

ATTACHMENT 10A

**THERMAL TREATMENT UNIT
ECOLOGICAL RISK ASSESSMENT**

DRAFT

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Acronyms and Abbreviations

AUF	area use factor
BAF	bioaccumulation factor
BCF	bioconcentration factor
COPEC	contaminant of potential ecological concern
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
ERA	ecological risk assessment
HAFB	Hill Air Force Base
HI	hazard index
HQ	hazard quotient
LD	lethal dose
LOAEL	lowest observed adverse effect level
LOEC	lowest observed effect concentration
NOAEL	no observed adverse effect level
NOEC	no observed effect concentration
OB/OD	open burn/open detonation
ORNL	Oak Ridge National Laboratory
PAH	polycyclic aromatic hydrocarbon
PCB	polychlorinated biphenyl
RCRA	Resource Conservation and Recovery Act
SLERA	screening-level ecological risk assessment
SVOC	semi-volatile organic compound
TCE	Trichloroethylene
TPH	total petroleum hydrocarbons
TRV	toxicity reference value
TSD	Treatment, Storage, and Disposal
TTU	Thermal Treatment Unit
UCL	upper confidence limit

UTTR	Utah Training and Test Range
VOC	volatile organic compound
WRS	Wilcoxon Rank Sum

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ECOLOGICAL RISK SCREEN

1.0 Introduction

In 1987, Hill Air Force Base (HAFB) applied for a Treatment, Storage, and Disposal (TSD) facility permit for the Thermal Treatment Unit (TTU) located at the Utah Test and Training Range (UTTR). The Utah Department of Environmental Quality (UDEQ) issued the final permit February 13, 2003, and reissued the permit September 13, 2013. Several attachments listed in the permit are to be updated and resubmitted to the State. An ecological risk assessment (ERA) is one of those required attachments. This risk assessment must be reviewed every fifth calendar year after issuance of the Permit (Section II.F.2 of the Permit) and updated if needed. A screening-level ecological risk assessment (SLERA) was completed and submitted in 2005 (CH2M HILL, 2005) with subsequent evaluations in 2007, 2009, 2011, 2013, and 2018 (CH2M HILL, 2007, 2009, 2011, 2013, and 2018).

The screening-level ecological risk assessment (SLERA) uses procedures outlined in the *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments* (U.S. Environmental Protection Agency [EPA], 1997) and incorporates site data collected in 2019 and 2021.

The risk assessment is conducted in two parts. The first is an initial, conservative screen using maximum concentrations and no-effect levels (to differentiate between analytes that clearly present no risk and analytes that may present a risk). The second is a refined screen in which more realistic exposure and effects assumptions are employed to better define whether analytes that failed the initial screen require additional evaluation. Where the potential for risks could not be excluded for contaminants of potential ecological concern (COPECs) in the refined analysis, a further step was made where only the samples collected from ecological habitat areas, excluding the open burn/open detonation (OB/OD) areas, were characterized. All other assumptions and calculations remained the same as in the refined analysis.

1.1 Project Background

The *Integrated Natural Resources Management Plan, Hill Air Force Base* (Blood, 2001) was used as a reference document during the development of the SLERA for the TTU. Marcus Blood (primary author of *Integrated Natural Resources Management Plan, Hill Air Force Base*) reviewed and approved the *Draft Ecological Screening Evaluation for the Utah Test and Training Range-North* before it was sent to the State for comment. In addition, Marcus Blood accompanied CH2M HILL staff on a site visit to discuss receptor selection and site goals.

1.2 Approach

The primary guidance utilized in completing the SLERA is the *Ecological Risk Assessment Guidance for Superfund* (EPA, 1997). The initial assessment of the SLERA is consistent with and focuses on the first two steps outlined in the guidance, and the refined risk evaluation begins the initial part of Step 3 as outlined in the guidance. This SLERA is also consistent with the following guidance documents:

- *Framework for Ecological Risk Assessment* (EPA, 1992)
- *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments* (EPA, 1997)
- *Final Guidelines for Ecological Risk Assessment* (EPA, 1998)
- *ECO Updates*, Volume 1, Numbers 1 through 5 (EPA, 1991a; 1991b; 1992a; 1992b; and 1992c)
- *ECO Updates*, Volume 2, Numbers 1 through 4 (EPA, 1994a; 1994b; 1994c; and 1994d)
- *ECO Updates*, Volume 3, Numbers 1 and 2 (EPA, 1996a and 1996b)
- *Final Guidelines for Ecological Risk Assessment* (EPA, 1998)
- *Ecological Risk Assessment and Risk Management Principles for Superfund Sites* (EPA, 1999)
- *The Role of Screening-Level Risk Assessments and Refining Contaminants of Concern in Baseline Ecological Risk Assessments* (EPA, 2001a)

Ecological risks were evaluated based on conservative assumptions, utilizing the maximum media concentration. Maximum non-detected concentrations were also screened to determine the potential for risk due to analytes with concentrations below detection limits. Failure to pass the screening assessment does not indicate the presence of risk. Rather, these results indicate that available data are insufficient to support a conclusion that ecological risks are absent and further evaluation may be required.

The results of this SLERA are intended for use to determine whether treatment activities at the TTU site have the potential to adversely affect ecological receptors at the site. Soil data collected from set locations on an annual basis at the completion of each set of burns/detonations (i.e., at the end of each sampling season) will continue to be added to the existing SLERA data. These combined data will be used to update the SLERA as required by the Permit. As the monitoring database develops, concentrations in soil and site activity (i.e., volume of material destroyed) can be associated to estimate future contaminant levels, and predictive models of risks may be developed based on previously existing trends.

1.3 Current Evaluation

This SLERA was originally completed in 2005 and incorporated into the Permit in 2006. Evaluations of the SLERA were conducted in 2007, 2009, 2011, 2013, 2018, and 2022. The 2022 Ecological Risk Screen Evaluation is attached as Appendix C. It summarizes the findings of the previous evaluations and incorporates new sampling data acquired since the initial SLERA was conducted.

2.0 Problem Formulation

2.1 Environmental Setting

The TTU is strictly an arid upland site, and no wetlands are present at the location. In addition, no state or federal special status species are known to use the site. Two soil types

exist at the TTU. The majority of the soils at the TTU are comprised of the Timpie-Tooele complex. Outlying areas near the southeast corner of the TTU contain the Amtoft-Rock outcrop complex. Further discussion of land use and the location of areas for those uses are presented in the *Integrated Natural Resource Management Plan for Hill AFB* (Blood, 2001). Specific details regarding the ecological resources at the site are also provided in the same document.

Samples were collected from within OB/OD areas that do not contain plants or wildlife habitat in addition to areas surrounding the OB/OD areas that do contain potential habitat for wildlife.

2.2 Fate and Transport

Analytes may be mobile in the environment through various pathways that are dependent on individual chemical properties. A summary of the fate mechanisms and transport processes for detected chemicals at the TTU is presented in Table 1.

2.3 Mechanisms of Ecotoxicity

The potential for adverse effects to ecological receptors in the environment is a function of the chemical exposure (dose) and the mechanism of toxicity for each chemical or class of chemicals with similar modes of action. The mechanisms of toxicity for inorganic, organic analytes, and explosives detected in on-site soils are summarized and presented in Table 2.

2.4 Complete Exposure Pathways

An exposure pathway is the course that an analyte takes from a source to an organism (receptor). For an exposure to occur, complete exposure pathways must exist. Ecological resources at the TTU site could potentially be exposed to analytes through different exposure routes. Several trophic guilds have been identified as having complete exposure pathways to site-related contaminants in soil. Eight of these guilds were identified for evaluation in this screening assessment. Figure 1 presents a food web diagram indicating complete exposure pathways for the site. The primary exposure pathways consist of the following:

- Direct exposure to contaminants in site soils
- Ingestion of prey items that have accumulated site contaminants
- Incidental ingestion of soil

Direct exposure occurs primarily for plants, insects, and burrow-dwelling birds and mammals. Second-order guilds and higher receive exposure primarily through ingestion of prey and incidental soil. Figure 2 is a conceptual model indicating the exposure pathways evaluated for each receptor guild. Samples originating within OB/OD areas do not represent media with a complete exposure pathway for wildlife, as the surface is barren and provides no habitat for ecological receptors. However, all samples collected from the TTU area, including those from the OB/OD areas, were evaluated in this SLERA as a conservative measure of exposure.

2.5 Summary of Available Site-Specific Data

Data used for this risk assessment included historical data and data collected in 2019 and 2021. Summary statistics for the site data used in this screening assessment are shown in Table 3. As part of the initial, conservative screen, the maximum detected concentration from this data set was used as an exposure point concentration (EPC), the representative concentration for exposure estimates to plants, soil invertebrates, birds, and mammals. Half of the maximum detection limit was evaluated as the EPC for analytes with concentrations below detection limits in all samples. In the refined screen, exposure for plants and soil invertebrates was evaluated on a point-by-point basis, whereas exposure for wildlife was calculated as the best statistical estimate of an upper bound on the average exposure concentrations, in accordance with EPA guidance for statistical analysis of monitoring data (EPA, 1989; EPA, 2002).

2.6 Identification of Contaminants of Potential Ecological Concern

COPECs in soil were identified following guidance presented in the *Ecological Risk Assessment Guidance for Superfund* (EPA, 1997). All inorganic and organic chemicals detected in soil were retained as COPECs for the initial conservative screen. In addition, to determine the adequacy of analytical detection limits, the maximum non-detected concentration of any analyte that was not detected in any sample was screened. Analytes (either detected or not detected) that lacked screening values were retained as uncertainties.

Chemicals considered to be essential nutrients (calcium, chloride, potassium, and sodium) were excluded from the risk evaluation because these essential nutrients have low toxicity, especially by the dermal and inhalation intake routes. Additionally, general chemical parameters used for the nature and extent of contamination evaluation (e.g., sulfate) were excluded from the risk evaluation due to a lack of toxicity values and expected low toxicity associated with exposures to these chemicals.

2.7 Measures of Exposure and Effects

Evaluation of ecological risks requires the definition of measures that will be considered. These are termed measures of exposure and effects (EPA, 1998) and consist of assessment and measurement endpoints.

2.7.1 Assessment Endpoints

Assessment endpoints describe the environmental resources to be protected and help to focus the SLERA on the most relevant trophic guilds and receptors for evaluation. Assessment endpoints for the site are described below and presented in Table 4. At this site, they are developed to protect ecological resources, i.e., plants (primary producers) in the terrestrial environment and the prey of wildlife communities that might come in contact with contamination on the site.

Assessment endpoints and representative receptors for the TTU were selected based on one or more of the following criteria:

- Receptor is a special-status species (e.g., federally listed as threatened or endangered)

- Receptor has a small home range
- Receptor is representative of an ecological guild
- Receptor is susceptible to bioaccumulation or biomagnification of COPECs (e.g., higher trophic-level predators)
- Receptor is likely to be exposed to contaminants
- Receptor occurs at the site
- Receptor is known or suspected to be sensitive to contaminants
- Receptor has a small body size such that food ingestion (and exposure) is maximized
- Receptor has a diet composition representing high proportions of food types representing specific bioaccumulation pathways (i.e., plants, soil invertebrates, or vertebrates) such that pathway-specific exposure and risk are maximized

For purposes of this screening-level assessment, current conditions are assumed to continue into the future and assessment endpoints apply under current and future scenarios. Eight assessment endpoints were identified to protect the following components of terrestrial habitats at the site:

1. Terrestrial plant community
2. Soil invertebrate community
3. Herbivorous mammals
4. Insectivorous mammals
5. Carnivorous mammals
6. Herbivorous birds
7. Insectivorous birds
8. Carnivorous birds

Table 5 documents the applicable selection criteria for each of the eight assessment endpoints (and their associated representative receptor), which are also listed below. No resident special status or federal sensitive species were identified at the site (Blood, 2001) and are, therefore, not specifically considered in this SLERA. The eight assessment endpoints are discussed below.

1. Protection of the terrestrial plant community from direct toxic effects on survival, reproduction, and growth due to chemicals in soil.

The first assessment endpoint reflects the potential presence of elevated concentrations of chemicals in site soils and the bioavailability, accumulation, and direct toxicity of chemicals to plants. The plant community is important as a component of habitat (cover and breeding sites) and as a food source for wildlife.

2. Protection of the soil invertebrate community from direct toxic effects on survival, reproduction, and growth due to chemicals in soil.

The second assessment endpoint is based on the potential presence of elevated concentrations of chemicals in site soils, and the bioavailability, accumulation, and direct toxicity of chemicals to the soil invertebrate community. The soil invertebrate community is an important component of the terrestrial ecosystem at the site. It contributes to soil conditions that promote plant growth and maintenance of the terrestrial plant community and provides food for wildlife.

3. Protection of populations of herbivorous small mammals from toxic effects on survival, reproduction, and growth due to chemicals in soil and plants.

The third assessment endpoint addresses the exposure of herbivorous small mammal populations to elevated concentrations of chemicals in site soils and waste materials and indirectly through consumption of plants. These animals are important components of the wildlife community, and serve as prey for higher trophic-level carnivorous birds and mammals. They may be sensitive to adverse effects on survival, reproduction, and growth from exposure to contaminants in soil and plants that live in site soils.

4. Protection of populations of insectivorous small mammals from toxic effects on survival, reproduction, and growth due to chemicals in soil and invertebrates.

The fourth assessment endpoint addresses the exposure of insectivorous small mammal populations to elevated concentrations of chemicals in site soils and waste materials and indirectly through consumption of terrestrial invertebrates. These animals are important components of the wildlife community, and serve as prey for higher trophic-level carnivorous birds and mammals. They may be sensitive to adverse effects on survival, reproduction, and growth from exposure to contaminants in soil and invertebrates that live in site soils.

5. Protection of populations of upper trophic-level species of carnivorous mammals from toxic effects on survival, reproduction, and growth due to chemicals in soil and prey.

The fifth assessment endpoint addresses the exposure of top-level carnivorous mammals to elevated concentrations of contaminants in site soils and indirectly through consumption of invertebrates and lower trophic-level vertebrate prey organisms that live on the site. These mammals are susceptible to uptake and direct toxic effects on survival, reproduction, and growth from exposure to contaminants in soil and bioaccumulation and related toxic effects of contaminants in invertebrates, small mammals, and birds that live on the site.

6. Protection of populations of herbivorous birds from toxic effects on survival, reproduction, and growth due to chemicals in soil and plants.

The sixth assessment endpoint addresses the exposure of herbivorous bird populations to elevated concentrations of chemicals in site soils and waste materials and indirectly through consumption of plants. These animals are important components of the wildlife community and serve as prey for higher trophic-level carnivorous birds and mammals. They may be sensitive to adverse effects on survival, reproduction, and growth from exposure to contaminants in soil and plants that live in site soils.

7. Protection of populations of insectivorous birds from toxic effects on survival, reproduction, and growth due to chemicals in soil and prey.

The seventh assessment endpoint addresses the exposure of insectivorous birds to elevated concentrations of site contaminants in soils and indirectly through consumption of invertebrates and other material. These animals are primarily insectivorous, but may consume some plant material, and are important components of the wildlife community. They serve as prey for higher trophic-level carnivorous birds and mammals. They may be sensitive to toxic effects on survival, reproduction, and growth from exposure to contaminants in soil, invertebrates, and plants that live in site soils.

8. Protection of populations of wide-ranging carnivorous birds from toxic effects on survival, reproduction, and growth due to chemicals in soil, plants, and prey.

The eighth assessment endpoint addresses the exposure of carnivorous birds to elevated concentrations of contaminants in site soils and indirectly through consumption of small mammals and reptiles and lower that live on and adjacent to the site. These vertebrates are susceptible to uptake and direct toxic effects on survival, reproduction, and growth from exposure to contaminants in soil and sediment, and bioaccumulation and related toxic effects from exposure to contaminants.

Reptiles were not selected as assessment endpoints for the TTU. Although they are present at the site, of interest and worthy of protection, both data and methods to estimate exposure and to evaluate toxicity are limited. As a consequence, reptiles are assumed to be protected if other vertebrate wildlife assessment endpoints are protected. In addition, no special status species were present at the TTU site; thus, they are not included among the final assessment endpoints.

2.7.2 Testable Hypotheses

The following paragraphs present the testable hypotheses for the assessment endpoints described above and the refined measurement endpoints described below. The benchmarks mentioned here represent measures of effects and refer to promulgated standards and published ecological screening benchmark values that, when available, represent the no-effect level and lowest-effect level for the representative ecological receptors.

The following hypotheses are related to exposure to COPECs in soils at the site:

- The concentrations of COPECs in soil are not greater than soil benchmarks protective of plants (Assessment Endpoint No. 1).
- The concentrations of COPECs in soil are not greater than soil benchmarks protective of soil invertebrates (Assessment Endpoint No. 2).
- The concentrations of chemicals in soil and biota are not sufficient to cause direct toxic effects, reduced growth, or reproductive impairment in populations of herbivorous small mammals that inhabit or forage at the site (Assessment Endpoint No. 3).
- The concentrations of chemicals in soil and biota are not sufficient to cause direct toxic effects, reduced growth, or reproductive impairment in populations of insectivorous small mammals that inhabit or forage at the site (Assessment Endpoint No. 4).
- The concentrations of chemicals in soil and biota are not sufficient to cause direct toxic effects, reduced growth, or reproductive impairment in populations of carnivorous mammals that inhabit or forage at the site (Assessment Endpoint No. 5).
- The concentrations of chemicals in soil and biota are not sufficient to cause direct toxic effects, reduced growth, or reproductive impairment in populations of herbivorous birds that inhabit or forage at the site (Assessment Endpoint No. 6).
- The concentrations of chemicals in soil and biota are not sufficient to cause direct toxic effects, reduced growth, or reproductive impairment in populations of insectivorous birds that inhabit or forage at the site (Assessment Endpoint No. 7).

- The concentrations of chemicals in soil and biota are not sufficient to cause direct toxic effects, reduced growth, or reproductive impairment in populations of carnivorous birds that inhabit or forage at the site (Assessment Endpoint No. 8).

2.7.3 Measurement Endpoints

Measurement endpoints are ecological characteristics related to an assessment endpoint by the route of exposure and mechanism of toxicity; they are used in the evaluation of testable hypotheses developed for each assessment endpoint (EPA, 1997). Measurement endpoints for the site are described below and presented in Table 4.

Measures of exposure can be an EPC of a chemical in an environmental medium or food item, or a related dose estimate. In the initial screening assessment, maximum detected or non-detected (if all samples were non-detects) concentrations were used as the EPC for all receptors. A point-by-point evaluation of all analytes retained from the initial screen was conducted for immobile receptors in the refined screening assessment. For mobile receptors (i.e., birds and mammals), the EPC was represented by the upper confidence limit (UCL) 95 (UCL95) for each retained analyte.

Measures of effects include media-specific ecological benchmarks and toxicity reference values (TRVs). Because site-related chemicals can induce ecotoxicological effects in exposed receptors if present at sufficiently high concentrations, ecotoxicity-based benchmarks and TRVs are also measurement endpoints. In the initial screen, TRVs were represented by literature-based, no observed effect concentrations (NOECs) and no observed adverse effect levels (NOAELs). In the refined screen, NOECs and NOAELs as well as lowest observed effect concentrations (LOECs) and lowest observed adverse effect levels (LOAELs) were used.

Direct comparison of the EPC of a chemical to an ecotoxicity-based benchmark for plants and invertebrates provides a measure of the possible effects attributable to direct exposure. If the EPCs fall below the concentration benchmarks estimated to be protective of direct toxicity, and if chemicals are not bioaccumulative, then it can be inferred that no adverse ecological effect is likely to occur. For mammals and birds, a food-chain exposure is calculated and compared to exposure dose-based TRVs. If the food-chain exposure doses fall below the NOAEL-based TRVs, then it can be inferred that no adverse effect is likely to occur through indirect (food-chain) exposure. If the calculated doses fall above the NOAEL-based TRV but below the LOAEL-based TRV, it is uncertain whether individuals would be adversely affected, and population-level effects are unlikely.

3.0 Exposure Assessment

This section provides the assumptions and equations used for developing initial exposure estimates for the receptors selected to represent the trophic guilds potentially exposed at this site. These estimates are used in the risk calculations developed for identifying contaminants requiring further evaluation.

3.1 Exposure Estimates for Receptors Exposed in Lower Order Trophic Guilds

Less mobile, lower trophic-level organisms (plants and invertebrates) are exposed to more localized concentrations of contaminants than are higher trophic-level receptors. As a measure of conservatism for the initial screen, potential toxicity of site-related chemicals to these receptors was evaluated by using the maximum detected concentration as the EPC, the concentration to which receptors are assumed to be exposed. The EPC used for plants and soil invertebrates included data from the top 6 inches. The highest concentrations of COPECs are expected to reside at or near the soil surface due to aerial deposition of potential contaminants at the TTU. Precipitation at the site is limited, resulting in limited infiltration. Assuming exposure for plants to be represented by concentrations in the top 6 inches of soil is both representative and protective. For these trophic guilds, it was also conservatively assumed that chemicals in sampled media are 100 percent bioavailable and that they remain at a steady concentration (i.e., decomposition rates are not considered).

3.2 Exposure Estimates for Higher Order Trophic Guilds

Selected receptor species were chosen to represent the bird and mammal feeding guilds that are expected at the site. These include the Ord's kangaroo rat (*Dipodomys ordii*), Townsend's ground squirrel (*Spermophilus townsendii*), black-tailed jackrabbit (*Lepus californicus*), Northern grasshopper mouse (*Onychomys leucogaster*), pronghorn (*Antilocapra americana*), coyote (*Canis latrans*), sage sparrow (*Amphispiza belli*), loggerhead shrike (*Lanius ludovicianus*), western meadowlark (*Sturnella neglecta*), and burrowing owl (*Speotyto cunicularia*). The species-specific exposure parameters used to estimate wildlife exposure doses include EPCs, body weight, food intake rate, diet composition, and percent of diet as soil. The exposure factor parameters and dietary compositions used for each bird and mammal receptor are provided in Table 6. The sources of these parameters for each of the selected endpoint species for the site include the Wildlife Exposure Factors Handbook (EPA, 1993), Oak Ridge National Laboratory's Toxicological Benchmarks for Wildlife (Sample et al., 1996), Oak Ridge National Laboratory's Methods and Tools for Estimation of the Exposure of Terrestrial Wildlife to Contaminants (Sample et al., 1997), and other available studies (as cited). In some cases, dietary compositions were simplified by lumping comparable food types to facilitate calculation of exposure estimates. Lumping allows for the use of existing bioaccumulation models to estimate COPEC concentrations in food items. Data from the top 6 inches were used to calculate the EPC for incidental media ingestion of all receptors and for exposure to prey items. Assuming exposure for burrowing animals is represented by concentrations in the top 6 inches of soil is both representative and protective because the release mechanism at the TTU is aerial deposition and precipitation is limited. Thus, infiltration will be limited, resulting in the highest concentrations remaining at the surface.

For the initial screen, the most conservative exposure assumptions were used. These assumptions included the use of maximum exposure concentrations, 100 percent site use, and 100 percent bioavailability of analytes. As a conservative measure of dietary exposure to contaminants, it was also assumed that 100 percent of the receptor diet was obtained from the primary food group.

For the refined screen, biologically more realistic assumptions were employed. These included the use of the 95 percent UCL as the EPC and area use factors (AUFs—weighting site use as a fraction of home-range size). AUFs based on species-specific average home range values are presented in Table 7. Allometric equations based on average body weights were used to estimate food ingestion rates. The taxonomically most specific allometric equation that was appropriate was used in all cases (e.g., the equation for passerines was used for the northern shrike instead of the equation for all birds).

Site-specific concentrations of contaminants in wildlife foods were not available for the TTU site. Bioaccumulation values and models derived from published literature were therefore used to estimate concentrations in food items based on media concentrations (Tables 8 and 9). Because bioaccumulation is a non-linear process, log-linear regression models were used if available. These log-linear bioaccumulation regression models for wildlife (Sample et al., 1998a), soil invertebrates (Sample et al., 1998b), and plant tissues (Bechtel Jacobs, 1998) were used to estimate the uptake of several metals into invertebrate tissues (Table 9). Calculated bioconcentration factors (BCFs) for each analyte were considered representative for all prey items from that food group. In the absence of these models, the 90th percentiles of bioaccumulation factors (BAFs) were used for determining uptake of inorganic contaminants into receptors from these or other sources (Oak Ridge National Laboratory [ORNL], 2000; Beyer and Stafford, 1993; and CH2M HILL, 2001). For organic contaminants, BAFs from the peer-reviewed literature were selected preferentially to calculating BAFs. In the absence of BAFs in the literature, they were calculated from log Kow-based models (EPA, 2003 and 2005).

Soil-to-invertebrate transfer factors were derived using:

$$BTF = 10^{(\log Kow - 0.6) / [f_{oc} * 10^{(0.983 \log Kow + 0.00028)}]}$$

Soil-to-mammal transfer factors for organics were derived using:

$$BAF = 10^{(0.338 - 0.145 * \log Kow)}$$

Soil-to-plant (rinsed foliage) transfer factors for organics were derived using:

$$BTF = 10^{(1.781 - 0.4057 * \log Kow)}$$

To be conservative, and in the absence of site specific data, the fraction of organic carbon (foc) used in these equations was 1 percent (EPA, 2005). If a BAF or other bioaccumulation model was unavailable from the literature or databases, a value of 1.0 was assumed for the screening calculations.

Exposure estimates were generated for the COPECs for each receptor species using the following exposure model:

$$E_t = [Soil * P_s * FIR] + \left[\sum_{i=1}^N B_i * P_i * FIR \right]$$

where:

$$E_t = \text{total exposure (mg/kg/d)}$$

- Soil* = chemical concentration in soil (mg/kg dry weight)
P_s = soil ingestion rate as proportion of diet
FIR = food ingestion rate (kg food/kg body weight/d)
B_i = chemical concentration in biota type (i) (mg/kg wet weight)
P_i = proportion of biota type (i) in diet

The following additional assumptions were incorporated into the exposure modeling:

- Exposure to total petroleum hydrocarbons (TPH) is only from abiotic media (soil and water); thus, there is no food component associated with exposure to TPH (Albers, 1995).
- In contrast, exposure to polycyclic aromatic hydrocarbons (PAHs) may be from both abiotic and biotic sources.

4.0 Ecological Effects Assessment

This section focuses on the ecological effects of COPECs found in site soils.

4.1 Screening for Ecological Effects from Direct Exposure to Contaminated Soil

Ecological benchmarks are used to evaluate the potential for direct toxicity of contaminants to ecological receptors but do not account for bioaccumulation potential and consequent exposure of higher trophic-level animals.

Soil screening values representing NOECs and LOECs in soil were extracted from multiple published literature sources (Tables 10 and 11). In the absence of a chemical-specific soil screening value, values for a similar, related chemical were used as a surrogate. Instances where a surrogate value was used are noted in Tables 10 and 11.

4.2 Screening Toxicity Reference Values for Wildlife

A literature review of toxicity information for COPECs was conducted to identify appropriate TRVs for mammals and birds. TRVs that represent doses for mammals and birds have been selected in accordance with the guidelines presented in EPA (1997). TRV evaluation included consideration of ecological relevance, study duration, effect level, study endpoints, test species, form of chemical, whether effect concentrations are bounded, and exposure routes. When available, studies representing NOAELs were selected over LOAELs and lethal dose to 50 percent of the test population (LD50s). LOAELs and LD50s were normalized to NOAELs through the use of uncertainty factors if no suitable NOAEL existed. When available, chronic studies were selected over subchronic and acute studies. In addition, chronic studies were selected that represented oral exposure routes because the oral route is being quantitatively evaluated in the effects assessment.

The endpoints for the TRVs for both the mammals and birds were not always population-level effects. When TRVs were not available for population-level effects, studies with behavioral endpoints (avoidance response, activity levels, impaired response, etc.) were used. Population-level NOAELs, had they been available, would likely present higher values for NOAELs and LOAELs.

Table 12 presents a matrix of the different TRVs for mammals, by chemical, that were reviewed, and shows the NOAEL and LOAEL (if available) TRVs that were selected for each chemical. Table 13 presents a similar matrix of TRVs for birds. Uncertainty factors were applied as needed. In the absence of chemical-specific bird or mammal toxicity values, values for a similar, related chemical were used as a surrogate. Instances where a surrogate value was used are summarized in Tables 12 and 13.

Appendix A presents summaries of the toxicity studies, including uncertainties and assumptions used to develop NOAEL and LOAEL reference values used in this SLERA.

5.0 Initial Risk Characterization

This section presents the initial characterization of risks at the TTU. In the risk characterization, exposure and effects data are compared to draw conclusions concerning the presence, nature, and magnitude of effects that may exist at the site. Risks were evaluated based on the ratio of exposure doses to TRVs, resulting in hazard quotients (HQs), and are described by the following equation:

$$HQ = ED/TRV \text{ or } C/TRV$$

where:

- HQ = Ecological hazard quotient (unitless)
- ED = Maximum estimated chemical intake (dose) by receptor (mg/kg-day)
- C = Maximum soil concentration (mg/kg)
- TRV = Toxicity reference value (soil concentration-based effect level [mg/kg] or measured or estimated dietary dose [mg/kg-day] both representing no-effect levels)

An HQ value less than 1.0 indicates that adverse effects associated with exposure to a given analyte are unlikely (EPA, 1997). These analytes were not considered to present any risk and were excluded from further evaluation. If the estimated daily intake for any COPEC equals or exceeds the TRV, the HQ will equal or exceed unity. An HQ greater than or equal to 1.0 indicates data is insufficient to exclude the potential for risk, but does not indicate that risks are actually present. Chemicals where the HQ exceeded 1.0 were retained for a more detailed evaluation in the refinement stage. Thus, the outcome of the initial step was to generate a list of preliminary COPECs for each media or a conclusion of no unacceptable risk.

When cumulative effects to a receptor are expected due to exposure to more than one chemical with similar toxicological effects, an ecological hazard index (HI) was calculated for detected analytes within a chemical class. An ecological HI is the sum of all hazard quotients from detected COPECs with similar toxicological mechanisms. This was based on the assumption that the effects are additive for COPECs that have the same toxic mechanism, which is typically only considered true for PAHs and polychlorinated biphenyls (PCBs). However, HIs were also calculated for total detected energetics, inorganics, petroleum products, semi-volatile organic compounds (SVOCs), and volatile organic compounds (VOCs) for each receptor as a conservative measure of potential risk. Only HQs for detected

analytes were summed in the HI calculation. This excluded the uncertainty associated with non-detected concentrations contributing to this estimation of potential for risk. If an HI exceeded 1.0 then all detected COPECs within the HI class were retained for the refined screening evaluation.

The risk characterization was conducted in two phases: an initial conservative phase and a refined phase. The initial phase employed maximum concentrations, no effect levels, and conservative assumptions to differentiate analytes that may present a risk from those that clearly do not. The refined phase evaluated the analytes retained in the initial phase in more detail using biologically more realistic assumptions and lowest effect levels in addition to no effect levels. Results of the initial and refined screens are presented below.

5.1 Terrestrial Plants

Table 14 presents a summary of the comparison of site soil data to NOEC-based media screening benchmarks for direct toxicity to plants. Screening values were found for 38 of the 87 analytes detected in at least one sample at the site, and for 40 of the 64 analytes below detection limits in all samples. No screening values could be identified for 49 detected analytes and 24 non-detected analytes. Consequently, these analytes were retained as uncertainties.

HI, the sum of all HQs for chemicals within each chemical class (energetics, inorganics, PAHs, petroleum products, SVOCs, and VOCs), were based only on detected analytes, and ranged from 0.013 for VOCs to more than 14,700 for inorganics. HIs did not exceed 1.0 for the energetic, VOC, and SVOC contaminant classes. Five energetics exceeded their respective NOEC-TRVs, although these exceedances were also based on detection limits (i.e., analytes were not detected in any samples). Eleven non-detected SVOCs also had HQs greater than 1.0. In the VOC chemical class, only non-detected 2-chlorophenol (HQ=15) and non-detected phenol (HQ=1.5) concentrations exceeded their NOEC-TRVs. The remaining 11 energetics, three SVOCs and eight VOCs with screening values did not exceed their TRVs and were determined to pose no risk to terrestrial plants. All non-detected analytes with HQs greater than 1.0 and all detected analytes from the inorganic, PAH, and petroleum product classes (HQs greater than 1.0) were retained for further analysis in the refined screening assessment.

NOEC-TRVs were exceeded for 17 of 20 inorganic COPECs with available TRVs. Only beryllium, cobalt, and perchlorate did not have HQs greater than 1.0 and were determined to not pose a risk to terrestrial plants at the site. Six analytes (carbon disulfide, iron, magnesium, nitrate, phosphorus, and strontium) did not have screening values; thus, they were retained as uncertainties. The NOEC-based HQ for aluminum was the greatest at 10,800. NOEC-based HQs for antimony (330), chromium (550), copper (1,800), lead (436), vanadium (129), and zinc (460) were also high. Barium, manganese, molybdenum, nickel, selenium, and silver all had NOEC-based HQs that ranged from 10 to 100. The remaining four inorganics (arsenic, cadmium, mercury, and thallium) had HQs greater than 1.0, but less than 10.

Fifteen of 17 PAHs exceeded their NOEC-TRVs for a HI sum of 851. The greatest HQs were for 2-methylnaphthalene (567) and naphthalene (177), while only two others (fluorene and

phenanthrene), both detected, had HQs between 10 and 100. Only detected fluoranthene and non-detected acenaphthene did not exceed their screening values.

The HI for petroleum products (5.9) was only comprised of TPH. This detected COPEC was retained for further analysis in the refined screening assessment.

Analytes that exceeded their NOEC-TRV, or those that contributed to an HI exceeding 1, could not be excluded from presenting a potential risk to terrestrial plants at the site, and were retained as COPECs for the refined screening assessment. This included all detected inorganics, PAHs, and petroleum products. The analytes not exceeding the NOEC-based TRVs, and where the contaminant class HI did not exceed 1, included 11 non-detected and 12 detected chemicals that are not considered to pose a potential risk to terrestrial plants at the HAFB – TTU site.

5.2 Soil Invertebrates

Table 15 presents a summary of the comparison of site soil data to NOEC-based media screening benchmarks for direct toxicity to invertebrates. Screening values were found for 53 of the 87 analytes detected at the site, and for 39 of the 64 analytes not found at concentrations greater than the detection limit. The remaining 34 detected analytes and 25 non-detected analytes without screening values were retained as uncertainties.

The HI for energetic compounds was 16. This was driven by the one detected analyte in this class (HMX) that exceeded its NOEC screening value. Two of the four detected analytes did not have screening values for soil invertebrates (picric acid and nitroguanidine), and were retained as uncertainties. The remaining detected energetic (2,4-dinitrotoluene) did not exceed its NOEC screening value (HQ=0.06). Only four of the 13 non-detected analytes with TRVs exceeded their respective NOECs, with HQs ranging from 2.6 (nitrobenzene) to 71 (4-nitrophenol and 2,4-dinitrophenol).

The highest HI score (5,150) was for the inorganic class of COPECs. There were 25 of 26 detected analytes in this chemical class. Only selenium was not detected in any sample (n=48), and concentrations did not exceed the NOEC. Eleven did not have screening values and, therefore, were retained as uncertainties. Screening values were exceeded by 10 of the remaining 14 detected analytes, with a NOEC-HQ of 3,600 (copper) driving the HI above 1. HQs were also high for chromium (1,383), zinc (115), and lead (28) while HQs for antimony, arsenic, barium, mercury, nickel, and perchlorate were less than 10. Screening values for beryllium, cadmium, cobalt, and thallium were not exceeded by detected analytes.

Five of the six detected PAHs (2-methylnaphthalene, anthracene, fluorene, naphthalene, and phenanthrene) exceeded their NOEC screening values and had HQs ranging from 7.2 (anthracene) to 57 (2-methylnaphthalene). These exceedances contributed to an HI of 177 for PAHs. Detected fluoranthene did not exceed its screening value. Two of the 10 non-detected PAHs also exceeded their respective screening values, with NOEC-based HQs of 4.6 (acenaphthylene) and 8.1 (pyrene).

The HI for petroleum products (67) was only comprised of TPH. This detected COPEC was retained for further analysis in the refined screening assessment.

A total of 14 SVOCs were evaluated against NOEC-TRVs for soil invertebrates. Only two of these were detected analytes (bis[2-ethylhexyl]phthalate and dibenzofuran) and only the dibenzofuran HQ exceeded 1.0 (8.6), to drive an HI greater than 1.0. Thus, both detected SVOCs were retained for the refined screening assessment. Seven of the 12 non-detected analytes that were screened against NOEC values had HQs greater than 1.0 and were also retained.

HIIs exceeded 1.0 for all chemical classes except for VOCs. HQs did not exceed 1.0 for any of the 28 VOCs that were detected and had screening values. NOEC-TRVs were not found for the other 20 detected VOCs. Only two of eight non-detected VOCs with TRVs had potential soil concentrations that exceeded their NOEC screening values, although 2-chlorophenol (10.5) was the only one where the HQ exceeded 10.

Analytes that exceeded the NOEC-TRV could not be excluded from presenting a potential risk to soil invertebrates at the site and were retained as COPECs for the refined screening assessment. This included all detected energetics, inorganics, PAHs, petroleum products, and SVOCs in addition to non-detected analytes where the HQ exceeded 1. The analytes not exceeding the NOEC-based TRVs included nine non-detected energetics, selenium, five non-detected PAHs, nine non-detected SVOCs, and 28 detected VOCs that are not considered to pose a potential risk to soil invertebrates at the HAFB – TTU site.

5.3 Mammals

Table 16 presents initial screening evaluation HQs calculated for mammalian wildlife receptors foraging across the site. Analytes found to exceed NOAEL-based TRVs in the initial screening assessment were retained for additional analysis in the refined screening assessment. NOEC-TRVs were found for 65 of the 87 detected COPECs at the site, and for 39 of the 64 non-detected COPECs at the site. The remaining 22 detected analytes and 25 non-detected analytes without TRVs were retained as uncertainties. Analytes were divided into six classes, of which there were 24 energetics, 26 inorganics, 17 PAHs, one TPH, 27 SVOCs, and 56 VOCs. All detected analytes within a class of analytes were also retained for the refined screening assessment when the HI exceeded 1.0. A summary of these results for all receptors is presented in Table 17.

All mammalian receptors (Ord's kangaroo rat, Townsend's ground squirrel, black-tailed jackrabbit, pronghorn, grasshopper mouse, and coyote) had NOAEL-based TRV exceedances for energetics, inorganics, and PAHs that led to HIIs greater than 1.0 for these classes of COPECs. All mammalian receptors, except for the coyote, also had maximum estimated exposures to detected VOCs greater than NOAEL-based TRVs, driving HIIs above 1.0. Only the grasshopper mouse had an HI for TPH greater than 1.0. No receptors had any detected COPECs that exceeded the NOAEL-based TRVs for SVOCs; thus, these compounds were determined not to pose a risk to mammalian wildlife receptors at the site.

All mammalian wildlife receptors had HIIs for energetics that exceeded 1. Exposures exceeded TRVs for 1,3-dinitrobenzene, 2,4-dinitrotoluene, 2,6-dinitrotoluene, HMX, RDX, and tetryl, with HQs ranging from 1.0 (1,3-dinitrobenzene; pronghorn) to 13 (1,3-dinitrobenzene; grasshopper mouse); however, HMX and 2,4-dinitrotoluene were the only energetic analytes with detected concentrations in soil. HMX doses were greater than the

NOAEL-based TRVs for all receptors, ranging from 2.5 (coyote) to 9.8 (kangaroo rat). Only grasshopper mouse exposure to 2,4-dinitrotoluene exceeded the NOAEL (HQ=1.3).

Inorganic HIs ranged from 90 (pronghorn) to 6,580 (grasshopper mouse). Aluminum, antimony, copper, and lead doses exceeded the NOAEL-based TRVs for each receptor within the inorganic class of contaminants. Lead and aluminum contributed greatest to each HI. NOAEC-based HQs also exceeded 1.0 in at least one receptor for all other metals except beryllium, cobalt, manganese, nitrate, and strontium. Except for non-detected selenium exposure to the ground squirrel, pronghorn, and coyote where HQs were less than 1.0, all inorganics were evaluated further in the refined screening evaluation for all mammalian receptors due to HIs greater than 1.0.

Similarly, all mammalian wildlife receptors had HIs for PAHs that exceeded 1.0. The only PAH that failed the NOEC-based TRV screen for all receptors was 2-methylnaphthalene. However, NOAEL-based HQs for 2-methylnaphthalene were generally less than 10, and ranged from 1.0 (coyote) to 7.1 (kangaroo rat) for all receptors except the grasshopper mouse (250). All detected PAHs and eight non-detected were retained for further evaluation in the refined screening assessment.

Only the grasshopper mouse had a TPH HQ greater than 1.0 (1.5), and it was retained for further characterization in the refined screening assessment. Petroleum products were determined not to pose a risk to all other mammalian wildlife receptors at the site.

Five of the six mammalian wildlife receptors (all except coyote) had HIs for VOCs that exceeded 1.0. In all cases, these HIs were driven by exposure to acetone exceeding the TRV doses. HQs for acetone ranged from 6.2 (pronghorn) to 20 (kangaroo rat). The exposure dose for phenol also exceeded the TRV for the grasshopper mouse (HQ=4.4); however, this was driven by non-detects.

Overall, HIs exceeded 1.0 in all species for energetics, inorganics, and PAHs; VOC HIs were also greater than 1.0 for all receptors except the coyote; and, only the grasshopper mouse had an HI greater than 1.0 for petroleum products. Detected COPECs from these classes were retained for further characterization in the refined assessment. The black-tailed jackrabbit, grasshopper mouse, and Ord's kangaroo rat were the most sensitive showing the highest HQs, while the pronghorn and coyote were less sensitive with lower HQs. A total of 21 non-detected COPECs with available TRVs had HQs greater than 1.0. These were also retained for further characterization in the refinement.

5.4 Birds

Table 16 also presents HQs calculated for avian wildlife receptors foraging across the site. NOAEL-TRVs were found for 62 of the 87 detected COPECs at the site, and for 34 of the 64 non-detected COPECs at the site. The remaining 25 detected analytes and 30 non-detected analytes without TRVs were retained as uncertainties. COPECs were divided into six classes of compounds and there were 24 energetics, 26 inorganics, 17 PAHs, one TPH, 27 SVOCs, and 56 VOCs. All detected analytes within a class were retained for the refined screening assessment when the HI exceeded 1.0 for the class, in addition to non-detected analytes where exposures exceeded the TRV. A summary of these results is presented in Table 17.

The only detected energetic compound that exceeded its TRV was 2,4-dinitrotoluene. Exceedances of 2.9 (western meadowlark), 3.3 (loggerhead shrike), and 3.5 (burrowing owl) were drivers for HIs greater than 1.0 for these three receptors. Several non-detected energetic compounds also exceeded their NOAEL-based TRVs, ranging in HQs from 1.0 (2-amino-4,6-dinitrotoluene; sage sparrow) to 99 (nitrobenzene; loggerhead shrike); however, these exceedances were all based on detection limits and have a high uncertainty.

All avian receptors (sage sparrow, loggerhead shrike, western meadowlark, and burrowing owl) had NOAEL-based TRV exceedances for inorganics that led to HIs exceeding 1.0 for this class. All detected inorganics, and non-detects greater than TRVs, were retained for further characterization in the refined screening evaluation. Inorganic HIs for each avian receptor ranged from 850 (sage sparrow) to 4,600 (owl). Lead and phosphorus were the dominant drivers for these high exceedances (greater than or equal to 98 percent of the HI) with phosphorus accounting for up to 80 percent of the inorganic HI score (sage sparrow) and lead contributing up to 50 percent (meadowlark). Other inorganics that exceeded their NOAEL-based TRVs included perchlorate in the sparrow (HQ=1.3). Aluminum, cadmium, chromium, and zinc in the shrike, meadowlark, and owl, and copper in the owl, also had HQs between 1.0 and 20.

Only one detected PAH (2-methylnaphthalene) exceeded its NOAEL-based TRV and was the primary HI driver. Exceedances ranged from 3.6 (meadowlark) to 4.1 (shrike). The sparrow did not exceed any single TRV for PAHs, but the HI still exceeded 1.0. Thus, all detected PAHs for these three receptors were retained for analysis in the refined screening assessment. PAH exposure to the owl did not exceed any TRV or HI. No non-detected PAHs had HQs greater than 1.0.

None of the receptors had any detected COPECs that exceeded the NOAEL-based TRVs in the petroleum product class of chemicals; thus, TPH was determined not to pose a risk to avian wildlife receptors at the site.

Shrike exposure to bis(2-ethylhexyl)phthalate was the only detected SVOC to exceed a NOAEL-based TRV (HQ=1.0). None of the other avian receptors had detected COPEC exposures greater than TRVs, and SVOC HIs for the sparrow, meadowlark, and owl were less than 1.0. Individual chemical HQs for non-detected SVOCs that also exceeded the NOAEL-based TRVs ranged from 1.1 for butyl benzylphthalate (owl) to 83 for butyl benzylphthalate (shrike). These non-detected COPECs were retained for further characterization in the refined screening assessment.

Sparrow exposure to acetone was the only detected VOC to exceed a NOAEL-based TRV (HQ=1.2). None of the other avian receptors had detected COPEC exposures greater than TRVs, and VOC HIs for the shrike, meadowlark, and owl were less than 1.0. Individual chemical exposures for non-detected VOCs were all less than their NOAEL-based TRV. Therefore, exposure to the sage sparrow from all detected VOCs was evaluated further in the refined screening assessment. All other COPECs were determined to pose no potential for risk to avian wildlife in the TTU site.

The HIs for inorganics exceeded 1.0 for all avian receptors. Lower-magnitude HIs were also calculated for energetics (shrike, meadowlark, and owl), PAHs (sparrow, shrike, and

meadowlark), SVOCs (shrike), and VOCs (sparrow). Thus, all detected COPECs from these classes were evaluated further in the refined screening assessment, in addition to non-detected COPECs with exposures greater than their TRV. The burrowing owl was the most sensitive avian receptor showing the highest HQs.

6.0 Refined Risk Characterization

COPECs in soil that were retained following the initial screening evaluation were evaluated further in the refined screening assessment. The refined screen was conducted to better clarify which analytes retained following the initial screen are present at concentrations that may present potential risks to ecological receptors. Refinements to the risk characterization take into account background concentrations, frequency of detection, frequency of exceedance, lowest effects levels, and more realistic exposure assumptions to provide a more detailed evaluation. Analytes retained at the conclusion of the refined screen may be the focus of risk management activities or may be subject to further, more definitive risk evaluation.

6.1 Risk Characterization Refinements

Multiple refinements to the exposure and effects analyses were incorporated. These are described below.

6.1.1 Background Screen

Soil data from the TTU were compared to background soil data collected in 1997, 1998, 2000, and 2004 for the purpose of excluding inorganic COPECs whose concentrations are not elevated due to on-site activities. COPECs with concentrations that do not exceed background are not likely to be site-associated, and are, therefore, unlikely to present a risk to ecological receptors. Background data for the TTU (URS, 2001) 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. In accordance with EPA guidance (EPA, 2002), data from these soil formations were statistically compared to site concentrations using the non-parametric Wilcoxon Rank Sum (WRS) test. If the null hypothesis was accepted (i.e., there was no significant [$p > 0.05$] difference between background and site data), then it was concluded that the analyte was not elevated relative to background and it was dropped from further consideration as a COPEC for all receptors. COPECs significantly greater than background concentrations were retained for further characterization in the refined screening evaluation.

6.1.2 Lowest Observed Effect Concentrations and Levels

In the initial evaluation, no-effect levels were conservatively assumed as the effect endpoints for plant, soil invertebrate, and wildlife HQ calculations. No-effect levels do not clearly indicate the lowest level of exposure at which effects are evident and, therefore, do not necessarily indicate that risks are present or impacts are occurring. In this refined evaluation, LOECs and LOAELs were identified or derived for plants, soil invertebrates, and wildlife for all COPECs where available (Tables 10 through 13).

