP)	93-65-2	SV		2.56E-01	2.56E-01	NC
METHYLCYCLOHEXANE	108-87-2	V		2.20E+02	2.20E+02	NC
METHYLENE BROMIDE	74-95-3	V		2.56E+00	2.56E+00	NC
METHYLENE CHLORIDE	75-09-2	V	5.43E-01	7.68E+01	5.43E-01	C
4,4'-METHYLENE BIS(2-CHLOROANILINE)	101-14-4	SV	6.89E-03	1.79E-01	6.89E-03	C
4,4'-METHYLENE BIS(N,N'-DIMETHYL)ANILINE	101-61-1	SV	1.95E-02		1.95E-02	C
4,4'-METHYLENEDIPHENYL ISOCYANATE	101-68-8	SV		4.35E-02	4.35E-02	NC
METHYL ETHYL KETONE (2-BUTANONE)	78-93-3	V		3.58E+02	3.58E+02	NC
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	108-10-1	V		2.20E+02	2.20E+02	NC

Appendix E

Risk-based Air Concentrations for the Boater

Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Chemical	CAS No.	Group	Carcinogenic Risk-based Concentration (mg/M^3) Inhalation	Non-carcinogenic Risk-based Concentration (mg/M^3) Inhalation	Final Risk-based Concentration (mg/M^3) Final	Final Risk-based Concentration (mg/M^3) Basis
METHYL METHACRYLATE	80-62-6	V		5.12E+01	5.12E+01	NC
METHYL PARATHION	298-00-0	SV		6.40E-02	6.40E-02	NC
2-METHYLPHENOL	95-48-7	SV		1.28E+01	1.28E+01	NC
3-METHYLPHENOL	108-39-4	SV		1.28E+01	1.28E+01	NC
4-METHYLPHENOL	106-44-5	SV		1.28E+00	1.28E+00	NC
METHYLSTYRENE MIX	25013-15-4	V		2.56E+00	2.56E+00	NC
ALPHA-METHYLSTYRENE	98-83-9	V		1.79E+01	1.79E+01	NC
METHYL TERT-BUTYL ETHER	1634-04-4	V	2.24E-01	2.19E+02	2.24E-01	C
METOLACHLOR (DUAL)	51218-45-2	SV		3.84E+01	3.84E+01	NC
MIREX	2385-85-5	SV		5.12E-02	5.12E-02	NC
MOLYBDENUM	7439-98-7	M		1.28E+00	1.28E+00	NC
MONOCHLORAMINE	10599-90-3	SV		2.56E+01	2.56E+01	NC
NALED	300-76-5	SV		5.12E-01	5.12E-01	NC
NICKEL REFINERY DUST	NA	M	1.07E-03		1.07E-03	C
NICKEL	7440-02-0	M		5.12E+00	5.12E+00	NC
NITRATE	14797-55-8	M		4.09E+02	4.09E+02	NC
NITRITE	14797-65-0	M		2.56E+01	2.56E+01	NC
2-NITROANILINE	88-74-4	SV		7.68E-03	7.68E-03	NC
3-NITROANILINE	99-09-2	SV	4.48E-02	7.68E-02	4.48E-02	C
4-NITROANILINE	100-01-6	SV	4.48E-02	2.56E-01	4.48E-02	C
NITROBENZENE	98-95-3	V		1.54E-01	1.54E-01	NC
NITROGLYCERIN	55-63-0	SV	6.40E-02		6.40E-02	C
NITROGUANIDINE	556-88-7	SV		2.56E+01	2.56E+01	NC
2-NITROPROPANE	79-46-9	V	9.53E-05	1.46E+00	9.53E-05	C
N-NITROSO-DI-N-BUTYLAMINE	924-16-3	V	1.60E-04		1.60E-04	C
N-NITROSODIETHANOLAMINE	1116-54-7	SV	3.20E-04		3.20E-04	C
N-NITROSODIETHYLAMINE	55-18-5	SV	5.97E-06		5.97E-06	C
N-NITROSODIMETHYLAMINE	62-75-9	SV	1.76E-05	2.05E-03	1.76E-05	C
N-NITROSODIPHENYLAMINE	86-30-6	SV	1.83E-01	5.12E+00	1.83E-01	C
N-NITROSODIPROPYLAMINE	621-64-7	SV	1.28E-04		1.28E-04	C
N-NITROSO-N-METHYLETHYLAMINE	10595-95-6	SV	4.07E-05		4.07E-05	C
N-NITROSOPYRROLIDINE	930-55-2	SV	4.27E-04		4.27E-04	C
M-NITROTOLUENE	99-08-1	V		5.12E+00	5.12E+00	NC
O-NITROTOLUENE	88-72-2	V	3.89E-03	2.56E+00	3.89E-03	C
P-NITROTOLUENE	99-99-0	V	5.27E-02	2.56E+00	5.27E-02	C
NUSTAR	85509-19-9	SV		1.79E-01	1.79E-01	NC
ORYZALIN	19044-88-3	SV		1.28E+01	1.28E+01	NC
OXADIAZON	19666-30-9	SV		1.28E+00	1.28E+00	NC
OXAMYL	23135-22-0	SV		6.40E+00	6.40E+00	NC
OXYFLUORFEN	42874-03-3	SV		7.68E-01	7.68E-01	NC
PARAQUAT DICHLORIDE	1910-42-5	SV		1.15E+00	1.15E+00	NC
PARATHION	56-38-2	SV		1.54E+00	1.54E+00	NC
PENTACHLOROBENZENE	608-93-5	SV		2.05E-01	2.05E-01	NC
PENTACHLORONITROBENZENE	82-68-8	SV	3.44E-03	7.68E-01	3.44E-03	C
PENTACHLOROPHENOL	87-86-5	SV	7.46E-03	7.68E+00	7.46E-03	C
Pentaerythritoltetranitrate	78-11-5	SV	8.14E-03	7.68E-01	8.14E-03	C
PERCHLORATE	7601-90-3	M		1.79E-01	1.79E-01	NC
PERMETHRIN	52645-53-1	SV		1.28E+01	1.28E+01	NC
PHENOL	108-95-2	SV		7.68E+01	7.68E+01	NC
M-PHENYLENEDIAMINE	108-45-2	SV		1.54E+00	1.54E+00	NC
O-PHENYLENEDIAMINE	95-54-5	SV	1.91E-02		1.91E-02	C
P-PHENYLENEDIAMINE	106-50-3	SV		4.86E+01	4.86E+01	NC
PHOSPHINE	7803-51-2	SV		2.20E-02	2.20E-02	NC
PHOSPHORIC ACID	7664-38-2	M		7.42E-01	7.42E-01	NC
PHOSPHORUS (WHITE)	7723-14-0	M		5.12E-03	5.12E-03	NC
PHTHALIC ANHYDRIDE	85-44-9	SV		8.78E+00	8.78E+00	NC
POLYBROMINATED BIPHENYLS	NA	SV	1.01E-04	1.79E-03	1.01E-04	C
POLYCHLORINATED BIPHENYLS	1336-36-3	SV	4.48E-04		4.48E-04	C
AROCLOR-1016	12674-11-2	SV	1.28E-02	1.79E-02	1.28E-02	C
AROCLOR-1221	11104-28-2	SV	4.48E-04		4.48E-04	C

Appendix E

Risk-based Air Concentrations for the Boater

Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Chemical	CAS No.	Group	Carcinogenic Risk-based Concentration (mg/M^3) Inhalation	Non-carcinogenic Risk-based Concentration (mg/M^3) Inhalation	Final Risk-based Concentration (mg/M^3) Final	Final Risk-based Concentration (mg/M^3) Basis
AROCLOR-1232	11141-16-5	SV	4.48E-04		4.48E-04	C
AROCLOR-1242	53469-21-9	SV	4.48E-04		4.48E-04	C
AROCLOR-1248	12672-29-6	SV	4.48E-04		4.48E-04	C
AROCLOR-1254	11097-69-1	SV	4.48E-04	5.12E-03	4.48E-04	C
AROCLOR-1260	11096-82-5	SV	4.48E-04		4.48E-04	C
POLYCHLORINATED TERPHENYLS	61788-33-8	SV	1.99E-04		1.99E-04	C
POLYNUCLEAR AROMATIC HYDROCARBONS:	NA	SV				
ACENAPHTHENE	83-32-9	V		1.54E+01	1.54E+01	NC
ANTHRACENE	120-12-7	V		7.68E+01	7.68E+01	NC
BENZ[A]ANTHRACENE	56-55-3	SV	1.23E-03		1.23E-03	C
BENZO[B]FLUORANTHENE	205-99-2	SV	1.23E-03		1.23E-03	C
BENZO[K]FLUORANTHENE	207-08-9	SV	1.23E-02		1.23E-02	C
BENZO[A]PYRENE	50-32-8	SV	2.89E-04		2.89E-04	C
CARBAZOLE	86-74-8	SV	4.48E-02		4.48E-02	C
CHRYSENE	218-01-9	SV	1.23E-01		1.23E-01	C
DIBENZ[A,H]ANTHRACENE	53-70-3	SV	1.23E-04		1.23E-04	C
FLUORANTHENE	206-44-0	SV		1.02E+01	1.02E+01	NC
FLUORENE	86-73-7	V		1.02E+01	1.02E+01	NC
INDENO[1,2,3-C,D]PYRENE	193-39-5	SV	1.23E-03		1.23E-03	C
2-METHYLNAPHTHALENE	91-57-6	V		1.02E+00	1.02E+00	NC
NAPHTHALENE	91-20-3	V		2.30E-01	2.30E-01	NC
PYRENE	129-00-0	V		7.68E+00	7.68E+00	NC
PROMETON	1610-18-0	SV		3.84E+00	3.84E+00	NC
PROMETRYN	7287-19-6	SV		1.02E+00	1.02E+00	NC
PROPACHLOR	1918-16-7	SV		3.33E+00	3.33E+00	NC
PROPARGITE	2312-35-8	SV		5.12E+00	5.12E+00	NC
PROPYLENE GLYCOL	57-55-6	SV		2.20E-01	2.20E-01	NC
PROPYLENE GLYCOL, MONOETHYL ETHER	52125-53-8	SV		1.79E+02	1.79E+02	NC
PROPYLENE GLYCOL, MONOMETHYL ETHER	107-98-2	SV		1.46E+02	1.46E+02	NC
PURSUIT	81335-77-5	SV		6.40E+01	6.40E+01	NC
PYRIDINE	110-86-1	SV		2.56E-01	2.56E-01	NC
QUINOLINE	91-22-5	SV	2.99E-04		2.99E-04	C
RDX	121-82-4	SV	8.14E-03	7.68E-01	8.14E-03	C
RESMETHRIN	10453-86-8	SV		7.68E+00	7.68E+00	NC
ROTENONE	83-79-4	SV		1.02E+00	1.02E+00	NC
SELENIUM	7782-49-2	M		1.28E+00	1.28E+00	NC
SILVER	7440-22-4	M		1.28E+00	1.28E+00	NC
SIMAZINE	122-34-9	SV	7.46E-03	1.28E+00	7.46E-03	C
SODIUM DIETHYLDITHIOCARBAMATE	148-18-5	SV	3.32E-03	7.68E+00	3.32E-03	C
STRONTIUM, STABLE	7440-24-6	M		1.54E+02	1.54E+02	NC
STRYCHNINE	57-24-9	SV		7.68E-02	7.68E-02	NC
STYRENE	100-42-5	V		7.32E+01	7.32E+01	NC
2,3,7,8-TETRACHLORODIBENZODIOXIN	1746-01-6	SV	5.97E-09		5.97E-09	C
1,2,4,5-TETRACHLOROBENZENE	95-94-3	SV		7.68E-02	7.68E-02	NC
1,1,1,2-TETRACHLOROETHANE	630-20-6	V	3.44E-02	7.68E+00	3.44E-02	C
1,1,2,2-TETRACHLOROETHANE	79-34-5	V	4.48E-03	1.54E+01	4.48E-03	C
TETRACHLOROETHENE	127-18-4	V	4.48E-02	3.58E+01	4.48E-02	C
2,3,4,6-TETRACHLOROPHENOL	58-90-2	SV		7.68E+00	7.68E+00	NC
P,A,A,A-TETRACHLOROTOLUENE	5216-25-1	SV	4.48E-05		4.48E-05	C
1,1,1,2-TETRAFLUOROETHANE	811-97-2	V		5.86E+03	5.86E+03	NC
TETRAHYDROFURAN	109-99-9	SV	1.32E-01	2.20E+01	1.32E-01	C
TETRYL	479-45-8	SV		1.02E+00	1.02E+00	NC
THALLIUM	7440-28-0	M		1.79E-02	1.79E-02	NC
THALLIUM ACETATE	563-68-8	M		2.30E-02	2.30E-02	NC
THALLIUM CARBONATE	6533-73-9	M		2.05E-02	2.05E-02	NC
THALLIUM CHLORIDE	7791-12-0	M		2.05E-02	2.05E-02	NC
THALLIUM NITRATE	10102-45-1	M		2.30E-02	2.30E-02	NC
THALLIUM SULFATE (2:1)	7446-18-6	M		2.05E-02	2.05E-02	NC
THIOBENCARB	28249-77-6	SV		2.56E+00	2.56E+00	NC
TIN	7440-31-5	M		1.54E+02	1.54E+02	NC

Appendix E

Risk-based Air Concentrations for the Boater

Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Chemical	CAS No.	Group	Carcinogenic Risk-based Concentration (mg/M^3) Inhalation	Non-carcinogenic Risk-based Concentration (mg/M^3) Inhalation	Final Risk-based Concentration (mg/M^3) Final	Final Risk-based Concentration (mg/M^3) Basis
TITANIUM	7440-32-6	M		2.20E+00	2.20E+00	NC
TITANIUM DIOXIDE	13463-67-7	M		2.20E+00	2.20E+00	NC
TOLUENE	108-88-3	V		2.92E+01	2.92E+01	NC
TOLUENE-2,4-DIAMINE	95-80-7	SV	2.80E-04		2.80E-04	C
TOLUENE-2,5-DIAMINE	95-70-5	SV		1.54E+02	1.54E+02	NC
TOLUENE-2,6-DIAMINE	823-40-5	SV		5.12E+01	5.12E+01	NC
P-TOLUIDINE	106-49-0	SV	4.71E-03		4.71E-03	C
TOXAPHENE	8001-35-2	SV	8.14E-04		8.14E-04	C
1,2,4-TRIBROMOBENZENE	615-54-3	SV		1.28E+00	1.28E+00	NC
TRIBUTYLTIN OXIDE	56-35-9	SV		7.68E-02	7.68E-02	NC
2,4,6-TRICHLOROANILINE	634-93-5	SV	2.63E-02		2.63E-02	C
1,2,4-TRICHLOROBENZENE	120-82-1	V		2.56E-01	2.56E-01	NC
1,1,1-TRICHLOROETHANE	71-55-6	V		1.61E+02	1.61E+02	NC
1,1,2-TRICHLOROETHANE	79-00-5	V	1.60E-02	1.02E+00	1.60E-02	C
TRICHLOROETHENE	79-01-6	V	2.24E-03	2.56E+00	2.24E-03	C
TRICHLOROFLUOROMETHANE	75-69-4	V		5.12E+01	5.12E+01	NC
2,4,5-TRICHLOROPHENOL	95-95-4	SV		2.56E+01	2.56E+01	NC
2,4,6-TRICHLOROPHENOL	88-06-2	SV	8.96E-02		8.96E-02	C
2,4,5-T	93-76-5	SV		2.56E+00	2.56E+00	NC
2-(2,4,5-TRICHLOROPHENOXY)PROPIONIC ACID	93-72-1	SV		2.05E+00	2.05E+00	NC
1,1,2-TRICHLOROPROPANE	598-77-6	V		1.28E+00	1.28E+00	NC
1,2,3-TRICHLOROPROPANE	96-18-4	V	4.48E-04	3.58E-01	4.48E-04	C
1,2,3-TRICHLOROPROPENE	96-19-5	V		7.68E-02	7.68E-02	NC
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	76-13-1	V		2.20E+03	2.20E+03	NC
1,2,4-TRIMETHYLBENZENE	95-63-6	V		4.35E-01	4.35E-01	NC
1,3,5-TRIMETHYLBENZENE	108-67-8	V		4.35E-01	4.35E-01	NC
1,3,5-TRINITROBENZENE	99-35-4	SV		7.68E+00	7.68E+00	NC
2,4,6-TRINITROTOLUENE	118-96-7	SV	2.99E-02	1.28E-01	2.99E-02	C
URANIUM (SOLUBLE SALTS; from IRIS)	7440-61-1	M		7.68E-01	7.68E-01	NC
URANIUM (SOLUBLE SALTS; provisional)	7440-61-1	M		5.12E-02	5.12E-02	NC
VANADIUM	7440-62-2	M		2.56E-01	2.56E-01	NC
VINCLOZOLIN	50471-44-8	SV		6.40E+00	6.40E+00	NC
VINYL ACETATE	108-05-4	V		1.46E+01	1.46E+01	NC
VINYL CHLORIDE: adult (see cover memos)	75-01-4	V	5.97E-02	7.17E+00	5.97E-02	C
WARFARIN	81-81-2	SV		7.68E-02	7.68E-02	NC
O-XYLENE	95-47-6	V		7.68E+00	7.68E+00	NC
M,P-XYLENES	1330-20-7	V		7.68E+00	7.68E+00	NC
XYLENES	1330-20-7	V		7.68E+00	7.68E+00	NC
ZINC	7440-66-6	M		7.68E+01	7.68E+01	NC
ZINEB	12122-67-7	SV		1.28E+01	1.28E+01	NC

APPENDIX F

Risk-Based Air Concentrations for the Oasis Resident

Appendix F

Risk-Based Air Concentrations for the Oasis Resident

Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Chemical	CAS No.	Group	Carcinogenic Risk-based Concentration (mg/M^3) Inhalation	Non-carcinogenic Risk-based Concentration (mg/M^3) Inhalation	Final Risk-based Concentration (mg/M^3) Final	Final Risk-based Concentration (mg/M^3) Basis
ACETALDEHYDE	75-07-0	V	2.24E-02	1.90E-01	2.24E-02	C
ACETOCHLOR	34256-82-1	SV		1.48E+00	1.48E+00	NC
ACETONE	67-64-1	V		6.67E+01	6.67E+01	NC
ACETONITRILE	75-05-8	V		1.26E+00	1.26E+00	NC
ACETOPHENONE	98-86-2	V		7.41E+00	7.41E+00	NC
ACROLEIN	107-02-8	V		4.22E-04	4.22E-04	NC
ACRYLAMIDE	79-06-1	SV	3.84E-05	1.48E-02	3.84E-05	C
ACRYLONITRILE	107-13-1	V	7.20E-04	4.22E-02	7.20E-04	C
ALACHLOR	15972-60-8	SV	2.16E-03	7.41E-01	2.16E-03	C
ALAR	1596-84-5	SV		1.11E+01	1.11E+01	NC
ALDICARB	116-06-3	SV		7.41E-02	7.41E-02	NC
ALDICARB SULFONE	1646-88-4	SV		7.41E-02	7.41E-02	NC
ALDRIN	309-00-2	SV	1.02E-05	2.22E-03	1.02E-05	C
ALLYL CHLORIDE	107-05-1	V		2.12E-02	2.12E-02	NC
ALUMINUM	7429-90-5	M		7.41E-02	7.41E-02	NC
AMINODINITROTOLUENES	NA	SV		1.48E-01	1.48E-01	NC
AMMONIA	7664-41-7	V		2.12E+00	2.12E+00	NC
ANILINE	62-53-3	SV	3.03E-02	2.15E-02	2.15E-02	NC
ANTIMONY	7440-36-0	M		2.96E-02	2.96E-02	NC
ANTIMONY TRIOXIDE	1309-64-4	M		4.22E-03	4.22E-03	NC
ARSENIC	7440-38-2	M	1.14E-05	2.22E-02	1.14E-05	C
ARSINE	7784-42-1	V		1.04E-03	1.04E-03	NC
ASSURE	76578-14-8	SV		6.67E-01	6.67E-01	NC
ATRAZINE	1912-24-9	SV	7.85E-04	2.59E+00	7.85E-04	C
BARIUM	7440-39-3	M		1.04E-02	1.04E-02	NC
BAYGON	114-26-1	SV		2.96E-01	2.96E-01	NC
BAYTHROID	68359-37-5	SV		1.85E+00	1.85E+00	NC
BENTAZON	25057-89-0	SV		2.22E+00	2.22E+00	NC
BENZALDEHYDE	100-52-7	SV		7.41E+00	7.41E+00	NC
BENZENE	71-43-2	V	6.40E-03	6.37E-01	6.40E-03	C
BENZENETHIOL	108-98-5	V		7.41E-04	7.41E-04	NC
BENZIDINE	92-87-5	SV	7.51E-07	2.22E-01	7.51E-07	C
BENZOIC ACID	65-85-0	SV		2.96E+02	2.96E+02	NC
BENZYL ALCOHOL	100-51-6	SV		2.22E+01	2.22E+01	NC
BENZYL CHLORIDE	100-44-7	V	1.02E-03	1.48E-01	1.02E-03	C
BERYLLIUM	7440-41-7	M	2.06E-05	4.22E-04	2.06E-05	C
BIPHENYL	92-52-4	V		3.70E+00	3.70E+00	NC
BIS(2-CHLOROETHYL)ETHER	111-44-4	V	1.57E-04		1.57E-04	C
BIS(2-CHLOROISOPROPYL)ETHER	108-60-1	V	4.94E-03	2.96E+00	4.94E-03	C
BIS(CHLOROMETHYL)ETHER	542-88-1	V	7.85E-07		7.85E-07	C
BIS(2-ETHYLHEXYL)PHTHALATE	117-81-7	SV	1.23E-02	1.48E+00	1.23E-02	C
BORON	7440-42-8	M		4.22E-01	4.22E-01	NC
BROMOBENZENE	108-86-1	V		2.22E-01	2.22E-01	NC
BROMODICHLOROMETHANE	75-27-4	V	2.79E-03	1.48E+00	2.79E-03	C
BROMOETHENE	593-60-2	V	1.57E-03	6.37E-02	1.57E-03	C
BROMOFORM	75-25-2	SV	4.43E-02	1.48E+00	4.43E-02	C
BROMOMETHANE	74-83-9	V		1.04E-01	1.04E-01	NC
BROMOPHOS	2104-96-3	SV		3.70E-01	3.70E-01	NC
1,3-BUTADIENE	106-99-0	V	1.73E-03	4.22E-02	1.73E-03	C
1-BUTANOL	71-36-3	SV		7.41E+00	7.41E+00	NC
BUTYLBENZYLPHTHALATE	85-68-7	SV	9.09E-02	1.48E+01	9.09E-02	C
CADMIUM-FOOD	7440-43-9	M	2.74E-05	4.22E-03	2.74E-05	C
CAPROLACTAM	105-60-2	SV		3.70E+01	3.70E+01	NC
CARBARYL	63-25-2	SV		7.41E+00	7.41E+00	NC
CARBON DISULFIDE	75-15-0	V		1.48E+01	1.48E+01	NC
CARBON TETRACHLORIDE	56-23-5	V	3.26E-03	3.70E+00	3.26E-03	C
CARBOSULFAN	55285-14-8	SV		7.41E-01	7.41E-01	NC
CHLORAL HYDRATE	302-17-0	SV		7.41E+00	7.41E+00	NC
CHLORANIL	118-75-2	SV	4.32E-04		4.32E-04	C
CHLORDANE	57-74-9	SV	4.94E-04	1.48E-02	4.94E-04	C

Appendix F

Risk-Based Air Concentrations for the Oasis Resident

Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Chemical	CAS No.	Group	Carcinogenic Risk-based Concentration (mg/M^3) Inhalation	Non-carcinogenic Risk-based Concentration (mg/M^3) Inhalation	Final Risk-based Concentration (mg/M^3) Final	Final Risk-based Concentration (mg/M^3) Basis
CHLORINE	7782-50-5	V		4.22E-03	4.22E-03	NC
CHLORINE DIOXIDE	10049-04-4	V		4.22E-03	4.22E-03	NC
CHLOROACETIC ACID	79-11-8	SV		1.48E-01	1.48E-01	NC
4-CHLOROANILINE	106-47-8	SV	3.20E-03	2.96E-01	3.20E-03	C
CHLOROBENZENE	108-90-7	V		1.26E+00	1.26E+00	NC
2-CHLORO-1,3-BUTADIENE	126-99-8	V		1.48E-01	1.48E-01	NC
1-CHLORO-1,1-DIFLUOROETHANE	75-68-3	V		1.04E+03	1.04E+03	NC
CHLORODIFLUOROMETHANE	75-45-6	V		1.04E+03	1.04E+03	NC
CHLOROETHANE	75-00-3	V	5.96E-02	2.15E+02	5.96E-02	C
CHLOROFORM	67-66-3	V	2.13E-03	1.04E+00	2.13E-03	C
CHLOROMETHANE	74-87-3	V		1.93E+00	1.93E+00	NC
4-CHLORO-2-METHYLANILINE	95-69-2	SV	2.98E-04		2.98E-04	C
BETA-CHLORONAPHTHALENE	91-58-7	V		5.92E+00	5.92E+00	NC
O-CHLORONITROBENZENE	88-73-3	V	1.78E-02	1.48E-03	1.48E-03	NC
P-CHLORONITROBENZENE	100-00-5	V	2.58E-02	1.26E-02	1.26E-02	NC
2-CHLOROPHENOL	95-57-8	V		3.70E-01	3.70E-01	NC
2-CHLOROPROPANE	75-29-6	V		2.15E+00	2.15E+00	NC
O-CHLOROTOLUENE	95-49-8	V		1.48E+00	1.48E+00	NC
CHLORPYRIFOS	2921-88-2	SV		2.22E-01	2.22E-01	NC
CHLORPYRIFOS-METHYL	5598-13-0	SV		7.41E-01	7.41E-01	NC
CHROMIUM	7440-47-3	M		1.11E+02	1.11E+02	NC
CHROMIUM III	16065-83-1	M		1.11E+02	1.11E+02	NC
CHROMIUM VI	18540-29-9	M	4.21E-06	2.22E-03	4.21E-06	C
COBALT	7440-48-4	M	1.76E-05	4.22E-04	1.76E-05	C
COKE OVEN EMISSIONS (COAL TAR)	8007-45-2	SV	7.85E-05		7.85E-05	C
COPPER	7440-50-8	M		2.96E+00	2.96E+00	NC
CUMENE	98-82-8	V		8.15E+00	8.15E+00	NC
CYANIDE (FREE)	57-12-5	M		1.48E+00	1.48E+00	NC
CALCIUM CYANIDE	592-01-8	M		2.96E+00	2.96E+00	NC
COPPER CYANIDE	544-92-3	M		3.70E-01	3.70E-01	NC
CYANOGEN	460-19-5	V		2.96E+00	2.96E+00	NC
HYDROGEN CYANIDE	74-90-8	V		6.37E-02	6.37E-02	NC
POTASSIUM CYANIDE	151-50-8	M		3.70E+00	3.70E+00	NC
POTASSIUM SILVER CYANIDE	506-61-6	M		1.48E+01	1.48E+01	NC
SILVER CYANIDE	506-64-9	M		7.41E+00	7.41E+00	NC
SODIUM CYANIDE	143-33-9	M		2.96E+00	2.96E+00	NC
THIOCYANATE	NA	M		7.41E-03	7.41E-03	NC
ZINC CYANIDE	557-21-1	M		3.70E+00	3.70E+00	NC
CYCLOHEXANE	110-82-7	V		1.26E+02	1.26E+02	NC
CYCLOHEXANONE	108-94-1	SV		3.70E+02	3.70E+02	NC
CYHALOTHRIN/KARATE	68085-85-8	SV		3.70E-01	3.70E-01	NC
CYPERMETHRIN	52315-07-8	SV		7.41E-01	7.41E-01	NC
DACTHAL	1861-32-1	SV		7.41E-01	7.41E-01	NC
DALAPON	75-99-0	SV		2.22E+00	2.22E+00	NC
DDD	72-54-8	SV	7.20E-04	1.48E-01	7.20E-04	C
DDE	72-55-9	SV	5.08E-04		5.08E-04	C
DDT	50-29-3	SV	5.08E-04	3.70E-02	5.08E-04	C
DIAZINON	333-41-5	SV		6.67E-02	6.67E-02	NC
DIBENZOFURAN	132-64-9	V		1.48E-01	1.48E-01	NC
1,4-DIBROMOBENZENE	106-37-6	SV		7.41E-01	7.41E-01	NC
DIBROMOCHLOROMETHANE	124-48-1	V	2.06E-03	1.48E+00	2.06E-03	C
1,2-DIBROMO-3-CHLOROPROPANE	96-12-8	V	7.20E-02	4.22E-03	4.22E-03	NC
1,2-DIBROMOETHANE	106-93-4	V	8.64E-05	1.93E-01	8.64E-05	C
DIBUTYLPHTHALATE	84-74-2	SV		7.41E+00	7.41E+00	NC
DICAMBA	1918-00-9	SV		2.22E+00	2.22E+00	NC
1,2-DICHLOROBENZENE	95-50-1	V		2.96E+00	2.96E+00	NC
1,3-DICHLOROBENZENE	541-73-1	V		2.22E-01	2.22E-01	NC
1,4-DICHLOROBENZENE	106-46-7	V	7.85E-03	1.70E+01	7.85E-03	C
3,3'-DICHLOROBENZIDINE	91-94-1	SV	3.84E-04		3.84E-04	C
DICHLORODIFLUOROMETHANE	75-71-8	V		3.70E+00	3.70E+00	NC

Appendix F

Risk-Based Air Concentrations for the Oasis Resident

Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Chemical	CAS No.	Group	Carcinogenic Risk-based Concentration (mg/M^3) Inhalation	Non-carcinogenic Risk-based Concentration (mg/M^3) Inhalation	Final Risk-based Concentration (mg/M^3) Final	Final Risk-based Concentration (mg/M^3) Basis
1,1-DICHLOROETHANE	75-34-3	V		1.04E+01	1.04E+01	NC
1,2-DICHLOROETHANE	107-06-2	V	1.90E-03	5.18E+01	1.90E-03	C
1,1-DICHLOROETHENE	75-35-4	V		4.44E+00	4.44E+00	NC
CIS-1,2-DICHLOROETHENE	156-59-2	V		7.41E-01	7.41E-01	NC
TRANS-1,2-DICHLOROETHENE	156-60-5	V		1.26E+00	1.26E+00	NC
TOTAL 1,2-DICHLOROETHENE	540-59-0	V		6.67E-01	6.67E-01	NC
2,4-DICHLOROPHENOL	120-83-2	SV		2.22E-01	2.22E-01	NC
2,4-D	94-75-7	SV		7.41E-01	7.41E-01	NC
4-(2,4-DICHLOROPHENOXY)BUTYRIC ACID	94-82-6	SV		5.92E-01	5.92E-01	NC
1,2-DICHLOROPROPANE	78-87-5	V	2.54E-03	8.44E-02	2.54E-03	C
1,3-DICHLOROPROPANE	142-28-9	V		1.48E+00	1.48E+00	NC
2,3-DICHLOROPROPANOL	616-23-9	SV		2.22E-01	2.22E-01	NC
1,3-DICHLOROPROPENE	542-75-6	V	1.73E-02	4.23E-01	1.73E-02	C
DICHLORVOS	62-73-7	SV	5.96E-04	1.06E-02	5.96E-04	C
DIELDRIN	60-57-1	SV	1.08E-05	3.70E-03	1.08E-05	C
DIESEL EMISSIONS	NA	SV		1.04E-01	1.04E-01	NC
DIETHYLPHTHALATE	84-66-2	SV		5.92E+01	5.92E+01	NC
DIETHYLENE GLYCOL, MONOBUTYL ETHER	112-34-5	SV		4.22E-01	4.22E-01	NC
DIETHYLENE GLYCOL, MONOETHYL ETHER	111-90-0	SV		6.37E-02	6.37E-02	NC
DI(2-ETHYLHEXYL)ADIPATE	103-23-1	SV	1.44E-01	4.44E+01	1.44E-01	C
DIETHYLSTILBESTROL	56-53-1	SV	3.68E-08		3.68E-08	C
DIFENZOQUAT (AVENGE)	43222-48-6	SV		5.92E+00	5.92E+00	NC
1,1-DIFLUOROETHANE	75-37-6	V		8.15E+02	8.15E+02	NC
DIISOPROPYL METHYLPHOSPHONATE (DIMP)	1445-75-6	SV		5.92E+00	5.92E+00	NC
3,3'-DIMETHOXYBENZIDINE	119-90-4	SV	1.23E-02		1.23E-02	C
N,N-DIMETHYLANILINE	121-69-7	SV		1.48E-01	1.48E-01	NC
3,3'-DIMETHYLBENZIDINE	119-93-7	SV	7.51E-05		7.51E-05	C
2,4-DIMETHYLPHENOL	105-67-9	SV		1.48E+00	1.48E+00	NC
2,6-DIMETHYLPHENOL	576-26-1	SV		4.44E-02	4.44E-02	NC
3,4-DIMETHYLPHENOL	95-65-8	SV		7.41E-02	7.41E-02	NC
DIMETHYLPHTHALATE	131-11-3	SV		7.41E+02	7.41E+02	NC
1,2-DINITROBENZENE	528-29-0	SV		7.41E-03	7.41E-03	NC
1,3-DINITROBENZENE	99-65-0	SV		7.41E-03	7.41E-03	NC
1,4-DINITROBENZENE	100-25-4	SV		7.41E-03	7.41E-03	NC
4,6-DINITRO-O-CYCLOHEXYL PHENOL	131-89-5	SV		1.48E-01	1.48E-01	NC
4,6-DINITRO-2-METHYLPHENOL	534-52-1	SV		7.41E-03	7.41E-03	NC
2,4-DINITROPHENOL	51-28-5	SV		1.48E-01	1.48E-01	NC
DINITROTOLUENE MIX	NA	SV	2.54E-04		2.54E-04	C
2,4-DINITROTOLUENE	121-14-2	SV		1.48E-01	1.48E-01	NC
2,6-DINITROTOLUENE	606-20-2	SV		7.41E-02	7.41E-02	NC
DINOSEB	88-85-7	SV		7.41E-02	7.41E-02	NC
DIOCTYLPHTHALATE	117-84-0	SV		2.96E+00	2.96E+00	NC
1,4-DIOXANE	123-91-1	SV	1.57E-02		1.57E-02	C
DIPHENYLAMINE	122-39-4	SV		1.85E+00	1.85E+00	NC
1,2-DIPHENYLHYDRAZINE	122-66-7	SV	2.16E-04		2.16E-04	C
DIQUAT	85-00-7	SV		1.63E-01	1.63E-01	NC
DISULFOTON	298-04-4	SV		2.96E-03	2.96E-03	NC
1,4-DITHIANE	505-29-3	SV		7.41E-01	7.41E-01	NC
DIURON	330-54-1	SV		1.48E-01	1.48E-01	NC
ENDOSULFAN	115-29-7	SV		4.44E-01	4.44E-01	NC
ENDRIN	72-20-8	SV		2.22E-02	2.22E-02	NC
EPICHLOROHYDRIN	106-89-8	V	4.11E-02	2.12E-02	2.12E-02	NC
ETHION	563-12-2	SV		3.70E-02	3.70E-02	NC
ETHYL ACETATE	141-78-6	V		6.67E+01	6.67E+01	NC
ETHYLBENZENE	100-41-4	V		2.15E+01	2.15E+01	NC
ETHYLENE DIAMINE	107-15-3	SV		6.67E+00	6.67E+00	NC
ETHYLENE GLYCOL	107-21-1	SV		1.48E+02	1.48E+02	NC
ETHYLENE GLYCOL, MONOBUTYL ETHER	111-76-2	SV		2.74E+02	2.74E+02	NC
ETHYLENE OXIDE	75-21-8	V	4.94E-04		4.94E-04	C
ETHYL ETHER	60-29-7	V		1.48E+01	1.48E+01	NC

Appendix F

Risk-Based Air Concentrations for the Oasis Resident

Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Chemical	CAS No.	Group	Carcinogenic Risk-based Concentration (mg/M^3) Inhalation	Non-carcinogenic Risk-based Concentration (mg/M^3) Inhalation	Final Risk-based Concentration (mg/M^3) Final	Final Risk-based Concentration (mg/M^3) Basis
FENAMIPHOS	22224-92-6	SV		1.85E-02	1.85E-02	NC
FLUOMETURON	2164-17-2	SV		9.63E-01	9.63E-01	NC
FLUORINE	7782-41-4	M		4.44E+00	4.44E+00	NC
FOMESAFEN	72178-02-0	SV	9.09E-04		9.09E-04	C
FONOFOS	944-22-9	SV		1.48E-01	1.48E-01	NC
FORMALDEHYDE	50-00-0	SV	3.84E-03	1.48E+01	3.84E-03	C
FURAN	110-00-9	V		7.41E-02	7.41E-02	NC
FURFURAL	98-01-1	SV		7.41E-01	7.41E-01	NC
GLYPHOSATE	1071-83-6	SV		7.41E+00	7.41E+00	NC
HEPTACHLOR	76-44-8	SV	3.84E-05	3.70E-02	3.84E-05	C
HEPTACHLOR EPOXIDE	1024-57-3	SV	1.90E-05	9.63E-04	1.90E-05	C
HEXABROMOBENZENE	87-82-1	SV		1.48E-01	1.48E-01	NC
HEXACHLOROBENZENE	118-74-1	SV	1.08E-04	5.92E-02	1.08E-04	C
HEXACHLOROBUTADIENE	87-68-3	SV	2.22E-03	1.48E-02	2.22E-03	C
ALPHA-HCH	319-84-6	SV	2.74E-05		2.74E-05	C
BETA-HCH	319-85-7	SV	9.60E-05		9.60E-05	C
GAMMA-HCH (LINDANE)	58-89-9	SV	1.33E-04	2.22E-02	1.33E-04	C
TECHNICAL HCH	608-73-1	SV	9.60E-05		9.60E-05	C
HEXACHLOROCYCLOPENTADIENE	77-47-4	SV		4.22E-03	4.22E-03	NC
HEXACHLORODIBENZODIOXIN MIX	19408-74-3	SV	3.80E-08		3.80E-08	C
HEXACHLOROETHANE	67-72-1	SV	1.23E-02	7.41E-02	1.23E-02	C
HEXACHLOROPHENE	70-30-4	SV		2.22E-02	2.22E-02	NC
1,6-HEXAMETHYLENE DIISOCYANATE	822-06-0	SV		2.15E-04	2.15E-04	NC
HEXANE	110-54-3	V		4.23E+00	4.23E+00	NC
HMX	2691-41-0	SV		3.70E+00	3.70E+00	NC
HYDRAZINE	302-01-2	V	1.02E-05		1.02E-05	C
HYDROGEN CHLORIDE	7647-01-0	V		4.22E-01	4.22E-01	NC
HYDROGEN SULFIDE	7783-06-4	V		4.22E-02	4.22E-02	NC
HYDROQUINONE	123-31-9	SV	3.09E-03	2.96E+00	3.09E-03	C
IRON	7439-89-6	M		2.22E+01	2.22E+01	NC
ISOBUTANOL	78-83-1	V		2.22E+01	2.22E+01	NC
ISOPHORONE	78-59-1	SV	1.82E-01	1.48E+01	1.82E-01	C
TETRAETHYLLEAD	78-00-2	V		7.41E-06	7.41E-06	NC
KEPONE	143-50-0	SV	2.16E-05	1.48E-02	2.16E-05	C
LITHIUM	7439-93-2	M		1.48E+00	1.48E+00	NC
MALATHION	121-75-5	SV		1.48E+00	1.48E+00	NC
MALEIC ANHYDRIDE	108-31-6	SV		7.41E+00	7.41E+00	NC
MANGANESE-FOOD	7439-96-5	M		1.06E-03	1.06E-03	NC
MEPHOSFOLAN	950-10-7	SV		6.67E-03	6.67E-03	NC
MEPIQUAT CHLORIDE	24307-26-4	SV		2.22E+00	2.22E+00	NC
MERCURIC CHLORIDE	7487-94-7	M		2.22E-02	2.22E-02	NC
MERCURY (elemental)	7439-97-6	M		6.37E-03	6.37E-03	NC
METHYLMERCURY	22967-92-6	V		7.41E-03	7.41E-03	NC
METHANOL	67-56-1	V		3.70E+01	3.70E+01	NC
METHIDATHION	950-37-8	SV		7.41E-02	7.41E-02	NC
METHOXYCHLOR	72-43-5	SV		3.70E-01	3.70E-01	NC
METHYL ACETATE	79-20-9	V		7.41E+01	7.41E+01	NC
METHYL ACRYLATE	96-33-3	V		2.22E+00	2.22E+00	NC
2-METHYLANILINE	95-53-4	SV	7.20E-04		7.20E-04	C
4-(2-METHYL-4-CHLOROPHENOXY) BUTYRIC ACID	94-81-5	SV		7.41E-01	7.41E-01	NC
2-METHYL-4-CHLOROPHENOXYACETIC ACID (MCPA)	94-74-6	SV		3.70E-02	3.70E-02	NC
2-(2-METHYL-4-CHLOROPHENOXY)PROPIONIC ACID (MCPP)	93-65-2	SV		7.41E-02	7.41E-02	NC
METHYLCYCLOHEXANE	108-87-2	V		6.37E+01	6.37E+01	NC
METHYLENE BROMIDE	74-95-3	V		7.41E-01	7.41E-01	NC
METHYLENE CHLORIDE	75-09-2	V	1.05E-01	2.22E+01	1.05E-01	C
4,4'-METHYLENE BIS(2-CHLOROANILINE)	101-14-4	SV	1.33E-03	5.18E-02	1.33E-03	C
4,4'-METHYLENE BIS(N,N'-DIMETHYL)ANILINE	101-61-1	SV	3.76E-03		3.76E-03	C
4,4'-METHYLENEDIPHENYL ISOCYANATE	101-68-8	SV		1.26E-02	1.26E-02	NC
METHYL ETHYL KETONE (2-BUTANONE)	78-93-3	V		1.04E+02	1.04E+02	NC
METHYL ISOBUTYL KETONE (4-METHYL-2-PENTANONE)	108-10-1	V		6.37E+01	6.37E+01	NC

Chemical	CAS No.	Group	Carcinogenic Risk-based Concentration (mg/M^3) Inhalation	Non-carcinogenic Risk-based Concentration (mg/M^3) Inhalation	Final Risk-based Concentration (mg/M^3) Final	Final Risk-based Concentration (mg/M^3) Basis
METHYL METHACRYLATE	80-62-6	V		1.48E+01	1.48E+01	NC
METHYL PARATHION	298-00-0	SV		1.85E-02	1.85E-02	NC
2-METHYLPHENOL	95-48-7	SV		3.70E+00	3.70E+00	NC
3-METHYLPHENOL	108-39-4	SV		3.70E+00	3.70E+00	NC
4-METHYLPHENOL	106-44-5	SV		3.70E-01	3.70E-01	NC
METHYLSTYRENE MIX	25013-15-4	V		7.41E-01	7.41E-01	NC
ALPHA-METHYLSTYRENE	98-83-9	V		5.18E+00	5.18E+00	NC
METHYL TERT-BUTYL ETHER	1634-04-4	V	4.32E-02	6.35E+01	4.32E-02	C
METOLACHLOR (DUAL)	51218-45-2	SV		1.11E+01	1.11E+01	NC
MIREX	2385-85-5	SV		1.48E-02	1.48E-02	NC
MOLYBDENUM	7439-98-7	M		3.70E-01	3.70E-01	NC
MONOCHLORAMINE	10599-90-3	SV		7.41E+00	7.41E+00	NC
NALED	300-76-5	SV		1.48E-01	1.48E-01	NC
NICKEL REFINERY DUST	NA	M	2.06E-04		2.06E-04	C
NICKEL	7440-02-0	M		1.48E+00	1.48E+00	NC
NITRATE	14797-55-8	M		1.18E+02	1.18E+02	NC
NITRITE	14797-65-0	M		7.41E+00	7.41E+00	NC
2-NITROANILINE	88-74-4	SV		2.22E-03	2.22E-03	NC
3-NITROANILINE	99-09-2	SV	8.64E-03	2.22E-02	8.64E-03	C
4-NITROANILINE	100-01-6	SV	8.64E-03	7.41E-02	8.64E-03	C
NITROBENZENE	98-95-3	V		4.44E-02	4.44E-02	NC
NITROGLYCERIN	55-63-0	SV	1.23E-02		1.23E-02	C
NITROGUANIDINE	556-88-7	SV		7.41E+00	7.41E+00	NC
2-NITROPROPANE	79-46-9	V	1.84E-05	4.22E-01	1.84E-05	C
N-NITROSO-DI-N-BUTYLAMINE	924-16-3	V	3.09E-05		3.09E-05	C
N-NITROSODIETHANOLAMINE	1116-54-7	SV	6.17E-05		6.17E-05	C
N-NITROSODIETHYLAMINE	55-18-5	SV	1.15E-06		1.15E-06	C
N-NITROSODIMETHYLAMINE	62-75-9	SV	3.39E-06	5.92E-04	3.39E-06	C
N-NITROSODIPHENYLAMINE	86-30-6	SV	3.53E-02	1.48E+00	3.53E-02	C
N-NITROSODIPROPYLAMINE	621-64-7	SV	2.47E-05		2.47E-05	C
N-NITROSO-N-METHYLETHYLAMINE	10595-95-6	SV	7.85E-06		7.85E-06	C
N-NITROSOPYRROLIDINE	930-55-2	SV	8.23E-05		8.23E-05	C
M-NITROTOLUENE	99-08-1	V		1.48E+00	1.48E+00	NC
O-NITROTOLUENE	88-72-2	V	7.51E-04	7.41E-01	7.51E-04	C
P-NITROTOLUENE	99-99-0	V	1.02E-02	7.41E-01	1.02E-02	C
NUSTAR	85509-19-9	SV		5.18E-02	5.18E-02	NC
ORYZALIN	19044-88-3	SV		3.70E+00	3.70E+00	NC
OXADIAZON	19666-30-9	SV		3.70E-01	3.70E-01	NC
OXAMYL	23135-22-0	SV		1.85E+00	1.85E+00	NC
OXYFLUORFEN	42874-03-3	SV		2.22E-01	2.22E-01	NC
PARAQUAT DICHLORIDE	1910-42-5	SV		3.33E-01	3.33E-01	NC
PARATHION	56-38-2	SV		4.44E-01	4.44E-01	NC
PENTACHLOROBENZENE	608-93-5	SV		5.92E-02	5.92E-02	NC
PENTACHLORONITROBENZENE	82-68-8	SV	6.65E-04	2.22E-01	6.65E-04	C
PENTACHLOROPHENOL	87-86-5	SV	1.44E-03	2.22E+00	1.44E-03	C
Pentaerythritoltetranitrate	78-11-5	SV	1.57E-03	2.22E-01	1.57E-03	C
PERCHLORATE	7601-90-3	M		5.18E-02	5.18E-02	NC
PERMETHRIN	52645-53-1	SV		3.70E+00	3.70E+00	NC
PHENOL	108-95-2	SV		2.22E+01	2.22E+01	NC
M-PHENYLENEDIAMINE	108-45-2	SV		4.44E-01	4.44E-01	NC
O-PHENYLENEDIAMINE	95-54-5	SV	3.68E-03		3.68E-03	C
P-PHENYLENEDIAMINE	106-50-3	SV		1.41E+01	1.41E+01	NC
PHOSPHINE	7803-51-2	SV		6.37E-03	6.37E-03	NC
PHOSPHORIC ACID	7664-38-2	M		2.15E-01	2.15E-01	NC
PHOSPHORUS (WHITE)	7723-14-0	M		1.48E-03	1.48E-03	NC
PHTHALIC ANHYDRIDE	85-44-9	SV		2.54E+00	2.54E+00	NC
POLYBROMINATED BIPHENYLS	NA	SV	1.94E-05	5.18E-04	1.94E-05	C
POLYCHLORINATED BIPHENYLS	1336-36-3	SV	8.64E-05		8.64E-05	C
AROCLOR-1016	12674-11-2	SV	2.47E-03	5.18E-03	2.47E-03	C
AROCLOR-1221	11104-28-2	SV	8.64E-05		8.64E-05	C