6.1.3 Point-by-Point Exceedance Evaluation

In the initial site-wide evaluation for plants and soil invertebrates, the maximum site-wide concentrations in soil were evaluated against NOEC-based TRVs. This approach serves to eliminate those chemicals that clearly do not present risks, but does not address specific areas or the nature of potential risks associated with retained analytes. In the refined screen, a point-by-point evaluation of concentrations of retained analytes was conducted. The relative risk presented by each retained analyte was judged based on the frequency of detection of the analyte and the frequency and magnitude of exceedances of available TRVs. Depending on the screening value(s) exceeded, each exposure point estimate was grouped into one of the following three HQ categories:

$HQ_{NOEC} < 1$: no adverse effect

$HQ_{NOEC} > 1 > HQ_{LOEC}$: possible adverse effect

$HQ_{LOEC} > 1$: probable adverse effect

Because the NOEC represents the highest dose at which no effects were observed and the LOEC is the lowest dose at which effects were evident, there is uncertainty regarding whether adverse effects will occur when the exposure concentration falls between the NOEC and LOEC. In this situation, the potential for risk cannot be excluded but is not considered likely.

The frequency with which environmental concentrations exceeded toxicity values (percentage of HQs in each HQ category for each media-receptor combination for each location) provides an estimate of the likelihood of adverse effects in the point-by-point analyses. The maximum acceptable adverse effect level generally selected for the assessment endpoints is a 20 percent reduction in the measured attribute (Suter et al., 2000). Thus, if 80 percent or more of a population is not affected, then the risk is not considered biologically significant. This level is consistent with current EPA regulatory practices (e.g., development of the National Ambient Water Quality Criteria [NAWQC] and effluent discharges regulated by the National Pollutant Discharge Elimination System [NPDES]) and measurement limits for many field and laboratory tests. For example, aquatic subchronic toxicity tests are not reliable at detecting reductions at less than 20 percent adverse effect responses of the test organism; LOECs for avian reproduction tests correspond to a 20 percent reduction; and 20 percent reduction in community is the limit of detection for assessing aquatic communities using EPA rapid bioassessment procedures (Suter et al., 2000). Using available methods, changes in natural populations of less than 20 percent cannot generally be differentiated from “noise” measurements.

Consequently, an effect level of 20 percent was selected for plants and soil invertebrates. Assuming that the total samples provided an adequate spatial representation of the area, if fewer than 20 percent of samples possess concentrations that exceeded the LOEC-based TRV, it was assumed that adverse effects to the assessment endpoint were not significant. Both detected and non-detected concentrations retained for additional evaluation after the initial risk characterization were evaluated based on this criterion. However, the potential for

adverse effects indicated by TRV exceedances from non-detected concentrations suggest insufficiently low detection limits and represent uncertainties.

6.1.4 Exposure Point Concentrations

Maximum, site-wide concentrations were used as the EPCs in the initial evaluation for wildlife receptors. However, birds and mammals are mobile organisms and it is over-protective to consider that they are exposed to the maximum detected concentrations at all times. In addition, each area of the site provides a different set of potential exposures. Therefore, the EPCs were refined to the 95th percent UCL of the mean environmental media concentrations (UCL95) for each analyte (Table 3). The maximum detected concentration was used as the EPC when the calculated UCL95 was greater than the maximum detected value. All EPCs were calculated using the most recent version of ProUCL (Version 3.0; EPA 2004) and the distributional basis for calculating each UCL95 are reported in Table 3. One-half the detection limit was used as a surrogate for non-detects in calculating the UCL95.

This EPC refinement provides a more realistic estimate of COPEC exposures to wildlife. For these trophic guilds, it was also conservatively assumed that chemicals in sampled media are 100 percent bioavailable and that they remain at a steady concentration (i.e., decomposition rates were not considered).

6.1.5 Samples from Within Habitat

The entire area of the TTU does not provide habitat suitable for ecological receptors. Open Burning and Open Detonation (OB/OD) of missile motors and waste munitions results in the disturbance and elimination of habitat in the immediate vicinity. Land cover immediately adjacent and within operational areas (labeled as OB/OD areas) are barren and devoid of habitat and, therefore, represent an incomplete exposure pathway for ecological receptors. Consequently, a further refinement was developed in which only data from samples collected within areas that provide habitat at the site were considered. Samples falling within habitat and OB/OD areas are listed in Table 18 and are displayed in Figure 3. New summary statistics and EPCs were calculated based only on the habitat dataset (i.e., all OB/OD samples were excluded) and are presented in Table 19. Additional refined screening analyses were performed for all receptors for the purpose of evaluating relative contribution of samples from OB/OD areas and habitat areas to overall risks within the TTU.

6.1.6 Area Use Factors

In the initial screening assessment it was conservatively assumed that the area each wildlife receptor was exposed to was equal to the home range of each receptor. However, wildlife may forage over distances that exceed the exposure area offered by the site. Home-range information for each receptor was evaluated against each area of potential exposure in the refined exposure analysis. These foraging ranges were compared against the areas of each potential exposure location at the site as a conservative measure of the potential for use at these locations. The resulting ratio of site area (220 acres) to home range area for each receptor (Table 7) was used to determine the proportion of diet and media exposure that would be derived from each area of concern.

6.1.7 Bioaccumulation Factors

Bioaccumulation models for retained COPEC metals were based on log-linear regression models for all metals except iron. The BAF regression models used to estimate the concentration of COPECs in prey were updated to be based on the refined EPCs instead of maximum detected concentrations. The conservative use of 90th percentile uptake factors for inorganic COPECs without log-linear regression calculations for calculating uptake factors were replaced with more ecologically relevant median uptake factors in the refined wildlife exposure analysis (Table 20). BAFs for most organic COPECs were calculated based on log Kow equations and remained the same as in the initial screening assessment.

6.2 Refined Risk Characterization

The refined risk characterizations for all retained COPECs are described below.

6.2.1 Background Screen

The result of background comparison statistics are summarized in Table 21, and detailed in Appendix B. Nine analytes had concentrations in all samples that were not significantly different from background (aluminum, beryllium, chromium, iron, manganese, mercury, nickel, phosphorus, and thallium). In the case of aluminum, not only were concentrations within the background range, but the pH of TTU soils is neutral to basic (7.4 to 8.9; Table 3). At these pHs, aluminum is unlikely to be in a bioavailable form (EPA, 2003). An additional six inorganic analytes were significantly greater in concentration in background samples than on-site samples (arsenic, barium, cobalt, magnesium, strontium, and vanadium). These 15 analytes were not considered to be site-associated COPECs and were eliminated from further characterization and analysis.

Phosphorus is of special consideration due to differences between forms. Pure elemental phosphorus (white phosphorus) is used as an incendiary in munitions. Burned phosphorus products, containing very little white phosphorus, remain after munitions are spent. Munitions containing white phosphorus are minimal at the TTU. White phosphorus also does not persist in soil (3-7 day half-life) (ATSDR, 1997e). Screening level NOAEL-HQs for avian wildlife were high (>500) based on the maximum detected phosphorus concentration in soil (990 mg/kg). An uncertainty associated with this exposure calculation is that the TRV was based on test species (mallard duck) exposure to white phosphorus (Sparling et al. 1997). Another uncertainty is that the total phosphorus measured in soil is likely comprised of forms other than pure elemental phosphorus. Ultimately, it is not considered a site-related contaminant because site concentrations were not significantly different from background.

The remaining eight metals (antimony, cadmium, copper, lead, molybdenum, selenium, silver, and zinc) were retained through the refined risk characterization to determine if they posed a potential for risk in the screening assessment.

Further evaluation of the data for COPECs where the site concentrations were greater than background revealed that the samples driving these differences were generally driven by samples collected from operational areas (OB/OD) within the TTU site (Appendix B). This bias is discussed as part of an additional component of the refined risk characterization. This component differentiates between samples collected within habitat areas and those from the

OB/OD areas, and determines which samples from which area are responsible for estimates of potential for risk over the TTU site.

6.2.2 Terrestrial Plants

A point-by-point evaluation of the frequency of exceedance of NOAC- and LOEC-TRVs for plants by concentrations of retained analytes in TTU soils is presented in Table 22. Detected concentrations of analytes in the energetics, SVOCs, and VOC chemical classes did not exceed NOEC- or LOAC-TRVs for any analyte. Multiple exceedances of NOEC- or LOEC-based plant screening values were observed for non-detected concentrations. These exceedances indicate insufficiently low detection limits and represent uncertainties. The frequency of these non-detected concentrations exceeding either NOECs or LOECs never exceeded 12 percent among energetics, SVOCs, and VOCs. Even if it is assumed that reanalyses with lower detection limits would still result in NOEC or LOEC exceedances for all of these analytes (a conservative assumption), the frequency of exceedances are insufficient to suggest the potential for adverse effects (i.e., less than 20 percent). Consequently, it was concluded that all analytes in the energetics, SVOC, and VOC chemical classes pose no risk to terrestrial plants at the site.

Seven of the nine retained inorganic COPECs had concentrations (detected or not detected) in at least one sample that exceeded their LOEC-TRV. Only two inorganic COPECs did not have concentrations in excess of LOEC-TRVs (cadmium and perchlorate) and NOEC exceedances (cadmium) were infrequent (2 percent). Thus, neither cadmium nor perchlorate pose risks to plants at the TTU. Antimony, copper, lead, molybdenum, and silver all had samples with concentrations that exceeded LOECs; however, these COPECs are not considered likely to present risks to plants because the frequency of LOEC exceedances were low for each (less than 10 percent). Antimony, copper, molybdenum, and silver had high frequencies of detected or non-detected concentrations exceeding the NOEC, and the potential for adverse effects at these concentrations is possible, but uncertain because NOEC exceedances represent concentrations lower than those where adverse effects are initially observed. These NOEC exceedances indicate that adverse effects are possible, but the lack of LOEC exceedances in samples from ecological habitat areas suggests the absence of adverse effects to the plant community (Table 23). Selenium exceeded the LOEC with high frequency (66 percent). Because these exceedances were due to inadequate detection limits (i.e., all were due to non-detected concentrations), actual presence of selenium risks to plants are uncertain. Only one inorganic, zinc, had detected concentrations that exceeded the LOEC with a high frequency (67 percent). Consideration of only those samples from within areas that provide habitat within the TTU reduces the frequency of LOEC exceedances by zinc to 57 percent (Table 23), a value that still exceeds the probable risk threshold. Zinc did not exceed the LOEC by a high magnitude (LOEC-HQmax = 1.3), but these elevated concentrations were consistently found at five locations in 1991 (SS-16 to SS-20), five sample locations in 2002 (NR-229, NR-230, NR-232, NR-234, and NR-235), and two locations in 2004 (NR-527 and NR-529), as shown in Figure 3. Consequently, potential for risks to plants from zinc cannot be excluded.

Only five of 16 PAHs (2-methylnaphthalene, anthracene, fluorene, naphthalene, and phenanthrene) had detected concentrations that exceeded NOECs or LOECs (Table 22). The

frequency of exceedances for both NOECs and LOECs by detected and non-detected concentrations never exceeded 15 percent. Therefore, these analytes were not considered to present any significant risks to the terrestrial plant community. Among the remaining 11 PAHs, no detected concentrations exceeded TRVs, and because non-detected concentrations in only four of 28 samples (14 percent) exceeded LOECs, the likelihood of potential adverse effects is considered negligible. Consideration of the habitat area of the TTU indicates the lack of NOEC exceedances for any PAH (Table 23). Consequently, there is no risk to plants in ecological habitat areas of the site from PAHs.

TPH was detected in all six TTU soil samples in which it was analyzed, and exceeded the LOEC-TRV in three of these (50 percent). Despite the small sample size and uncertainty concerning the applicability of the toxicity data to the TPH form at the site, the high frequency of exceedances suggests that the potential for adverse effects to plants from TPH cannot be excluded. TPH was analyzed in one sample from outside the OB/OD areas and representing potential habitat for plants. This sample did not exceed the plant NOEC and indicates samples driving the potential for risk were mostly associated with OB/OD areas and do not represent the potential for risks in the surrounding habitat areas of the site. Therefore, there is no potential for risk to plants from TPH in habitat areas at the TTU.

6.2.3 Soil Invertebrates

A summary of the point-by-point refined soil invertebrate screen is presented in Table 24. Similar to plants, there were no exceedances of LOEC-TRVs by detected concentrations for any analytes in the VOC chemical class. The few and infrequent LOEC exceedances (13 percent of samples) that did occur (2-chlorophenol) were based on insufficient detection limits. Therefore, the potential for risks from VOCs to soil invertebrates at the site are unlikely.

Only one of six retained energetics (HMX) had detected concentrations that exceeded the NOEC or LOEC (Table 24). Although 20 percent of samples had detected concentrations that exceeded the NOEC, only one of 42 samples exceeded the LOEC (2 percent). Non-detected concentrations of 2,4-dinitrophenol, 2-nitrophenol, and 4-nitrophenol also exceeded the LOEC with low frequency (less than or equal to 14 percent). Non-detected concentrations of nitrobenzene exceeded the NOEC-TRV in fewer than 7 percent of the samples. Neither the single detected concentration, nor any non-detected concentrations, exceeded the NOEC for 2,4-dinitrotoluene. Because all exceedances of NOECs and LOECs by energetics, whether detected or not, did not exceed 20 percent, potential risks from energetics to soil invertebrates at the site are not considered significant. Further, when only samples from within habitat areas of the TTU are considered, no energetic LOEC exceedances were observed (Table 25), and NOEC exceedances for HMX are low (11 percent). This indicates that samples driving any potential for risk were mostly associated with OB/OD areas and do not represent the potential for risks in the surrounding habitat areas of the site. Therefore, the conclusion is that there is no significant potential for risk to soil invertebrates from energetics at the TTU.

Cadmium was the only inorganic that did not exceed the NOEC or LOEC in any samples (detected or non-detected). Therefore, the potential for risks to soil invertebrates from this COPEC is excluded. Antimony and perchlorate had single detected concentrations greater

than the NOEC and are not considered to pose any significant risk. The potential for adverse effects from copper, lead, and zinc were considered low due to the low frequency of LOEC-TRV exceedances (19, 2, and 8 percent, respectively). Copper and zinc, however, did have high frequency of NOEC exceedances by detected concentrations (85 and 100 percent, respectively). The potential for adverse effects at these concentrations is possible, but uncertain because these NOEC exceedances represent concentrations lower than those where adverse effects are initially observed. When only samples from within habitat areas of the TTU are considered, no LOEC exceedances are observed for lead and zinc, and only one of 21 (5 percent) samples exceeded the copper LOEC (Table 25). This indicates that samples driving the potential for risk were mostly associated with OB/OD areas and do not represent any potential for risks in the surrounding habitat areas of the site. Therefore, the conclusion is that there is no significant potential for risk to soil invertebrates from inorganics at habitat areas of the TTU.

Four of eight retained PAHs (2-methylnaphthalene, fluorene, naphthalene, and phenanthrene) had detected concentrations that exceeded LOECs (Table 24). The frequency of exceedances of LOECs for these PAHs was low (less than or equal to 14 percent). Non-detected or detected concentrations of the remaining four PAHs (acenaphthylene, anthracene, fluoranthene, and pyrene) also exceeded the NOEC or LOEC with low frequency (less than or equal to 14 percent). Because all exceedances of LOECs by PAHs, whether detected or not, did not exceed 20 percent, risks from PAHs to soil invertebrates at the site are unlikely to be significant. Further, when only samples from within habitat areas of the TTU are considered, no PAH NOEC or LOEC exceedances were observed (Table 25). This indicates that samples driving any potential for risk were mostly associated with OB/OD areas and do not represent the potential for risks in the surrounding habitat areas of the site. Therefore, the conclusion is that there is no potential for risk from PAHs at habitat areas of the TTU.

TPH, detected in all six TTU soil samples in which it was measured, exceeded the LOEC-TRV in four. Despite the small sample size and the uncertainty concerning the applicability of the toxicity data to the TPH form at the site, the high frequency of exceedances (67 percent) indicates that the potential for adverse effects to soil invertebrates from TPH cannot be excluded. TPH was analyzed in one sample from outside the OB/OD areas and representing potential habitat for invertebrates. This sample did not exceed the NOEC and indicates no potential for risk to soil invertebrates from TPH in habitat areas of the TTU.

Only one of nine retained SVOCs (dibenzofuran) had detected concentrations that exceeded NOECs or LOECs (Table 24). The frequency of LOEC exceedance for dibenzofuran was low (11 percent). Non-detected concentrations of 2,4,5-trichlorophenol, 2,4,6-trichlorophenol, and 2,4-dichlorophenol also exceeded the LOEC with low frequency (less than or equal to 14 percent). Non-detected concentrations in few (less than 14 percent) samples of the remaining five SVOC COPECs exceed the NOEC-TRV. Because all LOEC exceedance by SVOCs, whether detected or not, did not exceed 20 percent, significant risks from SVOCs to soil invertebrates at the site are unlikely. Further, when only samples from within habitat areas of the TTU are considered, no SVOC LOEC exceedances were observed (Table 25). Only one sample concentration exceeded a NOEC (2,4,5-trichlorophenol) in samples from habitat areas. This indicates that samples driving any potential for risk were mostly associated with OB/OD areas and do not represent the potential for risks in the surrounding

habitat areas of the site. Therefore, the conclusion is that there is no potential for risk to soil invertebrates from SVOCs at habitat areas of the TTU.

6.2.4 Mammals

The refined screening assessment for wildlife resulted in a reduced number of COPECs that pose a potential risk to mammals at the TTU (Tables 26 and 27). Table 28 shows a summary of the refined screening evaluation results. Analyte groups considered in the refined screen included energetics, inorganics, PAHs, petroleum products, SVOCs, and VOCs.

Refined estimates of exposure to five energetic compounds exceeded NOAELs for at least one receptor: 1,3-dinitrobenzene, 2,6-dinitrotoluene, HMX, RDX, and tetryl (Table 26). These NOAEL-HQs were generally of low magnitude and only exceeded 10 for the grasshopper mouse (1,3-dinitrobenzene and RDX). With the exception of HMX, these exceedances were also based on non-detected concentrations, indicating significant uncertainty regarding the possible potential for risk from these energetic COPECs. LOAELs were exceeded for only two of the six species, Ord's kangaroo rat and the grasshopper mouse. These exceedances were for four analytes: detected concentrations of HMX for the kangaroo rat (HQ=1.1) and non-detected concentrations of RDX, 1,3-dinitrobenzene, and 2,6-dinitrotoluene for the grasshopper mouse (HQs less than 3.0). When only samples from the habitat area of the TTU are considered (Table 27), HMX and 2,6-dinitrotoluene no longer drive estimated exposures in excess of the LOAEL for the kangaroo rat and grasshopper mouse, respectively. However, LOAEL exceedances based on non-detected RDX (HQ=1.1) and 1,3-dinitrobenzene (HQ=2.7) for the grasshopper mouse remain. The potential for risk from non-detected COPECs is uncertain and cannot be excluded, but the low magnitude of LOAEL exceedances suggests that the likelihood of adverse effects to mammals from energetic COPECs is low. LOAEL HIs for energetics were less than 1.0 for all receptors except the kangaroo rat (HI = 1.1). There is low confidence that this HI indicates a potential for risk because the mode of toxic action for this class of contaminants is not known to be additive. Therefore, the conclusion is that energetics present no risk to five of six mammal species at the TTU. Risks to insectivorous mammals from RDX and 1,3-dinitrobenzene cannot be definitively excluded because they are based on non-detects, and are retained as uncertainties.

Refined exposure estimates resulted in exceedances of NOAELs or LOAELs for seven inorganics for at least one receptor: antimony, cadmium, copper, lead, molybdenum, perchlorate, and selenium (Table 26). All except selenium were detected and represent possible potential for risks to mammalian wildlife. The greatest number of inorganic LOAEL exceedances was for the grasshopper mouse (five: antimony, cadmium, copper, lead, and selenium), followed by the kangaroo rat (three: lead, perchlorate, and selenium) and jackrabbit (three: copper, lead, and perchlorate). Lead and perchlorate were the only inorganics to produce exposure estimates in excess of the LOAELs for ground squirrels and pronghorn (HQs less than 3.0), driving HIs above 1.0 for these receptors. Cadmium, copper, and lead EPCs were driven by a few very high concentrations collected within OB/OD areas. There were no LOAEL exceedances for coyotes, and the low magnitude of NOAEL-HQs for antimony (3.3) and lead (1.2) indicates the potential for adverse effects to mammalian carnivores is unlikely.

When only samples from the habitat area of the TTU are considered (Table 27), no exposure estimates for any inorganic exceed NOAELs for the ground squirrel, pronghorn, or coyote. NOAELs were only exceeded for non-detected selenium (kangaroo rat, jackrabbit, and grasshopper mouse) and detected antimony, cadmium, lead, and molybdenum for the grasshopper mouse. NOAEL-HQs for all inorganics in ecological habitat were less than 5.0. These differences between exposure modeling with all site data and wildlife habitat data indicate that samples driving any potential for risk were mostly associated with OB/OD areas and do not represent the potential for risks in the surrounding wildlife habitat areas of the site. LOAELs were only exceeded for cadmium (HQ=1.8) and selenium (HQ=2.8) for the grasshopper mouse, and selenium (HQ=1.0) for the kangaroo rat. The selenium LOAEL exceedances are based on non-detected concentrations, and the potential for risk from these selenium values is uncertain. Cadmium was detected in 62 percent of samples collected from habitat areas. The magnitude of this exposure exceeding the LOAEL is low, but even excluding a sample with a concentration three times higher than the others, collected at the roadside near Site 3 (sample SS-16) in 1991 (shown in Figure 3), does not reduce the cadmium exposure below the LOAEL (HQ=1.01). Therefore, the potential for risk to insectivorous mammals is low, but cannot be excluded due to cadmium exposure exceeding the LOAEL.

Due to the individual COPEC exceedances, the LOAEL HIs for inorganics were greater than 1.0 for all receptors except the coyote when considering all site data. These exceedances suggest that the cumulative potential for adverse effects from inorganics cannot be excluded. When only potential receptor habitat was considered in the refined exposure analysis, the LOAEL HIs for inorganic COPECs was only exceeded for the grasshopper mouse (HI=3.2) (Table 26). Therefore, the potential for risk from inorganic COPECs is much lower in potential habitat areas of the site than when including the OB/OD areas. Calculated HIs for inorganics are a conservative approach to risk characterization; however, the mechanisms of toxicity are not the same for all inorganic compounds, and inorganic HIs are not entirely appropriate. Rather, the potential for risk from inorganics can be best described for individual COPECs.

The conclusion for inorganics is that there is no potential for risk to four of six mammal species in habitat areas of the TTU. Potential risks to kangaroo rats and grasshopper mice from selenium cannot be excluded because they are based on non-detects and are retained as uncertainties. The potential for risk to insectivorous mammals from cadmium also cannot be excluded. It should be noted, however, that the LOAEL exceedance for cadmium is low (HQ=1.8).

NOAEL-based TRV exceedances by 10 PAHs (2-methylnaphthalene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, fluorene, and indeno(1,2,3-cd)pyrene) were observed for at least one COPEC for each mammalian receptor except the coyote. Therefore, the potential for risk to coyotes from PAHs was excluded. The NOAEL-HQs were generally of low magnitude and only exceeded 10 for the grasshopper mouse (2-methylnaphthalene NOAEL-HQ=114). Benzo(g,h,i)perylene exceeded the NOAEL for all mammalian receptors (except the coyote), but was driven by non-detects. NOAEL exceedances based on detected concentrations occurred for all receptors (except coyote) for 2-methylnaphthalene. LOAEL-

based TRV exceedances by PAHs were observed for only two COPECs in two species. Fluorene exposure to the kangaroo rat exceeded the LOAEL (HQ=1.4), and 2-methylnaphthalene exposure to the grasshopper mouse exceeded the LOAEL (HQ=14) (Table 26). In addition to these two COPECs driving HIs for PAHs above 1.0 for the kangaroo rat and grasshopper mouse, the LOAEL-HI for PAH exposure to the jackrabbit also exceeded 1.0 (HI=1.2). However, when only samples from the habitat area of the TTU are considered, neither the NOAEL nor LOAEL-HI for PAHs is greater than 1.0 for any mammalian receptor. The conclusion is that samples that drive the potential for risk from PAHs are associated with OB/OD areas and do not represent the potential for risks in the surrounding wildlife habitat areas of the site. PAHs present no risk to mammals in ecological habitat areas of the TTU.

Refined exposure modeling for TPH was only conducted for the grasshopper mouse, and the NOAEL-TRV exceedance persisted (HQ=1.5) (Table 26). However, the LOAEL-TRV was not exceeded. The potential for adverse effects at these concentrations is possible, but uncertain, because NOEC exceedances represent concentrations lower than those where adverse effects are initially observed. The NOEC for TPH was not exceeded when considering only concentrations in wildlife habitat areas of the TTU (Table 27). Thus, petroleum products were determined not to pose a potential risk to mammalian wildlife in habitat areas of the site, and only a possible potential for risk in the entire TTU.

SVOCs were retained in the focused screen for three mammalian receptors (jackrabbit, grasshopper mouse, and coyote). However, all of the COPECs driving the refined mammalian wildlife screen for SVOCs were below detection. Seven of these non-detected SVOCs exceeded both the NOAEL and LOAEL for the grasshopper mouse (Table 26). Only one NOAEL exceedance from 2,4,5-trichlorophenol was observed for jackrabbits, and none for coyotes. Samples driving the potential for risk from SVOCs are associated with OB/OD areas and do not represent the potential for risks in the surrounding wildlife habitat areas of the site. Only the 2,4,5-trichlorophenol LOAEL is exceeded (HQ=3.3) for the grasshopper mouse when only areas of the TTU that provide wildlife habitat are considered (Table 27). NOAEL exceedances for the grasshopper mouse were less than 10 for the six additional non-detected SVOCs (2,4,6-trichlorophenol, 2,4-dichlorophenol, hexachlorobenzene, hexachlorocyclopentadiene, hexachloroethane, and pentachlorophenol), and SVOCs did not exceed the NOAEL for the jackrabbit or coyote. Because these COPECs exceed NOAELs but not LOAELs where effects are first observed, the potential for risks is considered possible but not likely. Therefore, the conclusion is that potential risk to insectivorous mammals from 2,4,5-trichlorophenol cannot be excluded, but is retained as an uncertainty because it is based on non-detects. SVOCs present no risk to all other mammals in ecological habitat areas of the TTU.

Of the 33 VOCs retained for additional evaluation for mammals, only acetone and phenol produced exposure estimates that exceeded NOAELs (Table 26). Detected acetone exceeded the NOAEL by low magnitude (HQs less than 10) for all mammalian receptors except the coyote, while non-detected phenol only exceeded the NOAEL for the grasshopper mouse (HQ=4.4). LOAEL exceedances were also of low magnitude for each of three species: the kangaroo rat (HQ=1.9), jackrabbit (HQ=1.2), the grasshopper mouse (HQ=1.4). However, when only areas of the TTU that provide habitat are considered, neither NOAEL nor LOAEL

exceedances occur for any VOC (Table 27). The conclusion is that samples driving the potential for risk from VOCs are associated with OB/OD areas and do not represent the potential for risks in the surrounding wildlife habitat areas of the site. VOCs, therefore, present no risk to mammals in ecological habitat areas of the TTU.

6.2.5 Birds

The refined screening assessment for wildlife resulted in a reduced number of COPECs that pose a potential risk to birds at the TTU (Tables 26 and 27). Table 28 shows a summary of the refined screening evaluation results. Petroleum products were not considered in the refined screening assessment for birds because they were eliminated as presenting risk for all avian receptors during the initial screen. Analyte groups considered in the refined screen included energetics, inorganics, PAHs, SVOCs, and VOCs.

Refined estimates of exposure for four (for the sage sparrow and burrowing owl) to as many as eight (for the shrike and meadowlark) energetic COPECs exceeded avian NOAELs (Table 26). However, the only detected COPEC in this group was 2,4-dinitrotoluene, which did not exceed the LOAEL. There is a possible potential for adverse effects to these receptors from COPECs with NOAEL exceedances, but this potential is low when the LOAEL is not also exceeded. LOAELs were exceeded for only two of four species, the loggerhead shrike and western meadowlark. These exceedances were for two analytes: non-detected concentrations of RDX for shrikes and nitrobenzene for both species. LOAEL-HQs were less than 5.0. None of the LOAEL-HIs for energetics exceeded 1.0 for any avian receptor. When only samples from habitat areas of the TTU are considered (Table 27), nitrobenzene drops out as producing estimated exposures in excess of the LOAEL for both species. The LOAEL exceedance based on non-detected RDX for the shrike persists with low magnitude (HQ=1.1). Samples driving the potential for risk to birds from energetics are mainly associated with OB/OD areas. The conclusion is that energetics present no risk to three of four bird species at the TTU. Risk to insectivorous birds from RDX cannot be excluded, because it is based on non-detected concentrations, and is retained as an uncertainty.

Refined estimates of exposure for inorganics exceeded NOAELs and LOAELs for all avian receptors (Table 26). These exceedances were driven by cadmium, lead, perchlorate, and zinc. NOAEL-HQs ranged from 1.2 for zinc exposure for the owl to 360 for lead exposure for the owl. While there is a possible potential for adverse effects to these receptors from COPECs with NOAEL exceedances, this potential is low when the LOAEL is not also exceeded. Lead exceeded the LOAEL for all avian receptors, with HQs ranging from 3.9 (sparrow) to 39 (owl). Cadmium exceeded the LOAEL for the shrike and meadowlark, with HQs less than 2.0. These exceedances drove HIs above 1.0 for all avian receptors, ranging from 4 (sage sparrow) to 40 (owl). Cadmium and lead EPCs driving HI exceedances were also influenced by a few very high concentrations collected within OB/OD areas. When only samples from the habitat area of the TTU are considered (Table 27), no exposure estimates for any inorganic exceeded LOAELs for any species. NOAEL exceedances for inorganic COPECs in habitat areas were low for cadmium in the shrike (HQ=1.4) and meadowlark (HQ=1.0), and lead in the owl (HQ=2.9). The conclusion is that potential risks from inorganics are associated with OB/OD areas and do not represent the potential for risks in the

surrounding wildlife habitat areas of the site. Inorganics present no significant risk to any of the four bird species in ecological habitat areas of the TTU.

PAHs were evaluated in the refined risk characterization for all bird receptor species except the owl. Although screening level HIs for PAHs were greater than 1.0 for the sparrow, shrike, and meadowlark, only 2-methylnaphthalene exposure exceeded the shrike and meadowlark NOAELs in the refinement. These NOAEL-HQs were less than 2.0, and modeled exposures did not exceed the LOAELs. While there is a possible potential for adverse effects to these receptors from COPECs with NOAEL exceedances, this potential is low when the LOAEL is not also exceeded. The lack of LOAEL exceedances resulted in the conclusion that the potential for adverse effects in avian wildlife from PAHs is not likely. PAHs in samples representing habitat areas within the TTU did not exceed NOAELs. Therefore, there is a low potential for risk to avian receptors from PAHs at the TTU.

One detected SVOC (bis[2-ethylhexyl]phthalate) exceeded the NOAEL (HQ=1.0) for one receptor (shrike) in the refined screening assessment. Non-detected SVOCs exceeded their NOAEL-TRVs for all species. Exposure to four of these non-detected COPECs (2,4,5-trichlorophenol, hexachlorobenzene, hexachlorocyclopentadiene, and hexachloroethane) also exceeded LOAELs for the shrike and meadowlark, with LOAEL-HQs less than 5. While the potential for risk from non-detected COPECs is uncertain, it cannot be excluded. The LOAEL HI for the loggerhead shrike, the only avian receptor with detected SVOC COPECs retained, was below 1.0. When only samples from habitat area of the TTU are considered (Table 26), no exposure estimates for any SVOC exceed LOAELs for any species. Several non-detected phthalates continued to exceed their NOAELs for exposure to the shrike (butyl benzylphthalate, diethylphthalate, dimethylphthalate, di-n-butylphthalate, and di-n-octylphthalate) and meadowlark (butyl benzylphthalate, diethylphthalate, di-n-butylphthalate, and di-n-octylphthalate) in habitat areas. However, these NOAEL-HQs were all less than 1.5 and were based on non-detected concentrations. Uncertainty associated with phthalate exposure estimates is high. Phthalate exposures are likely overestimated due to the log Kows, ranging from 3.6 to 10.6, driving the large estimated biotransfer factor (using the Kow-based equation). Further, phthalate esters are rapidly broken down in the environment by photolysis and biodegradation (Staples et al., 1997). Biotransformation limits bioaccumulation of phthalate esters with increasing trophic level and general bioaccumulation models do not consider these chemical specific variances. It is, therefore, likely that the Kow BCF model contributes to overestimating exposure. The risk conclusion for avian exposure to SVOCs is that potential for adverse effects are uncertain in OB/OD areas and are not present in the surrounding wildlife habitat areas of the site. SVOCs present a low potential for risk to avian receptors in ecological habitat areas of the TTU.

The NOAEL-HI for VOC exposure to the sage sparrow was greater than 1.0 in the initial screening assessment, but did not exceed 1.0 in the refined screening assessment. Sparrow exposure to all VOCs was less than NOAELs. Therefore, there is no potential for adverse effects from VOCs to any avian wildlife receptor at the site.

7.0 Uncertainties

Uncertainties are inherent in all risk assessments. The nature and magnitude of uncertainties depend on the amount and quality of data available, the degree of knowledge concerning site conditions, and the assumptions made to perform the assessment. A qualitative evaluation of the major uncertainties associated with this screening assessment, in no particular order of importance, is outlined below.

- No avian and mammalian life history data specific to the site were available; therefore, exposure parameters were either modeled based on allometric relationships (e.g., food ingestion rates) or were based on data from these same species in other portions of their range. Because diet composition as well as food, water, and soil ingestion rates can differ among individuals and locations, published parameter values may not accurately reflect individuals present at the site. As a consequence, risk may be either overestimated or underestimated.
- No site-specific data on concentrations in terrestrial plants, invertebrates, or small mammals were available. Therefore, concentrations in these prey items were estimated using literature-derived bioaccumulation models. The suitability of these models is unknown. As a consequence, concentrations of COPECs in actual prey may be either higher or lower than the data used in this screen.
- BCFs for estimating chemical specific tissue concentrations in plants were calculated using a Kow-specific regression model from EPA (2005). These models were used when chemical-specific BCFs were not available and provide the best available tool for estimating the uptake of organic compounds into tissues. However, these models are less accurate at predicting tissue concentrations for chemicals with Kow values outside of the range for which they were developed (3-8). For these and other reasons, exposure doses and potential risks to wildlife may be either overestimated or underestimated.
- BCFs for estimating chemical-specific tissue concentrations in wildlife was estimated using a Kow-specific regression model developed by Travis and Arms (1988). This model was used only when chemical-specific BCFs were not available and is the best available tool for estimating the uptake of organic compounds into tissues. However, there are limitations to the Travis and Arms (1988) model that are described in Birak et al. (2001). Essentially, the model is less accurate at predicting BCFs for chemicals with Kow values outside of those used in the model development (6-6.9). For these and other reasons, exposure doses and potential risks to wildlife may be overestimated or underestimated.
- Assumptions that chemicals and organisms are at a steady state, that none of the chemicals are metabolized, and that BCFs are consistent in all ingested media may not be accurate. For these and other reasons, exposure doses and potential risks to wildlife may be overestimated or underestimated.
- Concentrations in many samples were below detection limits. Concentrations in these samples were estimated to be one-half the detection limit. If an analyte was never detected in any sample, it was assumed not to be present, which may lead to an underestimation of risk. In contrast, if an analyte was detected in at least one sample,

summary statistics were based on the one-half detection limit assumption, leading to an overestimation of risk.

- Literature-derived toxicity data based on laboratory studies were the only available toxicity data used to evaluate risk to all receptor groups. It was assumed that effects observed in laboratory species were indicative of effects that would occur in wild species. The suitability of this assumption is unknown. Consequently, risk may be either overestimated or underestimated. In addition, due to the limited availability of toxicity data, confidence in the quality of some of the screening values (as defined by the authors of these values) was low. This was particularly the case with the plant and soil invertebrate screening values. These values may, therefore, overestimate toxicity and risk.
- The exposure dose estimates in this screening risk assessment assume that 100 percent of the chemical concentrations to which receptors are exposed are in the bioavailable form. Most chemicals will not be 100 percent bioavailable. In the cases where bioavailability is less than 100 percent, risk is overestimated.
- Adequate toxicity information is not available for some constituents that were detected in environmental media to quantify ecological risks. In some cases, data for surrogate chemicals were used. The use of surrogate toxicity information to quantify toxicity for these contaminants might lead to overestimates or underestimates of risk to ecological receptors. For some contaminants, there is no information available from which to develop TRVs and these constituents could not be evaluated.
- Dietary compositions were simplified for the site receptors to estimate concentrations in food items using bioaccumulation models. It was assumed concentrations were similar in comparable food types. The suitability of this assumption is unknown. Consequently, risk may be either overestimated or underestimated.
- Few analyte-specific avian toxicity values were available for energetic compounds. As a consequence, available data were often used as surrogates. Similarly, bioaccumulation data for energetic compounds exist from EPA (2005) for TNT and RDX, and for HMX and dinitrotoluenes (U.S. Army, 2005), but are otherwise lacking. Further, only four energetics were detected in TTU soils, with frequencies of detection of 32 percent or less. The analytes estimated to exceed LOAELs (nitrobenzene and RDX) were below the detection limit in all samples analyzed. These factors indicate uncertainty in the evaluation of risks from energetics to birds and risks may be overestimated or underestimated.
- Because toxicity data specific for bird and mammal species at the site were not available, it was necessary to extrapolate toxicity values from test species to site receptor species. Therefore, risk may be either overestimated or underestimated.
- In this screen, risks for most chemicals were each considered independently. Because chemicals may interact in an additive, antagonistic, or synergistic manner, evaluation of single-chemical risk may either underestimate or overestimate risk associated with chemical mixtures. The risks from inorganic, energetic, PAH, TPH, VOC, and SVOC chemical classes were each summed to estimate the combined risk. The suitability of the assumption of additive toxicity is not known; consequently, risk may be either overestimated or underestimated.

- Toxicity data was not available to evaluate the effects of all COPECs for all receptors. The COPECs for which there is no toxicological information and the potential for causing risks to ecological receptors is uncertain are summarized below:

7.1 Chemical Uncertainties for Plants

1,1,1,2-Tetrachloroethane, 1,1,1-Trichloroethane, 1,1,2,2-Tetrachloroethane, 1,1,2-Trichloroethane, 1,1-Dichloroethane, 1,1-Dichloroethene, 1,2,3-Trichlorobenzene, 1,2,3-Trichloropropane, 1,2,4-Trichlorobenzene, 1,2-Dibromo-3-chloropropane, 1,2-Dichlorobenzene, 1,2-Dichloroethane, 1,2-Dichloropropane, 1,2-Ethylene Dibromide, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, 2,4-Dimethylphenol, 2-Butanone, 2-ChloroethylVinylEther, 2-Chloronaphthalene, 2-Hexanone, 2-Methylphenol, 2-Nitroaniline, 3,3-Dichlorobenzidine, 3-Nitroaniline, 4,6-Dinitro-2-methylphenol, 4-Bromophenylphenylether, 4-Chloro-3-methylphenol, 4-Chlorophenylphenylether, 4-Methyl-2-pentanone, 4-Methylphenol, 4-Nitroaniline, Acetone, Benzoic acid, Benzylalcohol, Bis(2-chloroethoxy)methane, Bis(2-chloroethyl)ether, Bis(2-chloroisopropyl)ether, Bromodichloromethane, Bromoform, Bromomethane, Carbon disulfide, Carbon tetrachloride, Chloroethane, Chloroform, Chloromethane, cis-1,2-Dichloroethene, cis-1,3-Dichloropropane, Dibenzofuran, Dibromochloromethane, Dibromomethane, Dichlorodifluoromethane, Hexachloroethane, Iron, Isophorone, Magnesium, Methylene chloride, Nitrate, Nitroglycerin, Nitroguanidine, n-Nitroso-di-n-propylamine, n-Nitrosodiphenylamine, PETN, Phosphorus, Picric Acid, Strontium, tert-ButylMethylEther, Trans-1,2-Dichloroethene, Trans-1,3-Dichloropropene, Trichloroethylene (TCE), Trichlorofluoromethane, Vinyl Acetate, Vinyl chloride

7.2 Chemical Uncertainties for Soil Invertebrates

1,2-Dibromo-3-chloropropane, 1,2-Ethylene Dibromide, 2,4-Dimethylphenol, 2-Butanone, 2-ChloroethylVinylEther, 2-Chloronaphthalene, 2-Hexanone, 2-Methylphenol, 2-Nitroaniline, 3,3-Dichlorobenzidine, 3-Nitroaniline, 4,6-Dinitro-2-methylphenol, 4-Bromophenylphenylether, 4-Chloro-3-methylphenol, 4-Chlorophenylphenylether, 4-Methyl-2-pentanone, 4-Methylphenol, 4-Nitroaniline, Acetone, Aluminum, Benzoic acid, Benzylalcohol, Bis(2-chloroethoxy)methane, bis(2-chloroethyl)ether, bis(2-chloroisopropyl)ether, Bromodichloromethane, Bromoform, Bromomethane, Carbon disulfide, Carbon tetrachloride, Dibromochloromethane, Dibromomethane, Dichlorodifluoromethane, Hexachlorobenzene, Hexachlorobutadiene, Hexachlorocyclopentadiene, Hexachloroethane, Iron, Isophorone, Magnesium, Manganese, Methylene chloride, Molybdenum, Nitrate, Nitroglycerin, Nitroguanidine, PETN, Phosphorus, Picric acid, Silver, Strontium, tert-ButylMethylEther, Tetrachloroethene, Tetryl, Trichloroethylene (TCE), Trichlorofluoromethane, Vanadium, Vinyl Acetate, Vinyl chloride

7.3 Uncertainties for Mammals

1,2,3-Trichlorobenzene, 1,2,4-Trichlorobenzene, 1,2-Dibromo-3-chloropropane, 1,2-Dichlorobenzene, 1,2-Ethylene Dibromide, 1,3-Dichlorobenzene, 1,4-Dichlorobenzene, 2,4-Dimethylphenol, 2,4-Dinitrophenol, 2-ChloroethylVinylEther, 2-Chloronaphthalene, 2-Chlorophenol, 2-Nitroaniline, 2-Nitrophenol, 3,3-Dichlorobenzidine, 3-Nitroaniline, 4,6-Dinitro-2-methylphenol, 4-Bromophenylphenylether, 4-Chloro-3-methylphenol, 4-

Chloroaniline, 4-Chlorophenylphenylether, 4-Nitroaniline, 4-Nitrophenol, Benzoic acid, Benzylalcohol, Bis(2-chloroethoxy)methane, bis(2-chloroethyl)ether, bis(2-chloroisopropyl)ether, Bromodichloromethane, Calcium, Carbon disulfide, Chloride, Dibenzofuran, Dibromochloromethane, Dibromomethane, Dichlorodifluoromethane, Iron, Isophorone, Magnesium, Nitrobenzene, Nitroguanidine, n-Nitroso-di-n-propylamine, n-Nitrosodiphenylamine, Phosphorus, Picric acid, Potassium, Sodium, Styrene, Sulfate, tert-ButylMethylEther, Trichlorofluoromethane, Vinyl Acetate

7.4 Uncertainties for Birds

1,2-Dibromo-3-chloropropane, 1,2-Ethylene Dibromide, 2,4-Dimethylphenol, 2,4-Dinitrophenol, 2-ChloroethylVinylEther, 2-Chloronaphthalene, 2-Methylphenol, 2-Nitroaniline, 2-Nitrophenol, 3,3-Dichlorobenzidine, 3-Nitroaniline, 4,6-Dinitro-2-methylphenol, 4-Bromophenylphenylether, 4-Chloro-3-methylphenol, 4-Chloroaniline, 4-Chlorophenylphenylether, 4-Methylphenol, 4-Nitroaniline, 4-Nitrophenol, Antimony, Benzylalcohol, Beryllium, bis(2-chloroethoxy)methane, bis(2-chloroethyl)ether, bis(2-chloroisopropyl)ether, Bromodichloromethane, Bromoform, Bromomethane, Calcium, Carbon disulfide, Carbon tetrachloride, Chloride, Chloroform, Chrysene, Dibenzofuran, Iron, Isophorone, Magnesium, Methylene chloride, Nitrate, Nitroglycerin, Nitroguanidine, n-Nitroso-di-n-propylamine, n-Nitrosodiphenylamine, PETN, Phenol, Picric acid, Potassium, Pyrene, Silver, Sodium, Strontium, Styrene, Sulfate, tert-ButylMethylEther, Tetryl, Trichloroethylene (TCE), Trichlorofluoromethane, Vinyl acetate, Vinyl chloride

8.0 Conclusions

A SLERA for the Hill AFB TTU site was conducted in two parts: an initial conservative site-wide screen followed by a refined evaluation. The initial site-wide screen employed conservative assumptions, and used the maximum detected concentration coupled with no-effect thresholds to differentiate between analytes that clearly presented no risk and those for which insufficient data were available to permit their exclusion (e.g., retained analytes). The refined screen employed biologically more realistic exposure and effects assumptions, and focused only on retained analytes. Key conclusions of potential risk are described below and are summarized in Table 28.

8.1 Background Comparison

Nine analytes had concentrations in all samples that were not significantly different from background (aluminum, beryllium, chromium, iron, manganese, mercury, nickel, phosphorus, and thallium). An additional six inorganic analytes were significantly greater in concentration in background samples than on-site samples (arsenic, barium, cobalt, magnesium, strontium, and vanadium). These 15 analytes were not considered to be site-associated COPECs and were eliminated from further characterization and analysis.

8.2 Plants

Analytes not exceeding the NOEC-based TRVs included 11 non-detected and 16 detected chemicals that are not considered to pose a potential risk to terrestrial plants at the Hill AFB – TTU site. No TRVs could be identified for 49 detected analytes and 24 non-detected analytes. Consequently, these analytes were retained as uncertainties.

There were no exceedances of either NOEC or LOEC-TRVs by any detected analytes in the energetics, SVOCs, and VOC chemical classes. The few and infrequent TRV exceedances that did occur in these classes were based on detection limits for analytes that were not detected. Therefore, it was concluded that all analytes in the energetics, SVOC, and VOC chemical classes do not pose a risk to terrestrial plants at the site.

Of the 30 analytes displaying concentrations in excess of LOECs, the likelihood of potential effects to the plant community was considered to be low. This was due to exceedances being driven by non-detected concentrations for 18 COPECs and the low frequency of exceedances by all detected and non-detected COPECs except zinc and TPH. The frequencies of LOEC exceedances for five PAHs in site samples were also low. The potential for risk was mostly associated with OB/OD areas and does not represent the potential for risks in the surrounding habitat areas of the site. Only metal COPECs showed any NOEC and LOEC exceedances in ecological habitat. Detected concentrations of antimony, copper, and molybdenum exceeded the NOEC with a high frequency in ecological habitat areas. These NOEC exceedances (less than or equal to 87 percent) indicate that adverse effects are possible, but the lack of LOEC exceedances suggests that adverse effects to the plant community are unlikely. Selenium exceeded the LOEC with high frequency (67 percent); however, these exceedances were due to inadequate detection limits (i.e., all were due to non-detected concentrations), and the actual risks to plants from selenium are uncertain. The potential for adverse effects to plants cannot be excluded for zinc due to the high frequency of LOEC-TRV exceedances in both OB/OD and habitat samples.

8.3 Soil Invertebrates

Screening values were found for 53 of the 87 analytes detected at the site, and for 39 of the 64 analytes not found at concentrations greater than the detection limit. The remaining 34 detected analytes and 25 non-detected analytes without TRVs were retained as uncertainties. The analytes not exceeding the NOEC-based TRVs included 24 non-detected and 35 detected chemicals that are not considered to pose a potential risk to soil invertebrates at the Hill AFB – TTU site.

There were no exceedances of either LOEC-TRVs by any detected analytes in the VOC chemical classes. The few and infrequent (less than 13 percent of samples) NOEC or LOEC exceedances that did occur in these classes were based on detection limits. Therefore, these classes of chemicals are not considered to pose a risk to terrestrial soil invertebrates at the site.

Of the 20 analytes displaying concentrations in excess of LOECs, the likelihood of potential effects to the soil invertebrate community was considered to be low. This was due to exceedances being driven by non-detected concentrations for 10 COPECs and the low frequency of exceedances by all detected and non-detected COPECs except TPH. Detected concentrations of HMX, copper, lead, zinc, 2-methylnaphthalene, fluorene, naphthalene, phenanthrene, and dibenzofuran each exceeded the LOEC in fewer than 20 percent of site-wide samples. These low frequencies of LOEC exceedances suggest the absence of adverse effects to the soil invertebrate community even when OB/OD samples are considered. No PAH, TPH, VOC, or SVOCs exceed NOECs or LOECs when only samples from within

habitat areas of the TTU are considered. Only HMX and two metal COPECs showed NOEC (HMX and zinc) and LOEC (copper) exceedances in ecological habitat areas by detected concentrations, indicating that samples driving the potential for risk were mostly associated with OB/OD areas and do not represent the potential for risks in the surrounding habitat areas of the site. HMX exceeded the NOEC by a low frequency of samples (10 percent) and is not considered to pose a significant risk to invertebrate communities. Detected concentrations of copper and zinc exceeded the NOEC with a high frequency in ecological habitat areas. These NOEC exceedances (less than or equal to 100 percent) indicate that adverse effects are possible, but the lack of LOEC exceedances for zinc, and low LOEC exceedance frequency for copper (5 percent), suggests the likelihood of significant community-level effects is low.

8.4 Mammals

NOEC-TRVs were found for 65 of the 87 detected COPECs at the site, and for 39 of the 64 non-detected COPECs at the site. The remaining 22 detected analytes and 25 non-detected analytes without TRVs were retained as uncertainties. Overall, NOAEL-based HIs exceeded 1.0 in all species for energetics and inorganics, and in some species for PAHs, petroleum products, SVOCs, and VOCs.

NOAEL exceedances by five energetics were generally of low magnitude and based on non-detected concentrations for all except HMX. LOAELs were exceeded at a low magnitude by only four energetic COPECs (HMX, RDX, 1,3-dinitrobenzene, and 2,6-dinitrotoluene) for two mammalian receptors (Ord's kangaroo rat and the grasshopper mouse). However, when only samples from the habitat area of the TTU are considered, only LOAEL exceedances based on non-detected RDX and 1,3-dinitrobenzene for the grasshopper mouse remain. Therefore, the potential for risks from energetics to five of the six mammalian receptor species in wildlife habitat areas of the TTU is considered unlikely. Risks to mammalian insectivores (grasshopper mice) from RDX and 1,3-dinitrobenzene cannot be excluded, but are retained as uncertainties because they are based on non-detects.

Refined exposure estimates resulted in exceedances of NOAELs or LOAELs for antimony, cadmium, copper, lead, molybdenum, perchlorate, and selenium in at least one receptor. All were detected except selenium, and represent possible potential for risks to mammalian wildlife. Samples driving any potential for risk were mostly associated with OB/OD areas and do not represent the potential for risks in the surrounding wildlife habitat areas. When only samples from the habitat area of the TTU are considered, no exposure estimates for any inorganic exceed NOAELs for the coyote, ground squirrel, or pronghorn. NOAELs were only exceeded for non-detected selenium (kangaroo rat, jackrabbit, and grasshopper mouse) and detected antimony, cadmium, lead, and molybdenum for the grasshopper mouse. LOAELs were only exceeded (HQs less than 3.0) for cadmium and selenium for the grasshopper mouse, and selenium for the kangaroo rat; therefore, there is no potential for significant risk to four of six mammal species in habitat areas of the TTU. Potential risks to small mammalian herbivores (kangaroo rats) and mammalian insectivores (grasshopper mice) from selenium cannot be excluded because they are based on non-detects and are retained as uncertainties; and, potential for risk to mammalian insectivores from cadmium also cannot be excluded.

NOAEL-based TRV exceedances by 10 PAHs were observed for at least one COPEC in each mammalian receptor, except the coyote. LOAEL exceedances were also observed for fluorene (kangaroo rat) and 2-methylnaphthalene (grasshopper mouse). However, PAHs are associated with OB/OD areas and do not represent the potential for risks in the surrounding wildlife habitat areas of the site. The NOAEL-HI for PAHs is less than 1.0 for all mammalian receptors when only samples from the habitat area of the TTU are considered. Therefore, PAHs present no risk to mammals in ecological habitat areas of the TTU.

Screening exposure estimates for TPH only exceeded NOAELs for the grasshopper mouse. Therefore, petroleum products do not pose a potential for risk to the five other mammalian receptors at the TTU. The refined exposure estimate for the grasshopper mouse exceeded the NOAEL, but not when considering concentrations only from wildlife habitat areas of the TTU. Thus, petroleum products were determined not to pose a potential risk to mammalian wildlife in habitat areas of the site, and only a possible potential for risk for the grasshopper mouse over the entire TTU.

SVOCs did not exceed initial screening exposure NOAEL-HIs for any mammalian receptor, although several non-detected COPECs did exceed individual NOAELs for the jackrabbit, grasshopper mouse, and coyote. These samples driving the potential for risk from SVOCs are associated with OB/OD areas and do not represent the potential for risks in the surrounding wildlife habitat areas of the site. Potential risk to mammalian insectivores (grasshopper mice) from non-detected 2,4,5-trichlorophenol cannot be excluded, but is retained as an uncertainty. Otherwise SVOCs present no risk to all other mammals in ecological habitat areas of the TTU.

Acetone and phenol were the only VOCs that exceeded NOAELs in the refined exposure estimates. However, the samples driving the potential for risk from VOCs are associated with OB/OD areas and do not represent the potential for risks in the surrounding wildlife habitat areas of the site. When only areas of the TTU that provide habitat are considered, NOAELs were not exceeded by any VOC. The conclusion is that VOCs present no risk to mammals in ecological habitat areas of the TTU.

8.5 Birds

NOAEL-TRVs were found for 62 of the 87 detected COPECs at the site, and for 34 of the 64 non-detected COPECs at the site. The remaining 25 detected analytes and 30 non-detected analytes without TRVs were retained as uncertainties. Neither detected nor non-detected petroleum products or VOCs exceeded their NOAELs for any avian receptor species. Thus, the potential for risk to birds from these chemical classes is excluded. Refined estimates of potential exposure identified NOAEL-based HIs greater than 1.0 in all species for inorganics, and in at least one species for energetics, PAHs, and SVOCs.

Refined estimates of exposure for eight energetic COPECs exceeded NOAELs for all four avian receptors. These exceedances were based on detected 2,4-dinitrotoluene, which did not exceed its LOAEL, and on non-detected COPECs where the potential for risks are uncertain. Samples driving the potential for risk to birds from energetics are mainly associated with OB/OD areas. No detected energetic COPEC exceeded the NOAEL for any avian receptor based on samples collected in habitat areas of the TTU. Eight COPECs continue to exceed

NOAELs in habitat samples, but only non-detected RDX poses a potential for risk to shrikes, based on the only LOAEL exceedance. The potential for risk to all avian receptors from all other non-detected energetics exceeding only NOAEL exposures are uncertain. Therefore, energetics do not present a potential for significant risk to three of four bird species in wildlife habitat areas of the TTU. Risk to avian insectivores (loggerhead shrikes) from RDX cannot be excluded because it is based on non-detects, and is retained as an uncertainty.

LOAEL-based HIs for inorganic COPECs were greater than 1.0 for all receptors, ranging from 5 (sparrow) to 39 (owl). The primary risk drivers for inorganic HIs were cadmium and lead. Perchlorate and zinc also exceeded shrike and owl NOAELs, but the possible potential for adverse effects to these receptors is low because the LOAELs were not exceeded. Cadmium, lead, perchlorate, and zinc EPCs driving NOAEL and LOAEL exceedances were also influenced by a few very high concentrations collected within OB/OD areas, primarily at the inactive burn pan site. When only samples from the habitat area of the TTU are considered, no exposure estimates for any inorganic COPEC exceed the LOAEL for any species. NOAEL exceedances for cadmium and lead in habitat areas were also of low magnitude (HQs less than 3.0). The conclusion is that potential risks from inorganics are associated with OB/OD areas and do not represent the potential for risks in the surrounding wildlife habitat areas of the site. Inorganics do not present a significant risk to any of the four bird species in ecological habitat areas of the TTU.

Screening exposure estimates for PAHs did not exceed burrowing owl NOAELs. Although screening-level HIs for PAHs were greater than 1.0 for the sparrow, shrike, and meadowlark, only detected 2-methylnaphthalene exposures exceeded the shrike and meadowlark NOAELs in the refinement (HQs less than 3.0). PAHs in samples representing habitat areas within the TTU did not exceed NOAELs. Therefore, there is no potential for risk to avian receptors from PAHs in habitat areas at the TTU.

Screening exposure estimates for SVOC did not exceed NOAEL-HIs for the sparrow, meadowlark, or owl. While the screening-level HI for the shrike exceeded 1.0, the refined exposure estimate was equal to 1.0. Bis(2-ethylhexyl)phthalate exposure to the shrike was equal to the NOAEL. No LOAEL was available for comparison to the exposure dose, but the low magnitude of this exceedance indicates that the likelihood of adverse effects is low. Otherwise, only non-detected SVOCs exceeded their NOAELs or LOAELs in the refined screening assessment. No exposure estimate for any SVOC exceeded a LOAEL for any species due to samples from habitat area of the TTU. Non-detected phthalates continue to exceed NOAELs for phthalate exposure to the shrike and meadowlark in wildlife habitat samples. However, the potential for possible adverse effects from these COPECs is considered low due to rapid environmental degradation, biotransformation, and inappropriate bioaccumulation modeling. The conclusion is that potential risks from SVOCs are uncertain in OB/OD areas and are not significant in the surrounding wildlife habitat areas of the site.

8.6 Possible Actions to Reduce Potential Risks

The potential for risks over the entire TTU site could not be excluded for zinc to plants; TPHs to plants and invertebrates; and HMX, antimony, cadmium, copper, lead, perchlorate, 2-methylnaphthalene, fluorene, total-PAHs, and acetone to one or more wildlife receptors.

Samples driving the potential for risks to receptors are generally associated with OB/OD areas, primarily at the inactive burn pan site, and do not represent the potential for risks in the surrounding wildlife habitat areas of the site due to incomplete exposure pathways.

In an effort to reduce potential risk at the TTU, several ongoing actions are in place to assist in the continual assessment and refinement of risk to receptors. These actions include: 1) the continued collection of chemical data and refinement of the risk assessment, including the revised soil sampling strategy for 2005, aimed at characterizing average chemical concentrations within the operational areas of the TTU; and 2) continued control and documentation of materials treated at the TTU, in accordance with the RCRA Part B permit, to prevent the introduction of unknown or excess environmental hazards. These items are addressed as part of the RCRA Part B Permit compliance activities that include the periodic review of both the human health and ecological risk assessments and the preparation of the Waste Characterization Technical Memorandum.

Remediation of OB/OD areas, once operations have ceased, will eliminate or reduce any significant potential for risk to receptors at the TTU. The only detected COPECs to pose a potential for adverse effects to receptors in habitat areas were cadmium for the grasshopper mouse (LOAEL-HQ = 1.8) and zinc for plants (LOEC exceedances = 57 percent; LOEC-HQmax = 1.3). These risk conclusions are based solely on literature-based toxicity, life history, and bioaccumulation data and, therefore, may not accurately reflect site conditions. When operations at the TTU have ceased and remedial plans are being developed for the OB/OD areas of the site, more detailed analyses, to include site-specific bioassays and bioaccumulation studies, may be considered to address retained risks from cadmium and zinc in the habitat areas of the site. Site-specific data developed from these studies could result in a more definitive risk determination and would support the development of site-specific remedial goals.

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Tables

Table 1

Environmental Fate and Transport of Detected Chemicals
 Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Chemical	Environmental Fate	Reference
Aluminum	Aluminum has only one oxidation state (3+); thus, its fate and transport in the environment depends upon its coordination chemistry and the characteristics of the local environmental system. Aluminum does not exist as a free metal in nature due to its reactivity; it partitions between the solid and liquid phases by reacting with water, chloride, fluoride, sulfate, nitrate, phosphate, humic materials, and clay. The greater the mineral content of the soil, the lower the mobility of aluminum. In water, aluminum forms relatively water-insoluble complexes, or is found as a water-soluble complex. Aluminum undergoes hydrolysis to form hydroxy aluminum species and pH determines the hydrolysis products that are formed. Aluminum adsorbs to suspended solids and sediment. At a pH greater than 5.5, aluminum compounds exist predominantly in undissolved forms. Decreasing pH generally results in an increase in mobility for monomeric forms of aluminum.	Bodek et al., 1988; and others in TOXNET
Antimony	Antimony usually occurs with the valence of 3+ and occasionally of 5+. Antimony binds to soil particles, particularly those containing iron, manganese, or aluminum. In water, antimony is oxidized when exposed to atmospheric oxygen.	TOXNET (http://toxnet.nlm.nih.gov/)
Arsenic	The physical characteristics of the soil matrix determine the dominant form of arsenic and its transport. Insoluble arsenic compounds bind tightly to organic matter in soil or sediment. Various forms of arsenic in soil are interconverted by chemical reactions and microbial activity. The bioavailability of arsenic in soil is inversely proportional to the organic carbon and clay content of the soil matrix. Arsenic in soil is directly taken up by plants and soil microbes and invertebrates, and indirectly taken up by terrestrial receptors via ingestion. In surface water, soluble inorganic arsenate (As5+) predominates under normal conditions and is more stable than arsenite. Movement and partitioning of arsenic in water depends on the chemical form of arsenic and on interactions with other materials present. Soluble forms of arsenic remain dissolved in the water column or adsorb onto sediments or soils, especially those containing clays, iron oxides, aluminum hydroxides, manganese compounds, and organic matter. Sediment bound arsenic is released back into the water by chemical or biological interconversions and is influenced by the oxidation-reduction potential, pH, temperature, other metals, salinity, and biota. Uptake by plants from soil is influenced by soil elements, temperature and plant species. Aquatic organisms accumulate arsenic but do not biomagnify it. Arsenic is accumulated by aquatic organisms primarily through dietary exposure. Bioavailability is not dependent on the concentration of acid-volatile sulfides (AVS). Sediments are the major source of arsenic to infaunal organisms.	Callahan et al., 1979; NRCC, 1978; Woolson, 1975; and others in TOXNET
Barium	In water, barium precipitates out of solution as an insoluble salt or adsorbs to suspended particulate matter. Barium in sediments is found mostly in the form of barium sulfate. Barium is not very mobile in most soil systems. The rate of transportation of barium in soil is dependent on soil characteristics such as cation exchange capacity and calcium carbonate content. Barium naturally forms compounds in the 2+ oxidation state. Only trace amounts of barium dissolve in surface water. In general, the solubility of barium compounds increases with decreasing pH.	Bodek et al., 1988; Kabata-Pendias and Pendias, 1984; and others in TOXNET
Cadmium	Cadmium exists primarily in the 2+ oxidation state. Cadmium in the water column can partition to dissolved and particulate organic carbon. Cadmium speciation yields primarily the divalent form (2+) between pH conc of 4.0 and 7.0 and it is this divalent form that is believed to be responsible for observed biological effects. Cadmium compounds in soil are stable and are not subject to degradation. Compounds can be transformed by precipitation, dissolution, complexation, and ion exchange. In aquatic environments, cadmium compounds are not affected by photolysis, volatilization, or biological methylation. Precipitation and sorption to mineral surfaces and organic materials are important removal processes. Concentrations are generally higher in sediments than in overlying water. Cadmium readily bioconcentrates in <i>Daphnia sp.</i> , aquatic insects, mollusks, and crayfish. Fish uptake occurs through both water and diet, however water is the primary uptake source. In mammals and birds, cadmium accumulates in the livers and kidneys following ingestion. The concentration of AVS is an important factor controlling the toxicity and bioaccumulation of cadmium in sediments.	ATSDR, 1990a; Callahan et al., 1979; and others in TOXNET

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Chemical	Environmental Fate	Reference
Chromium	<p>In soil, chromium 3+ is readily hydrolyzed and precipitated as chromium hydroxide. It exists in soil primarily as insoluble oxide with very limited mobility. In water, chromium 6+ can occur in the soluble state. It can be adsorbed onto clay-like materials, organics, or iron oxides. chromium 6+ persists in water for 140 days, but is eventually reduced to chromium 3+ by organic matter or other reducing agents in water.</p> <p>Plants can bioaccumulate and reduce chromium. In aqueous solutions, within a pH range of 6 to 8, hexavalent chromium is distributed between two species: monovalent hydrochromate anion and divalent chromate anion. A log bioconcentration factor (BCF) of 2.74 was reported for <i>Daphnia magna</i>. Hexavalent chromium tends to accumulate in the gills of fish following exposure.</p>	TOXNET (http://toxnet.nlm.nih.gov/)
Copper	<p>Copper occurs naturally in many organisms and is an essential micronutrient. Copper may exist in two oxidation states: 1+ or 2+. Copper (1+) is unstable and oxidizes to the 2+ state in many aerated waters within the pH range of 6 to 8. In the aquatic environment, the fate of copper is determined by the formation of complexes. Copper concentrations remaining in solution depend on water chemistry, such as pH and temperature, and the concentration of other chemical species. The majority of copper released to surface waters settles out or adsorbs to sediments. Some copper complexes with both inorganic and organic ligand.</p> <p>As an essential nutrient, copper is strongly bioaccumulated by plants and animals. All organisms have active transport mechanisms for it, but it does not biomagnify. Biogenic ligands play an important role in complexing copper (which affects precipitation and sorption behavior), an biological activity is a major factor in determining the distribution and occurrence of copper in the ecosystem. Free copper ions are the most bioavailable inorganic forms. The amount of bioavailable copper in sediment is controlled mostly by the concentration of AVS and organic matter. Copper is accumulated by aquatic organisms primarily through dietary exposure.</p>	Callahan et al., 1979; and others in TOXNET
Iron	<p>In the hydrosphere, iron minerals in igneous and metamorphic rocks are the primary sources of iron. Mobilization and redistribution occur with chemical weathering. Iron mobilizes mostly as dissolved Fe(II) in reducing conditions and as particulate Fe(III) oxyhydroxides in oxygenated conditions. In reducing conditions, Fe(II) is soluble and mobile below ~ pH 7 to 8. In oxidized surface waters and sediment, dissolved iron, Fe 3+ and Fe (III) inorganic complexes, are mobile below ~ pH 3 to 4. Fe (III) as ferric-organic complexes, are also mobile in many soils and in surface and groundwaters up to ~ pH 5 to 6; as colloidal ferric oxyhydroxides between ~ pH 3 to 8.</p>	TOXNET (http://toxnet.nlm.nih.gov/)
Lead	<p>In water, lead is most soluble and bioavailable under conditions of low pH, low organic content, low suspended sediment concentrations, and low concentrations of salts of other metals. Therefore, the solubility in water is low. Most lead in natural waters is precipitated to sediment as carbonates and hydroxides. Lead is readily precipitated by many common anions. In sediments, lead is mobilized and released during sharp decreases in pH.</p> <p>In soils, the major sink for lead, is relatively immobile and can persist for long periods of time in numerous forms. Adsorption or precipitation of in soils is promoted by presence of organic matter, carbonates, and phosphate minerals. It usually accumulates in topsoil due to complexation with organic matter and the transformation of soluble lead compounds to relatively insoluble sulfate or phosphate derivatives. The efficient fixation of lead by most soils greatly limits the transfer of lead to aquatic systems and also inhibits absorption of lead by plants. However, leaching of lead can be relatively rapid from some soils, especially at highly contaminated sites or landfills.</p> <p>Aquatic biota (invertebrate and vertebrate) can bioconcentrate lead at levels greater than in water, and sometimes similar to those in sediments. Concentrations of lead tend to decrease with increasing aquatic trophic levels. However, lead does not appear to bioconcentrate significantly in fish but does in some shellfish such as mussels. Lead is accumulated by aquatic organisms equally from water and through dietary exposure. Bioaccumulation of organolead compounds is rapid and high and concentrated in the fatty tissues of aquatic organisms. Log BCFs of 5.15 (cladoceran) and 3.56 (midge) were reported in the literature.</p>	Hodson et al., 1984; and others in TOXNET

Table 1

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Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Chemical	Environmental Fate	Reference
Manganese	<p>Manganese transport and partitioning is controlled by the solubility of the chemical form present, which is determined by pH, oxidation-reduction potential, and the characteristics of available anions. Manganese may exist in water in any of four oxidation states (2+, 3+, 4+, or 7+). Mn 2+ is most common in waters (pH 4-7) but may become oxidized at pH greater than 8 or 9. Adsorption to soil and sediment may be highly variable because adsorption depends on the cation exchange capacity and the organic composition of the substrate. Manganese in water may undergo oxidation at high pH or oxidation-reduction potential and is also subject to microbial activity.</p>	Kabata-Pendias and Pendias, 1984; and others in TOXNET
Mercury	<p>In soil, mercury exists in the mercuric (Hg^{+2}) and mercurous (Hg^{+1}) states. Mercury adsorbs to soil or is converted to volatile forms. Mercury can migrate by volatilization from aquatic and terrestrial sources through the reduction of metallic mercury to complex species. Atmospheric transport is a major environmental distribution pathway. Mercury 2+ is the predominant form of mercury in surface waters. Nonvolatile mercury in surface water binds to organic matter and sediment particles.</p> <p>Where mercury is found in soil, water and sediment methylmercury may also be found since it is both produced and destroyed by microbial processes involving mercury compounds. Fish and other aquatic organisms readily bioconcentrate methyl mercury either directly through water or through components of the food chain. Subsequently, fish eating birds tend to show the highest concentrations. Factors which affect the observed levels of mercury in plants and animals at different trophic levels include age, surface area, metabolism, habitat, and activity. There is an inverse relationship between total mercury and percent methylmercury in tissues of various avian species. Among mammals, mercury burdens are higher in fish-eating species than in herbivorous ones. Bioconcentration factors for methylmercury are highly variable. Log BCFs for methylmercury in brook trout range from 4.84 to 5.80.</p> <p>Bioaccumulation factors increased with higher levels in both the pelagic and benthic components of aquatic food webs. Fish bioconcentrate methylmercury directly from water by uptake across the gills and piscivores readily accumulate mercury from dietary sources. Mercury is accumulated by all trophic levels with biomagnification occurring up the food web. The transfer of mercury through the food web is affected by the form of mercury. Although inorganic mercury is the dominant form in the environment and easily accumulated, it is also depurated quickly. Methylmercury accumulates quickly, depurates very slowly, and therefore has a greater potential to biomagnify in higher trophic-level species.</p>	Callahan et al. 1979; ATSDR, 1994; Eisler, 2000; and others in TOXNET
Nickel	<p>Most nickel released into waterways is associated with particulate matter. Nickel is strongly adsorbed at mineral surfaces such as oxides and hydrous oxides of iron, manganese, and aluminum. It is strongly adsorbed by soil. Soil pH and clay content most influence nickel sorption. The 2+ valence is the predominant species in solution.</p> <p>Nickel BCFs ranging from 40-100 suggest that the potential for bioconcentration in aquatic organisms is low to moderate. Although aquatic organisms may accumulate nickel from their surroundings, there is little evidence for significant biomagnification along the food chain. Water-soluble nickel compounds, such as the chloride and sulfate compounds, are poorly absorbed by most living organisms. The uptake of nickel by plants depends upon the extractable nickel content of a soil which is a function of physical, chemical and biological factors of the soil environment. Higher nickel concentrations have been observed in shellfish and crustacea than in fish.</p> <p>Bioaccumulation of nickel is most pronounced in sediments when the ratio of simultaneously extracted metals to acid-volatile sulfide (SEM/AVS) is greater than 1. Although nickel concentrations in animals from sediments with SEM/AVS ratios >1 were approximately 2- to 10-fold greater than nickel concentrations in benthic organisms from sediments with SEM/AVS <1, nickel uptake (tissue concentration) was proportional to the concentration in sediment.</p>	SRC, 2000; and others in TOXNET

Table 1

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Chemical	Environmental Fate	Reference
Silver	Transport and partitioning is influenced by the particular form of the compound. Under oxidizing conditions, the primary silver compounds would be bromides, chlorides, and iodides, while under reducing conditions the free metal and silver sulfide would predominate. Mobility in soils is affected by oxidation-reduction potential, pH, and the presence of organic matter. In fresh water, silver often forms complex ions with chlorides, ammonium, and sulfates; forms soluble organic compounds; and adsorbs onto humic complexes and suspended particulates. Silver tends to form complexes with inorganic chemicals and humic substances in soil.	TOXNET (http://toxnet.nlm.nih.gov/)
Thallium	In soil, thallium exists in either the monovalent (thallous) or trivalent (thallic) form. The monovalent form is more common and stable. Thallium is reactive with air and moisture. Moisture increases the oxidation of thallium. Thallium adsorbs to soil and is not transformed or biodegraded. Elemental thallium is relatively insoluble in water.	Callahan et al., 1979; and others in TOXNET
Zinc	Zinc occurs naturally in the 2+ oxidation state. Sorption to suspended and bed sediments is the dominant reaction involving zinc. The relative mobility of zinc in soil and aquatic systems is determined by factors such as the solubility of the compound, pH, redox potential, and salinity. Zinc generally remains as a free ion at low pH conc.s. It partitions to sediments or suspended solids in surface water through sorption onto hydrous iron and manganese oxides, clay minerals, and organic material. Zinc tends to sorb more readily at a high pH (pH>7) than at a low pH. Zinc sorbs strongly onto soil particulates and its mobility depends on the solubility of the speciated forms of the element and on soil properties such as cation exchange capacity, pH, redox potential, and the chemical species present in soil. Zinc compounds have low mobility in soils and are absorbed by plants and vegetables. Adsorption to suspended solids and sediments is expected. Studies indicate that zinc is not a highly mobile element in most aquatic habitats. In fish, zinc tends to accumulate in the gills, liver, kidney and opercular bone, but not the muscle. A log BCF of 2.90 was determined for the midge <i>Chironomus riparius</i> .	Callahan et al., 1979; and others in TOXNET
Polynuclear Aromatic Hydrocarbons (PAHs)	Polynuclear aromatic hydrocarbons are a diverse group of organic molecules composed of two or more fused aromatic (benzene) rings. They are moderately persistent in the environment. In general, as the number of rings increases, mobility and volatility decrease. Because of these physical-chemical properties, PAHs have low solubility, low volatility, and a high tendency to sorb to organic matter. In water, PAHs have high boiling points and are insoluble. When oil is spilled in water, PAH in the oil can enter the water column in dispersed form or be absorbed on organic and inorganic compounds. In the terrestrial environment, PAHs tend to be associated with soil particulates and have low mobility in soil. PAHs generally do not biomagnify in food chains despite high lipid solubility, because they are rapidly metabolized. However, some PAHs can be detected in tissues of aquatic organisms and wildlife at high concentrations immediately following exposure. In general, biodegradation rates are inversely related to the number of fused benzene rings and are further slowed by substitutions, including alkylation. Bioaccumulation and metabolism vary greatly among clams, invertebrates, shrimp, and fish. Bioaccumulation was substantially higher for amphipods than for clams, shrimp, or fish. Clams unable to metabolize PAHs had higher concentration levels of PAHs than amphipods, shrimp, and fish.	Eisler, 2000; and others in TOXNET
Bis(2-Ethylhexyl)Phthalate	In the environment, bis(2-ethylhexyl)phthalate undergoes biodegradation in water and soil. It is predicted to react with hydroxyl radicals in the atmosphere. It has an estimated half-life of 12 hours in the air, 10 - 20 days in soil, and days to weeks in water. The half-life of the molecule, due to evaporation from bodies of water, is about 15 years. Bis(2-ethylhexyl)phthalate rapidly degrades in the marine environment by experimental microcosms. This chemical has been found to bind organic acids in the soil and water, resulting in an increase in its solubility and mobility in the environment. It also adsorbs to both freshwater and marine sediments.	Callahan et al., USEPA, 1987; and others in TOXNET

Table 1

Environmental Fate and Transport of Detected Chemicals
 Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Chemical	Environmental Fate	Reference
Dibenzofuran	In the atmosphere, dibenzofuran exists primarily in the gas-phase and sometimes in the particulate -phase. As a gas, this chemical reacts with photochemically - produced hydroxyl radicals and has a half-life of 4.1 days. As a particulate, wet and dry deposition are expected to be the dominant tropospheric removal process. In soil, this chemical has very low mobility. It is biodegraded in areas where populations of adapted microorganisms are present. In an aquatic environment, dibenzofuran is expected to strongly adsorb to particulates and sediment. Dissolved dibenzofuran may volatilize from water. Adapted microbes supplied with sufficient oxygen can readily biodegrade dibenzofuran.	SRC, 2000; and others in TOXNET
2,4-DNT	If released to air, 2,4-dinitrotoluene will exist solely as a vapor in the ambient atmosphere. Vapor-phase 2,4-dinitrotoluene will be degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals; the half-life for this reaction in air is estimated to be 75 days. If released to soil, it is expected to have moderate mobility based upon an estimated KOC of 360. Volatilization from moist soil surfaces is not expected to be an important fate process based upon an estimated Henry's Law constant of 1.3×10^{-7} atm-cu m/mole. 2,4-Dinitrotoluene may undergo direct photolysis in soil, based on the rapid rate of photolysis of 2,4-dinitrotoluene in water. If released into water, 2,4-dinitrotoluene is expected to adsorb to suspended solids and sediment in water based upon the estimated KOC. Volatilization from water surfaces is not an important fate process based upon this compound's estimated Henry's Law constant. An estimated BCF of 7 suggests the potential for bioconcentration in aquatic organisms is low.	SRC, 2000
HMX	When found in water, photolysis was found to be the dominant transformation process with half-lives ranging from 17 to 7900 days depending on the water body. Major photolytic transformation products were nitrate, nitrite, and formaldehyde. Poor light transmission in rivers was found to inhibit photolytic processes. One study suggests that HMX will be persistent in water with dilution serving as the major factor in reducing concentrations. Biotransformation of HMX may occur under both anaerobic and aerobic conditions resulting in mono-through tetra-nitroso derivatives of HMX as metabolites which are eventually metabolized to 1,1-dimethylhydrazine. Studies show that HMX is likely to move from soil into groundwater, particularly in sandy soils though this movement is expected to be slow.	ATSDR, 1997a (Public Health Statement)
Nitroguanidine	If released to air, 1-nitroguanidine will exist solely in the vapor phase in the ambient atmosphere. Vapor-phase 1-nitroguanidine will be degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals; the half-life for this reaction in air is estimated to be 18 hrs. If released to soil, this chemical is expected to have very high mobility based upon an estimated Koc of 25. Volatilization from moist soil surfaces is not expected to be an important fate process based upon an estimated Henry's Law constant of 4.4×10^{-12} atm-cu m/mole. If released into water, it is not expected to adsorb to suspended solids and sediment in water based upon the estimated Koc. Volatilization from water surfaces is not expected to be an important fate process based upon this compound's estimated Henry's Law constant. An estimated BCF of 3.2 suggests the potential for bioconcentration in aquatic organisms is low.	SRC, 2000

Table 1

Environmental Fate and Transport of Detected Chemicals

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Chemical	Environmental Fate	Reference
Picric Acid	If released to air, Picric acid otherwise known as 2,4,6-trinitrophenol, will exist in both the vapor and particulate phases in the ambient atmosphere. Vapor-phase 2,4,6-trinitrophenol will be degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals; the half-life for this reaction in air is an estimated 433 days. Particulate-phase 2,4,6-trinitrophenol may be removed from the air by wet and dry deposition. If released to soil, this acid is expected to have high mobility based upon an estimated Koc value of 130. This compound will exist primarily as an anion in moist soil surfaces and anions are expected to have very high mobility in soils. Volatilization of 2,4,6-trinitrophenol from moist soil surfaces is not expected to be an important fate process since the anion will not volatilize and the neutral species has a Henry's Law constant of 1.7×10^{-8} atm-cu m/mole at 25 deg C. 2,4,6-Trinitrophenol is not expected to volatilize from dry soil surfaces based upon its vapor pressure. If released into water, 2,4,6-trinitrophenol is not expected to adsorb to suspended solids and sediment in the water column based on the KOC values. A BCF value of less than 2.4 measured in carp suggests bioconcentration in aquatic organisms is low.	SRC, 2000
TPH	When TPH is released directly to water through spills or leaks, certain TPH fractions will float in water and form thin surface films. Other heavier fractions will accumulate in the sediment at the bottom of the water, which may affect bottom-feeding fish and organisms. Some organisms found in the water (primarily bacteria and fungi) may break down some of the TPH fractions. TPH released to the soil may move through the soil to the groundwater. Individual compounds may then separate from the original mixture, depending on the chemical properties of the compound. Some of these compounds will evaporate into the air and others will dissolve into the groundwater and move away from the release area. Other compounds will attach to particles in the soil and may stay in the soil for a long period of time, while others will be broken down by organisms found in the soil.	ATSDR, 1999 (Public Health Statement)
Nitrate	Nitrate (NO_3^-) is one of the many essential compounds in the nitrogen cycle. Nitrate is the preferred form of nitrogen as a macro-nutrient for most organisms. Nitrate is produced as a bi-product of nitrification from NH_3 and NH_4^+ , with NO_2^- as an intermediary. Nitrate is not held well in soils and consequently leaches readily into aquatic systems including groundwater and surface water runoff. Nitrate is typically high in areas where nitrogen is applied to fields such as farms and golf courses. Within both terrestrial and aquatic systems nitrate is reduced to N_2 through the process of denitrification. Nitrate can also be an intermediary in the process of nitrogen fixation in anaerobic environments.	McDowell, 1992
Phosphorus	Phosphorus exists in abundance in the earth's crust making up approximately 0.12 percent. It does not occur free in nature but is found in the form of phosphates in minerals. It is also found in fertile soils and is an essential constituent of protoplasm, nervous tissue and bones. In plants, active uptake occurs and generally accumulates in the living top part. Biomagnification of phosphorus was not found in a Precambrian Shield lake ecosystem within clams, fish, birds, and mammals.	Budavari, 1989; and others in TOXNET
Acetone	Acetone is expected to exist as a vapor in the ambient atmosphere. It is degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals and also undergoes photodecomposition by sunlight. Acetone has high mobility in soils and volatilization from moist and dry soils is expected to occur. In water, this chemical is not expected to adsorb to suspended solids or sediment. Volatilization from water surfaces is an important fate process. Bioconcentration in aquatic organisms is considered low based on the BCF value of 1.	Lyman et al., 1990; SRC, 2000; and others in TOXNET
2-Butanone	Methyl Ethyl Ketone is expected to exist solely as a vapor in the ambient atmosphere. It is degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals. It is also able to undergo photolysis in the natural light. Based on Koc values of 29 and 34 (in silty loams), Methyl Ethyl Ketone is expected to have high mobility in soils. Volatilization from moist and dry soil surfaces are expected. This chemical is not expected to adsorb to suspended solids or sediment in water. Bioconcentration in aquatic organisms is considered low due to the estimated BCF value of 1. The most common exposure to methyl ethyl ketone is through inhalation and ingestion of contaminated water or food.	Walton, et al., 1992; SRC, 2000; and others in TOXNET.

Table 1

Environmental Fate and Transport of Detected Chemicals

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Chemical	Environmental Fate	Reference
Benzene	In the ambient atmosphere, benzene will exist as a vapor with a vapor pressure of 94.8 mm Hg at 25 deg C. Vapor-phase benzene will be degraded by a reaction with photochemically-produced hydroxyl radicals and the half-life of this reaction is about 13 days. It can also be degraded by ozone radicals and nitrate found in the atmosphere. Benzene is expected to have high mobility in soil and volatilization in moist soil is an important fate process. Benzene may volatilize from dry soil based on vapor pressure. In an aquatic environment, volatilization is the important fate process. Inhalation of ambient air, ingestion of drinking water, and dermal contact are routes of exposure.	SRC, 2000; and others in TOXNET.
Xylenes	Based upon an experimental vapor pressure of 7.99 mm Hg at 25 deg C, xylene is expected to exist entirely in the vapor phase in the ambient atmosphere. Vapor-phase xylene is degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals with an estimated atmospheric lifetime of about 1-2 days. Xylene is expected to have moderate to high mobility in soils based upon experimental Koc values obtained with a variety of soils at differing pH values and organic carbon content. Volatilization from moist soil surfaces is expected based on an experimental Henry's Law constant of 7.0×10^{-3} atm-cu m/mole. Biodegradation is an important environmental fate process for xylene. In general, it has been found that xylene is biodegraded in soil and groundwater samples under aerobic conditions and may be degraded under anaerobic denitrifying conditions. In water, xylene is expected to adsorb somewhat to sediment or particulate matter based on its measured Koc values. This compound is expected to volatilize from water surfaces given its experimental Henry's Law constant. Estimated half-lives for a model river and model lake are 3 and 99 hours. The potential for bioconcentration in aquatic organisms is low based on an experimental BCF value of 20, measured in eels.	SRC, 2000
Styrene	If released to air, a vapor pressure of 6.40 mm Hg at 25 deg C indicates styrene will exist solely as a vapor in the ambient atmosphere. Vapor-phase styrene will be degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals and ozone; the half-life for these reactions in air are estimated to be 7 and 16 hrs, respectively. Direct photochemical or photolytic reactions for styrene are slow. If released to soil, styrene is expected to have low mobility based upon an estimated Koc of 960. Volatilization from moist soil surfaces is expected to be an important fate process. Biodegradation by aerobic microorganisms may lead to extensive or complete destruction of styrene in soil. If released into water, styrene is expected to adsorb to suspended solids and sediment based upon the estimated Koc. Degradation of styrene is rapid in sewage under aerobic conditions. Volatilization from water surfaces is expected to be rapid. A BCF of 13.5 for goldfish suggests bioconcentration in aquatic organisms is low. Styrene is not expected to undergo hydrolysis in the environment due to the lack of hydrolyzable functional groups.	SRC, 2000
Perchlorate	Perchlorate (ClO_4^-) is an anion that originates as a contaminant in ground water and surface waters from the dissolution of ammonium, potassium, magnesium, or sodium salts. Because perchlorate is nonlabile kinetically (i.e., the reduction of the central chlorine atom occurs extremely slowly) and sorption or natural chemical reduction in the environment is not significant, perchlorate is exceedingly mobile in aqueous systems and can persist for many decades under typical ground and surface water conditions.	USEPA, 2002

Notes:

Information on the fate and transport of chemicals was researched through TOXNET (<http://toxnet.nlm.nih.gov/>) in the Hazardous Substances Data Bank. Additional citations for the primary references listed can be found on the HSDB summary for each chemical listed.

Table 2

Mechanisms of Ecotoxicity

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Mechanisms of Ecotoxicity	References
Aluminum	Aluminum is a cytotoxin that interferes with enzymes associated with adenosine triphosphate and maintenance of neurotransmitters; it disrupts neuromotor activity and cognitive abilities; decreases offspring growth, body weights and neurological development; increases resorption rates; alters calcium and phosphorus metabolism; causes embryo lethality; minor skeletal malformations; decrease in egg shell strength and production.	ATSDR, 1992a; and others in TOXNET
Antimony	Mutagenic in bacteria or phage; induces chromosomal aberrations or abnormal cell division; antimony combines with sulfhydryl groups in several respiratory enzymes; trivalent antimony induces heme oxygenase, which causes heme degradation in the liver and kidney; causes pulmonary, hepatic and reproductive effects in mammals.	ATSDR, 1990ba; and others in TOXNET
Arsenic	Reaction of trivalent form (arsenite) with sulfhydryl groups leads to enzyme (oxidative respiration) inhibition. Methylated arsenic is transferred efficiently in food webs, but does not bioaccumulate. Arsenic reduces growth and development in plants and causes inhibition of light activation, wilting, chlorosis, browning, dehydration and death in plants. Arsenic causes malformations and death in toad embryos. It is carcinogenic and mutagenic and causes impaired behavior, reduced growth, lack of appetite, suffocation by gill clogging and vascular collapse in the gills, testicular and ovarian degeneration, liver damage, and failure to metabolize food in fish. Inorganic arsenic destroys the blood vessel lining in the gut and lowers blood pressure in birds. It also causes hepatocyte damage in birds by inhibition of the sodium pump. Behavioral, systemic, growth, systemic and reproductive effects occur as a result of chronic exposures. It is teratogenic, carcinogenic and possibly mutagenic in mammals. Its developmental effects include malformations (exencephaly, eye defects and renal and gonadal agenesis) and fetal death in mammals.	Sadiq 1992; Eisler, 2000; Stanley et al. 1994; Whitworth et al. 1991; Camardese et al. 1990; ATSDR, 1993a; Mance, 1990; and others in TOXNET
Barium	Barium can inhibit intestinal absorption in the winter flounder. Barium accumulates in plants and the bones in birds and mammals. It affects potassium metabolism in muscles and causes respiratory weakness, muscle paralysis and stimulation, irregular cardiac contractions and lowered pulse rate in mammals. Some reproductive effects (reduced ovary weight) have been observed.	Amdur et al. 1991; ATSDR 1990c; Schroeder 1970 as cited in ATSDR 1990b; Charney and Taglietta 1992; Borzelleca et al., 1988.
Cadmium	Cadmium causes mutagenesis, teratogenesis, carcinogenesis; It inhibits enzyme reactions by replacement of essential divalent nutrients (e.g., zinc) at critical sites on proteins and enzymes; combines with sulfhydryl groups in enzymes; inhibition of Phase I and Phase II biotransformation reactions; kidney lesions; reduces growth rates and feed consumption; causes reproductive effects in birds; testicular damage; decreases hemoglobin and hematocrit; causes behavior, growth, and physiological changes in aquatic organisms; accumulates primarily in the kidneys; immunosuppressive effects have been shown in mice, fish, and oysters. Soluble form is highly available for plant uptake and can disturb enzyme activity.	ATSDR, 1990b; Eisler, 2000; Rompala et al, 1994 as cited in Irwin et al, 1997; Wren et al., 1995, as cited in Irwin et al., 1997; Bodek et al., 1988; and others in TOXNET
Chromium	Beneficial but not essential for plants; trivalent form essential form in mammals for maintaining efficient lipid, glucose and protein metabolism; mutagenic, teratogenic and carcinogenic; hexavalent form associated with inhibition of photosynthesis and interference with transport and mobilization of essential nutrients. Hexavalent form can cause oxidation stress in cells, abnormal enzyme activity, lowered resistance to pathogens, disrupted feeding, disrupted osmoregulation, histopathology, and damage to beta cells of pancreatic islets. Can cause nephron and liver damage. Decreased weight gain, increased oxygen consumption, impaired reproduction, and increased hematocrit have been noted in aquatic organisms. High deposition of trivalent form in fish gills leads to tissue damage including hyperplasia, clubbing of lamellae, and necrosis.	ATSDR, 1993b; Eisler, 2000; Moore et al., 1990, as cited in Irwin et al., 1997.
Copper	Essential element for animals as a component of metalloenzymes and respiratory pigments, iron utilization, function of enzymes in pigmentation, connective tissue formation and energy production; forms stable inhibitory complexes with cytochrome P-450; impairs function of NADPH-cytochrome C reductase; inhibits heme biosynthesis; teratogen and possible carcinogen; accumulates in the liver and reduces liver's ability to excrete copper; decreases growth and food consumption in birds; disrupts internal ion balance in aquatic organisms; alters hematology, respiratory physiology, and cardiac physiology in fish; causes histological changes in the gills, kidneys, hematopoietic tissue, mechanoreceptors, and chemoreceptors in fish. Reproductive effects in fish include blockage of spawning, reduced egg production, abnormalities in young, and reduced survival of young.	ATSDR, 1990d; Rand and Petrocelli, 1985, as cited in Irwin et al., 1997; Sorenson, 1991, as cited in Irwin et al., 1997.
Iron	Essential for the production of proteins in plants and hemoglobin in animals. Toxicity related to cellular oxidative stress, dysfunction and toxicity due to peroxide formation.	TOXNET (http://toxnet.nlm.nih.gov/)

Table 2

Mechanisms of Ecotoxicity

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Mechanisms of Ecotoxicity	References
Lead	Inhibits growth in plants. Reduces photosynthetic activity by blocking sulfhydryl groups and inhibiting the conversion of coproporphyrinogen to protoporphyrinogen. Reduces mitosis and water absorption. In animals, lead inhibits the formation of heme and reduces amino-levulinic acid dehydratase activity in blood. Toxic effects in animals include reduced growth and reproductive output, accumulation in hematopoietic organs, changes in the central nervous system (at high concentrations near those causing mortality) kidney dysfunction, enzyme inhibition, and behavioral changes. In birds, lead decreases egg shell thickness and limits growth, ovulation, and sperm formation. In fish, lead can increase mucous formation and cause death from suffocation.	ATSDR, 1993c; Eisler, 2000; Finley and Stendell, 1978; Friberg et al., 1986; Rompala et al., 1984, as cited in Irwin et al., 1997.
Manganese	Manganese is cytotoxic and causes chromosomal aberrations in rodents. Reduction in testicular growth (weight) and reduced seminal vesicle weight have been noted in rodents exposed to manganese. Can cause dopamine depletion in nerve cells. Adverse behavioral and systemic effects have been noted in birds exposed to manganese above nutrient levels.	ATSDR, 1992b
Mercury	Mercury binds strongly with sulfhydryl groups and interferes with thiol metabolism, inhibiting or inactivating proteins containing thiol ligands. This leads to mitotic disturbances and inhibition of cell division. Organic mercury compounds are potent inhibitors of cell division. Methylmercury irreversibly destroys central nervous system neurons in mammals and aquatic organisms and is the most toxic form. Mercury compounds adversely affect metabolism, growth, development and behavior in birds and mammals at relatively low exposure levels. The most sensitive target organ of inorganic mercury appears to be the kidneys.	ATSDR, 1994; Eisler, 2000; Leland and Kuwabara, 1985, as cited in Irwin et al., 1997; Heinz, 1979.
Nickel	Nickel is nephrotoxic, carcinogenic, and immunotoxic in mammals. Elevated levels of nickel cause tremors, edema in joints and reduction in body weight and humerus length in birds; decreased reproductive capacity has been noted. Retarded growth, anemia, and decreased enzyme activity have been observed in rats.	ATSDR, 1995; Friberg et al., 1986.
Silver	Silver has a strong affinity for sulfhydryl groups and proteins, resulting in cytotoxicity. Respiratory depression in aquatic organisms has been noted; can cause cardiac enlargement, vascular hypertension, hepatic necrosis, anemia, lowered immunological activity, kidney pathology, enzyme inhibition, growth retardation, and shortened life span in mammals and birds.	ATSDR, 1990e; Eisler, 2000.
Thallium	Exposure to elevated levels of thallium causes neuromorphological changes and systemic effects in mammals (hair loss, increases in skeletal abnormalities and weight loss). No information was located for birds.	ATSDR, 1992c
Zinc	Zinc is essential for normal reproduction and growth in plants and animals. In animals, it is regulated by metallothioneins, which temporarily store zinc, reducing its toxicity. Zinc-dependent enzymes regulate the rates of biosynthesis and catabolism of RNA and DNA. At high exposures, zinc interferes with the metabolism of calcium and iron and induces copper deficiency. Zinc causes cytoplasmic vacuolation, cellular atrophy and cell death in the pancreas. It accumulates preferentially in bone and induces osteomalacia (softening of the bone) as a result of a deficiency of minerals, including calcium and phosphorus. In fish, zinc causes destruction of gill epithelium and tissue hypoxia. In rainbow trout, disruption of internal ion balance has been noted.	Eisler, 2000; Rand and Petrocelli, 1985, as cited in Irwin et al., 1997.
Polycyclic Aromatic Hydrocarbons (PAHs)	Toxicity is highly variable and related to the number of ring structures and molecular weight. Low molecular weight compounds of 2 or three rings (e. g., naphthalene) cause acute toxicity, but are not carcinogenic. Higher molecular weight PAHs with > 4 rings (e. g., benzo(a)pyrene) are mutagenic, teratogenic and carcinogenic to a wider variety of animals. PAHs are toxic to a variety of animal tissues. Causes narcosis toxicity in aquatic animals.	Eisler, 2000.
Phthalates	Little information is known about the ecotoxicological effects that might be caused by this type of chemical. Adverse effects in animals were generally seen only at high doses or with long term exposures. Mildly harmful effects have been seen in the livers and kidneys of some rats and mice given very high doses (e.g., di (2-ethylhexyl)phthalate, di-n-octylphthalate). Longer exposures to high doses might affect the ability of both males and females to reproduce and caused birth defects.	ATSDR, 1997b
2,4-DNT	2,4-DNT is a noncarcinogenic though it is found to bind covalently with the liver, lung and intestines. Inhalation of the fumes and dust, ingestion, or absorption through the skin may cause a chemical change of the blood oxyhemoglobin to methemoglobin (via oxidation of iron [II] to iron [III]).	TOXNET (http://toxnet.nlm.nih.gov/)
HMX	HMX may be harmful to the liver and central nervous system though the mechanisms by which HMX causes adverse effects is not understood.	ATSDR, 1997a (Public Health Statement)
Nitroguanidine	Data is not available on the carcinogenic effects of nitroguanidine. Reproductive studies on spargue dawley rats indicated no effects related to chemicals doses ranging from 100 to 1000 mg/kg/day. Nitroguanidine was found to cause chromosomal aberrations when incubated in vitro with Chinese hamster cells. An experimental hygienetic toxicological study suggested maximum tolerable level in water, based on toxicology endpoints should be 0.1 mg/L.	TOXNET (http://toxnet.nlm.nih.gov/)

Table 2

Mechanisms of Ecotoxicity

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Mechanisms of Ecotoxicity	References
Picric acid	Picric acid may be a permanent uncoupler, with delta psi transmembrane electrical potential difference. The uncoupling activity of picric acid in everted membrane systems is probably due to its protonophoric action. In crayfish picric acid caused a specific inhibition of voltage dependent K conductance. Weakly ionized phenols caused motor excitation and discoordination in intact crayfish.	TOXNET (http://toxnet.nlm.nih.gov/)
TPH	TPHs have a range of toxicities and mechanisms. Smaller compounds such as benzene, toluene, and xylene can affect the central nervous system. Other compounds affect blood, immune system, liver, spleen, kidneys, developing fetus, and lungs. Benzene has also been found to be carcinogenic.	ATSDR, 1999 (Public Health Statement)
Nitrate	Acute toxicity of nitrate occurs as a result of the reduction to nitrite, a process that can occur in the stomach. Nitrite acts in blood to oxidize hemoglobin to methemoglobin, which does not perform as oxygen carriers to tissues. Anoxia and death may occur. Additionally in water, nitrate may be converted to N-nitroso CMPD, a direct carcinogenic agent.	TOXNET (http://toxnet.nlm.nih.gov/)
Phosphorus	Phosphine toxicity results from inhalation of yellow phosphorus. Phosphorus may affect hepatocyte mitochondria, as well as cause liver cirrhosis.	TOXNET (http://toxnet.nlm.nih.gov/)
Acetone	As is typical of solvents, acetone is irritating to the mucous membranes. Acetone is also narcotic, and although the mechanism by which acetone exerts its effects on the central nervous system is unknown, as a solvent, it may interfere with the composition of membranes, altering their permeability to ions. The mechanisms by which acetone produces hematological, hepatic, renal, reproductive, and developmental effects is unknown, but acetone has been found to distribute to all of these target organs, including the brain, and can undergo transplacental transfer. One of the main effects of acetone is the induction of microsomal enzymes. Enzyme induction is probably responsible for the increased liver and kidney weights observed in animals.	ASTDR, 1997c
Toluene	LD50 for male mice was 1.15 g/kg. Known to have an additive effect with benzene. Evidence suggests lack of carcinogenicity in experimental animals. Alterations in specific neuron populations and their afferent and efferent terminal fields may complement changes in neurophysiology and behavior that have been observed in prenatally and perinatally exposed rodent pups. In utero exposure in rats can cause maternal malnutrition increasing the risk for fetotoxicity.	TOXNET (http://toxnet.nlm.nih.gov/)
Styrene	There is limited evidence in experimental animals for the carcinogenicity of styrene. Styrene has moderate toxicity to aquatic life. Styrene by itself is not likely to cause environmental harm at levels normally found in the environment. Styrene can contribute to smog formation when it reacts with other volatile substances in air. Animal studies have not reported developmental or reproductive effects from inhalation exposure to styrene.	USEPA, 1994
Perchlorate	The known mode of action for perchlorate is that it acts as a competitive inhibitor of active iodide uptake by the symporter in most mammals, including human and laboratory test species. This decrease in intrathyroidal iodide results in a decreased production of T3 and T4 thyroid hormones. This decrease can potentially perturb the hypothalamic-pituitary-thyroid axis to increase TSH from the pituitary to stimulate production of thyroid hormone. Prolonged stimulation may result in thyroid neoplasia, particularly in rodents known to be sensitive. Tumors have occurred in rats dosed with high levels of perchlorate for long periods.	TOXNET (http://toxnet.nlm.nih.gov/)
Xylene(s)	After inhalation exposure the retention in the lungs is about 60% of the inhaled dose. Xylene is efficiently metabolized. More than 90% is biotransformed to methylhippuric acid, which is excreted in urine. Xylene does not accumulate significantly in the human body. Acute exposure to high concentrations of xylene can result in CNS effects and irritation in humans. The chronic toxicity appears to be relatively low in laboratory animals. There is suggestive evidence, however, that chronic CNS effects may occur in animals at moderate concentrations of xylene. Xylene does not appear to be a mutagen or carcinogen. The critical end point is developmental toxicity. The xylene isomers are of moderate to low toxicity for aquatic organisms. The acute toxicity of xylene to birds is low. There is inadequate evidence in humans and experimental animals for the carcinogenicity of xylenes.	TOXNET (http://toxnet.nlm.nih.gov/)
2-Butanone	There is very limited info on the mechanisms of toxic action of 2-butanone. Relatively high inhalation exposure caused pulmonary vasoconstriction and hypertension in cats and dogs. From the toxicological point of view, interactions leading to the potentiation of effects, particularly neurotoxicity, by other intrinsically toxic substances constitute the main hazard of 2-butanone. The mechanisms underlying these interactions are incompletely known.	TOXNET (http://toxnet.nlm.nih.gov/)
Benzene	Benzene is a carcinogenic chemical. Exposure through ingestion of food or water cause blood and immune system damage and may cause cancer. Death in animals due to inhalation exposure has been linked to ventricular fibrillation due to an increased release of adrenaline.	ASTDR, 1997d

Notes:

Information on the fate and transport of chemicals was researched through TOXNET (<http://toxnet.nlm.nih.gov/>) in the Hazardous Substances Data Bank. Additional citations for the primary references listed can be found on the HSDB summary for each chemical listed.