Appendix F

Risk-Based Air Concentrations for the Oasis Resident

Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Chemical	CAS No.	Group	Carcinogenic Risk-based Concentration (mg/M^3) Inhalation	Non-carcinogenic Risk-based Concentration (mg/M^3) Inhalation	Final Risk-based Concentration (mg/M^3) Final	Final Risk-based Concentration (mg/M^3) Basis
AROCLOR-1232	11141-16-5	SV	8.64E-05		8.64E-05	C
AROCLOR-1242	53469-21-9	SV	8.64E-05		8.64E-05	C
AROCLOR-1248	12672-29-6	SV	8.64E-05		8.64E-05	C
AROCLOR-1254	11097-69-1	SV	8.64E-05	1.48E-03	8.64E-05	C
AROCLOR-1260	11096-82-5	SV	8.64E-05		8.64E-05	C
POLYCHLORINATED TERPHENYLS	61788-33-8	SV	3.84E-05		3.84E-05	C
POLYNUCLEAR AROMATIC HYDROCARBONS:	NA	SV				
ACENAPHTHENE	83-32-9	V		4.44E+00	4.44E+00	NC
ANTHRACENE	120-12-7	V		2.22E+01	2.22E+01	NC
BENZ[A]ANTHRACENE	56-55-3	SV	2.37E-04		2.37E-04	C
BENZO[B]FLUORANTHENE	205-99-2	SV	2.37E-04		2.37E-04	C
BENZO[K]FLUORANTHENE	207-08-9	SV	2.37E-03		2.37E-03	C
BENZO[A]PYRENE	50-32-8	SV	5.57E-05		5.57E-05	C
CARBAZOLE	86-74-8	SV	8.64E-03		8.64E-03	C
CHRYSENE	218-01-9	SV	2.37E-02		2.37E-02	C
DIBENZ[A,H]ANTHRACENE	53-70-3	SV	2.37E-05		2.37E-05	C
FLUORANTHENE	206-44-0	SV		2.96E+00	2.96E+00	NC
FLUORENE	86-73-7	V		2.96E+00	2.96E+00	NC
INDENO[1,2,3-C,D]PYRENE	193-39-5	SV	2.37E-04		2.37E-04	C
2-METHYLNAPHTHALENE	91-57-6	V		2.96E-01	2.96E-01	NC
NAPHTHALENE	91-20-3	V		6.67E-02	6.67E-02	NC
PYRENE	129-00-0	V		2.22E+00	2.22E+00	NC
PROMETON	1610-18-0	SV		1.11E+00	1.11E+00	NC
PROMETRYN	7287-19-6	SV		2.96E-01	2.96E-01	NC
PROPACHLOR	1918-16-7	SV		9.63E-01	9.63E-01	NC
PROPARGITE	2312-35-8	SV		1.48E+00	1.48E+00	NC
PROPYLENE GLYCOL	57-55-6	SV		6.37E-02	6.37E-02	NC
PROPYLENE GLYCOL, MONOETHYL ETHER	52125-53-8	SV		5.18E+01	5.18E+01	NC
PROPYLENE GLYCOL, MONOMETHYL ETHER	107-98-2	SV		4.22E+01	4.22E+01	NC
PURSUIT	81335-77-5	SV		1.85E+01	1.85E+01	NC
PYRIDINE	110-86-1	SV		7.41E-02	7.41E-02	NC
QUINOLINE	91-22-5	SV	5.76E-05		5.76E-05	C
RDX	121-82-4	SV	1.57E-03	2.22E-01	1.57E-03	C
RESMETHRIN	10453-86-8	SV		2.22E+00	2.22E+00	NC
ROTENONE	83-79-4	SV		2.96E-01	2.96E-01	NC
SELENIUM	7782-49-2	M		3.70E-01	3.70E-01	NC
SILVER	7440-22-4	M		3.70E-01	3.70E-01	NC
SIMAZINE	122-34-9	SV	1.44E-03	3.70E-01	1.44E-03	C
SODIUM DIETHYLDITHIOCARBAMATE	148-18-5	SV	6.40E-04	2.22E+00	6.40E-04	C
STRONTIUM, STABLE	7440-24-6	M		4.44E+01	4.44E+01	NC
STRYCHNINE	57-24-9	SV		2.22E-02	2.22E-02	NC
STYRENE	100-42-5	V		2.12E+01	2.12E+01	NC
2,3,7,8-TETRACHLORODIBENZODIOXIN	1746-01-6	SV	1.15E-09		1.15E-09	C
1,2,4,5-TETRACHLOROBENZENE	95-94-3	SV		2.22E-02	2.22E-02	NC
1,1,1,2-TETRACHLOROETHANE	630-20-6	V	6.65E-03	2.22E+00	6.65E-03	C
1,1,2,2-TETRACHLOROETHANE	79-34-5	V	8.64E-04	4.44E+00	8.64E-04	C
TETRACHLOROETHENE	127-18-4	V	8.64E-03	1.04E+01	8.64E-03	C
2,3,4,6-TETRACHLOROPHENOL	58-90-2	SV		2.22E+00	2.22E+00	NC
P,A,A,A-TETRACHLOROTOLUENE	5216-25-1	SV	8.64E-06		8.64E-06	C
1,1,1,2-TETRAFLUOROETHANE	811-97-2	V		1.70E+03	1.70E+03	NC
TETRAHYDROFURAN	109-99-9	SV	2.54E-02	6.37E+00	2.54E-02	C
TETRYL	479-45-8	SV		2.96E-01	2.96E-01	NC
THALLIUM	7440-28-0	M		5.18E-03	5.18E-03	NC
THALLIUM ACETATE	563-68-8	M		6.67E-03	6.67E-03	NC
THALLIUM CARBONATE	6533-73-9	M		5.92E-03	5.92E-03	NC
THALLIUM CHLORIDE	7791-12-0	M		5.92E-03	5.92E-03	NC
THALLIUM NITRATE	10102-45-1	M		6.67E-03	6.67E-03	NC
THALLIUM SULFATE (2:1)	7446-18-6	M		5.92E-03	5.92E-03	NC
THIOBENCARB	28249-77-6	SV		7.41E-01	7.41E-01	NC
TIN	7440-31-5	M		4.44E+01	4.44E+01	NC

Appendix F

Risk-Based Air Concentrations for the Oasis Resident

Attachment 10A - Thermal Treatment Unit Human Health Risk Assessment

Chemical	CAS No.	Group	Carcinogenic Risk-based Concentration (mg/M^3) Inhalation	Non-carcinogenic Risk-based Concentration (mg/M^3) Inhalation	Final Risk-based Concentration (mg/M^3) Final	Final Risk-based Concentration (mg/M^3) Basis
TITANIUM	7440-32-6	M		6.37E-01	6.37E-01	NC
TITANIUM DIOXIDE	13463-67-7	M		6.37E-01	6.37E-01	NC
TOLUENE	108-88-3	V		8.44E+00	8.44E+00	NC
TOLUENE-2,4-DIAMINE	95-80-7	SV	5.40E-05		5.40E-05	C
TOLUENE-2,5-DIAMINE	95-70-5	SV		4.44E+01	4.44E+01	NC
TOLUENE-2,6-DIAMINE	823-40-5	SV		1.48E+01	1.48E+01	NC
P-TOLUIDINE	106-49-0	SV	9.09E-04		9.09E-04	C
TOXAPHENE	8001-35-2	SV	1.57E-04		1.57E-04	C
1,2,4-TRIBROMOBENZENE	615-54-3	SV		3.70E-01	3.70E-01	NC
TRIBUTYLTIN OXIDE	56-35-9	SV		2.22E-02	2.22E-02	NC
2,4,6-TRICHLOROANILINE	634-93-5	SV	5.08E-03		5.08E-03	C
1,2,4-TRICHLOROBENZENE	120-82-1	V		7.41E-02	7.41E-02	NC
1,1,1-TRICHLOROETHANE	71-55-6	V		4.67E+01	4.67E+01	NC
1,1,2-TRICHLOROETHANE	79-00-5	V	3.09E-03	2.96E-01	3.09E-03	C
TRICHLOROETHENE	79-01-6	V	4.32E-04	7.41E-01	4.32E-04	C
TRICHLOROFLUOROMETHANE	75-69-4	V		1.48E+01	1.48E+01	NC
2,4,5-TRICHLOROPHENOL	95-95-4	SV		7.41E+00	7.41E+00	NC
2,4,6-TRICHLOROPHENOL	88-06-2	SV	1.73E-02		1.73E-02	C
2,4,5-T	93-76-5	SV		7.41E-01	7.41E-01	NC
2-(2,4,5-TRICHLOROPHENOXY)PROPIONIC ACID	93-72-1	SV		5.92E-01	5.92E-01	NC
1,1,2-TRICHLOROPROPANE	598-77-6	V		3.70E-01	3.70E-01	NC
1,2,3-TRICHLOROPROPANE	96-18-4	V	8.64E-05	1.04E-01	8.64E-05	C
1,2,3-TRICHLOROPROPENE	96-19-5	V		2.22E-02	2.22E-02	NC
1,1,2-TRICHLORO-1,2,2-TRIFLUOROETHANE	76-13-1	V		6.37E+02	6.37E+02	NC
1,2,4-TRIMETHYLBENZENE	95-63-6	V		1.26E-01	1.26E-01	NC
1,3,5-TRIMETHYLBENZENE	108-67-8	V		1.26E-01	1.26E-01	NC
1,3,5-TRINITROBENZENE	99-35-4	SV		2.22E+00	2.22E+00	NC
2,4,6-TRINITROTOLUENE	118-96-7	SV	5.76E-03	3.70E-02	5.76E-03	C
URANIUM (SOLUBLE SALTS; from IRIS)	7440-61-1	M		2.22E-01	2.22E-01	NC
URANIUM (SOLUBLE SALTS; provisional)	7440-61-1	M		1.48E-02	1.48E-02	NC
VANADIUM	7440-62-2	M		7.41E-02	7.41E-02	NC
VINCLOZOLIN	50471-44-8	SV		1.85E+00	1.85E+00	NC
VINYL ACETATE	108-05-4	V		4.23E+00	4.23E+00	NC
VINYL CHLORIDE: adult (see cover memos)	75-01-4	V	1.15E-02	2.07E+00	1.15E-02	C
WARFARIN	81-81-2	SV		2.22E-02	2.22E-02	NC
O-XYLENE	95-47-6	V		2.22E+00	2.22E+00	NC
M,P-XYLENES	1330-20-7	V		2.22E+00	2.22E+00	NC
XYLENES	1330-20-7	V		2.22E+00	2.22E+00	NC
ZINC	7440-66-6	M		2.22E+01	2.22E+01	NC
ZINEB	12122-67-7	SV		3.70E+00	3.70E+00	NC

APPENDIX G

2011 Human Health Risk Screen Evaluation

Hill Air Force Base, Utah

Utah Test and Training Range Thermal Treatment Unit

Final

2011 Human Health Risk Screen Evaluation

Contract FA8201-09-D-0002
Task Order 0029

October 2011

FINAL

Utah Test and Training Range Thermal Treatment Unit

2011 Human Health Risk Screen Evaluation

Hill Air Force Base
Contract No.: FA8201-09-D-0002
Task Order 0029

Prepared for:

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OCTOBER 2011

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Acronyms and Abbreviations

95UCL	95 Percent Upper Confidence Limit
AFB	Air Force Base
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	Below Ground Surface
Cal EPA	California Environmental Protection Agency
CAS	Chemical Abstract Service
CFR	*Code of Federal Regulations*
ELCR	Excess Lifetime Cancer Risk
EOD	Explosive Ordnance Disposal
EPA	United States Environmental Protection Agency
EPC	Exposure Point Concentration
ERPIMS	Environmental Restoration Program Information Management System
ft	Foot
HEAST	Health Effects Assessment Summary Tables
HHRA	Human Health Risk Assessment
HI	Hazard Index
HMX	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine
HQ	Hazard Quotient
ID	Identification
IRIS	Integrated Risk Information System
IUR	Inhalation Unit Risk
kg	Kilogram
mg/kg	Milligram per Kilogram
mg/kg-day	Milligram per Kilogram per Day
mg/m^3	Milligram per Cubic Meter
µg/L	Microgram per Liter
mg/L	Milligram per Liter
MIDAS	Munitions Items Disposition Action System
NA	Not Applicable
OB	Open Burn
OD	Open Detonation
PPRTV	Provisional Peer-reviewed Toxicity Values
RBC	Risked-based Concentration

RCRA	Resource Conservation and Recovery Act
RDX	Hexahydro-1,3,5-trinitro-1,3,5-triazine
RFC_i	Inhalation Reference Concentration
RFD_O	Oral Reference Dose
RSL	Regional Screening Level
SF_O	Oral Cancer Slope Factor
TTU	Thermal Treatment Unit
UCL	Upper Confidence Limit on the Mean
UDEQ	Utah Department of Environmental Quality
UTTR	Utah Test and Training Range

1.0 General

1.0.0.1 Hill Air Force Base (AFB) has been carrying out open burn (OB)/open denotation (OD) operations at the Utah Test and Training Range (UTTR)-North (United States Environmental Protection Agency [EPA] ID Number UT 0570090001) Thermal Treatment Unit (TTU) under a Resource Conservation and Recovery Act (RCRA) Part B permit issued by the Utah Department of Environmental Quality (UDEQ). The 1997 human health risk assessment (HHRA) submitted in support of the original permit request indicated that the OB/OD operations would not cause undue harm to the potential onsite and offsite receptors. The risk evaluation was updated in April 2005 with the inclusion of additional soil sampling data from the 2002 and 2004 sampling events. The human health risks were evaluated in August 2007 based on additional soil sampling data collected in 2005 and 2006 and again in 2009 based on data collected in 2007 and 2008. The 2005, 2007, and 2009 risk assessment evaluations also indicated that the OB/OD operations were protective of the potential onsite and offsite receptors. The 2005 risk assessment forms the baseline against which the future soil sampling data must be evaluated in terms of changes in the human health risk from the ongoing OB/OD operations.

1.0.0.2 The risk assessment must be evaluated every 2 years with the annual soil sampling data. This document assesses the human health risks using 2009 and 2010 soil data. The scope from the *UTTR RCRA Compliance Work Plan* (CH2M HILL, 2006b) pertaining to the risk assessment update follows.

1.1 Evaluation of the Risk Assessments

1.1.0.1 An evaluation of the completeness and accuracy of the ecological and human health risk assessments (Attachment 10 of the permit) has been prepared and is being submitted to UDEQ as required by Condition II.F of the RCRA permit. The evaluation will include a review of the chemicals in Attachments 10A (ecological risk) and 10B (human health) to add additional emissions as a result of updates in the Munitions Items Disposition Action System (MIDAS) database or other relevant emission data; a review of the toxicity information (reference doses, cancer slope factors) in Attachments 10A and 10B; and any new or updated toxicity data. These 2011 evaluation reports will also review the environmental sampling data acquired since the last evaluation and discuss how the new data affect the risk assessments in Attachments 10A and 10B.

1.1.0.2 The 1997, 2005, 2007, and 2009 risk assessments addressed risks for four distinct exposure scenarios or pathways. These are the groundwater exposure pathway (see Section 2.0), the surface water exposure pathway (see Section 3.0), the surface soil exposure pathway (see Section 4.0), and the air exposure pathway (see Section 5.0). The 2005, 2007, and 2009 risk assessments established a lack of exposure to groundwater and surface water. New groundwater analytical results collected since 2009 show no significant change in groundwater quality. Consequently, the discussion about groundwater (see Section 2.0) and surface water (see Section 3.0) does not categorically differ from that presented in the 2005, 2007, and 2009 risk assessments.

1.1.0.3 Section 4.0 discusses the potential risks for soil ingestion, inhalation, and dermal adsorption to an industrial worker. The industrial worker exposure assumptions represent a full-time career person working at the TTU. The industrial worker was not evaluated in the original permit. Rather, a resident and a construction worker involved in a hypothetical residential development onsite were evaluated. Given the unlikelihood that the site will ever be developed, the residential development scenario is not realistic; therefore, the assessment of risks to these hypothetical receptors is not appropriate at this time and has not been included. On the other hand, maintenance of the OB/OD area by an industrial worker is a current activity. Therefore, an assessment that the industrial TTU worker is not put at an unacceptable risk is appropriate and is required by Section III.G.1 of the Part B permit.

1.1.0.4 Section 5.0 discusses the air exposure pathway and analyzes inhalation risks to (1) explosive ordnance disposal (EOD) personnel monitoring the OB/OD operations onsite, (2) a resident at the nearby community of Oasis, and (3) a recreational boater on the Great Salt Lake. These receptors remain the same as in the original permit, but chemical information has been updated and chemical-specific risks have been recalculated.

1.2 Summary of the Risk Assessment Evaluation

1.2.0.1 This risk assessment evaluation does not show a calculated increase in risks for site-worker exposures to TTU soil, and soil-related risks are below target levels. Hazard indices (HIs) were below 1 for each of the three scenarios.

1.2.0.2 For surface soil exposure, the cumulative noncancer HI and cumulative excess lifetime cancer risk (ELCR) remained essentially unchanged compared with the 2009 risk assessment. The noncancer HI was below the target HI of 1. The cumulative ELCR was 4×10^{-6}, which is slightly above the lower end of the 1×10^{-6} to 1×10^{-4} target risk range. Practically all of the carcinogenic risk associated with soil arises from arsenic. Arsenic is not known to be a major component of the OB/OD items. Furthermore, arsenic concentrations in TTU soil are consistent with site-specific background concentrations (CH2M HILL, 2009a), indicating that it is naturally occurring. Excluding the naturally occurring arsenic, the calculated cumulative ELCR for the site worker is below 1×10^{-6}.

1.2.0.3 For the offsite air exposures (EOD worker, Salt Lake boater, and Oasis resident), the calculated cumulative ELCRs were within the target ELCR range of 1×10^{-6} to 1×10^{-4}. The calculated HIs were below 1 for each exposure scenario (United States Environmental Protection Agency [EPA], 1991). As a result, modifications to Attachment 10B of the permit are not warranted at this time.

2.0 Groundwater Pathway (40 CFR 264.601[a] and R315-8-161)

2.1 Performance Standards

2.1.0.1 The environmental performance standard for protection of groundwater calls for the prevention of any releases that may adversely affect human health or the environment due to migration of waste constituents in the groundwater or subsurface environments. Specific items to be considered include the following:

- The volume and chemical characteristics of the waste in the unit
- The hydrogeologic and geologic characteristics of the unit and surrounding area
- The existing quality of groundwater
- The quantity and direction of groundwater flow
- The proximity to and withdrawal rates of current and potential groundwater users
- The patterns of land use in the region
- The potential for deposition or migration of waste constituents into the subsurface, physical structures, and the root zone of food chain crops and other vegetation
- The potential for health risks caused by human exposure to waste constituents
- The potential for damage to domestic animals, wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents

2.2 Required Programs

2.2.0.1 Utah regulations require groundwater monitoring and reporting at all hazardous waste management facilities unless a waiver is granted. The groundwater monitoring program consists of detection monitoring, compliance monitoring, and monitoring during and after corrective actions. Detection monitoring at the TTU is conducted on a semiannual basis.

2.3 Site-specific Conditions

2.3.0.1 Groundwater and geologic conditions beneath the TTU facility were investigated starting in 1991 through installing and sampling Monitoring Wells TTU-l and TTU-2 (see Figure 2-1). Boreholes for the wells revealed extensive thicknesses of unsaturated, low-permeability soils. Groundwater in an unnamed aquifer occurs at depths ranging from 450 feet (ft) near the southwest corner of the facility to 650 ft beneath the ridge at Sedal Pass above the TTU. Based on groundwater levels in the upgradient and downgradient

monitoring wells, depth to groundwater beneath the three OB/OD units is estimated to be greater than 585 ft.

2.3.0.2 Groundwater samples collected from the wells at TTU-l and TTU-2 since 1991 were analyzed for energetics and metals. Table 2-1 shows the detected analytes.

2.3.0.3 Analytical results to date show various metals were present in most groundwater samples taken from both wells between 1992 and 2010 (see Table 2-1). Each is commonly found in area soils. There have been recent ephemeral detections of the energetic constituents hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX), octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX), and picric acid. Sampling conducted in 2009 and evaluation of the data suggested that surface contamination during sampling was the likely cause of these ephemeral detections (URS, 2009). Particulate matter entering the well during detonation events is suspected of contributing to contamination in the well. A seal has been added to the well head to eliminate this possible source of contamination. All analyses included equipment blanks and matrix spikes and were completed by environmental laboratories certified by the State of Utah.

2.3.0.4 Samples taken in 2004 through 2010 also show the presence of perchlorate at levels less than 1 part per billion. These findings do not appear to be the result of laboratory or field contamination. A previous groundwater dating study using carbon-14, tritium/helium, and chlorofluorocarbon methods has demonstrated that groundwater in this area is Pleistocene in age (14,000 years before present), is essentially stagnant, and receives little or no current recharge (CH2M HILL, 2006a). That study supports the conclusion that perchlorate in groundwater beneath the TTU does not result from TTU operations.

2.3.0.5 The information in Table 2-1 suggests that groundwater contamination resulting from OB/OD activities at the TTU is not likely. Groundwater contamination from this facility is unlikely because of the following:

- Groundwater occurs at greater than 400 to 600 ft below the ground surface (bgs).
- The average annual precipitation is generally low (i.e., approximately 6 inches per year).
- The potential for evapotranspiration is high.
- The soil deposits exhibit low-permeability characteristics.

A subsurface investigation performed in 2007 indicated that contamination was relatively shallow.

2.3.0.6 As discussed in Attachment 1 of the hazardous waste operating permit, the amount of groundwater recharged due to infiltration is slight. Groundwater recharge near the TTU enters the groundwater system only along the margins of the adjacent mountains where coarser-grained sediments are present.

2.4 Assessment of Potential Health Risks

2.4.0.1 Analytical results demonstrate that groundwater beneath the TTU has likely not been impacted by OB/OD activities. In addition to the lack of groundwater contamination, it is extremely unlikely that anyone would drink from the same groundwater source that lies beneath the TTU and be at risk for groundwater exposure because of TTU activities.

- Migration of contaminants from surface soil to the water table is unlikely. The area receives less than 6 inches of precipitation per year, on average; the soil and rock beneath the TTU have low vertical permeabilities; and groundwater is more than 400 ft bgs.
- There is no current or projected future use of groundwater resources near the TTU.
- Based on this assessment, the groundwater exposure pathway is considered incomplete. The groundwater protection performance standard has been met, and no revision to the permit is needed to address groundwater exposures.

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TABLE 2-1
TTU Groundwater Monitoring Well Sampling Results
Thermal Treatment Unit 2011 Human Health Risk Screen Evaluation

Analyte	Location Sample ID Sample Date Units	TTU-1 0225360001SA 4/30/1992	TTU-1 054881-0001-SA 4/28/1997	TTU-1 057633-0002-SA 10/21/1997	TTU-1 D9D160138-001 4/14/1999	TTU-1 D9J230128-001 10/20/1999	TTU-1 D0D070198-002 4/5/2000	TTU-1 D0J180140-002 10/17/2000	TTU-1 D1D190246-001 4/18/2001	TTU-1 D1J250338-005 10/22/2001	TTU-1 D2D220110-001 4/18/2002	TTU-1 D2J310257-001 10/28/2002	TTU-1 D3E020234-001 5/1/2003	TTU-1 TTU.1 12/21/2004	TTU-1 TTU.1-02 12/21/2004	TTU-1 TTU-1-060705 7/6/2005	TTU-1 TTU-1-260106 1/26/2006	TTU-1 TTU-1-060706 7/6/2006	TTU-1 TTU-1-17/8/07 8/17/2007	TTU-1 TTU-1-17/8/07-02 8/17/2007	TTU-1 TTU-1-24/8/08 8/24/2008	TTU-1 TTU-1-19/12/09 12/19/2009	TTU-1 TTU-1-240710 7/24/2010	TTU-2 0225360002SA 4/30/1992	TTU-2 054881-0002-SA 4/28/1997	TTU-2 057633-0001-SA 10/21/1997	TTU-2 D9D160138-002 4/15/1999
Energetics																											
1,3-Dinitrobenzene	µg/L	- -	0.1 U	0.24 U	4 U	4 U	4 U	0.26 U	0.12 U	0.12 U	0.023 U	0.023 U	0.013 U	- -	0.0667 U	0.0667 U	0.0667 U	0.089 U	0.089 U	- -	0.089 U	0.089 U	0.092 UJ	- -	0.1 U	0.2 U	4 U
1,3,5-Trinitrobenzene	µg/L	- -	0.62 U	1.5 U	7.3 U	7.3 U	7.3 U	0.26 U	0.12 U	0.12 U	0.025 U	0.025 U	0.015 U	- -	0.118 U	0.118 U	0.118 U	0.051 U	0.2 U	- -	0.2 U	0.2 U	0.21 UJ	- -	0.25 U	1.2 U	7.3 U
2,4,6-Trinitrotoluene (TNT)	µg/L	2 U	0.1 U	0.24 U	6.9 U	6.9 U	**0.016 J**	0.26 U	0.12 U	0.12 U	0.021 U	0.021 U	0.015 U	- -	0.0789 U	0.0789 U	0.0789 U	0.072 U	0.072 U	- -	0.072 U	0.072 U	0.075 U	2 U	0.1 U	0.2 U	6.9 U
2,4-Dinitrotoluene	µg/L	2 U	0.1 U	0.24 U	5.7 U	5.7 U	5.7 U	0.26 U	0.12 U	0.12 U	0.026 U	0.026 U	0.013 U	- -	0.0629 U	0.0629 U	0.0629 U	0.084 U	0.084 U	- -	0.084 U	0.084 U	0.087 U	2 U	0.1 U	0.2 U	5.7 U
2,6-Dinitrotoluene	µg/L	2 U	0.25 U	0.61 U	9.4 U	9.4 U	9.4 U	0.26 U	0.12 U	0.12 U	0.022 U	0.022 U	0.013 U	- -	0.075 U	0.075 U	0.075 U	0.064 U	- -	0.064 U	0.064 U	0.064 U	0.067 U	2 U	0.25 U	0.49 U	9.4 U
2-Amino-4,6-dinitrotoluene	µg/L	- -	0.1 U	0.24 U	10 U	10 U	10 U	0.26 U	0.12 U	0.12 U	0.036 U	0.036 U	0.012 U	- -	0.0677 U	0.0677 U	0.0677 U	0.051 U	0.051 U	- -	0.051 U	0.051 U	0.053 U	- -	0.1 U	0.2 U	10 U
2-Nitrotoluene	µg/L	- -	- -	- -	- -	- -	- -	- -	0.12 U	0.12 U	0.026 U	0.026 U	0.022 U	- -	0.24 U	0.24 U	0.24 U	0.086 U	0.086 U	- -	- -	0.086 U	0.089 U	- -	- -	- -	- -
2-Nitrotoluene and 4-Nitrotoluene (Total)	µg/L	- -	0.62 U	1.5 U	10 U	10 U	10 U	0.26 U	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	0.62 U	1.2 U	10 U
3-Nitrotoluene	µg/L	- -	0.62 U	1.5 U	10 U	10 U	10 U	0.26 U	0.12 U	0.12 U	- -	0.027 U	0.016 U	- -	0.173 U	0.173 U	0.173 U	0.083 U	- -	0.083 U	0.083 U	0.083 U	0.087 U	- -	0.62 U	1.2 U	10 U
4-Amino-2,6-dinitrotoluene	µg/L	- -	0.1 U	0.24 U	10 U	10 U	10 U	0.26 U	0.12 U	0.12 U	0.02 U	0.02 U	0.015 U	- -	0.0377 U	0.0377 U	0.0377 U	0.058 U	- -	0.058 U	0.058 U	0.058 U	0.06 UJ	- -	0.1 U	0.2 U	10 U
4-Nitrotoluene - SS	µg/L	- -	- -	- -	- -	- -	- -	- -	0.12 U	0.12 U	0.025 U	0.025 U	0.014 U	- -	0.163 U	0.163 U	0.163 U	0.16 U	- -	0.2 U	0.2 U	0.2 U	0.21 U	- -	- -	- -	- -
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	µg/L	2 U	0.25 U	0.61 U	14 U	14 U	14 U	0.26 U	0.12 U	0.12 U	0.02 U	0.02 U	0.014 U	- -	0.19 U	0.19 U	0.19 U	0.052 U	0.052 U	- -	0.052 U	0.052 U	0.054 U	2 U	0.62 U	0.49 U	14 U
Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	µg/L	2 U	0.5 U	1.2 U	4 U	4 U	4 U	0.26 U	0.12 U	0.12 U	0.024 U	0.024 U	0.066 U	- -	0.0894 U	0.0894 U	0.0894 U	0.079 U	0.079 U	- -	0.079 U	0.079 U	0.083 U	2 U	0.5 U	0.98 U	4 U
Nitrobenzene	µg/L	2 U	0.25 U	0.61 U	6.4 U	6.4 U	6.4 U	0.26 U	0.12 U	0.12 U	0.025 U	0.025 U	0.02 U	- -	0.221 U	0.221 U	0.221 U	0.091 U	- -	0.091 U	0.091 U	0.091 U	0.095 U	2 U	0.25 U	0.49 U	6.4 U
Nitroglycerin	µg/L	- -	2.5 U	6.1 U	20 U	20 U	20 U	1 U	0.12 U	0.12 U	0.03 U	0.03 U	0.039 U	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	2.5 U	4.9 U	20 U
Nitroguanidine	µg/L	- -	10 U	10 U	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	10 U	10 U	- -
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	µg/L	2 U	0.25 U	0.61 U	13 U	13 U	13 U	0.26 U	0.12 U	0.12 U	0.04 U	0.04 U	0.016 U	- -	0.0756 U	0.0756 U	0.0756 U	0.088 U	0.088 U	- -	0.088 U	0.088 U	0.091 U	2 U	0.25 U	0.49 U	13 U
PETN	µg/L	- -	10 U	12 U	10 U	10 U	10 U	1 U	0.12 U	0.12 U	0.051 U	0.051 U	0.016 U	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	10 U	9.8 U	10 U
Picric Acid	µg/L	- -	25 U	25 U	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	**0.12 J**	0.0011 UJ	- -	25 U	25 U	- -
Metallic Species																											
Aluminum	mg/L	0.2 U	0.2 U	0.2 U	**0.046 J**	**0.0962 J**	**0.04 J**	0.1 U	- -	0.1 U	0.02 U	0.02 U	0.02 U	- -	0.0207 U	0.037 U	**0.331**	- -	- -	- -	- -	- -	- -	0.2 U	0.2 U	0.2 U	**0.057 J**
Aluminum, dissolved	mg/L	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	0.042 UB	0.018 U	- -	0.018 U	0.018 U	0.018 U	- -	- -	- -	- -
Antimony	mg/L	- -	0.2 U	0.2 U	0.01 U	**0.0039**	0.01 U	- -	- -	- -	- -	0.0037 U	0.0036 U	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	0.2 U	0.2 U	0.01 U
Arsenic	mg/L	- -	- -	- -	**0.017**	**0.0175**	**0.019**	**0.017**	- -	- -	- -	**0.016**	**0.017**	- -	**0.0172 J**	**0.0169 J**	**0.0108 J**	- -	- -	- -	- -	- -	- -	- -	- -	- -	**0.0055 J**
Arsenic, dissolved	mg/L	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	**0.017**	**0.018 J**	- -	**0.017 J**	**0.015 J**	**0.016**	- -	- -	- -	- -
Barium	mg/L	0.1 U	0.1 U	0.1 U	**0.039**	**0.0443**	**0.042**	**0.042**	**0.035**	**0.042**	**0.04**	**0.039**	**0.041**	- -	**0.0385 J**	**0.0396**	**0.0282**	- -	- -	- -	- -	- -	- -	0.1 U	0.1 U	0.1 U	**0.054**
Barium, dissolved	mg/L	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	**0.043**	**0.041 J**	- -	**0.041**	**0.031 J**	**0.034**	- -	- -	- -	- -
Beryllium	mg/L	- -	0.002 U	0.002 U	0.002 U	0.005 U	0.002 U	0.005 U	0.005 U	0.005 U	0.0002 U	**0.0002 J**	0.0004 U	- -	0.00023 U	**0.00121 J**	0.00023 U	- -	- -	- -	- -	- -	- -	- -	0.002 U	0.002 U	0.002 U
Beryllium, dissolved	mg/L	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	0.00008 U	0.00008 U	- -	0.00008 U	0.00008 U	0.00008 U	- -	- -	- -	- -
Cadmium	mg/L	0.005 U	0.005 U	0.005 U	0.005 U	**0.0022**	**0.0014 J**	**0.0013 J**	**0.0005 J**	0.005 U	0.0003 U	0.0003 U	0.0003 U	- -	**0.000325 J**	0.00289 U	**0.000576 J**	- -	- -	- -	- -	- -	- -	0.005 U	0.005 U	0.005 U	0.005 U
Cadmium, dissolved	mg/L	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	**0.00057 J**	**0.0003 J**	- -	**0.000048 J**	**0.000041 J**	0.00004 U	- -	- -	- -	- -
Calcium	mg/L	**55**	**62.1**	**64.6**	**66.9**	**63.3**	**63.9**	**58.1**	**66.6**	**63.7**	**62.2 J**	**59**	**63**	- -	- -	**64.3**	**34**	- -	- -	- -	- -	- -	- -	**108**	**108**	**113**	**106**
Chromium	mg/L	0.03 U	0.03 U	0.03 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0026 U	0.0007 U	**0.0024 J**	- -	0.0046 U	**0.00695 J**	**0.00559 J**	- -	- -	- -	- -	- -	- -	0.03 U	0.03 U	0.03 U	0.01 U
Chromium, dissolved	mg/L	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	**0.002 J**	**0.0012 J**	- -	0.0005 U	0.0005 U	0.0005 U	- -	- -	- -	- -
Cobalt	mg/L	- -	0.04 U	0.04 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0009 U	0.0009 U	**0.0016 J**	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	0.04 U	0.04 U	0.01 U
Copper	mg/L	- -	0.03 U	0.03 U	0.02 U	0.01 U	0.02 U	0.01 U	0.01 U	0.01 U	0.0042 U	0.0008 U	0.001 U	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	0.03 U	0.03 U	0.02 U
Iron	mg/L	**0.12**	0.04 U	**0.086**	0.1 U	**0.164**	**0.018 J**	**0.0686 J**	**0.026 J**	**0.02 J**	0.013 U	0.013 U	- -	- -	0.0174 UJ	**0.347**	**0.587 J**	- -	- -	- -	- -	- -	- -	**0.048**	0.04 U	0.04 U	**0.047 J**
Iron, dissolved	mg/L	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	0.022 U	- -	0.032 UB	0.022 U	**0.077 J**	**0.065 J**	- -	- -	- -	- -
Lead	mg/L	0.005 U	0.005 U	0.005 U	0.003 U	**0.0019 J**	0.003 U	0.003 U	0.003 U	0.003 U	**0.0053**	0.0006 U	**0.021 J**	- -	0.0162 U	0.0245 U	0.0162 UJ	- -	- -	- -	- -	- -	- -	0.005 U	0.005 U	0.005 U	**0.0014 J**
Lead, dissolved	mg/L	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	**0.00038 J**	0.00018 U	- -	0.00018 U	**0.00023 J**	**0.00018 J**	- -	- -	- -	- -
Magnesium	mg/L	**18**	**25.7**	**26.1**	**27.6**	**27.2**	**27.7**	**26.2**	**27.6**	**28.6**	**27**	**26**	**30**	- -	- -	**27.3**	**23.6**	- -	- -	- -	- -	- -	- -	**56**	**57.7**	**58.1**	**59.3**
Manganese	mg/L	- -	0.01 U	**0.01**	**0.0026 J**	**0.0029 J**	0.01 U	**0.0017 J**	0.01 U	**0.0028 J**	**0.0034 J**	**0.0041 J**	**0.0021 J**	- -	- -	**0.00455 J**	**0.0165**	- -	- -	- -	- -	- -	- -	0.01 U	0.01 U	**0.0035 J**
Mercury	mg/L	0.0004 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	0.0002 U	**0 J**	- -	0.0000234 U	0.0000126 U	0.0000304 U	- -	- -	- -	- -	- -	- -	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Mercury, dissolved	mg/L	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	0.000027 U	0.000027 U	- -	0.000027 U	**0.000052 J**	0.000027 U	- -	- -	- -	- -
Molybdenum	mg/L	- -	0.04 U	0.04 U	- -	**0.0106 J**	- -	**0.01 J**	- -	**0.009 J**	**0.011 J**	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	0.04 U	0.04 U	- -
Nickel	mg/L	0.04 U	0.04 U	**0.04**	0.04 U	0.04 U	**0.0047 J**	**0.0086 J**	0.04 U	0.04 U	0.0041 U	**0.0032 J**	0.0042 U	- -	0.0145 U	0.0216 U	0.0145 U	- -	- -	- -	- -	- -	- -	0.04 U	0.04 U	0.04 U	0.04 U
Nickel, dissolved	mg/L	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	**0.0031**	**0.0024**	- -	**0.00069 J**	**0.00083 J**	**0.0008 J**	- -	- -	- -	- -
Potassium	mg/L	**33.2**	**36.5**	**36.1**	**35.5**	**35.2**	**36.9**	**35.8**	**35.4**	**36.6**	**34**	**35**	**41**	- -	- -	**35.9**	**36.2**	- -	- -	- -	- -	- -	- -	**34.2**	5 U	**35.7**	**33.8**
Selenium	mg/L	- -	- -	- -	**0.0059**	**0.0056**	**0.0041 J**	**0.0062**	- -	- -	- -	0.0049 U	**0.0063 J**	- -	**0.0034 J**	**0.00359 J**	**0.0127 J**	- -	- -	- -	- -	- -	- -	- -	- -	- -	**0.0037 J**
Selenium, dissolved	mg/L	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	**0.0044**	**0.0046 J**	- -	**0.006**	**0.0045 J**	**0.0049 J**	- -	- -	- -	- -
Silver	mg/L	- -	0.03 U	0.3 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0005 U	0.0005 U	0.0007 U	- -	0.000221 UJ	0.000221 UJ	0.000221 UJ	- -	- -	- -	- -	- -	- -	- -	0.03 U	0.03 U	0.01 U
Silver, dissolved	mg/L	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	0.00016 U	0.00016 U	- -	0.00016 U	0.000015 U	**0.000016 J**	- -	- -	- -	- -
Sodium	mg/L	**304**	**304**	**296**	**302**	**309**	**315**	**304**	**295**	**314**	**301**	**300**	**320**	- -	- -	**290**	**282**	- -	- -	- -	- -	- -	- -	**365**	**335**	**342**	**345**
Thallium	mg/L	5 U	- -	- -	0.0074 U	0.00001 U	0.0074 U	- -	- -	- -	- -	0.0068 U	**0.0085 J**	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	5 U	- -	- -	0.0074 U
Vanadium	mg/L	- -	0.04 U	0.04 U	**0.025**	**0.0244**	**0.025 J**	**0.022**	**0.024**	**0.025**	**0.023**	**0.02**	**0.025**	**0.0268 J**	- -	**0.0271 J**	0.0213 UJ	- -	- -	- -	- -	- -	- -	- -	0.04 U	0.04 U	**0.013**
Vanadium, dissolved	mg/L	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	**0.025**	**0.024**	- -	**0.017**	**0.019**	**0.019**	- -	- -	- -	- -
Zinc	mg/L	- -	**0.084**	**0.064**	**0.019 J**	**0.0657**	**0.017 J**	**0.0077 J**	**0.056**	**0.027**	**0.041**	**0.031**	**0.015 J**	- -	**0.00482 J**	0.0104 UJ	**1.9 J**	- -	- -	- -	- -	- -	- -	- -	**0.014**	**0.011**	**0.023**
Zinc, dissolved	mg/L	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	**0.094**	- -	**0.029**	**0.008 J**	**0.0077 J**	**0.0068 J**	- -	- -	- -	- -
General Chemical Assays																											
Alkalinity	mg/L	**175**	**195**	**196**	**176**	**204**	**196**	**104**	**197**	**196**	**200**	**200**	**190**	- -	**190**	**217**	**150**	**160**	- -	**190 J**	**110**	**110 J**	**110**	**183**	**187**	**187**	**177**
Alkalinity as $CaCO_3$, Bicarbonate	mg/L	**175**	**195**	**196**	**176**	**204**	**196**	**104**	**197**	**196**	**200**	**200**	**190**	- -	**190**	**217**	**139**	**160**	- -	- -	- -	- -	- -	**183**	**187**	**187**	**177**
Alkalinity as $CaCO_3$, Carbonate	mg/L	5 U	0 U	0 U	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	0 U	7.99 U	**11.2 J**	1.1 U	- -	- -	- -	- -	- -	5 U	0 U	0 U	- -
Chloride	mg/L	**450**	**451**	**448**	**427**	**426**	**441**	**417**	**426**	**442**	**433**	**420**	**450**	**472**	- -	**440 B**	**440**	**450**	- -	- -	- -	**460 J**	**450**	**748**	**756**	**766**	**714**
Fluoride	mg/L	- -	- -	- -	**0.6 J**	**0.55 J**	1 U	**1.5 J**	**0.78 J**	**0.96 J**	0.12 U	**0.63 J**	**0.71 J**	- -	**0.654 J**	**0.58 J**	**1.67 J**	**0.45 J**	**0.5**	- -	**0.4 J**	**0.4 J**	**0.4 J**	- -	- -	- -	**0.48 J**
Hydroxide	mg/L	5 U	0 U	0 U	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	5 U	0 U	0 U	- -
Nitrate + Nitrite as Nitrogen	mg/L	**2.2**	**3**	**3.1**	**3.6**	**3.3**	**3.2**	**3.1**	**3**	**3.2**	**2.8**	**3.1**	**3**	- -	**2.84**	**3.2 J**	**0.41**	**1.3**	- -	**2.7**	**0.27 J**	**0.2 J**	**0.67**	**2.3**	**2.5**	**2.6**	**2.7**
Nitrate as Nitrogen	mg/L	**2.1**	- -	- -	**3.6**	**3.3**	**3.2**	**3**	- -	**3.2**	- -	**3.1**	**3**	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	**2.2**	- -	- -	**2.7**
Nitrite as Nitrogen	mg/L	- -	- -	- -	0.1 U	0.1 U	0.1 U	0.1 U	- -	0.1 U	- -	**0.0055 J**	0.0018 U	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	**0.018 J**
Perchlorate	ug/L	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	**0.65**	**0.516**	**0.284**	**0.78**	**0.77 J**	- -	**0.6**	**0.6**	**0.69**	- -	- -	- -	- -
Phosphate	mg/L	0.05 U	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	0.05 U	- -	- -	- -
Phosphorus	mg/L	- -	0.05 U	**0.053**	0.05 U	**0.018 J**	**0.052**	**0.029 J**	**0.038 J**	**0.1 J**	**0.11**	**0.36**	**0.02 J**	**0.085 J**	- -	0.0562 U	0.0562 U	**0.015 J**	**0.026 J**	- -	0.005 U	**0.0066 J**	**0.0061 J**	- -	0.05 U	0.05 U	0.05 U
Silica	mg/L	- -	- -	- -	**70.9**	- -	**74.2**	- -	- -	- -	- -	**69**	**79**	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	**65**
Sulfate	mg/L	**142**	**132**	**138**	**123**	**124**	**131**	**124**	**119**	**125**	**123**	**130**	**130**	**135**	- -	**131**	**127**	**120 B**	- -	- -	- -	- -	**130**	**110**	**105**	**119**	**97.4**
Total Dissolved Solids	mg/L	- -	- -	- -	- -	- -	- -	- -	- -	- -	**1230**	**1200**	**1200**	**1230**	- -	**1250**	**1110**	**1200**	**1200**	- -	**1100**	**1000 J**	**1100**	- -	- -	- -	- -

NOTES:
ID = Identification
mg/L = Milligram per Liter
µg/L = Microgarm per Liter
- - = Not analyzed
B = The analyte was detected in the associated method and/or calibration blank.
J = The analyte was positively identified: the associated numerical value is the approximate concentration of the analyte in the sample.
U = The analyte was analyzed for, but was not detected above the reported sample quantitation limit.
UJ = The analyte was below the reported sample quantitation limit. However, the reported value is approximate.
Bold indicates the analyte was detected.