Table 3
 Summary Statistics for Combined Historical and Current Surface Soil Samples from the TTU at the UTRR
 Attachment 10A - Thermal Treatment/Unit, Ecological Risk Assessment

Analyte	CAS No.	Analyte Group	Units	Det	n	DF (%)	MinND	MaxND	MinDet	MaxDet	AvgDet	Mean*	StdDev*	Screening Evaluation			Refined Evaluation - COPECs for Wildlife Receptors		
														Initial LEP C*	Basis	95 UCL	Appropriate Distribution	Refined EPC*	EPC Basis*
1,3,5-Trinitrobenzene	99354	energetic	mg/kg	0	22	0%	0.0140	0.210				0.0471	0.0581	0.105	0.5*MaxND	0.105	0.5*MaxND		
1,3-Dinitrobenzene	99650	energetic	mg/kg	0	22	0%	0.0320	0.160				0.0501	0.0299	0.0800	0.5*MaxND	0.0800	0.5*MaxND		
2,4,6-Trinitrophenol (TNT)	119867	energetic	mg/kg	0	22	0%	0.0440	3.00				0.739	0.735	1.50	0.5*MaxND	1.50	0.5*MaxND		
2,4-Dinitrophenol	51285	energetic	mg/kg	0	28	0%	0.112	1.00				6.07	15.6	50	0.5*MaxND	50	0.5*MaxND		
2,4-Dinitrotoluene	121142	energetic	mg/kg	1	48	2%	0.0950	21	2.00	2.00	2.00	1.13	2.49	2.00	Max Det	2.00	Max Det		
2,6-Dinitrotoluene	602022	energetic	mg/kg	0	48	0%	0.100	21				1.39	2.47	10.5	0.5*MaxND	10.5	0.5*MaxND		
2-Amino-4,6-Dinitrotoluene	1321126	energetic	mg/kg	0	40	0%	0.156	3.00				0.799	0.710	1.50	0.5*MaxND	1.50	0.5*MaxND		
2-Nitroaniline	86744	energetic	mg/kg	0	28	0%	0.0544	100				6.07	15.6	50	0.5*MaxND	50	0.5*MaxND		
2-Nitrophenol	86755	energetic	mg/kg	0	28	0%	0.0522	21				1.28	3.26	10.5	0.5*MaxND	10.5	0.5*MaxND		
2-Nitrotoluene	86722	energetic	mg/kg	0	22	0%	0.0430	0.280				0.0822	0.0541	0.140	0.5*MaxND	0.140	0.5*MaxND		
3-Nitroaniline	99092	energetic	mg/kg	0	28	0%	0.0438	100				6.19	15.6	50	0.5*MaxND	50	0.5*MaxND		
3-Nitrotoluene	99081	energetic	mg/kg	0	22	0%	0.0760	0.300				0.0964	0.0500	0.150	0.5*MaxND	0.150	0.5*MaxND		
4,6-Dinitro-2-methylphenol	534521	energetic	mg/kg	0	28	0%	0.0396	1.00				6.06	15.6	50	0.5*MaxND	50	0.5*MaxND		
4-Nitroaniline	100016	energetic	mg/kg	0	28	0%	0.0457	100				6.06	15.6	50	0.5*MaxND	50	0.5*MaxND		
4-Nitrophenol	100027	energetic	mg/kg	0	28	0%	0.0697	100				6.06	15.6	50	0.5*MaxND	50	0.5*MaxND		
4-Nitrotoluene	99990	energetic	mg/kg	0	22	0%	0.0930	0.380				0.122	0.0654	0.190	0.5*MaxND	0.190	0.5*MaxND		
HMX	2691410	energetic	mg/kg	13	42	31%	0.0900	3.00	0.230	25	4.36	1.91	4.04	25	Max Det	8.12	UCL		
Nitrobenzene	96953	energetic	mg/kg	0	48	0%	0.0600	21				1.37	2.47	10.5	0.5*MaxND	10.5	0.5*MaxND		
Nitroglycerin	55630	energetic	mg/kg	0	41	0%	0.300	0.680				0.238	0.0536	0.340	0.5*MaxND	0.340	0.5*MaxND		
Nitroguanidine	556887	energetic	mg/kg	2	42	5%	0.0360	1.00	0.100	0.300	0.200	0.179	0.210	0.300	Max Det	0.501	Max Det		
PEIN	76115	energetic	mg/kg	0	30	0%	0.530	1.00				0.433	0.0969	0.500	0.5*MaxND	0.500	0.5*MaxND		
Picric acid	86891	energetic	mg/kg	3	42	7%	0.00800	0.300	0.400	0.500	0.433	0.0909	0.102	0.248	Max Det	0.248	UCL		
RDX	121824	energetic	mg/kg	0	42	0%	0.0300	3.00				0.748	0.726	1.50	0.5*MaxND	1.50	0.5*MaxND		
Tetryl	479468	energetic	mg/kg	0	22	0%	0.0690	0.460				0.136	0.0911	0.230	0.5*MaxND	0.230	0.5*MaxND		
Aluminum	7429905	inorganic	mg/kg	48	48	100%		5390		54000	13200	13200	6950	54000	Max Det	14600	UCL		
Antimony	7440360	inorganic	mg/kg	22	28	79%	1.60	1.70	0.120	167	10.1	8.12	31.3	167	Max Det	67	UCL		
Arsenic	7440382	inorganic	mg/kg	28	48	58%	10	10	1.90	41.3	7.50	6.46	5.34	41.3	Max Det	7.75	UCL		
Barium	7440393	inorganic	mg/kg	48	48	100%		110		640	206	206	72.9	640	Max Det	224	UCL		
Beryllium	7440417	inorganic	mg/kg	23	48	48%	0.150	1.00	0.280	0.720	0.518	0.465	0.162	0.720	Max Det	0.567	UCL		
Cadmium	7440439	inorganic	mg/kg	21	48	44%	0.110	1.00	0.270	32	2.36	1.25	4.56	32	Max Det	7.80	UCL		
Calcium	7440702	inorganic	mg/kg	42	42	100%		15400		1560000	188000	188000	297000	1560000	Max Det	--	not a COPEC		
Carbon disulfide	75150	inorganic	mg/kg	1	22	5%	0.00600	0.00180	0.00110	0.00110	0.00110	0.000542	0.000164	0.00110	Max Det	--	not a COPEC		
Chloride	16887006	inorganic	mg/kg	30	42	71%	0.100	10.4	0.100	120000	4080	2920	18500	120000	Max Det	--	not a COPEC		
Chromium	7440473	inorganic	mg/kg	48	48	100%		6.50		55.3	14.4	14.4	7.79	55.3	Max Det	16	UCL		
Cobalt	7440484	inorganic	mg/kg	22	28	79%	4.20	4.90	1.00	4.90	2.90	2.78	1.12	4.90	Max Det	3.13	UCL		
Copper	7440508	inorganic	mg/kg	41	48	85%	1.00	94.7	6.00	18000	498	429	2590	18000	Max Det	4150	UCL		
Iron	7439896	inorganic	mg/kg	42	42	100%		4510		15000	10600	10600	2790	15000	Max Det	11400	UCL		
Lead	7439921	inorganic	mg/kg	40	48	83%	2.00	811	2.80	48000	1270	1070	6920	48000	Max Det	11000	UCL		
Magnesium	7439954	inorganic	mg/kg	42	42	100%		9700		24300	16700	16700	4000	24300	Max Det	17800	UCL		
Manganese	7439965	inorganic	mg/kg	48	48	100%		120		519	318	318	116	519	Max Det	350	UCL		
Mercury	7439976	inorganic	mg/kg	13	48	27%	0.0100	0.110	0.00500	0.0700	0.0172	0.0223	0.0153	0.0700	Max Det	0.0319	UCL		
Molybdenum	7439987	inorganic	mg/kg	20	22	91%	0.300	0.300	0.600	17	1.89	1.73	3.45	17	Max Det	4.93	UCL		
Nickel	7440020	inorganic	mg/kg	48	48	100%		6.70		41.3	11.3	11.3	5.83	41.3	Max Det	12.7	UCL		
Nitrate	14797558	inorganic	mg/kg	44	48	92%	1.70	2.50	0.0400	22.8	4.57	4.28	5.92	22.8	Max Det	12.8	UCL		
Perchlorate	7601903	inorganic	mg/kg	11	22	50%	0.0106	0.112	0.0156	4.50	0.833	0.422	1.09	4.50	Max Det	2.73	UCL		
Phosphorus	7723140	inorganic	mg/kg	20	20	100%		450		990	666	666	171	990	Max Det	722	UCL		
Potassium	7440097	inorganic	mg/kg	42	42	100%		1300		490000	15800	15800	75000	490000	Max Det	--	not a COPEC		
Selenium	7782492	inorganic	mg/kg	0	48	0%	0.180	10				2.48	2.17	5.00	0.5*MaxND	--	not a COPEC		
Silver	7440224	inorganic	mg/kg	4	48	8%	0.171	2.00	0.170	4.00	1.14	0.608	0.643	4.00	Max Det	1.01	UCL		
Sodium	7440235	inorganic	mg/kg	42	42	100%		274		2020	917	917	462	2020	Max Det	--	not a COPEC		
Strontium	7440246	inorganic	mg/kg	23	22	100%		244		484	351	351	71.9	484	Max Det	377	UCL		
Sulfate	14808798	inorganic	mg/kg	23	42	55%	0.500	0.500	9.20	3060	297	163	538	3060	Max Det	--	not a COPEC		
Thallium	7440280	inorganic	mg/kg	26	48	54%	0.170	5.00	0.110	0.550	0.279	1.20	1.12	0.550	Max Det	2.80	Max Det		
Vanadium	7440622	inorganic	mg/kg	28	28	100%		9.90		25.7	16.7	16.7	3.42	25.7	Max Det	17.8	UCL		
Zinc	7440666	inorganic	mg/kg	48	48	100%		29.7		2300	125	125	336	2300	Max Det	337	UCL		
2-Methylnaphthalene	91576	PAH	mg/kg	4	28	14%	0.0733	0.410	18	170	104	14.9	43.7	170	Max Det	97	UCL		
Acenaphthene	83329	PAH	mg/kg	0	10	0%	0.0635	0.0837				0.0360	0.00301	0.0418	0.5*MaxND	--	0.5*MaxND		
Acenaphthylene	203968	PAH	mg/kg	0	28	0%	0.0584	21				1.28	3.26	10.5	0.5*MaxND	--	0.5*MaxND		

Table 3
Summary Statistics for Combined Historical and Current Surface Soil Samples from the TTU at the UTRR
Attachment 10A - Thermal Treatment/Unit, Ecological Risk Assessment

Analyte	CAS No.	Analyte Group	Units	Det	n	DF (%)	MinND	MaxND	MinDet	MaxDet	AvgDet	Mean*	StdDev*	Screening Evaluation		Refined Evaluation - COPECs for Wildlife Receptors			
														Initial LEP C*	Basis	95 UCL	Appropriate Distribution	Refined EPC*	EPC Basis*
Anthracene	120127	PAH	mg/kg	2	28	7%	0.0462	20	3.60	3.70	3.65	0.793	2.12	3.70	Max Det	4.79	NON-PARAMETRIC	3.70	Max Det
Benzo(a)anthracene	56553	PAH	mg/kg	0	28	0%	0.0574	21				1.29	3.26	10.5	0.5*MaxND	--	--	10.5	0.5*MaxND
Benzo(a)pyrene	50328	PAH	mg/kg	0	28	0%	0.0573	21				1.28	3.26	10.5	0.5*MaxND	--	--	10.5	0.5*MaxND
Benzo(b)fluoranthene	205992	PAH	mg/kg	0	28	0%	0.0968	21				1.30	3.26	10.5	0.5*MaxND	--	--	10.5	0.5*MaxND
Benzo(g,h,i)perylene	191242	PAH	mg/kg	0	28	0%	0.0535	21				1.28	3.26	10.5	0.5*MaxND	--	--	10.5	0.5*MaxND
Benzo(k)fluoranthene	207069	PAH	mg/kg	0	28	0%	0.0903	21				1.29	3.26	10.5	0.5*MaxND	--	--	10.5	0.5*MaxND
Chrysene	218019	PAH	mg/kg	0	28	0%	0.0538	21				1.28	3.26	10.5	0.5*MaxND	--	--	10.5	0.5*MaxND
Dibenz(a,h)anthracene	53703	PAH	mg/kg	0	28	0%	0.0701	21				1.29	3.26	10.5	0.5*MaxND	--	--	10.5	0.5*MaxND
Fluoranthene	206440	PAH	mg/kg	1	28	4%	0.0546	21	0.144	0.144	0.144	1.28	3.26	0.144	Max Det	7.42	NON-PARAMETRIC	0.144	Max Det
Fluorene	86737	PAH	mg/kg	4	28	14%	0.0604	0.360	1.70	33	19.7	2.86	8.31	33	Max Det	18.5	NON-PARAMETRIC	18.5	UCL
Indeno(1,2,3-c,d)pyrene	193395	PAH	mg/kg	0	28	0%	0.0674	21				1.29	3.26	10.5	0.5*MaxND	--	--	10.5	0.5*MaxND
Naphthalene	91203	PAH	mg/kg	7	28	25%	0.00500	0.360	0.00600	53	18.1	4.54	13.6	53	Max Det	9.95	NON-PARAMETRIC	9.95	UCL
Phenanthrene	85018	PAH	mg/kg	5	28	18%	0.0528	0.360	0.380	92	42.5	7.62	22	92	Max Det	49.1	NON-PARAMETRIC	49.1	UCL
Pyrene	129000	PAH	mg/kg	0	28	0%	0.0689	21				1.30	3.26	10.5	0.5*MaxND	--	--	10.5	0.5*MaxND
TPH		petroleum	mg/kg	6	6	100%			20	47000	22800	22800	23500	47000	Max Det	328000	GAMMA	47000.0	Max Det
2,4,6-Trichlorophenol	95954	SVOC	mg/kg	0	28	0%	0.0643	100				6.05	15.6	50	0.5*MaxND	--	--	50	0.5*MaxND
2,4,6-Trichlorophenol	86062	SVOC	mg/kg	0	28	0%	0.0726	21				1.28	3.26	10.5	0.5*MaxND	--	--	10.5	0.5*MaxND
2,4-Dichlorophenol	120632	SVOC	mg/kg	0	28	0%	0.0681	21				1.29	3.26	10.5	0.5*MaxND	--	--	10.5	0.5*MaxND
2,4-Dimethylphenol	105679	SVOC	mg/kg	0	28	0%	0.0676	21				1.29	3.26	10.5	0.5*MaxND	--	--	10.5	0.5*MaxND
2-Chloronaphthalene	91587	SVOC	mg/kg	0	28	0%	0.0667	21				1.28	3.26	10.5	0.5*MaxND	--	--	10.5	0.5*MaxND
2-Methylphenol	95487	SVOC	mg/kg	0	28	0%	0.0535	21				1.28	3.26	10.5	0.5*MaxND	--	--	10.5	0.5*MaxND
3,3-Dichlorobenzidine	91941	SVOC	mg/kg	0	28	0%	0.0501	42				2.55	6.52	21	0.5*MaxND	--	--	21	0.5*MaxND
4-Chloro-3-methylphenol	59507	SVOC	mg/kg	0	28	0%	0.0710	21				1.29	3.26	10.5	0.5*MaxND	--	--	10.5	0.5*MaxND
4-Chloroaniline	106478	SVOC	mg/kg	0	28	0%	0.184	21				1.43	3.21	10.5	0.5*MaxND	--	--	10.5	0.5*MaxND
4-Methylphenol	106445	SVOC	mg/kg	0	28	0%	0.0633	21				1.29	3.26	10.5	0.5*MaxND	--	--	10.5	0.5*MaxND
Benzoic acid	65850	SVOC	mg/kg	0	28	0%	0.0714	100				6.07	15.6	50	0.5*MaxND	--	--	50	0.5*MaxND
Benzylalcohol	100516	SVOC	mg/kg	0	28	0%	0.0525	21				1.29	3.26	10.5	0.5*MaxND	--	--	10.5	0.5*MaxND
bis(2-Ethylhexyl)phthalate	117817	SVOC	mg/kg	5	28	18%	0.0710	21	0.0832	1.50	0.661	0.539	1.98	1.50	Max Det	2.10	NON-PARAMETRIC	1.50	Max Det
Butyl benzylphthalate	85697	SVOC	mg/kg	0	28	0%	0.0678	21				1.29	3.26	10.5	0.5*MaxND	--	--	10.5	0.5*MaxND
Dibenzofuran	132649	SVOC	mg/kg	4	28	14%	0.0633	0.360	0.640	12	6.96	1.05	2.99	12	Max Det	6.66	NON-PARAMETRIC	6.66	UCL
Diethylphthalate	84662	SVOC	mg/kg	0	28	0%	0.0800	21				1.29	3.26	10.5	0.5*MaxND	--	--	10.5	0.5*MaxND
Dimethylphthalate	131113	SVOC	mg/kg	0	28	0%	0.0648	21				1.28	3.26	10.5	0.5*MaxND	--	--	10.5	0.5*MaxND
Di-n-butylphthalate	84742	SVOC	mg/kg	0	28	0%	0.0805	21				1.29	3.26	10.5	0.5*MaxND	--	--	10.5	0.5*MaxND
Di-n-octylphthalate	117840	SVOC	mg/kg	0	28	0%	0.0500	21				1.29	3.26	10.5	0.5*MaxND	--	--	10.5	0.5*MaxND
Hexachlorobenzene	118741	SVOC	mg/kg	0	28	0%	0.0560	21				1.29	3.26	10.5	0.5*MaxND	--	--	10.5	0.5*MaxND
Hexachlorobutadiene	87663	SVOC	mg/kg	1	28	4%	0.00700	21	0.000800	0.000800	0.000800	1.25	3.28	0.000800	Max Det	3.81	NON-PARAMETRIC	0.000800	Max Det
Hexachlorocyclopentadiene	77474	SVOC	mg/kg	0	28	0%	0.0685	21				1.34	3.24	10.5	0.5*MaxND	--	--	10.5	0.5*MaxND
Hexachloroethane	67721	SVOC	mg/kg	0	28	0%	0.0584	21				1.29	3.26	10.5	0.5*MaxND	--	--	10.5	0.5*MaxND
Isophorone	76591	SVOC	mg/kg	0	28	0%	0.0664	21				1.29	3.26	10.5	0.5*MaxND	--	--	10.5	0.5*MaxND
n-Nitroso-d-n-propylamine	621647	SVOC	mg/kg	0	28	0%	0.0585	21				1.28	3.26	10.5	0.5*MaxND	--	--	10.5	0.5*MaxND
n-Nitrosodiphenylamine	86306	SVOC	mg/kg	0	28	0%	0.0463	21				1.29	3.26	10.5	0.5*MaxND	--	--	10.5	0.5*MaxND
Penta-chlorophenol	87865	SVOC	mg/kg	0	28	0%	0.0665	100				6.04	15.6	50	0.5*MaxND	--	--	50	0.5*MaxND
1,1,1,2-Tetrachloroethane	630206	VOC	mg/kg	1	22	5%	0.000500	0.00150	0.000600	0.000600	0.000600	0.000436	0.000136	0.000600	Max Det	0.000475	NORMAL	0.000475	UCL
1,1,1-Trichloroethane	71556	VOC	mg/kg	1	22	5%	0.000680	0.00130	0.000900	0.000900	0.000900	0.000496	0.000120	0.000900	Max Det	0.000616	NON-PARAMETRIC	0.000616	UCL
1,1,2,2-Tetrachloroethane	79345	VOC	mg/kg	1	22	5%	0.000790	0.00140	0.00100	0.00100	0.00100	0.000558	0.000133	0.00100	Max Det	0.000692	NON-PARAMETRIC	0.000692	UCL
1,1,2-Trichloroethane	79005	VOC	mg/kg	1	22	5%	0.000640	0.00140	0.000800	0.000800	0.000800	0.000480	0.000117	0.000800	Max Det	0.000597	NON-PARAMETRIC	0.000597	UCL
1,1-Dichloroethane	75343	VOC	mg/kg	1	22	5%	0.000550	0.000900	0.000700	0.000700	0.000700	0.000387	0.0000916	0.000700	Max Det	0.000479	NON-PARAMETRIC	0.000479	UCL
1,1-Dichloroethane	75354	VOC	mg/kg	1	22	5%	0.000450	0.00290	0.00110	0.00110	0.00110	0.000593	0.000349	0.00110	Max Det	0.000897	NON-PARAMETRIC	0.000897	UCL
1,2,3-Trichlorobenzene	87616	VOC	mg/kg	1	22	5%	0.000600	0.00110	0.00280	0.00280	0.00280	0.000538	0.000111	0.00280	Max Det	0.000725	NON-PARAMETRIC	0.000725	UCL
1,2,3-Trichlorobenzene	96184	VOC	mg/kg	1	22	5%	0.000780	0.00210	0.000900	0.000900	0.000900	0.000585	0.000188	0.000900	Max Det	0.000638	NORMAL	0.000638	UCL
1,2,4-Trichlorobenzene	120821	VOC	mg/kg	1	28	4%	0.000600	21	0.00320	0.00320	0.00320	1.25	3.28	0.00320	Max Det	2.02	NON-PARAMETRIC	0.00320	Max Det
1,2-Dibromo-3-chloropropane	96128	VOC	mg/kg	1	22	5%	0.000630	0.00690	0.00390	0.00390	0.00390	0.00209	0.000673	0.00390	Max Det	--	--	--	not a COPEC
1,2-Dichlorobenzene	95501	VOC	mg/kg	1	28	4%	0.000600	21	0.00140	0.00140	0.00140	1.25	3.28	0.00140	Max Det	2.01	NON-PARAMETRIC	0.00140	Max Det
1,2-Dichloroethane	107062	VOC	mg/kg	1	22	5%	0.000630	0.00140	0.000800	0.000800	0.000800	0.000466	0.000121	0.000800	Max Det	0.000585	NON-PARAMETRIC	0.000585	UCL
1,2-Dichloropropane	78875	VOC	mg/kg	1	22	5%	0.000580	0.00110	0.000700	0.000700	0.000700	0.000418	0.0000939	0.000700	Max Det	0.000515	NON-PARAMETRIC	0.000515	UCL
1,2-Ethylene Dichloride	106934	VOC	mg/kg	1	22	5%	0.000630	0.00190	0.000900	0.000900	0.000900	0.000518	0.000176	0.000900	Max Det	--	--	--	not a COPEC
1,3-Dichlorobenzene	547131	VOC	mg/kg	1	28	4%	0.000600	21	0.00190	0.00190	0.00190	1.25	3.28	0.00190	Max Det	2.01	NON-PARAMETRIC	0.00190	Max Det

Table 3
 Summary Statistics for Combined Historical and Current Surface Soil Samples from the TTU at the UTRR
 Attachment 10A - Thermal Treatment/Unit, Ecological Risk Assessment

Analyte	CAS No.	Analyte Group	Units	Det	n	DF (%)	MinND	MaxND	MinDet	MaxDet	AvgDet	Mean*	StdDev*	Screening Evaluation			Refined Evaluation - COPECs for Wildlife Receptors		
														Initial LEP C*	Basis	95 UCL	Appropriate Distribution	Refined EPC*	EPC Basis*
1,4-Dichlorobenzene	108467	VOC	mg/kg	1	28	4%	0.00600	21	0.00310	0.00310	0.00310	1.25	3.28	0.00310	Max Det	2.01	NON-PARAMETRIC	0.00310	Max Det
2-Butanone	78933	VOC	mg/kg	4	22	18%	0.00350	0.00750	0.00430	0.0159	0.0108	0.00409	0.00375	0.0159	Max Det	0.00758	NON-PARAMETRIC	0.00758	UCL
2-Chloroethyl Ether	110758	VOC	mg/kg	0	12	0%	0.00580	0.1119				0.00469	0.00106	0.00595	0.5*MaxND	--	--	0.00595	0.5*MaxND
2-Chlorophenol	95578	VOC	mg/kg	0	28	0%	0.0636	21				1.28	3.26	10.5	0.5*MaxND	--	--	10.5	0.5*MaxND
2-Hexanone	591786	VOC	mg/kg	1	22	5%	0.00320	0.00780	0.00380	0.00380	0.00380	0.00260	0.000724	0.00360	Max Det	0.00281	NORMAL	0.00281	UCL
4-Bromophenyl Ether	101553	VOC	mg/kg	0	28	0%	0.0645	21				1.29	3.26	10.5	0.5*MaxND	--	--	10.5	0.5*MaxND
4-Chlorophenyl Ether	7005723	VOC	mg/kg	0	28	0%	0.0645	21				1.28	3.26	10.5	0.5*MaxND	--	--	10.5	0.5*MaxND
4-Methyl-2-pentanone	108101	VOC	mg/kg	1	22	5%	0.00360	0.00680	0.00430	0.00430	0.00430	0.00264	0.000607	0.00430	Max Det	0.00326	NON-PARAMETRIC	0.00326	UCL
Acetone	67641	VOC	mg/kg	9	28	32%	0.00350	0.1110	0.00410	24	4.13	1.72	5.20	24	Max Det	11.5	NON-PARAMETRIC	11.5	UCL
Benzene	71432	VOC	mg/kg	3	22	14%	0.00600	0.00130	0.00116	0.00410	0.00282	0.000703	0.000905	0.00410	Max Det	0.00154	NON-PARAMETRIC	0.00154	UCL
bis(2-chloroethoxy)methane	111911	VOC	mg/kg	0	22	0%	0.0690	0.148				0.0566	0.0158	0.0740	0.5*MaxND	--	--	0.0740	0.5*MaxND
bis(2-chloroethyl) ether	111444	VOC	mg/kg	0	28	0%	0.0538	21				1.28	3.26	10.5	0.5*MaxND	--	--	10.5	0.5*MaxND
bis(2-chloroisopropyl) ether	108601	VOC	mg/kg	0	28	0%	0.0668	21				1.29	3.26	10.5	0.5*MaxND	--	--	10.5	0.5*MaxND
Bromodichloromethane	75274	VOC	mg/kg	1	22	5%	0.00580	0.00130	0.000700	0.000700	0.000700	0.000429	0.000106	0.000700	Max Det	0.000432	NORMAL	0.000432	UCL
Bromoform	74839	VOC	mg/kg	1	22	5%	0.00400	0.00160	0.000500	0.000500	0.000500	0.000385	0.000161	0.000500	Max Det	0.000917	NON-PARAMETRIC	0.000917	UCL
Bromomethane	56235	VOC	mg/kg	1	22	5%	0.00900	0.00200	0.00150	0.00150	0.00150	0.000720	0.000205	0.00150	Max Det	0.000607	NON-PARAMETRIC	0.000607	UCL
Carbon tetrachloride	108907	VOC	mg/kg	1	22	5%	0.00650	0.00130	0.000900	0.000900	0.000900	0.000490	0.000117	0.000900	Max Det	0.000560	NON-PARAMETRIC	0.000560	UCL
Chlorobenzene	75003	VOC	mg/kg	1	22	5%	0.00600	0.00120	0.000700	0.000700	0.000700	0.000457	0.0000981	0.000700	Max Det	0.000748	NON-PARAMETRIC	0.000748	UCL
Chloroethane	75007	VOC	mg/kg	1	22	5%	0.00630	0.00210	0.00100	0.00100	0.00100	0.000561	0.000205	0.00100	Max Det	0.000457	NON-PARAMETRIC	0.000457	UCL
Chloroform	67663	VOC	mg/kg	1	22	5%	0.00600	0.00120	0.000700	0.000700	0.000700	0.000426	0.000107	0.000700	Max Det	0.000738	NON-PARAMETRIC	0.000738	UCL
Chloromethane	74873	VOC	mg/kg	1	22	5%	0.00700	0.00200	0.00100	0.00100	0.00100	0.000567	0.000184	0.00100	Max Det	0.000497	NORMAL	0.000497	UCL
cis-1,2-Dichloroethane	158592	VOC	mg/kg	1	22	5%	0.00600	0.00110	0.000600	0.000600	0.000600	0.000423	0.000115	0.000600	Max Det	0.000535	NON-PARAMETRIC	0.000535	UCL
cis-1,3-Dichloropropene	10061015	VOC	mg/kg	1	22	5%	0.00500	0.00110	0.000600	0.000600	0.000600	0.000430	0.000149	0.000700	Max Det	0.000567	NON-PARAMETRIC	0.000567	UCL
Dibromochloromethane	124481	VOC	mg/kg	1	22	5%	0.00560	0.00160	0.000700	0.000700	0.000700	0.000402	0.000139	0.000700	Max Det	0.000442	NORMAL	0.000442	UCL
Dibromomethane	74953	VOC	mg/kg	1	22	5%	0.00500	0.00150	0.000500	0.000500	0.000500	0.000402	0.000139	0.000500	Max Det	0.000665	NON-PARAMETRIC	0.000665	UCL
Dichlorodifluoromethane	75718	VOC	mg/kg	1	22	5%	0.00610	0.00150	0.00110	0.00110	0.00110	0.000515	0.000161	0.00110	Max Det	0.000563	NON-PARAMETRIC	0.000563	UCL
Ethylbenzene	100414	VOC	mg/kg	1	22	5%	0.00700	0.00120	0.00130	0.00130	0.00130	0.000489	0.000200	0.00130	Max Det	0.000965	NON-PARAMETRIC	0.000965	UCL
m,p-Xylene	1330207	VOC	mg/kg	1	22	5%	0.00900	0.00250	0.00200	0.00200	0.00200	0.000882	0.000374	0.00200	Max Det	0.00146	NON-PARAMETRIC	0.00146	UCL
Methylene chloride	75092	VOC	mg/kg	1	22	5%	0.00680	0.00320	0.00320	0.00320	0.00320	0.000878	0.000632	0.00320	Max Det	0.00118	NON-PARAMETRIC	0.00118	UCL
o-Xylene	95478	VOC	mg/kg	3	22	14%	0.00400	0.00120	0.000800	0.00270	0.00191	0.000591	0.000630	0.00270	Max Det	0.00118	NON-PARAMETRIC	0.00118	UCL
Phenol	108952	VOC	mg/kg	0	28	0%	0.0712	21				1.29	3.26	10.5	0.5*MaxND	--	--	10.5	0.5*MaxND
Styrene	100425	VOC	mg/kg	3	22	14%	0.00500	0.00270	0.000600	0.00260	0.00160	0.000622	0.000563	0.00260	Max Det	0.00115	NON-PARAMETRIC	0.00115	UCL
tert-ButylMethylEther	1634044	VOC	mg/kg	1	22	5%	0.00600	0.00170	0.000700	0.000700	0.000700	0.000473	0.000158	0.000700	Max Det	--	--	--	not a COPEC
Tetrachloroethene	127184	VOC	mg/kg	1	22	5%	0.00790	0.00130	0.000900	0.000900	0.000900	0.000531	0.000123	0.000900	Max Det	0.000656	NON-PARAMETRIC	0.000656	UCL
Toluene	108883	VOC	mg/kg	5	22	23%	0.00600	0.00110	0.00180	0.0187	0.0111	0.00284	0.00536	0.0187	Max Det	0.0142	NON-PARAMETRIC	0.0142	UCL
Trans-1,2-Dichloroethene	158605	VOC	mg/kg	1	22	5%	0.00600	0.00120	0.000700	0.000700	0.000700	0.000448	0.000102	0.000700	Max Det	0.000552	NON-PARAMETRIC	0.000552	UCL
Trans-1,3-Dichloropropene	10061026	VOC	mg/kg	1	22	5%	0.00600	0.00140	0.000800	0.000800	0.000800	0.000483	0.000125	0.000800	Max Det	0.000519	NORMAL	0.000519	UCL
Trichloroethylene (TCE)	79016	VOC	mg/kg	1	22	5%	0.00600	0.00110	0.000700	0.000700	0.000700	0.000410	0.0000982	0.000700	Max Det	0.000509	NON-PARAMETRIC	0.000509	UCL
Trichlorofluoromethane	75694	VOC	mg/kg	1	22	5%	0.000510	0.00160	0.00110	0.00110	0.00110	0.000503	0.000183	0.00110	Max Det	--	--	--	not a COPEC
Vinyl Acetate	108054	VOC	mg/kg	1	22	5%	0.00100	0.00180	0.00120	0.00120	0.00120	0.000707	0.000169	0.00120	Max Det	--	--	--	not a COPEC
Vinyl chloride	75014	VOC	mg/kg	1	22	5%	0.00610	0.00170	0.00120	0.00120	0.00120	0.000567	0.000184	0.00120	Max Det	0.000738	NON-PARAMETRIC	0.000738	UCL
pH	Other				20	100%			7.4	8.9	7.98	7.98	0.3764096	7.98	Average	--	--	--	not a COPEC

Notes:
 Det = number of samples where the analyte concentration exceeded the analytical detection limit
 n = number of samples that were analyzed for each chemical
 DF = detection frequency
 UCL 95 = 95% Upper Confidence Limit
 * includes 1/2 DL proxy values for NDS

Table 4

Linkage Between Assessment and Measurement Endpoints

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Assessment Endpoint	Measurement Endpoints	Linkage	Null Hypotheses
1. Protection of the terrestrial plant community from direct toxic effects on survival, reproduction and growth due to chemicals in soil	Comparison of concentrations of chemicals in on-site surface soil to literature-based survival, growth and reproduction effects concentrations for terrestrial plants (Table 10)	Direct exposure	Maximum Detected soil concentrations of chemicals do not exceed relevant NOEC or LOEC benchmarks
2. Protection of the soil invertebrate community from direct toxic effects on survival, reproduction and growth due to chemicals in soil	Comparison of concentrations of chemicals in on-site surface soil to literature-based survival, growth and reproduction concentrations for terrestrial invertebrates (Table 11)	Direct exposure	Maximum Detected soil concentrations of chemicals do not exceed relevant NOEC or LOEC benchmarks
3. Protection of populations of herbivorous small mammals from toxic effects on survival, reproduction and growth due to chemicals in soil and plants	Comparison of exposure doses (based on the EPC) to published values for survival, growth and reproduction no observed adverse effect levels (NOAELs) or lowest observed adverse effect levels (LOAELs) (Table 12)	Direct exposure, ingestion	Exposure doses, based on UCL95 concentrations within the TTU, do not exceed survival, growth, reproduction, or other relevant NOAELs or LOAELs
4. Protection of populations of insectivorous small mammals from toxic effects on survival, reproduction and growth due to chemicals in soil and terrestrial invertebrates	Comparison of exposure doses (based on the EPC) to published values for survival, growth and reproduction no observed adverse effect levels (NOAELs) or lowest observed adverse effect levels (LOAELs) (Table 12)	Direct exposure, ingestion	Exposure doses, based on UCL95 concentrations within the TTU, do not exceed survival, growth, reproduction, or other relevant NOAELs or LOAELs
5. Protection of populations of carnivorous mammals from toxic effects on survival, reproduction, and growth due to chemicals in soil and prey	Comparison of exposure doses (based on the EPC) to published values for survival, growth and reproduction no observed adverse effect levels (NOAELs) or lowest observed adverse effect levels (LOAELs) (Table 12)	Direct exposure, ingestion	Exposure doses, based on UCL95 concentrations within the TTU, do not exceed survival, growth, reproduction, or other relevant NOAELs or LOAELs
6. Protection of populations of herbivorous birds from toxic effects on survival, reproduction and growth due to chemicals in soil and plants	Comparison of exposure doses (based on the EPC) to published values for survival, growth and reproduction no observed adverse effect levels (NOAELs) or lowest observed adverse effect levels (LOAELs) (Table 13)	Direct exposure, ingestion	Exposure doses, based on UCL95 concentrations within the TTU, do not exceed survival, growth, reproduction, or other relevant NOAELs or LOAELs
7. Protection of populations of insectivorous birds from toxic effects on survival, reproduction, and growth due to chemicals in soil and invertebrates	Comparison of exposure doses (based on 95th UCL soil concentrations) to published values for survival, growth and reproduction no observed adverse effect levels (NOAELs) or lowest observed adverse effect levels (LOAELs) (Table 13)	Direct exposure, ingestion	Exposure doses, based on UCL95 concentrations within the TTU, do not exceed survival, growth, reproduction, or other relevant NOAELs or LOAELs
8. Protection of populations of carnivorous birds from toxic effects on survival, reproduction, and growth due to chemicals in soil and invertebrates	Comparison of exposure doses (based on the EPC) to published values for survival, growth and reproduction no observed adverse effect levels (NOAELs) or lowest observed adverse effect levels (LOAELs) (Table 13)	Direct exposure, ingestion	Exposure doses, based on UCL95 concentrations within the TTU, do not exceed survival, growth, reproduction, or other relevant NOAELs or LOAELs

Notes:

The EPC (Exposure Point Concentration) was calculated as the maximum detected concentration (or maximum non-detected concentration) in the initial risk characterization. The lesser of the UCL 95 or maximum soil concentration was the EPC in the refined risk characterization.

Table 5
Rationale for Selection of Wildlife Receptors of Concern
Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Assessment Endpoint	Representative Receptor	Special Status?	Home Range Size?	Representative of Ecological Guild?	Susceptible to bioaccumulation?	Likely to be exposed?	Occurs at site?	Sensitivity to contaminants?	Body Size	Diet Composition
Terrestrial plant community	plants	no	immobile	yes	no	yes	yes	unknown	NA	NA
Soil invertebrate community	soil invertebrates	no	very small (<1 acre)	yes	no	yes	yes	unknown	NA	NA
Herbivorous small mammal	Ord's Kangaroo Rat	no	small (<10 acre)	yes	no	yes	yes	unknown	small (<1 kg)	100% plants
Herbivorous small mammal	Townsend's Ground Squirrel	no	very small (<1 acre)	yes	no	yes	yes	unknown	small (<1 kg)	100% plants
Herbivorous small mammal	Black-tailed Jackrabbit	no	medium (>10 acre; <100 acre)	yes	no	yes	yes	unknown	medium (>1kg; <10 kg)	100% plants
Herbivorous large mammal	Pronghorn	no	medium (>10 acre; <100 acre)	yes	no	yes	yes	unknown	large (>10 kg)	100% plants
Insectivorous mammal	Grasshopper Mouse	no	small (<10 acre)	yes	yes	yes	possible	unknown	small (<1 kg)	100 % invertebrates
Carnivorous mammal	Coyote	no	very large (>1000 acre)	yes	yes	yes	yes	unknown	large (>10 kg)	100% vertebrates
Herbivorous bird	Sage Sparrow	no	large (>100 acre; <1000 acre)	yes	no	yes	yes	unknown	small (<1 kg)	100% plants
Insectivorous bird	Loggerhead Shrike	no	medium (>10 acre; <100 acre)	yes	yes	yes	yes	unknown	small (<1 kg)	100% invertebrates
Insectivorous bird	Western Meadowlark	no	small (<10 acre)	yes	yes	yes	yes	unknown	small (<1 kg)	100 % invertebrates
Carnivorous bird	Burrowing Owl	no	small (<10 acre)	yes	yes	yes	yes	unknown	small (<1 kg)	100% vertebrates

Note: Unchanged in October 2005 Update

Table 6
Exposure Parameters for Selected Wildlife Receptors of Concern
Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Species	Receptor Guild	Kg body weight		Food Ingestion Rate		Dietary Composition (%)					Reference ¹	
		kg	Reference	kg/kg-bw/d dry weight	Reference ^{1,2}	Terrestrial Invertebrates	Plants	Small Mammals and Other Vertebrates	Reference ¹	Soil		
Ord's Kangaroo Rat	herbivorous small mammal	0.052	Jones, 1985	0.111	Nagy, 1987		100		Garrison and Best, 1990	2.0	Soil	measure of conservatism
Townsend's Ground Squirrel	herbivorous small mammal	0.325	Rickart, 1987	0.050	Nagy, 1987		100		Rickart, 1987.	2.0		measure of conservatism
Black-tailed Jackrabbit	herbivorous small mammal	2.100	Goodwin and Currie, 1965 in Sample et al., 1997	0.071	Nagy, 1987		100		Sample et al., 1997	6.3		Arthur and Gates (1988) in Sample et al., 1997
Grasshopper Mouse	Invertivorous small mammal	0.041	Harriman, 1973	0.250	Bailey and Sperry, 1929	100			Bailey and Sperry, 1929	13.0		Talmage and Walton, 1993
Pronghorn	herbivorous large mammal	48.761	Smith and Beale, 1974	0.034	Nagy, 1987		100		Beale and Smith, 1970	2.0		measure of conservatism
Coyote	carnivorous mammal	10.330	Average of values from California and Arizona presented in Sample et al., 1997	0.045	Nagy, 1987			100	Assumed (99% vertebrate diet in Sperry, 1934)	2.8		Used Red Fox Data from Beyer et al., 1994
Sage Sparrow	herbivorous bird	0.019	Average of male and female data from Bonneville Basin, UT in Martin and Carlson, 1998	0.026	Nagy, 1987		100		Assumed (87% plants and 13% invertebrates - winter diet in Lower Colorado river reported in Martin and Carlson, 1998)	2.0		Measure of conservatism
Loggerhead Shrike	insectivorous bird	0.047	Yosef, 1996	0.022	Nagy, 1987	100			Assumed (66 % invertebrates and 34 % vertebrates in diet - Burton, 1990 in Yosef, 1996)	0.0		Species does not generally forage near ground

Table 6

Exposure Parameters for Selected Wildlife Receptors of Concern
Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Species	Receptor Guild	Kg body weight		Food Ingestion Rate		Dietary Composition (%)					Reference ¹
		kg	Reference	kg/kg-bw/d dry weight	Reference ^{1,2}	Terrestrial Invertebrates	Plants	Small Mammals and Other Vertebrates	Reference ¹	Soil	
Western Meadowlark	omnivorous bird	0.103	Average of values in Sample et al., 1997	0.020	Nagy, 1987	100			Assumed 100% (98% insects in Rotenberry, 1980)	2.0	Measure of conservatism
Burrowing Owl	camivorous bird	0.157	Average of males and females in Colorado from Haug et al., 1993 in Sample et al., 1997	0.111	Nagy, 1987			100	Assumed (71 % vertebrates / 29% invertebrates in diet - Gleason and Craig, 1979)	5.0	Thomsen, 1971 in Sample et al., 1997

Notes:

1) Complete references are available in the references section of the main body of the ERA

2) Ingestion rates were calculated from Kg body weight using Nagy's allometric equations as modified in Sample et al. 1997 where:

food ingestion rate (birds [burrowing owl]) = $0.0582 \cdot (\text{Kg body weight}^{0.651}) / (\text{Kg body weight})$

food ingestion rate (passerine birds[sage sparrow, loggerhead shrike, western meadowlark]) = $0.0141 \cdot (\text{Kg body weight}^{0.850}) / (\text{Kg body weight})$

food ingestion rate (mammals [coyote, pronghorn]) = $0.0687 \cdot (\text{Kg body weight}^{0.822}) / (\text{Kg body weight})$

food ingestion rate (rodents [Ord's kangaroo rat, townsend's ground squirrel]) = $0.0306 \cdot (\text{Kg body weight}^{0.564}) / (\text{Kg body weight})$, and

food ingestion rate (herbivores [black-tailed jackrabbit]) = $0.0875 \cdot (\text{Kg body weight}^{0.727}) / (\text{Kg body weight})$.

Table 7**Area Use Factors for Selected Receptors***Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment*

Habitat Size (Acres)	Species	Home Range (Acres)	Home Range Source	Area Use Factor ¹
220	Ord's Kangaroo Rat	1.5	O'Farrel (1978)	1.000
220	Townsend's Ground Squirrel	0.3	Smith and Johnson (1985)	1.000
220	Black-tailed Jackrabbit	45.0	Average of two values presented in Sample et al. (1997)	1.000
220	Grasshopper Mouse	5.7	Large home range for a small mammal due to predatory life history (Blair 1953)	1.000
220	Pronghorn	49.4	minimum undisturbed daily range from Gregg, 1955 reported in O'Gara (1978)	1.000
220	Coyote	3533.6	Bekoff (1982) and Bekoff and Wells (1980) in Sample et al. (1997)	0.062
220	Sage Sparrow	124.1	Martin and Carlson (1998) reported traveling 800 meters from nest	1.000
220	Loggerhead Shrike	69.8	Distance between nests averaged 600 meters in data reported from Colorado and Nevada in Porter et al. (1975)	1.000
220	Western Meadowlark	6.9	Sample et al. (1997)	1.000
220	Burrowing Owl	2.0	Thomsen (1971)	1.000

Notes:

1) The area use factors were calculated as Habitat Size divided by Home Range Size with a resulting maximum area use Full references are found in the main text of Appendix N.

Table 8
Chemical Uptake for Dietary Items

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Plant BTF	Source for Plant BTFs	Terrestrial Invertebrates BTF	Source for Terrestrial Invertebrate BTFs	Small Mammal BTF	Source for Mammal BTFs	Log Ko	LogKo Source	Notes
Aluminum	0.0040	A	0.34	E	0.073	I	NA	-	-
Antimony	0.050	A	0.025	D	1.0	J	NA	-	-
Arsenic	Regression Based	B	Regression Based	F	Regression Based	K	NA	-	-
Barium	0.10	A	0.36	E	0.112	I	NA	-	-
Beryllium	0.010	A	1.82	G	0.41	I	NA	-	-
Cadmium	Regression Based	B	Regression Based	F	Regression Based	K	NA	-	-
Chromium	0.040	A	3.16	G	0.3333	I	NA	-	-
Cobalt	0.054	A	0.291	G	Regression Based	K	NA	-	-
Copper	Regression Based	B	Regression Based	F	Regression Based	K	NA	-	-
Iron	0.010	A	0.38	E	Regression Based	K	NA	-	-
Lead	Regression Based	B	Regression Based	F	Regression Based	K	NA	-	-
Magnesium	2.060	B	0.425	G	0.993	I	NA	-	-
Manganese	0.68	A	Regression Based	F	0.079	I	NA	-	-
Mercury	Regression Based	B	Regression Based	F	0.192	I	NA	-	-
Molybdenum	0.400	A	2.091	G	1.0	J	NA	-	-
Nickel	Regression Based	B	4.7	G	0.5891	I	NA	-	-
Selenium	Regression Based	B	Regression Based	F	Regression Based	K	NA	-	-
Silver	1.0	A	15.3	G	0.81	I	NA	-	-
Sodium	0.820	A	64.5	G	81.94	I	NA	-	-
Strontium	1.1	A	0.3	G	1.0	J	NA	-	-
Thallium	0.0040	A	0.26	D	0.1227	I	NA	-	general trophic group
Vanadium	0.006	A	0.088	G	0.019	I	NA	-	-
Zinc	Regression Based	B	Regression Based	F	Regression Based	K	NA	-	-
1,3,5-Trinitrobenzene	4.8	C	28	H	0.88	H	2.71	Hansch and Leo 1985	-
1,3-Dinitrobenzene	15.0	C	27	H	1.32	H	1.49	Hansch and Leo 1985	-
2,4,6-Trinitrobenzene (TNT)	4.2	C*	0.170	N	0	C*	3.68	Hansch and Leo 1985	-
2,4-Dinitrophenol	2.4	C	29	H	0.69	H	3.45	Mabey et al. 1982	-
2,4-Dinitrotoluene	0.607	N	5.10	N	1.05	H	2.2	SRC, 1998	-
2,6-Dinitrotoluene	11.0	N	3.16	N	1.10	H	2.05	Callahan et al. 1979	-
2-Amino-4,6-Dinitrotoluene	Regression Based	N	Regression Based	N	1.18	H	1.84	SRC, 2004	-
2-Nitroaniline	10.7	C	27	H	1.17	H	1.9	Hansch and Leo 1985	-
2-Nitrophenol	11.3	C	27	H	1.20	H	1.79	Hansch and Leo 1985	-
2-Nitrotoluene	0.43	C	31	H	0.37	H	5.30	Howard and Maylan 1997	-
3-Nitroaniline	16.8	C	26	H	1.38	H	1.37	Hansch et al. 1995	-
3-Nitrotoluene	6.1	C	28	H	0.96	H	2.45	USEPA 2004	-
4,6-Dinitro-2-methylphenol	0.18	C	32	H	0.27	H	6.22	Mabey et al. 1982	-
4-Nitroaniline	3.0	C	28	H	3.20	H	3.20	Fujita et al. 1964	-
4-Nitrophenol	1.0	C	30	H	0.50	H	4.40	Fujita et al. 1964	-
4-Nitrotoluene	6.7	C	28	H	0.99	H	2.36	SRC, 2004	-
HMX	Regression Based	N	1.0	N	2.13	H	0.060	Holdsworth et al. 2001a	-
Nitrobenzene	1.1	C	30	H	0.53	H	4.26	Callahan et al. 1979	-
Nitroglycerin	14.7	C	27	H	1.32	H	1.51	SRC, 2004	-
Nitroguanidine	138.7	C	24	H	2.9	H	-0.89	HSDb, 2002	-
PETN	6.5	C	28	H	0.98	H	2.38	SRC, 2004	-
Picric acid	17.4	C	26	H	1.4	H	1.3	HSDb, 2002	-
RDX	Regression Based	N	Regression Based	N	0	C*	2.00	Howard and Maylan 1997	-
Tetryl	1.8	C	29	H	0.62	H	3.78	Howard and Maylan 1997	-
Carbon disulfide	9.3	C	27	H	1.12	H	2.00	USEPA 1995	-

Table 8
Chemical Uptake for Dietary Items
Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Anal. te	Plant BTF	Source for Plant BTFs	Terrestrial Invertebrates BTF	Source for Terrestrial Invertebrate BTFs	Small Mammal BTF	Source for Mammal BTFs	Log Ko	LogKo	Source	Notes
Nitrate	1.0	J	1.0	J	1.0	J	NA	NA	-	-
Perchlorate	282.0	L	1.0	J	0.1	J	NA	--	-	-
Phosphorus	1.0	J	1.0	J	1.0	J	3.1	TNRCC, 1996	-	-
2-Methylnaphthalene	1.9	C	29	H	0.63	H	3.7	SRC, 1998	-	-
Acenaphthene	Regression Based	C	1.47	C*	0	C*	4.2	SRC, 1998	-	-
Acenaphthylene	Regression Based	C	22.9	C*	0	C*	8.52	Mabey et al., 1982	-	-
Anthracene	Regression Based	C	2.42	C*	0	C*	4.6	SRC, 1998	-	-
Benzo(a)anthracene	Regression Based	C	1.59	C*	0	C*	13.26	Howard and Maylan 1997	-	-
Benzo(a)pyrene	Regression Based	C	1.33	C*	0	C*	13.75	Howard and Maylan 1997	-	-
Benzo(b)fluoranthene	0.31	C*	2.60	C*	0	C*	13.31	Howard and Maylan 1997	-	-
Benzo(g,h,i)perylene	Regression Based	C	2.94	C*	0	C*	6.58	SRC 1988	-	-
Benzo(k)fluoranthene	Regression Based	C	2.60	C*	0	C*	14.07	Howard and Maylan 1997	-	-
Chrysene	Regression Based	C	2.29	C*	0	C*	12.66	Howard and Maylan 1997	-	-
Dibenzo(a,h)anthracene	0.13	C*	2.31	C*	0	C*	15.43	MacKay et al., 1992	-	-
Fluoranthene	0.5	C*	3.04	C*	0	C*	5.1	SRC, 1998	-	-
Fluorene	Regression Based	C	9.57	C*	0	C*	4.0	SRC, 1998	-	-
Indeno(1,2,3-c,d)pyrene	0.11	C*	2.86	C*	0	C*	15.43	Howard and Maylan 1997	-	-
Naphthalene	12.2	C*	4.40	C*	0	C*	3.4	SRC, 1998	-	-
Phenanthrene	Regression Based	C	1.72	C*	0	C*	4.5	SRC, 1998	-	-
Pyrene	0.72	C*	1.75	C*	0	C*	11.24	Howard and Maylan 1997	-	-
TPH	60.4	C	25	H	2.18	H	0.0	M - Albers 1995	-	-
2,4,5-Trichlorophenol	0.02	C	35	H	0.12	H	8.57	EPA 1984e	-	-
2,4,6-Trichlorophenol	0.01	C	36	H	0.11	H	8.91	EPA 1984f	-	-
2,4-Dichlorophenol	0.12	C	33	H	0.23	H	6.68	Mabey et al. 1982	-	-
2,4-Dimethylphenol	0.14	C	32	H	0.25	H	6.47	Mabey et al. 1982	-	-
2-Chloronaphthalene	0.0	C	36	H	0.10	H	9.21	Mabey et al. 1982	-	-
2-Methylphenol	9.8	C	27	H	1.14	H	1.95	Hansch and Leo 1985	-	-
3,3-Dichlorobenzidine	2.3	C	29	H	0.67	H	3.51	Hansch and Leo 1985	-	-
4-Chloro-3-methylphenol	0.08	C	33	H	0.20	H	7.14	Cutler 1970	-	-
4-Chloroaniline	1.2	C	30	H	0.53	H	4.21	Tichy and Bocek 1987	-	-
4-Methylphenol	1.0	C	30	H	0.49	H	4.44	EPA 1979	-	-
Benzoic acid	1.1	C	30	H	0.52	H	4.31	Hansch and Leo 1981	-	-
Benzylalcohol	5.7	C	28	H	0.93	H	2.53	Howard and Maylan 1997	-	-
bis(2-Ethylhexyl)phthalate	0.1	C	33	H	0.19	H	7.3	SRC, 1998	-	-
Butyl benzylphthalate	0.002	C	39	H	0.05	H	11.14	MacKay et al., 1992	-	-
Dibenzofuran	1.9	C	29	H	0.63	H	3.7	SRC, 1998	-	-
Diethylphthalate	0.30	C	31	H	0.33	H	5.66	McDuffie et al. 1984	-	-
Dimethylphthalate	2.1	C	29	H	0.66	H	3.59	Mabey et al. 1982	-	-
Di-n-butylphthalate	0.003	C	38	H	0.06	H	10.61	MacKay et al., 1992	-	-
Di-n-octylphthalate	0.46	C	31	H	0.38	H	5.22	Hansch and Leo 1985	-	-
Hexachlorobenzene	0.0	C	40	H	0.04	H	12.04	EPA 1984j	-	-
Hexachlorobutadiene	0.0	C	39	H	0.06	H	11.01	EPA 1984k	-	-
Hexachlorocyclopentadiene	0.0	C	36	H	0.10	H	9.21	Mabey et al. 1982	-	-
Hexachloroethane	0.0	C	38	H	0.06	H	10.59	Mabey et al. 1982	-	-
Isophorone	0.47	C	31	H	0.38	H	5.20	Mabey et al. 1982	-	-
n-Nitroso-di-n-propylamine	2.4	C	29	H	0.69	H	3.43	Mabey et al. 1982	-	-
n-Nitrosodiphenylamine	0.07	C	33	H	0.20	H	7.21	Mabey et al. 1982	-	-
Pentachlorophenol	0.001	C	5.93	C	0.05	H	11.51	Mabey et al. 1982	-	-

Table 8
Chemical Uptake for Dietary Items

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Anal te	Plant BTF	Source for Plant BTFs	Terrestrial Invertebrates BTF	Source for Terrestrial Invertebrate BTFs	Small Mammal BTF	Source for Mammal BTFs	Log Ko	LogKo Source	Notes
1,1,1,2-Tetrachloroethane	3.6	C	28	H	0.79	H	3.03	SRC, 2004	-
1,1,1-Trichloroethane	0.28	C	31	H	0.32	H	5.76	Mabey et al. 1982	-
1,1,2,2-Tetrachloroethane	0.35	C	31	H	0.35	H	5.50	EPA 1984c	-
1,1,2-Trichloroethane	0.30	C	31	H	0.33	H	5.69	EPA 1984b	-
1,1-Dichloroethane	1.3	C	29	H	0.55	H	4.12	EPA 1984a	-
1,1-Dichloroethane	8.3	C	27	H	1.07	H	2.13	Hansch and Leo 1985	-
1,2,3-Trichlorobenzene	1.4	C	29	H	0.56	H	4.05	Hansch and Leo 1985	-
1,2,3-Trichloropropane	5.8	C	28	H	0.95	H	2.50	SRC, 2004	-
1,2,4-Trichlorobenzene	0.01	C	37	H	0.08	H	9.90	Mabey et al. 1982	-
1,2-Dibromo-3-chloropropane	0.44	C	31	H	0.37	H	5.27	Jaber et al. 1984	-
1,2-Dichlorobenzene	2.6	C	29	H	0.70	H	3.38	Hansch and Leo 1985	-
1,2-Dichloroethane	2.5	C	29	H	0.70	H	3.41	EPA 1984d	-
1,2-Dichloropropane	0.82	C	30	H	0.47	H	4.61	Mabey et al. 1982	-
1,2-Ethylene Dibromide	11.7	C	27	H	1.21	H	1.8	Hansch and Leo 1985	-
1,3-Dichlorobenzene	0.03	C	35	H	0.14	H	8.29	Mabey et al. 1982	-
1,4-Dichlorobenzene	0.026	C	35	H	0.14	H	8.29	Mabey et al. 1982	-
2-Butanone	46.1	C	25	H	2.0	H	0.29	SRC, 1998	-
2-ChloroethylVinylEther	20.2	C	26	H	1.47	H	1.17	SRC, 2004	-
2-Chlorophenol	0.56	C	31	H	0.41	H	5.02	Mabey et al. 1982	-
2-Hexanone	16.6	C	26	H	1.37	H	1.38	Hansch and Leo 1985	-
4-Bromophenylphenylether	0.6	C	31	H	0.41	H	5.0	USEPA, 1995	-
4-Chlorophenylphenylether	0.0	C	36	H	0.09	H	9.39	Evanson 1977	-
4-Methyl-2-pentanone	19.9	C	26	H	1.46	H	1.19	SRC, 2004	-
Acetone	75.6	C	25	H	2.4	H	-0.24	SRC, 1998	-
Benzene	8.3	C	27	H	1.1	H	2.1	USEPA, 1995	-
Bis(2-chloroethoxy)methane	17.9	C	26	H	1.4	H	1.30	SRC, 2004	-
bis(2-chloroethyl)ether	2.4	C	29	H	0.69	H	3.45	Mabey et al. 1982	-
bis(2-chloroisopropyl)ether	0.66	C	30	H	0.43	H	4.84	Mabey et al. 1982	-
Bromoforn	8.5	C	27	H	1.08	H	2.10	USEPA 1995	-
Bromomethane	0.35	C	31	H	0.34	H	5.53	Mabey et al. 1982	-
Carbon tetrachloride	19.9	C	26	H	1.46	H	1.19	Hansch and Leo 1985	-
Chlorobenzene	4.3	C	28	H	0.85	H	2.83	Hansch and Leo 1985	-
Chloroethane	0.13	C	32	H	0.25	H	6.54	EPA 1984g	-
Chloroform	2.8	C	29	H	0.73	H	3.29	Jow and Hansch 1987	-
Chloromethane	0.87	C	30	H	0.48	H	4.54	EPA 1984h	-
cis-1,2-Dichloroethane	7.8	C	27	H	1.05	H	2.19	Jaber et al. 1984	-
cis-1,3-Dichloropropene	10.6	C	27	H	1.17	H	1.86	Hansch and Leo 1985	-
Dibromochloromethane	0.67	C	30	H	1.01	H	2.29	SRC, 2004	-
Dibromomethane	13.3	C	27	H	1.27	H	1.62	Callahan et al. 1979	-
Dichlorodifluoromethane	0.58	C	30	H	0.41	H	4.97	USEPA 1995	-
Ethylbenzene	0.07	C	33	H	0.19	H	7.25	Howard and Maylan 1997	-
m,p-Xylene	3.0	C	28	H	0.75	H	3.20	EPA 1984i	-
Methylene chloride	4.1	C	28	H	0.83	H	2.88	Hansch and Leo 1985	-
o-Xylene	3.3	C	28	H	0.77	H	3.1	Howard and Maylan 1997	-
Phenol	2.6	C	29	H	0.71	H	3.36	TNRCC, 1996	-
Styrene	4.0	C	28	H	0.83	H	2.9	EPA 1984j	-
tert-ButylMethylEther	19.0	C	26	H	1.44	H	1.24	TNRCC, 1996	-
Tetrachloroethane	2.5	C	29	H	0.70	H	3.40	FUJIMURA, Y ET AL. 1984	-
								Hansch and Leo 1985	-

Table 8
Chemical Uptake for Dietary Items

Attachment 104 - Thermal Treatment Unit, Ecological Risk Assessment

Anal te	Plant BTF	Source for Plant BTFs	Terrestrial Invertebrates BTF	Source for Terrestrial Invertebrate BTFs	Small Mammal BTF	Source for Mammal BTFs	Log Ko	LogKo Source	Notes
Toluene	4.7	C	28	H	0.88	H	2.7	USEPA, 1995	-
Trans-1,2-Dichloroethene	2.5	C	29	H	0.70	H	3.41	ORNL 2000	-
Trans-1,3-Dichloropropene	0.82	C	30	H	0.47	H	4.61	Mabey et al. 1982	-
Trichloroethylene (TCE)	0.33	C	31	H	0.34	H	5.57	Howard and Maylan 1997	-
Trichlorofluoromethane	0.26	C	32	H	0.31	H	5.83	Callahan et al. 1979	-
Vinyl Acetate	22.0	C	26	H	1.52	H	1.08	NA	-
Vinyl chloride	3.1	C	28	H	0.75	H	3.18	EPA 1984m	-

Notes:

All biotransfer factors are expressed as dry weight

Full references can be found in the reference section of the main body of the ERA

NA = Not applicable; applies to uptake factors for analytes without toxicity reference values for the given receptor

BTF = biotransfer factor

A Soil-to-plant transfer factors for inorganics are from soil-to-dry plant uptake factors presented by ORNL (2000)

B Bechte Jacobs, 1998 - 90th percentile uptake factors; soil to plant bioaccumulation regression models presented in Table 9

C Soil-to-plant transfer factors for organics were derived using $\log BTF = 1.781 - 0.4057 \cdot \log Kow$ for non-ionic organic compounds ranging from Kow 3 to 8; or modelled for PAHs using $\ln[\text{tissue concentration}] = 0.7912 \cdot \ln[\text{soil concentration}] - 1.1442$; Pentachlorophenol median BAF for soil to terrestrial invertebrates (USEPA, 2005).

C* Soil-to-plant; soil to invertebrate; and soil to mammal BAFs from USEPA (2005).

D Ninetieth percentile value from ARAAMS (Development of Terrestrial Exposure and Bioaccumulation Information for the Army Risk Assessment Modeling System

([ARAMS]), CH2M HILL, 2001). Naphthalene data substituted for 2-methylnaphthalene.

E Beyer and Stafford, 1993

F Sample et al., 1997 - Soil to earthworm bioaccumulation regression model in Table 9

G Sample et al., 1998a - 90th percentile UCL of soil-to-earthworm transfer factors were used

H Soil-to-invertebrate transfer factors were derived using $BTF = 10^{-(\log KOW - 0.6) / (0.01 \cdot 10^{-(0.983 \log Kow + 0.00028)})}$

Soil-to-mammal transfer factors for organics were derived using $BAF = 10^{(0.338 - 0.145 \cdot \log Kow)}$. Both models presented by USEPA (2000).

An organic carbon default value of 0.01 was used since a site-specific value was unavailable (EPA 2003).

I 90% UCL (Sample et al., 1998b) of soil-to-mammal transfer factors were used, except where the 90% UCL was unavailable; maximum transfer factors were then used (manganese, silver, and vanadium).

J Bioaccumulation data were not available. A default value of 1 was assumed.

K Sample et al., 1998 - Soil to small mammal bioaccumulation regression model presented in Table 9

L Ellington et al., 2001

M A Log Kow was not available for TPH. A default value of 0 was used since TPHs are not bioaccumulated (Albers 1995).

N Maximum BAFs calculated for the Army Risk Assessment Modelling System (2005)

Table 9**Regression Equations for Chemical Biotransfer Factors***Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment*

Analyte	Receptor	B0	B1	Source
Small Mammal/Bird BTF				
Arsenic	General	-4.847	0.8188	Sample et. al (1998a)
Cadmium	General	-0.4036	0.4865	Sample et. al (1998a)
Cobalt	General	-4.4669	1.307	Sample et. al (1998a)
Copper	General	2.042	0.1444	Sample et. al (1998a)
Iron	General	-0.2879	0.5969	Sample et. al (1998a)
Lead	General	0.0761	0.4422	Sample et. al (1998a)
Selenium	General	-0.4158	0.3764	Sample et. al (1998a)
Zinc	General	4.4713	0.0738	Sample et. al (1998a)
Terrestrial Invertebrate BTF				
Arsenic	Earthworm	-1.421	0.706	Sample et. al (1998b)
Cadmium	Earthworm	2.114	0.795	Sample et. al (1998b)
Copper	Earthworm	1.675	0.264	Sample et. al (1998b)
Lead	Earthworm	-0.218	0.807	Sample et. al (1998b)
Manganese	Earthworm	-0.809	0.682	Sample et. al (1998b)
Mercury	Earthworm	-0.684	0.118	Sample et. al (1998b)
Selenium	Earthworm	-0.075	0.733	Sample et. al (1998b)
Zinc	Earthworm	4.449	0.328	Sample et. al (1998b)
RDX	Soil Invertebrate	4.376	0.230	Army Risk Assessment Modelling System (2005)
2-Amino-4,6-Dinitrotoluene	Soil Invertebrate	1.593	0.766	Army Risk Assessment Modelling System (2005)
Plant BTF				
Arsenic	General	-1.992	0.564	Bechtel Jacobs (1998)
Cadmium	General	-0.476	0.546	Bechtel Jacobs (1998)
Copper	General	0.669	0.394	Bechtel Jacobs (1998)
Lead	General	-1.328	0.561	Bechtel Jacobs (1998)
Mercury	General	-0.996	0.544	Bechtel Jacobs (1998)
Nickel	General	-2.224	0.748	Bechtel Jacobs (1998)
Selenium	General	-0.678	1.104	Bechtel Jacobs (1998)
Zinc	General	1.575	0.555	Bechtel Jacobs (1998)
2-Amino-4,6-Dinitrotoluene	General	0.8777	0.3026	Army Risk Assessment Modelling System (2005)
Acenaphthene	General	5.562	0.8556	USEPA 2005
Acenaphthylene	General	1.144	0.791	USEPA 2005
Anthracene	General	0.9887	0.7784	USEPA 2005
Benzo(a)anthracene	General	0.7078	0.5944	USEPA 2005
Benzo(a)pyrene	General	0.0615	0.975	USEPA 2005
Benzo(g,h,i)perylene	General	0.9313	1.1829	USEPA 2005
Benzo(k)fluoranthene	General	0.1579	0.8595	USEPA 2005
Chrysene	General	0.7078	0.5944	USEPA 2005
Fluorene	General	5.562	0.8556	USEPA 2005
HMX	General	2.769	0.5296	Army Risk Assessment Modelling System (2005)
RDX	General	3.453	0.4305	Army Risk Assessment Modelling System (2005)
Phenanthrene	General	0.1665	0.6203	USEPA 2005

Notes:

All values are reported as dry weight.

mg/kg = Milligrams per kilogram.

95UCL = 95% upper confidence limit

Equations:

$${}^1 \ln(\text{Prey Conc}) = B1 * (\ln[\text{Site Specific Soil Concentration}]) + B0$$

where:

BTF = Biotransfer Factor.

B0 = Slope.

B1 = Intercept.

Table 10

Ecological Screening Benchmarks for Terrestrial Plants Exposed to Soil
Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Surrogate	Reference	Uncertainty Factor (for normalized NOEC) ^a	Normalized NOEC (mg/kg) ^b	Uncertainty Factor (for normalized LOEC) ^c	Normalized LOEC (mg/kg) ^d	Notes
Aluminum	NA	Efroymson et al. 1997a	0.1	5	1	50	
Antimony	NA	Efroymson et al. 1997a	0.1	0.5	1	5	
Arsenic	NA	USEPA 2005 (Eco SSL)	1	18	NA	NSV	
Barium	NA	Efroymson et al. 1997a	0.1	50	1	500	
Beryllium	NA	Efroymson et al. 1997a	0.1	1	1	10	
Cadmium	NA	USEPA 2005 (Eco SSL)	1	32	NA	NSV	
Calcium	NA	NA	NA	NSV	NA	NSV	
Carbon disulfide	NA	NA	NA	NSV	NA	NSV	
Chloride	NA	NA	NA	NSV	NA	NSV	
Chromium	NA	Efroymson et al. 1997a	0.1	0.1	1	1	
Cobalt	NA	USEPA 2005 (Eco SSL)	1	13	1	20	LOEC from Efroymson et al. 1997a
Copper	NA	Efroymson et al. 1997a	0.1	10	1	100	
Iron	NA	NA	NA	NSV	NA	NSV	
Lead	NA	USEPA 2005 (Eco SSL)	1	110	NA	207	
Magnesium	NA	NA	NA	NSV	NA	NSV	
Manganese	NA	Efroymson et al. 1997a	0.1	50	1	500	
Mercury	NA	Efroymson et al. 1997a	0.1	0.03	1	0.3	
Molybdenum	NA	Efroymson et al. 1997a	0.1	0.2	1	2	
Nickel	NA	Efroymson et al. 1997a	0.1	3	1	30	
Nitrate	NA	NA	NA	NSV	NA	NSV	
Perchlorate	NA	EPA 2002	0.5	20	1	40	
Phosphorus	NA	NA	NA	NSV	NA	NSV	
Potassium	NA	NA	NA	NSV	NA	NSV	
Selenium	NA	Efroymson et al. 1997a	0.1	0.1	1	1	
Silver	NA	Efroymson et al. 1997a	0.1	0.2	1	2	
Sodium	NA	NA	NA	NSV	NA	NSV	
Strontium	NA	NA	NA	NSV	NA	NSV	
Sulfate	NA	NA	NA	NSV	NA	NSV	
Thallium	NA	Efroymson et al. 1997a	0.1	0.1	1	1	
Vanadium	NA	Efroymson et al. 1997a	0.1	0.2	1	2	
Zinc	NA	Efroymson et al. 1997a	0.1	5	1	50	
2,4-Dinitrotoluene	TNT	Gong et al. 1999	0.1	5	1	50	
2-Butanone	NA	NA	NA	NSV	NA	NSV	
2-Methylnaphthalene	naphthalene	CCME 1999	0.1	0.3	1	3	seed emergence LC25s
Acenaphthene	NA	Efroymson et al. 1997a	0.1	2	1	20	
Acetone	NA	NA	NA	NSV	NA	NSV	
Anthracene	Benzo(a)pyrene	CCME 1999	1	1.2	1	3.3	
Benzene	toluene	Efroymson et al. 1997a	0.1	20	1	200	
bis(2-Ethylhexyl)phthalate	Diethylphthalate	Efroymson et al. 1997a	0.1	10	1	100	
Dibenzofuran	NA	NA	NA	NSV	NA	NSV	
Fluoranthene	Benzo(a)pyrene	CCME 1999	1	1.2	1	3.3	
Fluorene	Benzo(a)pyrene	CCME 1999	1	1.2	1	3.3	
HMX	NA	Robidoux et al. 2003	1	4500	NA	NSV	
Naphthalene	NA	CCME 1999	0.1	0.3	1	3	seed emergence LC25s
Nitroguanidine	NA	NA	NA	NSV	NA	NSV	

Table 10

Ecological Screening Benchmarks for Terrestrial Plants Exposed to Soil Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Surrogate	Reference	Uncertainty Factor (for normalized NOEC) ^a	Normalized NOEC (mg/kg) ^b	Uncertainty Factor (for normalized LOEC) ^c	Normalized LOEC (mg/kg) ^d	Notes
o-Xylene	xylene	CCME 1999	0.1	0.5	1	5	seed LC25s
Phenanthrene	Benzo(a)pyrene	CCME 1999	1	1.2	1	3.3	
Picric acid	NA	NA	NA	NSV	NA	NSV	
Styrene	NA	Efroymson et al. 1997a	0.1	30	1	300	
Toluene	NA	Efroymson et al. 1997a	0.1	20	1	200	
TPH	NA	Efroymson et al. 2004	1	8000	1	10000	lowest NOEC/NOEC for diesel range TPH
1,1,1,2-Tetrachloroethane	NA	NA	NA	NSV	NA	NSV	
1,1,1-Trichloroethane	NA	NA	NA	NSV	NA	NSV	
1,1,2,2-Tetrachloroethane	NA	NA	NA	NSV	NA	NSV	
1,1,2-Trichloroethane	NA	NA	NA	NSV	NA	NSV	
1,1-Dichloroethane	NA	NA	NA	NSV	NA	NSV	
1,1-Dichloroethene	NA	NA	NA	NSV	NA	NSV	
1,2,3-Trichlorobenzene	NA	NA	NA	NSV	NA	NSV	
1,2,3-Trichloropropane	NA	NA	NA	NSV	NA	NSV	
1,2,4-Trichlorobenzene	NA	NA	NA	NSV	NA	NSV	
1,2-Dibromo-3-chloropropane	NA	NA	NA	NSV	NA	NSV	
1,2-Dichlorobenzene	NA	NA	NA	NSV	NA	NSV	
1,2-Dichloroethane	NA	NA	NA	NSV	NA	NSV	
1,2-Dichloropropane	NA	NA	NA	NSV	NA	NSV	
1,2-Ethylene Dibromide	NA	NA	NA	NSV	NA	NSV	
1,3,5-Trinitrobenzene	TNT	Gong et al. 1999	0.1	5	1	50	
1,3-Dichlorobenzene	NA	NA	NA	NSV	NA	NSV	
1,3-Dinitrobenzene	TNT	Gong et al. 1999	0.1	5	1	50	
1,4-Dichlorobenzene	NA	NA	NA	NSV	NA	NSV	
2,4,5-Trichlorophenol	3,4-dichlorophenol	Efroymson et al. 1997a	0.1	2	1	20	
2,4,6-Trichlorophenol	3,4-dichlorophenol	Efroymson et al. 1997a	0.1	2	1	20	
2,4,6-Trinitrotoluene (TNT)	NA	Gong et al. 1999	0.1	5	1	50	
2,4-Dichlorophenol	3,4-dichlorophenol	Efroymson et al. 1997a	0.1	2	1	20	
2,4-Dimethylphenol	NA	NA	NA	NSV	NA	NSV	
2,4-Dinitrophenol	NA	Efroymson et al. 1997a	0.1	2	1	20	
2,6-Dinitrotoluene	TNT	Gong et al. 1999	0.1	5	1	50	
2-Amino-4,6-Dinitrotoluene	NA	Talmage et al. 1999	1	80	NA	NSV	
2-ChloroethyVinylEther	NA	NA	NA	NSV	NA	NSV	
2-Chloronaphthalene	NA	NA	NA	NSV	NA	NSV	
2-Chlorophenol	3-chlorophenol	Efroymson et al. 1997a	0.1	0.7	1	7	
2-Hexanone	NA	NA	NA	NSV	NA	NSV	
2-Methylphenol	NA	NA	NA	NSV	NA	NSV	
2-Nitroaniline	NA	NA	NA	NSV	NA	NSV	
2-Nitrophenol	2,4-Dinitrophenol	Efroymson et al. 1997a	0.1	2	1	20	
2-Nitrotoluene	TNT	Gong et al. 1999	0.1	5	1	50	
3,3-Dichlorobenzidine	NA	NA	NA	NSV	NA	NSV	
3-Nitroaniline	NA	NA	NA	NSV	NA	NSV	
3-Nitrotoluene	TNT	Gong et al. 1999	0.1	5	1	50	
4,6-Dinitro-2-methylphenol	NA	NA	NA	NSV	NA	NSV	

Table 10

Ecological Screening Benchmarks for Terrestrial Plants Exposed to Soil Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Surrogate	Reference	Uncertainty Factor (for normalized NOEC) ^a	Normalized NOEC (mg/kg) ^b	Uncertainty Factor (for normalized LOEC) ^c	Normalized LOEC (mg/kg) ^d	Notes
4-Bromophenylphenylether	NA	NA	NA	NSV	NA	NSV	
4-Chloro-3-methylphenol	NA	NA	NA	NSV	NA	NSV	
4-Chloroaniline	3-chloroaniline	Efroymson et al. 1997a	0.1	2	1	20	
4-Chlorophenylphenylether	NA	NA	NA	NSV	NA	NSV	
4-Methyl-2-pentanone	NA	NA	NA	NSV	NA	NSV	
4-Methylphenol	NA	NA	NA	NSV	NA	NSV	
4-Nitroaniline	NA	NA	NA	NSV	NA	NSV	
4-Nitrophenol	2,4-Dinitrophenol	Efroymson et al. 1997a	0.1	2	1	20	
4-Nitrotoluene	TNT	Gong et al. 1999	0.1	5	1	50	
Acenaphthylene	Benzo(a)pyrene	CCME 1999	1	1.2	1	3.3	
Benzo(a)anthracene	Benzo(a)pyrene	CCME 1999	1	1.2	1	3.3	
Benzo(a)pyrene	NA	CCME 1999	1	1.2	1	3.3	NOEC for rye, wheat and corn (Sims and Overcash 1983); high NOEC used for LOEC (Montizaan et al. 1989)
Benzo(b)fluoranthene	Benzo(a)pyrene	CCME 1999	1	1.2	1	3.3	
Benzo(g,h,i)perylene	Benzo(a)pyrene	CCME 1999	1	1.2	1	3.3	
Benzo(k)fluoranthene	Benzo(a)pyrene	CCME 1999	1	1.2	1	3.3	
Benzoic acid	NA	NA	NA	NSV	NA	NSV	
Benzylalcohol	NA	NA	NA	NSV	NA	NSV	
bis(2-chloroethoxy)methane	NA	NA	NA	NSV	NA	NSV	
bis(2-chloroethyl)ether	NA	NA	NA	NSV	NA	NSV	
bis(2-chloroisopropyl)ether	NA	NA	NA	NSV	NA	NSV	
Bromodichloromethane	NA	NA	NA	NSV	NA	NSV	
Bromoform	NA	NA	NA	NSV	NA	NSV	
Bromomethane	NA	NA	NA	NSV	NA	NSV	
Butyl benzylphthalate	Diethylphthalate	Efroymson et al. 1997a	0.1	10	1	100	
Carbon tetrachloride	NA	NA	NA	NSV	NA	NSV	
Chlorobenzene	NA	Hulzeboz et al. 1993	0.01	2.48	0.1	24.8	based on EC50 = 248 mg/kg
Chloroethane	NA	NA	NA	NSV	NA	NSV	
Chloroform	NA	NA	NA	NSV	NA	NSV	
Chloromethane	NA	NA	NA	NSV	NA	NSV	
Chrysene	Benzo(a)pyrene	CCME 1999	1	1.2	1	3.3	
cis-1,2-Dichloroethene	NA	NA	NA	NSV	NA	NSV	
cis-1,3-Dichloropropene	NA	NA	NA	NSV	NA	NSV	
Dibenz(o,a,h)anthracene	Benzo(a)pyrene	CCME 1999	1	1.2	1	3.3	
Dibromochloromethane	NA	NA	NA	NSV	NA	NSV	
Dibromomethane	NA	NA	NA	NSV	NA	NSV	
Dichlorodifluoromethane	NA	NA	NA	NSV	NA	NSV	
Diethylphthalate	NA	Efroymson et al. 1997a	0.1	10	1	100	
Dimethylphthalate	Diethylphthalate	Efroymson et al. 1997a	0.1	10	1	100	
Di-n-butylphthalate	NA	Efroymson et al. 1997a	0.1	20	1	200	
Di-n-octylphthalate	Diethylphthalate	Efroymson et al. 1997a	0.1	10	1	100	
Ethylbenzene	NA	CCME 1999	0.1	0.6	1	6	seed LC25s
Hexachlorobenzene	Hexachlorocyclopentadiene	Efroymson et al. 1997a	0.1	1	1	10	
Hexachlorobutadiene	Hexachlorocyclopentadiene	Efroymson et al. 1997a	0.1	1	1	10	

Table 10

Ecological Screening Benchmarks for Terrestrial Plants Exposed to Soil Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Surrogate	Reference	Uncertainty Factor (for normalized NOEC) ^a	Normalized NOEC (mg/kg) ^b	Uncertainty Factor (for normalized LOEC) ^c	Normalized LOEC (mg/kg) ^d	Notes
Hexachlorocyclopentadiene	NA	Efroymson et al. 1997a	0.1	1	1	10	
Hexachloroethane	NA	NA	NA	NSV	NA	NSV	
Indeno(1,2,3-c,d)pyrene	Benzo(a)pyrene	CCME 1999	1	1.2	1	3.3	
Isophorone	NA	NA	NA	NSV	NA	NSV	
m,p-Xylene	xylenes	CCME 1999	0.1	0.5	1	5	seed LC25s
Methylene chloride	NA	NA	NA	NSV	NA	NSV	
Nitrobenzene	TNT	Gong et al. 1999	0.1	5	1	50	
Nitroglycerin	NA	NA	NA	NSV	NA	NSV	
n-Nitroso-di-n-propylamine	NA	NA	NA	NSV	NA	NSV	
n-Nitrosodiphenylamine	NA	NA	NA	NSV	NA	NSV	
Pentachlorophenol	NA	USEPA 2005 (Eco SSL)	1	5	NA	NSV	
PETN	NA	NA	NA	NSV	NA	NSV	
Phenol	NA	Efroymson et al. 1997a	0.1	7	1	70	
Pyrene	Benzo(a)pyrene	CCME 1999	1	1.2	1	3.3	
RDX	NA	Talmage et al. 1999	0.5	50	1	100	
Trichloroethylene (TCE)	NA	NA	NA	NSV	NA	NSV	
tert-ButylMethylEther	NA	NA	NA	NSV	NA	NSV	
Tetrachloroethene	NA	Huizebos et al., 1993	0.01	10	0.1	100	based on EC50 = 1000 mg/kg
Tetyl	NA	Talmage et al. 1999	0.1	2.5	1	25	
Trans-1,2-Dichloroethene	NA	NA	NA	NSV	NA	NSV	
Trans-1,3-Dichloropropene	NA	NA	NA	NSV	NA	NSV	
Trichlorofluoromethane	NA	NA	NA	NSV	NA	NSV	
Vinyl Acetate	NA	NA	NA	NSV	NA	NSV	
Vinyl chloride	NA	NA	NA	NSV	NA	NSV	

Notes:

NA - not applicable

NSV - no screening value available

mg/kg = milligrams per kilogram

NOEC = No-observed-effect-concentration.

LOEC = Lowest-observed-effect-concentration.

a Uncertainty factors were used to adjust all measured effect concentrations to chronic NOECs as follows:
LOEC to NOEC = 0.1

b Normalized NOEC was calculated by multiplying the effect concentration by the uncertainty factor.

c Uncertainty factors were used to adjust all measured effect concentrations to chronic LOECs as follows:

Subchronic to chronic = 0.1

EC50 to chronic = 0.1

Acute to chronic = 0.1

d Normalized LOEC was calculated by multiplying the effect concentration by the uncertainty factor.