TABLE 2-1
TTU Groundwater Monitoring Well Sampling Results
Thermal Treatment Unit 2011 Human Health Risk Screen Evaluati

Analyte	TTU-2 D9J230128-002 10/20/1999	TTU-2 D0D070198-001 4/5/2000	TTU-2 D0J180140-003 10/17/2000	TTU-2 D1D190246-002 4/18/2001	TTU-2 D1J250338-006 10/22/2001	TTU-2 D2D220110-002 4/18/2002	TTU-2 D2J310257-002 10/28/2002	TTU-2 D3E020234-002 5/1/2003	TTU-2 TTU.2 12/21/2004	TTU-2 TTU-2-060705 7/6/2005	TTU-2 TTU-2-060705-02 7/6/2005	TTU-2 TTU-2-260106 1/26/2006	TTU-2 TTU-2-260106-2 1/26/2006	TTU-2 TTU-2-060706 7/6/2006	TTU-2 TTU-2-060706-02 7/6/2006	TTU-2 TTU2-20/12/07 12/20/2007	TTU-2 TTU-2-24/8/08 8/24/2008	TTU-2 TTU-2-24/8/08-02 8/24/2008	TTU-2 TTU-2-23/12/08 12/23/2008	TTU-2 TTU-2-19/12/09 12/19/2009	TTU-2 TTU-2-19/12/09-02 12/19/2009	TTU-2 TTU-2-240710 7/24/2010	TTU-2 TTU-2-240710-02 7/24/2010
Energetics																							
1,3-Dinitrobenzene	4 U	4 U	0.26 U	0.12 U	0.12 U	0.023 U	0.023 U	0.013 U	0.0667 U	- -	0.0667 U	0.0667 U	- -	0.089 U	- -	0.089 U	- -	0.089 U	0.014 U	0.089 U	0.089 U	- -	0.09 UJ
1,3,5-Trinitrobenzene	7.3 U	7.3 U	0.26 U	0.12 U	0.12 U	0.025 U	0.025 U	0.015 U	0.118 U	- -	0.118 U	0.118 U	- -	0.051 U	- -	**0.85 J**	- -	0.2 U	0.017 U	0.2 U	0.2 U	- -	0.2 UJ
2,4,6-Trinitrotoluene (TNT)	6.9 U	**0.011 J**	0.26 U	0.12 U	0.12 U	0.021 U	0.021 U	0.015 U	0.0789 U	- -	0.0789 U	0.0789 U	- -	0.072 U	- -	0.072 U	- -	0.072 U	0.022 U	0.072 U	0.072 U	- -	0.073 U
2,4-Dinitrotoluene	5.7 U	5.7 U	0.26 U	0.12 U	0.12 U	0.026 U	0.026 U	0.013 U	0.0629 U	- -	0.0629 U	0.0629 U	- -	0.084 U	- -	0.084 U	- -	0.084 U	0.019 U	0.084 U	0.084 U	- -	0.085 U
2,6-Dinitrotoluene	9.4 U	9.4 U	0.26 U	0.12 U	0.12 U	0.022 U	0.022 U	0.013 U	0.075 U	- -	0.075 U	0.075 U	- -	0.064 U	- -	0.064 U	- -	0.064 U	0.022 U	0.064 U	0.064 U	- -	0.065 U
2-Amino-4,6-dinitrotoluene	10 U	10 U	0.26 U	0.12 U	0.12 U	0.036 U	0.036 U	0.012 U	0.0677 U	- -	0.0677 U	0.0677 U	- -	0.051 U	- -	0.051 U	- -	0.051 U	0.021 U	0.051 U	0.051 U	- -	0.051 U
2-Nitrotoluene	- -	- -	- -	0.12 U	0.12 U	0.026 U	0.026 U	0.022 U	0.24 U	- -	0.24 U	0.24 U	- -	0.086 U	- -	0.086 U	- -	- -	0.022 U	0.086 U	0.086 U	- -	0.087 U
2-Nitrotoluene and 4-Nitrotoluene (Total)	10 U	10 U	0.26 U	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
3-Nitrotoluene	10 U	10 U	0.26 U	0.12 U	0.12 U	0.027 U	0.027 U	0.016 U	0.173 U	- -	0.173 U	0.173 U	- -	0.083 U	- -	0.083 U	- -	0.083 U	0.025 U	0.083 U	0.083 U	- -	0.084 U
4-Amino-2,6-dinitrotoluene	10 U	10 U	0.26 U	0.12 U	0.12 U	0.02 U	0.02 U	0.015 U	0.0377 U	- -	0.0377 U	0.0377 U	- -	0.058 U	- -	0.058 U	- -	0.058 U	0.019 U	0.058 U	0.058 U	0.059 U	- -
4-Nitrotoluene - SS	- -	- -	- -	0.12 U	0.12 U	0.025 U	0.025 U	0.014 U	0.163 U	- -	0.163 U	0.163 U	- -	0.16 U	- -	0.2 U	- -	0.2 U	0.026 U	0.2 U	0.2 U	- -	0.2 U
Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	14 U	14 U	0.26 U	0.12 U	0.12 U	0.02 U	0.02 U	0.014 U	0.19 U	- -	0.19 U	0.19 U	- -	- -	**0.51 J**	0.052 U	**1.3 J**	- -	0.021 U	0.052 U	0.052 U	- -	**0.19 J**
Methyl-2,4,6-trinitrophenylnitramine (Tetryl)	4 U	4 U	0.26 U	0.12 U	0.12 U	0.024 U	0.024 U	0.066 U	0.0894 U	- -	0.0894 U	0.0894 U	- -	0.079 U	- -	0.079 U	- -	0.079 U	0.021 U	0.079 U	0.079 U	- -	0.08 U
Nitrobenzene	6.4 U	6.4 U	0.26 U	0.12 U	0.12 U	0.025 U	0.025 U	0.02 U	0.221 U	- -	0.221 U	0.221 U	- -	0.091 U	- -	0.091 U	- -	**0.16 J**	0.033 U	0.091 U	0.091 U	- -	0.092 U
Nitroglycerin	20 U	20 U	1 U	0.12 U	0.12 U	0.03 U	0.03 U	0.039 U	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Nitroguanidine	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	13 U	13 U	0.26 U	0.12 U	0.12 U	0.04 U	0.04 U	0.016 U	0.0756 U	- -	0.0756 U	0.0756 U	- -	0.088 U	- -	0.088 U	**0.22 J**	- -	**0.023 J**	**0.13 J**	**0.11 J**	**0.27 J**	- -
PETN	10 U	10 U	1 U	0.12 U	0.12 U	0.051 U	0.051 U	0.016 U	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Picric Acid	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	0.0011 U	**0.35 J**	**1.2**	- -	0.001 UJ
Metallic Species																							
Aluminum	**0.073 J**	**0.1 J**	0.2 U	- -	0.1 U	0.02 U	0.02 U	0.02 U	0.0207 U	- -	0.037 U	- -	**0.0255 J**	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Aluminum, dissolved	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	0.039 UB	- -	0.018 U	0.018 U	- -	- -	0.018 U	- -	0.018 U	- -
Antimony	0.00001 U	0.01 U	- -	- -	- -	- -	0.0037 U	**0.007 J**	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Arsenic	**0.0034**	**0.0054 J**	**0.0063 J**	- -	- -	- -	**0.0067 J**	**0.0069 J**	**0.00508 J**	**0.00568 J**	- -	- -	**0.00584 J**	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Arsenic, dissolved	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	**0.0069**	**0.005 J**	**0.0052 J**	- -	- -	**0.0037 J**	- -	**0.0031 J**	- -
Barium	**0.0588**	**0.059**	**0.058**	0.01 U	**0.063**	**0.059**	**0.056**	**0.06**	**0.0547 J**	- -	**0.054**	- -	**0.0535**	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Barium, dissolved	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	**0.059**	**0.061**	**0.067**	- -	- -	**0.056 J**	- -	**0.056**	- -
Beryllium	0.005 U	0.002 U	0.005 U	0.005 U	0.005 U	0.0002 U	**0.0004 J**	0.0004 U	0.00023 U	- -	0.000315 U	0.00023 U	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Beryllium, dissolved	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	0.00008 U	- -	0.00008 U	0.00008 U	- -	- -	0.00008 U	- -	0.00008 U	- -
Cadmium	0.000005 U	0.005 U	0.005 U	0.005 U	0.005 U	0.0003 U	0.0003 U	0.0003 U	0.00263 U	- -	0.00289 U	- -	**0.000336 J**	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Cadmium, dissolved	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	0.00004 U	- -	**0.00004 J**	0.00004 U	- -	- -	0.00004 U	- -	0.00004 U	- -
Calcium	**109**	**108**	**115**	**102**	**110**	**110 J**	**110**	**120**	- -	**106**	- -	**107**	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Chromium	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0026 U	**0.0011 J**	0.0021 U	0.0046 U	- -	**0.00627 J**	- -	**0.0152**	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Chromium, dissolved	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	**0.0018 J**	**0.0012 J**	**0.00091 J**	- -	- -	**0.0014 J**	- -	0.0005 U	- -
Cobalt	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0009 U	0.0009 U	**0.0017 J**	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Copper	0.01 U	0.02 U	0.01 U	0.01 U	0.01 U	0.0042 U	0.0008 U	0.001 U	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Iron	**0.0429 J**	**0.032 J**	**0.0286 J**	**0.014 J**	0.1 U	0.013 U	**0.039 J**	**0.042 J**	0.039 UJ	**0.154**	- -	- -	**0.24 J**	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Iron, dissolved	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	0.022 U	- -	0.022 U	0.022 U	- -	- -	**0.032 J**	- -	0.022 U	- -
Lead	0.000003 U	0.003 U	0.003 U	0.003 U	0.003 U	0.0018 U	0.0006 U	0.0018 U	0.0162 U	- -	0.0245 U	0.0162 UJ	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Lead, dissolved	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	**0.00024 J**	0.00018 U	0.00018 U	- -	- -	0.00018 U	- -	0.00018 U	- -
Magnesium	**59.9**	**60.5**	**63.7**	**55**	**61.1**	**59.9**	**58**	**64**	- -	- -	**54.6**	- -	**55.3**	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Manganese	**0.0016 J**	**0.003 J**	**0.0032 J**	0.01 U	**0.0023 J**	**0.0026 J**	**0.0047 J**	**0.0035 J**	- -	- -	**0.00328 J**	- -	**0.00432 J**	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Mercury	0.0002 U	0.0002 U	- -	0.0002 U	0.0002 U	0.0002 U	0.0002 U	**0 J**	0.0000234 U	- -	0.0000126 U	0.0000304 U	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Mercury, dissolved	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	0.000027 U	- -	0.000027 U	0.000027 U	- -	- -	**0.00005 J**	- -	0.000027 U	- -
Molybdenum	0.02 U	- -	**0.0036 J**	- -	**0.0026 J**	**0.0041 J**	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Nickel	0.04 U	**0.0063 J**	**0.0055 J**	**0.0054 J**	**0.0093 J**	**0.0074 J**	**0.026 J**	**0.028 J**	**0.0277 J**	- -	**0.0329 J**	0.0145 U	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Nickel, dissolved	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	**0.013**	**0.023**	**0.022**	- -	- -	**0.096**	- -	**0.061**	- -
Potassium	**34**	**35**	**35.9**	**31.6**	**34.8**	**32.9**	**34**	**40**	- -	**33.4**	- -	**35.1**	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Selenium	**0.0044**	0.005 U	**0.0068**	- -	- -	- -	**0.007**	**0.0069 J**	**0.00359 J**	**0.00346 J**	- -	- -	**0.0156 J**	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Selenium, dissolved	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	**0.0042**	**0.003 J**	**0.0052**	- -	- -	**0.0048 J**	- -	**0.00092 J**	- -
Silver	0.01 U	0.01 U	0.01 U	0.01 U	0.01 U	0.0005 U	0.0005 U	0.0007 U	0.000221 UJ	- -	0.000221 UJ	0.000221 UJ	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Silver, dissolved	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	0.00016 U	- -	0.00016 U	0.00016 U	- -	- -	0.000015 U	- -	**0.00002 J**	- -
Sodium	**359**	**358**	**375**	**323**	**364**	**353**	**350**	**380**	- -	- -	**329**	- -	**334**	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Thallium	0.00001 U	0.0074 U	- -	- -	- -	- -	0.0068 U	**0.0098 J**	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Vanadium	**0.0125**	**0.012**	**0.012**	**0.012**	**0.013**	**0.013**	**0.0097 J**	**0.013**	**0.00835 J**	- -	**0.018 J**	- -	**0.0227 J**	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Vanadium, dissolved	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	**0.012**	- -	**0.0091 J**	**0.012**	- -	- -	**0.01**	- -	**0.0012 J**	- -
Zinc	**0.0778**	**0.0061 J**	0.02 U	**0.12**	**0.072**	**0.018 J**	**0.022**	**0.014 J**	**0.00421 J**	0.00731 UJ	- -	- -	**0.426 J**	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Zinc, dissolved	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	**0.19**	- -	**0.46 J**	**0.021 J**	- -	- -	**0.013 J**	- -	**0.019**	- -
General Chemical Assays																							
Alkalinity	**182**	**180**	**113**	**189**	**190**	**185**	**190**	**190**	**190**	- -	**188**	- -	**198**	**190**	- -	**180**	**210**	- -	- -	**180 J**	- -	**180**	- -
Alkalinity as $CaCO_3$, Bicarbonate	**182**	**180**	**113**	**189**	**190**	**185**	**190**	**190**	**190**	- -	**188**	- -	**198**	**190**	- -	- -	- -	- -	- -	- -	- -	- -	- -
Alkalinity as $CaCO_3$, Carbonate	- -	- -	- -	- -	- -	- -	- -	- -	0 U	- -	7.99 U	3.16 U	- -	1.1 U	- -	- -	- -	- -	- -	- -	- -	- -	- -
Chloride	**736**	**726**	**747**	**729**	**796**	**724**	**730**	**750**	**749**	**690 B**	- -	**739**	- -	**760**	- -	**750**	- -	- -	- -	**750 J**	- -	**720**	- -
Fluoride	**0.041 J**	**1.5 J**	5 U	**0.64 J**	**0.45 J**	0.12 U	**0.39 J**	0.03 U	**0.551 J**	**0.545 J**	- -	- -	**0.621 J**	**0.27 J**	- -	**0.27 J**	**0.26 J**	- -	- -	**0.26 J**	- -	**0.25 J**	- -
Hydroxide	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Nitrate + Nitrite as Nitrogen	**2.4**	**2.4**	**2.2**	**2.2**	**2.1**	**2.4**	**2.3**	**2.3**	**1.43**	**1.94 J**	- -	**2.2**	- -	**1.9**	- -	**1.7**	**1.4 J**	- -	- -	**1.4 J**	- -	**1.6**	- -
Nitrate as Nitrogen	**2.4**	**2.4**	**2.2**	- -	**2.1**	- -	**2.3**	**2.3**	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Nitrite as Nitrogen	0.1 U	**0.019 J**	0.1 U	- -	**0.012 J**	- -	**0.016 J**	**0.018**	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Perchlorate	- -	- -	- -	- -	- -	- -	- -	- -	**0.502**	- -	**0.633**	- -	**0.456**	**0.38**	- -	**0.37**	**0.27**	- -	- -	**0.53**	- -	**0.28**	- -
Phosphate	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Phosphorus	**0.021 J**	**0.047 J**	**0.065**	0.05 U	**0.11 J**	**0.14**	**0.28**	**0.053**	0.0847 U	- -	0.0562 U	0.122 UJ	- -	**0.0069 J**	- -	**0.0095 J**	0.005 U	- -	- -	**0.0093 J**	- -	**0.007 J**	- -
Silica	- -	**71.1**	- -	- -	- -	- -	**70**	**77**	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -	- -
Sulfate	**97.6**	**105**	**106**	**99.6**	**104**	**95.9**	**98**	**100**	**106**	**104**	- -	**109**	- -	**100 B**	- -	**98**	- -	- -	- -	- -	- -	**110**	- -
Total Dissolved Solids	- -	- -	- -	- -	- -	**1570**	**1500**	**1600**	**1620**	- -	**1620**	- -	**1600**	**1700**	- -	**1600**	**1600**	- -	- -	**1600 J**	- -	**1600**	- -

NOTES:
ID = Identification
mg/L = Milligram per Liter
µg/L = Microgarm per Liter
- - = Not analyzed
B = The analyte was detected in the associated method and
J = The analyte was positively identified: the associated num
U = The analyte was analyzed for, but was not detected abo
UJ = The analyte was below the reported sample quantitatio
Bold indicates the analyte was detected.

SLC \\SLCDB\GIS\PROJ\NEWHILLAFB\MAPFILES\UTTR\TTU\HEALTHRISKSCREEN\2011\COMPOSITESAMPLINGGRID.MXD PMOELLER 10/14/2011 13:05:02

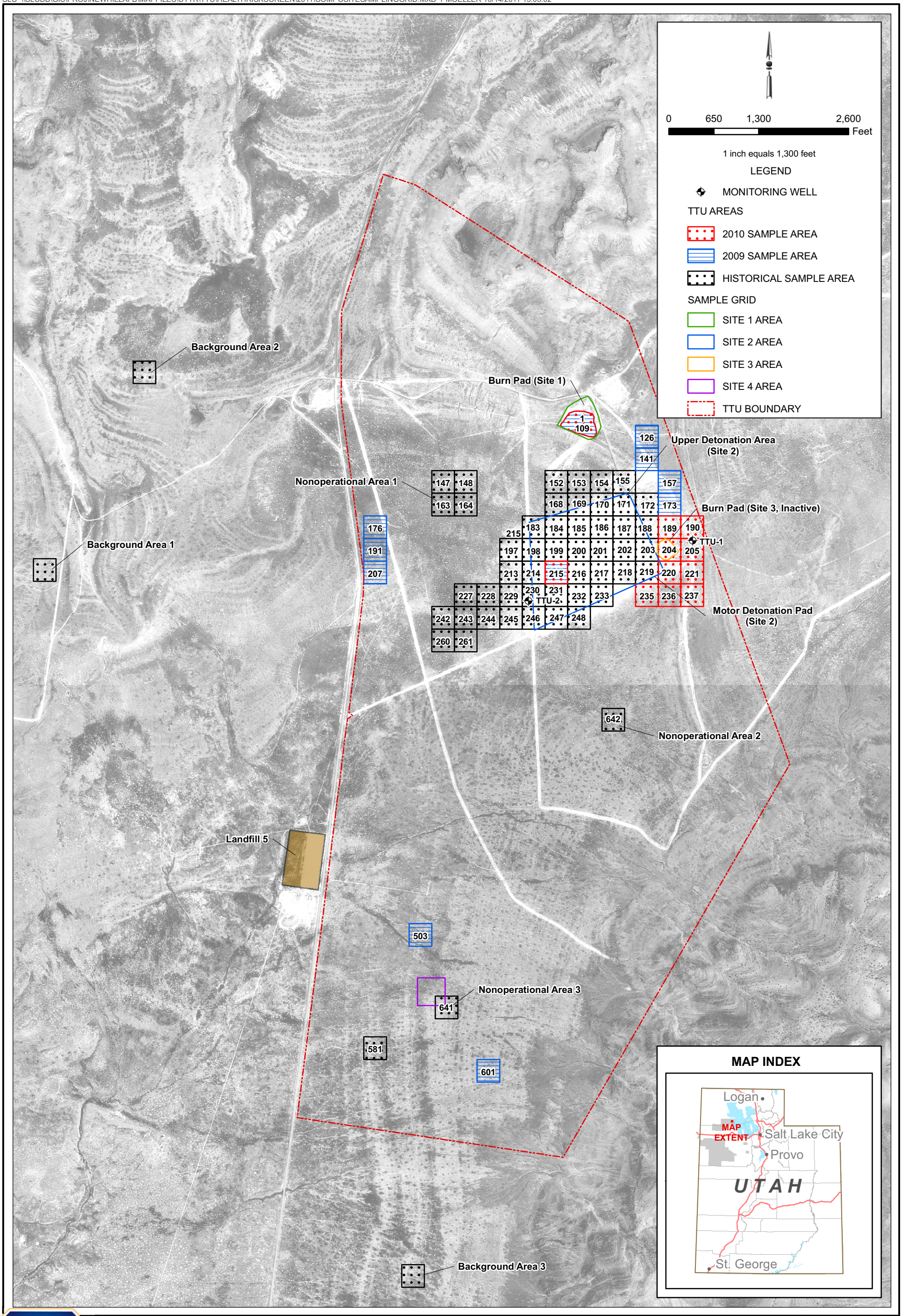

FIGURE 2-1
COMPOSITE SAMPLING GRID
2011 UTTR TTU HUMAN HEALTH RISK SCREEN EVALUATION
HILL AIR FORCE BASE, UTAH

3.0 Surface Water (40 CFR 264.601[b] and R315-846)

3.1 Performance Standards

3.1.0.1 The environmental performance standard for surface water calls for the prevention of any releases that may have adverse effects on human health or the environment due to migration of waste constituents in surface water or in wetlands. Considerations include the following:

- The volume and physical and chemical characteristics of the waste in the unit
- The effectiveness and reliability of containing, confining, and collecting systems and structures and preventing migration
- The hydrologic characteristics of the unit and surrounding area, including the topography and land around the unit
- The patterns of precipitation in the region
- The quantity, quality, and direction of groundwater flow
- The proximity of the unit to surface waters
- The current and potential uses of nearby surface waters and any other water quality standards established for those surface waters
- The existing quality of surface waters and surface soils, including other sources of contamination
- Patterns of land use in the region
- The potential for health risks caused by human exposure to waste constituents
- The potential for damage to domestic animals, wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents

3.2 Required Programs

3.2.0.1 The *Open Burning/Open Detonation Permitting Guidelines* (EPA, 2002) requires sampling of surface waters and wetlands within and contiguous to the OB/OD units.

3.3 Site-specific Conditions

3.3.0.1 There are no permanent surface water bodies within the confines of the TTU or in the surrounding area. However, there is an erosional dry wash located topographically below the TTU subunits. Surface water is present in the dry wash infrequently during major storm events. Annual precipitation in and around the TTU is generally less than 6 inches per

year. The only additional water input to the site is from localized dust control operations. Because the TTU subunits are located near the top of the precipitation catchment basin, there is little potential for surface water runoff collecting in the subunits. The natural topography directs the flow away from active portions of the TTU. The closest surface water body to the TTU is the Great Salt Lake, which lies approximately 3 miles eastward. Because the TTU is located on the west side of the Lakeside Mountain Range, surface water runoff from the TTU facility is directed to the west, away from the Great Salt Lake, into the Sink Valley, which is a closed, internally drained basin.

3.3.0.2 For these reasons, surface water resources in the vicinity will not be affected by OB/OD operations at the TTU. In addition, there are no known surface water pathways from the TTU subunits to human receptors.

3.4 Assessment of Potential Health Risks

3.4.0.1 The surface water pathway is incomplete since there are no surface water bodies into which contaminants could migrate. Therefore, there is no potential for health risks from this pathway.

4.0 Surface Soil (40 CFR 264.601[b] and R315-8-16)

4.1 Performance Standards

4.1.0.1 The environmental performance standard for soil calls for the prevention of any releases that may have adverse effects on human health.

4.2 Required Programs

4.2.0.1 The *Open Burning/Open Detonation Permitting Guidelines* (EPA, 2002) requires sampling of surface soil within and contiguous to the OB/OD units' area of impact.

4.3 Surface Soil Data

4.3.0.1 This report addresses soil data from the 2009 and 2010 sampling events (CH2M HILL, 2010; CH2M HILL, 2011). These more recent results were compared with those presented in the last risk screen evaluation (CH2M HILL, 2009b). The analytical data for these sampling events were verified and validated according to the Air Force Center for Engineering and the Environment data quality assessment and validation guidelines. The discussion in this section pertains to data collected in 2009 and 2010 and constitutes the 2011 risk assessment review required by the RCRA permit compliance work plan.

4.3.1 Chemicals of Concern

4.3.1.1 Table 4-1 presents the descriptive statistics for the soil samples collected in 2009 and 2010, including total number of samples, number of detects, the maximum detection by analyte, and the upper confidence limit on the mean (UCL). The composite sampling quadrants are indicated in Figure 2-1.

4.3.1.2 EPA Region 8 does not require a toxicity assessment for chemicals with less than a 5 percent detection frequency (EPA, 2008). However, Hill AFB screened the detected analytes against risk-based screening levels regardless of the detection frequency. The surface soil analytes are presented in Table 4-1.

4.3.2 Exposure Point Concentrations

4.3.2.1 The exposure point concentration (EPC) is a statistical concentration for the exposure area in which the receptor works. It was assumed that the worker had an equal probability of exposure to soils anywhere in the TTU sampling area; therefore, data from all locations were grouped together. For each detected analyte, the EPCs used in this assessment were the 95 percent UCL calculated using ProUCL software (EPA, Version 4.1; the highest "recommended" values from the ProUCL output are presented in Table 4-1).

4.3.2.2 Version 4.1 of ProUCL accounts for a dataset with nondetect values without the use of the substitution methods (e.g., one-half the method detection limit for nondetect).

4.3.3 Background Evaluation

4.3.3.1 Most of the metals detected in the TTU samples also occur naturally. In risk characterization, it is important to distinguish metals that may be attributable to the OB/OD operations from those not originating from the operations. If the site sample concentration for a metal is not statistically distinguishable from the natural concentration, it could be concluded that TTU operations have not affected the area soils with respect to that metal; therefore, that metal can be excluded from risk characterization.

4.3.3.2 Soil characterization studies surrounding the TTU have adequately characterized the background soil composition (Appendix A of CH2M HILL, 2009a). This updated HHRA report addresses background versus site comparisons only for analytes that exceed risk-based screening levels.

4.4 Assessment of Potential Health Risks

4.4.0.1 A screening level risk assessment was conducted to determine whether existing concentrations of the analytes in soil are protective of the health of the industrial worker. The EPA's regional screening levels (RSLs) for the industrial worker soil exposure were the basis of this risk screening evaluation (EPA, 2011). The RSLs are risk-based concentrations (RBCs) derived from standardized equations combining exposure information assumptions with EPA toxicity data. The RSLs are considered by the EPA to be protective for humans (including sensitive groups) over a lifetime. The ELCR and HI used to calculate the RSLs are 10^{-6} and 1, respectively.

4.4.1 Exposure and Intake Parameters

4.4.1.1 The RSLs account for exposure to soil via oral ingestion, dermal contact, inhalation of volatiles, and particulate inhalation. These are the same exposure pathways considered in the 2009 risk screening evaluation (CH2M HILL, 2009b).

4.4.1.2 The basic exposure parameters used in the RSL calculations are consistent with those used in the 2005 update Attachment 10B to the permit. The RSL table and User's Guide (EPA, 2011) presenting these variables and the exposure calculations are presented in Appendices A and B.

4.4.2 Toxicity Factors

4.4.2.1 The RSLs use toxicity factors derived from the three-tier hierarchy established by EPA (2003). These sources include the following:

- Tier 1—The EPA's Integrated Risk Information System.
- Tier 2—The EPA's Provisional Peer-reviewed Toxicity Values (PPRTVs). The Office of Research and Development/National Center for Environmental Assessment/Superfund Health Risk Technical Support Center develops PPRTVs on a chemical-specific basis when requested by EPA's Superfund program.
- Tier 3—Other Toxicity Values. Tier 3 includes additional EPA and non-EPA sources of toxicity information. Priority should be given to those sources of information that are the most current, the basis for which is transparent and publicly available, and which have

been peer reviewed. Common Tier 3 sources include Agency for Toxic Substances and Disease Registry toxicity profiles.

4.4.2.2 Appendix A provides the complete toxicity factor tables from the RSL spreadsheets. Table 4-2 contains the toxicity factors for analytes detected in TTU soils. Table 4-3 summarized significant changes between the toxicity factors used in the 2011 human health risk evaluation for the TTU compared to those used in 2009.

4.4.3 Risk Characterization

4.4.3.1 The ELCR and noncancer hazard quotient (HQ) for detected analytes were calculated using the chemical-specific EPCs and RSL as follows:

- ELCR = EPC/Cancer RSL$\times 10^{-6}$
- HQ = EPC/RBC

4.4.3.2 Table 4-1 presents the RSLs, ELCRs, and HQs for individual analytes. The cumulative ELCR was calculated by adding the ELCRs for the individual analytes. The noncancer HI was calculated by adding the HQs for the individual analytes. These cumulative estimates are also presented in Table 4-1.

4.4.3.3 The noncancer HI (0.1) was well below the target level of 1. It is also less than the value calculated in 2009 based on soil samples collected in 2007 and 2008 (CH2M HILL, 2009b). The cumulative ELCR was 4×10^{-6}, which is slightly above the lower end of the 1×10^{-6} to 1×10^{-4} target risk range. Practically all of the carcinogenic risk associated with soil arises from arsenic. Arsenic is not known to be a major component of the OB/OD items. Furthermore, arsenic concentrations in TTU soil are consistent with site-specific background concentrations (CH2M HILL, 2009a), indicating that it is naturally occurring. Excluding the naturally occurring arsenic, the calculated cumulative ELCR for the site worker is below 1×10^{-6}. The cumulative ELCR also remains unchanged from 2009. These observations indicate that no modification to the permit Attachment 10B is warranted with respect to soil exposure at the TTU.

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TABLE 4-1

Analyte and Contaminants of Concern Detection, Upper Confidence Limits, and Exposure Point Concentrations for Surface Soil Samples Collected in 2009 and 2010

Thermal Treatment Unit 2011 Human Health Risk Screen Evaluation

				Summary Statistics								Risk Screening					
Analyte Name	Analyte ERPIMS Parlabel	CAS Number	Result Units	Total Samples	Total Detects	Detection Frequency (percent)	Maximum Detect	UCL Type	95UCL	EPC	EPC Basis[1]	Cancer RSL (mg/kg)	Screening ELCR	ELCR Percent Total	Noncancer RSL (mg/kg)	Screening HI	HQ Percent Total
2,4-Dinitrotoluene	DNT24	121-14-2	mg/kg	22	4	18	0.43	Chebyshev (Mean, Sd)	0.129	0.129	UCL	5.5	2.E-08	1%	1200	1.E-04	
Aluminum	AL	7429-90-5	mg/kg	22	22	100	15000	Approximate Gamma	12980	12980	UCL	--			990000	1.E-02	10%
Antimony	SB	7440-36-0	mg/kg	22	13	59	0.47	Chebyshev (Mean, Sd)	0.177	0.177	UCL	--			410	4.E-04	
Arsenic	AS	7440-38-2	mg/kg	22	22	100	7.8	Student's-t	6.426	6.426	UCL	1.6	**4.E-06**	99%	260	2.E-02	18%
Barium	BA	7440-39-3	mg/kg	22	22	100	230	Student's-t	207.4	207.4	UCL	--			190000	1.E-03	1%
Beryllium	BE	7440-41-7	mg/kg	22	22	100	0.69	Student's-t	0.548	0.548	UCL	6900	8.E-11		2000	3.E-04	
Cadmium	CD	7440-43-9	mg/kg	22	22	100	2.7	Chebyshev (Mean, Sd)	1.393	1.393	UCL	9300	1.E-10		800	2.E-03	1%
Calcium	CA	7440-70-2	mg/kg	22	22	100	190000	Modified-t	107523	107523	UCL	--			--		
Chloride	CL	16887-00-6	mg/kg	22	22	100	2800	Chebyshev (Mean, Sd)	851.7	851.7	UCL	--			--		
Chromium	CR	7440-47-3	mg/kg	22	22	100	27	Modified-t	16.34	16.34	UCL	--			--		
Cobalt	CO	7440-48-4	mg/kg	22	22	100	4.1	Approximate Gamma	3.543	3.543	UCL	1900	2.E-09		300	1.E-02	9%
Copper	CU	7440-50-8	mg/kg	22	22	100	75	Chebyshev (Mean, Sd)	42.53	42.53	UCL	--			41000	1.E-03	1%
RDX	RDX	121-82-4	mg/kg	22	1	5	0.046	Student's-t	0.0434	0.0434	UCL	24	2.E-09		2800	2.E-05	
Iron	FE	7439-89-6	mg/kg	22	22	100	12000	Student's-t	10294	10294	UCL	--			720000	1.E-02	11%
Lead	PB	7439-92-1	mg/kg	22	22	100	44	Modified-t	18.95	18.95	UCL	--			800	2.E-02	17%
Magnesium	MG	7439-95-4	mg/kg	22	22	100	18000	Student's-t	15243	15243	UCL	--			--		
Manganese	MN	7439-96-5	mg/kg	22	22	100	430	Student's-t	361.9	361.9	UCL	--			--		
Mercury	HG	7439-97-6	mg/kg	22	21	95	0.46	Chebyshev (Mean, Sd)	0.127	0.127	UCL	--			43	3.E-03	2%
Molybdenum	MO	7439-98-7	mg/kg	22	22	100	8.2	Chebyshev (Mean, Sd)	3.357	3.357	UCL	--			5100	7.E-04	
Nickel	NI	7440-02-0	mg/kg	22	22	100	14	Student's-t	10.35	10.35	UCL	64000	2.E-10		20000	5.E-04	
Nitrate as Nitrogen	NO3N	7697-37-2	mg/kg	22	22	100	20	Approximate Gamma	10.88	10.88	UCL	--			--		
Nitroglycerin	NTG	55-63-0	mg/kg	22	1	5	1.0	Modified-t	0.319	0.319	UCL	100	3.E-09		62	5.E-03	4%
Nitroguanidine	NO2GUAN	556-88-7	mg/kg	22	1	5	0.073	Modified-t	0.0269	0.0269	UCL	--			62000	4.E-07	
HMX	HMX	2691-41-0	mg/kg	22	14	64	2.0	Approximate Gamma	0.529	0.529	UCL	--			49000	1.E-05	
Perchlorate	PCATE	14797-73-0	mg/kg	22	22	100	18	Chebyshev (Mean, Sd)	9.482	9.482	UCL	--			720	1.E-02	10%
Picric Acid	TNP246	88-89-1	mg/kg	22	1	5	0.0039	Modified-t	0.00147	0.00147	UCL	--			--		
Potassium	K	7440-09-7	mg/kg	22	22	100	5300	Student's-t	4552	4552	UCL	--			--		
Selenium	SE	7782-49-2	mg/kg	22	22	100	0.91	H-UCL	0.636	0.636	UCL	--			5100	1.E-04	
Silver	AG	7440-22-4	mg/kg	22	22	100	1.6	Approximate Gamma	0.604	0.604	UCL	--			5100	1.E-04	
Sodium	NA	7440-23-5	mg/kg	22	22	100	4900	Chebyshev (Mean, Sd)	2039	2039	UCL	--			--		
Strontium	SR	7440-24-6	mg/kg	22	22	100	450	Student's-t	338.7	338.7	UCL	--			610000	6.E-04	
Sulfate	SO4	14808-79-8	mg/kg	22	22	100	2700	Chebyshev (Mean, Sd)	1003	1003	UCL	--			--		
Thallium	TL	7440-28-0	mg/kg	22	22	100	0.24	Student's-t	0.204	0.204	UCL	--			10	2.E-02	15%
Vanadium	V	7440-62-2	mg/kg	22	22	100	23	Approximate Gamma	21.37	21.37	UCL	--			--		
Zinc	ZN	7440-66-6	mg/kg	22	22	100	58	Student's-t	49.35	49.35	UCL	--			310000	2.E-04	
													4.E-06			1.E-01	

NOTES:

95UCL = 95 Percent Upper Confidence Limit

CAS = Chemical Abstract Service

ELCR = Excess Lifetime Cancer Risk

EPC = Exposure Point Concentration

ERPIMS = Environmental Restoration Program Information Management System

HI = Hazard Index

HMX = Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine

HQ = Hazard Quotient

mg/kg = Milligram per Kilogram

RDX = Hexahydro-1,3,5-trinitro-1,3,5-triazine

RSL = Regional Screening Level

UCL = Upper Confidence Limit

[1]EPC Basis: max = maximum detected, UCL = 95UCL from EPA ProUCL 4.1 (http://www.epa.gov/esd/tsc/TSC_form.htm).

TABLE 4-2
Toxicity Factors
Thermal Treatment Unit 2011 Human Health Risk Screen Evaluation

Chemical	Standard Name	CAS Number	SF_O $(mg/kg\text{-}day)^{-1}$	SF_O Ref	RFD_O (mg/kg-day)	RFD_O Ref	IUR $(mg/m^3)^{-1}$	IUR Ref	RFC_i (mg/m^3)	RFC_i Ref
1,1,2,2-Tetrachoroethae	1,1,2,2-Tetrachloroethane	79-34-5	0.2	IRIS	0.02	IRIS	5.8E-02	Cal EPA		
1,2,4-Trimethylbenzene	1,2,4-Trimethylbenzene	95-63-6							0.007	PPRTV
1,3,5-Trimethylbenzene	1,3,5-Trimethylbenzene	108-67-8			0.01	PPRTV Appendix				
1,3-Butadiene	1,3-Butadiene	106-99-0	3.4	Cal EPA			3.0E-02	IRIS	0.002	IRIS
2,4,6-Trinitrotoluene	2,4,6-Trinitrotoluene	118-96-7	0.03	IRIS	0.0005	IRIS				
2,4-Dinitrotoluene	2,4-Dinitrotoluene	121-14-2	0.31	Cal EPA	0.002	IRIS	8.9E-02	Cal EPA		
2-Nitrodiphenylamine	2-Nitrodiphenylamine	119-75-5								
Allyl chloride	Allyl chloride	107-05-1	0.021	Cal EPA			6.0E-03	Cal EPA	0.001	IRIS
Aluminum	Aluminum	7429-90-5			1	PPRTV			0.005	PPRTV
Antimony	Antimony	7440-36-0			4.0E-04	IRIS				
Arsenic	Arsenic	7440-38-2	1.5	IRIS	3.0E-04	IRIS	4.3E+00	IRIS	1.5E-05	Cal EPA
Barium	Barium	7440-39-3			0.2	IRIS			5.0E-04	HEAST
Benzene	Benzene	71-43-2	0.055	IRIS	0.004	IRIS	7.8E-03	IRIS	0.03	IRIS
Benzo(a)anthracene	Benzo(a)anthracene	56-55-3	0.73				1.1E-01	Cal EPA		
Benzo(a)pyrene	Benzo(a)pyrene	50-32-8	7.3	IRIS			1.1E+00	Cal EPA		
Beryllium	Beryllium	7440-41-7			0.002	IRIS	2.4E+00	IRIS	2.0E-05	IRIS
bis(2-ethylhexyl)phthalate	bis(2-ethylhexyl)phthalate	117-81-7	0.014	IRIS	0.02	IRIS	2.4E-03	Cal EPA		
Butylbenzylphthalate	Butylbenzylphthalate	85-68-7	0.0019	PPRTV	0.2	IRIS				
Cadmium	Cadmium	7440-43-9			0.001	IRIS	1.8E+00	IRIS	2.0E-05	Cal EPA
Calcium	Calcium	7440-70-2								
Carbon tetrachloride	Carbon tetrachloride	56-23-5	0.07	IRIS	0.004	IRIS	6.0E-03	IRIS	0.1	IRIS
Chloride	Chloride	16887-00-6								
Chromium	Chromium	7440-47-3								
Chrysene	Chrysene	218-01-9	0.0073				1.1E-02	Cal EPA		
Cobalt	Cobalt	7440-48-4			0.0003	PPRTV	9.0E+00	PPRTV	6.0E-06	PPRTV
Copper	Copper	7440-50-8			0.04	HEAST				
Dichloromethane	Methylene chloride	75-09-2	0.0075	IRIS	0.06	IRIS	4.7E-04	IRIS	1	ATSDR
Diethylphthalate	Diethylphthalate	84-66-2			0.8	IRIS				
Dimethylphthalate	Dimethylphthalate	131-11-3								
Di-n-butylphthalate	Di-n-butylphthalate	84-74-2			0.1	IRIS				
Di-n-octylphthalate	Di-n-octylphthalate	117-84-0								
Ethyl chloride	Chloroethane	75-00-3							10	IRIS
Ethylbenzene	Ethylbenzene	100-41-4	0.011	Cal EPA	0.1	IRIS	2.5E-03	Cal EPA	1	IRIS
Fluoranthene	Fluoranthene	206-44-0			0.04	IRIS				
Fluorene	Fluorene	86-73-7			0.04	IRIS				
Freon11	Trichlorofluoromethane	75-69-4			0.3	IRIS			0.7	HEAST
Freon113	1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1			30	IRIS			30	HEAST
Freon12	Dichlorodifluoromethane	75-71-8			0.2	IRIS			0.1	PPRTV Appendix
Hexachlorobenzene	Hexachlorobenzene	118-74-1	1.6	IRIS	0.0008	IRIS	4.6E-01	IRIS		
Hexahydro-1,3,5…(RDX)	Hexahydro-1,3,5-trinitro-1,3,5-triazine	121-82-4	0.11	IRIS	0.003	IRIS				
Iron	Iron	7439-89-6			0.7	PPRTV				
Lead	Lead	7439-92-1								
m,p-Xylene	m,p-Xylenes	1330-20-7			0.2	IRIS			0.1	IRIS
Magnesium	Magnesium	7439-95-4								
Manganese	Manganese	7439-96-5			0.14	IRIS			5.0E-05	IRIS
Mercury	Mercury	7439-97-6							3.0E-04	IRIS
Methane	Methane	74-82-8								
Methyl bromide	Bromomethane	74-83-9			0.0014	IRIS			0.005	IRIS
Methyl chloride	Chloromethane	74-87-3							0.09	IRIS
Methyl chloroform	1,1,1-Trichloroethane	71-55-6			2	IRIS			5	IRIS
Molybdenum	Molybdenum	7439-98-7			0.005	IRIS				
Naphthalene	Naphthalene	91-20-3			0.02	IRIS	3.4E-02	Cal EPA	0.003	IRIS
Nickel	Nickel	7440-02-0			0.02	IRIS	2.6E-01	Cal EPA	9.0E-05	ATSDR
Nitrate as nitrogen	Nitrate as nitrogen	7697-37-2								

TABLE 4-2
Toxicity Factors
Thermal Treatment Unit 2011 Human Health Risk Screen Evaluation

Chemical	Standard Name	CAS Number	SF_O $(mg/kg\text{-}day)^{-1}$	SF_O Ref	RFD_O (mg/kg-day)	RFD_O Ref	IUR $(mg/m^3)^{-1}$	IUR Ref	RFC_i (mg/m^3)	RFC_i Ref
Nitroglycerine	Nitroglycerin	55-63-0	0.017	PPRTV	1.0E-04	PPRTV				
Nitroguanidine	Nitroguanidine	556-88-7			0.1	IRIS				
Octahydro-1,3,5,7…(HMX)	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine	2691-41-0			0.05	IRIS				
o-Xylene	o-Xylene	95-47-6			0.2				0.1	
Pentaerythritol tetranitrate (PETN)	Pentaerythritoltetranitrate	78-11-5	0.004	PPRTV Appendix	0.002	PPRTV				
Perchlorate	Perchlorate	14797-73-0			7.0E-04	IRIS				
p-Ethyltoluene	p-Ethyltoluene	622-96-8								
Phenanthrene	Phenanthrene	85-01-8								
Phenol	Phenol	108-95-2			0.3	IRIS			0.2	Cal EPA
Picric Acid	Picric Acid	88-89-1								
Potassium	Potassium	7440-09-7								
Pyrene	Pyrene	129-00-0			0.03	IRIS				
Selenium	Selenium	7782-49-2			0.005	IRIS			0.02	Cal EPA
Silver	Silver	7440-22-4			0.005	IRIS				
Sodium	Sodium	7440-23-5								
Strontium	Strontium	7440-24-6			0.6	IRIS				
Styrene	Styrene	100-42-5			0.2	IRIS			1	IRIS
Sulfate	Sulfate	14808-79-8								
Thallium	Thallium	7440-28-0			1.0E-05	PPRTV Appendix				
Titanium	Titanium	7440-32-6								
Toluene	Toluene	108-88-3			0.08	IRIS			5	IRIS
Vanadium	Vanadium	7440-62-2								
Vinyl chloride	Vinyl Chloride	75-01-4	0.72	IRIS	0.003	IRIS	4.4E-03	IRIS	0.1	IRIS
Vinylidene chloride	1,1-Dichloroethene	75-35-4			0.05	IRIS			0.2	IRIS
Zinc	Zinc	7440-66-6			0.3	IRIS				

NOTES:
ATSDR = Agency for Toxic Substances and Disease Registry
Cal EPA = California Environmental Protection Agency
CAS = Chemical Abstract Service
HEAST = Health Effects Assessment Summary Tables
IRIS = Integrated Risk Information System
IUR = Inhalation Unit Risk
mg/kg-day = Milligrams per Kilogram per Day
mg/m^3 = Milligram per Cubic Meter
PPRTV = Provisional Peer-reviewed Toxicity Values
RFC_i = Inhalation Reference Concentration
RFD_O = Oral Reference Dose
SF_O = Oral Cancer Slope Factor

TABLE 4-3
Changes in Toxicity Factors from 2009 to 2011
Thermal Treatment Unit 2011 Human Health Risk Screen Evaluation

			Oral Toxicity Factors						Inhalation Toxicity Factors					
Chemical	**Standard Name**	**CAS Number**	**2009 SF_O $(mg/kg\text{-}day)^{-1}$**	**2010 SF_O $(mg/kg\text{-}day)^{-1}$**	**2010 SF_O Ref**	**2009 RFD_O (mg/kg-day)**	**2010 RFD_O (mg/kg-day)**	**2010 RFD_O Ref**	**2009 IUR $(mg/m^3)^{-1}$**	**2010 IUR $(mg/m^3)^{-1}$**	**2010 IUR Ref**	**2009 RFC_i (mg/m^3)**	**2010 RFC_i (mg/m^3)**	**2010 RFC_i Ref**
1,1,2,2-Tetrachoroethane	1,1,2,2-Tetrachloroethane	79-34-5	0.2	0.2	IRIS	**0.004**	**0.02**	IRIS	0.058	0.058	Cal EPA			
1,3,5-Trimethylbenzene	1,3,5-Trimethylbenzene	108-67-8				**0.05**	**0.01**	PPRTV				**0.006**		
Cadmium	Cadmium	7440-43-9				0.001	0.001	IRIS	1.8	1.8	IRIS	**0.00001**	**0.00002**	Cal EPA
Carbon tetrachloride	Carbon tetrachloride	56-23-5	**0.13**	**0.07**	IRIS	**0.0007**	**0.004**	IRIS	**0.015**	**0.006**	IRIS	**0.19**	**0.1**	IRIS
Chromium	Chromium	7440-47-3							**12**					
Freon12	Dichlorodifluoromethane	75-71-8				0.2	0.2	IRIS				**0.2**	**0.1**	PPRTV
Mercury	Mercury	7439-97-6				**0.00016**						0.0003	0.0003	IRIS
o-Xylene	o-Xylene	95-47-6				**2**	**0.2**					**0.7**	**0.1**	
Pentaerythritol tetranitrate	Pentaerythritoltetranitrate	78-11-5		**0.004**	PPRTV		**0.002**	PPRTV						
Thallium	Thallium	7440-28-0				**0.000065**	**0.00001**	PPRTV						
Vanadium	Vanadium	7440-62-2				**0.007**								

NOTES:
Cal EPA = California Environmental Protection Agency
CAS = Chemical Abstract Service
IRIS = Integrated Risk Information System
IUR = Inhalation Unit Risk
mg/kg-day = Milligrams per Kilogram per Day
mg/m^3 = Milligram per Cubic Meter
PPRTV = Provisional Peer-reviewed Toxicity Values
RFC_i = Inhalation Reference Concentration
RFD_O = Oral Reference Dose
SF_O = Oral Cancer Slope Factor

5.0 Air (40 CFR 264.601[c] and R315-8-61)

5.1 Performance Standards

5.1.0.1 The environmental performance standard for the protection of the air pathway requires the prevention of any release that may have adverse effects on human health or the environment due to migration of waste constituents in the air. Specific items to be considered include the following:

- The volume and physical and chemical characteristics of the waste in the unit, including its potential for the emission and dispersal of gases, aerosols, and particulates
- The effectiveness and reliability of systems and structures to reduce or prevent emissions of hazardous constituents to the air
- The operating characteristics of the unit
- The atmospheric, meteorological, and topographic characteristics of the unit and surrounding area
- The existing quality of the air, including other sources of contamination and their cumulative impact on the air
- The potential for health risks caused by human exposure to waste constituents
- The potential for damage to domestic animals, wildlife, crops, vegetation, and physical structures caused by exposure to waste constituents

5.2 Receptors

5.2.0.1 The air pathway entails potential inhalation risks to (1) EOD personnel monitoring the OB/OD operations onsite, (2) a resident at the nearby community of Oasis, and (3) a recreational boater on the Great Salt Lake. These receptors remain the same as in the original permit.

5.3 Emission Characterization

5.3.0.1 As a source of air pollutants, OB/OD units must operate in accordance with specifications provided in the State-issued hazardous waste permit. All OB/OD units must comply with National Ambient Air Quality Standards and the Utah Division of Air Quality standards, as demonstrated by the use of State-approved air dispersion modeling protocol. In addition, OB/OD facilities must evaluate whether air emissions pose a risk to human health or the environment.

5.3.0.2 The air modeling exercise was completed as part of the 1997 permit application. The EPA's INPUFF model was used to estimate the air concentrations (hence, risks for three specific receptors). The air modeling does not need to be redone unless significant changes have been made to the usage patterns at the TTU or to the emission factor inputs to the air

dispersion model. The OB/OD is carried out as on-demand batch operation, depending on the needs of the time. However, an analysis of the materials destroyed over a period of 10 years indicated that regardless of the items being destroyed (i.e., a rocket motor or missile engine), the explosive and propellant types and quantities have remained relatively unchanged (Hill AFB, 2005). From year to year, the detonation of C-4 missile motors has comprised from 60 to 85 percent of the net amount of explosives and propellants destroyed. Further, there is no new information in the MIDAS database to warrant a revision of the modeling or a change in the emissions.

5.3.0.3 Thus, it is not necessary to modify in the EPCs presented Tables 8, 9, and 10 of the 1997 permit application at this time. These EPCs were used in the risk characterization for offsite air exposures (see Table 5-2).

5.3.1 Dioxin and Furan Emissions

5.3.1.1 As part of the 2005 risk assessment revision and as a requirement of Section II.F.2.c, Hill AFB investigated the potential for formation of dioxins and furans from the OB/OD operations, including the burning of dunnage and diesel fuel. A thorough discussion of the previous dioxins/furans investigation and data evaluation results is presented in the 2009 risk screening evaluation (CH2M HILL, 2009b).

5.4 Assessment of Potential Health Risks

5.4.0.1 The results of the 1997 INPUFF air dispersion modeling were used in the inhalation risk characterization. The toxicity factors were updated to the most recent values available.

5.4.1 Exposure and Intake Parameters

5.4.1.1 The exposure and intake parameters for the air receptors are included in Table 5-1. These parameters are the same as in the 1997, 2003, 2005, 2007, and 2009 assessments. It was assumed that the EOD person was exposed to the emissions during the conduct of the OB/OD operations. The Oasis resident was assumed to spend at least 5 days per week at the Oasis compound, while the recreational boater was assumed to spend 2 days on the lake every week. All receptors were assumed to be adults weighing 70 kilograms. The daily exposure times include a factor to account for the fraction of the time the wind blows in the direction of a given receptor as presented in the 2003 Permit Attachment 10B. These factors are shown in Table 5-1.

5.4.1.2 Lifetime averaged inhalation exposure concentrations were calculated as follows:

$$C_{AIR} \bullet \frac{ET \times 24\ hrs/day \times EF \times ED}{AT} = Conc_{LifeAvg}$$

where:

$Conc_{LifeAvg}$ = Lifetime averaged exposure concentration.

ED = Exposure duration (years), or the number of years that a receptor is potentially exposed to contamination.

EF = Exposure frequency (days per year), or the number of days per year a receptor spends in the exposure location.

ET = Exposure time (hours per day), or the amount of time a receptor spends in an exposure setting on a daily basis (e.g., in the shower). Used for dermal and inhalation exposures.

AT = Averaging time (days). For cancer effects, the dose (dermal and oral) or concentration (inhalation) is averaged over an assumed lifetime of 70 years (25,500 days). Noncancer doses were averaged over the period of exposure.

5.4.2 Toxicity Factors

5.4.2.1 The three-tiered sources for toxicity factors were the same as described for soil exposures (see Section 4.0). Inhalation-specific toxicity factors were used if they were available. These factors include the inhalation unit risk (IUR) for cancer risk and the inhalation reference concentration (RFCi) for noncancer effects (Table 4-2).

5.4.3 Risk Characterization

5.4.3.1 The risks for each chemical of concern were calculated using the chemical-specific emission rates and RBCs as follows for noncancer and cancer effects:

$$\frac{Conc_{LifeAvg}}{RFC_i} = HQ$$

where:

RFC_i = Inhalation reference concentration for chronic exposure (milligrams per cubic meter [mg/m^3]), chemical-specific

HQ = Noncancer HQ (unitless)

$$Conc_{LifeAvg} \times IUR = ELCR$$

where:

IUR = Inhalation unit risk $(mg/m^3)^{-1}$, chemical-specific

ELCR = Excess lifetime cancer risk (unitless)

5.4.3.2 The individual chemical risks were then added for each receptor. The total risks are provided in Table 5-3 for the EOD personnel, Salt Lake boater, and Oasis resident. These results correspond to those in Tables 8, 9, and 10 in the original permit.

5.4.3.3 For the offsite air exposures (EOD worker, Salt Lake boater, and Oasis resident), the calculated cumulative ELCRs were within the target ELCR range of 1×10^{-6} to 1×10^{-4} and the HIs were below 1.

5.4.3.4 Based on the evaluations of the soil data and the air emissions, it appears that continuation of the OB/OD operations will not cause undue harm to the workers and the citizen population near the TTU.

TABLE 5-1

Intake and Exposure Parameters

Thermal Treatment Unit 2011 Human Health Risk Screen Evaluation

		Air Emissions		
Intake and Exposure Parameter	**Units**	**Oasis Resident Value**	**EOD Worker Value**	**Boater Value**
Target Excess Lifetime Cancer Risk (TR)	--	1.00E-06	1.00E-06	1.00E-06
Target Hazard Index (THI)	--	1	1	1
Body Weight Adult (BW)	kg	NA	NA	NA
Averaging Time, Cancer (ATc)	days	25,500	25,500	25,500
Averaging Time, Noncancer (ATn)	years	10,950	7,300	7,300
Exposure Frequency (EF)	days per year	350	250	104
Exposure Time—No Wind Factor	hours per day	24	1	24
Wind Factor—Fraction of Time Blowing Toward Receptor	percent	10%	3%	7%
Final Exposure Time (ET)	hours per day	2.3	0.027	1.6
Exposure Duration (ED)	years	30	20	20

NOTES:

EOD = Explosive Ordnance Disposal

kg = Kilogram

NA = Not Applicable

TABLE 5-2
Risk Summary for Hypothetical Offsite Air Exposures (Permit Tables 8, 9, and 10)
Thermal Treatment Unit 2011 Human Health Risk Screening Evaluation

		Current EOD Worker				Current Salt Lake Boater				Current Oasis Resident			
Standard Name	**Chemical**	**ELCR**	**ELCR Percent Total**	**HQ**	**HQ Percent Total**	**ELCR**	**ELCR Percent Total**	**HQ**	**HQ Percent Total**	**ELCR**	**ELCR Percent Total**	**HQ**	**HQ Percent Total**
1,1,1-trichloroethane	Methyl chloroform			2.E-08				7.E-09				1.E-08	
1,1,2,2-Tetrachloroethane	1,1,2,2-Tetrachoroethae	2.E-09		8.E-06		6.E-10		2.E-06		1.E-09		4.E-06	
1,1,2-trichloro-1,2,2-trifluoroethane	Freon113			1.E-10				5.E-11				7.E-11	
1,1-Dichloroethene	Vinylidene chloride			1.E-07				4.E-08				7.E-08	
1,2,4-Trimethylbenzene	1,2,4-Trimethylbenzene			3.E-05				1.E-05				2.E-05	
1,3,5-Trimethylbenzene	1,3,5-Trimethylbenzene												
2,4,6-Trinitrotoluene	2,4,6-TNT	7.E-11		2.E-05		2.E-11		6.E-06		6.E-11		9.E-06	
2,4-Dinitrotoluene	2,4-DNT	2.E-10		1.E-06		7.E-11		4.E-07		2.E-10		6.E-07	
2-Nitrodiphenylamine	2-Nitrodiphenylamine												
Allyl Chloride	Allyl chloride	3.E-10		2.E-04		1.E-10		6.E-05		2.E-10		9.E-05	
Aluminum	Aluminum			4.E-02	5%			1.E-02	5%			2.E-02	5%
Antimony	Antimony			8.E-04				3.E-04				4.E-04	
Barium	Barium			6.E-03				2.E-03				3.E-03	
Benzene	Benzene	1.E-09		2.E-05		4.E-10		7.E-06		1.E-09		1.E-05	
Benzo[a]anthracene	Benzo(a)anthracene	1.E-11				5.E-12				1.E-11			
Benzo[a]pyrene	Benzo(a)pyrene	2.E-09				6.E-10				1.E-09			
Butadiene	1,3-Butadiene	2.E-09		9.E-05		5.E-10		3.E-05		1.E-09		5.E-05	
Butyl benzyl phthalate	Butylbenzylphthalate	5.E-13		5.E-09		2.E-13		2.E-09		4.E-13		2.E-09	
Cadmium	Cadmium	**6.E-06**	87%	6.E-01	84%	**2.E-06**	87%	2.E-01	84%	**5.E-06**	87%	3.E-01	84%
Calcium	Calcium												
Carbon tetrachloride	Carbon tetrachloride	1.E-11		6.E-08		4.E-12		2.E-08		8.E-12		3.E-08	
Chromium	Chromium												
Chrysene	Chrysene	1.E-12				4.E-13				1.E-12			
Copper	Copper			3.E-04				9.E-05				1.E-04	
Cyclotrimethylenetrinitramine	Hexahydro-1,3,5…(RDX)	5.E-07	8%	6.E-03		2.E-07	8%	2.E-03		4.E-07	8%	3.E-03	
Dibutyl phthalate	Di-n-butyl phthalate			6.E-07				2.E-07				3.E-07	
Dichlorodifluoromethane	Freon12			1.E-07				3.E-08				5.E-08	
Dichloromethane	Dichloromethane	4.E-10		3.E-06		1.E-10		8.E-07		3.E-10		1.E-06	
Diethylphthalate	Diethylphthalate			3.E-06				9.E-07				1.E-06	
Dimethylphthalate	Dimethylphthalate												
Di-n-octylphthalate	Di-n-octylphthalate												
Di-sec-octyl phthalate	Bis(2-ethylhexyl)phthalate	3.E-11		7.E-07		1.E-11		2.E-07		2.E-11		3.E-07	
Ethyl Benzene	Ethylbenzene	1.E-11		2.E-08		4.E-12		6.E-09		1.E-11		1.E-08	
Ethyl Chloride	Ethyl chloride			2.E-09				6.E-10				9.E-10	
Fluoranthene	Fluoranthene			1.E-08				4.E-09				6.E-09	
Fluorene	Fluorene			1.E-09				5.E-10				7.E-10	
Hexachlorobenzene	Hexachlorobenzene	2.E-09		6.E-06		7.E-10		2.E-06		2.E-09		3.E-06	
Lead	Lead												
m,p-Xylenes	m,p-Xylene			1.E-07				5.E-08				7.E-08	
Mercury	Mercury			5.E-06				2.E-06				2.E-06	
Methane	Methane												
Methyl bromide	Methyl bromide			1.E-05				3.E-06				5.E-06	
Methyl Chloride	Methyl chloride			3.E-07				1.E-07				1.E-07	
Naphthalene	Naphthalene	7.E-11		2.E-06		2.E-11		7.E-07		5.E-11		1.E-06	
Nickel	Nickel	4.E-07	6%	6.E-02	8%	1.E-07	6%	2.E-02	8%	3.E-07	6%	3.E-02	8%
Nitroglycerin	Nitroglycerine	2.E-11		4.E-05		6.E-12		1.E-05		1.E-11		2.E-05	
Octahydro-1,3,5,7-Tetranitro-1,3,5,7-Tetrazocine	Octahydro-1,3,5,7…(HMX)			3.E-05				8.E-06				1.E-05	
o-Xylene	o-Xylene			7.E-08				2.E-08				4.E-08	
Pentaerythritoltetranitrate	Pentaerythritol tetranitrate (PETN)												
p-Ethyltoluene	p-Ethyltoluene												
Phenanthrene	Phenanthrene												
Phenol	Phenol			4.E-08				1.E-08				2.E-08	
Potassium	Potassium												
Pyrene	Pyrene			6.E-08				2.E-08				3.E-08	
Sodium	Sodium												
Styrene	Styrene			2.E-07				5.E-08				8.E-08	
Titanium	Titanium												
Toluene	Toluene			3.E-08				1.E-08				2.E-08	
Trichlorofluoromethane	Freon11			2.E-08				7.E-09				1.E-08	
Vinyl chloride	Vinyl chloride	2.E-11		1.E-07		5.E-12		4.E-08		1.E-11		6.E-08	
Zinc	Zinc			3.E-05				1.E-05				2.E-05	
	Sum:	7.E-06		7.E-01		2.E-06		2.E-01		5.E-06		3.E-01	

NOTES:
ELCR = Excess Lifetime Cancer Risk
EOD = Explosive Ordnance Disposal
HQ = Noncancer Hazard Quotient
Bolded values indicate an ELCR $\geqslant 10^{-6}$ or an HQ $\geqslant 1$.

6.0 References

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APPENDIX A

Regional Screening Level Table

Key: I = IRIS; P = PPRTV; A = ATSDR; C = Cal EPA; X = PPRTV Appendix; H = HEAST; J = New Jersey; Y = New York; O = EPA Office of Water; E = Environmental Criteria and Assessment Office; S = see user guide Section 5; L = see user guide on lead; M = mutagen; V = volatile; F = See FAQ; c = cancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; n = noncancer; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide); SSL values are based on DAF=1

Toxicity and Chemical-specific Information												Contaminant		Screening Levels											Protection of Ground Water SSLs	
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	muta-gen	GIABS	ABS	C_{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Resident Air (ug/m^3)	key	Industrial Air (ug/m^3)	key	Tapwater (ug/L)	key	MCL (ug/L)	Risk-based SSL (mg/kg)	MCL-based SSL (mg/kg)
1.8E-02	C	5.1E-06	C	1.5E-01	I					1	0.1		ALAR	1596-84-5	2.7E+01	c	9.6E+01	c	4.8E-01	c	2.4E+00	c	3.7E+00	c		8.2E-04	
8.7E-03	I			4.0E-03	I					1	0.1		Acephate	30560-19-1	5.6E+01	c**	2.0E+02	c*					7.7E+00	c*		1.7E-03	
		2.2E-06	I			9.0E-03	I	V		1		1.1E+05	Acetaldehyde	75-07-0	1.0E+01	c**	5.2E+01	c**	1.1E+00	c**	5.6E+00	c**	2.2E+00	c**		4.5E-04	
				2.0E-02	I					1	0.1		Acetochlor	34256-82-1	1.2E+03	n	1.2E+04	n					7.3E+02	n		5.8E-01	
				9.0E-01	I	3.1E+01	A	V		1		1.1E+05	Acetone	67-64-1	6.1E+04	n	6.3E+05	nms	3.2E+04	n	1.4E+05	n	2.2E+04	n		4.5E+00	
				3.0E-03	P	6.0E-02	P	V		1		1.1E+05	Acetone Cyanohydrin	75-86-5	2.0E+02	n	2.1E+03	n	6.3E+01	n	2.6E+02	n	5.8E+01	n		1.2E-02	
						6.0E-02	I	V		1		1.3E+05	Acetonitrile	75-05-8	8.7E+02	n	3.7E+03	n	6.3E+01	n	2.6E+02	n	1.3E+02	n		2.6E-02	
				1.0E-01	I			V		1		2.5E+03	Acetophenone	98-86-2	7.8E+03	ns	1.0E+05	nms					3.7E+03	n		1.1E+00	
3.8E+00	C	1.3E-03	C							1	0.1		Acetylaminofluorene, 2-	53-96-3	1.3E-01	c	4.5E-01	c	1.9E-03	c	9.4E-03	c	1.8E-02	c		8.2E-05	
				5.0E-04	I	2.0E-05	I	V		1		2.3E+04	Acrolein	107-02-8	1.5E-01	n	6.5E-01	n	2.1E-02	n	8.8E-02	n	4.2E-02	n		8.4E-06	
5.0E-01	I	1.0E-04	I	2.0E-03	I	6.0E-03	I			1	0.1		Acrylamide	79-06-1	9.7E-01	c	3.4E+00	c	2.4E-02	c	1.2E-01	c	1.3E-01	c		2.8E-05	
				5.0E-01	I	1.0E-03	I			1	0.1		Acrylic Acid	79-10-7	3.0E+04	n	2.9E+05	nm	1.0E+00	n	4.4E+00	n	1.8E+04	n		3.7E+00	
5.4E-01	I	6.8E-05	I	4.0E-02	A	2.0E-03	I	V		1		1.1E+04	Acrylonitrile	107-13-1	2.4E-01	c*	1.2E+00	c*	3.6E-02	c*	1.8E-01	c*	4.5E-02	c*		9.9E-06	
						6.0E-03	P			1	0.1		Adiponitrile	111-69-3	8.5E+06	nm	3.6E+07	nm	6.3E+00	n	2.6E+01	n					
5.6E-02	C			1.0E-02	I					1	0.1		Alachlor	15972-60-8	8.7E+00	c*	3.1E+01	c					1.2E+00	c	2.0E+00	9.9E-04	1.6E-03
				1.0E-03	I					1	0.1		Aldicarb	116-06-3	6.1E+01	n	6.2E+02	n					3.7E+01	n		9.1E-03	
				1.0E-03	I					1	0.1		Aldicarb Sulfone	1646-88-4	6.1E+01	n	6.2E+02	n					3.7E+01	n		8.0E-03	
1.7E+01	I	4.9E-03	I	3.0E-05	I					1	0.1		Aldrin	309-00-2	2.9E-02	c*	1.0E-01	c	5.0E-04	c	2.5E-03	c	4.0E-03	c		6.5E-04	
				2.5E-01	I					1	0.1		Ally	74223-64-6	1.5E+04	n	1.5E+05	nm					9.1E+03	n		3.5E+00	
				5.0E-03	I	1.0E-04	X			1	0.1		Allyl Alcohol	107-18-6	3.0E+02	n	3.1E+03	n	1.0E-01	n	4.4E-01	n	1.8E+02	n		3.7E-02	
2.1E-02	C	6.0E-06	C			1.0E-03	I	V		1		1.4E+03	Allyl Chloride	107-05-1	6.8E-01	c**	3.4E+00	c**	4.1E-01	c**	2.0E+00	c**	6.5E-01	c**		2.1E-04	
				1.0E+00	P	5.0E-03	P			1			Aluminum	7429-90-5	7.7E+04	n	9.9E+05	nm	5.2E+00	n	2.2E+01	n	3.7E+04	n		5.5E+04	
				4.0E-04	I					1			Aluminum Phosphide	20859-73-8	3.1E+01	n	4.1E+02	n					1.5E+01	n			
				3.0E-04	I					1	0.1		Amdro	67485-29-4	1.8E+01	n	1.8E+02	n					1.1E+01	n		3.9E+03	
				9.0E-03	I					1	0.1		Ametryn	834-12-8	5.5E+02	n	5.5E+03	n					3.3E+02	n		3.5E-01	
2.1E+01	C	6.0E-03	C							1	0.1		Aminobiphenyl, 4-	92-67-1	2.3E-02	c	8.2E-02	c	4.1E-04	c	2.0E-03	c	3.2E-03	c		1.6E-05	
				8.0E-02	P					1	0.1		Aminophenol, m-	591-27-5	4.9E+03	n	4.9E+04	n					2.9E+03	n		1.1E+00	
				2.0E-02	P					1	0.1		Aminophenol, p-	123-30-8	1.2E+03	n	1.2E+04	n					7.3E+02	n		2.8E-01	
				2.5E-03	I					1	0.1		Amitraz	33089-61-1	1.5E+02	n	1.5E+03	n					9.1E+01	n		4.7E+01	
						1.0E-01	I			1			Ammonia	7664-41-7					1.0E+02	n	4.4E+02	n					
				2.0E-01	I					1			Ammonium Sulfamate	7773-06-0	1.6E+04	n	2.0E+05	nm					7.3E+03	n			
5.7E-03	I	1.6E-06	C	7.0E-03	P	1.0E-03	I			1	0.1		Aniline	62-53-3	8.5E+01	c**	3.0E+02	c*	1.0E+00	n	4.4E+00	n	1.2E+01	c*		4.0E-03	
4.0E-02	P			2.0E-03	X					1	0.1		Anthraquinone, 9,10-	84-65-1	1.2E+01	c*	4.3E+01	c*					1.7E+00	c*			
				4.0E-04	I					0.15			Antimony (metallic)	7440-36-0	3.1E+01	n	4.1E+02	n					1.5E+01	n	6.0E+00	6.6E-01	2.7E-01
				5.0E-04	H					0.15			Antimony Pentoxide	1314-60-9	3.9E+01	n	5.1E+02	n					1.8E+01	n			
				9.0E-04	H					0.15			Antimony Potassium Tartrate	11071-15-1	7.0E+01	n	9.2E+02	n					3.3E+01	n			
				4.0E-04	H					0.15			Antimony Tetroxide	1332-81-6	3.1E+01	n	4.1E+02	n					1.5E+01	n			
						2.0E-04	I			0.15			Antimony Trioxide	1309-64-4	2.8E+05	nm	1.2E+06	nm	2.1E-01	n	8.8E-01	n					
				1.3E-02	I					1	0.1		Apollo	74115-24-5	7.9E+02	n	8.0E+03	n					4.7E+02	n		2.9E+01	
2.5E-02	I	7.1E-06	I	5.0E-02	H					1	0.1		Aramite	140-57-8	1.9E+01	c	6.9E+01	c	3.4E-01	c	1.7E+00	c	2.7E+00	c		3.0E-02	
1.5E+00	I	4.3E-03	I	3.0E-04	I	1.5E-05	C			1	0.03		Arsenic, Inorganic	7440-38-2	3.9E-01	c*	1.6E+00	c	5.7E-04	c*	2.9E-03	c*	4.5E-02	c	1.0E+01	1.3E-03	2.9E-01
				3.5E-06	C	5.0E-05	I			1			Arsine	7784-42-1	2.7E-01	n	3.6E+00	n	5.2E-02	n	2.2E-01	n	1.3E-01	n			
				9.0E-03	I					1	0.1		Assure	76578-14-8	5.5E+02	n	5.5E+03	n					3.3E+02	n		5.1E+00	
				5.0E-02	I					1	0.1		Asulam	3337-71-1	3.1E+03	n	3.1E+04	n					1.8E+03	n		4.7E-01	
2.3E-01	C			3.5E-02	I					1	0.1		Atrazine	1912-24-9	2.1E+00	c	7.5E+00	c					2.9E-01	c	3.0E+00	1.9E-04	1.9E-03
8.8E-01	C	2.5E-04	C							1	0.1		Auramine	492-80-8	5.5E-01	c	2.0E+00	c	9.7E-03	c	4.9E-02	c	7.6E-02	c		7.0E-04	
				4.0E-04	I					1	0.1		Avermectin B1	65195-55-3	2.4E+01	n	2.5E+02	n					1.5E+01	n		2.6E+01	
1.1E-01	I	3.1E-05	I					V		1			Azobenzene	103-33-3	5.1E+00	c	2.3E+01	c	7.8E-02	c	4.0E-01	c	1.2E-01	c		9.6E-04	
				2.0E-01	I	5.0E-04	H			0.07			Barium	7440-39-3	1.5E+04	n	1.9E+05	nm	5.2E-01	n	2.2E+00	n	7.3E+03	n	2.0E+03	3.0E+02	8.2E+01
				4.0E-03	I					1	0.1		Baygon	114-26-1	2.4E+02	n	2.5E+03	n					1.5E+02	n		4.7E-02	
				3.0E-02	I					1	0.1		Bayleton	43121-43-3	1.8E+03	n	1.8E+04	n					1.1E+03	n		8.7E-01	
				2.5E-02	I					1	0.1		Baythroid	68359-37-5	1.5E+03	n	1.5E+04	n					9.1E+02	n		2.4E+02	
				3.0E-01	I					1	0.1		Benefin	1861-40-1	1.8E+04	n	1.8E+05	nm					1.1E+04	n		3.6E+02	
				5.0E-02	I					1	0.1		Benomyl	17804-35-2	3.1E+03	n	3.1E+04	n					1.8E+03	n		1.6E+00	
				3.0E-02	I					1	0.1		Bentazon	25057-89-0	1.8E+03	n	1.8E+04	n					1.1E+03	n		2.4E-01	
				1.0E-01	I			V		1		1.2E+03	Benzaldehyde	100-52-7	7.8E+03	ns	1.0E+05	nms					3.7E+03	n		8.1E-01	
5.5E-02	I	7.8E-06	I	4.0E-03	I	3.0E-02	I	V		1		1.8E+03	Benzene	71-43-2	1.1E+00	c*	5.4E+00	c*	3.1E-01	c	1.6E+00	c*	4.1E-01	c	5.0E+00	2.1E-04	2.6E-03
				2.0E-04	X					1	0.1		Benzenediamine-2-methyl sulfate, 1,4-	6369-59-1	1.2E+01	n	1.2E+02	n					7.3E+00	n			
				1.0E-03	P			V		1		1.3E+03	Benzenethiol	108-98-5	7.8E+01	n	1.0E+03	n					3.7E+01	n		2.4E-02	
2.3E+02	I	6.7E-02	I	3.0E-03	I				M	1	0.1		Benzidine	92-87-5	5.0E-04	c	7.5E-03	c	1.4E-05	c	1.8E-04	c	9.4E-05	c		2.4E-07	
				4.0E+00	I					1	0.1		Benzoic Acid	65-85-0	2.4E+05	nm	2.5E+06	nm					1.5E+05	n		3.4E+01	
1.3E+01	I							V		1		3.2E+02	Benzotrichloride	98-07-7	4.9E-02	c	2.2E-01	c					5.2E-03	c		1.1E-05	
				1.0E-01	P					1	0.1		Benzyl Alcohol	100-51-6	6.1E+03	n	6.2E+04	n					3.7E+03	n		8.9E-01	
1.7E-01	I	4.9E-05	C	2.0E-03	P	1.0E-03	P	V		1		1.5E+03	Benzyl Chloride	100-44-7	1.0E+00	c*	4.9E+00	c*	5.0E-02	c*	2.5E-01	c*	7.9E-02	c*		8.7E-05	
		2.4E-03	I	2.0E-03	I	2.0E-05	I			0.007			Beryllium and compounds	7440-41-7	1.6E+02	n	2.0E+03	n	1.0E-03	c*	5.1E-03	c*	7.3E+01	n	4.0E+00	5.8E+01	3.2E+00

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Toxicity and Chemical-specific Information												Contaminant		Screening Levels												Protection of Ground Water SSLs	
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	voc	muta-gen	GIABS	ABS	C_{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Resident Air (ug/m^3)	key	Industrial Air (ug/m^3)	key	Tapwater (ug/L)	key	MCL (ug/L)	Risk-based SSL (mg/kg)	MCL-based SSL (mg/kg)
				1.0E-04	I					1	0.1		Bidrin	141-66-2	6.1E+00	n	6.2E+01	n					3.7E+00	n		8.5E-04	
				9.0E-03	P					1	0.1		Bifenox	42576-02-3	5.5E+02	n	5.5E+03	n					3.3E+02	n		2.5E+00	
				1.5E-02	I					1	0.1		Biphenthrin	82657-04-3	9.2E+02	n	9.2E+03	n					5.5E+02	n		2.5E+03	
8.0E-03	X			5.0E-02	I	4.0E-04	X	V		1		2.1E+02	Biphenyl, 1,1'-	92-52-4	5.1E+01	n	2.1E+02	n	4.2E-01	n	1.8E+00	n	8.3E-01	n		8.7E-03	
7.0E-02	H	1.0E-05	H	4.0E-02	I			V		1		1.0E+03	Bis(2-chloro-1-methylethyl) ether	108-60-1	4.6E+00	c	2.2E+01	c	2.4E-01	c	1.2E+00	c	3.2E-01	c		1.2E-04	
				3.0E-03	P					1	0.1		Bis(2-chloroethoxy)methane	111-91-1	1.8E+02	n	1.8E+03	n					1.1E+02	n		2.5E-02	
1.1E+00	I	3.3E-04	I					V		1		5.1E+03	Bis(2-chloroethyl)ether	111-44-4	2.1E-01	c	1.0E+00	c	7.4E-03	c	3.7E-02	c	1.2E-02	c		3.1E-06	
1.4E-02	I	2.4E-06	C	2.0E-02	I					1	0.1		Bis(2-ethylhexyl)phthalate	117-81-7	3.5E+01	c*	1.2E+02	c	1.0E+00	c	5.1E+00	c	4.8E+00	c	6.0E+00	1.1E+00	1.4E+00
2.2E+02	I	6.2E-02	I					V		1		4.2E+03	Bis(chloromethyl)ether	542-88-1	7.7E-05	c	3.9E-04	c	3.9E-05	c	2.0E-04	c	6.2E-05	c		1.5E-08	
				5.0E-02	I					1	0.1		Bisphenol A	80-05-7	3.1E+03	n	3.1E+04	n					1.8E+03	n		1.4E+02	
				2.0E-01	I	2.0E-02	H			1			Boron And Borates Only	7440-42-8	1.6E+04	n	2.0E+05	nm	2.1E+01	n	8.8E+01	n	7.3E+03	n		2.3E+01	
				4.0E-02	C	1.3E-02	C			1			Boron Trifluoride	7637-07-2	3.1E+03	n	4.1E+04	n	1.4E+01	n	5.7E+01	n	1.5E+03	n			
7.0E-01	I			4.0E-03	I					1			Bromate	15541-45-4	9.1E-01	c	4.1E+00	c					9.6E-02	c	1.0E+01	7.4E-04	7.7E-02
2.0E+00	X	6.0E-04	X					V		1		2.4E+03	Bromo-2-chloroethane, 1-	107-04-0	2.4E-02	c	1.2E-01	c	4.1E-03	c	2.0E-02	c	6.5E-03	c		1.8E-06	
				8.0E-03	I	6.0E-02	I	V		1		6.8E+02	Bromobenzene	108-86-1	3.0E+02	n	1.8E+03	ns	6.3E+01	n	2.6E+02	n	8.8E+01	n		5.9E-02	
						4.0E-02	X	V		1		4.0E+03	Bromochloromethane	74-97-5	1.6E+02	n	6.8E+02	n	4.2E+01	n	1.8E+02	n	8.3E+01	n		2.1E-02	
6.2E-02	I	3.7E-05	C	2.0E-02	I			V		1		9.3E+02	Bromodichloromethane	75-27-4	2.7E-01	c	1.4E+00	c	6.6E-02	c	3.3E-01	c	1.2E-01	c	8.0E+01(F)	3.2E-05	2.2E-02
7.9E-03	I	1.1E-06	I	2.0E-02	I					1	0.1		Bromoform	75-25-2	6.2E+01	c*	2.2E+02	c*	2.2E+00	c	1.1E+01	c	8.5E+00	c*	8.0E+01(F)	2.3E-03	2.1E-02
				1.4E-03	I	5.0E-03	I	V		1		3.6E+03	Bromomethane	74-83-9	7.3E+00	n	3.2E+01	n	5.2E+00	n	2.2E+01	n	8.7E+00	n		2.2E-03	
				5.0E-03	H					1	0.1		Bromophos	2104-96-3	3.1E+02	n	3.1E+03	n					1.8E+02	n		7.7E-01	
				2.0E-02	I					1	0.1		Bromoxynil	1689-84-5	1.2E+03	n	1.2E+04	n					7.3E+02	n		6.3E-01	
				2.0E-02	I					1	0.1		Bromoxynil Octanoate	1689-99-2	1.2E+03	n	1.2E+04	n					7.3E+02	n		6.4E+00	
3.4E+00	C	3.0E-05	I			2.0E-03	I	V		1		6.7E+02	Butadiene, 1,3-	106-99-0	5.4E-02	c*	2.6E-01	c*	8.1E-02	c*	4.1E-01	c*	1.8E-02	c		9.7E-06	
				1.0E-01	I					1	0.1		Butanol, N-	71-36-3	6.1E+03	n	6.2E+04	n					3.7E+03	n		7.6E-01	
1.9E-03	P			2.0E-01	I					1	0.1		Butyl Benzyl Phthlate	85-68-7	2.6E+02	c*	9.1E+02	c					3.5E+01	c		5.1E-01	
				2.0E+00	P	3.0E+01	P			1	0.1		Butyl alcohol, sec-	78-92-2	1.2E+05	nm	1.2E+06	nm	3.1E+04	n	1.3E+05	n	7.3E+04	n		1.5E+01	
				5.0E-02	I					1	0.1		Butylate	2008-41-5	3.1E+03	n	3.1E+04	n					1.8E+03	n		1.8E+00	
2.0E-04	C	5.7E-08	C							1	0.1		Butylated hydroxyanisole	25013-16-5	2.4E+03	c	8.6E+03	c	4.3E+01	c	2.2E+02	c	3.4E+02	c		6.3E-01	
				5.0E-02	P			V		1		1.1E+02	Butylbenzene, n-	104-51-8	3.9E+03	ns	5.1E+04	ns					1.8E+03	n		5.9E+00	
				1.0E+00	I					1	0.1		Butylphthalyl Butylglycolate	85-70-1	6.1E+04	n	6.2E+05	nm					3.7E+04	n		8.3E+02	
				2.0E-02	A					1	0.1		Cacodylic Acid	75-60-5	1.2E+03	n	1.2E+04	n					7.3E+02	n			
		1.8E-03	I	1.0E-03	I	2.0E-05	C			0.025	0.001		Cadmium (Diet)	7440-43-9	7.0E+01	n	8.0E+02	n									
		1.8E-03	I	5.0E-04	I	2.0E-05	C			0.05	0.001		Cadmium (Water)	7440-43-9					1.4E-03	c*	6.8E-03	c*	1.8E+01	n	5.0E+00	1.4E+00	3.8E-01
				5.0E-01	I					1	0.1		Caprolactam	105-60-2	3.1E+04	n	3.1E+05	nm					1.8E+04	n		4.5E+00	
1.5E-01	C	4.3E-05	C	2.0E-03	I					1	0.1		Captafol	2425-06-1	3.2E+00	c*	1.1E+01	c	5.7E-02	c	2.9E-01	c	4.5E-01	c		7.9E-04	
2.3E-03	C	6.6E-07	C	1.3E-01	I					1	0.1		Captan	133-06-2	2.1E+02	c*	7.5E+02	c	3.7E+00	c	1.9E+01	c	2.9E+01	c		2.1E-02	
				1.0E-01	I					1	0.1		Carbaryl	63-25-2	6.1E+03	n	6.2E+04	n					3.7E+03	n		3.3E+00	
				5.0E-03	I					1	0.1		Carbofuran	1563-66-2	3.1E+02	n	3.1E+03	n					1.8E+02	n	4.0E+01	7.1E-02	1.6E-02
				1.0E-01	I	7.0E-01	I	V		1		7.4E+02	Carbon Disulfide	75-15-0	8.2E+02	ns	3.7E+03	ns	7.3E+02	n	3.1E+03	n	1.0E+03	n		3.1E-01	
7.0E-02	I	6.0E-06	I	4.0E-03	I	1.0E-01	I	V		1		4.6E+02	Carbon Tetrachloride	56-23-5	6.1E-01	c	3.0E+00	c	4.1E-01	c	2.0E+00	c	4.4E-01	c	5.0E+00	1.7E-04	1.9E-03
				1.0E-02	I					1	0.1		Carbosulfan	55285-14-8	6.1E+02	n	6.2E+03	n					3.7E+02	n		8.8E+00	
				1.0E-01	I					1	0.1		Carboxin	5234-68-4	6.1E+03	n	6.2E+04	n					3.7E+03	n		2.0E+00	
						9.0E-04	I			1			Ceric oxide	1306-38-3	1.3E+06	nm	5.4E+06	nm	9.4E-01	n	3.9E+00	n					
				1.0E-01	I					1	0.1		Chloral Hydrate	302-17-0	6.1E+03	n	6.2E+04	n					3.7E+03	n		7.4E-01	
				1.5E-02	I					1	0.1		Chloramben	133-90-4	9.2E+02	n	9.2E+03	n					5.5E+02	n		1.3E-01	
4.0E-01	H									1	0.1		Chloranil	118-75-2	1.2E+00	c	4.3E+00	c					1.7E-01	c		1.4E-04	
3.5E-01	I	1.0E-04	I	5.0E-04	I	7.0E-04	I			1	0.04		Chlordane	12789-03-6	1.6E+00	c*	6.5E+00	c*	2.4E-02	c*	1.2E-01	c*	1.9E-01	c*	2.0E+00	1.3E-02	1.4E-01
1.0E+01	I	4.6E-03	C	3.0E-04	I					1	0.1		Chlordecone (Kepone)	143-50-0	4.9E-02	c	1.7E-01	c	5.3E-04	c	2.7E-03	c	6.7E-03	c		2.4E-04	
				7.0E-04	A					1	0.1		Chlorfenvinphos	470-90-6	4.3E+01	n	4.3E+02	n					2.6E+01	n		7.0E-02	
				2.0E-02	I					1	0.1		Chlorimuron, Ethyl-	90982-32-4	1.2E+03	n	1.2E+04	n					7.3E+02	n		2.5E-01	
				1.0E-01	I	1.5E-04	A			1			Chlorine	7782-50-5	7.5E+03	n	9.1E+04	n	1.5E-01	n	6.4E-01	n	3.7E+03	n		1.6E+00	
				3.0E-02	I	2.0E-04	I			1			Chlorine Dioxide	10049-04-4	2.3E+03	n	3.0E+04	n	2.1E-01	n	8.8E-01	n	1.1E+03	n			
				3.0E-02	I					1			Chlorite (Sodium Salt)	7758-19-2	2.3E+03	n	3.1E+04	n					1.1E+03	n	1.0E+03		
						5.0E+01	I	V		1		1.2E+03	Chloro-1,1-difluoroethane, 1-	75-68-3	5.8E+04	ns	2.4E+05	nms	5.2E+04	n	2.2E+05	n	1.0E+05	n		5.2E+01	
		3.0E-04	I	2.0E-02	H	2.0E-02	I	V		1		7.5E+02	Chloro-1,3-butadiene, 2-	126-99-8	9.4E-03	c	4.7E-02	c	8.1E-03	c	4.1E-02	c	1.6E-02	c		8.5E-06	
4.6E-01	H									1	0.1		Chloro-2-methylaniline HCl, 4-	3165-93-3	1.1E+00	c	3.7E+00	c					1.5E-01	c		8.3E-05	
1.0E-01	P	7.7E-05	C	3.0E-03	X					1	0.1		Chloro-2-methylaniline, 4-	95-69-2	4.9E+00	c*	1.7E+01	c	3.2E-02	c	1.6E-01	c	6.7E-01	c		3.8E-04	
2.7E-01	X									1	0.1		Chloroacetaldehyde, 2-	107-20-0	1.8E+00	c	6.4E+00	c					2.5E-01	c		5.0E-05	
				2.0E-03	H					1	0.1		Chloroacetic Acid	79-11-8	1.2E+02	n	1.2E+03	n					7.3E+01	n	6.0E+01	1.5E-02	1.2E-02
						3.0E-05	I			1	0.1		Chloroacetophenone, 2-	532-27-4	4.3E+04	n	1.8E+05	nm	3.1E-02	n	1.3E-01	n					
2.0E-01	P			4.0E-03	I					1	0.1		Chloroaniline, p-	106-47-8	2.4E+00	c	8.6E+00	c					3.4E-01	c		1.4E-04	
				2.0E-02	I	5.0E-02	P	V		1		7.6E+02	Chlorobenzene	108-90-7	2.9E+02	n	1.4E+03	ns	5.2E+01	n	2.2E+02	n	9.1E+01	n	1.0E+02	6.2E-02	6.8E-02
1.1E-01	C	3.1E-05	C	2.0E-02	I					1	0.1		Chlorobenzilate	510-15-6	4.4E+00	c	1.6E+01	c	7.8E-02	c	4.0E-01	c	6.1E-01	c		2.0E-03	
				3.0E-02	X					1	0.1		Chlorobenzoic Acid, p-	74-11-3	1.8E+03	n	1.8E+04	n					1.1E+03	n		2.8E-01	
				3.0E-03	P	3.0E-01	P	V		1		1.2E+02	Chlorobenzotrifluoride, 4-	98-56-6	2.1E+02	ns	2.3E+03	ns	3.1E+02	n	1.3E+03	n	9.3E+01	n		3.3E-01	