Table 11
Ecological Screening Benchmarks for Invertebrates Exposed to Soil
Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Surrogate	Reference	Uncertainty Factor (for normalized NOEC) ^a	Normalized NOEC (mg/kg) ^b	Uncertainty Factor (for normalized LOEC) ^c	Normalized LOEC (mg/kg) ^d	Notes
Aluminum	NA	NA	NA	NSV	NA	NSV	
Antimony	NA	USEPA 2005 (Eco SSL)	1	78	NA	NSV	
Arsenic	NA	Efroymsen et al. 1997b	0.1	6	1	60	
Barium	NA	USEPA 2005 (Eco SSL)	1	330	1	585	LOEL = maximum of 3 EC20 values used to derive EcoSSL
Beryllium	NA	USEPA 2005 (Eco SSL)	1	40	NA	NSV	
Cadmium	NA	USEPA 2005 (Eco SSL)	1	140	NA	NSV	
Calcium	NA	NA	NA	NSV	NA	NSV	
Chloride	NA	NA	NA	NSV	NA	NSV	
Chromium	NA	Efroymsen et al. 1997b	0.1	0.04	1	0.4	
Cobalt	NA	Hartenstein et al., 1981	1	300	NA	NSV	<i>Eisenia ferida</i> Growth 8 wk NOEC
Copper	NA	Efroymsen et al. 1997b	0.1	5	1	50	
Iron	NA	NA	NA	NSV	NA	NSV	
Lead	NA	USEPA 2005 (Eco SSL)	1	1700	1	3500	Mean of LOECs from studies used to derive EcoSSL
Magnesium	NA	NA	NA	NSV	NA	NSV	
Manganese	NA	NA	NA	NSV	NA	NSV	
Mercury	NA	Efroymsen et al. 1997b	0.1	0.01	1	0.1	
Molybdenum	NA	NA	NA	NSV	NA	NSV	
Nickel	NA	Efroymsen et al. 1997b	0.1	20	1	200	
Nitrate	NA	NA	NA	NSV	NA	NSV	
Perchlorate	NA	EPA 2002	0.01	4.45	0.1	44.4	
pH	NA	NA	NA	NSV	NA	NSV	
Phosphorus	NA	NA	NA	NSV	NA	NSV	
Potassium	NA	NA	NA	NSV	NA	NSV	
Silver	NA	NA	NA	NSV	NA	NSV	
Sodium	NA	NA	NA	NSV	NA	NSV	
Strontium	NA	NA	NA	NSV	NA	NSV	
Sulfate	NA	NA	NA	NSV	NA	NSV	
Thallium	NA	CCME 1999	1	12	1	27	earthworm mortality
Vanadium	NA	NA	NA	NSV	NA	NSV	
Zinc	NA	Efroymsen et al. 1997b	0.1	20	1	200	
2,4-Dinitrotoluene	TNT	Robidoux et al. 2002	1	32.8	1	58.8	
2-Butanone	NA	NA	NA	NSV	NA	NSV	
2-Methylnaphthalene	Fluorene	Efroymsen et al. 1997b	0.1	3	1	30	
Acenaphthene	NA	Sverdrup et al. 2002	0.1	3.1	0.1	10.7	NOEC=reprod EC10; LOEC=LC50 for collembola
Acetone	NA	NA	NA	NSV	NA	NSV	
Anthracene	NA	Sverdrup et al. 2002	0.1	0.5	0.1	6.7	NOEC=reprod EC10; LOEC=LC50 for collembola
Benzene	NA	CCME 1999	0.01	1.61	0.1	16.1	
bis(2-Ethylhexyl)phthalate	Dimethylphthalate	Efroymsen et al. 1997b	0.1	20	1	200	
Dibenzofuran	NA	Sverdrup et al. 2001	0.1	1.4	0.1	2.3	LOEC=reprod EC50 for collembola
Fluoranthene	NA	Sverdrup et al. 2001	0.1	4.7	0.1	5.1	LOEC=reprod EC50 for collembola
Fluorene	NA	Sverdrup et al. 2002	0.1	0.77	0.1	3.9	NOEC=reprod EC10; LOEC=LC50 for collembola
HMX	NA	Robidoux et al. 2002	0.1	1.56	1	15.6	
Naphthalene	NA	Sverdrup et al. 2002	0.1	2	0.1	16.7	NOEC=reprod EC10; LOEC=LC50 for collembola
Nitroquandine	NA	NA	NA	NSV	NA	NSV	
o-Xylene	xylenes	CCME 1999	0.01	0.56	0.1	5.6	based on LC25
Phenanthrene	NA	Sverdrup et al. 2001	0.1	2.1	0.1	3	LOEC=reprod EC50 for collembola
Picric acid	NA	NA	NA	NSV	NA	NSV	

Table 11
Ecological Screening Benchmarks for Invertebrates Exposed to Soil
Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Surrogate	Reference	Uncertainty Factor (for normal ed NOEC) ^a	Normal ed NOEC (mg/kg) ^b	Uncertainty Factor (for normal ed LOEC) ^c	Normal ed LOEC (mg/kg) ^d	Notes
Styrene	xylenes	CCME 1999	0.01	0.56	0.1	5.6	interim remediation criterion = 56 mg/kg
Toluene	NA	CCME 1999	0.01	0.44	0.1	4.4	based on LC25
TPH	NA	Efroymsen et al. 2004	1	700	1	2400	lowest NOEC/LOEC for No.2 fuel oil range TPH
Carbon disulfide	NA	NA	NA	NSV	NA	NSV	
Selenium	NA	Efroymsen et al. 1997b	0.1	7	1	70	
1,1,1,2-Tetrachloroethane	1,2,3-Trichlorobenzene	Efroymsen et al. 1997b	0.1	2	1	20	
1,1,1-Trichloroethane	1,2,3-Trichlorobenzene	Efroymsen et al. 1997b	0.1	2	1	20	
1,1,2,2-Tetrachloroethane	1,2,3-Trichlorobenzene	Efroymsen et al. 1997b	0.1	2	1	20	
1,1,2-Trichloroethane	1,2,3-Trichlorobenzene	Efroymsen et al. 1997b	0.1	2	1	20	
1,1-Dichloroethane	1,2,3-Trichlorobenzene	Efroymsen et al. 1997b	0.1	2	1	20	
1,1-Dichloroethane	1,2,3-Trichlorobenzene	Efroymsen et al. 1997b	0.1	2	1	20	
1,2,3-Trichlorobenzene	NA	Efroymsen et al. 1997b	0.1	2	1	20	
1,2,3-Trichloropropane	1,2-Dichloropropane	Efroymsen et al. 1997b	0.1	70	1	700	
1,2,4-Trichlorobenzene	NA	Efroymsen et al. 1997b	0.1	2	1	20	
1,2-Dibromo-3-chloropropane	NA	NA	NA	NSV	NA	NSV	
1,2-Dichlorobenzene	1,2,3-Trichlorobenzene	Efroymsen et al. 1997b	0.1	2	1	20	
1,2-Dichloroethane	1,2-Dichloropropane	Efroymsen et al. 1997b	0.1	70	1	700	
1,2-Dichloroethane	NA	Efroymsen et al. 1997b	0.1	70	1	700	
1,2-Ethylene Dibromide	NA	NA	NA	NSV	NA	NSV	
1,3,5-Trinitrobenzene	TNT	Robidoux et al. 2002	1	32.8	1	58.8	
1,3-Dichlorobenzene	1,2,3-Trichlorobenzene	Efroymsen et al. 1997b	0.1	2	1	20	
1,3-Dinitrobenzene	TNT	Robidoux et al. 2002	1	32.8	1	58.8	
1,4-Dichlorobenzene	NA	Efroymsen et al. 1997b	0.1	2	1	20	
2,4,5-Trichlorophenol	NA	Efroymsen et al. 1997b	0.1	0.9	1	9	
2,4,6-Trichlorophenol	NA	Efroymsen et al. 1997b	0.1	1	1	10	
2,4,6-Trinitrochloroene (TNT)	NA	Robidoux et al. 2002	1	32.8	1	58.8	
2,4-Dichlorophenol	3-Chlorophenol	Efroymsen et al. 1997b	0.1	1	1	10	
2,4-Dimethylphenol	NA	NA	NA	NSV	NA	NSV	
2,4-Dinitrophenol	4-Nitrophenol	Efroymsen et al. 1997b	0.1	0.7	1	7	
2,6-Dinitrotoluene	TNT	Robidoux et al. 2002	1	32.8	1	58.8	
2-Amino-4,6-Dinitrotoluene	TNT	Robidoux et al. 2002	1	32.8	1	58.8	
2-ChloroethylVinylEther	NA	NA	NA	NSV	NA	NSV	
2-Chloronaphthalene	NA	NA	NA	NSV	NA	NSV	
2-Chlorophenol	3-Chlorophenol	Efroymsen et al. 1997b	0.1	1	1	10	
2-Hexanone	NA	NA	NA	NSV	NA	NSV	
2-Methylphenol	NA	NA	NA	NSV	NA	NSV	
2-Nitroaniline	NA	NA	NA	NSV	NA	NSV	
2-Nitrophenol	4-Nitrophenol	Efroymsen et al. 1997b	0.1	0.7	1	7	
2-Nitrotoluene	TNT	Robidoux et al. 2002	1	32.8	1	58.8	
3,3-Dichlorobenzidine	NA	NA	NA	NSV	NA	NSV	
3-Nitroaniline	NA	NA	NA	NSV	NA	NSV	
3-Nitrotoluene	TNT	Robidoux et al. 2002	1	32.8	1	58.8	
4,6-Dinitro-2-methylphenol	NA	NA	NA	NSV	NA	NSV	
4-Bromophenylphenylether	NA	NA	NA	NSV	NA	NSV	
4-Chloro-3-methylphenol	NA	NA	NA	NSV	NA	NSV	
4-Chloroaniline	3-Chloroaniline	Efroymsen et al. 1997b	0.1	3	1	30	
4-Chlorophenylphenylether	NA	NA	NA	NSV	NA	NSV	

Table 11
Ecological Screening Benchmarks for Invertebrates Exposed to Soil
Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Surrogate	Reference	Uncertainty Factor (for normalized NOEC) ^a	Normalized NOEC (mg/kg) ^b	Uncertainty Factor (for normalized LOEC) ^c	Normalized LOEC (mg/kg) ^d	Notes
4-Methyl-2-pentanone	NA	NA	NA	NSV	NA	NSV	
4-Methylphenol	NA	NA	NA	NSV	NA	NSV	
4-Nitroaniline	NA	NA	NA	NSV	NA	NSV	
4-Nitrophenol	NA	Efroymsen et al. 1997b	0.1	0.7	1	7	
4-Nitrotoluene	TNT	Robidoux et al. 2002	1	32.8	1	58.8	
Acenaphthylene	NA	Sverdrup et al. 2002	0.1	2.3	0.1	14.5	NOEC=reprod EC10; LOEC=LC50 for collembola
Benzo(a)anthracene	NA	Sverdrup et al. 2002	1	980	NA	NSV	
Benzo(a)pyrene	NA	Sverdrup et al. 2002	1	840	NA	NSV	
Benzo(b)fluoranthene	NA	Sverdrup et al. 2002	1	360	NA	NSV	
Benzo(k)fluoranthene	Benzo(b)fluoranthene	Sverdrup et al. 2002	1	360	NA	NSV	
Benzoic acid	NA	Sverdrup et al. 2002	1	560	NA	NSV	
Benzylalcohol	NA	NA	NA	NSV	NA	NSV	
bis(2-chloroethoxy)methane	NA	NA	NA	NSV	NA	NSV	
bis(2-chloroethyl)ether	NA	NA	NA	NSV	NA	NSV	
bis(2-chloroisopropyl)ether	NA	NA	NA	NSV	NA	NSV	
Bromodichloromethane	NA	NA	NA	NSV	NA	NSV	
Bromoform	NA	NA	NA	NSV	NA	NSV	
Bromomethane	NA	NA	NA	NSV	NA	NSV	
Butyl benzylphthalate	Dimethylphthalate	Efroymsen et al. 1997b	0.1	20	1	200	
Carbon tetrachloride	NA	NA	NA	NSV	NA	NSV	
Chlorobenzene	NA	Efroymsen et al. 1997b	0.1	4	1	40	
Chloroethane	Chlorobenzene	Efroymsen et al. 1997b	0.1	4	1	40	
Chloroform	Chlorobenzene	Efroymsen et al. 1997b	0.1	4	1	40	
Chloromethane	Chlorobenzene	Efroymsen et al. 1997b	0.1	4	1	40	
Chrysene	NA	Sverdrup et al. 2002	1	1030	NA	NSV	
cis-1,2-Dichloroethene	1,2-Dichloropropane	Efroymsen et al. 1997b	0.1	70	1	700	
cis-1,3-Dichloropropene	1,2-Dichloropropane	Efroymsen et al. 1997b	0.1	70	1	700	
Dibenz(a,h)anthracene	NA	Sverdrup et al. 2002	1	780	NA	NSV	
Dibromochloromethane	NA	NA	NA	NSV	NA	NSV	
Dibromomethane	NA	NA	NA	NSV	NA	NSV	
Dichlorodifluoromethane	NA	NA	NA	NSV	NA	NSV	
Diethylphthalate	Dimethylphthalate	Efroymsen et al. 1997b	0.1	20	1	200	
Dimethylphthalate	NA	Efroymsen et al. 1997b	0.1	20	1	200	
D,n-butylphthalate	Dimethylphthalate	Efroymsen et al. 1997b	0.1	20	1	200	
D,n-octylphthalate	Dimethylphthalate	Efroymsen et al. 1997b	0.1	20	1	200	
Ethylbenzene	NA	CCME 1999	0.01	1.13	0.1	11.3	based on LC25
Hexachlorobenzene	NA	NA	NA	NSV	NA	NSV	
Hexachlorobutadiene	NA	NA	NA	NSV	NA	NSV	
Hexachlorocyclopentadiene	NA	NA	NA	NSV	NA	NSV	
Hexachloroethane	NA	NA	NA	NSV	NA	NSV	
Indeno(1,2,3-c,d)pyrene	NA	Sverdrup et al. 2002	1	910	NA	NSV	
Isophorone	NA	NA	NA	NSV	NA	NSV	
m,p-Xylene	xylenes	CCME 1999	0.01	0.56	0.1	5.6	based on LC25
Methylene chloride	NA	NA	NA	NSV	NA	NSV	
Nitrobenzene	NA	Efroymsen et al. 1997b	0.1	4	1	40	
Nitroglycerin	NA	NA	NA	NSV	NA	NSV	

Table 11
Ecological Screening Benchmarks for Invertebrates Exposed to Soil
Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Surrogate	Reference	Uncertain Factor (for normalized NOEC) ^a	Normalized NOEC (mg/kg) ^b	Uncertain Factor (for normalized LOEC) ^c	Normalized LOEC (mg/kg) ^d	Notes
n-Nitroso-di-n-propylamine	N-Nitrosodiphenylamine	Efroymsen et al. 1997b	0.1	2	1	20	
n-Nitrosodiphenylamine	N-Nitrosodiphenylamine	Efroymsen et al. 1997b	0.1	2	1	20	
Pentachlorophenol	NA	USEPA 2005 (Eco SSL)	1	31	NA	NSV	
PETN	NA	NA	NA	NSV	NA	NSV	
Phenol	NA	Efroymsen et al. 1997b	0.1	3	1	30	
Pyrene	NA	Sverdrup et al. 2001	0.1	1.3	0.1	1.6	LOEC=reprod EC50 for collembola
RDX	NA	Robidoux et al. 2002	1	27.4	1	46.7	
Trichloroethylene (TCE)	NA	NA	NA	NSV	NA	NSV	
tert-ButylMethylEther	NA	NA	NA	NSV	NA	NSV	
Tetrachloroethene	NA	NA	NA	NSV	NA	NSV	
Tetryl	NA	NA	NA	NSV	NA	NSV	
Trans-1,2-Dichloroethene	1,2-Dichloropropane	Efroymsen et al. 1997b	0.1	70	1	700	
Trans-1,3-Dichloropropene	1,2-Dichloropropane	Efroymsen et al. 1997b	0.1	70	1	700	
Trichlorofluoromethane	NA	NA	NA	NSV	NA	NSV	
Vinyl Acetate	NA	NA	NA	NSV	NA	NSV	
Vinyl chloride	NA	NA	NA	NSV	NA	NSV	

Notes:

- NA - not applicable
- NSV - no screening value available
- mg/kg = milligrams per kilogram
- NOEC = No-observed-effect-concentration.
- LOEC = Lowest-observed-effect-concentration.
- a Uncertainty factors were used to adjust all measured effect concentrations to chronic NOECs as follows:
 LOEC to NOEC = 0.1
 Subchronic to chronic = 0.1
 EC50 to chronic = 0.01
- Acute to chronic = 0.01
- b Normalized NOEC was calculated by multiplying the effect concentration by the uncertainty factor.
- c Uncertainty factors were used to adjust all measured effect concentrations to chronic LOECs as follows:
 Subchronic to chronic = 0.1
 EC50 to chronic = 0.1
 Acute to chronic = 0.1
- d Normalized LOEC was calculated by multiplying the effect concentration by the uncertainty factor.

Table 12

Toxicity Reference Values Considered for Mammalian Wildlife Receptors
 Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Surrogate	Reference	Normalized NOAEL TRV1,3 (mg/kgbw-d)	Normalized LOAEL TRV1,3 (mg/kgbw-d)	Notes
Aluminum	NA	Ondreicka et al. 1986	1.93	19.3	from Sample et al. 1996
Antimony	NA	USEPA 2003 (Eco SSL)	0.059	0.64	LOAEL from Poon et al., 1998 in EcoSSL
Arsenic	NA	Nemec et al. 1998	0.396	1.58	
Barium	NA	NTP 1994	45	75	
Beryllium	NA	USEPA 2003 (Eco SSL)	0.532	NSV	
Cadmium	NA	USEPA 2003 (Eco SSL)	0.77	1.42	LOAEL from Webster (1978) in EcoSSL
Calcium	NA	NA	NSV	NSV	
Chloride	NA	NA	NSV	NSV	
Chromium	NA	Mackenzie et al. 1958/Steven et al. 1976	3.28	13.14	from Sample et al. 1996
Copper	NA	Aulerich et al. 1982	11.7	15.14	from Sample et al. 1996
Cobalt	NA	Paternain et al. 1988	1.135	11.35	
Iron	NA	NA	NSV	NSV	
Lead	NA	Kimmel et al. 1980	0.92	4.7	
Manganese	NA	Laskey et al. 1982	88	284	from Sample et al. 1996
Magnesium	NA	NA	NSV	NSV	
Mercury	NA	Verschuuren et al. 1976	0.032	0.16	from Sample et al. 1996
Nickel	NA	Ambrose et al. 1976	40	80	from Sample et al. 1996
Molybdenum	NA	Schroeder and Mitchener 1971	0.26	2.6	from Sample et al. 1996
Nitrate	NA	Sleight and Atallah 1988	507	1130	from Sample et al. 1996
Perchlorate	NA	EPA 2002	2.59	25.9	
Phosphorus	NA	NA	NSV	NSV	
Potassium	NA	NA	NSV	NSV	
Silver	NA	Rungby and Dacsher 1984	2.38	23.8	
Sulfate	NA	NA	NSV	NSV	
Thallium	NA	Formigli et al. 1986	0.0074	0.074	from Sample et al. 1996
Sodium	NA	NA	NSV	NSV	
Strontium	NA	Skoryna 1981	263	NSV	from Sample et al. 1996
Zinc	NA	Schlicker and Cox 1968	160	320	from Sample et al. 1996
2,4-Dinitrotoluene	TNT	Johnson et al. 2000	2	8	
Vanadium	NA	Domingo et al. 1986	0.21	2.1	from Sample et al. 1996
2-Butanone	acetone	EPA 1986c	10	50	from Sample et al. 1996
2-Methylnaphthalene	NA	Murata et al. 1997	5.03	50.3	from Sample et al. 1996
Acenaphthene	NA	USEPA 2001	175	350	
Acetone	NA	EPA 1986c	10	50	from Sample et al. 1996
Anthracene	NA	USEPA 2001	1000	NSV	
Benzene	NA	Wolf et al. 1956	0.7	7	
bis(2-ethylhexyl)phthalate	NA	Lamb et al. 1987	18.3	183	from Sample et al. 1996
Dibenzofuran	NA	NA	NSV	NSV	
Fluoranthene	NA	USEPA 2001	125	250	
Fluorene	NA	USEPA 2001	125	250	

Table 12

Toxicity Reference Values Considered for Mammalian Wildlife Receptors
 Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Surrogate	Reference	Normalized NOAEL TRV1,3 (mg/kgbw-d)	Normalized LOAEL TRV1,3 (mg/kgbw-d)	Notes
HMX	NA	Holdsworth et al. 2001a	1	5	
Naphthalene	NA	Navarro et al. 1991	50	150	
Nitroguanidine	NA	NA	NSV	NSV	
o-Xylene	xylenes	USEPA 2001	179	357	
Phenanthrene	Acenaphthene	USEPA 2001	175	350	
Picric acid	NA	NA	NSV	NSV	
Styrene	NA	NA	NSV	NSV	
Toluene	NA	Gospe et al. 1994	52	520	
TPH	NA	Cooper and Mattie 1996	1000	15000	
Carbon disulfide	NA	NA	NSV	NSV	
Selenium	NA	Rosenfeld and Beath 1954	0.2	0.33	from Sample et al. 1996
1,1,1,2-Tetrachloroethane	Tetrachloroethene	Buben and O'Flaherty 1985	1.4	7	from Sample et al. 1996
1,1,1-Trichloroethane	NA	Lane et al. 1982	1000	NSV	from Sample et al. 1996
1,1,2,2-Tetrachloroethane	Tetrachloroethene	Buben and O'Flaherty 1985	1.4	7	from Sample et al. 1996
1,1,1-Trichloroethane	1,1,1-Trichloroethane	Lane et al. 1982	1000	NSV	from Sample et al. 1996
1,1-Dichloroethane	1,2-Dichloroethane	Lane et al. 1982	50	NSV	from Sample et al. 1996
1,1-Dichloroethane	1,1-Dichloroethylene	Quast et al. 1983	2.5	NSV	from Sample et al. 1996
1,2,3-Trichlorobenzene	NA	NA	NSV	NSV	
1,2,3-Trichloropropane	1,1,1-Trichloroethane	Lane et al. 1982	1000	NSV	from Sample et al. 1996
1,2,4-Trichlorobenzene	NA	NA	NSV	NSV	
1,2-Dibromo-3-chloropropane	NA	NA	NSV	NSV	
1,2-Dichlorobenzene	NA	NA	NSV	NSV	
1,2-Dichloroethane	NA	Lane et al. 1982	50	NSV	from Sample et al. 1996
1,2-Dichloropropane	1,2-Dichloroethane	Lane et al. 1982	50	NSV	from Sample et al. 1996
1,2-Ethylene Dibromide	NA	NA	NSV	NSV	
1,3,5-Trinitrobenzene	NA	Holdsworth et al. 2001b	2.68	13.31	
1,3-Dichlorobenzene	NA	NA	NSV	NSV	
1,3-Dinitrobenzene	NA	Holdsworth et al. 2001c	0.04	0.2	
1,4-Dichlorobenzene	NA	NA	NSV	NSV	
2,4,5-Trichlorophenol	pentachlorophenol	Schwetz et al. 1978	0.24	2.4	from Sample et al. 1996
2,4,6-Trichlorophenol	pentachlorophenol	Schwetz et al. 1978	0.24	2.4	from Sample et al. 1996
2,4,6-Trinitrotoluene (TNT)	NA	Johnson et al. 2000	2	8	
2,4-Dichlorophenol	pentachlorophenol	Schwetz et al. 1978	0.24	2.4	from Sample et al. 1996
2,4-Dimethylphenol	NA	NA	NSV	NSV	
2,4-Dinitrophenol	NA	NA	NSV	NSV	
2,6-Dinitrotoluene	TNT	Johnson et al. 2000	2	8	
2-Amino-4,6-Dinitrotoluene	NA	Holdsworth et al. 2001d	9	48	
2-ChloroethylVinylEther	NA	NA	NSV	NSV	
2-Chloronaphthalene	NA	NA	NSV	NSV	
2-Chlorophenol	NA	NA	NSV	NSV	

Table 12

Toxicity Reference Values Considered for Mammalian Wildlife Receptors
 Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Surrogate	Reference	Normalized NOAEL TRV1,3 (mg/kgbw-d)	Normalized LOAEL TRV1,3 (mg/kgbw-d)	Notes
2-Hexanone	acetone	EPA 1986c	10	50	from Sample et al. 1996
2-Methylphenol	NA	Hornshaw et al. 1986	340	NSV	from Sample et al. 1996
2-Nitroaniline	NA	NA	NSV	NSV	
2-Nitrophenol	NA	NA	NSV	NSV	
2-Nitrotoluene	TNT	Johnson et al. 2000	2	8	
3,3-Dichlorobenzidine	NA	NA	NSV	NSV	
3-Nitroaniline	NA	NA	NSV	NSV	
3-Nitrotoluene	TNT	Johnson et al. 2000	2	8	
4,6-Dinitro-2-methylphenol	NA	NA	NSV	NSV	
4-Bromophenylphenylether	NA	NA	NSV	NSV	
4-Chloro-3-methylphenol	NA	NA	NSV	NSV	
4-Chloroaniline	NA	NA	NSV	NSV	
4-Chlorophenylphenylether	NA	NA	NSV	NSV	
4-Methyl-2-pentanone	NA	Microbiological Assoc. 1986	25	NSV	from Sample et al. 1996
4-Methylphenol	2-Methylphenol	Hornshaw et al. 1986	340	NSV	updated from Sample et al. 1996
4-Nitroaniline	NA	NA	NSV	NSV	
4-Nitrophenol	NA	NA	NSV	NSV	
4-Nitrotoluene	TNT	Johnson et al. 2000	2	8	
Acenaphthylene	Acenaphthene	USEPA 2001	175	350	
Benzo(a)anthracene	Benzo(a)pyrene	Mackenzie and Angevine 1981	1	10	from Sample et al. 1996
Benzo(a)pyrene	NA	Mackenzie and Angevine 1981	1	10	from Sample et al. 1996
Benzo(b)fluoranthene	Benzo(a)pyrene	Mackenzie and Angevine 1981	1	10	from Sample et al. 1996
Benzo(g,h,i)perylene	Benzo(a)pyrene	Mackenzie and Angevine 1981	1	10	from Sample et al. 1996
Benzo(k)fluoranthene	Benzo(a)pyrene	Mackenzie and Angevine 1981	1	10	from Sample et al. 1996
Benzoic acid	NA	NA	NSV	NSV	
Benzylalcohol	NA	NA	NSV	NSV	
Bis(2-chloroethoxy)methane	NA	NA	NSV	NSV	
bis(2-chloroethyl)ether	NA	NA	NSV	NSV	
bis(2-chloroisopropyl)ether	NA	NA	NSV	NSV	
Bromodichloromethane	NA	NA	NSV	NSV	
Bromoform	Chloroform	Palmer et al. 1979	15	41	from Sample et al. 1996
Bromomethane	Chloroform	Palmer et al. 1979	15	41	from Sample et al. 1996
Butyl benzylphthalate	Di-n-butylphthalate	Lamb et al. 1987	550	1833	from Sample et al. 1996
Carbon tetrachloride	NA	Alumot et al. 1976a	16	NSV	from Sample et al. 1996

Table 12

**Toxicity Reference Values Considered for Mammalian Wildlife Receptors
Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment**

Analyte	Surrogate	Reference	Normalized NOAEL TRV1,3 (mg/kgbw-d)	Normalized LOAEL TRV1,3 (mg/kgbw-d)	Notes
Chlorobenzene	Chloroform	Palmer et al. 1979	15	41	from Sample et al. 1996
Chloroethane	Chloroform	Palmer et al. 1979	15	41	from Sample et al. 1996
Chloroform	NA	Palmer et al. 1979	15	41	from Sample et al. 1996
Chloromethane	Chloroform	Palmer et al. 1979	15	41	from Sample et al. 1996
Chrysene	Benzo(a)pyrene	Mackenzie and Angevine 1981	1	10	from Sample et al. 1996
cis-1,2-Dichloroethene	NA	Barnes et al. 1985	45.2	NSV	from Sample et al. 1996
cis-1,3-Dichloropropene	cis-1,2-Dichloroethene	Barnes et al. 1985	45.2	NSV	from Sample et al. 1996
Dibenzo(a,h)anthracene	Benzo(a)pyrene	Mackenzie and Angevine 1981	1	10	from Sample et al. 1996
Dibromochloromethane	NA	NA	NSV	NSV	
Dibromomethane	NA	NA	NSV	NSV	
Dichlorodifluoromethane	NA	NA	NSV	NSV	
Diethylphthalate	NA	Lamb et al. 1987	4583	NSV	from Sample et al. 1996
Dimethylphthalate	Di-n-butylphthalate	Lamb et al. 1987	550	1833	from Sample et al. 1996
Di-n-butylphthalate	NA	Lamb et al. 1987	550	1833	from Sample et al. 1996
Di-n-octylphthalate	Di-n-butylphthalate	Lamb et al. 1987	550	1833	from Sample et al. 1996
Ethylbenzene	NA	Wolf et al. 1956	97	291	
Hexachlorobenzene	NA	Grant et al. 1977	1.6	3.2	from Sample et al. 1996
Hexachlorobutadiene	Hexachlorobenzene	Grant et al. 1977	1.6	3.2	from Sample et al. 1996
Hexachlorocyclopentadiene	Hexachlorobenzene	Grant et al. 1977	1.6	3.2	from Sample et al. 1996
Hexachloroethane	Hexachlorobenzene	Grant et al. 1977	1.6	3.2	from Sample et al. 1996
Indeno(1,2,3-c,d)pyrene	Benzo(a)pyrene	Mackenzie and Angevine 1981	1	10	from Sample et al. 1996
Isophorone	NA	NA	NSV	NSV	
m,p-Xylene	xylene	USEPA 2001	179	357	
Methylene chloride	NA	NCA 1982	5.85	50	from Sample et al. 1996
Nitrobenzene	NA	NA	NSV	NSV	
Nitroglycerin	NA	Midgely et al. 2001	3	32	
n-Nitroso-di-n-propylamine	NA	NA	NSV	NSV	
n-Nitrosodiphenylamine	NA	NA	NSV	NSV	
Pentachlorophenol	NA	Schwetz et al. 1978	0.24	2.4	from Sample et al. 1996
PETN	NA	Holdsworth et al. 2001e	170	1700	
Phenol	NA	Bishop et al. 1997	17.1	NSV	
Pyrene	NA	USEPA 2001	75	125	
RDX	NA	Talmage et al. 1999	2	20	
Trichloroethylene (TCE)	NA	Buben and OFlaherty 1985	0.7	7	from Sample et al. 1996
tert-ButylMethylEther	NA	NA	NSV	NSV	
Tetrachloroethene	NA	Buben and OFlaherty 1985	1.4	7	from Sample et al. 1996
Tetlryl	NA	Talmage et al. 1999	1.3	6.2	
Trans-1,2-Dichloroethene	cis-1,2-Dichloroethene	Barnes et al. 1985	45.2	NSV	from Sample et al. 1996
Trans-1,3-Dichloropropene	cis-1,2-Dichloroethene	Barnes et al. 1985	45.2	NSV	from Sample et al. 1996
Trichlorofluoromethane	NA	NA	NSV	NSV	

Table 12

Toxicity Reference Values Considered for Mammalian Wildlife Receptors
 Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Surrogate	Reference	Normalized NOAEL TRV1,3 (mg/kgbw-d)	Normalized LOAEL TRV1,3 (mg/kgbw-d)	Notes
Vinyl Acetate	NA	NA	NSV	NSV	
Vinyl chloride	NA	Feron et al. 1981	0.17	1.7	from Sample et al. 1996

Notes:

NA - not applicable

NSV - no screening value available

NOAEL = no observed adverse effect level

LOAEL = lowest observed adverse effect level

1) Selections of TRVs and application of Uncertainty Factors was performed in accordance with USEPA (1997) as described in footnotes 3 and 4

2) > denotes selected NOAEL endpoint study; + denotes selected LOAEL endpoint study; >+ denotes both NOAEL and LOAEL were selected from the same study.

3) the following preferences were used when selecting studies:

NOAEL endpoints were given preference over LOAEL endpoints when both were available. Studies with LD50s as endpoints were only selected when studies for sublethal effects were available. Chronic studies were selected over subchronic studies and subchronic studies were selected over acute studies when multiple studies of varying duration were available for selection. Studies with reproduction as the endpoint were selected before studies with mortality as the endpoint which were selected before studies with growth as the endpoint which were selected. Studies with the most complete information and therefore the least resulting uncertainty were given preference in study selection.

Studies from surrogate chemicals were only selected when no other study for a particular COPEC was found.

4) Uncertainty factors were used to adjust all measured effect concentrations to chronic NOAELs and chronic LOAELs as follows:

NOAEL to LOAEL = 0.1

Subchronic to Chronic = 0.1

LD50 to chronic = 0.01

subacute to chronic = 0.01

acute to chronic = 0.01

where:

chronic = >12 weeks or during critical lifestage

subchronic = 4-12 weeks

subacute = <4 weeks, multiple doses

acute = only one dose

5) the weight of the black-tailed jackrabbit was used for the rabbit study for phosphorus

6) The weight of the beagle dog is from the lower range from the following web site <http://www.dogbiz.com/dogs-grp2/beagle/beagle.htm>

7) The TRV for naphthalene was used for phenanthrene because the naphthalene study included a more appropriate endpoint and study duration. Also, the resulting TRV for phenanthrene Finally, limited acute and chronic animal toxicity tests with phenanthrene indicate low to moderate toxicity (Sandmeyer, 1981).

8) The study for JP-8 was selected for TPH over other studies because it was the only study of a mixture of compounds versus a single compound.

9) Complete references are available in the references section of the main body of the ERA

Table 13

**Toxicity Reference Values Considered for Avian Wildlife Receptors
Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment**

Analyte	Surrogate	Reference	Normali ed NOAEL TRV ^{1,3} (mg/kgbw-d)	Normali ed LOAEL TRV ^{1,3} (mg/kgbw-d)	Notes
Aluminum	Al ₂ (SO ₄) ₃	Carriere et al. 1986	109.7	NSV	From Sample et al. 1996
Antimony	NA	NA	NSV	NSV	
Arsenic	sodium arsenate	Stanley et al. 1994	9.3	40	
Barium	Barium hydroxide	Johnson et al. 1960	20.8	41.7	From Sample et al. 1996
Beryllium	NA	NA	NSV	NSV	
Cadmium	cadmium sulfate	Leach et al. 1979	0.16	0.61	From Sample et al. 1996
Calcium	NA	NA	NSV	NSV	
Chloride	NA	NA	NSV	NSV	
Chromium	CrK(SO ₄)	Haseltine et al., 1985	1	5	From Sample et al. 1996
Cobalt	NA	USEPA 2003 (Eco SSL)	7.61	NSV	
Copper	NA	Mehring et al. 1960	47	61.7	From Sample et al. 1996
Iron	NA	NA	NSV	NSV	
Lead	NA	Edens and Garlich 1983	0.19	1.78	updated from Sample et al. 1996
Magnesium	NA	NA	NSV	NSV	
Manganese	NA	Laskey and Edens 1985	977	NSV	From Sample et al. 1996
Mercury	NA	Heinz 1976; Heinz and Hoffman 1998	0.068	0.37	From Sample et al. 1996
Molybdenum	NA	Lepore and Miller 1965	3.5	35.3	From Sample et al. 1996
Nickel	NA	Cain and Paford 1981	17.6	77.4	updated from Sample et al. 1996
Nitrate	NA	NA	NSV	NSV	
Perchlorate	NH ₄ (ClO ₄)	McNabb et al. 2004	3.26	32.6	
Phosphorus	NA	Sparling et al. 1997	0.037	0.26	
Potassium	NA	NA	NSV	NSV	
Silver	NA	NA	NSV	NSV	
Sodium	NA	NA	NSV	NSV	
Strontium	NA	NA	NSV	NSV	
Sulfate	NA	NA	NSV	NSV	
Thallium	NA	Bean and Hudson 1976	0.6	1.2	
Vanadium	NA	White and Dieter 1978	11.4	NSV	From Sample et al. 1996
Zinc	NA	Stahl et al. 1990	14.5	131	From Sample et al. 1996
2,4-DINITROTOLUENE	TNT	Johnson et al. 2000	0.07	1.8	
2-Butanone	acetone	Hill and Camardese 1986	39.3	393	
2-Methylnaphthalene	naphthalene	Wildlife International 1985	26.9	269	
Acenaphthene	aromatic hydrocarbon	Patton and Dieter 1980	325.2	NSV	
Acetone	NA	Hill and Camardese 1986	39.3	NSV	
Anthracene	aromatic hydrocarbon	Patton and Dieter 1980	325.2	NSV	
Benzene	xylene	Hill and Camardese 1986	10.2	101.7	
bis(2-ethylhexyl)phthalate	NA	Peakall 1974	1.1	NSV	From Sample et al. 1996
Dibenzofuran	NA	NA	NSV	NSV	

Table 13

**Toxicity Reference Values Considered for Avian Wildlife Receptors
Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment**

Analyte	Surrogate	Reference	Normal ed NOAEL TRV ^{1,3} (mg/kgbw-d)	Normal ed LOAEL TRV ^{1,3} (mg/kgbw-d)	Notes
Fluoranthene	aromatic hydrocarbon	Patton and Dieter 1980	325.2	NSV	
Fluorene	aromatic hydrocarbon	Patton and Dieter 1980	325.2	NSV	
HMX	NA	Holdsworth et al. 2001a	9	62.5	
Naphthalene	NA	Wildlife International 1985	26.9	269	
Nitroguanidine	NA	NA	NSV	NSV	
o-Xylene	xylenes	Hill and Camardese 1986	10.2	101.7	
Phenanthrene	aromatic hydrocarbon	Patton and Dieter 1980	325.2	NSV	
Picric acid	NA	NA	NSV	NSV	
Styrene	NA	NA	NSV	NSV	
Toluene	xylenes	Hill and Camardese 1986	10.2	101.7	
TPH	NA	Szaro et al. 1981	500	5000	No. 2 fuel oil
Carbon disulfide	NA	NA	NSV	NSV	
Selenium	NA	Heinz et al. 1987	0.4	0.8	From Sample et al. 1996
1,1,1,2-Tetrachloroethane	1,2-Dichloroethane	Alumot et al. 1976b	17.2	34.4	From Sample et al. 1996
1,1,1-Trichloroethane	1,2-Dichloroethane	Alumot et al. 1976b	17.2	34.4	From Sample et al. 1996
1,1,2,2-Tetrachloroethane	1,2-Dichloroethane	Alumot et al. 1976b	17.2	34.4	From Sample et al. 1996
1,1,2-Trichloroethane	1,2-Dichloroethane	Alumot et al. 1976b	17.2	34.4	From Sample et al. 1996
1,1-Dichloroethane	1,2-Dichloroethane	Alumot et al. 1976b	17.2	34.4	From Sample et al. 1996
1,1-Dichloroethane	1,2-Dichloroethane	Alumot et al. 1976b	17.2	34.4	From Sample et al. 1996
1,2,3-Trichlorobenzene	1,2-Dichloroethane	Alumot et al. 1976b	17.2	34.4	From Sample et al. 1996
1,2,3-Trichloropropane	1,2-Dichloroethane	Alumot et al. 1976b	17.2	34.4	From Sample et al. 1996
1,2,4-Trichlorobenzene	1,2-Dichloroethane	Alumot et al. 1976b	17.2	34.4	From Sample et al. 1996
1,2-Dibromo-3-chloropropane	NA	NA	NSV	NSV	
1,2-Dichlorobenzene	1,2-Dichloroethane	Alumot et al. 1976b	17.2	34.4	From Sample et al. 1996
1,2-Dichloroethane	NA	Alumot et al. 1976b	17.2	34.4	From Sample et al. 1996
1,2-Dichloropropane	1,2-Dichloroethane	Alumot et al. 1976b	17.2	34.4	From Sample et al. 1996
1,2-Ethylene Dibromide	NA	NA	NSV	NSV	
1,3,5-Trinitrobenzene	TNT	Johnson et al. 2000	0.07	1.8	
1,3-Dichlorobenzene	1,2-Dichloroethane	Alumot et al. 1976b	17.2	34.4	From Sample et al. 1996
1,3-Dinitrobenzene	NA	Schafer 1972	0.42	NSV	
1,4-Dichlorobenzene	1,2-Dichloroethane	Alumot et al. 1976b	17.2	34.4	From Sample et al. 1996
2,4,5-Trichlorophenol	pentachlorophenol	Nebeker et al. 1994	16.9	38.4	
2,4,6-Trichlorophenol	pentachlorophenol	Nebeker et al. 1994	16.9	38.4	
2,4,6-Trinitrotoluene (TNT)	NA	Johnson et al. 2000	0.07	1.8	
2,4-Dichlorophenol	pentachlorophenol	Nebeker et al. 1994	16.9	38.4	
2,4-Dimethylphenol	NA	NA	NSV	NSV	
2,4-Dinitrophenol	NA	NA	NSV	NSV	
2,6-Dinitrotoluene	TNT	Johnson et al. 2000	0.07	1.8	

Table 13

**Toxicity Reference Values Considered for Avian Wildlife Receptors
Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment**

Analyte	Surrogate	Reference	Normalized NOAEL TRV ^{1,3} (mg/kgbw-d)	Normalized LOAEL TRV ^{1,3} (mg/kgbw-d)	Notes
2-Amino-4,6-Dinitrotoluene	TNT	Johnson et al. 2000	0.07	1.8	
2-ChloroethylVinylEther	NA	NA	NSV	NSV	
2-Chloronaphthalene	NA	NA	NSV	NSV	
2-Chlorophenol	pentachlorophenol	Nebeker et al. 1994	16.9	38.4	subchronic values
2-Hexanone	acetone	Hill and Camardese 1986	39.3	393	
2-Methylphenol	NA	NA	NSV	NSV	
2-Nitroaniline	NA	NA	NSV	NSV	
2-Nitrophenol	NA	NA	NSV	NSV	
2-Nitrotoluene	TNT	Johnson et al. 2000	0.07	1.8	
3,3-Dichlorobenzidine	NA	NA	NSV	NSV	
3-Nitroaniline	NA	NA	NSV	NSV	
3-Nitrotoluene	TNT	Johnson et al. 2000	0.07	1.8	
4,6-Dinitro-2-methylphenol	NA	NA	NSV	NSV	
4-Bromophenylphenylether	NA	NA	NSV	NSV	
4-Chloro-3-methylphenol	NA	NA	NSV	NSV	
4-Chloroaniline	NA	NA	NSV	NSV	
4-Chlorophenylphenylether	NA	NA	NSV	NSV	
4-Methyl-2-pentanone	acetone	Hill and Camardese 1986	39.3	393	
4-Methylphenol	NA	NA	NSV	NSV	
4-Nitroaniline	NA	NA	NSV	NSV	
4-Nitrophenol	NA	NA	NSV	NSV	
4-Nitrotoluene	TNT	Johnson et al. 2000	0.07	1.8	
Acenaphthylene	aromatic hydrocarbon	Patton and Dieter 1980	325.2	NSV	
Benzo(a)anthracene	aromatic hydrocarbon	Patton and Dieter 1980	325.2	NSV	
Benzo(a)pyrene	aromatic hydrocarbon	Patton and Dieter 1980	325.2	NSV	
Benzo(b)fluoranthene	aromatic hydrocarbon	Patton and Dieter 1980	325.2	NSV	
Benzo(g,h,i)perylene	aromatic hydrocarbon	Patton and Dieter 1980	325.2	NSV	
Benzo(k)fluoranthene	aromatic hydrocarbon	Patton and Dieter 1980	325.2	NSV	
Benzoic acid	aromatic hydrocarbon	Patton and Dieter 1980	325.2	NSV	
Benzylalcohol	NA	NA	NSV	NSV	
bis(2-chloroethoxy)methane	NA	NA	NSV	NSV	
bis(2-chloroethyl)ether	NA	NA	NSV	NSV	
bis(2-chloroisopropyl)ether	NA	NA	NSV	NSV	
Bromodichloromethane	NA	NA	NSV	NSV	
Bromoform	NA	NA	NSV	NSV	
Bromomethane	NA	NA	NSV	NSV	
Butyl benzylphthalate	Di-n-butylphthalate	Peakall 1974	0.11	11	From Sample et al. 1996
Carbon tetrachloride	NA	NA	NSV	NSV	

Table 13

**Toxicity Reference Values Considered for Avian Wildlife Receptors
Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment**

Analyte	Surrogate	Reference	Normalized NOAEL TRV ^{1,3} (mg/kgbw-d)	Normalized LOAEL TRV ^{1,3} (mg/kgbw-d)	Notes
Chlorobenzene	1,2-Dichloroethane	Alumot et al. 1976b	17.2	34.4	From Sample et al. 1996
Chloroethane	1,2-Dichloroethane	Alumot et al. 1976b	17.2	34.4	From Sample et al. 1996
Chloroform	NA	NA	NSV	NSV	
Chloromethane	1,2-Dichloroethane	Alumot et al. 1976b	17.2	34.4	From Sample et al. 1996
Chrysene	NA	NA	NSV	NSV	
cis-1,2-Dichloroethane	1,2-Dichloroethane	Alumot et al. 1976b	17.2	34.4	From Sample et al. 1996
cis-1,3-Dichloropropene	1,2-Dichloroethane	Alumot et al. 1976b	17.2	34.4	From Sample et al. 1996
Dibenzo(a,h)anthracene	aromatic hydrocarbon	Patton and Dieter 1980	325.2	NSV	
Dibromochloromethane	1,2-Dichloroethane	Alumot et al. 1976b	17.2	34.4	From Sample et al. 1996
Dibromomethane	1,2-Dichloroethane	Alumot et al. 1976b	17.2	34.4	From Sample et al. 1996
Dichlorodifluoromethane	1,2-Dichloroethane	Alumot et al. 1976b	17.2	34.4	From Sample et al. 1996
Diethylphthalate	Di-n-butylphthalate	Peakall 1974	0.11	11	From Sample et al. 1996
Dimethylphthalate	Di-n-butylphthalate	Peakall 1974	0.11	11	From Sample et al. 1996
Di-n-butylphthalate	NA	Peakall 1974	0.11	11	From Sample et al. 1996
Di-n-octylphthalate	Di-n-butylphthalate	Peakall 1974	0.11	11	From Sample et al. 1996
Ethylbenzene	xylenes	Hill and Camardese 1986	10.2	101.7	
Hexachlorobenzene	NA	Vos et al. 1971	0.56	2.25	From Sample et al. 1996
Hexachlorobutadiene	Hexachlorobenzene	Vos et al. 1971	0.56	2.25	From Sample et al. 1996
Hexachlorocyclopentadiene	Hexachlorobenzene	Vos et al. 1971	0.56	2.25	From Sample et al. 1996
Hexachloroethane	Hexachlorobenzene	Vos et al. 1971	0.56	2.25	From Sample et al. 1996
Indeno(1,2,3-c,d)pyrene	aromatic hydrocarbon	Patton and Dieter 1980	325.2	NSV	
Isophorone	NA	NA	NSV	NSV	
m,p-Xylene	xylenes	Hill and Camardese 1986	10.2	101.7	
Methylene chloride	NA	NA	NSV	NSV	
Nitrobenzene	TNT	Johnson et al. 2000	0.07	1.8	
Nitroglycerin	NA	NA	NSV	NSV	
n-Nitroso-di-n-propylamine	NA	NA	NSV	NSV	
n-Nitrosodiphenylamine	NA	NA	NSV	NSV	
Pentachlorophenol	NA	Nebeker et al. 1994	16.9	38.4	
PETN	NA	NA	NSV	NSV	
Phenol	NA	NA	NSV	NSV	
Pyrene	NA	NA	NSV	NSV	
RDX	TNT	Johnson et al. 2000	0.07	1.8	
Trichloroethylene (TCE)	NA	NA	NSV	NSV	
tert-ButylMethylEther	NA	NA	NSV	NSV	
Tetrachloroethene	1,2-Dichloroethane	Alumot et al. 1976b	17.2	34.4	From Sample et al. 1996
Tetyl	NA	NA	NSV	NSV	
Trans-1,2-Dichloroethane	1,2-Dichloroethane	Alumot et al. 1976b	17.2	34.4	From Sample et al. 1996

Table 13

**Toxicity Reference Values Considered for Avian Wildlife Receptors
Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment**

Analyte	Surrogate	Reference	Normalized NOAEL TRV ^{1,3} (mg/kgbw-d)	Normalized LOAEL TRV ^{1,3} (mg/kgbw-d)	Notes
Trans-1,3-Dichloropropene	1,2-Dichloroethane	Alumot et al. 1976b	17.2	34.4	From Sample et al. 1996
Trichlorofluoromethane	NA	NA	NSV	NSV	
Vinyl acetate	NA	NA	NSV	NSV	
Vinyl chloride	NA	NA	NSV	NSV	

Notes:

NA - not applicable

NSV - no screening value available

NOAEL = no observed adverse effect level

LOAEL = lowest observed adverse effect level

1) Selections of TRVs and application of Uncertainty Factors was performed in accordance with USEPA, (1997) as described in footnotes 3 and 4.

2) > denotes selected NOAEL endpoint study; + denotes selected LOAEL endpoint study; >+ denotes both NOAEL and LOAEL were selected from the same study.

3) The following preferences were used when selecting studies:

NOAEL endpoints were given preference over LOAEL endpoints when both were available. Studies with LD50s as endpoints were only selected when studies for sublethal effects were not available. Chronic studies were selected over subchronic studies and subchronic studies were selected over acute studies when multiple studies of varying duration were available for selection.

Studies with reproduction as the endpoint were selected before studies with mortality as the endpoint which were selected before studies with growth as the endpoint which were selected before studies with the most complete information and therefore the least resulting uncertainty were given preference in study selection.

Studies from surrogate chemicals were only selected when no other study for a particular COPEC was found.

4) Uncertainty factors were used to adjust all measured effect concentrations to chronic NOAELs and chronic LOAELs as follows:

NOAEL to LOAEL = 0.1

Subchronic to Chronic = 0.1

LD50 to chronic = 0.01

subacute to chronic = 0.01

acute to chronic = 0.01

Where:

chronic = >10 weeks or during critical lifestage

subchronic = 4-10 weeks

subacute = <4 weeks, multiple doses

acute = only one dose

5) The weight of the red-winged blackbird from the Stickel et al., (1983) was used for the weight for starling in Shafer (1972) Thallium study

6) The TRV for arsenic was selected for the study that used the sodium arsenate form because that form of arsenic is more likely to be found in nature.

7) The study on aromatic hydrocarbon mixtures was selected for all PAHs because using a mixture of these chemicals is more appropriate than using the value for just naphthalene.

Table 14

Direct Toxicity Screening for Plants Exposed to Soil Using Maximum Detected Concentrations

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Soil NOEC Screening Value (mg/kg)	EPC ¹ (mg/kg)	DF	NOEC HQ ²	Screening Conclusion
1,3,5-Trinitrobenzene	5.00	0.105	0%	0.021	Pass
1,3-Dinitrobenzene	5.00	0.08	0%	0.016	Pass
2,4,6-Trinitrotoluene (TNT)	5.00	1.5	0%	0.30	Pass
2,4-Dinitrophenol	2.00	50	0%	25	Retain
2,4-Dinitrotoluene	5.00	2	2%	0.40	Pass
2,6-Dinitrotoluene	5.00	10.5	0%	2.1	Retain
2-Amino-4,6-Dinitrotoluene	80.00	1.5	0%	0.019	Pass
2-Nitroaniline	NSV	50	0%	NA	Uncertain
2-Nitrophenol	2.00	10.5	0%	5.2	Retain
2-Nitrotoluene	5.00	0.14	0%	0.028	Pass
3-Nitroaniline	NSV	50	0%	NA	Uncertain
3-Nitrotoluene	5.00	0.15	0%	0.030	Pass
4,6-Dinitro-2-methylphenol	NSV	50	0%	NA	Uncertain
4-Nitroaniline	NSV	50	0%	NA	Uncertain
4-Nitrophenol	2.00	50	0%	25	Retain
4-Nitrotoluene	5.00	0.19	0%	0.038	Pass
HMX	4500	25	31%	0.0056	Pass
Nitrobenzene	5.00	10.5	0%	2.1	Retain
Nitroglycerin	NSV	0.34	0%	NA	Uncertain
Nitroguanidine	NSV	0.3	5%	NA	Uncertain
PETN	NSV	0.5	0%	NA	Uncertain
Picric acid	NSV	0.5	7%	NA	Uncertain
RDX	50.00	1.5	0%	0.030	Pass
Tetryl	2.50	0.23	0%	0.092	Pass
HI - Energetics				0.41	Pass
Aluminum	5.00	54000	100%	11000	Retain
Antimony	0.50	166.93	79%	330.00	Retain
Arsenic	18.00	41.3	58%	2.3	Retain
Barium	50.00	640	100%	13.00	Retain
Beryllium	1.00	0.72	48%	0.72	Pass
Cadmium	32.00	32	44%	1.0	Retain
Carbon disulfide	NSV	0.0011	5%	NA	Uncertain
Chromium	0.10	55.3	100%	550	Retain
Cobalt	13.00	4.9	79%	0.38	Pass
Copper	10.00	18000	85%	1800	Retain
Iron	NSV	15000	100%	NA	Uncertain
Lead	110.00	48000	83%	440	Retain
Magnesium	NSV	24300	100%	NA	Uncertain
Manganese	50.00	519	100%	10.00	Retain
Mercury	0.03	0.07	27%	2.3	Retain
Molybdenum	0.20	17	91%	85	Retain
Nickel	3.00	41.3	100%	14	Retain
Nitrate	NSV	22.8	92%	NA	Uncertain
Perchlorate	20.00	4.5	50%	0.22	Pass
Phosphorus	NSV	990	100%	NA	Uncertain

Table 14

Direct Toxicity Screening for Plants Exposed to Soil Using Maximum Detected Concentrations

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Soil NOEC Screening Value (mg/kg)	EPC ¹ (mg/kg)	DF	NOEC HQ ²	Screening Conclusion
Selenium	0.10	5	0%	50	Retain
Silver	0.20	4	8%	20	Retain
Strontium	NSV	484	100%	NA	Uncertain
Thallium	0.10	0.55	54%	5.5	Retain
Vanadium	0.20	25.7	100%	130	Retain
Zinc	5.00	2300	100%	460	Retain
HI - Inorganics				15000	Retain
2-Methylnaphthalene	0.30	170	14%	570	Retain
Acenaphthene	2.00	0.04185	0%	0.021	Pass
Acenaphthylene	1.20	10.5	0%	8.8	Retain
Anthracene	1.20	3.7	7%	3.1	Retain
Benzo(a)anthracene	1.20	10.5	0%	8.8	Retain
Benzo(a)pyrene	1.20	10.5	0%	8.8	Retain
Benzo(b)fluoranthene	1.20	10.5	0%	8.8	Retain
Benzo(g,h,i)perylene	1.20	10.5	0%	8.8	Retain
Benzo(k)fluoranthene	1.20	10.5	0%	8.8	Retain
Chrysene	1.20	10.5	0%	8.8	Retain
Dibenzo(a,h)anthracene	1.20	10.5	0%	8.8	Retain
Fluoranthene	1.20	0.144	4%	0.12	Pass
Fluorene	1.20	33	14%	28	Retain
Indeno(1,2,3-c,d)pyrene	1.20	10.5	0%	8.8	Retain
Naphthalene	0.30	53	25%	180	Retain
Phenanthrene	1.20	92	18%	77	Retain
Pyrene	1.20	10.5	0%	8.8	Retain
HI - PAHs				850	Retain
TPH	8000.00	47000	100%	5.9	Retain
HI - Petroleum				5.9	Retain
2,4,5-Trichlorophenol	2.00	50	0%	25	Retain
2,4,6-Trichlorophenol	2.00	10.5	0%	5.2	Retain
2,4-Dichlorophenol	2.00	10.5	0%	5.2	Retain
2,4-Dimethylphenol	NSV	10.5	0%	NA	Uncertain
2-Chloronaphthalene	NSV	10.5	0%	NA	Uncertain
2-Methylphenol	NSV	10.5	0%	NA	Uncertain
3,3-Dichlorobenzidine	NSV	21	0%	NA	Uncertain
4-Chloro-3-methylphenol	NSV	10.5	0%	NA	Uncertain
4-Chloroaniline	2.00	10.5	0%	5.2	Retain
4-Methylphenol	NSV	10.5	0%	NA	Uncertain
Benzoic acid	NSV	50	0%	NA	Uncertain
Benzylalcohol	NSV	10.5	0%	NA	Uncertain
bis(2-Ethylhexyl)phthalate	10.00	1.5	18%	0.15	Pass
Butyl benzylphthalate	10.00	10.5	0%	1.0	Retain
Dibenzofuran	NSV	12	14%	NA	Uncertain
Diethylphthalate	10.00	10.5	0%	1.0	Retain
Dimethylphthalate	10.00	10.5	0%	1.0	Retain
Di-n-butylphthalate	20.00	10.5	0%	0.52	Pass

Table 14

Direct Toxicity Screening for Plants Exposed to Soil Using Maximum Detected Concentrations

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Soil NOEC Screening Value (mg/kg)	EPC ¹ (mg/kg)	DF	NOEC HQ ²	Screening Conclusion
Di-n-octylphthalate	10.00	10.5	0%	1.0	Retain
Hexachlorobenzene	1.00	10.5	0%	11.00	Retain
Hexachlorobutadiene	1.00	0.0008	4%	0.00080	Pass
Hexachlorocyclopentadiene	1.00	10.5	0%	11.00	Retain
Hexachloroethane	NSV	10.5	0%	NA	Uncertain
Isophorone	NSV	10.5	0%	NA	Uncertain
n-Nitroso-di-n-propylamine	NSV	10.5	0%	NA	Uncertain
n-Nitrosodiphenylamine	NSV	10.5	0%	NA	Uncertain
Pentachlorophenol	5.00	50	0%	10.00	Retain
HI - SVOCs				<i>0.15</i>	Pass
1,1,1,2-Tetrachloroethane	NSV	0.0006	5%	NA	Uncertain
1,1,1-Trichloroethane	NSV	0.0009	5%	NA	Uncertain
1,1,2,2-Tetrachloroethane	NSV	0.001	5%	NA	Uncertain
1,1,2-Trichloroethane	NSV	0.0008	5%	NA	Uncertain
1,1-Dichloroethane	NSV	0.0007	5%	NA	Uncertain
1,1-Dichloroethene	NSV	0.0011	5%	NA	Uncertain
1,2,3-Trichlorobenzene	NSV	0.0028	5%	NA	Uncertain
1,2,3-Trichloropropane	NSV	0.0009	5%	NA	Uncertain
1,2,4-Trichlorobenzene	NSV	0.0032	4%	NA	Uncertain
1,2-Dibromo-3-chloropropane	NSV	0.0039	5%	NA	Uncertain
1,2-Dichlorobenzene	NSV	0.0014	4%	NA	Uncertain
1,2-Dichloroethane	NSV	0.0008	5%	NA	Uncertain
1,2-Dichloropropane	NSV	0.0007	5%	NA	Uncertain
1,2-Ethylene Dibromide	NSV	0.0009	5%	NA	Uncertain
1,3-Dichlorobenzene	NSV	0.0019	4%	NA	Uncertain
1,4-Dichlorobenzene	NSV	0.0031	4%	NA	Uncertain
2-Butanone	NSV	0.0159	18%	NA	Uncertain
2-ChloroethylVinylEther	NSV	0.00595	0%	NA	Uncertain
2-Chlorophenol	0.70	10.5	0%	15.00	Retain
2-Hexanone	NSV	0.0038	5%	NA	Uncertain
4-Bromophenylphenylether	NSV	10.5	0%	NA	Uncertain
4-Chlorophenylphenylether	NSV	10.5	0%	NA	Uncertain
4-Methyl-2-pentanone	NSV	0.0043	5%	NA	Uncertain
Acetone	NSV	24	32%	NA	Uncertain
Benzene	20.00	0.0041	14%	0.00020	Pass
Bis(2-chloroethoxy)methane	NSV	0.074	0%	NA	Uncertain
Bis(2-chloroethyl)ether	NSV	10.5	0%	NA	Uncertain
Bis(2-chloroisopropyl)ether	NSV	10.5	0%	NA	Uncertain
Bromodichloromethane	NSV	0.0007	5%	NA	Uncertain
Bromoform	NSV	0.0005	5%	NA	Uncertain
Bromomethane	NSV	0.0015	5%	NA	Uncertain
Carbon tetrachloride	NSV	0.0009	5%	NA	Uncertain
Chlorobenzene	2.48	0.0007	5%	0.00028	Pass
Chloroethane	NSV	0.001	5%	NA	Uncertain
Chloroform	NSV	0.0007	5%	NA	Uncertain

Table 14

Direct Toxicity Screening for Plants Exposed to Soil Using Maximum Detected Concentrations

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Soil NOEC Screening Value (mg/kg)	EPC ¹ (mg/kg)	DF	NOEC HQ ²	Screening Conclusion
Chloromethane	NSV	0.001	5%	NA	Uncertain
cis-1,2-Dichloroethene	NSV	0.0007	5%	NA	Uncertain
cis-1,3-Dichloropropene	NSV	0.0006	5%	NA	Uncertain
Dibromochloromethane	NSV	0.0007	5%	NA	Uncertain
Dibromomethane	NSV	0.0005	5%	NA	Uncertain
Dichlorodifluoromethane	NSV	0.0011	5%	NA	Uncertain
Ethylbenzene	0.60	0.0013	5%	0.0022	Pass
m,p-Xylene	0.50	0.002	5%	0.0040	Pass
Methylene chloride	NSV	0.0032	5%	NA	Uncertain
o-Xylene	0.50	0.0027	14%	0.0054	Pass
Phenol	7.00	10.5	0%	1.5	Retain
Styrene	30.00	0.0026	14%	0.000087	Pass
tert-ButylMethylEther	NSV	0.0007	5%	NA	Uncertain
Tetrachloroethene	10.00	0.0009	5%	0.000090	Pass
Toluene	20.00	0.0187	23%	0.00093	Pass
Trans-1,2-Dichloroethene	NSV	0.0007	5%	NA	Uncertain
Trans-1,3-Dichloropropene	NSV	0.0008	5%	NA	Uncertain
Trichloroethylene (TCE)	NSV	0.0007	5%	NA	Uncertain
Trichlorofluoromethane	NSV	0.0011	5%	NA	Uncertain
Vinyl Acetate	NSV	0.0012	5%	NA	Uncertain
Vinyl chloride	NSV	0.0012	5%	NA	Uncertain
HI - VOCs				0.013	Pass

Notes:

¹ EPC = Exposure Point Concentration. Maximum detected concentration or 1/2 detection limit for non-detected analytes

² Hazard Indices (HI) calculated as the sum of HQs for detected analytes

Retain = screening value exceeded, chemical is retained for refined risk characterization

Pass = Screening value not exceeded and chemical passed screening evaluation; conclusion of no potential for risk; no further evaluation

Uncertain = uncertainty exists because no toxicological screening value was found for evaluating potential for risk

HQ = Hazard Quotient = Maximum Detect / Benchmark

DF = Detection Frequency

mg/kg = milligram per kilogram

NOEC = No observed Effect concentration

Hazard quotients in bold exceed one.

Chemicals not detected in any samples are

NA - not applicable

NSV - no screening value available

Table 15

Direct Toxicity Screening for Invertebrates Exposed to Soil Using Maximum Detected Concentrations
Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Anal yte	Soil NOEC Screening Value mg/kg	Soil Maximum Detection Concentration ¹ (mg/kg)	DF	NOEC HQ ²	Screening Conclusion
1,3,5-Trinitrobenzene	32.80	0.105	0%	0.0032	Pass
1,3-Dinitrobenzene	32.80	0.08	0%	0.0024	Pass
2,4,6-Trinitrotoluene (TNT)	32.80	1.5	0%	0.046	Pass
2,4-Dinitrophenol	0.70	50	0%	71.00	Retain
2,4-Dinitrotoluene	32.80	2	2%	0.061	Pass
2,6-Dinitrotoluene	32.80	10.5	0%	0.32	Pass
2-Amino-4,6-Dinitrotoluene	32.80	1.5	0%	0.046	Pass
2-Nitroaniline	NSV	50	0%	NA	Uncertain
2-Nitrophenol	0.70	10.5	0%	15.00	Retain
2-Nitrotoluene	32.80	0.14	0%	0.0043	Pass
3-Nitroaniline	NSV	50	0%	NA	Uncertain
3-Nitrotoluene	32.80	0.15	0%	0.0046	Pass
4,6-Dinitro-2-methylphenol	NSV	50	0%	NA	Uncertain
4-Nitroaniline	NSV	50	0%	NA	Uncertain
4-Nitrophenol	0.70	50	0%	71.00	Retain
4-Nitrotoluene	32.80	0.19	0%	0.0058	Pass
HMX	1.56	25	31%	16.00	Retain
Nitrobenzene	4.00	10.5	0%	2.6	Retain
Nitroglycerin	NSV	0.34	0%	NA	Uncertain
Nitroguanidine	NSV	0.3	5%	NA	Uncertain
PETN	NSV	0.5	0%	NA	Uncertain
Picric acid	NSV	0.5	7%	NA	Uncertain
RDX	27.40	1.5	0%	0.055	Pass
Tetryl	NSV	0.23	0%	NA	Uncertain
HI - Energetics				16.00	Retain
Aluminum	NSV	54000	100%	NA	Uncertain
Antimony	78.00	166.93	79%	2.1	Retain
Arsenic	6.00	41.3	58%	6.9	Retain
Barium	330.00	640	100%	1.9	Retain
Beryllium	40.00	0.72	48%	0.018	Pass
Cadmium	140.00	32	44%	0.23	Pass
Carbon disulfide	NSV	0.0011	5%	NA	Uncertain
Chromium	0.04	55.3	100%	1400	Retain
Cobalt	300.00	4.9	79%	0.016	Pass
Copper	5.00	18000	85%	3600.00	Retain
Iron	NSV	15000	100%	NA	Uncertain
Lead	1700.00	48000	83%	28.00	Retain
Magnesium	NSV	24300	100%	NA	Uncertain
Manganese	NSV	519	100%	NA	Uncertain
Mercury	0.01	0.07	27%	7.0	Retain
Molybdenum	NSV	17	91%	NA	Uncertain
Nickel	20.00	41.3	100%	2.1	Retain
Nitrate	NSV	22.8	92%	NA	Uncertain
Perchlorate	4.45	4.5	50%	1.0	Retain
Phosphorus	NSV	990	100%	NA	Uncertain
Selenium	7.00	5	0%	0.71	Pass
Silver	NSV	4	8%	NA	Uncertain
Strontium	NSV	484	100%	NA	Uncertain
Thallium	12.00	0.55	54%	0.046	Pass

Table 15

Direct Toxicity Screening for Invertebrates Exposed to Soil Using Maximum Detected Concentrations
 Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Soil NOEC Screening Value mg/kg	Soil Maximum Detection Concentration ¹ (mg/kg)	DF	NOEC HQ ²	Screening Conclusion
Vanadium	NSV	25.7	100%	NA	Uncertain
Zinc	20.00	2300	100%	120.00	Retain
HI - Inorganics				5100	Retain
2-Methylnaphthalene	3.00	170	14%	57.00	Retain
Acenaphthene	3.10	0.04185	0%	0.014	Pass
Acenaphthylene	2.30	10.5	0%	4.6	Retain
Anthracene	0.50	3.7	7%	7.4	Retain
Benzo(a)anthracene	980.00	10.5	0%	0.011	Pass
Benzo(a)pyrene	840.00	10.5	0%	0.012	Pass
Benzo(b)fluoranthene	360.00	10.5	0%	0.029	Pass
Benzo(g,h,i)perylene	360.00	10.5	0%	0.029	Pass
Benzo(k)fluoranthene	560.00	10.5	0%	0.019	Pass
Chrysene	1030.00	10.5	0%	0.010	Pass
Dibenzo(a,h)anthracene	780.00	10.5	0%	0.013	Pass
Fluoranthene	4.70	0.144	4%	0.031	Pass
Fluorene	0.77	33	14%	43.00	Retain
Indeno(1,2,3-c,d)pyrene	910.00	10.5	0%	0.012	Pass
Naphthalene	2.00	53	25%	27.00	Retain
Phenanthrene	2.10	92	18%	44.00	Retain
Pyrene	1.30	10.5	0%	8.1	Retain
HI - PAHs				180	Retain
TPH	700.00	47000	100%	67.00	Retain
HI - Petroleum				67.00	Retain
2,4,5-Trichlorophenol	0.90	50	0%	56.00	Retain
2,4,6-Trichlorophenol	1.00	10.5	0%	11.00	Retain
2,4-Dichlorophenol	1.00	10.5	0%	11.00	Retain
2,4-Dimethylphenol	NSV	10.5	0%	NA	Uncertain
2-Chloronaphthalene	NSV	10.5	0%	NA	Uncertain
2-Methylphenol	NSV	10.5	0%	NA	Uncertain
3,3-Dichlorobenzidine	NSV	21	0%	NA	Uncertain
4-Chloro-3-methylphenol	NSV	10.5	0%	NA	Uncertain
4-Chloroaniline	3.00	10.5	0%	3.5	Retain
4-Methylphenol	NSV	10.5	0%	NA	Uncertain
Benzoic acid	NSV	50	0%	NA	Uncertain
Benzylalcohol	NSV	10.5	0%	NA	Uncertain
bis(2-Ethylhexyl)phthalate	20.00	1.5	18%	0.075	Pass
Butyl benzylphthalate	20.00	10.5	0%	0.52	Pass
Dibenzofuran	1.40	12	14%	8.6	Retain
Diethylphthalate	20.00	10.5	0%	0.52	Pass
Dimethylphthalate	20.00	10.5	0%	0.52	Pass
Di-n-butylphthalate	20.00	10.5	0%	0.52	Pass
Di-n-octylphthalate	20.00	10.5	0%	0.52	Pass
Hexachlorobenzene	NSV	10.5	0%	NA	Uncertain
Hexachlorobutadiene	NSV	0.0008	4%	NA	Uncertain
Hexachlorocyclopentadiene	NSV	10.5	0%	NA	Uncertain
Hexachloroethane	NSV	10.5	0%	NA	Uncertain
Isophorone	NSV	10.5	0%	NA	Uncertain
n-Nitroso-di-n-propylamine	2.00	10.5	0%	5.2	Retain
n-Nitrosodiphenylamine	2.00	10.5	0%	5.2	Retain

Table 15

Direct Toxicity Screening for Invertebrates Exposed to Soil Using Maximum Detected Concentrations
 Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Anal yte	Soil NOEC Screening Value mg/kg	Soil Maximum Detection Concentration ¹ (mg/kg)	DF	NOEC HQ ²	Screening Conclusion
Pentachlorophenol	31.00	50	0%	1.6	Retain
HI - SVOCs				8.6	Retain
1,1,1,2-Tetrachloroethane	2.00	0.0006	5%	0.00030	Pass
1,1,1-Trichloroethane	2.00	0.0009	5%	0.00045	Pass
1,1,2,2-Tetrachloroethane	2.00	0.001	5%	0.00050	Pass
1,1,2-Trichloroethane	2.00	0.0008	5%	0.00040	Pass
1,1-Dichloroethane	2.00	0.0007	5%	0.00035	Pass
1,1-Dichloroethene	2.00	0.0011	5%	0.00055	Pass
1,2,3-Trichlorobenzene	2.00	0.0028	5%	0.0014	Pass
1,2,3-Trichloropropane	70.00	0.0009	5%	0.000013	Pass
1,2,4-Trichlorobenzene	2.00	0.0032	4%	0.0016	Pass
1,2-Dibromo-3-chloropropane	NSV	0.0039	5%	NA	Uncertain
1,2-Dichlorobenzene	2.00	0.0014	4%	0.00070	Pass
1,2-Dichloroethane	70.00	0.0008	5%	0.000011	Pass
1,2-Dichloropropane	70.00	0.0007	5%	0.0000100	Pass
1,2-Ethylene Dibromide	NSV	0.0009	5%	NA	Uncertain
1,3-Dichlorobenzene	2.00	0.0019	4%	0.00095	Pass
1,4-Dichlorobenzene	2.00	0.0031	4%	0.0016	Pass
2-Butanone	NSV	0.0159	18%	NA	Uncertain
2-ChloroethylVinylEther	NSV	0.00595	0%	NA	Uncertain
2-Chlorophenol	1.00	10.5	0%	11.00	Retain
2-Hexanone	NSV	0.0038	5%	NA	Uncertain
4-Bromophenylphenylether	NSV	10.5	0%	NA	Uncertain
4-Chlorophenylphenylether	NSV	10.5	0%	NA	Uncertain
4-Methyl-2-pentanone	NSV	0.0043	5%	NA	Uncertain
Acetone	NSV	24	32%	NA	Uncertain
Benzene	1.61	0.0041	14%	0.0025	Pass
Bis(2-chloroethoxy)methane	NSV	0.074	0%	NA	Uncertain
bis(2-chloroethyl)ether	NSV	10.5	0%	NA	Uncertain
bis(2-chloroisopropyl)ether	NSV	10.5	0%	NA	Uncertain
Bromodichloromethane	NSV	0.0007	5%	NA	Uncertain
Bromoform	NSV	0.0005	5%	NA	Uncertain
Bromomethane	NSV	0.0015	5%	NA	Uncertain
Carbon tetrachloride	NSV	0.0009	5%	NA	Uncertain
Chlorobenzene	4.00	0.0007	5%	0.00018	Pass
Chloroethane	4.00	0.001	5%	0.00025	Pass
Chloroform	4.00	0.0007	5%	0.00018	Pass
Chloromethane	4.00	0.001	5%	0.00025	Pass
cis-1,2-Dichloroethene	70.00	0.0007	5%	0.0000100	Pass
cis-1,3-Dichloropropene	70.00	0.0006	5%	0.0000086	Pass
Dibromochloromethane	NSV	0.0007	5%	NA	Uncertain
Dibromomethane	NSV	0.0005	5%	NA	Uncertain
Dichlorodifluoromethane	NSV	0.0011	5%	NA	Uncertain
Ethylbenzene	1.13	0.0013	5%	0.0012	Pass
m,p-Xylene	0.56	0.002	5%	0.0036	Pass
Methylene chloride	NSV	0.0032	5%	NA	Uncertain
o-Xylene	0.56	0.0027	14%	0.0048	Pass
Phenol	3.00	10.5	0%	3.5	Retain
Styrene	0.56	0.0026	14%	0.0046	Pass

Table 15

Direct Toxicity Screening for Invertebrates Exposed to Soil Using Maximum Detected Concentrations
Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Soil NOEC Screening Value mg/kg	Soil Maximum Detection Concentration ¹ (mg/kg)	DF	NOEC HQ ²	Screening Conclusion
tert-ButylMethylEther	NSV	0.0007	5%	NA	Uncertain
Tetrachloroethene	NSV	0.0009	5%	NA	Uncertain
Toluene	0.44	0.0187	23%	0.042	Pass
Trans-1,2-Dichloroethene	70.00	0.0007	5%	0.0000100	Pass
Trans-1,3-Dichloropropene	70.00	0.0008	5%	0.000011	Pass
Trichloroethylene (TCE)	NSV	0.0007	5%	NA	Uncertain
Trichlorofluoromethane	NSV	0.0011	5%	NA	Uncertain
Vinyl Acetate	NSV	0.0012	5%	NA	Uncertain
Vinyl chloride	NSV	0.0012	5%	NA	Uncertain
HI - VOCs				0.065	Pass

Notes:

¹ EPC = Exposure Point Concentration. Maximum detected concentration or 1/2 detection limit for non-detected analytes

² Hazard Indices (HI) calculated as the sum of HQs for detected analytes

Retain = screening value exceeded, chemical is retained for refined risk characterization

Pass = Screening value not exceeded and chemical passed screening evaluation; conclusion of no potential for risk; no further evaluation

Uncertain = uncertainty exists because no toxicological screening value was found for evaluating potential for risk

HQ = Hazard Quotient = Maximum Detect / Benchmark

DF = Detection Frequency

mg/kg = milligram per kilogram

NOEC = No observed Effect concentration

Hazard quotients in bold exceed one.

NA - not applicable

NSV - no screening value available

Table 16
 Initial Risk Estimation for Wildlife Exposed to Site Soils
 Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Receptor	Chemical	Bed Weight (kg)	Dail Food Ingestion Rate (g/kg-bw/d)	Dail Food Ingestion Area (m²)	Small Mammals and Other Vertebrates			Soil Invertebrates			Terrestrial Plants			MOAEL TRV (mg/kg-d)	MOAEL HQ and Quotient	Detection Frequency (%)	Screening Risk Conclusions				
					% of Soil to Ingestion	Soil to Tissue Transfer Factor	Tissue Concentration (mg/kg DW)	% of Soil to Ingestion	Soil to Tissue Transfer Factor	Tissue Concentration (mg/kg DW)	% of Diet to Ingestion	Soil to Tissue Transfer Factor	Tissue Concentration (mg/kg DW)					% of Diet to Ingestion	Soil to Tissue Transfer Factor	Tissue Concentration (mg/kg DW)	
Pronghorn	Strontium	48.761	0.034	1	0.034	0	0	0	0	0	1.97	16.9	11	263.0	0.071	100%	Pass				
	Thallium	48.761	0.034	1	0.034	0	0	0	0	0.0220	0.000757	0.000757	18.3	16.6	0.00454	0.0	54%	Pass			
	Vanadium	48.761	0.034	1	0.034	0	0	0	0	0.0450	0.00486	0.00486	1.41	0.222	0.11	100%	Pass				
Pronghorn	Zinc	48.761	0.034	1	0.034	0	0	0	0	Regression Based	355	42.2	12.2	13.8	0.086	100%	Pass				
	2-Methylphenanthrene	48.761	0.034	1	0.034	0	0	0	0	Regression Based	3.18	16.9	11	5.0	2.2	14%	Retain				
	Acenaphthylene	48.761	0.034	1	0.034	0	0	0	0	Regression Based	0.59	16.9	11	0.13	0.04	0%	Pass				
Pronghorn	Anthracene	48.761	0.034	1	0.034	0	0	0	0	Regression Based	20.2	0.894	0.694	175.0	<0.01	0%	Pass				
	Benzo(a)anthracene	48.761	0.034	1	0.034	0	0	0	0	Regression Based	7.44	0.256	0.256	1000.0	<0.01	7%	Pass				
	Benzo(a)pyrene	48.761	0.034	1	0.034	0	0	0	0	Regression Based	8.21	0.262	0.262	10.0	0.29	0%	Pass				
Pronghorn	Benzo(b)fluoranthene	48.761	0.034	1	0.034	0	0	0	0	Regression Based	3.26	0.112	0.112	1.19	0.12	0%	Pass				
	Benzo(k)fluoranthene	48.761	0.034	1	0.034	0	0	0	0	Regression Based	4.1	1.41	1.41	1.0	1.4	0%	Pass				
	Benzo(e)fluoranthene	48.761	0.034	1	0.034	0	0	0	0	Regression Based	8.84	0.384	0.384	0.311	0.31	0%	Pass				
Pronghorn	Chrysene	48.761	0.034	1	0.034	0	0	0	0	Regression Based	1.56	0.0469	0.0469	1.0	0.64	0%	Pass				
	Fluoranthene	48.761	0.034	1	0.034	0	0	0	0	Regression Based	0.0250	0.00248	0.00248	125.0	<0.01	4%	Pass				
	Fluorene	48.761	0.034	1	0.034	0	0	0	0	Regression Based	51.90	1.78	1.78	125.0	1.4	14%	Retain				
Pronghorn	Indeno(1,2,3-cd)pyrene	48.761	0.034	1	0.034	0	0	0	0	Regression Based	1.16	0.0397	0.0397	10.0	0.47	0%	Pass				
	Naphthalene	48.761	0.034	1	0.034	0	0	0	0	Regression Based	64.7	22.2	22.2	50.0	0.45	25%	Pass				
	Phenanthrene	48.761	0.034	1	0.034	0	0	0	0	Regression Based	16.5	0.671	0.671	175.0	<0.01	16%	Pass				
Pronghorn	Pyrene	48.761	0.034	1	0.034	0	0	0	0	Regression Based	7.58	0.280	0.280	75.0	<0.01	0%	Pass				
	TPH	48.761	0.034	1	0.034	0	0	0	0				47.000	2.00	32.3	1000.0	0.13	0%	Pass		
	TPH	48.761	0.034	1	0.034	0	0	0	0				47.000	2.00	32.3	1000.0	0.13	0%	Pass		
Pronghorn	2,4,5-Trichloroaniline	48.761	0.034	1	0.034	0	0	0	0	0.0202	1.01	0.0348	0.0048	50	2.00	0.0344	0.0092	0.2	0.29	0%	Pass
	2,4,6-Trichloroaniline	48.761	0.034	1	0.034	0	0	0	0	0.0147	0.154	0.0529	0.0529	10.5	2.00	0.00722	0.125	0.2	0.52	0%	Pass
	2,4-Dichlorophenol	48.761	0.034	1	0.034	0	0	0	0	0.118	1.24	0.0426	0.0426	10.5	2.00	0.00722	0.0689	0.2	0.21	0%	Pass
Pronghorn	2,4-Dimethylphenol	48.761	0.034	1	0.034	0	0	0	0	0.143	1.50	0.0517	0.0517	10.5	2.00	0.00722	0.0980	NSV	NSV	Uncertain	
	2-Chlorophenol	48.761	0.034	1	0.034	0	0	0	0	0.0111	0.00400	0.00400	0.00400	10.5	2.00	0.00722	0.0172	NSV	NSV	Uncertain	
	2-Methylphenol	48.761	0.034	1	0.034	0	0	0	0	3.77	4.03	3.53	3.53	10.5	2.00	0.00722	3.54	340.0	0.010	0%	Pass
Pronghorn	2,6-Dimethylphenol	48.761	0.034	1	0.034	0	0	0	0	0.0767	0.835	0.0277	0.0277	10.5	2.00	0.00722	0.343	NSV	NSV	Uncertain	
	4-Chlorophenol	48.761	0.034	1	0.034	0	0	0	0	1.18	12.4	0.426	0.426	10.5	2.00	0.00722	0.0390	NSV	NSV	Uncertain	
	4-Methylphenol	48.761	0.034	1	0.034	0	0	0	0	0.951	9.98	0.343	0.343	10.5	2.00	0.00722	0.351	340.0	<0.01	0%	Pass
Pronghorn	Benzoic acid	48.761	0.034	1	0.034	0	0	0	0	1.08	84.1	1.86	1.86	50	2.00	0.00722	1.90	NSV	NSV	Uncertain	
	Benzoin	48.761	0.034	1	0.034	0	0	0	0	6.07	59.5	2.05	2.05	10.5	2.00	0.00722	2.05	NSV	NSV	Uncertain	
	Bis(2-Ethylhexyl)phthalate	48.761	0.034	1	0.034	0	0	0	0	0.0680	0.0990	0.00400	0.00400	15.0	2.00	0.00103	0.00444	16.3	<0.01	16%	Pass
Pronghorn	Bis(2-Propylhexyl)phthalate	48.761	0.034	1	0.034	0	0	0	0	0.0182	0.0191	0.00087	0.00087	10.5	2.00	0.00722	0.0789	550.0	<0.01	0%	Pass
	Diethylstilbestrol	48.761	0.034	1	0.034	0	0	0	0	0.39	4.26	0.11	0.11	10.5	2.00	0.00722	0.17	433.0	<0.01	14%	Uncertain
	Diethylstilbestrol	48.761	0.034	1	0.034	0	0	0	0	2.11	22.1	0.761	0.761	10.5	2.00	0.00722	0.768	550.0	<0.01	0%	Pass
Pronghorn	Di-n-butylphthalate	48.761	0.034	1	0.034	0	0	0	0	0.0248	0.0313	0.00108	0.00108	10.5	2.00	0.00722	0.00380	550.0	<0.01	0%	Pass
	Di-n-octylphthalate	48.761	0.034	1	0.034	0	0	0	0	0.461	4.84	0.166	0.166	10.5	2.00	0.00722	0.174	550.0	<0.01	0%	Pass
	Hexachlorobenzene	48.761	0.034	1	0.034	0	0	0	0	0.00785	0.00824	0.000284	0.000284	10.5	2.00	0.00722	0.00751	1.6	<0.01	0%	Pass
Pronghorn	Hexachlorobiphenyl	48.761	0.034	1	0.034	0	0	0	0	0.0207	0.00000569	0.00000569	0.00000569	10.5	2.00	0.00000569	0.00000607	1.6	<0.01	0%	Pass
	Hexachlorocyclopentadiene	48.761	0.034	1	0.034	0	0	0	0	0.0111	0.116	0.00400	0.00400	10.5	2.00	0.00722	0.0172	1.6	<0.01	0%	Pass
	Hexachlorocyclopentadiene	48.761	0.034	1	0.034	0	0	0	0	0.0305	0.0320	0.010	0.010	10.5	2.00	0.00722	0.0382	1.6	<0.01	0%	Pass
Pronghorn	Hexachlorocyclopentadiene	48.761	0.034	1	0.034	0	0	0	0	2.45	25.7	0.885	0.885	10.5	2.00	0.00722	0.882	1.6	<0.01	0%	Pass
	Hexachlorobenzene	48.761	0.034	1	0.034	0	0	0	0	0.719	0.755	0.0260	0.0260	10.5	2.00	0.00722	0.0322	NSV	NSV	Uncertain	
	Hexachlorobenzene	48.761	0.034	1	0.034	0	0	0	0	0.0129	0.0644	0.00222	0.00222	50	2.00	0.0344	0.0366	0.2	<0.01	0%	Pass
Pronghorn	1,1,1,2-Tetrachloroethane	48.761	0.034	1	0.034	0	0	0	0	3.56	0.00214	0.0000758	0.0000758	0.000600	2.00	0.00000413	0.000739	1.4	<0.01	5%	Pass
	1,1,1-Trichloroethane	48.761	0.034	1	0.034	0	0	0	0	0.279	0.00251	0.0000864	0.0000864	0.000600	2.00	0.00000619	0.0000926	100.0	<0.01	5%	Pass
	1,1,2,2-Tetrachloroethane	48.761	0.034	1	0.034	0	0	0	0	0.354	0.00354	0.000122	0.000122	0.00100	2.00	0.00000888	0.000729	1.4	<0.01	5%	Pass
Pronghorn	1,2-Dichloroethane	48.761	0.034	1	0.034	0	0	0	0	0.268	0.00268	0.000360	0.000360	0.00050	2.00	0.00000462	0.000314	50.0	<0.01	5%	Pass
	1,2-Dichloroethane	48.761	0.034	1	0.034	0	0	0	0	8.26	0.06828	0.00312	0.00312	0.00110	2.00	0.000000767	0.00313	2.5	<0.01	5%	Pass
	1,2,3-Trichloroethane	48.761	0.034	1	0.034	0	0	0	0	1.37	0.0385	0.00132	0.00132	0.00080	2.00	0.00000193	0.00134	NSV	NSV	Uncertain	
Pronghorn	1,2,3-Trichloroethane	48.761	0.034	1	0.034	0	0	0	0	5.84	0.00526	0.00081	0.00081	0.00080	2.00	0.00000193	0.00132	100.0	<0.01	5%	Pass
	1,2-Dibromo-3-chloropropane	48.761	0.034	1	0.034	0	0	0	0	0.0480	0.0001851	0.00000638	0.00000638	0.000200	2.00	0.000000220	0.0000284	NSV	NSV	Uncertain	
	1,2-Dibromoethane	48.761	0.034	1	0.034	0	0	0	0	0.438	0.00171	0.0000568	0.0000568	0.00050	2.00	0.00000068	0.00054	NSV	NSV	Uncertain	
Pronghorn	1,2-Dibromoethane	48.761	0.034	1	0.034	0	0	0	0	2.57	0.00289	0.000124	0.000124	0.00140	2.00	0.000000683	0.000725	NSV	NSV	Uncertain	
	1,2-Dibromoethane	48.761	0.034	1	0.034	0	0	0	0	2.90	0.00289	0.0000693	0.0000693	0.000600	2.00	0.000000683	0.000394	50.0	<0.01	5%	Pass
	1,2-Dibromoethane	48.761	0.034	1	0.034	0	0	0	0	11.7	0.0105	0.000361	0.000361	0.000600	2.00	0.000000619	0.000362	NSV	NSV	Uncertain	
Pronghorn	1,3-Dibromobenzene	48.761	0.034	1	0.034	0	0	0	0	0.262	0.00000680	0.00000171	0.00000171	0.0000100	2.00	0.000000131	0.0000302	NSV	NSV	Uncertain	
	1,3-Dibromobenzene	48.761	0.034	1	0.034	0	0	0	0	0.262	0.00000680	0.00000171	0.00000171	0.0000100	2.00						

Table 16: Initial Risk Estimation for Wildlife Exposed to Site Soils
Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Receptor	Chemical	Bed Weight (kg)	Dall Food Ingestion Rate (b/day)	Area (b/day)	Soil Invertebrates										Terrestrial Plants										MOAEL TTR (mg/kg/d)	MOAEL HQ and Quotient	Detection Frequency (%)	Screening Risk Conclusions
					Dall Food Ingestion Rate (b/day)	Percent of Diet	Soil to Tissue Transfer Factor	Tissue Concentration (mg/kg DW)	Food Intake (mg/kg DW)	Percent of Diet	Soil to Tissue Transfer Factor	Tissue Concentration (mg/kg DW)	Food Intake (mg/kg DW)	Percent of Diet	Soil to Tissue Transfer Factor	Tissue Concentration (mg/kg DW)	DHI	Percent of Diet	Soil to Tissue Transfer Factor	Total Food Intake (mg/kg/d)	Soil POC (mg/kg)	Percent of Diet Soil	Inhabitant Soil Intake (mg/kg/d)	MOAEL TTR (mg/kg/d)				
Coyote	Benflumoprol	10,330	0.045	1	0.045	100	Regression Based	0.410	0.295	0.0134	0	0	0	0	0.0134	0.72	2.80	0.000914	0.0143	0.5	0.027	48%	Pass					
Coyote	Carbaryl	10,330	0.045	1	0.045	100	Regression Based	1.12	0.851	0.0163	0	0	0	0	0.000957	3.22	2.80	0.000040	0.204	0.8	0.27	44%	Pass					
Coyote	Carbofendathion	10,330	0.045	1	0.045	100	Regression Based	1.12	0.851	0.0163	0	0	0	0	0.000957	3.22	2.80	0.000040	0.204	0.8	0.27	44%	Pass					
Coyote	Chlorpyrifos	10,330	0.045	1	0.045	100	Regression Based	0.333	18.4	0.836	0	0	0	0	0.836	55.3	2.80	0.00702	0.068	3.3	0.28	5%	Uncertain					
Coyote	Cyfluthrin	10,330	0.045	1	0.045	100	Regression Based	0.0977	0.0977	0.00418	0	0	0	0	0.00418	43.0	2.80	0.00822	0.008	1.1	0.21	79%	Pass					
Coyote	Deltamethrin	10,330	0.045	1	0.045	100	Regression Based	0.144	31.7	1.44	0	0	0	0	1.44	18.00	2.80	0.0022	0.008	1.1	0.21	79%	Pass					
Coyote	Endosulfan	10,330	0.045	1	0.045	100	Regression Based	127	5.75	0	0	0	0	0	5.75	483.00	2.80	60.9	66.7	0.9	72	100%	Uncertain					
Coyote	Malathion	10,330	0.045	1	0.045	100	Regression Based	0.602	241.00	10.90	0	0	0	0	10.90	30.8	2.80	0.000635	0.0172	0.2	0.31	100%	Pass					
Coyote	Marginalia	10,330	0.045	1	0.045	100	0.700	41	1.86	0	0	0	0	0	1.86	51.9	2.80	0.00059	0.282	88.0	0.029	100%	Pass					
Coyote	Mercaptopyrazole	10,330	0.045	1	0.045	100	0.192	0.0134	0.000610	0	0	0	0	0	0.000610	0.0700	2.80	0.000698	0.000698	0.0	0.022	27%	Pass					
Coyote	Metolachlor	10,330	0.045	1	0.045	100	1.00	17	0.771	0	0	0	0	0	0.771	17	2.80	0.00218	0.762	0.3	3.0	91%	Pass					
Coyote	Nitrate	10,330	0.045	1	0.045	100	0.989	24.3	1.10	0	0	0	0	0	1.10	41.3	2.80	0.0528	1.16	40.0	0.029	100%	Pass					
Coyote	Permethrin	10,330	0.045	1	0.045	100	0.100	13.0	0	0	0	0	0	0	0	0.100	22.8	2.80	0.0029	0.08	50.0	<0.01	92%	Pass				
Coyote	Phenanthrene	10,330	0.045	1	0.045	100	0.989	24.3	1.10	0	0	0	0	0	1.10	41.3	2.80	0.0528	1.16	40.0	0.029	100%	Pass					
Coyote	Phthalate	10,330	0.045	1	0.045	100	1.00	96.0	44.9	0	0	0	0	0	44.9	90.0	2.80	0.126	0.81	NSV	<0.01	0%	Pass					
Coyote	Sesquiterpene	10,330	0.045	1	0.045	100	Regression Based	1.21	0.0348	0	0	0	0	0	0.0348	5.00	2.80	0.00635	0.0812	0.2	0.31	100%	Pass					
Coyote	Silver	10,330	0.045	1	0.045	100	0.610	3.24	0.147	0	0	0	0	0	0.147	4.47	2.80	0.00508	0.152	0.4	0.64	8%	Pass					
Coyote	Strobulin	10,330	0.045	1	0.045	100	0.123	484	21.9	0	0	0	0	0	21.9	484	2.80	0.00668	22.6	263.0	0.066	100%	Pass					
Coyote	Thiamin	10,330	0.045	1	0.045	100	0.195	0.0675	0.00308	0	0	0	0	0	0.00308	0.550	2.80	0.000698	0.00376	0.0	0.51	54%	Pass					
Coyote	Vinadim	10,330	0.045	1	0.045	100	Regression Based	165	7.02	0	0	0	0	0	7.02	25.7	2.80	0.0326	0.953	0.2	0.26	100%	Pass					
Coyote	Zinc	10,330	0.045	1	0.045	100	Regression Based	107	4.85	0	0	0	0	0	4.85	17.0	2.80	0.0718	5.08	10.0	0.062	100%	Pass					
Coyote	2,4-Dichlorophenoxyacetic acid	10,330	0.045	1	0.045	100	0.629	107	4.85	0	0	0	0	0	4.85	17.0	2.80	0.0718	5.08	10.0	0.062	100%	Pass					
Coyote	Acarabenzene	10,330	0.045	1	0.045	100	0	0	0	0	0	0	0	0	0	0.1418	2.80	0.000531	0.000531	125.0	0.0	14%	Pass					
Coyote	Azinphosmethyl	10,330	0.045	1	0.045	100	0	0	0	0	0	0	0	0	0	10.5	2.80	0.0133	0.133	175.0	<0.01	0%	Pass					
Coyote	ATPase	10,330	0.045	1	0.045	100	0	0	0	0	0	0	0	0	0	3.70	2.80	0.00470	0.00470	1000.0	<0.01	0%	Pass					
Coyote	Benzothiazole	10,330	0.045	1	0.045	100	0	0	0	0	0	0	0	0	0	10.5	2.80	0.0133	0.133	1.0	0.013	0%	Pass					
Coyote	Benzothiazole	10,330	0.045	1	0.045	100	0	0	0	0	0	0	0	0	0	10.5	2.80	0.0133	0.133	1.0	0.013	0%	Pass					
Coyote	Benzothiazole	10,330	0.045	1	0.045	100	0	0	0	0	0	0	0	0	0	10.5	2.80	0.0133	0.133	1.0	0.013	0%	Pass					
Coyote	Benzothiazole	10,330	0.045	1	0.045	100	0	0	0	0	0	0	0	0	0	10.5	2.80	0.0133	0.133	1.0	0.013	0%	Pass					
Coyote	Benzothiazole	10,330	0.045	1	0.045	100	0	0	0	0	0	0	0	0	0	10.5	2.80	0.0133	0.133	1.0	0.013	0%	Pass					
Coyote	Benzothiazole	10,330	0.045	1	0.045	100	0	0	0	0	0	0	0	0	0	10.5	2.80	0.0133	0.133	1.0	0.013	0%	Pass					
Coyote	Chlorobenzene	10,330	0.045	1	0.045	100	0	0	0	0	0	0	0	0	0	10.5	2.80	0.0133	0.133	1.0	0.013	0%	Pass					
Coyote	Fluoranthene	10,330	0.045	1	0.045	100	0	0	0	0	0	0	0	0	0	10.5	2.80	0.0133	0.133	1.0	0.013	0%	Pass					
Coyote	Fluorene	10,330	0.045	1	0.045	100	0	0	0	0	0	0	0	0	0	10.5	2.80	0.0133	0.133	1.0	0.013	0%	Pass					
Coyote	Hexachloro-2,3-dioxine	10,330	0.045	1	0.045	100	0	0	0	0	0	0	0	0	0	33	2.80	0.0418	0.126	<0.01	<0.01	4%	Pass					
Coyote	Naphthalene	10,330	0.045	1	0.045	100	0	0	0	0	0	0	0	0	0	10.5	2.80	0.0133	0.133	1.0	0.013	0%	Pass					
Coyote	Phenanthrene	10,330	0.045	1	0.045	100	0	0	0	0	0	0	0	0	0	5.5	2.80	0.0073	0.0073	50.0	<0.01	29%	Pass					
Coyote	Pyrene	10,330	0.045	1	0.045	100	0	0	0	0	0	0	0	0	0	32	2.80	0.117	0.117	175.0	<0.01	18%	Pass					
Coyote	TPH	10,330	0.045	1	0.045	100	0	0	0	0	0	0	0	0	0	19.5	2.80	0.0138	0.0138	75.0	1.0	46%	Pass					
Coyote	2,4,5-Trichlorophenoxyacetic acid	10,330	0.045	1	0.045	100	0.125	6.24	0.293	0	0	0	0	0	0.293	50	2.80	0.0636	0.246	0.2	0.28	0%	Pass					
Coyote	2,4,6-Trichlorophenoxyacetic acid	10,330	0.045	1	0.045	100	0.111	1.77	0.0529	0	0	0	0	0	0.0529	10.5	2.80	0.0133	0.0662	0.2	0.28	0%	Pass					
Coyote	2,4-Dichlorophenoxyacetic acid	10,330	0.045	1	0.045	100	0.254	2.46	0.112	0	0	0	0	0	0.112	10.5	2.80	0.0133	0.125	0.2	0.52	0%	Pass					
Coyote	2,4-Dimethylphenoxyacetic acid	10,330	0.045	1	0.045	100	0.251	2.84	0.120	0	0	0	0	0	0.120	10.5	2.80	0.0133	0.133	NSV	--	0%	Uncertain					
Coyote	2-Chlorodiphenyl ether	10,330	0.045	1	0.045	100	0.101	1.38	0.0479	0	0	0	0	0	0.0479	10.5	2.80	0.0133	0.0712	NSV	--	0%	Uncertain					
Coyote	2-Chlorodiphenyl ether	10,330	0.045	1	0.045	100	0.101	1.38	0.0479	0	0	0	0	0	0.0479	10.5	2.80	0.0133	0.0712	NSV	--	0%	Uncertain					
Coyote	2-Chlorodiphenyl ether	10,330	0.045	1	0.045	100	0.101	1.38	0.0479	0	0	0	0	0	0.0479	10.5	2.80	0.0133	0.0712	NSV	--	0%	Uncertain					
Coyote	2-Chlorodiphenyl ether	10,330	0.045	1	0.045	100	0.101	1.38	0.0479	0	0	0	0	0	0.0479	10.5	2.80	0.0133	0.0712	NSV	--	0%	Uncertain					
Coyote	2-Chlorodiphenyl ether	10,330	0.045	1	0.045	100	0.101	1.38	0.0479	0	0	0	0	0	0.0479	10.5	2.80	0.0133	0.0712	NSV	--	0%	Uncertain					
Coyote	2-Chlorodiphenyl ether	10,330	0.045	1	0.045	100	0.101	1.38	0.0479	0	0	0	0	0	0.0479	10.5	2.80	0.0133	0.0712	NSV	--	0%	Uncertain					
Coyote	2-Chlorodiphenyl ether	10,330	0.045	1	0.045	100	0.101	1.38	0.0479	0	0	0	0	0	0.0479	10.5	2.80	0.0133	0.0712	NSV	--	0%	Uncertain					
Coyote	2-Chlorodiphenyl ether	10,330	0.045	1	0.045	100	0.101	1.38	0.0479	0	0	0	0	0	0.0479	10.5	2.80	0.0133	0.0712	NSV	--	0%	Uncertain					
Coyote	2-Chlorodiphenyl ether	10,330	0.045	1	0.045	100	0.101	1.38	0.0479	0	0	0	0	0	0.0479	10.5	2.80	0.0133	0.0712	NSV	--	0%	Uncertain					
Coyote	2-Chlorodiphenyl ether	10,330	0.045	1	0.045	100	0.101	1.38	0.0479	0	0	0	0	0	0.0479	10.5	2.80	0.0133	0.0712	NSV	--	0%	Uncertain					
Coyote	2-Chlorodiphenyl ether	10,330	0.045	1	0.045	100	0.101	1.38	0.0479	0	0	0	0	0	0.0479	10.5	2.80	0.0133	0.0712	NSV	--	0%	Uncertain					
Coyote	2-Chlorodiphenyl ether	10,330	0.045	1	0.045	100	0.101	1.38	0.0479	0	0	0	0	0	0.0479	10.5	2.80	0.0133	0.0712	NSV	--	0%	Uncertain					
Coyote	2-Chlorodiphenyl ether	10,330	0.045	1	0.045	100	0.101	1.38	0.0479	0	0	0	0	0	0.0479	10.5	2.80	0.0133	0.0712	NSV	--	0%	Uncertain					
Coyote	2-Chlorodiphenyl ether	10,330	0.045	1	0.045	100	0.101	1.38	0.0479	0	0	0	0	0	0.0479	10.5	2.80	0.0133	0.0712	NSV	--	0%	Uncertain					
Coyote	2-Chlorodiphenyl ether	10,330	0.045																									