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Toxicity and Chemical-specific Information												Contaminant		Screening Levels												Protection of Ground Water SSLs	
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	voc	muta-gen	GIABS	ABS	C_{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Resident Air (ug/m^3)	key	Industrial Air (ug/m^3)	key	Tapwater (ug/L)	key	MCL (ug/L)	Risk-based SSL (mg/kg)	MCL-based SSL (mg/kg)
				4.0E-02	P			V		1		7.3E+02	Chlorobutane, 1-	109-69-3	3.1E+03	ns	4.1E+04	ns					1.5E+03	n		5.9E-01	
						5.0E+01	I	V		1		1.7E+03	Chlorodifluoromethane	75-45-6	5.3E+04	ns	2.2E+05	nms	5.2E+04	n	2.2E+05	n	1.0E+05	n		4.3E+01	
3.1E-02	C	2.3E-05	I	1.0E-02	I	9.8E-02	A	V		1		2.5E+03	Chloroform	67-66-3	2.9E-01	c	1.5E+00	c	1.1E-01	c	5.3E-01	c	1.9E-01	c	8.0E+01(F)	5.3E-05	2.2E-02
						9.0E-02	I	V		1		1.3E+03	Chloromethane	74-87-3	1.2E+02	n	5.0E+02	n	9.4E+01	n	3.9E+02	n	1.9E+02	n		4.9E-02	
2.4E+00	C	6.9E-04	C					V		1		2.6E+04	Chloromethyl Methyl Ether	107-30-2	1.9E-02	c	9.4E-02	c	3.5E-03	c	1.8E-02	c	5.6E-03	c		1.2E-06	
				8.0E-02	I			V		1		1.8E+02	Chloronaphthalene, Beta-	91-58-7	6.3E+03	ns	8.2E+04	ns					2.9E+03	n		1.5E+01	
3.0E-01	P			3.0E-03	P	1.0E-05	X			1	0.1		Chloronitrobenzene, o-	88-73-3	1.6E+00	c	5.7E+00	c	1.0E-02	n	4.4E-02	n	2.2E-01	c		2.1E-04	
6.3E-03	P			1.0E-03	P	6.0E-04	P			1	0.1		Chloronitrobenzene, p-	100-00-5	6.1E+01	n	2.7E+02	c**	6.3E-01	n	2.6E+00	n	1.1E+01	c**		9.9E-03	
				5.0E-03	I			V		1		2.2E+04	Chlorophenol, 2-	95-57-8	3.9E+02	n	5.1E+03	n					1.8E+02	n		1.5E-01	
						4.0E-04	C	V		1		6.2E+02	Chloropicrin	76-06-2	2.1E+00	n	8.8E+00	n	4.2E-01	n	1.8E+00	n	8.3E-01	n		2.5E-04	
3.1E-03	C	8.9E-07	C	1.5E-02	I					1	0.1		Chlorothalonil	1897-45-6	1.6E+02	c**	5.6E+02	c*	2.7E+00	c	1.4E+01	c	2.2E+01	c*		4.9E-02	
				2.0E-02	I			V		1		9.1E+02	Chlorotoluene, o-	95-49-8	1.6E+03	ns	2.0E+04	ns					7.3E+02	n		7.1E-01	
				2.0E-02	X			V		1		2.5E+02	Chlorotoluene, p-	106-43-4	1.6E+03	ns	2.0E+04	ns					7.3E+02	n		7.1E-01	
2.4E+02	C	6.9E-02	C							1	0.1		Chlorozotocin	54749-90-5	2.0E-03	c	7.2E-03	c	3.5E-05	c	1.8E-04	c	2.8E-04	c		6.2E-08	
				2.0E-01	I					1	0.1		Chlorpropham	101-21-3	1.2E+04	n	1.2E+05	nm					7.3E+03	n		6.6E+00	
				3.0E-03	I					1	0.1		Chlorpyrifos	2921-88-2	1.8E+02	n	1.8E+03	n					1.1E+02	n		1.6E+00	
				1.0E-02	H					1	0.1		Chlorpyrifos Methyl	5598-13-0	6.1E+02	n	6.2E+03	n					3.7E+02	n		1.7E+00	
				5.0E-02	I					1	0.1		Chlorsulfuron	64902-72-3	3.1E+03	n	3.1E+04	n					1.8E+03	n		1.5E+00	
				8.0E-04	H					1	0.1		Chlorthiophos	60238-56-4	4.9E+01	n	4.9E+02	n					2.9E+01	n		7.5E-01	
				1.5E+00	I					0.013			Chromium(III), Insoluble Salts	16065-83-1	1.2E+05	nm	1.5E+06	nm					5.5E+04	n		9.9E+07	
5.0E-01	J	8.4E-02	S	3.0E-03	I	1.0E-04	I		M	0.025			Chromium(VI)	18540-29-9	2.9E-01	c	5.6E+00	c	1.1E-05	c	1.5E-04	c	4.3E-02	c		8.3E-04	
										0.013			Chromium, Total	7440-47-3											1.0E+02		1.8E+05
		9.0E-03	P	3.0E-04	P	6.0E-06	P			1			Cobalt	7440-48-4	2.3E+01	n	3.0E+02	n	2.7E-04	c*	1.4E-03	c*	1.1E+01	n		4.9E-01	
		6.2E-04	I						M	1	0.1		Coke Oven Emissions	8007-45-2					1.5E-03	c	2.0E-02	c					
				4.0E-02	H					1			Copper	7440-50-8	3.1E+03	n	4.1E+04	n					1.5E+03	n	1.3E+03	5.1E+01	4.6E+01
				5.0E-02	I	6.0E-01	C			1	0.1		Cresol, m-	108-39-4	3.1E+03	n	3.1E+04	n	6.3E+02	n	2.6E+03	n	1.8E+03	n		1.5E+00	
				5.0E-02	I	6.0E-01	C			1	0.1		Cresol, o-	95-48-7	3.1E+03	n	3.1E+04	n	6.3E+02	n	2.6E+03	n	1.8E+03	n		1.5E+00	
				5.0E-03	H	6.0E-01	C			1	0.1		Cresol, p-	106-44-5	3.1E+02	n	3.1E+03	n	6.3E+02	n	2.6E+03	n	1.8E+02	n		1.5E-01	
				1.0E-01	X					1	0.1		Cresol, p-chloro-m-	59-50-7	6.1E+03	n	6.2E+04	n					3.7E+03	n		4.3E+00	
				1.0E-01	A	6.0E-01	C	V		1		5.0E+04	Cresols	1319-77-3	7.5E+03	n	9.1E+04	ns	6.3E+02	n	2.6E+03	n	9.3E+02	n		7.6E-01	
1.9E+00	H			1.0E-03	P			V		1		1.7E+04	Crotonaldehyde, trans-	123-73-9	3.4E-01	c	1.5E+00	c					3.5E-02	c		7.2E-06	
				1.0E-01	I	4.0E-01	I	V		1		2.7E+02	Cumene	98-82-8	2.1E+03	ns	1.1E+04	ns	4.2E+02	n	1.8E+03	n	6.8E+02	n		1.1E+00	
2.2E-01	C	6.3E-05	C							1	0.1		Cupferron	135-20-6	2.2E+00	c	7.8E+00	c	3.9E-02	c	1.9E-01	c	3.1E-01	c		5.3E-04	
8.4E-01	H			2.0E-03	H					1	0.1		Cyanazine	21725-46-2	5.8E-01	c	2.1E+00	c					8.0E-02	c		3.7E-05	
													Cyanides														
				4.0E-02	I					1			~Calcium Cyanide	592-01-8	3.1E+03	n	4.1E+04	n					1.5E+03	n			
				5.0E-03	I					1			~Copper Cyanide	544-92-3	3.9E+02	n	5.1E+03	n					1.8E+02	n			
				2.0E-02	I			V		1		1.0E+07	~Cyanide (CN-)	57-12-5	1.6E+03	n	2.0E+04	n					7.3E+02	n	2.0E+02	7.4E+00	2.0E+00
				4.0E-02	I			V		1			~Cyanogen	460-19-5	3.1E+03	n	4.1E+04	n					1.5E+03	n			
				9.0E-02	I			V		1			~Cyanogen Bromide	506-68-3	7.0E+03	n	9.2E+04	n					3.3E+03	n			
				5.0E-02	I			V		1			~Cyanogen Chloride	506-77-4	3.9E+03	n	5.1E+04	n					1.8E+03	n			
				6.0E-04	I	8.0E-04	I	V		1			~Hydrogen Cyanide	74-90-8	4.7E+01	n	6.1E+02	n	8.3E-01	n	3.5E+00	n	1.6E+00	n			
				5.0E-02	I					1			~Potassium Cyanide	151-50-8	3.9E+03	n	5.1E+04	n					1.8E+03	n			
				2.0E-01	I					0.04			~Potassium Silver Cyanide	506-61-6	1.6E+04	n	2.0E+05	nm					7.3E+03	n			
				1.0E-01	I					0.04			~Silver Cyanide	506-64-9	7.8E+03	n	1.0E+05	nm					3.7E+03	n			
				4.0E-02	I					1			~Sodium Cyanide	143-33-9	3.1E+03	n	4.1E+04	n					1.5E+03	n	2.0E+02		
				2.0E-04	P			V		1		4.6E+03	~Thiocyanate	463-56-9	1.6E+01	n	2.0E+02	n					7.3E+00	n		1.5E-03	
				5.0E-02	I					1			~Zinc Cyanide	557-21-1	3.9E+03	n	5.1E+04	n					1.8E+03	n			
						6.0E+00	I	V		1		1.2E+02	Cyclohexane	110-82-7	7.0E+03	ns	2.9E+04	ns	6.3E+03	n	2.6E+04	n	1.3E+04	n		1.3E+01	
2.3E-02	H									1	0.1		Cyclohexane, 1,2,3,4,5-pentabromo-6-chloro-	87-84-3	2.1E+01	c	7.5E+01	c					2.9E+00	c		1.7E-02	
				5.0E+00	I	7.0E-01	P			1	0.1		Cyclohexanone	108-94-1	3.1E+05	nm	3.1E+06	nm	7.3E+02	n	3.1E+03	n	1.8E+05	n		4.3E+01	
				2.0E-01	I					1	0.1		Cyclohexylamine	108-91-8	1.2E+04	n	1.2E+05	nm					7.3E+03	n		1.9E+00	
				5.0E-03	I					1	0.1		Cyhalothrin/karate	68085-85-8	3.1E+02	n	3.1E+03	n					1.8E+02	n		1.2E+02	
				1.0E-02	I					1	0.1		Cypermethrin	52315-07-8	6.1E+02	n	6.2E+03	n					3.7E+02	n		5.8E+01	
				7.5E-03	I					1	0.1		Cyromazine	66215-27-8	4.6E+02	n	4.6E+03	n					2.7E+02	n		7.0E-02	
2.4E-01	I	6.9E-05	C							1	0.1		DDD	72-54-8	2.0E+00	c	7.2E+00	c	3.5E-02	c	1.8E-01	c	2.8E-01	c		6.6E-02	
3.4E-01	I	9.7E-05	C							1	0.1		DDE, p,p'-	72-55-9	1.4E+00	c	5.1E+00	c	2.5E-02	c	1.3E-01	c	2.0E-01	c		4.7E-02	
3.4E-01	I	9.7E-05	I	5.0E-04	I					1	0.03		DDT	50-29-3	1.7E+00	c*	7.0E+00	c*	2.5E-02	c	1.3E-01	c	2.0E-01	c*		6.7E-02	
				1.0E-02	I					1	0.1		Dacthal	1861-32-1	6.1E+02	n	6.2E+03	n					3.7E+02	n		4.5E-01	
				3.0E-02	I					1	0.1		Dalapon	75-99-0	1.8E+03	n	1.8E+04	n					1.1E+03	n	2.0E+02	2.3E-01	4.1E-02
7.0E-04	I			7.0E-03	I					1	0.1		Decabromodiphenyl ether, 2,2',3,3',4,4',5,5',6,6'- (BDE-209)	1163-19-5	4.3E+02	n	2.5E+03	c**					9.6E+01	c**		5.3E+01	
				4.0E-05	I					1	0.1		Demeton	8065-48-3	2.4E+00	n	2.5E+01	n					1.5E+00	n			
1.2E-03	I			6.0E-01	I					1	0.1		Di(2-ethylhexyl)adipate	103-23-1	4.1E+02	c*	1.4E+03	c					5.6E+01	c	4.0E+02	4.0E+00	2.9E+01
6.1E-02	H									1	0.1		Diallate	2303-16-4	8.0E+00	c	2.8E+01	c					1.1E+00	c		1.6E-03	
				7.0E-04	A					1	0.1		Diazinon	333-41-5	4.3E+01	n	4.3E+02	n					2.6E+01	n		1.6E-01	

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Toxicity and Chemical-specific Information													Contaminant		Screening Levels										Protection of Ground Water SSLs	
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	voc	muta-gen	GIABS	ABS	C_{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Resident Air (ug/m^3)	key	Industrial Air (ug/m^3)	key	Tapwater (ug/L)	key	MCL (ug/L)	Risk-based SSL (mg/kg)	MCL-based SSL (mg/kg)
8.0E-01	P	6.0E-03	P	2.0E-04	P	2.0E-04	I	V	M	1		9.8E+02	Dibromo-3-chloropropane, 1,2-	96-12-8	5.4E-03	c	6.9E-02	c	1.6E-04	c	2.0E-03	c	3.2E-04	c	2.0E-01	1.4E-07	8.6E-05
				1.0E-02	I					1	0.1		Dibromobenzene, 1,4-	106-37-6	6.1E+02	n	6.2E+03	n					3.7E+02	n		3.5E-01	
8.4E-02	I	2.7E-05	C	2.0E-02	I			V		1	0.1	8.0E+02	Dibromochloromethane	124-48-1	6.8E-01	c	3.3E+00	c	9.0E-02	c	4.5E-01	c	1.5E-01	c	8.0E+01(F)	3.9E-05	2.1E-02
2.0E+00	I	6.0E-04	I	9.0E-03	I	9.0E-03	I	V		1		1.3E+03	Dibromoethane, 1,2-	106-93-4	3.4E-02	c	1.7E-01	c	4.1E-03	c	2.0E-02	c	6.5E-03	c	5.0E-02	1.8E-06	1.4E-05
				1.0E-02	H	4.0E-03	X	V		1		2.8E+03	Dibromomethane (Methylene Bromide)	74-95-3	2.5E+01	n	1.1E+02	n	4.2E+00	n	1.8E+01	n	8.2E+00	n		2.0E-03	
				1.0E-01	I					1	0.1		Dibutyl Phthalate	84-74-2	6.1E+03	n	6.2E+04	n					3.7E+03	n		9.2E+00	
				3.0E-04	P					1	0.1		Dibutyltin Compounds	NA	1.8E+01	n	1.8E+02	n					1.1E+01	n			
				3.0E-02	I					1	0.1		Dicamba	1918-00-9	1.8E+03	n	1.8E+04	n					1.1E+03	n		2.8E-01	
		4.2E-03	P					V		1		5.2E+02	Dichloro-2-butene, 1,4-	764-41-0	6.9E-03	c	3.5E-02	c	5.8E-04	c	2.9E-03	c	1.2E-03	c		5.4E-07	
		4.2E-03	P					V		1	0.1	5.2E+02	Dichloro-2-butene, cis-1,4-	1476-11-5	6.9E-03	c	3.5E-02	c	5.8E-04	c	2.9E-03	c	1.2E-03	c		5.4E-07	
		4.2E-03	P					V		1	0.1	7.6E+02	Dichloro-2-butene, trans-1,4-	110-57-6	6.9E-03	c	3.5E-02	c	5.8E-04	c	2.9E-03	c	1.2E-03	c		5.4E-07	
5.0E-02	I			4.0E-03	I					1	0.1		Dichloroacetic Acid	79-43-6	9.7E+00	c*	3.4E+01	c*					1.3E+00	c	6.0E+01	2.8E-04	1.2E-02
				9.0E-02	I	2.0E-01	H	V		1		3.8E+02	Dichlorobenzene, 1,2-	95-50-1	1.9E+03	ns	9.8E+03	ns	2.1E+02	n	8.8E+02	n	3.7E+02	n	6.0E+02	3.6E-01	5.8E-01
5.4E-03	C	1.1E-05	C	7.0E-02	A	8.0E-01	I	V		1			Dichlorobenzene, 1,4-	106-46-7	2.4E+00	c	1.2E+01	c	2.2E-01	c	1.1E+00	c	4.3E-01	c	7.5E+01	4.1E-04	7.2E-02
4.5E-01	I	3.4E-04	C							1	0.1		Dichlorobenzidine, 3,3'-	91-94-1	1.1E+00	c	3.8E+00	c	7.2E-03	c	3.6E-02	c	1.5E-01	c		9.8E-04	
				9.0E-03	X					1	0.1		Dichlorobenzophenone, 4,4'-	90-98-2	5.5E+02	n	5.5E+03	n					3.3E+02	n		2.0E+00	
				2.0E-01	I	1.0E-01	X	V		1		8.5E+02	Dichlorodifluoromethane	75-71-8	9.4E+01	n	4.0E+02	n	1.0E+02	n	4.4E+02	n	2.0E+02	n		3.1E-01	
5.7E-03	C	1.6E-06	C	2.0E-01	P			V		1		1.7E+03	Dichloroethane, 1,1-	75-34-3	3.3E+00	c	1.7E+01	c	1.5E+00	c	7.7E+00	c	2.4E+00	c		6.9E-04	
9.1E-02	I	2.6E-05	I	6.0E-03	X	7.0E-03	P	V		1		3.0E+03	Dichloroethane, 1,2-	107-06-2	4.3E-01	c*	2.2E+00	c*	9.4E-02	c*	4.7E-01	c*	1.5E-01	c*	5.0E+00	4.2E-05	1.4E-03
				5.0E-02	I	2.0E-01	I	V		1		1.2E+03	Dichloroethylene, 1,1-	75-35-4	2.4E+02	n	1.1E+03	n	2.1E+02	n	8.8E+02	n	3.4E+02	n	7.0E+00	1.2E-01	2.5E-03
				9.0E-03	H			V		1		1.3E+03	Dichloroethylene, 1,2- (Mixed Isomers)	540-59-0	7.0E+02	n	9.2E+03	ns					3.3E+02	n		9.7E-02	
				2.0E-03	I			V		1		2.4E+03	Dichloroethylene, 1,2-cis-	156-59-2	1.6E+02	n	2.0E+03	n					7.3E+01	n	7.0E+01	2.1E-02	2.1E-02
				2.0E-02	I	6.0E-02	P	V		1		1.7E+03	Dichloroethylene, 1,2-trans-	156-60-5	1.5E+02	n	6.9E+02	n	6.3E+01	n	2.6E+02	n	1.1E+02	n	1.0E+02	3.1E-02	2.9E-02
				3.0E-03	I					1	0.1		Dichlorophenol, 2,4-	120-83-2	1.8E+02	n	1.8E+03	n					1.1E+02	n		1.3E-01	
				1.0E-02	I					1	0.05		Dichlorophenoxy Acetic Acid, 2,4-	94-75-7	6.9E+02	n	7.7E+03	n					3.7E+02	n	7.0E+01	9.5E-02	1.8E-02
				8.0E-03	I					1	0.1		Dichlorophenoxy)butyric Acid, 4-(2,4-	94-82-6	4.9E+02	n	4.9E+03	n					2.9E+02	n		1.2E-01	
3.6E-02	C	1.0E-05	C	9.0E-02	A	4.0E-03	I	V		1		1.4E+03	Dichloropropane, 1,2-	78-87-5	9.4E-01	c*	4.7E+00	c*	2.4E-01	c*	1.2E+00	c*	3.9E-01	c*	5.0E+00	1.3E-04	1.7E-03
				2.0E-02	P			V		1		1.5E+03	Dichloropropane, 1,3-	142-28-9	1.6E+03	ns	2.0E+04	ns					7.3E+02	n		2.5E-01	
				3.0E-03	I					1	0.1		Dichloropropanol, 2,3-	616-23-9	1.8E+02	n	1.8E+03	n					1.1E+02	n		2.3E-02	
1.0E-01	I	4.0E-06	I	3.0E-02	I	2.0E-02	I	V		1		1.6E+03	Dichloropropene, 1,3-	542-75-6	1.7E+00	c*	8.3E+00	c*	6.1E-01	c*	3.1E+00	c*	4.3E-01	c*		1.5E-04	
2.9E-01	I	8.3E-05	C	5.0E-04	I	5.0E-04	I			1	0.1		Dichlorvos	62-73-7	1.7E+00	c*	5.9E+00	c*	2.9E-02	c*	1.5E-01	c*	2.3E-01	c*		7.1E-05	
				8.0E-03	P	7.0E-03	P	V		1		1.3E+02	Dicyclopentadiene	77-73-6	3.1E+01	n	1.3E+02	ns	7.3E+00	n	3.1E+01	n	1.4E+01	n		4.8E-02	
1.6E+01	I	4.6E-03	I	5.0E-05	I					1	0.1		Dieldrin	60-57-1	3.0E-02	c	1.1E-01	c	5.3E-04	c	2.7E-03	c	4.2E-03	c		1.7E-04	
		3.0E-04	C			5.0E-03	I			1	0.1		Diesel Engine Exhaust	NA					8.1E-03	c	4.1E-02	c					
						3.0E-03	C			1	0.1		Diethanolamine	111-42-2	4.3E+06	nm	1.8E+07	nm	3.1E+00	n	1.3E+01	n					
				8.0E-01	I					1	0.1		Diethyl Phthalate	84-66-2	4.9E+04	n	4.9E+05	nm					2.9E+04	n		1.2E+01	
				3.0E-02	P	1.0E-04	P			1	0.1		Diethylene Glycol Monobutyl Ether	112-34-5	1.8E+03	n	1.8E+04	n	1.0E-01	n	4.4E-01	n	1.1E+03	n		2.4E-01	
				6.0E-02	P	3.0E-04	P			1	0.1		Diethylene Glycol Monoethyl Ether	111-90-0	3.6E+03	n	3.6E+04	n	3.1E-01	n	1.3E+00	n	2.2E+03	n		4.4E-01	
				1.0E-03	P					1	0.1		Diethylformamide	617-84-5	6.1E+01	n	6.2E+02	n					3.7E+01	n		7.5E-03	
3.5E+02	C	1.0E-01	C							1	0.1		Diethylstilbestrol	56-53-1	1.4E-03	c	4.9E-03	c	2.4E-05	c	1.2E-04	c	1.9E-04	c		1.1E-04	
				8.0E-02	I					1	0.1		Difenzoquat	43222-48-6	4.9E+03	n	4.9E+04	n					2.9E+03	n			
				2.0E-02	I					1	0.1		Diflubenzuron	35367-38-5	1.2E+03	n	1.2E+04	n					7.3E+02	n		8.2E-01	
						4.0E+01	I	V		1		1.4E+03	Difluoroethane, 1,1-	75-37-6	5.2E+04	ns	2.2E+05	nms	4.2E+04	n	1.8E+05	n	8.3E+04	n		2.8E+01	
4.4E-02	C	1.3E-05	C							1	0.1		Dihydrosafrole	94-58-6	1.1E+01	c	3.9E+01	c	1.9E-01	c	9.4E-01	c	1.5E+00	c		1.9E-03	
						7.0E-01	P	V		1		2.3E+03	Diisopropyl Ether	108-20-3	2.4E+03	ns	1.0E+04	ns	7.3E+02	n	3.1E+03	n	1.5E+03	n		3.7E-01	
				8.0E-02	I			V		1		5.3E+02	Diisopropyl Methylphosphonate	1445-75-6	6.3E+03	ns	8.2E+04	ns					2.9E+03	n		8.3E-01	
				2.0E-02	I					1	0.1		Dimethipin	55290-64-7	1.2E+03	n	1.2E+04	n					7.3E+02	n		1.6E-01	
				2.0E-04	I					1	0.1		Dimethoate	60-51-5	1.2E+01	n	1.2E+02	n					7.3E+00	n		1.6E-03	
1.4E-02	H									1	0.1		Dimethoxybenzidine, 3,3'-	119-90-4	3.5E+01	c	1.2E+02	c					4.8E+00	c		5.8E-03	
1.7E-03	P			6.0E-02	P					1	0.1		Dimethyl methylphosphonate	756-79-6	2.9E+02	c*	1.0E+03	c*					4.0E+01	c*		8.3E-03	
4.6E+00	C	1.3E-03	C							1	0.1		Dimethylamino azobenzene [p-]	60-11-7	1.1E-01	c	3.7E-01	c	1.9E-03	c	9.4E-03	c	1.5E-02	c		6.2E-05	
5.8E-01	H									1	0.1		Dimethylaniline HCl, 2,4-	21436-96-4	8.4E-01	c	3.0E+00	c					1.2E-01	c		6.6E-05	
2.0E-01	P			2.0E-03	X					1	0.1		Dimethylaniline, 2,4-	95-68-1	2.4E+00	c*	8.6E+00	c					3.4E-01	c		1.9E-04	
				2.0E-03	I			V		1		8.3E+02	Dimethylaniline, N,N-	121-69-7	1.6E+02	n	2.0E+03	ns					7.3E+01	n		2.6E-02	
1.1E+01	P									1	0.1		Dimethylbenzidine, 3,3'-	119-93-7	4.4E-02	c	1.6E-01	c					6.1E-03	c		4.0E-05	
				1.0E-01	P	3.0E-02	I			1	0.1		Dimethylformamide	68-12-2	6.1E+03	n	6.2E+04	n	3.1E+01	n	1.3E+02	n	3.7E+03	n		7.4E-01	
				1.0E-04	X	2.0E-06	X			1	0.1		Dimethylhydrazine, 1,1-	57-14-7	6.1E+00	n	6.1E+01	n	2.1E-03	n	8.8E-03	n	3.7E+00	n		8.2E-04	
5.5E+02	C	1.6E-01	C							1	0.1		Dimethylhydrazine, 1,2-	540-73-8	8.8E-04	c	3.1E-03	c	1.5E-05	c	7.7E-05	c	1.2E-04	c		2.8E-08	
				2.0E-02	I					1	0.1		Dimethylphenol, 2,4-	105-67-9	1.2E+03	n	1.2E+04	n					7.3E+02	n		8.6E-01	
				6.0E-04	I					1	0.1		Dimethylphenol, 2,6-	576-26-1	3.7E+01	n	3.7E+02	n					2.2E+01	n		2.6E-02	
				1.0E-03	I					1	0.1		Dimethylphenol, 3,4-	95-65-8	6.1E+01	n	6.2E+02	n					3.7E+01	n		4.3E-02	
				1.0E-01	I			V		1		5.5E+00	Dimethylterephthalate	120-61-6	7.8E+03	ns	1.0E+05	nms					3.7E+03	n		9.6E-01	
4.5E-02	C	1.3E-05	C							1	0.1		Dimethylvinylchloride	513-37-1	1.1E+01	c	3.8E+01	c	1.9E-01	c	9.4E-01	c	1.5E+00	c		9.2E-04	
				8.0E-05	X					1	0.1		Dinitro-o-cresol, 4,6-	534-52-1	4.9E+00	n	4.9E+01	n					2.9E+00	n		5.0E-03	
				2.0E-03	I					1	0.1		Dinitro-o-cyclohexyl Phenol, 4,6-	131-89-5	1.2E+02	n	1.2E+03	n					7.3E+01	n		2.4E+00	

Key: I = IRIS; P = PPRTV; A = ATSDR; C = Cal EPA; X = PPRTV Appendix; H = HEAST; J = New Jersey; Y = New York; O = EPA Office of Water; E = Environmental Criteria and Assessment Office; S = see user guide Section 5; L = see user guide on lead; M = mutagen; V = volatile; F = See FAQ; c = cancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; n = noncancer; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide); SSL values are based on DAF=1

Toxicity and Chemical-specific Information													Contaminant		Screening Levels												Protection of Ground Water SSLs	
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	muta-gen	GIABS	ABS	C_{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Resident Air (ug/m^3)	key	Industrial Air (ug/m^3)	key	Tapwater (ug/L)	key	MCL (ug/L)	Risk-based SSL (mg/kg)	MCL-based SSL (mg/kg)
				1.0E-04	P					1	0.1		Dinitrobenzene, 1,2-	528-29-0	6.1E+00	n	6.2E+01	n					3.7E+00	n		3.3E-03	
				1.0E-04	I					1	0.1		Dinitrobenzene, 1,3-	99-65-0	6.1E+00	n	6.2E+01	n					3.7E+00	n		3.3E-03	
				1.0E-04	P					1	0.1		Dinitrobenzene, 1,4-	100-25-4	6.1E+00	n	6.2E+01	n					3.7E+00	n		3.3E-03	
				2.0E-03	I					1	0.1		Dinitrophenol, 2,4-	51-28-5	1.2E+02	n	1.2E+03	n					7.3E+01	n		8.2E-02	
6.8E-01	I									1	0.1		Dinitrotoluene Mixture, 2,4/2,6-	25321-14-6	7.2E-01	c	2.5E+00	c					9.9E-02	c		1.4E-04	
3.1E-01	C	8.9E-05	C	2.0E-03	I					1	0.102		Dinitrotoluene, 2,4-	121-14-2	1.6E+00	c*	5.5E+00	c	2.7E-02	c	1.4E-01	c	2.2E-01	c		2.9E-04	
				1.0E-03	P					1	0.099		Dinitrotoluene, 2,6-	606-20-2	6.1E+01	n	6.2E+02	n					3.7E+01	n		5.0E-02	
				2.0E-03	S					1	0.006		Dinitrotoluene, 2-Amino-4,6-	35572-78-2	1.5E+02	n	2.0E+03	n					7.3E+01	n		5.6E-02	
				2.0E-03	S					1	0.009		Dinitrotoluene, 4-Amino-2,6-	19406-51-0	1.5E+02	n	1.9E+03	n					7.3E+01	n		5.6E-02	
				1.0E-03	I					1	0.1		Dinoseb	88-85-7	6.1E+01	n	6.2E+02	n					3.7E+01	n	7.0E+00	3.2E-01	6.2E-02
1.0E-01	I	7.7E-06	C	3.0E-02	I	3.0E+00	C			1	0.1		Dioxane, 1,4-	123-91-1	4.9E+00	c	1.7E+01	c	3.2E-01	c	1.6E+00	c	6.7E-01	c		1.4E-04	
													Dioxins															
6.2E+03	I	1.3E+00	I							1	0.03		~Hexachlorodibenzo-p-dioxin, Mixture	NA	9.4E-05	c	3.9E-04	c	1.9E-06	c	9.4E-06	c	1.1E-05	c		1.5E-05	
1.3E+05	C	3.8E+01	C	1.0E-09	A	4.0E-08	C			1	0.03		~TCDD, 2,3,7,8-	1746-01-6	4.5E-06	c*	1.8E-05	c*	6.4E-08	c	3.2E-07	c	5.2E-07	c*	3.0E-05	2.6E-07	1.5E-05
				3.0E-02	I					1	0.1		Diphenamid	957-51-7	1.8E+03	n	1.8E+04	n					1.1E+03	n		1.1E+01	
				8.0E-04	X					1	0.1		Diphenyl Sulfone	127-63-9	4.9E+01	n	4.9E+02	n					2.9E+01	n		7.1E-02	
				2.5E-02	I					1	0.1		Diphenylamine	122-39-4	1.5E+03	n	1.5E+04	n					9.1E+02	n		1.7E+00	
8.0E-01	I	2.2E-04	I							1	0.1		Diphenylhydrazine, 1,2-	122-66-7	6.1E-01	c	2.2E+00	c	1.1E-02	c	5.6E-02	c	8.4E-02	c		2.7E-04	
				2.2E-03	I					1	0.1		Diquat	85-00-7	1.3E+02	n	1.4E+03	n					8.0E+01	n	2.0E+01	1.5E+00	3.7E-01
7.4E+00	C	2.1E-03	C							1	0.1		Direct Black 38	1937-37-7	6.6E-02	c	2.3E-01	c	1.2E-03	c	5.8E-03	c	9.1E-03	c		4.4E+00	
7.4E+00	C	2.1E-03	C							1	0.1		Direct Blue 6	2602-46-2	6.6E-02	c	2.3E-01	c	1.2E-03	c	5.8E-03	c	9.1E-03	c		1.4E+01	
6.7E+00	C	1.9E-03	C							1	0.1		Direct Brown 95	16071-86-6	7.3E-02	c	2.6E-01	c	1.3E-03	c	6.5E-03	c	1.0E-02	c			
				4.0E-05	I					1	0.1		Disulfoton	298-04-4	2.4E+00	n	2.5E+01	n					1.5E+00	n		2.7E-03	
				1.0E-02	I					1	0.1		Dithiane, 1,4-	505-29-3	6.1E+02	n	6.2E+03	n					3.7E+02	n		1.8E-01	
				2.0E-03	I					1	0.1		Diuron	330-54-1	1.2E+02	n	1.2E+03	n					7.3E+01	n		3.1E-02	
				4.0E-03	I					1	0.1		Dodine	2439-10-3	2.4E+02	n	2.5E+03	n					1.5E+02	n		7.5E-01	
				2.5E-02	I			V		1		4.1E+02	EPTC	759-94-4	2.0E+03	ns	2.6E+04	ns					9.1E+02	n		4.8E-01	
				6.0E-03	I					1	0.1		Endosulfan	115-29-7	3.7E+02	n	3.7E+03	n					2.2E+02	n		3.0E+00	
				2.0E-02	I					1	0.1		Endothall	145-73-3	1.2E+03	n	1.2E+04	n					7.3E+02	n	1.0E+02	1.7E-01	2.4E-02
				3.0E-04	I					1	0.1		Endrin	72-20-8	1.8E+01	n	1.8E+02	n					1.1E+01	n	2.0E+00	4.4E-01	8.1E-02
9.9E-03	I	1.2E-06	I	6.0E-03	P	1.0E-03	I	V		1		1.1E+04	Epichlorohydrin	106-89-8	2.0E+01	n	8.8E+01	n	1.0E+00	n	4.4E+00	n	2.1E+00	n		4.5E-04	
						2.0E-02	I	V		1		1.5E+04	Epoxybutane, 1,2-	106-88-7	1.7E+02	n	7.2E+02	n	2.1E+01	n	8.8E+01	n	4.2E+01	n		9.2E-03	
				5.0E-03	I					1	0.1		Ethephon	16672-87-0	3.1E+02	n	3.1E+03	n					1.8E+02	n		3.8E-02	
				5.0E-04	I					1	0.1		Ethion	563-12-2	3.1E+01	n	3.1E+02	n					1.8E+01	n		3.6E-02	
				1.0E-01	P	6.0E-02	P			1	0.1		Ethoxyethanol Acetate, 2-	111-15-9	6.1E+03	n	6.2E+04	n	6.3E+01	n	2.6E+02	n	3.7E+03	n		7.6E-01	
				4.0E-01	H	2.0E-01	I			1	0.1		Ethoxyethanol, 2-	110-80-5	2.4E+04	n	2.5E+05	nm	2.1E+02	n	8.8E+02	n	1.5E+04	n		2.9E+00	
				9.0E-01	I			V		1		1.1E+04	Ethyl Acetate	141-78-6	7.0E+04	ns	9.2E+05	nms					3.3E+04	n		7.0E+00	
4.8E-02	H							V		1		2.5E+03	Ethyl Acrylate	140-88-5	1.3E+01	c	6.0E+01	c					1.4E+00	c		3.1E-04	
						1.0E+01	I	V		1		2.1E+03	Ethyl Chloride	75-00-3	1.5E+04	ns	6.1E+04	ns	1.0E+04	n	4.4E+04	n	2.1E+04	n		5.9E+00	
				2.0E-01	I			V		1		1.0E+04	Ethyl Ether	60-29-7	1.6E+04	ns	2.0E+05	nms					7.3E+03	n		1.6E+00	
				9.0E-02	H	3.0E-01	P	V		1		1.1E+03	Ethyl Methacrylate	97-63-2	1.5E+03	ns	7.5E+03	ns	3.1E+02	n	1.3E+03	n	5.3E+02	n		1.2E-01	
				1.0E-05	I					1	0.1		Ethyl-p-nitrophenyl Phosphonate	2104-64-5	6.1E-01	n	6.2E+00	n					3.7E-01	n		1.1E-02	
1.1E-02	C	2.5E-06	C	1.0E-01	I	1.0E+00	I	V		1		4.8E+02	Ethylbenzene	100-41-4	5.4E+00	c	2.7E+01	c	9.7E-01	c	4.9E+00	c	1.5E+00	c	7.0E+02	1.7E-03	7.8E-01
				3.0E-02	P					1	0.1		Ethylene Cyanohydrin	109-78-4	1.8E+03	n	1.8E+04	n					1.1E+03	n		2.2E-01	
				9.0E-02	P					1	0.1		Ethylene Diamine	107-15-3	5.5E+03	n	5.5E+04	n					3.3E+03	n		7.5E-01	
				2.0E+00	I	4.0E-01	C			1	0.1		Ethylene Glycol	107-21-1	1.2E+05	nm	1.2E+06	nm	4.2E+02	n	1.8E+03	n	7.3E+04	n		1.5E+01	
				1.0E-01	I	1.6E+00	I			1	0.1		Ethylene Glycol Monobutyl Ether	111-76-2	6.1E+03	n	6.2E+04	n	1.7E+03	n	7.0E+03	n	3.7E+03	n		7.5E-01	
3.1E-01	C	8.8E-05	C			3.0E-02	C	V		1		1.2E+05	Ethylene Oxide	75-21-8	1.7E-01	c	8.3E-01	c	2.8E-02	c	1.4E-01	c	4.4E-02	c		9.1E-06	
4.5E-02	C	1.3E-05	C	8.0E-05	I					1	0.1		Ethylene Thiourea	96-45-7	4.9E+00	n	3.8E+01	c**	1.9E-01	c	9.4E-01	c	1.5E+00	c**		3.4E-04	
6.5E+01	C	1.9E-02	C							1	0.1		Ethyleneimine	151-56-4	7.5E-03	c	2.7E-02	c	1.3E-04	c	6.5E-04	c	1.0E-03	c		2.3E-07	
				3.0E+00	I					1	0.1		Ethylphthalyl Ethyl Glycolate	84-72-0	1.8E+05	nm	1.8E+06	nm					1.1E+05	n		2.5E+02	
				8.0E-03	I					1	0.1		Express	101200-48-0	4.9E+02	n	4.9E+03	n					2.9E+02	n		1.1E-01	
				2.5E-04	I					1	0.1		Fenamiphos	22224-92-6	1.5E+01	n	1.5E+02	n					9.1E+00	n		9.1E-03	
				2.5E-02	I					1	0.1		Fenpropathrin	39515-41-8	1.5E+03	n	1.5E+04	n					9.1E+02	n		4.1E+01	
				1.3E-02	I					1	0.1		Fluometuron	2164-17-2	7.9E+02	n	8.0E+03	n					4.7E+02	n		3.7E-01	
				4.0E-02	C	1.3E-02	C			1			Fluoride	16984-48-8	3.1E+03	n	4.1E+04	n	1.4E+01	n	5.7E+01	n	1.5E+03	n		2.2E+02	
				6.0E-02	I	1.3E-02	C			1			Fluorine (Soluble Fluoride)	7782-41-4	4.7E+03	n	6.1E+04	n	1.4E+01	n	5.7E+01	n	2.2E+03	n	4.0E+03	3.3E+02	6.0E+02
				8.0E-02	I					1	0.1		Fluridone	59756-60-4	4.9E+03	n	4.9E+04	n					2.9E+03	n		3.3E+02	
				2.0E-02	I					1	0.1		Flurprimidol	56425-91-3	1.2E+03	n	1.2E+04	n					7.3E+02	n		3.3E+00	
				6.0E-02	I					1	0.1		Flutolanil	66332-96-5	3.7E+03	n	3.7E+04	n					2.2E+03	n		1.2E+01	
				1.0E-02	I					1	0.1		Fluvalinate	69409-94-5	6.1E+02	n	6.2E+03	n					3.7E+02	n		5.3E+02	
3.5E-03	I			1.0E-01	I					1	0.1		Folpet	133-07-3	1.4E+02	c*	4.9E+02	c					1.9E+01	c		4.5E-03	
1.9E-01	I									1	0.1		Fomesafen	72178-02-0	2.6E+00	c	9.1E+00	c					3.5E-01	c		1.2E-03	
				2.0E-03	I					1	0.1		Fonofos	944-22-9	1.2E+02	n	1.2E+03	n					7.3E+01	n		1.4E-01	
		1.3E-05	I	2.0E-01	I	9.8E-03	A			1	0.1		Formaldehyde	50-00-0	1.2E+04	n	1.2E+05	nm	1.9E-01	c*	9.4E-01	c*	7.3E+03	n		1.5E+00	

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Toxicity and Chemical-specific Information													Contaminant		Screening Levels												Protection of Ground Water SSLs	
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	volc	muta-gen	GIABS	ABS	C_{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Resident Air (ug/m^3)	key	Industrial Air (ug/m^3)	key	Tapwater (ug/L)	key	MCL (ug/L)	Risk-based SSL (mg/kg)	MCL-based SSL (mg/kg)
				9.0E-01	P	3.0E-04	X			1	0.1		Formic Acid	64-18-6	4.9E+04	n	4.2E+05	nm	3.1E-01	n	1.3E+00	n	3.3E+04	n		6.6E+00	
				3.0E+00	I					1	0.1		Fosetyl-AL	39148-24-8	1.8E+05	nm	1.8E+06	nm					1.1E+05	n			
													Furans															
				1.0E-03	X			V		1		1.7E+02	~Dibenzofuran	132-64-9	7.8E+01	n	1.0E+03	ns					3.7E+01	n		6.8E-01	
				1.0E-03	I			V		1		6.2E+03	~Furan	110-00-9	7.8E+01	n	1.0E+03	n					3.7E+01	n		1.4E-02	
3.8E+00	H									1	0.1		Furazolidone	67-45-8	1.3E-01	c	4.5E-01	c					1.8E-02	c		3.4E-05	
				3.0E-03	I	5.0E-02	H			1	0.1		Furfural	98-01-1	1.8E+02	n	1.8E+03	n	5.2E+01	n	2.2E+02	n	1.1E+02	n		2.3E-02	
1.5E+00	C	4.3E-04	C							1	0.1		Furium	531-82-8	3.2E-01	c	1.1E+00	c	5.7E-03	c	2.9E-02	c	4.5E-02	c		6.1E-05	
3.0E-02	I	8.6E-06	C							1	0.1		Furmecyclox	60568-05-0	1.6E+01	c	5.7E+01	c	2.8E-01	c	1.4E+00	c	2.2E+00	c		2.4E-03	
				4.0E-04	I					1	0.1		Glufosinate, Ammonium	77182-82-2	2.4E+01	n	2.5E+02	n					1.5E+01	n		3.2E-03	
						8.0E-05	C			1	0.1		Glutaraldehyde	111-30-8	1.1E+05	nm	4.8E+05	nm	8.3E-02	n	3.5E-01	n					
				4.0E-04	I	1.0E-03	H			1	0.1		Glycidyl	765-34-4	2.4E+01	n	2.5E+02	n	1.0E+00	n	4.4E+00	n	1.5E+01	n		2.9E-03	
				1.0E-01	I					1	0.1		Glyphosate	1071-83-6	6.1E+03	n	6.2E+04	n					3.7E+03	n	7.0E+02	7.4E-01	1.4E-01
				3.0E-03	I					1	0.1		Goal	42874-03-3	1.8E+02	n	1.8E+03	n					1.1E+02	n		8.8E+00	
				3.0E-03	A	1.0E-02	A			1	0.1		Guthion	86-50-0	1.8E+02	n	1.8E+03	n	1.0E+01	n	4.4E+01	n	1.1E+02	n		3.3E-02	
				5.0E-05	I					1	0.1		Haloxyfop, Methyl	69806-40-2	3.1E+00	n	3.1E+01	n					1.8E+00	n		2.0E-02	
				1.3E-02	I					1	0.1		Harmony	79277-27-3	7.9E+02	n	8.0E+03	n					4.7E+02	n		1.4E-01	
4.5E+00	I	1.3E-03	I	5.0E-04	I					1	0.1		Heptachlor	76-44-8	1.1E-01	c	3.8E-01	c	1.9E-03	c	9.4E-03	c	1.5E-02	c	4.0E-01	1.2E-03	3.3E-02
9.1E+00	I	2.6E-03	I	1.3E-05	I					1	0.1		Heptachlor Epoxide	1024-57-3	5.3E-02	c*	1.9E-01	c*	9.4E-04	c	4.7E-03	c	7.4E-03	c*	2.0E-01	1.5E-04	4.1E-03
				2.0E-03	I					1	0.1		Hexabromobenzene	87-82-1	1.2E+02	n	1.2E+03	n					7.3E+01	n		4.2E-01	
				2.0E-04	I					1	0.1		Hexabromodiphenyl ether, 2,2',4,4',5,5'- (BDE-153)	68631-49-2	1.2E+01	n	1.2E+02	n					7.3E+00	n			
1.6E+00	I	4.6E-04	I	8.0E-04	I					1	0.1		Hexachlorobenzene	118-74-1	3.0E-01	c	1.1E+00	c	5.3E-03	c	2.7E-02	c	4.2E-02	c	1.0E+00	5.3E-04	1.3E-02
7.8E-02	I	2.2E-05	I	1.0E-03	P					1	0.1		Hexachlorobutadiene	87-68-3	6.2E+00	c**	2.2E+01	c*	1.1E-01	c	5.6E-01	c	8.6E-01	c*		1.7E-03	
6.3E+00	I	1.8E-03	I	8.0E-03	A					1	0.1		Hexachlorocyclohexane, Alpha-	319-84-6	7.7E-02	c	2.7E-01	c	1.4E-03	c	6.8E-03	c	1.1E-02	c		6.2E-05	
1.8E+00	I	5.3E-04	I							1	0.1		Hexachlorocyclohexane, Beta-	319-85-7	2.7E-01	c	9.6E-01	c	4.6E-03	c	2.3E-02	c	3.7E-02	c		2.2E-04	
1.1E+00	C	3.1E-04	C	3.0E-04	I					1	0.04		Hexachlorocyclohexane, Gamma- (Lindane)	58-89-9	5.2E-01	c*	2.1E+00	c	7.8E-03	c	4.0E-02	c	6.1E-02	c	2.0E-01	3.6E-04	1.2E-03
1.8E+00	I	5.1E-04	I							1	0.1		Hexachlorocyclohexane, Technical	608-73-1	2.7E-01	c	9.6E-01	c	4.8E-03	c	2.4E-02	c	3.7E-02	c		2.2E-04	
				6.0E-03	I	2.0E-04	I			1	0.1		Hexachlorocyclopentadiene	77-47-4	3.7E+02	n	3.7E+03	n	2.1E-01	n	8.8E-01	n	2.2E+02	n	5.0E+01	6.8E-01	1.6E-01
1.4E-02	I	4.0E-06	I	1.0E-03	I					1	0.1		Hexachloroethane	67-72-1	3.5E+01	c**	1.2E+02	c**	6.1E-01	c	3.1E+00	c	4.8E+00	c**		2.9E-03	
				3.0E-04	I					1	0.1		Hexachlorophene	70-30-4	1.8E+01	n	1.8E+02	n					1.1E+01	n		1.5E+01	
1.1E-01	I			3.0E-03	I					1	0.015		Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	5.6E+00	c*	2.4E+01	c					6.1E-01	c		2.3E-04	
						1.0E-05	I	V		1		5.2E+03	Hexamethylene Diisocyanate, 1,6-	822-06-0	3.4E+00	n	1.4E+01	n	1.0E-02	n	4.4E-02	n	2.1E-02	n		2.1E-04	
				6.0E-02	H	7.0E-01	I	V		1		1.4E+02	Hexane, N-	110-54-3	5.7E+02	ns	2.6E+03	ns	7.3E+02	n	3.1E+03	n	8.8E+02	n		6.2E+00	
				2.0E+00	P					1	0.1		Hexanedioic Acid	124-04-9	1.2E+05	nm	1.2E+06	nm					7.3E+04	n		1.8E+01	
				5.0E-03	I	3.0E-02	I	V		1		3.3E+03	Hexanone, 2-	591-78-6	2.1E+02	n	1.4E+03	n	3.1E+01	n	1.3E+02	n	4.7E+01	n		1.1E-02	
				3.3E-02	I					1	0.1		Hexazinone	51235-04-2	2.0E+03	n	2.0E+04	n					1.2E+03	n		5.5E-01	
3.0E+00	I	4.9E-03	I			3.0E-05	P			1			Hydrazine	302-01-2	2.1E-01	c	9.5E-01	c	5.0E-04	c*	2.5E-03	c*	2.2E-02	c			
3.0E+00	I	4.9E-03	I							1			Hydrazine Sulfate	10034-93-2	2.1E-01	c	9.5E-01	c	5.0E-04	c	2.5E-03	c	2.2E-02	c			
						2.0E-02	I			1			Hydrogen Chloride	7647-01-0	2.8E+07	nm	1.2E+08	nm	2.1E+01	n	8.8E+01	n					
				4.0E-02	C	1.4E-02	C			1			Hydrogen Fluoride	7664-39-3	3.1E+03	n	4.1E+04	n	1.5E+01	n	6.1E+01	n	1.5E+03	n			
						2.0E-03	I			1			Hydrogen Sulfide	7783-06-4	2.8E+06	nm	1.2E+07	nm	2.1E+00	n	8.8E+00	n					
6.0E-02	P			4.0E-02	P					1	0.1		Hydroquinone	123-31-9	8.1E+00	c	2.9E+01	c					1.1E+00	c		7.6E-04	
				1.3E-02	I					1	0.1		Imazalil	35554-44-0	7.9E+02	n	8.0E+03	n					4.7E+02	n		8.2E+00	
				2.5E-01	I					1	0.1		Imazaquin	81335-37-7	1.5E+04	n	1.5E+05	nm					9.1E+03	n		4.5E+01	
				1.0E-02	A					1			Iodine	7553-56-2	7.8E+02	n	1.0E+04	n					3.7E+02	n		2.2E+01	
				4.0E-02	I					1	0.1		Iprodione	36734-19-7	2.4E+03	n	2.5E+04	n					1.5E+03	n		4.5E-01	
				7.0E-01	P					1			Iron	7439-89-6	5.5E+04	n	7.2E+05	nm					2.6E+04	n		6.4E+02	
				3.0E-01	I			V		1		1.0E+04	Isobutyl Alcohol	78-83-1	2.3E+04	ns	3.1E+05	nms					1.1E+04	n		2.3E+00	
9.5E-04	I			2.0E-01	I	2.0E+00	C			1	0.1		Isophorone	78-59-1	5.1E+02	c*	1.8E+03	c*	2.1E+03	n	8.8E+03	n	7.1E+01	c		2.3E-02	
				1.5E-02	I					1	0.1		Isopropalin	33820-53-0	9.2E+02	n	9.2E+03	n					5.5E+02	n		1.3E+01	
						7.0E+00	C			1	0.1		Isopropanol	67-63-0	9.9E+09	nm	4.2E+10	nm	7.3E+03	n	3.1E+04	n					
				1.0E-01	I					1	0.1		Isopropyl Methyl Phosphonic Acid	1832-54-8	6.1E+03	n	6.2E+04	n					3.7E+03	n		7.9E-01	
				5.0E-02	I					1	0.1		Isoxaben	82558-50-7	3.1E+03	n	3.1E+04	n					1.8E+03	n		5.0E+00	
						3.0E-01	A	V		1			JP-7	NA	4.3E+08	nm	1.8E+09	nm	3.1E+02	n	1.3E+03	n	6.3E+02	n			
				7.5E-02	I					1	0.1		Kerb	23950-58-5	4.6E+03	n	4.6E+04	n					2.7E+03	n		2.8E+00	
				2.0E-03	I					1	0.1		Lactofen	77501-63-4	1.2E+02	n	1.2E+03	n					7.3E+01	n		3.4E+00	
													Lead Compounds															
2.8E-01	C	8.0E-05	C							1	0.1		~Lead acetate	301-04-2	1.7E+00	c	6.2E+00	c	3.0E-02	c	1.5E-01	c	2.4E-01	c			
										1			~Lead and Compounds	7439-92-1	4.0E+02	n	8.0E+02	n							1.5E+01		1.4E+01
3.8E-02	C	1.1E-05	C							1	0.1		~Lead subacetate	1335-32-6	1.3E+01	c	4.5E+01	c	2.2E-01	c	1.1E+00	c	1.8E+00	c			
				1.0E-07	I					1	0.1		~Tetraethyl Lead	78-00-2	6.1E-03	n	6.2E-02	n					3.7E-03	n		1.3E-05	
				2.0E-03	I					1	0.1		Linuron	330-55-2	1.2E+02	n	1.2E+03	n					7.3E+01	n		6.4E-02	
				2.0E-03	P					1			Lithium	7439-93-2	1.6E+02	n	2.0E+03	n					7.3E+01	n		2.2E+01	
				2.0E-01	I					1	0.1		Londax	83055-99-6	1.2E+04	n	1.2E+05	nm					7.3E+03	n		1.9E+00	
				5.0E-04	I					1	0.1		MCPA	94-74-6	3.1E+01	n	3.1E+02	n					1.8E+01	n		4.7E-03	

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Toxicity and Chemical-specific Information													Contaminant		Screening Levels														Protection of Ground Water SSLs	
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	muta-gen	GIABS	ABS	C_{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Resident Air (ug/m^3)	key	Industrial Air (ug/m^3)	key	Tapwater (ug/L)	key	MCL (ug/L)	Risk-based SSL (mg/kg)	MCL-based SSL (mg/kg)
				1.0E-02	I					1	0.1		MCPB	94-81-5	6.1E+02	n	6.2E+03	n					3.7E+02	n		1.4E-01	
				1.0E-03	I					1	0.1		MCPP	93-65-2	6.1E+01	n	6.2E+02	n					3.7E+01	n		1.1E-02	
				2.0E-02	I					1	0.1		Malathion	121-75-5	1.2E+03	n	1.2E+04	n					7.3E+02	n		1.9E-01	
				1.0E-01	I	7.0E-04	C			1	0.1		Maleic Anhydride	108-31-6	6.1E+03	n	6.1E+04	n	7.3E-01	n	3.1E+00	n	3.7E+03	n		7.4E-01	
				5.0E-01	I					1	0.1		Maleic Hydrazide	123-33-1	3.1E+04	n	3.1E+05	nm					1.8E+04	n		3.8E+00	
				1.0E-04	P					1	0.1		Malononitrile	109-77-3	6.1E+00	n	6.2E+01	n					3.7E+00	n		7.5E-04	
				3.0E-02	H					1	0.1		Mancozeb	8018-01-7	1.8E+03	n	1.8E+04	n					1.1E+03	n		1.5E+00	
				5.0E-03	I					1	0.1		Maneb	12427-38-2	3.1E+02	n	3.1E+03	n					1.8E+02	n		2.6E-01	
				1.4E-01	I	5.0E-05	I			1			Manganese (Diet)	7439-96-5													
				2.4E-02	S	5.0E-05	I			0.04			Manganese (Non-diet)	7439-96-5	1.8E+03	n	2.3E+04	n	5.2E-02	n	2.2E-01	n	8.8E+02	n		5.7E+01	
				9.0E-05	H					1	0.1		Mephosfolan	950-10-7	5.5E+00	n	5.5E+01	n					3.3E+00	n		4.8E-03	
				3.0E-02	I					1	0.1		Mepiquat Chloride	24307-26-4	1.8E+03	n	1.8E+04	n					1.1E+03	n		3.6E-01	
													Mercury Compounds															
				3.0E-04	I	3.0E-05	C			0.07			~Mercuric Chloride (and other Mercury salts)	7487-94-7	2.3E+01	n	3.1E+02	n	3.1E-02	n	1.3E-01	n	1.1E+01	n	2.0E+00		
						3.0E-04	I	V		1		3.1E+00	~Mercury (elemental)	7439-97-6	1.0E+01	ns	4.3E+01	ns	3.1E-01	n	1.3E+00	n	6.3E-01	n	2.0E+00	3.3E-02	1.0E-01
				1.0E-04	I					1			~Methyl Mercury	22967-92-6	7.8E+00	n	1.0E+02	n					3.7E+00	n			
				8.0E-05	I					1	0.1		~Phenylmercuric Acetate	62-38-4	4.9E+00	n	4.9E+01	n					2.9E+00	n		9.1E-04	
				3.0E-05	I					1	0.1		Merphos	150-50-5	1.8E+00	n	1.8E+01	n					1.1E+00	n		1.1E-01	
				3.0E-05	I					1	0.1		Merphos Oxide	78-48-8	1.8E+00	n	1.8E+01	n					1.1E+00	n		5.4E-03	
				6.0E-02	I					1	0.1		Metalaxyl	57837-19-1	3.7E+03	n	3.7E+04	n					2.2E+03	n		6.1E-01	
				1.0E-04	I	7.0E-04	H	V		1		4.6E+03	Methacrylonitrile	126-98-7	3.2E+00	n	1.8E+01	n	7.3E-01	n	3.1E+00	n	1.0E+00	n		2.4E-04	
				5.0E-05	I					1	0.1		Methamidophos	10265-92-6	3.1E+00	n	3.1E+01	n					1.8E+00	n		3.8E-04	
				5.0E-01	I	4.0E+00	C			1	0.1		Methanol	67-56-1	3.1E+04	n	3.1E+05	nm	4.2E+03	n	1.8E+04	n	1.8E+04	n		3.7E+00	
				1.0E-03	I					1	0.1		Methidathion	950-37-8	6.1E+01	n	6.2E+02	n					3.7E+01	n		8.9E-03	
				2.5E-02	I					1	0.1		Methomyl	16752-77-5	1.5E+03	n	1.5E+04	n					9.1E+02	n		2.0E-01	
4.9E-02	C	1.4E-05	C							1	0.1		Methoxy-5-nitroaniline, 2-	99-59-2	9.9E+00	c	3.5E+01	c	1.7E-01	c	8.8E-01	c	1.4E+00	c		4.7E-04	
				5.0E-03	I					1	0.1		Methoxychlor	72-43-5	3.1E+02	n	3.1E+03	n					1.8E+02	n	4.0E+01	9.9E+00	2.2E+00
				8.0E-03	P	1.0E-03	P			1	0.1		Methoxyethanol Acetate, 2-	110-49-6	4.9E+02	n	4.9E+03	n	1.0E+00	n	4.4E+00	n	2.9E+02	n		6.0E-02	
				5.0E-03	P	2.0E-02	I			1	0.1		Methoxyethanol, 2-	109-86-4	3.1E+02	n	3.1E+03	n	2.1E+01	n	8.8E+01	n	1.8E+02	n		3.7E-02	
				1.0E+00	X			V		1		2.9E+04	Methyl Acetate	79-20-9	7.8E+04	ns	1.0E+06	nms					3.7E+04	n		7.5E+00	
				3.0E-02	H			V		1		6.8E+03	Methyl Acrylate	96-33-3	2.3E+03	n	3.1E+04	ns					1.1E+03	n		2.3E-01	
				6.0E-01	I	5.0E+00	I	V		1		2.8E+04	Methyl Ethyl Ketone (2-Butanone)	78-93-3	2.8E+04	n	2.0E+05	nms	5.2E+03	n	2.2E+04	n	7.1E+03	n		1.5E+00	
		1.0E-03	X	1.0E-03	P	2.0E-05	X			1	0.1		Methyl Hydrazine	60-34-4	6.1E+01	n	6.1E+02	n	2.4E-03	c**	1.2E-02	c**	3.7E+01	n		8.3E-03	
				8.0E-02	H	3.0E+00	I	V		1		3.4E+03	Methyl Isobutyl Ketone (4-methyl-2-pentanone)	108-10-1	5.3E+03	ns	5.3E+04	ns	3.1E+03	n	1.3E+04	n	2.0E+03	n		4.5E-01	
						1.0E-03	C			1	0.1		Methyl Isocyanate	624-83-9	1.4E+06	nm	6.0E+06	nm	1.0E+00	n	4.4E+00	n					
				1.4E+00	I	7.0E-01	I	V		1		2.4E+03	Methyl Methacrylate	80-62-6	4.8E+03	ns	2.1E+04	ns	7.3E+02	n	3.1E+03	n	1.4E+03	n		3.1E-01	
				2.5E-04	I					1	0.1		Methyl Parathion	298-00-0	1.5E+01	n	1.5E+02	n					9.1E+00	n		1.5E-02	
				6.0E-02	X					1	0.1		Methyl Phosphonic Acid	993-13-5	3.7E+03	n	3.7E+04	n					2.2E+03	n		4.4E-01	
				6.0E-03	H	4.0E-02	H	V		1		3.8E+02	Methyl Styrene (Mixed Isomers)	25013-15-4	2.5E+02	n	1.6E+03	ns	4.2E+01	n	1.8E+02	n	6.0E+01	n		9.7E-02	
9.9E-02	C	2.8E-05	C							1	0.1		Methyl methanesulfonate	66-27-3	4.9E+00	c	1.7E+01	c	8.7E-02	c	4.4E-01	c	6.8E-01	c		1.4E-04	
1.8E-03	C	2.6E-07	C			3.0E+00	I	V		1		8.9E+03	Methyl tert-Butyl Ether (MTBE)	1634-04-4	4.3E+01	c	2.2E+02	c	9.4E+00	c	4.7E+01	c	1.2E+01	c		2.8E-03	
				2.0E-04	X					1	0.1		Methyl-1,4-benzenediamine dihydrochloride, 2-	615-45-2	1.2E+01	n	1.2E+02	n					7.3E+00	n			
9.0E-03	P			2.0E-02	X					1	0.1		Methyl-5-Nitroaniline, 2-	99-55-8	5.4E+01	c*	1.9E+02	c*					7.5E+00	c*		4.2E-03	
8.3E+00	C	2.4E-03	C							1	0.1		Methyl-N-nitro-N-nitrosoguanidine, N-	70-25-7	5.9E-02	c	2.1E-01	c	1.0E-03	c	5.1E-03	c	8.1E-03	c		2.8E-06	
1.3E-01	C	3.7E-05	C							1	0.1		Methylaniline Hydrochloride, 2-	636-21-5	3.7E+00	c	1.3E+01	c	6.6E-02	c	3.3E-01	c	5.2E-01	c		2.2E-04	
				1.0E-02	A					1	0.1		Methylarsonic acid	124-58-3	6.1E+02	n	6.2E+03	n					3.7E+02	n			
				2.0E-04	X					1	0.1		Methylbenzene,1-4-diamine monohydrochloride, 2-	74612-12-7	1.2E+01	n	1.2E+02	n					7.3E+00	n			
				2.0E-04	X					1	0.1		Methylbenzene-1,4-diamine sulfate, 2-	615-50-9	1.2E+01	n	1.2E+02	n					7.3E+00	n			
2.2E+01	C	6.3E-03	C						M	1	0.1		Methylcholanthrene, 3-	56-49-5	5.2E-03	c	7.8E-02	c	1.5E-04	c	1.9E-03	c	9.8E-04	c		1.9E-03	
7.5E-03	I	4.7E-07	I	6.0E-02	I	1.0E+00	A	V		1		3.3E+03	Methylene Chloride	75-09-2	1.1E+01	c	5.3E+01	c	5.2E+00	c	2.6E+01	c	4.8E+00	c	5.0E+00	1.2E-03	1.3E-03
1.0E-01	P	4.3E-04	C	2.0E-03	P				M	1	0.1		Methylene-bis(2-chloroaniline), 4,4'-	101-14-4	1.2E+00	c	1.7E+01	c*	2.2E-03	c	2.9E-02	c	2.2E-01	c		2.5E-03	
4.6E-02	I	1.3E-05	C							1	0.1		Methylene-bis(N,N-dimethyl) Aniline, 4,4'-	101-61-1	1.1E+01	c	3.7E+01	c	1.9E-01	c	9.4E-01	c	1.5E+00	c		8.1E-03	
1.6E+00	C	4.6E-04	C			2.0E-02	C			1	0.1		Methylenebisbenzenamine, 4,4'-	101-77-9	3.0E-01	c	1.1E+00	c	5.3E-03	c	2.7E-02	c	4.2E-02	c		1.9E-04	
						6.0E-04	I			1	0.1		Methylenediphenyl Diisocyanate	101-68-8	8.5E+05	nm	3.6E+06	nm	6.3E-01	n	2.6E+00	n					
				7.0E-02	H			V		1		5.0E+02	Methylstyrene, Alpha-	98-83-9	5.5E+03	ns	7.2E+04	ns					2.6E+03	n		4.1E+00	
				1.5E-01	I					1	0.1		Metolachlor	51218-45-2	9.2E+03	n	9.2E+04	n					5.5E+03	n		6.4E+00	
				2.5E-02	I					1	0.1		Metribuzin	21087-64-9	1.5E+03	n	1.5E+04	n					9.1E+02	n		2.8E-01	
				3.0E+00	P					1	0.1		Mineral oils	8012-95-1	1.8E+05	nm	1.8E+06	nm					1.1E+05	n		4.3E+03	
1.8E+01	C	5.1E-03	C	2.0E-04	I					1	0.1		Mirex	2385-85-5	2.7E-02	c	9.6E-02	c	4.8E-04	c	2.4E-03	c	3.7E-03	c		2.7E-03	
				2.0E-03	I					1	0.1		Molinate	2212-67-1	1.2E+02	n	1.2E+03	n					7.3E+01	n		4.1E-02	
				5.0E-03	I					1			Molybdenum	7439-98-7	3.9E+02	n	5.1E+03	n					1.8E+02	n		3.7E+00	
				1.0E-01	I					1			Monochloramine	10599-90-3	7.8E+03	n	1.0E+05	nm					3.7E+03	n			
				2.0E-03	P					1	0.1		Monomethylaniline	100-61-8	1.2E+02	n	1.2E+03	n					7.3E+01	n		2.7E-02	
				3.0E-04	X					1	0.1		N,N'-Diphenyl-1,4-benzenediamine	74-31-7	1.8E+01	n	1.8E+02	n					1.1E+01	n		1.1E+00	
				2.0E-03	I					1	0.1		Naled	300-76-5	1.2E+02	n	1.2E+03	n					7.3E+01	n		3.3E-02	

Key: I = IRIS; P = PPRTV; A = ATSDR; C = Cal EPA; X = PPRTV Appendix; H = HEAST; J = New Jersey; Y = New York; O = EPA Office of Water; E = Environmental Criteria and Assessment Office; S = see user guide Section 5; L = see user guide on lead; M = mutagen; V = volatile; F = See FAQ; c = cancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; n = noncancer; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide); SSL values are based on DAF=1

Toxicity and Chemical-specific Information												Contaminant		Screening Levels										Protection of Ground Water SSLs	
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	muta-gen	GIABS	ABS	C_{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Resident Air (ug/m^3)	key	Industrial Air (ug/m^3)	key	Tapwater (ug/L)	key	MCL (ug/L)	Risk-based SSL (mg/kg)	MCL-based SSL (mg/kg)
				3.0E-02	X	1.0E-01	P	V		1			Naphtha, High Flash Aromatic (HFAN)	64724-95-6	2.3E+03	n	3.1E+04	n	1.0E+02	n	4.4E+02	n	1.8E+02	n			
1.8E+00	C	0.0E+00	C							1	0.1		Naphthylamine, 2-	91-59-8	2.7E-01	c	9.6E-01	c					3.7E-02	c		1.9E-04	
				1.0E-01	I					1	0.1		Napropamide	15299-99-7	6.1E+03	n	6.2E+04	n					3.7E+03	n		2.4E+01	
				5.0E-02	C	5.0E-05	C			0.04			Nickel Carbonyl	13463-39-3	3.7E+03	n	4.4E+04	n	5.2E-02	n	2.2E-01	n	1.8E+03	n			
				5.0E-02	C	1.0E-04	C			1			Nickel Oxide	1313-99-1	3.8E+03	n	4.7E+04	n	1.0E-01	n	4.4E-01	n	1.8E+03	n			
		2.4E-04	I	5.0E-02	C	5.0E-05	C			0.04			Nickel Refinery Dust	NA	3.7E+03	n	4.4E+04	n	1.0E-02	c**	5.1E-02	c**	1.8E+03	n		2.7E+02	
		2.6E-04	C	2.0E-02	I	9.0E-05	A			0.04			Nickel Soluble Salts	7440-02-0	1.5E+03	n	2.0E+04	n	9.4E-03	c*	4.7E-02	c**	7.3E+02	n		4.8E+01	
1.7E+00	C	4.8E-04	I	5.0E-02	C	5.0E-05	C			0.04			Nickel Subsulfide	12035-72-2	3.8E-01	c	1.7E+00	c	5.1E-03	c*	2.6E-02	c**	4.0E-02	c			
				1.6E+00	I					1			Nitrate	14797-55-8	1.3E+05	nm	1.6E+06	nm					5.8E+04	n	1.0E+04		
				1.0E-01	I					1			Nitrite	14797-65-0	7.8E+03	n	1.0E+05	nm					3.7E+03	n	1.0E+03		
				1.0E-02	X	5.0E-05	X			1	0.1		Nitroaniline, 2-	88-74-4	6.1E+02	n	6.0E+03	n	5.2E-02	n	2.2E-01	n	3.7E+02	n		1.5E-01	
2.0E-02	P			4.0E-03	P	6.0E-03	P			1	0.1		Nitroaniline, 4-	100-01-6	2.4E+01	c*	8.6E+01	c*	6.3E+00	n	2.6E+01	n	3.4E+00	c*		1.4E-03	
		4.0E-05	I	2.0E-03	I	9.0E-03	I	V		1		3.1E+03	Nitrobenzene	98-95-3	4.8E+00	c*	2.4E+01	c*	6.1E-02	c	3.1E-01	c	1.2E-01	c		7.9E-05	
				3.0E+03	P					1	0.1		Nitrocellulose	9004-70-0	1.8E+08	nm	1.8E+09	nm					1.1E+08	n		2.4E+04	
				7.0E-02	H					1	0.1		Nitrofurantoin	67-20-9	4.3E+03	n	4.3E+04	n					2.6E+03	n		1.1E+00	
1.3E+00	C	3.7E-04	C							1	0.1		Nitrofurazone	59-87-0	3.7E-01	c	1.3E+00	c	6.6E-03	c	3.3E-02	c	5.2E-02	c		4.7E-05	
1.7E-02	P			1.0E-04	P					1	0.1		Nitroglycerin	55-63-0	6.1E+00	n	6.2E+01	n					3.7E+00	n		1.6E-03	
				1.0E-01	I					1	0.1		Nitroguanidine	556-88-7	6.1E+03	n	6.2E+04	n					3.7E+03	n		8.8E-01	
		9.0E-06	P			2.0E-02	P	V		1		1.8E+04	Nitromethane	75-52-5	4.9E+00	c*	2.5E+01	c*	2.7E-01	c*	1.4E+00	c*	5.4E-01	c*		1.2E-04	
		2.7E-03	H			2.0E-02	I	V		1		4.9E+03	Nitropropane, 2-	79-46-9	1.3E-02	c	6.4E-02	c	9.0E-04	c	4.5E-03	c	1.8E-03	c		4.7E-07	
2.7E+01	C	7.7E-03	C						M	1	0.1		Nitroso-N-ethylurea, N-	759-73-9	4.3E-03	c	6.4E-02	c	1.2E-04	c	1.6E-03	c	8.0E-04	c		1.9E-07	
1.2E+02	C	3.4E-02	C						M	1	0.1		Nitroso-N-methylurea, N-	684-93-5	9.6E-04	c	1.4E-02	c	2.8E-05	c	3.6E-04	c	1.8E-04	c		4.0E-08	
5.4E+00	I	1.6E-03	I					V		1		7.1E+03	Nitroso-di-N-butylamine, N-	924-16-3	8.7E-02	c	4.0E-01	c	1.5E-03	c	7.7E-03	c	2.4E-03	c		5.0E-06	
7.0E+00	I	2.0E-03	C							1	0.1		Nitroso-di-N-propylamine, N-	621-64-7	6.9E-02	c	2.5E-01	c	1.2E-03	c	6.1E-03	c	9.6E-03	c		7.2E-06	
2.8E+00	I	8.0E-04	C							1	0.1		Nitrosodiethanolamine, N-	1116-54-7	1.7E-01	c	6.2E-01	c	3.0E-03	c	1.5E-02	c	2.4E-02	c		4.9E-06	
1.5E+02	I	4.3E-02	I						M	1	0.1		Nitrosodiethylamine, N-	55-18-5	7.7E-04	c	1.1E-02	c	2.2E-05	c	2.9E-04	c	1.4E-04	c		5.3E-08	
5.1E+01	I	1.4E-02	I	8.0E-06	P	4.0E-05	X		M	1	0.1		Nitrosodimethylamine, N-	62-75-9	2.3E-03	c	3.4E-02	c	6.9E-05	c	8.8E-04	c	4.2E-04	c		1.0E-07	
4.9E-03	I	2.6E-06	C							1	0.1		Nitrosodiphenylamine, N-	86-30-6	9.9E+01	c	3.5E+02	c	9.4E-01	c	4.7E+00	c	1.4E+01	c		7.5E-02	
2.2E+01	I	6.3E-03	C							1	0.1		Nitrosomethylethylamine, N-	10595-95-6	2.2E-02	c	7.8E-02	c	3.9E-04	c	1.9E-03	c	3.1E-03	c		8.8E-07	
6.7E+00	C	1.9E-03	C							1	0.1		Nitrosomorpholine [N-]	59-89-2	7.3E-02	c	2.6E-01	c	1.3E-03	c	6.5E-03	c	1.0E-02	c		2.5E-06	
9.4E+00	C	2.7E-03	C							1	0.1		Nitrosopiperidine [N-]	100-75-4	5.2E-02	c	1.8E-01	c	9.0E-04	c	4.5E-03	c	7.2E-03	c		3.8E-06	
2.1E+00	I	6.1E-04	I							1	0.1		Nitrosopyrrolidine, N-	930-55-2	2.3E-01	c	8.2E-01	c	4.0E-03	c	2.0E-02	c	3.2E-02	c		1.2E-05	
				1.0E-04	X					1	0.1		Nitrotoluene, m-	99-08-1	6.1E+00	n	6.2E+01	n					3.7E+00	n		3.4E-03	
2.2E-01	P			9.0E-04	P			V		1		1.5E+03	Nitrotoluene, o-	88-72-2	2.9E+00	c*	1.3E+01	c*					3.1E-01	c		2.9E-04	
1.6E-02	P			4.0E-03	P					1	0.1		Nitrotoluene, p-	99-99-0	3.0E+01	c**	1.1E+02	c*					4.2E+00	c*		3.9E-03	
				3.0E-04	X	2.0E-01	P	V		1		6.9E+00	Nonane, n-	111-84-2	2.1E+01	ns	2.3E+02	ns	2.1E+02	n	8.8E+02	n	1.1E+01	n		1.5E-01	
				4.0E-02	I					1	0.1		Norflurazon	27314-13-2	2.4E+03	n	2.5E+04	n					1.5E+03	n		9.4E+00	
				7.0E-04	I					1	0.1		Nustar	85509-19-9	4.3E+01	n	4.3E+02	n					2.6E+01	n		4.1E+00	
				3.0E-03	I					1	0.1		Octabromodiphenyl Ether	32536-52-0	1.8E+02	n	1.8E+03	n					1.1E+02	n		2.2E+01	
				5.0E-02	I					1	0.006		Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetra (HMX)	2691-41-0	3.8E+03	n	4.9E+04	n					1.8E+03	n		2.3E+00	
				2.0E-03	H					1	0.1		Octamethylpyrophosphoramide	152-16-9	1.2E+02	n	1.2E+03	n					7.3E+01	n		1.8E-02	
				5.0E-02	I					1	0.1		Oryzalin	19044-88-3	3.1E+03	n	3.1E+04	n					1.8E+03	n		3.4E+00	
				5.0E-03	I					1	0.1		Oxadiazon	19666-30-9	3.1E+02	n	3.1E+03	n					1.8E+02	n		1.9E+00	
				2.5E-02	I					1	0.1		Oxamyl	23135-22-0	1.5E+03	n	1.5E+04	n					9.1E+02	n	2.0E+02	2.0E-01	4.4E-02
				1.3E-02	I					1	0.1		Paclobutrazol	76738-62-0	7.9E+02	n	8.0E+03	n					4.7E+02	n		9.7E-01	
				4.5E-03	I					1	0.1		Paraquat Dichloride	1910-42-5	2.7E+02	n	2.8E+03	n					1.6E+02	n		2.3E+00	
				6.0E-03	H					1	0.1		Parathion	56-38-2	3.7E+02	n	3.7E+03	n					2.2E+02	n		1.1E+00	
				5.0E-02	H					1	0.1		Pebulate	1114-71-2	3.1E+03	n	3.1E+04	n					1.8E+03	n		1.5E+00	
				4.0E-02	I					1	0.1		Pendimethalin	40487-42-1	2.4E+03	n	2.5E+04	n					1.5E+03	n		1.7E+01	
				2.0E-03	I					1	0.1		Pentabromodiphenyl Ether	32534-81-9	1.2E+02	n	1.2E+03	n					7.3E+01	n		3.2E+00	
				1.0E-04	I					1	0.1		Pentabromodiphenyl ether, 2,2',4,4',5- (BDE-99)	60348-60-9	6.1E+00	n	6.2E+01	n					3.7E+00	n		1.6E-01	
				8.0E-04	I					1	0.1		Pentachlorobenzene	608-93-5	4.9E+01	n	4.9E+02	n					2.9E+01	n		2.2E-01	
9.0E-02	P									1	0.1		Pentachloroethane	76-01-7	5.4E+00	c	1.9E+01	c					7.5E-01	c		3.6E-04	
2.6E-01	H			3.0E-03	I					1	0.1		Pentachloronitrobenzene	82-68-8	1.9E+00	c*	6.6E+00	c					2.6E-01	c		3.2E-03	
4.0E-01	I	5.1E-06	C	5.0E-03	I					1	0.25		Pentachlorophenol	87-86-5	8.9E-01	c	2.7E+00	c	4.8E-01	c	2.4E+00	c	1.7E-01	c	1.0E+00	1.7E-03	1.0E-02
4.0E-03	X			2.0E-03	P					1	0.1		Pentaerythritol tetranitrate (PETN)	78-11-5	1.2E+02	c**	4.3E+02	c**					1.7E+01	c**		2.5E-02	
						1.0E+00	P	V		1		3.9E+02	Pentane, n-	109-66-0	8.7E+02	ns	3.7E+03	ns	1.0E+03	n	4.4E+03	n	2.1E+03	n		1.0E+01	
													Perchlorates														
				7.0E-04	I					1			~Ammonium Perchlorate	7790-98-9	5.5E+01	n	7.2E+02	n					2.6E+01	n			
				7.0E-04	I					1			~Lithium Perchlorate	7791-03-9	5.5E+01	n	7.2E+02	n					2.6E+01	n			
				7.0E-04	I					1			~Perchlorate and Perchlorate Salts	14797-73-0	5.5E+01	n	7.2E+02	n					2.6E+01	n	1.5E+01(F)		
				7.0E-04	I					1			~Potassium Perchlorate	7778-74-7	5.5E+01	n	7.2E+02	n					2.6E+01	n			
				7.0E-04	I					1			~Sodium Perchlorate	7601-89-0	5.5E+01	n	7.2E+02	n					2.6E+01	n			
				5.0E-02	I					1	0.1		Permethrin	52645-53-1	3.1E+03	n	3.1E+04	n					1.8E+03	n		4.3E+02	
2.2E-03	C	6.3E-07	C							1	0.1		Phenacetin	62-44-2	2.2E+02	c	7.8E+02	c	3.9E+00	c	1.9E+01	c	3.1E+01	c		8.6E-03	

Key: I = IRIS; P = PPRTV; A = ATSDR; C = Cal EPA; X = PPRTV Appendix; H = HEAST; J = New Jersey; Y = New York; O = EPA Office of Water; E = Environmental Criteria and Assessment Office; S = see user guide Section 5; L = see user guide on lead; M = mutagen; V = volatile; F = See FAQ; c = cancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; n = noncancer; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide); SSL values are based on DAF=1

Toxicity and Chemical-specific Information													Contaminant		Screening Levels													Protection of Ground Water SSLs	
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	muta-gen	GIABS	ABS	C_{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Resident Air (ug/m^3)	key	Industrial Air (ug/m^3)	key	Tapwater (ug/L)	key	MCL (ug/L)	Risk-based SSL (mg/kg)	MCL-based SSL (mg/kg)
				2.5E-01	I					1	0.1		Phenmedipham	13684-63-4	1.5E+04	n	1.5E+05	nm					9.1E+03	n		4.9E+01	
				3.0E-01	I	2.0E-01	C			1	0.1		Phenol	108-95-2	1.8E+04	n	1.8E+05	nm	2.1E+02	n	8.8E+02	n	1.1E+04	n		6.3E+00	
				5.0E-04	X					1	0.1		Phenothiazine	92-84-2	3.1E+01	n	3.1E+02	n					1.8E+01	n			
				6.0E-03	I					1	0.1		Phenylenediamine, m-	108-45-2	3.7E+02	n	3.7E+03	n					2.2E+02	n		5.9E-02	
4.7E-02	H									1	0.1		Phenylenediamine, o-	95-54-5	1.0E+01	c	3.7E+01	c					1.4E+00	c		3.8E-04	
				1.9E-01	H					1	0.1		Phenylenediamine, p-	106-50-3	1.2E+04	n	1.2E+05	nm					6.9E+03	n		1.9E+00	
1.9E-03	H									1	0.1		Phenylphenol, 2-	90-43-7	2.5E+02	c	8.9E+02	c					3.5E+01	c		4.7E-01	
				2.0E-04	H					1	0.1		Phorate	298-02-2	1.2E+01	n	1.2E+02	n					7.3E+00	n		8.2E-03	
						3.0E-04	I	V		1		1.6E+03	Phosgene	75-44-5	3.3E-01	n	1.4E+00	n	3.1E-01	n	1.3E+00	n					
				2.0E-02	I					1	0.1		Phosmet	732-11-6	1.2E+03	n	1.2E+04	n					7.3E+02	n		1.6E-01	
													Phosphates, Inorganic															
				4.9E+01	P					1			~Aluminum metaphosphate	13776-88-0	3.8E+06	nm	5.0E+07	nm					1.8E+06	n			
				4.9E+01	P					1			~Ammonium polyphosphate	68333-79-9	3.8E+06	nm	5.0E+07	nm					1.8E+06	n			
				4.9E+01	P					1			~Calcium pyrophosphate	7790-76-3	3.8E+06	nm	5.0E+07	nm					1.8E+06	n			
				4.9E+01	P					1			~Diammonium phosphate	7783-28-0	3.8E+06	nm	5.0E+07	nm					1.8E+06	n			
				4.9E+01	P					1			~Dicalcium phosphate	7757-93-9	3.8E+06	nm	5.0E+07	nm					1.8E+06	n			
				4.9E+01	P					1			~Dimagnesium phosphate	7782-75-4	3.8E+06	nm	5.0E+07	nm					1.8E+06	n			
				4.9E+01	P					1			~Dipotassium phosphate	7758-11-4	3.8E+06	nm	5.0E+07	nm					1.8E+06	n			
				4.9E+01	P					1			~Disodium phosphate	7558-79-4	3.8E+06	nm	5.0E+07	nm					1.8E+06	n			
				4.9E+01	P					1			~Monoaluminum phosphate	13530-50-2	3.8E+06	nm	5.0E+07	nm					1.8E+06	n			
				4.9E+01	P					1			~Monoammonium phosphate	7722-76-1	3.8E+06	nm	5.0E+07	nm					1.8E+06	n			
				4.9E+01	P					1			~Monocalcium phosphate	7758-23-8	3.8E+06	nm	5.0E+07	nm					1.8E+06	n			
				4.9E+01	P					1			~Monomagnesium phosphate	7757-86-0	3.8E+06	nm	5.0E+07	nm					1.8E+06	n			
				4.9E+01	P					1			~Monopotassium phosphate	7778-77-0	3.8E+06	nm	5.0E+07	nm					1.8E+06	n			
				4.9E+01	P					1			~Monosodium phosphate	7558-80-7	3.8E+06	nm	5.0E+07	nm					1.8E+06	n			
				4.9E+01	P					1			~Polyphosphoric acid	8017-16-1	3.8E+06	nm	5.0E+07	nm					1.8E+06	n			
				4.9E+01	P					1			~Potassium tripolyphosphate	13845-36-8	3.8E+06	nm	5.0E+07	nm					1.8E+06	n			
				4.9E+01	P					1			~Sodium acid pyrophosphate	7758-16-9	3.8E+06	nm	5.0E+07	nm					1.8E+06	n			
				4.9E+01	P					1			~Sodium aluminum phosphate (acidic)	7785-88-8	3.8E+06	nm	5.0E+07	nm					1.8E+06	n			
				4.9E+01	P					1			~Sodium aluminum phosphate (anhydrous)	10279-59-1	3.8E+06	nm	5.0E+07	nm					1.8E+06	n			
				4.9E+01	P					1			~Sodium aluminum phosphate (tetrahydrate)	10305-76-7	3.8E+06	nm	5.0E+07	nm					1.8E+06	n			
				4.9E+01	P					1			~Sodium hexametaphosphate	10124-56-8	3.8E+06	nm	5.0E+07	nm					1.8E+06	n			
				4.9E+01	P					1			~Sodium polyphosphate	68915-31-1	3.8E+06	nm	5.0E+07	nm					1.8E+06	n			
				4.9E+01	P					1			~Sodium trimetaphosphate	7785-84-4	3.8E+06	nm	5.0E+07	nm					1.8E+06	n			
				4.9E+01	P					1			~Sodium tripolyphosphate	7758-29-4	3.8E+06	nm	5.0E+07	nm					1.8E+06	n			
				4.9E+01	P					1			~Tetrapotassium phosphate	7320-34-5	3.8E+06	nm	5.0E+07	nm					1.8E+06	n			
				4.9E+01	P					1			~Tetrasodium pyrophosphate	7722-88-5	3.8E+06	nm	5.0E+07	nm					1.8E+06	n			
				4.9E+01	P					1			~Trialuminum sodium tetra decahydrogenoctaorthophosphate (dihydrate)	15136-87-5	3.8E+06	nm	5.0E+07	nm					1.8E+06	n			
				4.9E+01	P					1			~Tricalcium phosphate	7758-87-4	3.8E+06	nm	5.0E+07	nm					1.8E+06	n			
				4.9E+01	P					1			~Trimagnesium phosphate	7757-87-1	3.8E+06	nm	5.0E+07	nm					1.8E+06	n			
				4.9E+01	P					1			~Tripotassium phosphate	7778-53-2	3.8E+06	nm	5.0E+07	nm					1.8E+06	n			
				4.9E+01	P					1			~Trisodium phosphate	7601-54-9	3.8E+06	nm	5.0E+07	nm					1.8E+06	n			
				3.0E-04	I	3.0E-04	I			1			Phosphine	7803-51-2	2.3E+01	n	3.1E+02	n	3.1E-01	n	1.3E+00	n	1.1E+01	n			
				4.9E+01	P	1.0E-02	I			1			Phosphoric Acid	7664-38-2	3.0E+06	nm	2.7E+07	nm	1.0E+01	n	4.4E+01	n	1.8E+06	n			
				2.0E-05	I					1			Phosphorus, White	7723-14-0	1.6E+00	n	2.0E+01	n					7.3E-01	n		2.7E-03	
				1.0E+00	H					1	0.1		Phthalic Acid, P-	100-21-0	6.1E+04	n	6.2E+05	nm					3.7E+04	n		1.3E+01	
				2.0E+00	I	2.0E-02	C			1	0.1		Phthalic Anhydride	85-44-9	1.2E+05	nm	1.2E+06	nm	2.1E+01	n	8.8E+01	n	7.3E+04	n		1.6E+01	
				7.0E-02	I					1	0.1		Picloram	1918-02-1	4.3E+03	n	4.3E+04	n					2.6E+03	n	5.0E+02	7.1E-01	1.4E-01
				1.0E-04	X					1	0.1		Picramic Acid (2-Amino-4,6-dinitrophenol)	96-91-3	6.1E+00	n	6.2E+01	n					3.7E+00	n		2.4E-03	
				1.0E-02	I					1	0.1		Pirimiphos, Methyl	29232-93-7	6.1E+02	n	6.2E+03	n					3.7E+02	n		3.5E-01	
3.0E+01	C	8.6E-03	C	7.0E-06	H					1	0.1		Polybrominated Biphenyls	59536-65-1	1.6E-02	c*	5.7E-02	c*	2.8E-04	c	1.4E-03	c	2.2E-03	c			
													Polychlorinated Biphenyls (PCBs)															
7.0E-02	S	2.0E-05	S	7.0E-05	I					1	0.14		~Aroclor 1016	12674-11-2	3.9E+00	n	2.1E+01	c**	1.2E-01	c	6.1E-01	c	9.6E-01	c**		9.2E-02	
2.0E+00	S	5.7E-04	S					V		1	0.14	7.6E+02	~Aroclor 1221	11104-28-2	1.4E-01	c	5.4E-01	c	4.3E-03	c	2.1E-02	c	6.8E-03	c		1.2E-04	
2.0E+00	S	5.7E-04	S					V		1	0.14	7.3E+01	~Aroclor 1232	11141-16-5	1.4E-01	c	5.4E-01	c	4.3E-03	c	2.1E-02	c	6.8E-03	c		1.2E-04	
2.0E+00	S	5.7E-04	S							1	0.14		~Aroclor 1242	53469-21-9	2.2E-01	c	7.4E-01	c	4.3E-03	c	2.1E-02	c	3.4E-02	c		5.3E-03	
2.0E+00	S	5.7E-04	S							1	0.14		~Aroclor 1248	12672-29-6	2.2E-01	c	7.4E-01	c	4.3E-03	c	2.1E-02	c	3.4E-02	c		5.2E-03	
2.0E+00	S	5.7E-04	S	2.0E-05	I					1	0.14		~Aroclor 1254	11097-69-1	2.2E-01	c**	7.4E-01	c*	4.3E-03	c	2.1E-02	c	3.4E-02	c*		8.8E-03	
2.0E+00	S	5.7E-04	S							1	0.14		~Aroclor 1260	11096-82-5	2.2E-01	c	7.4E-01	c	4.3E-03	c	2.1E-02	c	3.4E-02	c		2.4E-02	
3.9E+00	E	1.1E-03	E	3.3E-05	E	1.3E-03	E			1	0.14		~Heptachlorobiphenyl, 2,3,3',4,4',5,5'- (PCB 189)	39635-31-9	1.1E-01	c*	3.8E-01	c*	2.1E-03	c	1.1E-02	c	1.7E-02	c*		1.2E-02	
3.9E+00	E	1.1E-03	E	3.3E-05	E	1.3E-03	E			1	0.14		~Hexachlorobiphenyl, 2,3',4,4',5,5'- (PCB 167)	52663-72-6	1.1E-01	c*	3.8E-01	c*	2.1E-03	c	1.1E-02	c	1.7E-02	c*		7.2E-03	
3.9E+00	E	1.1E-03	E	3.3E-05	E	1.3E-03	E			1	0.14		~Hexachlorobiphenyl, 2,3,3',4,4',5'- (PCB 157)	69782-90-7	1.1E-01	c*	3.8E-01	c*	2.1E-03	c	1.1E-02	c	1.7E-02	c*		7.4E-03	
3.9E+00	E	1.1E-03	E	3.3E-05	E	1.3E-03	E			1	0.14		~Hexachlorobiphenyl, 2,3,3',4,4',5- (PCB 156)	38380-08-4	1.1E-01	c*	3.8E-01	c*	2.1E-03	c	1.1E-02	c	1.7E-02	c*		7.4E-03	
3.9E+03	E	1.1E+00	E	3.3E-08	E	1.3E-06	E			1	0.14		~Hexachlorobiphenyl, 3,3',4,4',5,5'- (PCB 169)	32774-16-6	1.1E-04	c*	3.8E-04	c*	2.1E-06	c	1.1E-05	c	1.7E-05	c*		7.2E-06	
3.9E+00	E	1.1E-03	E	3.3E-05	E	1.3E-03	E			1	0.14		~Pentachlorobiphenyl, 2',3,4,4',5- (PCB 123)	65510-44-3	1.1E-01	c*	3.8E-01	c*	2.1E-03	c	1.1E-02	c	1.7E-02	c*		4.5E-03	

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Toxicity and Chemical-specific Information												Contaminant		Screening Levels										Protection of Ground Water SSLs	
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	voc	muta-gen	GIABS	ABS	C_{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Resident Air (ug/m^3)	key	Industrial Air (ug/m^3)	key	Tapwater (ug/L)	key	MCL (ug/L)	Risk-based SSL (mg/kg)	MCL-based SSL (mg/kg)
3.9E+00	E	1.1E-03	E	3.3E-05	E	1.3E-03	E			1	0.14		~Pentachlorobiphenyl, 2,3',4,4',5- (PCB 118)	31508-00-6	1.1E-01	c*	3.8E-01	c*	2.1E-03	c	1.1E-02	c	1.7E-02	c*		4.4E-03	
3.9E+00	E	1.1E-03	E	3.3E-05	E	1.3E-03	E			1	0.14		~Pentachlorobiphenyl, 2,3,3',4,4'- (PCB 105)	32598-14-4	1.1E-01	c*	3.8E-01	c*	2.1E-03	c	1.1E-02	c	1.7E-02	c*		4.5E-03	
3.9E+00	E	1.1E-03	E	3.3E-05	E	1.3E-03	E			1	0.14		~Pentachlorobiphenyl, 2,3,4,4',5- (PCB 114)	74472-37-0	1.1E-01	c*	3.8E-01	c*	2.1E-03	c	1.1E-02	c	1.7E-02	c*		4.5E-03	
1.3E+04	E	3.8E+00	E	1.0E-08	E	4.0E-07	E			1	0.14		~Pentachlorobiphenyl, 3,3',4,4',5- (PCB 126)	57465-28-8	3.4E-05	c*	1.1E-04	c*	6.4E-07	c	3.2E-06	c	5.2E-06	c*		1.3E-06	
2.0E+00	I	5.7E-04	I							1	0.14		~Polychlorinated Biphenyls (high risk)	1336-36-3	2.2E-01	c	7.4E-01	c	4.3E-03	c	2.1E-02	c					
4.0E-01	I	1.0E-04	I							1	0.14		~Polychlorinated Biphenyls (low risk)	1336-36-3					2.4E-02	c	1.2E-01	c	1.7E-01	c	5.0E-01	2.6E-02	7.8E-02
7.0E-02	I	2.0E-05	I							1	0.14		~Polychlorinated Biphenyls (lowest risk)	1336-36-3					1.2E-01	c	6.1E-01	c					
1.3E+01	E	3.8E-03	E	1.0E-05	E	4.0E-04	E			1	0.14		~Tetrachlorobiphenyl, 3,3',4,4'- (PCB 77)	32598-13-3	3.4E-02	c*	1.1E-01	c*	6.4E-04	c	3.2E-03	c	5.2E-03	c*		8.1E-04	
3.9E+01	E	1.1E-02	E	3.3E-06	E	1.3E-04	E			1	0.14		~Tetrachlorobiphenyl, 3,4,4',5- (PCB 81)	70362-50-4	1.1E-02	c*	3.8E-02	c*	2.1E-04	c	1.1E-03	c	1.7E-03	c*		2.7E-04	
						6.0E-04	I			1	0.1		Polymeric Methylene Diphenyl Diisocyanate (PMDI)	9016-87-9	8.5E+05	nm	3.6E+06	nm	6.3E-01	n	2.6E+00	n					
													Polynuclear Aromatic Hydrocarbons (PAHs)													
				6.0E-02	I			V		1	0.13		~Acenaphthene	83-32-9	3.4E+03	n	3.3E+04	n					2.2E+03	n		2.2E+01	
				3.0E-01	I			V		1	0.13		~Anthracene	120-12-7	1.7E+04	n	1.7E+05	nm					1.1E+04	n		3.6E+02	
7.3E-01	E	1.1E-04	C						M	1	0.13		~Benz[a]anthracene	56-55-3	1.5E-01	c	2.1E+00	c	8.7E-03	c	1.1E-01	c	2.9E-02	c		1.0E-02	
1.2E+00	C	1.1E-04	C							1	0.13		~Benzo(j)fluoranthene	205-82-3	3.8E-01	c	1.3E+00	c	2.2E-02	c	1.1E-01	c	5.6E-02	c		6.7E-02	
7.3E+00	I	1.1E-03	C						M	1	0.13		~Benzo[a]pyrene	50-32-8	1.5E-02	c	2.1E-01	c	8.7E-04	c	1.1E-02	c	2.9E-03	c	2.0E-01	3.5E-03	2.4E-01
7.3E-01	E	1.1E-04	C						M	1	0.13		~Benzo[b]fluoranthene	205-99-2	1.5E-01	c	2.1E+00	c	8.7E-03	c	1.1E-01	c	2.9E-02	c		3.5E-02	
7.3E-02	E	1.1E-04	C						M	1	0.13		~Benzo[k]fluoranthene	207-08-9	1.5E+00	c	2.1E+01	c	8.7E-03	c	1.1E-01	c	2.9E-01	c		3.5E-01	
7.3E-03	E	1.1E-05	C						M	1	0.13		~Chrysene	218-01-9	1.5E+01	c	2.1E+02	c	8.7E-02	c	1.1E+00	c	2.9E+00	c		1.1E+00	
7.3E+00	E	1.2E-03	C						M	1	0.13		~Dibenz[a,h]anthracene	53-70-3	1.5E-02	c	2.1E-01	c	8.0E-04	c	1.0E-02	c	2.9E-03	c		1.1E-02	
1.2E+01	C	1.1E-03	C							1	0.13		~Dibenzo(a,e)pyrene	192-65-4	3.8E-02	c	1.3E-01	c	2.2E-03	c	1.1E-02	c	5.6E-03	c		7.3E-02	
2.5E+02	C	7.1E-02	C						M	1	0.13		~Dimethylbenz(a)anthracene, 7,12-	57-97-6	4.3E-04	c	6.2E-03	c	1.4E-05	c	1.7E-04	c	8.6E-05	c		8.5E-05	
				4.0E-02	I					1	0.13		~Fluoranthene	206-44-0	2.3E+03	n	2.2E+04	n					1.5E+03	n		1.6E+02	
				4.0E-02	I			V		1	0.13		~Fluorene	86-73-7	2.3E+03	n	2.2E+04	n					1.5E+03	n		2.7E+01	
7.3E-01	E	1.1E-04	C						M	1	0.13		~Indeno[1,2,3-cd]pyrene	193-39-5	1.5E-01	c	2.1E+00	c	8.7E-03	c	1.1E-01	c	2.9E-02	c		1.2E-01	
2.9E-02	P			7.0E-02	A			V		1		3.9E+02	~Methylnaphthalene, 1-	90-12-0	2.2E+01	c	9.9E+01	c					2.3E+00	c		1.2E-02	
				4.0E-03	I			V		1		3.7E+02	~Methylnaphthalene, 2-	91-57-6	3.1E+02	n	4.1E+03	ns					1.5E+02	n		7.5E-01	
		3.4E-05	C	2.0E-02	I	3.0E-03	I	V		1	0.13		~Naphthalene	91-20-3	3.6E+00	c*	1.8E+01	c*	7.2E-02	c*	3.6E-01	c*	1.4E-01	c*		4.7E-04	
1.2E+00	C	1.1E-04	C							1	0.13		~Nitropyrene, 4-	57835-92-4	3.8E-01	c	1.3E+00	c	2.2E-02	c	1.1E-01	c	5.6E-02	c		9.7E-03	
				3.0E-02	I			V		1	0.13		~Pyrene	129-00-0	1.7E+03	n	1.7E+04	n					1.1E+03	n		1.2E+02	
1.5E-01	I			9.0E-03	I					1	0.1		Prochloraz	67747-09-5	3.2E+00	c	1.1E+01	c					4.5E-01	c		2.3E-03	
				6.0E-03	H					1	0.1		Profluralin	26399-36-0	3.7E+02	n	3.7E+03	n					2.2E+02	n		1.3E+01	
				1.5E-02	I					1	0.1		Prometon	1610-18-0	9.2E+02	n	9.2E+03	n					5.5E+02	n		2.6E-01	
				4.0E-03	I					1	0.1		Prometryn	7287-19-6	2.4E+02	n	2.5E+03	n					1.5E+02	n		2.2E-01	
				1.3E-02	I					1	0.1		Propachlor	1918-16-7	7.9E+02	n	8.0E+03	n					4.7E+02	n		2.9E-01	
				5.0E-03	I					1	0.1		Propanil	709-98-8	3.1E+02	n	3.1E+03	n					1.8E+02	n		1.0E-01	
				2.0E-02	I					1	0.1		Propargite	2312-35-8	1.2E+03	n	1.2E+04	n					7.3E+02	n		5.4E+01	
				2.0E-03	I					1	0.1		Propargyl Alcohol	107-19-7	1.2E+02	n	1.2E+03	n					7.3E+01	n		1.5E-02	
				2.0E-02	I					1	0.1		Propazine	139-40-2	1.2E+03	n	1.2E+04	n					7.3E+02	n		6.5E-01	
				2.0E-02	I					1	0.1		Propham	122-42-9	1.2E+03	n	1.2E+04	n					7.3E+02	n		4.7E-01	
				1.3E-02	I					1	0.1		Propiconazole	60207-90-1	7.9E+02	n	8.0E+03	n					4.7E+02	n		1.6E+00	
						8.0E-03	I	V		1		3.3E+04	Propionaldehyde	123-38-6	8.0E+01	n	3.4E+02	n	8.3E+00	n	3.5E+01	n	1.7E+01	n		3.4E-03	
				1.0E-01	X	1.0E+00	X	V		1	0.1	2.6E+02	Propyl benzene	103-65-1	3.4E+03	ns	2.1E+04	ns	1.0E+03	n	4.4E+03	n	1.3E+03	n		2.5E+00	
						3.0E+00	C			1	0.1		Propylene	115-07-1	4.3E+09	nm	1.8E+10	nm	3.1E+03	n	1.3E+04	n					
				2.0E+01	P					1	0.1		Propylene Glycol	57-55-6	1.2E+06	nm	1.2E+07	nm					7.3E+05	n		1.5E+02	
						2.7E-04	A	V		1		1.5E+03	Propylene Glycol Dinitrate	6423-43-4	5.7E+01	n	2.4E+02	n	2.8E-01	n	1.2E+00	n	5.7E-01	n		1.8E-04	
				7.0E-01	H					1	0.1		Propylene Glycol Monoethyl Ether	1569-02-4	4.3E+04	n	4.3E+05	nm					2.6E+04	n		5.2E+00	
				7.0E-01	H	2.0E+00	I			1	0.1		Propylene Glycol Monomethyl Ether	107-98-2	4.3E+04	n	4.3E+05	nm	2.1E+03	n	8.8E+03	n	2.6E+04	n		5.2E+00	
2.4E-01	I	3.7E-06	I			3.0E-02	I	V		1		7.8E+04	Propylene Oxide	75-56-9	2.0E+00	c	9.0E+00	c	6.6E-01	c*	3.3E+00	c*	2.3E-01	c		4.9E-05	
				2.5E-01	I					1	0.1		Pursuit	81335-77-5	1.5E+04	n	1.5E+05	nm					9.1E+03	n		8.0E+00	
				2.5E-02	I					1	0.1		Pydrin	51630-58-1	1.5E+03	n	1.5E+04	n					9.1E+02	n		5.8E+02	
				1.0E-03	I			V		1		5.3E+05	Pyridine	110-86-1	7.8E+01	n	1.0E+03	n					3.7E+01	n		1.3E-02	
				5.0E-04	I					1	0.1		Quinalphos	13593-03-8	3.1E+01	n	3.1E+02	n					1.8E+01	n		1.6E-01	
3.0E+00	I									1	0.1		Quinoline	91-22-5	1.6E-01	c	5.7E-01	c					2.2E-02	c		7.4E-05	
						3.0E-02	A			1			Refractory Ceramic Fibers	NA	4.3E+07	nm	1.8E+08	nm	3.1E+01	n	1.3E+02	n					
				3.0E-02	I					1	0.1		Resmethrin	10453-86-8	1.8E+03	n	1.8E+04	n					1.1E+03	n		6.8E+02	
				5.0E-02	H					1	0.1		Ronnel	299-84-3	3.1E+03	n	3.1E+04	n					1.8E+03	n		1.7E+01	
				4.0E-03	I					1	0.1		Rotenone	83-79-4	2.4E+02	n	2.5E+03	n					1.5E+02	n		7.6E+01	
2.2E-01	C	6.3E-05	C						M	1	0.1		Safrole	94-59-7	5.2E-01	c	7.8E+00	c	1.5E-02	c	1.9E-01	c	9.8E-02	c		6.0E-05	
				2.5E-02	I					1	0.1		Savey	78587-05-0	1.5E+03	n	1.5E+04	n					9.1E+02	n		4.1E+00	
				5.0E-03	I					1			Selenious Acid	7783-00-8	3.9E+02	n	5.1E+03	n					1.8E+02	n			
				5.0E-03	I	2.0E-02	C			1			Selenium	7782-49-2	3.9E+02	n	5.1E+03	n	2.1E+01	n	8.8E+01	n	1.8E+02	n	5.0E+01	9.5E-01	2.6E-01
				5.0E-03	C	2.0E-02	C			1			Selenium Sulfide	7446-34-6	3.9E+02	n	5.1E+03	n	2.1E+01	n	8.8E+01	n	1.8E+02	n			
				9.0E-02	I					1	0.1		Sethoxydim	74051-80-2	5.5E+03	n	5.5E+04	n					3.3E+03	n		2.9E+01	
						3.0E-03	C			1			Silica (crystalline, respirable)	7631-86-9	4.3E+06	nm	1.8E+07	nm	3.1E+00	n	1.3E+01	n					

Key: I = IRIS; P = PPRTV; A = ATSDR; C = Cal EPA; X = PPRTV Appendix; H = HEAST; J = New Jersey; Y = New York; O = EPA Office of Water; E = Environmental Criteria and Assessment Office; S = see user guide Section 5; L = see user guide on lead; M = mutagen; V = volatile; F = See FAQ; c = cancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; n = noncancer; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide); SSL values are based on DAF=1

Toxicity and Chemical-specific Information												Contaminant		Screening Levels												Protection of Ground Water SSLs	
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	muta-gen	GIABS	ABS	C_{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Resident Air (ug/m^3)	key	Industrial Air (ug/m^3)	key	Tapwater (ug/L)	key	MCL (ug/L)	Risk-based SSL (mg/kg)	MCL-based SSL (mg/kg)
				5.0E-03	I					0.04			Silver	7440-22-4	3.9E+02	n	5.1E+03	n					1.8E+02	n		1.6E+00	
1.2E-01	H			5.0E-03	I					1	0.1		Simazine	122-34-9	4.1E+00	c*	1.4E+01	c					5.6E-01	c	4.0E+00	2.8E-04	2.0E-03
				1.3E-02	I					1	0.1		Sodium Acifluorfen	62476-59-9	7.9E+02	n	8.0E+03	n					4.7E+02	n		3.8E+00	
				4.0E-03	I					1			Sodium Azide	26628-22-8	3.1E+02	n	4.1E+03	n					1.5E+02	n			
2.7E-01	H			3.0E-02	I					1	0.1		Sodium Diethyldithiocarbamate	148-18-5	1.8E+00	c	6.4E+00	c					2.5E-01	c			
				5.0E-02	A	1.3E-02	C			1			Sodium Fluoride	7681-49-4	3.9E+03	n	5.1E+04	n	1.4E+01	n	5.7E+01	n	1.8E+03	n			
				2.0E-05	I					1	0.1		Sodium Fluoroacetate	62-74-8	1.2E+00	n	1.2E+01	n					7.3E-01	n		1.5E-04	
				1.0E-03	H					1			Sodium Metavanadate	13718-26-8	7.8E+01	n	1.0E+03	n					3.7E+01	n			
2.4E-02	H			3.0E-02	I					1	0.1		Stirofos (Tetrachlorovinphos)	961-11-5	2.0E+01	c*	7.2E+01	c					2.8E+00	c		8.3E-03	
				6.0E-01	I					1			Strontium, Stable	7440-24-6	4.7E+04	n	6.1E+05	nm					2.2E+04	n		7.7E+02	
				3.0E-04	I					1	0.1		Strychnine	57-24-9	1.8E+01	n	1.8E+02	n					1.1E+01	n		1.2E-01	
				2.0E-01	I	1.0E+00	I	V		1		8.7E+02	Styrene	100-42-5	6.3E+03	ns	3.6E+04	ns	1.0E+03	n	4.4E+03	n	1.6E+03	n	1.0E+02	1.8E+00	1.1E-01
				8.0E-04	P					1	0.1		Sulfonylbis(4-chlorobenzene), 1,1'-	80-07-9	4.9E+01	n	4.9E+02	n					2.9E+01	n		1.7E-01	
						1.0E-03	C			1			Sulfuric Acid	7664-93-9	1.4E+06	nm	6.0E+06	nm	1.0E+00	n	4.4E+00	n					
				2.5E-02	I					1	0.1		Systhane	88671-89-0	1.5E+03	n	1.5E+04	n					9.1E+02	n		1.1E+01	
				3.0E-02	H					1	0.1		TCMTB	21564-17-0	1.8E+03	n	1.8E+04	n					1.1E+03	n		7.6E+00	
				7.0E-02	I					1	0.1		Tebuthiuron	34014-18-1	4.3E+03	n	4.3E+04	n					2.6E+03	n		7.3E-01	
				2.0E-02	H					1	0.1		Temephos	3383-96-8	1.2E+03	n	1.2E+04	n					7.3E+02	n		1.4E+02	
				1.3E-02	I					1	0.1		Terbacil	5902-51-2	7.9E+02	n	8.0E+03	n					4.7E+02	n		1.4E-01	
				2.5E-05	H					1	0.1		Terbufos	13071-79-9	1.5E+00	n	1.5E+01	n					9.1E-01	n		2.0E-03	
				1.0E-03	I					1	0.1		Terbutryn	886-50-0	6.1E+01	n	6.2E+02	n					3.7E+01	n		5.2E-02	
				1.0E-04	I					1	0.1		Tetrabromodiphenyl ether, 2,2',4,4'- (BDE-47)	5436-43-1	6.1E+00	n	6.2E+01	n					3.7E+00	n		9.7E-02	
				3.0E-04	I					1	0.1		Tetrachlorobenzene, 1,2,4,5-	95-94-3	1.8E+01	n	1.8E+02	n					1.1E+01	n		5.1E-02	
2.6E-02	I	7.4E-06	I	3.0E-02	I			V		1		6.8E+02	Tetrachloroethane, 1,1,1,2-	630-20-6	1.9E+00	c	9.3E+00	c	3.3E-01	c	1.7E+00	c	5.2E-01	c		2.0E-04	
2.0E-01	I	5.8E-05	C	2.0E-02	I			V		1		1.9E+03	Tetrachloroethane, 1,1,2,2-	79-34-5	5.6E-01	c	2.8E+00	c	4.2E-02	c	2.1E-01	c	6.7E-02	c		2.6E-05	
5.4E-01	C	5.9E-06	C	1.0E-02	I	2.7E-01	A	V		1		1.7E+02	Tetrachloroethylene	127-18-4	5.5E-01	c	2.6E+00	c	4.1E-01	c	2.1E+00	c	1.1E-01	c	5.0E+00	4.9E-05	2.3E-03
				3.0E-02	I					1	0.1		Tetrachlorophenol, 2,3,4,6-	58-90-2	1.8E+03	n	1.8E+04	n					1.1E+03	n		6.7E+00	
2.0E+01	H									1	0.1		Tetrachlorotoluene, p- alpha, alpha, alpha-	5216-25-1	2.4E-02	c	8.6E-02	c					3.4E-03	c		1.1E-05	
				5.0E-04	I					1	0.1		Tetraethyl Dithiopyrophosphate	3689-24-5	3.1E+01	n	3.1E+02	n					1.8E+01	n		1.3E-02	
						8.0E+01	I	V		1		1.1E+03	Tetrafluoroethane, 1,1,1,2-	811-97-2	1.1E+05	nms	4.6E+05	nms	8.3E+04	n	3.5E+05	n	1.7E+05	n		9.3E+01	
				4.0E-03	P					1	0.1		Tetryl (Trinitrophenylmethylnitramine)	479-45-8	2.4E+02	n	2.5E+03	n					1.5E+02	n		1.4E+00	
				1.0E-05	X					1			Thallium (Soluble Salts)	7440-28-0	7.8E-01	n	1.0E+01	n					3.7E-01	n	2.0E+00	2.6E-02	1.4E-01
				1.0E-02	I					1	0.1		Thiobencarb	28249-77-6	6.1E+02	n	6.2E+03	n					3.7E+02	n		1.3E+00	
				7.0E-02	X					1	0.008		Thiodiglycol	111-48-8	5.4E+03	n	6.8E+04	n					2.6E+03	n		5.2E-01	
				3.0E-04	H					1	0.1		Thiofanox	39196-18-4	1.8E+01	n	1.8E+02	n					1.1E+01	n		3.8E-03	
				8.0E-02	I					1	0.1		Thiophanate, Methyl	23564-05-8	4.9E+03	n	4.9E+04	n					2.9E+03	n		2.5E+00	
				5.0E-03	I					1	0.1		Thiram	137-26-8	3.1E+02	n	3.1E+03	n					1.8E+02	n		2.6E-01	
				6.0E-01	H					1			Tin	7440-31-5	4.7E+04	n	6.1E+05	nm					2.2E+04	n		5.5E+03	
						1.0E-04	A			1			Titanium Tetrachloride	7550-45-0	1.4E+05	nm	6.0E+05	nm	1.0E-01	n	4.4E-01	n					
				8.0E-02	I	5.0E+00	I	V		1		8.2E+02	Toluene	108-88-3	5.0E+03	ns	4.5E+04	ns	5.2E+03	n	2.2E+04	n	2.3E+03	n	1.0E+03	1.6E+00	6.9E-01
1.8E-01	X			1.0E-04	X					1	0.1		Toluene-2,5-diamine	95-70-5	2.7E+00	c**	9.6E+00	c**					3.7E-01	c**		1.2E-04	
1.9E-01	H									1	0.1		Toluidine, p-	106-49-0	2.6E+00	c	9.1E+00	c					3.5E-01	c		1.5E-04	
1.1E+00	I	3.2E-04	I							1	0.1		Toxaphene	8001-35-2	4.4E-01	c	1.6E+00	c	7.6E-03	c	3.8E-02	c	6.1E-02	c	3.0E+00	9.4E-03	4.6E-01
				7.5E-03	I					1	0.1		Tralomethrin	66841-25-6	4.6E+02	n	4.6E+03	n					2.7E+02	n		1.0E+02	
				3.0E-04	A					1	0.1		Tri-n-butyltin	688-73-3	1.8E+01	n	1.8E+02	n					1.1E+01	n		2.4E-01	
				1.3E-02	I					1	0.1		Triallate	2303-17-5	7.9E+02	n	8.0E+03	n					4.7E+02	n		1.1E+00	
				1.0E-02	I					1	0.1		Triasulfuron	82097-50-5	6.1E+02	n	6.2E+03	n					3.7E+02	n		3.8E-01	
				5.0E-03	I					1	0.1		Tribromobenzene, 1,2,4-	615-54-3	3.1E+02	n	3.1E+03	n					1.8E+02	n		2.6E-01	
9.0E-03	P			1.0E-02	P					1	0.1		Tributyl Phosphate	126-73-8	5.4E+01	c*	1.9E+02	c*					7.5E+00	c*		3.7E-02	
				3.0E-04	P					1	0.1		Tributyltin Compounds	NA	1.8E+01	n	1.8E+02	n					1.1E+01	n			
				3.0E-04	I					1	0.1		Tributyltin Oxide	56-35-9	1.8E+01	n	1.8E+02	n					1.1E+01	n		5.7E+02	
				3.0E+01	I	3.0E+01	H	V		1		9.1E+02	Trichloro-1,2,2-trifluoroethane, 1,1,2-	76-13-1	4.3E+04	ns	1.8E+05	nms	3.1E+04	n	1.3E+05	n	5.9E+04	n		1.5E+02	
										1	0.1		Trichloroacetic Acid	76-03-9											6.0E+01		1.2E-02
2.9E-02	H									1	0.1		Trichloroaniline HCl, 2,4,6-	33663-50-2	1.7E+01	c	5.9E+01	c					2.3E+00	c		6.4E-03	
7.0E-03	X			3.0E-05	X					1	0.1		Trichloroaniline, 2,4,6-	634-93-5	1.8E+00	n	1.8E+01	n					1.1E+00	n		9.9E-03	
				8.0E-04	X			V		1	0.1	1.5E+02	Trichlorobenzene, 1,2,3-	87-61-6	4.9E+01	n	4.9E+02	ns					2.9E+01	n		8.7E-02	
2.9E-02	P			1.0E-02	I	2.0E-03	P	V		1		4.0E+02	Trichlorobenzene, 1,2,4-	120-82-1	2.2E+01	c**	9.9E+01	c**	2.1E+00	n	8.8E+00	n	2.3E+00	c**	7.0E+01	6.8E-03	2.0E-01
				2.0E+00	I	5.0E+00	I	V		1		6.4E+02	Trichloroethane, 1,1,1-	71-55-6	8.7E+03	ns	3.8E+04	ns	5.2E+03	n	2.2E+04	n	9.1E+03	n	2.0E+02	3.2E+00	7.0E-02
5.7E-02	I	1.6E-05	I	4.0E-03	I	2.0E-04	X	V		1		2.2E+03	Trichloroethane, 1,1,2-	79-00-5	1.1E+00	c**	5.3E+00	c**	1.5E-01	c**	7.7E-01	c**	2.4E-01	c**	5.0E+00	7.8E-05	1.6E-03
5.9E-03	C	2.0E-06	C			1.0E-02	Y	V		1		6.9E+02	Trichloroethylene	79-01-6	2.8E+00	c**	1.4E+01	c**	1.2E+00	c**	6.1E+00	c**	2.0E+00	c*	5.0E+00	7.2E-04	1.8E-03
				3.0E-01	I	7.0E-01	H	V		1		1.2E+03	Trichlorofluoromethane	75-69-4	7.9E+02	n	3.4E+03	ns	7.3E+02	n	3.1E+03	n	1.3E+03	n		8.3E-01	
				1.0E-01	I					1	0.1		Trichlorophenol, 2,4,5-	95-95-4	6.1E+03	n	6.2E+04	n					3.7E+03	n		1.4E+01	
1.1E-02	I	3.1E-06	I	1.0E-03	P					1	0.1		Trichlorophenol, 2,4,6-	88-06-2	4.4E+01	c**	1.6E+02	c**	7.8E-01	c	4.0E+00	c	6.1E+00	c**		2.3E-02	
				1.0E-02	I					1	0.1		Trichlorophenoxyacetic Acid, 2,4,5-	93-76-5	6.1E+02	n	6.2E+03	n					3.7E+02	n		1.5E-01	
				8.0E-03	I					1	0.1		Trichlorophenoxypropionic acid, -2,4,5	93-72-1	4.9E+02	n	4.9E+03	n					2.9E+02	n	5.0E+01	1.6E-01	2.8E-02

Key: I = IRIS; P = PPRTV; A = ATSDR; C = Cal EPA; X = PPRTV Appendix; H = HEAST; J = New Jersey; Y = New York; O = EPA Office of Water; E = Environmental Criteria and Assessment Office; S = see user guide Section 5; L = see user guide on lead; M = mutagen; V = volatile; F = See FAQ; c = cancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; n = noncancer; m = Concentration may exceed ceiling limit (See User Guide); s = Concentration may exceed Csat (See User Guide); SSL values are based on DAF=1

Toxicity and Chemical-specific Information													Contaminant		Screening Levels												Protection of Ground Water SSLs	
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	muta-gen	GIABS	ABS	C_{sat} (mg/kg)	Analyte	CAS No.	Resident Soil (mg/kg)	key	Industrial Soil (mg/kg)	key	Resident Air (ug/m^3)	key	Industrial Air (ug/m^3)	key	Tapwater (ug/L)	key	MCL (ug/L)	Risk-based SSL (mg/kg)	MCL-based SSL (mg/kg)
				5.0E-03	I			V		1		1.3E+03	Trichloropropane, 1,1,2-	598-77-6	3.9E+02	n	5.1E+03	ns					1.8E+02	n		7.1E-02	
3.0E+01	I			4.0E-03	I	3.0E-04	I	V	M	1		1.4E+03	Trichloropropane, 1,2,3-	96-18-4	5.0E-03	c	9.5E-02	c	3.1E-01	n	1.3E+00	n	7.2E-04	c		3.1E-07	
				3.0E-03	X	3.0E-04	P	V		1		4.5E+02	Trichloropropene, 1,2,3-	96-19-5	7.8E-01	n	3.3E+00	n	3.1E-01	n	1.3E+00	n	6.2E-01	n		3.1E-04	
				3.0E-03	I					1	0.1		Tridiphane	58138-08-2	1.8E+02	n	1.8E+03	n					1.1E+02	n		7.8E-01	
						7.0E-03	I	V		1		2.8E+04	Triethylamine	121-44-8	1.2E+02	n	5.2E+02	n	7.3E+00	n	3.1E+01	n	1.5E+01	n		4.4E-03	
7.7E-03	I			7.5E-03	I					1	0.1		Trifluralin	1582-09-8	6.3E+01	c**	2.2E+02	c*					8.7E+00	c*		2.9E-01	
2.0E-02	P			1.0E-02	P					1	0.1		Trimethyl Phosphate	512-56-1	2.4E+01	c*	8.6E+01	c*					3.4E+00	c		7.4E-04	
						5.0E-03	P	V					Trimethylbenzene, 1,2,3-	526-73-8	7.1E+06	nm	3.0E+07	nm	5.2E+00	n	2.2E+01	n	1.0E+01	n			
						7.0E-03	P	V		1		2.2E+02	Trimethylbenzene, 1,2,4-	95-63-6	6.2E+01	n	2.6E+02	ns	7.3E+00	n	3.1E+01	n	1.5E+01	n		2.1E-02	
				1.0E-02	X			V		1		1.8E+02	Trimethylbenzene, 1,3,5-	108-67-8	7.8E+02	ns	1.0E+04	ns					3.7E+02	n		5.2E-01	
				3.0E-02	I					1	0.019		Trinitrobenzene, 1,3,5-	99-35-4	2.2E+03	n	2.7E+04	n					1.1E+03	n		3.9E+00	
3.0E-02	I			5.0E-04	I					1	0.032		Trinitrotoluene, 2,4,6-	118-96-7	1.9E+01	c**	7.9E+01	c**					2.2E+00	c**		1.3E-02	
				2.0E-02	P					1	0.1		Triphenylphosphine Oxide	791-28-6	1.2E+03	n	1.2E+04	n					7.3E+02	n		3.0E+00	
2.0E-02	P			7.0E-03	P					1	0.1		Tris(2-chloroethyl)phosphate	115-96-8	2.4E+01	c*	8.6E+01	c*					3.4E+00	c*		3.3E-03	
3.2E-03	P			1.0E-01	P					1	0.1		Tris(2-ethylhexyl)phosphate	78-42-2	1.5E+02	c*	5.4E+02	c					2.1E+01	c		1.0E+02	
				3.0E-03	I	3.0E-04	A			1			Uranium (Soluble Salts)	NA	2.3E+02	n	3.1E+03	n	3.1E-01	n	1.3E+00	n	1.1E+02	n	3.0E+01	4.9E+01	1.4E+01
1.0E+00	C	2.9E-04	C						M	1	0.1		Urethane	51-79-6	1.2E-01	c	1.7E+00	c	3.3E-03	c	4.2E-02	c	2.2E-02	c		4.8E-06	
		8.3E-03	P	9.0E-03	I	7.0E-06	P			0.026			Vanadium Pentoxide	1314-62-1	4.0E+02	c**	2.0E+03	c**	2.9E-04	c*	1.5E-03	c*	3.3E+02	n			
				2.0E-02	H					0.026			Vanadium Sulfate	36907-42-3	1.6E+03	n	2.0E+04	n					7.3E+02	n			
				5.0E-03	S					1			Vanadium and Compounds	NA	3.9E+02	n	5.2E+03	n					1.8E+02	n		1.8E+02	
				1.0E-03	I					1	0.1		Vernolate	1929-77-7	6.1E+01	n	6.2E+02	n					3.7E+01	n		2.9E-02	
				2.5E-02	I					1	0.1		Vinclozolin	50471-44-8	1.5E+03	n	1.5E+04	n					9.1E+02	n		7.0E-01	
				1.0E+00	H	2.0E-01	I	V		1		2.8E+03	Vinyl Acetate	108-05-4	9.7E+02	n	4.1E+03	ns	2.1E+02	n	8.8E+02	n	4.1E+02	n		8.8E-02	
		3.2E-05	H			3.0E-03	I	V		1		0.0E+00	Vinyl Bromide	593-60-2	1.1E-01	c*s	5.6E-01	c*s	7.6E-02	c*	3.8E-01	c*	1.5E-01	c*		4.4E-05	
7.2E-01	I	4.4E-06	I	3.0E-03	I	1.0E-01	I	V	M	1		3.9E+03	Vinyl Chloride	75-01-4	6.0E-02	c	1.7E+00	c	1.6E-01	c	2.8E+00	c	1.6E-02	c	2.0E+00	5.6E-06	6.9E-04
				3.0E-04	I					1	0.1		Warfarin	81-81-2	1.8E+01	n	1.8E+02	n					1.1E+01	n		1.2E-02	
				2.0E-01	S	1.0E-01	S	V		1		3.9E+02	Xylene, P-	106-42-3	6.0E+02	ns	2.6E+03	ns	1.0E+02	n	4.4E+02	n	2.0E+02	n		2.0E-01	
				2.0E-01	S	1.0E-01	S	V		1		3.9E+02	Xylene, m-	108-38-3	5.9E+02	ns	2.5E+03	ns	1.0E+02	n	4.4E+02	n	2.0E+02	n		2.0E-01	
				2.0E-01	S	1.0E-01	S	V		1		4.3E+02	Xylene, o-	95-47-6	6.9E+02	ns	3.0E+03	ns	1.0E+02	n	4.4E+02	n	2.0E+02	n		2.0E-01	
				2.0E-01	I	1.0E-01	I	V		1		2.6E+02	Xylenes	1330-20-7	6.3E+02	ns	2.7E+03	ns	1.0E+02	n	4.4E+02	n	2.0E+02	n	1.0E+04	2.0E-01	9.8E+00
				3.0E-04	I					1			Zinc Phosphide	1314-84-7	2.3E+01	n	3.1E+02	n					1.1E+01	n			
				3.0E-01	I					1			Zinc and Compounds	7440-66-6	2.3E+04	n	3.1E+05	nm					1.1E+04	n		6.8E+02	
				5.0E-02	I					1	0.1		Zineb	12122-67-7	3.1E+03	n	3.1E+04	n					1.8E+03	n		5.3E+00	

APPENDIX B

Regional Screening Level User's Guide

ARCHIVE INFORMATION -

Go to http://www.epa.gov/reg3hwmd/risk/human/rb-concentration_table/usersguide.htm for the current guide

USERS' GUIDE AND BACKGROUND TECHNICAL DOCUMENT FOR USEPA REGION 9'S PRELIMINARY REMEDIATION GOALS (PRG) TABLE

TABLE OF CONTENTS

DISCLAIMER

Preliminary remediation goals (PRGs) focus on common exposure pathways and may not consider all exposure pathways encountered at CERCLA / RCRA sites (Exhibit 1-1). PRGs do not consider impact to groundwater or address ecological concerns. The PRG Table is specifically not intended as a (1) stand-alone decision-making tool, (2) as a substitute for EPA guidance for preparing baseline risk assessments, (3) a rule to determine if a waste is hazardous under RCRA, or (4) set of final cleanup or action levels to be applied at contaminated sites.

The guidance set out in this document is not final Agency action. It is not intended, nor can it be relied upon to create any rights enforceable by any party in litigation with the United States. EPA officials may decide to follow the guidance provided herein, or act at variance with the guidance, based on an analysis of specific circumstances. The Agency also reserves the right to change this guidance at any time without public notice.

1.0 INTRODUCTION

Region 9 Preliminary Remediation Goals (PRGs) are risk-based tools for evaluating and cleaning up contaminated sites. They are being used to streamline and standardize all stages of the risk decision-making process.

The Region 9 PRG Table combines current human health toxicity values with standard exposure factors to estimate contaminant concentrations in environmental media (soil, air, and water) that are considered by the Agency to be health protective of human exposures (including sensitive groups), over a lifetime. Chemical concentrations above these levels would not automatically designate a site as "dirty" or trigger a response action. However, exceeding a PRG suggests that further evaluation of the potential risks that may be posed by site contaminants is appropriate. Further evaluation may include additional sampling, consideration of ambient levels in the environment, or a reassessment of the assumptions contained in these screening-level estimates (e.g. appropriateness of route-to-route extrapolations, appropriateness of using chronic toxicity values to evaluate childhood exposures, appropriateness of generic exposure factors for a specific site etc.).

The risk-based concentrations presented in the Table may be used as screening goals or initial cleanup goals if applicable. Generally a screening goal is intended to provide health protection without knowledge of the specific exposure conditions at a site. PRGs may also be used as initial cleanup goals when the exposure assumptions based on site-specific data match up with the default exposure assumptions in the PRG Table. When considering PRGs as cleanup goals, it is EPA's preference to assume maximum beneficial use of a property (that is, residential use) unless a non-residential number (for example, industrial soil PRG) can be justified.

Before applying PRGs at a particular site, the Table user should consider whether the exposure pathways and exposure scenarios at the site are fully accounted for in the PRG calculations. Region 9 PRG concentrations are based on direct contact pathways for which generally accepted methods, models, and assumptions have been developed (i.e. ingestion, dermal contact, and inhalation) for specific land-use conditions and do not consider impact to groundwater or ecological receptors (see Developing a Conceptual Site Model below).

EXHIBIT 1-1
TYPICAL EXPOSURE PATHWAYS BY MEDIUM
FOR RESIDENTIAL AND INDUSTRIAL LAND USES[a]

EXPOSURE PATHWAYS, ASSUMING:		
MEDIUM	RESIDENTIAL LAND USE	INDUSTRIAL LAND USE
Ground Water	***Ingestion from drinking***	Ingestion from drinking
	Inhalation of volatiles	Inhalation of volatiles
	Dermal absorption from bathing	Dermal absorption
Surface Water	***Ingestion from drinking***	Ingestion from drinking
	Inhalation of volatiles	Inhalation of volatiles
	Dermal absorption from bathing	Dermal absorption
	Ingestion during swimming	
	Ingestion of contaminated fish	
Soil	***Ingestion***	***Ingestion***
	Inhalation of particulates	***Inhalation of particulates***
	Inhalation of volatiles	***Inhalation of volatiles***
	Exposure to indoor air from soil gas	Exposure to indoor air from soil gas
	Exposure to ground water contaminated by soil leachate	Exposure to ground water contaminated by soil leachate
	Ingestion via plant, meat, or dairy products	Inhalation of particulates from trucks and heavy equipment
	Dermal absorption	***Dermal absorption***

Footnote:
[a]Exposure pathways considered in the PRG calculations are indicated in boldface italics.

2.0 READING THE PRG TABLE

2.1 General Considerations

With the exceptions described below, PRGs are chemical concentrations that correspond to fixed levels of risk (i.e. either a one-in-one million [10^{-6}] cancer risk or a noncarcinogenic hazard quotient of 1) in soil, air, and water. In most cases, where a substance causes both cancer and noncancer (systemic) effects, the 10^{-6} cancer risk will result in a more stringent criteria and consequently this value is presented in the printed copy of the Table. PRG concentrations that equate to a 10^{-6} cancer risk are indicated by "ca". PRG concentrations that equate to a hazard quotient of 1 for noncarcinogenic concerns are indicated by "nc".

If the risk-based concentrations are to be used for site screening, it is recommended that both cancer and noncancer-based PRGs be used. Both carcinogenic and noncarcinogenic values may be obtained at the Region 9 PRG homepage at:

http://www.epa.gov/region09/*superfund*/prg/

It has come to my attention that some users have been multiplying the cancer PRG concentrations by 10 or 100 to set "action levels" for triggering remediation or to set less stringent cleanup levels for a specific site after considering non-risk-based factors such as ambient levels, detection limits, or technological feasibility. This risk management practice recognizes that there may be a range of values that may be "acceptable" for carcinogenic risk (EPA's risk management range is one-in-a-million [10^{-6}] to one-in-ten thousand [10^{-4}]). However, this practice could lead one to overlook serious noncancer health threats and it is strongly recommended that the user consult with a toxicologist or regional risk assessor before doing this. For carcinogens, I have indicated by asterisk ("ca*") in the PRG Table where the noncancer PRGs would be exceeded if the cancer value that is displayed is multiplied by 100. Two stars ("ca**") indicate that the noncancer values would be exceeded if the cancer PRG were multiplied by 10. There is no range of "acceptable" noncarcinogenic "risk" so that under no circumstances should noncancer PRGs be multiplied by 10 or 100, when setting final cleanup criteria. In the rare case where noncancer PRGs are more stringent than cancer PRGs set at one-in-one-million risk, a similar approach has been applied (e.g. “nc**”).

In general, PRG concentrations in the printed Table are risk-based but for soil there are two important exceptions: (1) for several volatile chemicals, PRGs are based on the soil saturation equation ("sat") and (2) for relatively less toxic inorganic and semivolatile contaminants, a non-risk based "ceiling limit" concentration is given as 10^{+5} mg/kg ("max"). At the Region 9 PRG website, the risk-based calculations for these same chemicals are also available in the “InterCalc Tables” if the user wants to view the risk-based concentrations prior to the application of “sat” or “max”. For more information on why the “sat” value and not a risk-based value is presented for several volatile chemicals in the PRG Table, please see the discussion in Section 4.6.

With respect to applying a “ceiling limit” for chemicals other than volatiles, it is recognized that

this is not a universally accepted approach. Some within the agency argue that all values should be risk-based to allow for scaling (for example, if the risk-based PRG is set at a hazard quotient = 1.0, and the user would like to set the hazard quotient to 0.1 to take into account multiple chemicals, then this is as simple as multiplying the risk-based PRG by 1/10th). If scaling is necessary, PRG users can do this simply by referring to the "InterCalc Tables" at our website where risk-based soil concentrations are presented for all chemicals (see soil calculations, "combined" pathways column).

In spite of the fact that applying a ceiling limit is not a universally accepted approach, we have opted to continue applying a "max"soil concentration to the PRG Table for the following reasons:

- Risk-based PRGs for some chemicals in soil exceed unity (>1,000,000 mg/kg) which is not possible.

- The ceiling limit of 10^{+5} mg/kg is equivalent to a chemical representing 10% by weight of the soil sample. At this contaminant concentration (and higher), the assumptions for soil contact may be violated (for example, soil adherence and windborne dispersion assumptions) due to the presence of the foreign substance itself.
- PRGs currently do not address short-term exposures (e.g. pica children and construction workers). Although extremely high soil PRGs are likely to represent relatively non-toxic chemicals, such high values may not be justified if in fact more toxicological data were available for evaluating short-term and/or acute exposures.

In addition to Region 9 PRG values, the PRG Table also includes California EPA PRGs ("CAL-Modified PRGs") for specific chemicals where CAL-EPA screening values may deviate significantly from the federal values (see Section 2.4) and EPA OSWER soil screening levels (SSLs) for protection of groundwater (see Section 2.5).

2.2 Toxicity Values

Hierarchy of Toxicity Values

There is a new hierarchy of human health toxicity values that replaces earlier guidance. This is important because human toxicity values known as cancer slope factors (SF) or non-cancer reference doses (RfDs) form the basis of the PRG values listed in the table. As noted in OSWER Directive 9285.7-53 (dated December 5, 2003), the updated EPA hierarchy is as follows: Tier 1 - EPA's Integrated IRIS, Tier 2 - EPA's Provisional Peer Reviewed Toxicity Values (PPRTVs), and Tier 3 - Other Toxicity Values. Tier 3 includes additional EPA sources (e.g. historic HEAST and NCEA provisional values) and non-EPA sources of toxicity information (e.g. California EPA toxicity values).

The PRG Table lists Tier 1 toxicity values from IRIS as "i" and Tier 2 toxicity values known as PPRTVs as "p". Tier 3 toxicity values were obtained from various sources including California EPA databases "c", historic HEAST tables "h" and NCEA provisional values "n".

Inhalation Conversion Factors

As of January 1991, IRIS and NCEA databases no longer present RfDs or SFs for the inhalation route. These criteria have been replaced with reference concentrations (RfC) for noncarcinogenic effects and unit risk factors (URF) for carcinogenic effects. However, for purposes of estimating risk and calculating risk-based concentrations, inhalation reference doses (RfDi) and inhalation slope factors (SFi) are preferred. This is not a problem for most chemicals because the inhalation toxicity criteria are easily converted. To calculate an RfDi from an RfC, the following equation and assumptions may be used for most chemicals:

$$\text{RfDi}\ \frac{\text{mg}}{(\text{kg}\cdot\text{day})} = \text{RfC}\,(\text{mg}/\text{m}^3)\times\frac{20\text{m}^3}{\text{day}}\times\frac{1}{70\text{kg}}$$

Likewise, to calculate an SFi from an inhalation URF, the following equation and assumptions may be used:

$$\text{SFi}\ \frac{(\text{kg}\cdot\text{day})}{(\text{mg})} = \text{URF}\,(\text{m}^3/\text{ug})\times\frac{\text{day}}{20\text{m}^3}\times 70\text{kg}\times\frac{10^3\ \text{ug}}{\text{mg}}$$

Route-to-Route Methods

Route-to-route extrapolations ("r") were frequently used when there were no toxicity values available for a given route of exposure. Oral cancer slope factors ("SFo") and reference doses ("RfDo") were used for both oral and inhaled exposures for organic compounds lacking inhalation values. Inhalation slope factors ("SFi") and inhalation reference doses ("RfDi") were used for both inhaled and oral exposures for organic compounds lacking oral values. Route extrapolations were not performed for inorganics due to portal of entry effects and known differences in absorption efficiency for the two routes of exposure.

An additional route extrapolation is the use of oral toxicity values for evaluating dermal exposures. In general, dermal toxicity values are not listed in EPA databases and consequently must be estimated from oral toxicity information. However, a scientifically defensible data base often does not exist for making an adjustment to the oral slope factor/RfD so that the oral toxicity value is often applied without adjustment to estimate a dermal toxicity value. For more information please refer to recent Agency guidance (USEPA 2004) entitled *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment)* available on the web at: http://www.epa.gov/superfund/programs/risk/ragse/index.htm

Please note that whenever route-extrapolated values are used to calculate risk-based PRGs, additional uncertainties are introduced in the calculation.

2.3 PRGs Derived with Special Considerations

Most of the Region 9 PRGs are readily derived by referring to Equations 4-1 thru 4-8 contained in this "User's Guide/Technical Background Document" to the Region 9 PRGs. However, there are some chemicals for which the standard equations do no apply and/or adjustments to the toxicity values are recommended. These special case chemicals are discussed below.

Cadmium The PRGs for Cadmium are based on the oral RfD for water which is slightly more conservative (by a factor of 2) than the RfD for food. Because the PRGs are considered screening values, we elected to use the more conservative RfD for cadmium. However, reasonable arguments could be made for applying an RfD for food (instead of the oral RfD for water) for some media such as soils.

The water RfD for cadmium assumes a 5% oral absorption factor. The assumption of an oral absorption efficiency of 5% for Cadmium leads to an estimated dermal RfD of 2.5E-05. The PRG calculations incorporate these adjustments per recent guidance (USEPA 2004).

Chromium 6 For Chromium 6 (Cr6), IRIS shows an air unit risk of 1.2E-2 per (ug/cu.m) or expressed as an inhalation cancer slope factor (adjusting for inhalation/body weight) of 42 $(mg/kg\text{-}day)^{-1}$. However, the supporting documentation in the IRIS file states that these toxicity values are based on an assumed 1:6 ratio of Cr6:Cr3. Because of this assumption, we in Region 9 prefer to present PRGs based on these cancer toxicity values as "total chromium" numbers.

In the PRG Table, we also include a Cr6 specific value (assuming 100% Cr6) that is derived by multiplying the "total chromium" value by 7, yielding a cancer potency factor of 290 $(mg/kg\text{-}day)^{-1}$. This is considered to be an overly conservative assumption by some within the Agency. However, this calculation is also consistent with the State of California's interpretation of the Mancuso study that forms the basis of Cr6's toxicity values.

If you are working on a project outside of California (and outside of Region 9), you may want to contact the appropriate regulatory officials to determine what their position is on this issue. As mentioned, Region 9 also includes PRGs for "total chromium" which is based on the same ratio (1:6 ratio Cr6:Cr3) that forms the basis of the cancer slope factor of 42 $(mg/kg\text{-}day)^{-1}$ presented in IRIS.

Dioxin Dioxins, furans, and some polychlorinated biphenyls are members of the same family and exhibit similar toxicological properties. Before using the dioxin PRG at an individual site, these dioxin-related compounds must be summed together. However, they differ in the degree of toxicity so that a toxicity equivalence factor (TEF) must first be applied to adjust the measured concentrations to a toxicity equivalent concentration. EPA Region 9 has adopted the 1997 World Health Organization (WHO) TEFs. For more on this, please refer to the following article (in Environmental Health Perspectives, Vol. 6, No. 12, Dec. 1998) online at: http://ehp.niehs.nih.gov/members/1998/106p775-792vandenberg/vandenberg-full.html

Lead Residential PRGs for Lead (Region 9 EPA and California EPA) are derived based on pharmacokinetic models. Both EPA's Integrated Exposure Uptake Biokinetic (IEUBK) Model and California's LeadSpread model are designed to predict the probable blood lead concentrations for children between six months and seven years of age who have been exposed to lead through various sources (air, water, soil, dust, diet and *in utero* contributions from the mother). Run in the reverse, these models also allow the user to calculate lead PRGs that are considered "acceptable" by EPA or the State of California.

EPA uses a second Adult Lead Model to estimate PRGs for an industrial setting. This PRG is intended to protect a fetus that may be carried by a pregnant female worker. It is assumed that a cleanup goal that is protective of a fetus will also afford protection for male or female adult workers. The model equations were developed to calculate cleanup goals such that there would be no more than a 5% probability that fetuses exposed to lead would exceed a blood lead (PbB) of 10 Fg/dL. An updated screening level for soil lead at commercial/industrial (i.e., non-residential) sites of 800 ppm is based on a recent analysis of the combined phases of NHANES III that chooses a cleanup goal protective of all subpopulations.

For more information on EPA's lead models and other lead-related topics, please go to:
http://www.epa.gov/oerrpage/superfund/programs/lead/

For more information on California's LeadSpread Model and Cal-Modified PRGs for lead, please go to:
http://www.dtsc.ca.gov/ScienceTechnology/ledspred.html

Manganese The IRIS RfD (0.14 mg/kg-day) includes manganese from all sources, including diet. The author of the IRIS assessment for manganese recommends that the dietary contribution from the normal U.S. diet (an upper limit of 5 mg/day) be subtracted when evaluating non-food (e.g. drinking water or soil) exposures to manganese, leading to a RfD of 0.071 mg/kg-day for non-food items. The explanatory text in IRIS further recommends using a modifying factor of 3 when calculating risks associated with non-food sources due to a number of uncertainties that are discussed in the IRIS file for manganese, leading to a RfD of 0.024 mg/kg-day. This modified RfD is applied in the derivation of the Region 9 PRGs for soil and water. For more information regarding the Manganese RfD, you may want to contact Dr. Bob Benson at (303) 312-7070.

Nitrates/Nitrates Tap water PRGs for Nitrates/Nitrites are based on the MCL as there is no available RfD for these compounds. For more information, please see IRIS at:
http://www.epa.gov/iriswebp/iris/index.html

Thallium IRIS has many values for the different salts of thallium. However, our analytical data packages typically report "thallium". Therefore, as a practical matter it makes more sense to report a PRG for plain thallium. We have done this by making the adjustment contained in the IRIS file for thallium sulfate based on the molecular weight of the thallium in the thallium salt. The adjusted oral RfD for plain thallium is 6.6 E-05 mg/kg-day which we use to calculate a thallium PRG.

Vinyl Chloride In EPA's recent reassessment of vinyl chloride toxicity, IRIS presents two cancer slope factors for vinyl chloride (VC): one that is intended to be applied towards evaluating adult risks and a second more protective slope factor that takes into account the unique susceptibility of developing infants and young children. For residential PRGs, the Region 9 PRG Table applies the more conservative cancer potency factor that addresses exposures to both children and adults whereas for the industrial soils PRG, the adult only cancer slope factor is applied.

Because of the age-dependent vulnerability associated with vinyl chloride exposures, and due to the method that is applied in deriving the cancer slope factor for VC, an assumption of a 70 year exposure over the lifetime is assumed, consistent with the way that the toxicity value for VC was derived. Therefore, instead of the usual exposure assumption of 6 years as a child and 24 years as an adult that is assumed for carcinogenic substances, we have revised the exposure assumption for VC to 6 years as a child and 64 years as adult. Since most of the cancer risk is associated with the first 30 years of exposure to VC, there is actually little difference between a 30 year exposure assumption (typically assumed for Superfund risk assessments) and the 70 year exposure assumption that is assumed in calculating the PRG for VC.

2.4 Cal-Modified PRGs

When EPA Region 9 first came out with a Draft of the PRG Table in 1992, there was concern expressed by California EPA's Department of Toxic Substances and Control (DTSC) that for some chemicals, the risk-based concentrations that are calculated using Cal-EPA toxicity values are "significantly" more protective than the risk-based concentrations that are calculated using EPA toxicity values. Because the risk-based PRGs are order-of-magnitude estimates at best, it was agreed by both Agencies that a difference of approximately 4 or greater would be regarded as a significant difference. For chemicals with California and EPA values that differ by a factor of 4 or more, both the EPA PRGs and the "Cal-Modified PRGs" are listed in the Table.

Please note that in the State of California, Cal-Modified PRGs should be used as screening levels for contaminated sites if they are more stringent than the Federal numbers.

2.5 Soil Screening Levels

Generic, soil screening levels (SSLs) for the protection of groundwater have been included in the PRG Table for 100 of the most common contaminants at Superfund sites. Generic SSLs are derived using default values in standardized equations presented in EPA OSWER's *Soil Screening Guidance* series, available on the web at http://www.epa.gov/superfund/resources/soil/index.htm .

The SSLs were developed using a default dilution-attenuation factor (DAF) of 20 to account for natural processes that reduce contaminant concentrations in the subsurface. Also included are generic SSLs that assume no dilution or attenuation between the source and the receptor well (i.e., a DAF of 1). These values can be used at sites where little or no dilution or attenuation of soil leachate concentrations is expected at a site (e.g., sites with shallow water tables, fractured media, karst topography, or source size greater than 30 acres).

In general, if an SSL is not exceeded for the migration to groundwater pathway, the user may eliminate this pathway from further investigation.

It should be noted that in the State of California, the California Regional Water Quality Control Board has derived "California SSLs" for a number of pathways including migration to groundwater. These are not included in the Region 9 PRG Table, but may be accessed at the following website:

http://www.swrcb.ca.gov/rwqcb2/rbsl.htm

Or, for more information on the "California SSLs", please contact Dr Roger Brewer at: (510) 622-2374.

2.6 Miscellaneous

Volatile organic compounds (VOCs) are indicated by "y" in the VOC column of the Table and in general, are defined as those chemicals having a Henry's Law constant greater than 10^{-5} (atm-m^3/mol) and a molecular weight less than 200 g/mole). Three borderline chemicals (dibromochloromethane, 1,2-dibromochloropropane, and pyrene) which do not strictly meet these criteria of volatility have also been included based upon discussions with other state and federal agencies and after a consideration of vapor pressure characteristics etc. Volatile organic chemicals are evaluated for potential volatilization from soil/water to air using volatilization factors (see Section 4.4).

Chemical-specific dermal absorption values for contaminants in soil and dust are presented for arsenic, cadmium, chlordane, 2,4-D, DDT, lindane, TCDD, PAHs, PCBs, and pentachlorophenols as recommended in the *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim Guidance* (USEPA 2004). Otherwise, default skin absorption fractions are assumed to be 0.10 for nonvolatile organics. Please note that previous defaults of 0.01 and 0.10 for inorganics and VOCs respectively, have been withdrawn per new guidance.

3.0 USE OF PRGS AT SITES

The decision to use PRGs at a site will be driven by the potential benefits of having generic risk-based concentrations in the absence of site-specific risk assessments. The original intended use of PRGs was to provide initial cleanup goals for individual chemicals given specific medium and land-use combinations (see RAGS Part B, 1991), however risk-based concentrations have several applications. They can also be used for:

- Setting health-based detection limits for chemicals of potential concern
- Screening sites to determine whether further evaluation is appropriate
- Calculating cumulative risks associated with multiple contaminants

A few basic procedures are recommended for using PRGs properly. These are briefly described below. Potential problems with the use of PRGs are also identified.

3.1 Conceptual Site Model

The primary condition for use of PRGs is that exposure pathways of concern and conditions at the site match those taken into account by the PRG framework. Thus, it is always necessary to develop a conceptual site model (CSM) to identify likely contaminant source areas, exposure pathways, and potential receptors. This information can be used to determine the applicability of PRGs at the site and the need for additional information. For those pathways not covered by PRGs, a risk assessment specific to these additional pathways may be necessary. Nonetheless, the PRG lookup values will still be useful in such situations for focusing further investigative efforts on the exposure pathways not addressed.

To develop a site-specific CSM, perform an extensive records search and compile existing data (e.g. available site sampling data, historical records, aerial photographs, and hydrogeologic information). Once this information is obtained, CSM worksheets such as those provided in ASTM's *Standard Guide for Risk-Based Corrective Action Applied at Petroleum Release Sites* (1995) can be used to tailor the generic worksheet model to a site-specific CSM. The final CSM diagram represents linkages among contaminant sources, release mechanisms, exposure pathways and routes and receptors. It summarizes our understanding of the contamination problem.

As a final check, the CSM should answer the following questions:

- Are there potential ecological concerns?
- Is there potential for land use other than those covered by the PRGs (that is, residential and industrial)?
- Are there other likely human exposure pathways that were not considered in development of the PRGs (e.g. impact to groundwater, local fish consumption, raising beef, dairy, or other livestock)?
- Are there unusual site conditions (e.g. large areas of contamination, high fugitive dust levels, potential for indoor air contamination)?

If any of these four conditions exist, the PRG may need to be adjusted to reflect this new information. Suggested websites for the evaluation of pathways not currently addressed by Region 9 PRG's are presented in Exhibit 3-1.

EXHIBIT 3-1
SUGGESTED WEBSITES FOR EVALUATING EXPOSURE PATHWAYS NOT CURRENTLY ADDRESSED BY REGION 9 PRGs

EXPOSURE PATHWAY	WEBSITE
Migration of contaminants to an underlying potable aquifer	EPA Soil Screening Guidance: http://www.epa.gov/superfund/resources/soil/index.htm California Water Board Guidance: http://www.swrcb.ca.gov/rwqcb2/rbsl.htm
Ingestion via plant uptake	EPA Soil Screening Guidance: http://www.epa.gov/superfund/resources/soil/index.htm EPA Fertilizer Risk Assessment: http://www.epa.gov/epaoswer/hazwaste/recycle/fertiliz/risk/
Ingestion via meat, dairy products, human milk	EPA Protocol for Combustion Facilities: http://www.epa.gov/epaoswer/hazwaste/combust/riskvol.htm#volume1 California "Hot Spots" Risk Guidelines: http://www.oehha.ca.gov/air/hot_spots/HRSguide.html
Inhalation of volatiles that have migrated into basements or other enclosed spaces.	EPA's draft Subsurface Vapor Intrusion Guidance: http://www.epa.gov/correctiveaction/eis/vapor.htm EPA's Version of Johnson & Ettinger Model: http://www.epa.gov/oerrpage/superfund/programs/risk/airmodel/johnson_ettinger.htm
Ecological pathways	EPA Ecological Soil Screening Guidance: http://www.epa.gov/superfund/programs/risk/ecorisk/ecossl.htm NOAA Sediment Screening Table: http://response.restoration.noaa.gov/cpr/sediment/squirt/squirt.html

3.2 Background Levels Evaluation

A necessary step in determining the applicability of Region 9 risk-based PRGs is the consideration of background contaminant concentrations. There is new EPA guidance on determining background at sites. *Guidance for Characterizing Background Chemicals in Soil at Superfund Sites* (USEPA 2001b) is available on the web at: http://www.epa.gov/superfund/programs/risk/background.pdf .

EPA may be concerned with two types of background at sites: naturally occurring and

anthropogenic. Natural background is usually limited to metals whereas anthropogenic (i.e. human-made) "background" includes both organic and inorganic contaminants. Before embarking on an extensive sampling and analysis program to determine local background concentrations in the area, one should first compile existing data on the subject. Far too often there is pertinent information in the literature that gets ignored, resulting in needless expenditures of time and money.

Generally EPA does not clean up below natural background. In some cases, the predictive risk-based models generate PRG concentrations that lie within or even below typical background concentrations for the same element or compound. If natural background concentrations are higher than the risk-based PRG concentrations, then background concentrations should also be considered in determining whether further evaluation and/or remediation is necessary at a particular site. Exhibit 3-2 presents summary statistics for selected elements in soils that have background levels that may exceed risk-based PRGs.

Where anthropogenic "background" levels exceed PRGs and EPA has determined that a response action is necessary and feasible, EPA's goal will be to develop a comprehensive response to the widespread contamination. This will often require coordination with different authorities that have jurisdiction over the sources of contamination in the area.

EXHIBIT 3-2
BACKGROUND CONCENTRATIONS OF SELECTED ELEMENTS IN SOILS

TRACE	U.S. STUDY DATA[1]			CALIFORNIA DATA[2]		
ELEMENT	Range	GeoMean	ArMean	Range	GeoMean	ArMean
Arsenic	<.1-97	5.2 mg/kg	7.2 mg/kg	0.59-11	2.75 mg/kg	3.54 mg/kg
Beryllium	<1-15	0.63 "	0.92 "	0.10-2.7	1.14 "	1.28 "
Cadmium	<1-10	--	<1	0.05-1.7	0.26	0.36
Chromium	1-2000	37	54	23-1579	76.25	122.08
Nickel	<5-700	13	19	9.0-509	35.75	56.60

[1]Shacklette and Hansford, "Element Concentrations in Soils and Other Surficial Materials of the Conterminous United States",USGS Professional Paper 1270, 1984.

[2]Bradford et. al, "Background Concentrations of Trace and Major Elements in California Soils", Kearney Foundation Special Report, UC-Riverside and CAL-EPA DTSC, March 1996.

3.3 Screening Sites with Multiple Pollutants

A suggested stepwise approach for PRG-screening of sites with multiple pollutants is as follows:

- Perform an extensive records search and compile existing data.

- Identify site contaminants in the PRG Table. Record the PRG concentrations for various media and note whether PRG is based on cancer risk (indicated by "ca") or noncancer hazard (indicated by "nc"). Segregate cancer PRGs from non-cancer PRGs and exclude (but don't eliminate) non-risk based PRGs ("sat" or "max").

- For cancer risk estimates, take the site-specific concentration (maximum or 95 UCL) and divide by the PRG concentrations that are designated for cancer evaluation ("ca"). Multiply this ratio by 10^{-6} to estimate chemical-specific risk for a reasonable maximum exposure (RME). For multiple pollutants, simply add the risk for each chemical:

$$Risk = \left[\left(\frac{conc_x}{PRG_x}\right) + \left(\frac{conc_y}{PRG_y}\right) + \left(\frac{conc_z}{PRG_z}\right)\right] \times 10^{-6}$$

- For non-cancer hazard estimates. Divide the concentration term by its respective non-cancer PRG designated as "nc" and sum the ratios for multiple contaminants. The cumulative ratio represents a non-carcinogenic hazard index (HI). A hazard index of 1 or less is generally considered “safe”. A ratio greater than 1 suggests further evaluation. **[Note that carcinogens may also have an associated non-cancer PRG that is not listed in the PRG Table. To obtain these values, the user should view or download the InterCalc Tables at the PRG website and display the appropriate sections.]**

$$Hazard\ Index = \left[\left(\frac{conc_x}{PRG_x}\right) + \left(\frac{conc_y}{PRG_y}\right) + \left(\frac{conc_z}{PRG_z}\right)\right]$$

For more information on screening site risks, the reader should contact EPA Region 9's Technical Support Section.

3. 4 Potential Problems

As with any risk-based tool, the potential exists for misapplication. In most cases the root cause will be a lack of understanding of the intended use of Region 9 PRGs. In order to prevent misuse of PRGs, the following should be avoided:

- Applying PRGs to a site without adequately developing a conceptual site model that identifies relevant exposure pathways and exposure scenarios,

- Not considering background concentrations when choosing PRGs as cleanup goals,

- Use of PRGs as cleanup levels without the nine-criteria analysis specified in the National Contingency Plan (or, comparable analysis for programs outside of Superfund),

- Use of PRGs as cleanup levels without verifying numbers with a toxicologist or regional risk assessor,

- Use of antiquated PRG Tables that have been superseded by more recent publications,

- Not considering the effects of additivity when screening multiple chemicals, and

- Adjusting PRGs upward by factors of 10 or 100 without consulting a toxicologist or regional risk assessor.

4.0 TECHNICAL SUPPORT DOCUMENTATION

Region 9 PRGs consider human exposure hazards to chemicals from contact with contaminated soils, air, and water. The emphasis of the PRG equations and technical discussion are aimed at developing screening criteria for soils, since this is an area where few standards exist. For air and water, additional reference concentrations or standards are available for many chemicals (e.g. MCLs, non-zero MCLGs, AWQC, and NAAQS) and consequently the discussion of these media are brief.

4.1 Ambient Air and the Vapor Intrusion Pathway

The ambient air PRG is applicable to both indoor and outdoors and is based on a residential exposure scenario using standard Superfund exposure factors (see Exhibit 4-1 below).

The air PRG may also be used as a health-protective indoor air target for determining soil gas and groundwater screening levels for the evaluation of the subsurface vapor intrusion pathway. The "vapor intrusion pathway" refers to the migration of volatile chemicals from the subsurface into overlying buildings. Volatile chemicals in buried wastes and/or contaminated groundwater can emit vapors that may migrate through subsurface soils and into indoor air spaces of overlying buildings in ways similar to that of radon gas seeping into homes.

To derive a soil gas and/or groundwater screening level that targets the air PRG, it is necessary to divide the air PRG by an appropriate attenuation factor. The attenuation factor represents the factor by which subsurface vapor concentrations migrating into indoor air spaces are reduced due to diffusive, advective, and/or other attenuating mechanisms. The attenuation factor can be empirically determined and/or calculated using an appropriate vapor intrusion model such as the Johnson and Ettinger model available at: http://www.epa.gov/oerrpage/superfund/programs/risk/airmodel/johnson_ettinger.htm . Once the appropriate attenuation factor is determined, the following equation can be used to derive a screening level that would be protective of indoor air assuming residential land use.

For Soil Gas, the relationship is as follows:

$C_{soil\text{-}gas}[ug/m^3] = \text{Air PRG } [ug/m^3]/AF$

where

$C_{soil\text{-}gas}$ = soil gas screening level
AF = attenuation factor (ratio of indoor air concentration to soil gas concentration)

For Groundwater, the relationship is as follows:

C_{gw}[ug/L] = Air PRG [ug/m^3] x 10^{-3} m^3/L x 1/H x 1/AF

where

C_{gw} = groundwater screening level
H = dimensionless Henry's Law Constant at 25C [(mg/L - vapor)/(mg/L - water)]
AF = attenuation factor (ratio of indoor air concentration to soil gas concentration)

For more information on EPA's current understanding of this emerging exposure pathway, please refer to EPA's recent draft guidance *Evaluating the Vapor Intrusion to Indoor Air Pathway from Groundwater and Soils (Subsurface Vapor Intrusion Guidance)* (USEPA 2002) available on the web at:
http://www.epa.gov/correctiveaction/eis/vapor.htm

4.2 Soils - Direct Ingestion

Calculation of risk-based PRGs for direct ingestion of soil is based on methods presented in RAGS HHEM, Part B (USEPA 1991a) and *Soil Screening Guidance* (USEPA 1996a,b, USEPA 2001a). Briefly, these methods backcalculate a soil concentration level from a target risk (for carcinogens) or hazard quotient (for noncarcinogens).

Residential Soil PRGs

A number of studies have shown that inadvertent ingestion of soil is common among children 6 years old and younger (Calabrese et al. 1989, Davis et al. 1990, Van Wijnen et al. 1990). To take into account the higher soil intake rate for children, two different approaches are used to estimate PRGs, depending on whether the adverse health effect is cancer or some effect other than cancer.

For carcinogens, the method for calculating PRGs uses an age-adjusted soil ingestion factor that takes into account the difference in daily soil ingestion rates, body weights, and exposure duration for children from 1 to 6 years old and others from 7 to 31 years old. This health-protective approach is chosen to take into account the higher daily rates of soil ingestion in children as well as the longer duration of exposure that is anticipated for a long-term resident. For more on this method, see USEPA RAGs Part B (1991a).

For noncarcinogenic concerns, the more protective method of calculating a soil PRG is to evaluate childhood exposures separately from adult exposures. In other words, an age-adjustment factor is not applied as was done for carcinogens. This approach is considered conservative because it combines the higher 6-year exposure for children with chronic toxicity criteria. In their analysis of the method, the Science Advisory Board (SAB) indicated that, for most chemicals, the approach may be overly protective. However, they noted that there are specific instances when the chronic RfD may be based on endpoints of toxicity that are specific to children (e.g. fluoride and nitrates) or when the dose-response is steep (i.e., the dosage difference between the no-observed-adverse-effects level [NOAEL] and an adverse effects level is small). Thus, for the purposes of screening, EPA Region 9 has adopted this approach for calculating soil PRGs for noncarcinogenic health concerns.

Industrial Soil PRGs

In the *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites* (Supplemental SSL Guidance, EPA 2001a), two different soil ingestion rates are assumed for non-construction workers: 100 mg/day is assumed for outdoor workers whereas 50 mg/day is assumed for indoor workers. The default value of 100 mg/day for outdoor workers is also recommended by EPA's Technical Review Workgroup for Lead (TRW), and it reflects increased exposures to soils for outdoor workers relative to their indoor counterparts. For more on this, please see the Supplemental SSL Guidance available at the following website:

http://www.epa.gov/superfund/resources/soil/index.htm

Because the Region 9 PRGs are generic and intended for screening sites early in the investigation process (often before site-specific information is available), we have chosen to use the 100 mg/day soil ingestion (i.e. outdoor worker) assumption to calculate industrial soil PRGs. The appropriateness of this assumption for a particular site may be evaluated when additional information becomes available regarding site conditions or site development.

4.3 Soils - Dermal Contact

Dermal Contact Assumptions

Exposure factors for dermal contact with soil are based on recommendations in *Risk Assessment Guidance for Superfund Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment) Interim Guidance* (USEPA 2004). Recommended RME (reasonable maximum exposure) defaults for adult workers' skin surface areas (3300 cm^2/day) and soil adherence factors (0.2 mg/cm^2) now differ from the defaults recommended for adult residents (5700 cm^2/day, 0.07 mg/cm^2) as noted in Exhibit 4-1. This is due to differences in the range of activities experienced by workers versus residents.

Dermal Absorption

Chemical-specific skin absorption values recommended by the Superfund Dermal Workgroup were applied when available. Chemical-specific values are included for the following chemicals: arsenic, cadmium, chlordane, 2,4-D, DDT, lindane, TCDD, PAHs, PCBs, and pentachlorophenols.

The *Supplemental Guidance for Dermal Risk Assessment* (USEPA 2004) recommends a default dermal absorption factor for semivolatile organic compounds of 10% as a screening method for the majority of SVOCs without dermal absorption factors. Default dermal absorption values for other chemicals (VOCs and inorganics) are not recommended in this new guidance. Therefore, the assumption of 1% for inorganics and 10% for volatiles is no longer included in the PRG Table. This change has minimal impact on the final risk-based calculations because human exposure to VOCs and inorganics in soils is generally driven by other pathways of exposure.

4.4 Soils - Vapor and Particulate Inhalation

Agency toxicity criteria indicate that risks from exposure to some chemicals via inhalation far outweigh the risk via ingestion; therefore soil PRGs have been designed to address this pathway

as well. The models used to calculate PRGs for inhalation of volatiles/particulates are based on updates to risk assessment methods presented in RAGS Part B (USEPA 1991a) and are identical to the *Soil Screening Guidance: User's Guide and Technical Background Document* (USEPA 1996a,b).

It should be noted that the soil-to-air pathway that is evaluated in the PRGs calculations is based on inhalation exposures that result from the volatilization or particulate emissions of chemicals from soil to outdoor air. **The soil PRG calculations do not evaluate potential for volatile contaminants in soil to migrate indoors. For more on the subsurface vapor intrusion pathway please see Section 4.1.**

To address the soil-to-outdoor air pathways, the PRG calculations incorporate volatilization factors (VF_s) for volatile contaminants and particulate emission factors (PEF) for nonvolatile contaminants. These factors relate soil contaminant concentrations to air contaminant concentrations that may be inhaled on-site. The VF_s and PEF equations can be broken into two separate models: an emission model to estimate emissions of the contaminant from the soil and a dispersion model to simulate the dispersion of the contaminant in the atmosphere.

The box model in RAGS Part B has been replaced with a dispersion term (Q/C) derived from a modeling exercise using meteorological data from 29 locations across the United States because the box model may not be applicable to a broad range of site types and meteorology and does not utilize state-of-the-art techniques developed for regulatory dispersion modeling. The dispersion model for both volatiles and particulates is the AREA-ST, an updated version of the Office of Air Quality Planning and Standards, Industrial Source Complex Model, ISC2. However, different Q/C terms are used in the VF and PEF equations. Los Angeles was selected as the 90th percentile data set for volatiles and Minneapolis was selected as the 90th percentile data set for fugitive dusts (USEPA 1996 a,b). A default source size of 0.5 acres was chosen for the PRG calculations. This is consistent with the default exposure area over which Region 9 typically averages contaminant concentrations in soils. If unusual site conditions exist such that the area source is substantially larger than the default source size assumed here, an alternative Q/C could be applied (see USEPA 1996a,b).

Volatilization Factor for Soils

Volatile chemicals, defined as those chemicals having a Henry's Law constant greater than 10^{-5} (atm-m^3/mol) and a molecular weight less than 200 g/mole, were screened for inhalation exposures using a volatilization factor for soils (VF_s). Please note that VF_s's and other physical-chemical data for VOCs are contained in the InterCalc Tables at the EPA Region 9 PRG website.

The emission terms used in the VF_s are chemical-specific and were calculated from physical-chemical information obtained from several sources. The priority of these sources were as follows: *Soil Screening Guidance* (USEPA 1996a,b), *Superfund Chemical Data Matrix* (USEPA 1996c), *Fate and Exposure Data* (Howard 1991), *Subsurface Contamination Reference Guide* (EPA 1990a), and *Superfund Exposure Assessment Manual* (SEAM, EPA 1988). When there was a choice between a measured or a modeled value (e.g. Koc), our default was to use modeled values. In those cases where Diffusivity Coefficients (Di) were not provided in existing literature, Di's were calculated using Fuller's Method described in SEAM. A surrogate term was required for some chemicals that lacked physico-chemical information. In these cases, a proxy chemical of similar structure was used that may over- or under-estimate the PRG for soils.

Equation 4-9 forms the basis for deriving generic soil PRGs for the inhalation pathway. The following parameters in the standardized equation can be replaced with specific site data to develop a simple site-specific PRG

- Source area
- Average soil moisture content
- Average fraction organic carbon content
- Dry soil bulk density

The basic principle of the VF_s model (Henry's law) is applicable only if the soil contaminant concentration is at or below soil saturation "sat". Above the soil saturation limit, the model cannot predict an accurate VF-based PRG. How these particular cases are handled, depends on whether the contaminant is liquid or solid at ambient soil temperatures (see Section 4.6).

Particulate Emission Factor for Soils

Inhalation of chemicals adsorbed to respirable particles (PM_{10}) were assessed using a default PEF equal to 1. 316 x 10^9 m^3/kg that relates the contaminant concentration in soil with the concentration of respirable particles in the air due to fugitive dust emissions from contaminated soils. The generic PEF was derived using default values in Equation 4-11, which corresponds to a receptor point concentration of approximately 0.76 ug/m^3. The relationship is derived by Cowherd (1985) for a rapid assessment procedure applicable to a typical hazardous waste site where the surface contamination provides a relatively continuous and constant potential for emission over an extended period of time (e.g. years). This represents an annual average emission rate based on wind erosion that should be compared with chronic health criteria; it is not appropriate for evaluating the potential for more acute exposures.

The impact of the PEF on the resultant PRG concentration (that combines soil exposure pathways for ingestion, skin contact, and inhalation) can be assessed by accessing the Region 9 PRG website and viewing the pathway-specific soil concentrations listed in the InterCalc Tables. Equation 4-11 forms the basis for deriving a generic PEF for the inhalation pathway. For more details regarding specific parameters used in the PEF model, the reader is referred to *Soil Screening Guidance: Technical Background Document* (USEPA 1996a).

Note: the generic PEF evaluates windborne emissions and does not consider dust emissions from traffic or other forms of mechanical disturbance that could lead to greater emissions than assumed here.

4.5 Soils - Migration to Groundwater

The methodology for calculating SSLs for the migration to groundwater was developed to identify chemical concentrations in soil that have the potential to contaminate groundwater. Migration of contaminants from soil to groundwater can be envisioned as a two-stage process: (1) release of contaminant in soil leachate and (2) transport of the contaminant through the underlying soil and aquifer to a receptor well. The SSL methodology considers both of these fate and transport mechanisms.

SSLs are backcalculated from acceptable ground water concentrations (i.e. nonzero MCLGs, MCLs, or risk-based PRGs). First, the acceptable groundwater concentration is multiplied by a

dilution factor to obtain a target leachate concentration. For example, if the dilution factor is 10 and the acceptable ground water concentration is 0.05 mg/L, the target soil leachate concentration would be 0.5 mg/L. The partition equation (presented in the *Soil Screening Guidance* document) is then used to calculate the total soil concentration (i.e. SSL) corresponding to this soil leachate concentration.

The SSL methodology was designed for use during the early stages of a site evaluation when information about subsurface conditions may be limited. Because of this constraint, the methodology is based on conservative, simplifying assumptions about the release and transport of contaminants in the subsurface. For more on SSLs, and how to calculate site-specific SSLs versus generic SSLs presented in the PRG Table, the reader is referred to the *Soil Screening Guidance* document (USEPA 1996a,b).

4.6 Soil Saturation Limit

The soil saturation concentration "sat" corresponds to the contaminant concentration in soil at which the absorptive limits of the soil particles, the solubility limits of the soil pore water, and saturation of soil pore air have been reached. Above this concentration, the soil contaminant may be present in free phase, i.e., nonaqueous phase liquids (NAPLs) for contaminants that are liquid at ambient soil temperatures and pure solid phases for compounds that are solid at ambient soil temperatures.

Equation 4-10 is used to calculate "sat" for each volatile contaminant. As an update to RAGS HHEM, Part B (USEPA 1991a), this equation takes into account the amount of contaminant that is in the vapor phase in soil in addition to the amount dissolved in the soil's pore water and sorbed to soil particles.

Chemical-specific "sat" concentrations must be compared with each VF-based PRG because a basic principle of the PRG volatilization model is not applicable when free-phase contaminants are present. How these cases are handled depends on whether the contaminant is liquid or solid at ambient temperatures. Liquid contaminant that have a VF-based PRG that exceeds the "sat" concentration are set equal to "sat" whereas for solids (e.g., PAHs), soil screening decisions are based on the appropriate PRGs for other pathways of concern at the site (e.g., ingestion).

4.7 Tap Water - Ingestion and Inhalation

Calculation of PRGs for ingestion and inhalation of contaminants in domestic water is based on the methodology presented in RAGS HHEM, Part B (USEPA 1991a). Ingestion of drinking water is an appropriate pathway for all chemicals. For the purposes of this guidance, however, inhalation of volatile chemicals from water is considered routinely only for chemicals with a Henry's Law constant of 1×10^{-5} atm-m^3/mole or greater and with a molecular weight of less than 200 g/mole.

For volatile chemicals, an upperbound volatilization constant (VF_w) is used that is based on all uses of household water (e.g showering, laundering, and dish washing). Certain assumptions were made. For example, it is assumed that the volume of water used in a residence for a family of four is 720 L/day, the volume of the dwelling is 150,000 L and the air exchange rate is 0.25 air changes/hour (Andelman in RAGS Part B). Furthermore, it is assumed that the average transfer efficiency weighted by water use is 50 percent (i.e. half of the concentration of each

chemical in water will be transferred into air by all water uses). Note: the range of transfer efficiencies extends from 30% for toilets to 90% for dishwashers.

4.8 Default Exposure Factors

Default exposure factors were obtained primarily from RAGS Supplemental Guidance Standard Default *Exposure Factors* (OSWER Directive, 9285.6-03) dated March 25, 1991 and more recent information from U.S. EPA's Office of Solid Waste and Emergency Response, U.S. EPA's Office of Research and Development, and California EPA's Department of Toxic Substances Control (see Exhibit 4-1).

Because contact rates may be different for children and adults, carcinogenic risks during the first 30 years of life were calculated using age-adjusted factors ("adj"). Use of age-adjusted factors are especially important for soil ingestion exposures, which are higher during childhood and decrease with age. However, for purposes of combining exposures across pathways, additional age-adjusted factors are used for inhalation and dermal exposures. These factors approximate the integrated exposure from birth until age 30 combining contact rates, body weights, and exposure durations for two age groups - small children and adults. Age-adjusted factors were obtained from RAGS PART B or developed by analogy (see derivations next page).

For soils only, noncarcinogenic contaminants are evaluated in children separately from adults. No age-adjustment factor is used in this case. The focus on children is considered protective of the higher daily intake rates of soil by children and their lower body weight. For maintaining consistency when evaluating soils, dermal and inhalation exposures are also based on childhood contact rates.

(1) ingestion([mg-yr]/[kg-d]:

$$IFS_{adj} = \frac{ED_c \times IRS_c}{BW_c} + \frac{(ED_r - ED_c) \times IRS_a}{BW_a}$$

(2) skin contact([mg-yr]/[kg-d]:

$$SFS_{adj} = \frac{ED_c \times AF \times SA_c}{BW_c} + \frac{(ED_r - ED_c) \times AF \times SA_a}{BW_a}$$

(3) inhalation ([m^3-yr]/[kg-d]):

$$InhF_{adj} = \frac{ED_c \times IRA_c}{BW_c} + \frac{(ED_r - ED_c) \times IRA_a}{BW_a}$$

EXHIBIT 4-1
STANDARD DEFAULT FACTORS

Symbol	Definition (units)	Default	Reference
CSFo	Cancer slope factor oral (mg/kg-d)-1	--	IRIS, PPRTV, HEAST, NCEA, or California
CSFi	Cancer slope factor inhaled (mg/kg-d)-1	--	IRIS, PPRTV, HEAST, NCEA, or California
RfDo	Reference dose oral (mg/kg-d)	--	IRIS, PPRTV, HEAST, NCEA, or California
RfDi	Reference dose inhaled (mg/kg-d)	--	IRIS, PPRTV, HEAST, NCEA, or California
TR	Target cancer risk	10^{-6}	--
THQ	Target hazard quotient	1	--
BWa	Body weight, adult (kg)	70	RAGS (Part A), EPA 1989 (EPA/540/1-89/002)
BWc	Body weight, child (kg)	15	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
ATc	Averaging time - carcinogens (days)	25550	RAGS(Part A), EPA 1989 (EPA/540/1-89/002)
ATn	Averaging time - noncarcinogens (days)	ED*365	
SAa	Exposed surface area for soil/dust (cm^2/day)		Dermal Assessment, EPA 2004 (EPA/540/R-99/005)
	– adult resident	5700	
	– adult worker	3300	
SAc	Exposed surface area, child in soil (cm^2/day)	2800	Dermal Assessment, EPA 2004 (EPA/540/R-99/005)
AFa	Adherence factor, soils (mg/cm^2)		Dermal Assessment, EPA 2004 (EPA/540/R-99/005)
	– adult resident	0.07	
	– adult worker	0.2	
AFc	Adherence factor, child (mg/cm^2)	0.2	Dermal Assessment, EPA 2004 (EPA/540/R-99/005)
ABS	Skin absorption defaults (unitless):		
	– semi-volatile organics	0.1	Dermal Assessment, EPA 2004 (EPA/540/R-99/005)
	– volatile organics	--	Dermal Assessment, EPA 2004 (EPA/540/R-99/005)
	– inorganics	--	Dermal Assessment, EPA 2004 (EPA/540/R-99/005)
IRAa	Inhalation rate - adult (m^3/day)	20	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
IRAc	Inhalation rate - child (m^3/day)	10	Exposure Factors, EPA 1997 (EPA/600/P-95/002Fa)
IRWa	Drinking water ingestion - adult (L/day	2	RAGS(Part A), EPA 1989 (EPA/540/1-89/002)
IRWc	Drinking water ingestion - child (L/day)	1	PEA, Cal-EPA (DTSC, 1994)
IRSa	Soil ingestion - adult (mg/day)	100	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
IRSc	Soil ingestion - child (mg/day),	200	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
IRSo	Soil ingestion - occupational (mg/day)	100	Soil Screening Guidance (EPA 2001a)
EFr	Exposure frequency - residential (d/y)	350	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
EFo	Exposure frequency - occupational (d/y)	250	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
EDr	Exposure duration - residential (years)	30[a]	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
EDc	Exposure duration - child (years)	6	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
EDo	Exposure duration - occupational (years)	25	Exposure Factors, EPA 1991 (OSWER No. 9285.6-03)
	Age-adjusted factors for carcinogens:		
IFSadj	Ingestion factor, soils ([mg-yr]/[kg-d])	114	RAGS(Part B), EPA 1991 (OSWER No. 9285.7-01B)
SFSadj	Dermal factor, soils ([mg-yr]/[kg-d])	361	By analogy to RAGS (Part B)
InhFadj	Inhalation factor, air ([m^3-yr]/[kg-d])	11	By analogy to RAGS (Part B)
IFWadj	Ingestion factor, water ([L-yr]/[kg-d])	1.1	By analogy to RAGS (Part B)
VFw	Volatilization factor for water (L/m^3)	0.5	RAGS(Part B), EPA 1991 (OSWER No. 9285.7-01B)
PEF	Particulate emission factor (m^3/kg)	See below	Soil Screening Guidance (EPA 1996a,b)
VFs	Volatilization factor for soil (m^3/kg)	See below	Soil Screening Guidance (EPA 1996a,b)
sat	Soil saturation concentration (mg/kg)	See below	Soil Screening Guidance (EPA 1996a,b)

Footnote:
[a]Exposure duration for lifetime residents is assumed to be 30 years total. For carcinogens, exposures are combined for children (6 years) and adults (24 years) .

4.9 Standardized Equations

The equations used to calculate the PRGs for carcinogenic and noncarcinogenic contaminants are presented in Equations 4-1 through 4-8. The PRG equations update RAGS Part B equations. The methodology backcalculates a soil, air, or water concentration level from a target risk (for carcinogens) or hazard quotient (for noncarcinogens). For completeness, the soil equations combine risks from ingestion, skin contact, and inhalation simultaneously. **Note: the InterCalc Tables available at the EPA Region 9 PRG website also includes pathway-specific concentrations, should the user decide against combining specific exposure pathways; or, the user wants to identify the relative contribution of each pathway to exposure.**

To calculate PRGs for volatile chemicals in soil, a chemical-specific volatilization factor is calculated per Equation 4-9. Because of its reliance on Henry's law, the VF_s model is applicable only when the contaminant concentration in soil is at or below saturation (i.e. there is no free-phase contaminant present). Soil saturation ("sat") corresponds to the contaminant concentration in soil at which the adsorptive limits of the soil particles and the solubility limits of the available soil moisture have been reached. Above this point, pure liquid-phase contaminant is expected in the soil. If the PRG calculated using VF_s was greater than the calculated sat, the PRG was set equal to sat, in accordance with *Soil Screening Guidance* (USEPA 1996 a,b). The equation for deriving sat is presented in Equation 4-10.

PRG EQUATIONS

Soil Equations: For soils, equations were based on three exposure routes (ingestion, skin contact, and inhalation).

Equation 4-1: Combined Exposures to Carcinogenic Contaminants in Residential Soil

$$C(mg/kg) = \frac{TR \times AT_c}{EF_r \left[\left(\frac{IFS_{adj} \times CSF_o}{10^6 mg/kg}\right) + \left(\frac{SFS_{adj} \times ABS \times CSF_o}{10^6 mg/kg}\right) + \left(\frac{InhF_{adj} \times CSF_i}{VF_s{}^a}\right)\right]}$$

Equation 4-2: Combined Exposures to Noncarcinogenic Contaminants in Residential Soil

$$C(mg/kg) = \frac{THQ \times BW_c \times AT_n}{EF_r \times ED_c \left[\left(\frac{1}{RfD_o} \times \frac{IRS_c}{10^6 mg/kg}\right) + \left(\frac{1}{RfD_o} \times \frac{SA_c \times AF \times ABS}{10^6 mg/kg}\right) + \left(\frac{1}{RfD_i} \times \frac{IRA_c}{VF_s{}^a}\right)\right]}$$

Equation 4-3: Combined Exposures to Carcinogenic Contaminants in Industrial Soil

$$C(mg/kg) = \frac{TR \times BW_a \times AT_c}{EF_o \times ED_o \left[\left(\frac{IRS_o \times CSF_o}{10^6 mg/kg}\right) + \left(\frac{SA_a \times AF \times ABS \times CSF_o}{10^6 mg/kg}\right) + \left(\frac{IRA_a \times CSF_i}{VF_s{}^a}\right)\right]}$$

Footnote:
[a]Use VF_s for volatile chemicals (defined as having a Henry's Law Constant [atm-m^3/mol] greater than 10^{-5} and a molecular weight less than 200 grams/mol) or PEF for non-volatile chemicals.

Equation 4-4: Combined Exposures to Noncarcinogenic Contaminants in Industrial Soil

$$C(mg/kg) = \frac{THQ \times BW_a \times AT_n}{EF_o \times ED_o\left[\left(\frac{1}{RfD_o} \times \frac{IRS_o}{10^6 mg/kg}\right) + \left(\frac{1}{RfD_o} \times \frac{SA_a \times AF \times ABS}{10^6 mg/kg}\right) + \left(\frac{1}{RfD_i} \times \frac{IRA_a}{VF_s^a}\right)\right]}$$

Tap Water Equations:

Equation 4-5: Ingestion and Inhalation Exposures to Carcinogenic Contaminants in Water

$$C(ug/L) = \frac{TR \times AT_c \times 1000 ug/mg}{EF_r\left[\left(IFW_{adj} \times CSF_o\right) + \left(VF_w \times InhF_{adj} \times CSF_i\right)\right]}$$

Equation 4-6: Ingestion and Inhalation Exposures to Noncarcinogenic Contaminants in Water

$$C(ug/L) = \frac{THQ \times BW_a \times AT_n \times 1000 ug/mg}{EF_r \times ED_r\left[\left(\frac{IRW_a}{RfD_o}\right) + \left(\frac{VF_w \times IRA_a}{RfD_i}\right)\right]}$$

Air Equations:

Equation 4-7: Inhalation Exposures to Carcinogenic Contaminants in Air

$$C(ug/m^3) = \frac{TR \times AT_c \times 1000 ug/mg}{EF_r \times InhF_{adj} \times CSF_i}$$

Equation 4-8: Inhalation Exposures to Noncarcinogenic Contaminants in Air

$$C(ug/m^3) = \frac{THQ \times RfD_i \times BW_a \times AT_n \times 1000 ug/mg}{EF_r \times ED_r \times IRA_a}$$

Footnote:

[a]Use VF_s for volatile chemicals (defined as having a Henry's Law Constant [atm-m^3/mol] greater than 10^{-5} and a molecular weight less than 200 grams/mol) or PEF for non-volatile chemicals.

SOIL-TO-AIR VOLATILIZATION FACTOR (VF_s)

Equation 4-9: Derivation of the Volatilization Factor

$$VF_s(m^3/kg) = (Q/C) \times \frac{(3.14 \times D_A \times T)^{1/2}}{(2 \times \rho_b \times D_A)} \times 10^{-4}(m^2/cm^2)$$

where:

$$D_A = \frac{[(\Theta_a^{10/3} D_i H) + \Theta_w^{10/3} D_w)/n^2]}{\rho_B K_d + \Theta_w + \Theta_a H)}$$

Parameter	Definition (units)	Default
VF_s	Volatilization factor (m^3/kg)	--
D_A	Apparent diffusivity (cm^2/s)	--
Q/C	Inverse of the mean conc. at the center of a 0.5-acre square source ($g/^{M2}$-s per kg/m^3)	68.81
T	Exposure interval (s)	9.5×10^8
ρ_b	Dry soil bulk density (g/cm^3)	1.5
Θ_a	Air filled soil porosity (L_{air}/L_{soil})	0.28 or n-Θ_w
n	Total soil porosity (L_{pore}/L_{soil})	0.43 or 1 - (ρ_b/ρ_s)
Θ_w	Water-filled soil porosity (L_{water}/L_{soil})	0.15
ρ_s	Soil particle density (g/cm^3)	2.65
Di	Diffusivity in air (cm^2/s)	Chemical-specific
H	Henry's Law constant (atm-m^3/mol)	Chemical-specific
H'	Dimensionless Henry's Law constant	Calculated from H by multiplying by 41 (USEPA 1991a)
D_w	Diffusivity in water (cm^2/s)	Chemical-specific
K_d	Soil-water partition coefficient (cm^3/g) = $K_{oc}f_{oc}$	Chemical-specific
K_{oc}	Soil organic carbon-water partition coefficient (cm^3/g)	Chemical-specific
f_{oc}	Fraction organic carbon in soil (g/g)	0.006 (0.6%)

SOIL SATURATION CONCENTRATION (sat)

Equation 4-10: Derivation of the Soil Saturation Limit

$$sat = \frac{S}{\rho_b} (K_d \rho_b + \Theta_w + H' \Theta_a)$$

Parameter	Definition (units)	Default
sat	Soil saturation concentration (mg/kg)	--
S	Solubility in water (mg/L-water)	Chemical-specific
ρ_b	Dry soil bulk density (kg/L)	1.5
n	Total soil porosity (L_{pore}/L_{soil})	0.43 or 1 - (ρ_b/ρ_s)
ρ_s	Soil particle density (kg/L)	2.65
K_d	Soil-water partition coefficient (L/kg)	K_{oc} x f_{oc} (chemical-specific)
k_{oc}	Soil organic carbon/water partition coefficient (L/kg)	Chemical-specific
f_{oc}	Fraction organic carbon content of soil (g/g)	0.006 or site-specific
Θ_w	Water-filled soil porosity (L_{water}/L_{soil})	0.15
Θ_a	Air filled soil porosity (L_{air}/L_{soil})	0.28 or n-Θ_w
w	Average soil moisture content (kg_{water}/kg_{soil} or L_{water}/kg_{soil})	0.1
H	Henry's Law constant (atm-m^3/mol)	Chemical-specific
H'	Dimensionless Henry's Law constant	H x 41, where 41 is a units conversion factor

Equation 4-11: Derivation of the Particulate Emission Factor

$$PEF(m^3/kg) = Q/C \times \frac{3600 s/h}{0.036 \times (1-V) \times (U_m/U_t)^3 \times F(x)}$$

Parameter	Definition (units)	Default
PEF	Particulate emission factor (m^3/kg)	1.316×10^9
Q/C	Inverse of the mean concentration at the center of a 0.5-acre-square source ($g/^{M2}$-s per kg/m^3)	90.80
V	Fraction of vegetative cover (unitless)	0.5
U_m	Mean annual windspeed (m/s)	4.69
U_t	Equivalent threshold value of windspeed at 7 m (m/s)	11.32
F(x)	Function dependent on U_m/U_t derived using Cowherd (1985) (unitless)	0.194

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