Table 16
 Initial Risk Estimation for Wildlife Exposed to Site Soils
 Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Receptor	Chemical	Bed Weight (kg)	Dail Food Ingestion Rate (g/kg-bw/d)	Soil to Tissue Transfer Factor	Small Mammals and Other Vertebrates					Soil Invertebrates					Terrestrial Plants					MOAEL TRV (mg/kg-d)	MOAEL HQ and Quotient	Detection Frequency (%)	Screening Risk Conclusions	
					Percent of Diet	Soil to Tissue Transfer Factor	Tissue Concentration (mg/kg DW)	Food Intake (mg/kg-bw/d)	Percent of Diet	Soil to Tissue Transfer Factor	Tissue Concentration (mg/kg DW)	Food Intake (mg/kg-bw/d)	Percent of Diet	Soil to Tissue Transfer Factor	Tissue Concentration (mg/kg DW)	Food Intake (mg/kg-bw/d)	Percent of Diet	Soil to Tissue Transfer Factor	Tissue Concentration (mg/kg DW)					Food Intake (mg/kg-bw/d)
Coyote	1,1,2-Trichloroethane	10.330	0.045	1	0.045	100	0.326	0.000261	0.0000175	0	0	0	0	0.0000118	0.0000070	2.80	0.00000102	0.0000128	10.000	<0.01	<0.01	5%	Pass	
Coyote	1,1-Dichloroethane	10.330	0.045	1	0.045	100	0.550	0.000385	0.0000175	0	0	0	0	0.0000175	0.0000070	2.80	0.00000102	0.0000175	10.000	<0.01	<0.01	5%	Pass	
Coyote	1,1-Dibromochloroethane	10.330	0.045	1	0.045	100	1.07	0.00115	0.0000559	0	0	0	0	0.0000553	0.000110	2.80	0.00000102	0.0000553	NSV	NSV	<0.01	5%	Uncertain	
Coyote	1,2,3-Trichlorobenzene	10.330	0.045	1	0.045	100	0.563	0.000158	0.0000175	0	0	0	0	0.0000158	0.0000070	2.80	0.00000102	0.0000158	NSV	NSV	<0.01	5%	Pass	
Coyote	1,2,3-Trichloropropene	10.330	0.045	1	0.045	100	0.945	0.000951	0.0000388	0	0	0	0	0.0000388	0.0000070	2.80	0.00000102	0.0000388	NSV	NSV	<0.01	5%	Pass	
Coyote	1,2,4-Trichlorobenzene	10.330	0.045	1	0.045	100	0.798	0.000255	0.0000175	0	0	0	0	0.0000255	0.0000070	2.80	0.00000102	0.0000255	NSV	NSV	<0.01	5%	Pass	
Coyote	1,2,4-Trichloropropene	10.330	0.045	1	0.045	100	1.00	0.000447	0.0000175	0	0	0	0	0.0000447	0.0000070	2.80	0.00000102	0.0000447	NSV	NSV	<0.01	5%	Pass	
Coyote	1,2-Dibromochloroethane	10.330	0.045	1	0.045	100	0.688	0.000558	0.0000263	0	0	0	0	0.0000263	0.0000070	2.80	0.00000102	0.0000263	NSV	NSV	<0.01	5%	Pass	
Coyote	1,2-Dibromochloroethane	10.330	0.045	1	0.045	100	0.468	0.000329	0.0000449	0	0	0	0	0.0000449	0.0000070	2.80	0.00000102	0.0000449	NSV	NSV	<0.01	5%	Pass	
Coyote	1,2-Ethylene Dichloride	10.330	0.045	1	0.045	100	1.21	0.001029	0.0000494	0	0	0	0	0.0000494	0.0000070	2.80	0.00000102	0.0000494	NSV	NSV	<0.01	5%	Pass	
Coyote	1,3-Dibromobenzene	10.330	0.045	1	0.045	100	0.137	0.000269	0.0000118	0	0	0	0	0.0000118	0.0000070	2.80	0.00000102	0.0000118	NSV	NSV	<0.01	5%	Pass	
Coyote	1,4-Dibromobenzene	10.330	0.045	1	0.045	100	0.137	0.000294	0.0000192	0	0	0	0	0.0000192	0.0000070	2.80	0.00000102	0.0000192	NSV	NSV	<0.01	5%	Pass	
Coyote	2-Ethylanthracene	10.330	0.045	1	0.045	100	1.98	0.00142	0.000018	0	0	0	0	0.000018	0.0000070	2.80	0.00000102	0.000018	NSV	NSV	<0.01	5%	Pass	
Coyote	2-Chloroanthracene	10.330	0.045	1	0.045	100	0.408	0.000247	0.000018	0	0	0	0	0.000018	0.0000070	2.80	0.00000102	0.000018	NSV	NSV	<0.01	5%	Pass	
Coyote	2-Chloroanthracene	10.330	0.045	1	0.045	100	0.408	0.000247	0.000018	0	0	0	0	0.000018	0.0000070	2.80	0.00000102	0.000018	NSV	NSV	<0.01	5%	Pass	
Coyote	2-Fluorene	10.330	0.045	1	0.045	100	1.37	0.000622	0.0000263	0	0	0	0	0.0000263	0.0000070	2.80	0.00000102	0.0000263	NSV	NSV	<0.01	5%	Pass	
Coyote	4-Bromophenylbiphenyl ether	10.330	0.045	1	0.045	100	0.470	0.31	0.195	0	0	0	0	0.195	0.0000070	2.80	0.00000102	0.195	NSV	NSV	<0.01	5%	Pass	
Coyote	4-Chlorophenylbiphenyl ether	10.330	0.045	1	0.045	100	0.09446	0.884	0.000263	0	0	0	0	0.000263	0.0000070	2.80	0.00000102	0.000263	NSV	NSV	<0.01	5%	Pass	
Coyote	4-Methyl-2-phenylene	10.330	0.045	1	0.045	100	1.46	0.000624	0.000263	0	0	0	0	0.000263	0.0000070	2.80	0.00000102	0.000263	NSV	NSV	<0.01	5%	Pass	
Coyote	Arochlor	10.330	0.045	1	0.045	100	2.38	56.6	2.57	0	0	0	0	2.57	24	2.80	0.0000070	2.60	0.0000070	2.60	0.0000070	0.7	14%	Pass
Coyote	Benzene	10.330	0.045	1	0.045	100	1.07	0.000438	0.0000189	0	0	0	0	0.0000189	0.0000070	2.80	0.00000102	0.0000189	NSV	NSV	<0.01	5%	Pass	
Coyote	Bis(2-chloroethoxy)ethane	10.330	0.045	1	0.045	100	0.688	0.132	0.347	0	0	0	0	0.347	0.40	2.80	0.0000070	0.40	NSV	NSV	<0.01	5%	Pass	
Coyote	Bis(2-chloroethoxy)ethane	10.330	0.045	1	0.045	100	0.433	4.55	0.208	0	0	0	0	0.208	0.5	2.80	0.0000070	0.5	NSV	NSV	<0.01	5%	Pass	
Coyote	Bromobenzene	10.330	0.045	1	0.045	100	1.08	0.000176	0.0000343	0	0	0	0	0.0000343	0.0000070	2.80	0.00000102	0.0000343	NSV	NSV	<0.01	5%	Pass	
Coyote	Bromobenzene	10.330	0.045	1	0.045	100	0.344	0.000172	0.00000780	0	0	0	0	0.00000780	0.0000070	2.80	0.00000102	0.00000780	NSV	NSV	<0.01	5%	Pass	
Coyote	Carbon tetrachloride	10.330	0.045	1	0.045	100	0.847	0.000162	0.0000345	0	0	0	0	0.0000345	0.0000070	2.80	0.00000102	0.0000345	NSV	NSV	<0.01	5%	Pass	
Coyote	Chlorobenzene	10.330	0.045	1	0.045	100	0.245	0.000172	0.00000779	0	0	0	0	0.00000779	0.0000070	2.80	0.00000102	0.00000779	NSV	NSV	<0.01	5%	Pass	
Coyote	Chlorobenzene	10.330	0.045	1	0.045	100	0.728	0.00028	0.0000329	0	0	0	0	0.0000329	0.0000070	2.80	0.00000102	0.0000329	NSV	NSV	<0.01	5%	Pass	
Coyote	Chlorobenzene	10.330	0.045	1	0.045	100	1.05	0.000105	0.00003476	0	0	0	0	0.00003476	0.0000070	2.80	0.00000102	0.00003476	NSV	NSV	<0.01	5%	Pass	
Coyote	Diethylstilbestrol	10.330	0.045	1	0.045	100	1.17	0.000819	0.0000371	0	0	0	0	0.0000371	0.0000070	2.80	0.00000102	0.0000371	NSV	NSV	<0.01	5%	Pass	
Coyote	Diethylstilbestrol	10.330	0.045	1	0.045	100	1.01	0.000609	0.0000276	0	0	0	0	0.0000276	0.0000070	2.80	0.00000102	0.0000276	NSV	NSV	<0.01	5%	Pass	
Coyote	Dibromochloroethane	10.330	0.045	1	0.045	100	0.457	0.000306	0.0000139	0	0	0	0	0.0000139	0.0000070	2.80	0.00000102	0.0000139	NSV	NSV	<0.01	5%	Pass	
Coyote	Dibromochloroethane	10.330	0.045	1	0.045	100	1.27	0.000634	0.0000287	0	0	0	0	0.0000287	0.0000070	2.80	0.00000102	0.0000287	NSV	NSV	<0.01	5%	Pass	
Coyote	Dibromochloroethane	10.330	0.045	1	0.045	100	0.414	0.000455	0.0000288	0	0	0	0	0.0000288	0.0000070	2.80	0.00000102	0.0000288	NSV	NSV	<0.01	5%	Pass	
Coyote	Endrin	10.330	0.045	1	0.045	100	0.183	0.000251	0.0000114	0	0	0	0	0.0000114	0.0000070	2.80	0.00000102	0.0000114	NSV	NSV	<0.01	5%	Pass	
Coyote	Endrin	10.330	0.045	1	0.045	100	0.633	0.000266	0.0000121	0	0	0	0	0.0000121	0.0000070	2.80	0.00000102	0.0000121	NSV	NSV	<0.01	5%	Pass	
Coyote	Endrin	10.330	0.045	1	0.045	100	0.774	0.000203	0.00000447	0	0	0	0	0.00000447	0.0000070	2.80	0.00000102	0.00000447	NSV	NSV	<0.01	5%	Pass	
Coyote	Endrin	10.330	0.045	1	0.045	100	0.709	7.45	0.338	0	0	0	0	0.338	10.5	2.80	0.00000102	10.5	NSV	NSV	<0.01	5%	Pass	
Coyote	Endrin	10.330	0.045	1	0.045	100	0.827	0.000115	0.00000975	0	0	0	0	0.00000975	0.0000070	2.80	0.00000102	0.00000975	NSV	NSV	<0.01	5%	Pass	
Coyote	Endrin	10.330	0.045	1	0.045	100	1.44	0.00101	0.0000457	0	0	0	0	0.0000457	0.0000070	2.80	0.00000102	0.0000457	NSV	NSV	<0.01	5%	Pass	
Coyote	Endrin	10.330	0.045	1	0.045	100	0.700	0.000630	0.0000288	0	0	0	0	0.0000288	0.0000070	2.80	0.00000102	0.0000288	NSV	NSV	<0.01	5%	Pass	
Coyote	Endrin	10.330	0.045	1	0.045	100	0.875	0.00164	0.0000742	0	0	0	0	0.0000742	0.0000070	2.80	0.00000102	0.0000742	NSV	NSV	<0.01	5%	Pass	
Coyote	Endrin	10.330	0.045	1	0.045	100	0.468	0.000329	0.0000132	0	0	0	0	0.0000132	0.0000070	2.80	0.00000102	0.0000132	NSV	NSV	<0.01	5%	Pass	
Coyote	Endrin	10.330	0.045	1	0.045	100	0.339	0.000237	0.0000118	0	0	0	0	0.0000118	0.0000070	2.80	0.00000102	0.0000118	NSV	NSV	<0.01	5%	Pass	
Coyote	Endrin	10.330	0.045	1	0.045	100	0.311	0.000342	0.0000155	0	0	0	0	0.0000155	0.0000070	2.80	0.00000102	0.0000155	NSV	NSV	<0.01	5%	Pass	
Coyote	Endrin	10.330	0.045	1	0.045	100	1.52	0.00182	0.0000268	0	0	0	0	0.0000268	0.0000070	2.80	0.00000102	0.0000268	NSV	NSV	<0.01	5%	Pass	
Coyote	Endrin	10.330																						

Table 16. Initial Risk Estimation for Wildlife Exposed to Site Soils
Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Receptor	Chemical	Bed Weight (kg)	Soil Weight (kg)	Dail Food Ingestion Rate (g/day)	Area (ha)	Small Mammals and Other Vertebrates				Soil Invertebrates				Terrestrial Plants				MOAEL TRV (mg/kg-d)	MOAEL HQ and Quotient	Detection Frequency (%)	Screening Risk Conclusions					
						Percent of Diet	Soil to Tissue Transfer Factor	Tissue Concentration (mg/kg DW)	Food Intake (mg/kg-d)	Percent of Diet	Soil to Tissue Transfer Factor	Tissue Concentration (mg/kg DW)	Food Intake (mg/kg-d)	Percent of Diet	Soil to Tissue Transfer Factor	Tissue Concentration (mg/kg DW)	Food Intake (mg/kg-d)					Percent of Diet	Soil to Tissue Transfer Factor	Tissue Concentration (mg/kg DW)	Food Intake (mg/kg-d)	
Western Meadowlark	2,4,6-Trinitrochlorobenzene (TNT)	0.003	0.020	1	0.020	0	0	0	0	0.170	0.255	0	0	0.05056	1.50	2.00	0.000595	0	0.0186	28.5	NSV	0	0.881	0%	Uncertain	
Western Meadowlark	2,4-Dichlorophenol	0.003	0.020	1	0.020	0	0	0	0	28.7	28.5	0	0	0.202	5.0	2.00	0.000793	0	0.198	0.203	NSV	0	2.9	2%	Retain	
Western Meadowlark	2,4-Dinitrochlorobenzene	0.003	0.020	1	0.020	0	0	0	0	5.0	10.2	0	0	0.202	10.5	2.00	0.000793	0	0.198	0.682	NSV	0	8.5	0%	Retain	
Western Meadowlark	2,6-Dinitrochlorobenzene	0.003	0.020	1	0.020	0	0	0	0	3.16	0.658	0	0	0.133	1.50	2.00	0.000595	0	0.198	0.134	NSV	0	1.9	0%	Retain	
Western Meadowlark	2-Amino-4,6-Dinitrochlorobenzene	0.003	0.020	1	0.020	0	0	0	0	2.7	5.0	0	0	0.133	1.50	2.00	0.000595	0	0.198	0.682	NSV	0	1.9	0%	Retain	
Western Meadowlark	2,4-Dinitrophenol	0.003	0.020	1	0.020	0	0	0	0	27.0	28.5	0	0	0.202	5.0	2.00	0.000793	0	0.198	0.682	NSV	0	2.9	2%	Retain	
Western Meadowlark	2,6-Dinitrophenol	0.003	0.020	1	0.020	0	0	0	0	30.9	4.32	0	0	0.05056	1.50	2.00	0.000595	0	0.198	0.05056	NSV	0	1.2	0%	Retain	
Western Meadowlark	2-Nitrochlorobenzene	0.003	0.020	1	0.020	0	0	0	0	26.5	13.20	28.3	0	0	26.3	5.0	2.00	0.000595	0	0.198	26.3	NSV	0	1.2	0%	Retain
Western Meadowlark	4-Nitrochlorobenzene	0.003	0.020	1	0.020	0	0	0	0	27.6	4.14	0.0522	0	0	0.0522	1.50	2.00	0.000595	0	0.198	0.0522	NSV	0	1.2	0%	Retain
Western Meadowlark	4,6-Dinitro-2-methylphenol	0.003	0.020	1	0.020	0	0	0	0	32	16.00	31.8	0	0	31.8	5.0	2.00	0.000595	0	0.198	31.8	NSV	0	1.2	0%	Retain
Western Meadowlark	4-Nitroanisole	0.003	0.020	1	0.020	0	0	0	0	28.5	14.20	28.2	0	0	28.2	5.0	2.00	0.000595	0	0.198	28.2	NSV	0	1.2	0%	Retain
Western Meadowlark	4-Nitrophenol	0.003	0.020	1	0.020	0	0	0	0	29.8	14.00	29.6	0	0	29.6	5.0	2.00	0.000595	0	0.198	29.6	NSV	0	1.2	0%	Retain
Western Meadowlark	4-Nitrotoluene	0.003	0.020	1	0.020	0	0	0	0	27.5	5.22	0.104	0	0	0.104	1.50	2.00	0.000595	0	0.198	0.104	NSV	0	1.8	0%	Retain
Western Meadowlark	2-Nitrotoluene	0.003	0.020	1	0.020	0	0	0	0	29.7	3.11	6.18	0	0	6.18	1.50	2.00	0.000595	0	0.198	6.18	NSV	0	0.89	0%	Retain
Western Meadowlark	2-Nitrotoluene	0.003	0.020	1	0.020	0	0	0	0	29.7	3.11	6.18	0	0	6.18	1.50	2.00	0.000595	0	0.198	6.18	NSV	0	0.89	0%	Retain
Western Meadowlark	Nitrobenzene	0.003	0.020	1	0.020	0	0	0	0	26.6	9.05	0.180	0	0	0.180	1.50	2.00	0.000595	0	0.198	0.180	NSV	0	1.8	0%	Retain
Western Meadowlark	Nitrobenzene	0.003	0.020	1	0.020	0	0	0	0	24.2	7.27	0.144	0	0	0.144	1.50	2.00	0.000595	0	0.198	0.144	NSV	0	1.8	0%	Retain
Western Meadowlark	Perchloric acid	0.003	0.020	1	0.020	0	0	0	0	27.6	13.8	0.273	0	0	0.273	1.50	2.00	0.000595	0	0.198	0.273	NSV	0	1.8	0%	Retain
Western Meadowlark	Perchloric acid	0.003	0.020	1	0.020	0	0	0	0	26.4	13.2	0.262	0	0	0.262	1.50	2.00	0.000595	0	0.198	0.262	NSV	0	1.8	0%	Retain
Western Meadowlark	Perchloric acid	0.003	0.020	1	0.020	0	0	0	0	26.4	13.2	0.262	0	0	0.262	1.50	2.00	0.000595	0	0.198	0.262	NSV	0	1.8	0%	Retain
Western Meadowlark	Perchloric acid	0.003	0.020	1	0.020	0	0	0	0	26.4	13.2	0.262	0	0	0.262	1.50	2.00	0.000595	0	0.198	0.262	NSV	0	1.8	0%	Retain
Western Meadowlark	Perchloric acid	0.003	0.020	1	0.020	0	0	0	0	26.4	13.2	0.262	0	0	0.262	1.50	2.00	0.000595	0	0.198	0.262	NSV	0	1.8	0%	Retain
Western Meadowlark	Perchloric acid	0.003	0.020	1	0.020	0	0	0	0	26.4	13.2	0.262	0	0	0.262	1.50	2.00	0.000595	0	0.198	0.262	NSV	0	1.8	0%	Retain
Western Meadowlark	Perchloric acid	0.003	0.020	1	0.020	0	0	0	0	26.4	13.2	0.262	0	0	0.262	1.50	2.00	0.000595	0	0.198	0.262	NSV	0	1.8	0%	Retain
Western Meadowlark	Perchloric acid	0.003	0.020	1	0.020	0	0	0	0	26.4	13.2	0.262	0	0	0.262	1.50	2.00	0.000595	0	0.198	0.262	NSV	0	1.8	0%	Retain
Western Meadowlark	Perchloric acid	0.003	0.020	1	0.020	0	0	0	0	26.4	13.2	0.262	0	0	0.262	1.50	2.00	0.000595	0	0.198	0.262	NSV	0	1.8	0%	Retain
Western Meadowlark	Perchloric acid	0.003	0.020	1	0.020	0	0	0	0	26.4	13.2	0.262	0	0	0.262	1.50	2.00	0.000595	0	0.198	0.262	NSV	0	1.8	0%	Retain
Western Meadowlark	Perchloric acid	0.003	0.020	1	0.020	0	0	0	0	26.4	13.2	0.262	0	0	0.262	1.50	2.00	0.000595	0	0.198	0.262	NSV	0	1.8	0%	Retain
Western Meadowlark	Perchloric acid	0.003	0.020	1	0.020	0	0	0	0	26.4	13.2	0.262	0	0	0.262	1.50	2.00	0.000595	0	0.198	0.262	NSV	0	1.8	0%	Retain
Western Meadowlark	Perchloric acid	0.003	0.020	1	0.020	0	0	0	0	26.4	13.2	0.262	0	0	0.262	1.50	2.00	0.000595	0	0.198	0.262	NSV	0	1.8	0%	Retain
Western Meadowlark	Perchloric acid	0.003	0.020	1	0.020	0	0	0	0	26.4	13.2	0.262	0	0	0.262	1.50	2.00	0.000595	0	0.198	0.262	NSV	0	1.8	0%	Retain
Western Meadowlark	Perchloric acid	0.003	0.020	1	0.020	0	0	0	0	26.4	13.2	0.262	0	0	0.262	1.50	2.00	0.000595	0	0.198	0.262	NSV	0	1.8	0%	Retain
Western Meadowlark	Perchloric acid	0.003	0.020	1	0.020	0	0	0	0	26.4	13.2	0.262	0	0	0.262	1.50	2.00	0.000595	0	0.198	0.262	NSV	0	1.8	0%	Retain
Western Meadowlark	Perchloric acid	0.003	0.020	1	0.020	0	0	0	0	26.4	13.2	0.262	0	0	0.262	1.50	2.00	0.000595	0	0.198	0.262	NSV	0	1.8	0%	Retain
Western Meadowlark	Perchloric acid	0.003	0.020	1	0.020	0	0	0	0	26.4	13.2	0.262	0	0	0.262	1.50	2.00	0.000595	0	0.198	0.262	NSV	0	1.8	0%	Retain
Western Meadowlark	Perchloric acid	0.003	0.020	1	0.020	0	0	0	0	26.4	13.2	0.262	0	0	0.262	1.50	2.00	0.000595	0	0.198	0.262	NSV	0	1.8	0%	Retain
Western Meadowlark	Perchloric acid	0.003	0.020	1	0.020	0	0	0	0	26.4	13.2	0.262	0	0	0.262	1.50	2.00	0.000595	0	0.198	0.262	NSV	0	1.8	0%	Retain
Western Meadowlark	Perchloric acid	0.003	0.020	1	0.020	0	0	0	0	26.4	13.2	0.262	0	0	0.262	1.50	2.00	0.000595	0	0.198	0.262	NSV	0	1.8	0%	Retain
Western Meadowlark	Perchloric acid	0.003	0.020	1	0.020	0	0	0	0	26.4	13.2	0.262	0	0	0.262	1.50	2.00	0.000595	0	0.198	0.262	NSV	0	1.8	0%	Retain
Western Meadowlark	Perchloric acid	0.003	0.020	1	0.020	0	0	0	0	26.4	13.2	0.262	0	0	0.262	1.50	2.00	0.000595	0	0.198	0.262	NSV	0	1.8	0%	Retain
Western Meadowlark	Perchloric acid	0.003	0.020	1	0.020	0	0	0	0	26.4	13.2	0.262	0	0	0.262	1.50	2.00	0.000595	0	0.198	0.262	NSV	0	1.8	0%	Retain
Western Meadowlark	Perchloric acid	0.003	0.020	1	0.020	0	0	0	0	26.4	13.2	0.262	0	0	0.262	1.50	2.00	0.000595	0	0.198	0.262	NSV	0	1.8	0%	Retain
Western Meadowlark	Perchloric acid	0.003	0.020	1	0.020	0	0	0	0	26.4	13.2	0.262	0	0	0.262	1.50	2.00	0.000595	0	0.198	0.262	NSV	0	1.8	0%	Retain
Western Meadowlark	Perchloric acid	0.003	0.020	1	0.020	0	0	0	0	26.4	13.2	0.262	0	0	0.262	1.50	2.00	0.000595	0	0.198	0.262	NSV	0	1.8	0%	Retain
Western Meadowlark	Perchloric acid	0.003	0.020	1	0.020	0	0	0	0	26.4	13.2	0.262	0	0	0.262	1.50	2.00	0.000595	0	0.198	0.262	NSV	0	1.8	0%	Retain
Western Meadowlark	Perchloric acid	0.003	0.020	1	0.020	0	0	0	0	26.4	13.2	0.262	0	0	0.262	1.50	2.00	0.000595	0	0.198	0.262	NSV	0	1.8	0%	Retain
Western Meadowlark	Perchloric acid	0.003	0.020	1	0.020	0	0	0	0	26.4	13.2	0.262	0	0	0.262	1.50	2.00	0.000595	0	0.198	0.262	NSV	0	1.8	0%	Retain

Table 16. Initial Risk Estimation for Wildlife Exposed to Site Soils
Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Receptor	Chemical	Small Mammals and Other Vertebrates				Soil Invertebrates				Terrestrial Plants				MOAEL TRV (mg/kg d) (mg/kg d)	MOAEL HQ and Quotient	Detection Frequency (%)	Screening Risk Conclusions						
		Daily Food Ingestion Rate (kg Site Ingested / kg BW / d)	Daily Food Intake (kg Food Ingested / kg BW / d)	Soil to Tissue Transfer Factor	Tissue Concentration (mg/kg DW)	Toxicity (mg/kg Food Ingested / kg BW / d)	Percent of Diet	Soil to Tissue Transfer Factor	Tissue Concentration (mg/kg DW)	Total Invertebrate Concentration (mg/kg DW)	Percent of Diet	DHI	Soil to Tissue Transfer Factor					Tissue Concentration (mg/kg DW)	Total Plant Food Intake (mg/kg DW)	Percent of Diet	Soil to Tissue Transfer Factor	Tissue Concentration (mg/kg DW)	
Western Meadowlark	2-Chloroethanol	0.013	0.020	1	0.020	0	100	36	274	0	0	0	0	0	7.50	10.5	2.00	0.00417	7.50	NSV	0%	Uncertain	
Western Meadowlark	2-Methylpropane	0.013	0.020	1	0.020	0	100	27.1	284	0	0	0	0	0	5.64	10.5	2.00	0.00417	5.64	NSV	0%	Uncertain	
Western Meadowlark	1,1,2,2-Tetrachloroethane	0.013	0.020	1	0.020	0	100	28.6	605	12	0	0	0	0	1.2	2.1	2.00	0.00383	1.2	NSV	0%	Uncertain	
Western Meadowlark	1,2-Dichloroethane	0.013	0.020	1	0.020	0	100	34.9	649	6.91	0	0	0	0	6.91	10.5	2.00	0.00417	6.91	NSV	0%	Uncertain	
Western Meadowlark	4-Chloro-3-methylphenol	0.013	0.020	1	0.020	0	100	29.6	311	6.77	0	0	0	0	6.77	10.5	2.00	0.00417	6.77	NSV	0%	Uncertain	
Western Meadowlark	2-Chlorophenol	0.013	0.020	1	0.020	0	100	29.9	314	6.92	0	0	0	0	6.92	10.5	2.00	0.00417	6.92	NSV	0%	Uncertain	
Western Meadowlark	1,2-Dichlorobenzene	0.013	0.020	1	0.020	0	100	34.7	369	6.92	0	0	0	0	6.92	10.5	2.00	0.00417	6.92	NSV	0%	Uncertain	
Western Meadowlark	1,3-Dichlorobenzene	0.013	0.020	1	0.020	0	100	34.7	369	6.92	0	0	0	0	6.92	10.5	2.00	0.00417	6.92	NSV	0%	Uncertain	
Western Meadowlark	1,4-Dichlorobenzene	0.013	0.020	1	0.020	0	100	40.2	422	5.38	0	0	0	0	5.38	10.5	2.00	0.00417	5.38	NSV	0%	Uncertain	
Western Meadowlark	Hexachlorocyclopentadiene	0.013	0.020	1	0.020	0	100	38.6	0.0369	0.00613	0	0	0	0	0.00613	0.00800	2.00	0.00000317	0.00613	1	<0.01	4%	Pass
Western Meadowlark	Hexachlorocyclohexane	0.013	0.020	1	0.020	0	100	36	378	7.50	0	0	0	0	7.50	10.5	2.00	0.00417	7.50	NSV	0%	Uncertain	
Western Meadowlark	Hexachlorobenzene	0.013	0.020	1	0.020	0	100	30.6	329	7.91	0	0	0	0	7.91	10.5	2.00	0.00417	7.91	NSV	0%	Uncertain	
Western Meadowlark	n-Nonane	0.013	0.020	1	0.020	0	100	28.7	323	6.41	0	0	0	0	6.41	10.5	2.00	0.00417	6.41	NSV	0%	Uncertain	
Western Meadowlark	n-Nonyl-3-oxo-1-propanamine	0.013	0.020	1	0.020	0	100	33.3	349	6.98	0	0	0	0	6.98	10.5	2.00	0.00417	6.98	NSV	0%	Uncertain	
Western Meadowlark	Pentachlorobenzene	0.013	0.020	1	0.020	0	100	58.3	0.170	0.00536	0	0	0	0	0.00536	0.00600	2.00	0.00000238	0.00536	17	<0.01	5%	Pass
Western Meadowlark	1,1,2,2-Tetrachloroethane	0.013	0.020	1	0.020	0	100	28.3	0.283	0.00561	0	0	0	0	0.00561	0.00600	2.00	0.00000267	0.00561	17	<0.01	5%	Pass
Western Meadowlark	1,1,1,1-Tetrachloroethane	0.013	0.020	1	0.020	0	100	31.4	0.931	0.00618	0	0	0	0	0.00618	0.00600	2.00	0.00000297	0.00618	17	<0.01	5%	Pass
Western Meadowlark	1,1,2,2-Tetrachloroethane	0.013	0.020	1	0.020	0	100	31.4	0.291	0.00498	0	0	0	0	0.00498	0.00600	2.00	0.00000317	0.00498	17	<0.01	5%	Pass
Western Meadowlark	1,1-Dibromobenzene	0.013	0.020	1	0.020	0	100	29.5	0.926	0.00410	0	0	0	0	0.00410	0.00600	2.00	0.00000278	0.00410	17	<0.01	5%	Pass
Western Meadowlark	1,2-Dibromobenzene	0.013	0.020	1	0.020	0	100	27.3	0.920	0.00595	0	0	0	0	0.00595	0.0110	2.00	0.00000438	0.00595	17	<0.01	5%	Pass
Western Meadowlark	1,2,3-Trichlorobenzene	0.013	0.020	1	0.020	0	100	29.4	0.0624	0.00163	0	0	0	0	0.00163	0.0250	2.00	0.00000111	0.00163	17	<0.01	5%	Pass
Western Meadowlark	1,2,4-Trichlorobenzene	0.013	0.020	1	0.020	0	100	27	0.118	0.00255	0	0	0	0	0.00255	0.0330	2.00	0.00000127	0.00255	17	<0.01	4%	Pass
Western Meadowlark	1,2-Dibromo-3-chlorobenzene	0.013	0.020	1	0.020	0	100	30.9	0.120	0.00239	0	0	0	0	0.00239	0.0330	2.00	0.00000156	0.00239	NSV	<<	5%	Uncertain
Western Meadowlark	1,2-Dibromobenzene	0.013	0.020	1	0.020	0	100	28.7	0.0401	0.00196	0	0	0	0	0.00196	0.0330	2.00	0.00000155	0.00196	17	<0.01	4%	Pass
Western Meadowlark	1,2-Dibromobenzene	0.013	0.020	1	0.020	0	100	28.7	0.0229	0.000455	0	0	0	0	0.000455	0.0330	2.00	0.00000151	0.000455	17	<0.01	4%	Pass
Western Meadowlark	1,2-Dibromobenzene	0.013	0.020	1	0.020	0	100	30.1	0.0210	0.000417	0	0	0	0	0.000417	0.0330	2.00	0.00000151	0.000417	17	<0.01	5%	Pass
Western Meadowlark	2-Ethylene Dibromide	0.013	0.020	1	0.020	0	100	26.9	0.0942	0.00489	0	0	0	0	0.00489	0.00600	2.00	0.00000357	0.00489	NSV	<<	5%	Uncertain
Western Meadowlark	1,3-Dichlorobenzene	0.013	0.020	1	0.020	0	100	34.7	0.0860	0.00131	0	0	0	0	0.00131	0.0150	2.00	0.00000154	0.00131	17	<0.01	4%	Pass
Western Meadowlark	1,3-Dichlorobenzene	0.013	0.020	1	0.020	0	100	34.7	0.089	0.00141	0	0	0	0	0.00141	0.0150	2.00	0.00000154	0.00141	17	<0.01	4%	Pass
Western Meadowlark	1,4-Dichlorobenzene	0.013	0.020	1	0.020	0	100	26.3	0.156	0.00610	0	0	0	0	0.00610	0.0150	2.00	0.00000154	0.00610	39	<0.01	18%	Pass
Western Meadowlark	2-Chloroethyl Ethyl Ether	0.013	0.020	1	0.020	0	100	26.3	0.156	0.00610	0	0	0	0	0.00610	0.0150	2.00	0.00000154	0.00610	NSV	<<	18%	Pass
Western Meadowlark	2-Chloroethyl Ethyl Ether	0.013	0.020	1	0.020	0	100	30.6	321	6.36	0	0	0	0	6.36	10.5	2.00	0.00417	6.37	17	0.38	0%	Uncertain
Western Meadowlark	2-Nonylone	0.013	0.020	1	0.020	0	100	30.5	0.101	0.00200	0	0	0	0	0.00200	0.0380	2.00	0.00000151	0.00200	39	<0.01	5%	Pass
Western Meadowlark	4-Ethoxyphenyl Ethyl Ether	0.013	0.020	1	0.020	0	100	30.5	321	6.36	0	0	0	0	6.36	10.5	2.00	0.00417	6.36	NSV	<<	5%	Uncertain
Western Meadowlark	4-Chlorophenyl Ethyl Ether	0.013	0.020	1	0.020	0	100	36.3	381	7.55	0	0	0	0	7.55	10.5	2.00	0.00417	7.56	NSV	0%	Uncertain	
Western Meadowlark	4-Methyl-2-pentanone	0.013	0.020	1	0.020	0	100	26.3	0.113	0.00224	0	0	0	0	0.00224	0.0430	2.00	0.00000171	0.00225	39	<0.01	5%	Pass
Western Meadowlark	Acetone	0.013	0.020	1	0.020	0	100	24.9	597	0.118	0	0	0	0	0.118	0.24	2.00	0.00000171	0.00224	39	0.30	32%	Pass
Western Meadowlark	Acetone	0.013	0.020	1	0.020	0	100	26.4	0.272	0.00523	0	0	0	0	0.00523	0.0330	2.00	0.00000171	0.00523	NSV	<<	10%	Uncertain
Western Meadowlark	Bis(2-chlorophenyl) Ether	0.013	0.020	1	0.020	0	100	28.7	302	5.98	0	0	0	0	5.98	10.5	2.00	0.00417	5.99	NSV	<<	0%	Uncertain
Western Meadowlark	Bis(2-chlorophenyl) Ether	0.013	0.020	1	0.020	0	100	30.3	319	6.32	0	0	0	0	6.32	10.5	2.00	0.00417	6.32	NSV	<<	0%	Uncertain
Western Meadowlark	Bromochlorobenzene	0.013	0.020	1	0.020	0	100	27.3	0.081	0.00278	0	0	0	0	0.00278	0.00700	2.00	0.00000278	0.00278	NSV	<<	5%	Uncertain
Western Meadowlark	Bromobenzene	0.013	0.020	1	0.020	0	100	31.2	0.0158	0.000509	0	0	0	0	0.000509	0.00600	2.00	0.00000168	0.000509	NSV	<<	5%	Uncertain
Western Meadowlark	Bromobenzene	0.013	0.020	1	0.020	0	100	26.3	0.094	0.00783	0	0	0	0	0.00783	0.0150	2.00	0.00000154	0.00783	NSV	<<	5%	Uncertain
Western Meadowlark	Carbon tetrachloride	0.013	0.020	1	0.020	0	100	28	0.00501	0.000501	0	0	0	0	0.000501	0.00600	2.00	0.00000154	0.00501	NSV	<<	5%	Uncertain
Western Meadowlark	Chlorobenzene	0.013	0.020	1	0.020	0	100	28.6	0.0368	0.00166	0	0	0	0	0.00166	0.0150	2.00	0.00000154	0.00166	NSV	<<	5%	Uncertain
Western Meadowlark	Chloroform	0.013	0.020	1	0.020	0	100	30	0.0210	0.00416	0	0	0	0	0.00416	0.0100	2.00	0.00000236	0.00417	NSV	<<	5%	Uncertain
Western Meadowlark	Chloroform	0.013	0.020	1	0.020	0	100	27.3	0.0793	0.00542	0	0	0	0	0.00542	0.0100	2.00	0.00000236	0.00542	17	<0.01	5%	Pass
Western Meadowlark	Di-n-butyltin dichloride	0.013	0.020	1	0.020	0	100	27	0.089	0.00575	0	0	0	0	0.00575	0.0330	2.00	0.00000236	0.00575	17	<0.01	5%	Pass
Western Meadowlark	Di-n-butyltin dichloride	0.013	0.020	1	0.020	0	100	27.5	0.045	0.00227	0	0	0	0	0.00227	0.00600	2.00	0.00000236	0.00227	17	<0.01	5%	Pass
Western Meadowlark	Dibromochlorobenzene	0.013	0.020	1	0.020	0	100	30.3	0.0512	0.00265	0	0	0	0	0.00265	0.00600	2.00	0.00000236	0.00265	17	<0.01	5%	Pass

Table 16
 Initial Risk Estimation for Wildlife Exposed to Site Soils
 Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Receptor	Chemical	Bed Weight (kg)	Soil Feed Rate (kg/ha/yr)	Area (ha)	Daily Ingestion Rate (mg/kg/day)	Small Mammals and Other Vertebrates				Soil Invertebrates				Terrestrial Plants				MOAEL TRV (mg/kg/d)	MOAEL HQ and Quotient	Detection Frequency (%)	Screening Risk Conclusions						
						Tissue Concentration (mg/kg DW)	Soil to Tissue Transfer Factor	Percent of Food Ingested (mg/kg DW)	Total Available Food Ingested (mg/kg DW)	Tissue Concentration (mg/kg DW)	Soil to Tissue Transfer Factor	Percent of Food Ingested (mg/kg DW)	Total Available Food Ingested (mg/kg DW)	Tissue Concentration (mg/kg DW)	Soil to Tissue Transfer Factor	Percent of Food Ingested (mg/kg DW)	Total Available Food Ingested (mg/kg DW)					Incidental Soil Ingestion (mg/kg DW)	Soil to Plant Transfer Factor	Percent of Food Ingested (mg/kg DW)	Total Available Food Ingested (mg/kg DW)		
Burrowing Owl	Phenanthrene	0.157	0.111	1	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.511	NSV	325	<0.01	18%	Pass		
Burrowing Owl	Pyrene	0.157	0.111	1	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.511	NSV	325	<0.01	18%	Pass		
Burrowing Owl	TPH	0.157	0.111	1	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0	47000	5.00	281	0.49	100%	Pass		
Burrowing Owl	HI - Paracetamol	0.157	0.111	1	0.111	6.24	0.125	0.683	0	0	0	0	0	0	0	0	0	0	0	0.893	5.00	0.278	0.170	17	0.057	0%	Pass
Burrowing Owl	2,4,5-Trichlorobenzene	0.157	0.111	1	0.111	6.24	0.125	0.683	0	0	0	0	0	0	0	0	0	0	0	0.893	5.00	0.278	0.170	17	0.057	0%	Pass
Burrowing Owl	2,4,6-Trichlorobenzene	0.157	0.111	1	0.111	2.16	0.125	0.730	0	0	0	0	0	0	0	0	0	0	0	0.293	5.00	0.093	0.063	0.11	0.011	0%	Pass
Burrowing Owl	2,4-Dinitrophenol	0.157	0.111	1	0.111	2.84	0.251	0.293	0	0	0	0	0	0	0	0	0	0	0	0.293	5.00	0.093	0.063	0.11	0.011	0%	Pass
Burrowing Owl	2-Chlorobenzothiazole	0.157	0.111	1	0.111	1.06	0.117	0	0	0	0	0	0	0	0	0	0	0	0	0.117	5.00	0.0363	0.176	NSV	>>	0%	Uncertain
Burrowing Owl	2-Methylphenol	0.157	0.111	1	0.111	1.19	1.32	0	0	0	0	0	0	0	0	0	0	0	0	1.32	5.00	0.0363	1.38	NSV	>>	0%	Uncertain
Burrowing Owl	3,3-Dibromobenzene	0.157	0.111	1	0.111	0.075	14.2	1.57	0	0	0	0	0	0	0	0	0	0	0	1.57	5.00	0.117	1.69	NSV	>>	0%	Uncertain
Burrowing Owl	4-Chloro-3-methylphenol	0.157	0.111	1	0.111	0.201	2.11	0.234	0	0	0	0	0	0	0	0	0	0	0	0.234	5.00	0.0363	0.263	NSV	>>	0%	Uncertain
Burrowing Owl	4-Chlorophenol	0.157	0.111	1	0.111	0.533	5.89	0.622	0	0	0	0	0	0	0	0	0	0	0	0.622	5.00	0.0363	0.690	NSV	>>	0%	Uncertain
Burrowing Owl	4-Methylphenol	0.157	0.111	1	0.111	0.484	5.19	0.576	0	0	0	0	0	0	0	0	0	0	0	0.576	5.00	0.0363	0.624	NSV	>>	0%	Uncertain
Burrowing Owl	4-Nitrophenol	0.157	0.111	1	0.111	0.484	5.19	0.576	0	0	0	0	0	0	0	0	0	0	0	0.576	5.00	0.0363	0.624	NSV	>>	0%	Uncertain
Burrowing Owl	Benzo(a)anthracene	0.157	0.111	1	0.111	0.925	9.92	1.09	0	0	0	0	0	0	0	0	0	0	0	1.09	5.00	0.0363	1.15	NSV	>>	0%	Uncertain
Burrowing Owl	Bis(2-Ethylhexyl)phthalate	0.157	0.111	1	0.111	0.190	0.265	0.0317	0	0	0	0	0	0	0	0	0	0	0	0.0317	5.00	0.00333	0.0400	1	0.038	18%	Pass
Burrowing Owl	Bis(2-Ethylhexyl)phthalate	0.157	0.111	1	0.111	0.0627	0.854	0.0615	0	0	0	0	0	0	0	0	0	0	0	0.0615	5.00	0.0363	0.0400	1	0.038	18%	Pass
Burrowing Owl	Bis(2-Ethylhexyl)phthalate	0.157	0.111	1	0.111	0.0627	0.854	0.0615	0	0	0	0	0	0	0	0	0	0	0	0.0615	5.00	0.0363	0.0400	1	0.038	18%	Pass
Burrowing Owl	Bis(2-Ethylhexyl)phthalate	0.157	0.111	1	0.111	0.0627	0.854	0.0615	0	0	0	0	0	0	0	0	0	0	0	0.0615	5.00	0.0363	0.0400	1	0.038	18%	Pass
Burrowing Owl	Diethylstilbestrol	0.157	0.111	1	0.111	0.0627	0.854	0.0615	0	0	0	0	0	0	0	0	0	0	0	0.0615	5.00	0.0363	0.0400	1	0.038	18%	Pass
Burrowing Owl	Dibenzofuran	0.157	0.111	1	0.111	7.57	0.319	0.347	0	0	0	0	0	0	0	0	0	0	0	0.347	5.00	0.0363	0.389	17	<0.01	5%	Pass
Burrowing Owl	Dibenzofuran	0.157	0.111	1	0.111	7.57	0.319	0.347	0	0	0	0	0	0	0	0	0	0	0	0.347	5.00	0.0363	0.389	17	<0.01	5%	Pass
Burrowing Owl	Dibenzofuran	0.157	0.111	1	0.111	7.57	0.319	0.347	0	0	0	0	0	0	0	0	0	0	0	0.347	5.00	0.0363	0.389	17	<0.01	5%	Pass
Burrowing Owl	Dibenzofuran	0.157	0.111	1	0.111	7.57	0.319	0.347	0	0	0	0	0	0	0	0	0	0	0	0.347	5.00	0.0363	0.389	17	<0.01	5%	Pass
Burrowing Owl	Dibenzofuran	0.157	0.111	1	0.111	7.57	0.319	0.347	0	0	0	0	0	0	0	0	0	0	0	0.347	5.00	0.0363	0.389	17	<0.01	5%	Pass
Burrowing Owl	Dibenzofuran	0.157	0.111	1	0.111	7.57	0.319	0.347	0	0	0	0	0	0	0	0	0	0	0	0.347	5.00	0.0363	0.389	17	<0.01	5%	Pass
Burrowing Owl	Dibenzofuran	0.157	0.111	1	0.111	7.57	0.319	0.347	0	0	0	0	0	0	0	0	0	0	0	0.347	5.00	0.0363	0.389	17	<0.01	5%	Pass
Burrowing Owl	Dibenzofuran	0.157	0.111	1	0.111	7.57	0.319	0.347	0	0	0	0	0	0	0	0	0	0	0	0.347	5.00	0.0363	0.389	17	<0.01	5%	Pass
Burrowing Owl	Dibenzofuran	0.157	0.111	1	0.111	7.57	0.319	0.347	0	0	0	0	0	0	0	0	0	0	0	0.347	5.00	0.0363	0.389	17	<0.01	5%	Pass
Burrowing Owl	Dibenzofuran	0.157	0.111	1	0.111	7.57	0.319	0.347	0	0	0	0	0	0	0	0	0	0	0	0.347	5.00	0.0363	0.389	17	<0.01	5%	Pass
Burrowing Owl	Dibenzofuran	0.157	0.111	1	0.111	7.57	0.319	0.347	0	0	0	0	0	0	0	0	0	0	0	0.347	5.00	0.0363	0.389	17	<0.01	5%	Pass
Burrowing Owl	Dibenzofuran	0.157	0.111	1	0.111	7.57	0.319	0.347	0	0	0	0	0	0	0	0	0	0	0	0.347	5.00	0.0363	0.389	17	<0.01	5%	Pass
Burrowing Owl	Dibenzofuran	0.157	0.111	1	0.111	7.57	0.319	0.347	0	0	0	0	0	0	0	0	0	0	0	0.347	5.00	0.0363	0.389	17	<0.01	5%	Pass
Burrowing Owl	Dibenzofuran	0.157	0.111	1	0.111	7.57	0.319	0.347	0	0	0	0	0	0	0	0	0	0	0	0.347	5.00	0.0363	0.389	17	<0.01	5%	Pass
Burrowing Owl	Dibenzofuran	0.157	0.111	1	0.111	7.57	0.319	0.347	0	0	0	0	0	0	0	0	0	0	0	0.347	5.00	0.0363	0.389	17	<0.01	5%	Pass
Burrowing Owl	Dibenzofuran	0.157	0.111	1	0.111	7.57	0.319	0.347	0	0	0	0	0	0	0	0	0	0	0	0.347	5.00	0.0363	0.389	17	<0.01	5%	Pass
Burrowing Owl	Dibenzofuran	0.157	0.111	1	0.111	7.57	0.319	0.347	0	0	0	0	0	0	0	0	0	0	0	0.347	5.00	0.0363	0.389	17	<0.01	5%	Pass
Burrowing Owl	Dibenzofuran	0.157	0.111	1	0.111	7.57	0.319	0.347	0	0	0	0	0	0	0	0	0	0	0	0.347	5.00	0.0363	0.389	17	<0.01	5%	Pass
Burrowing Owl	Dibenzofuran	0.157	0.111	1	0.111	7.57	0.319	0.347	0	0	0	0	0	0	0	0	0	0	0	0.347	5.00	0.0363	0.389	17	<0.01	5%	Pass
Burrowing Owl	Dibenzofuran	0.157	0.111	1	0.111	7.57	0.319	0.347	0	0	0	0	0	0	0	0	0	0	0	0.347	5.00	0.0363	0.389	17	<0.01	5%	Pass
Burrowing Owl	Dibenzofuran	0.157	0.111	1	0.111	7.57	0.319	0.347	0	0	0	0	0	0	0	0	0	0	0	0.347	5.00	0.0363	0.389	17	<0.01	5%	Pass
Burrowing Owl	Dibenzofuran	0.157	0.111	1	0.111	7.57	0.319	0.347	0	0	0	0	0	0	0	0	0	0	0	0.347	5.00	0.0363	0.389	17	<0.01	5%	Pass
Burrowing Owl	Dibenzofuran	0.157	0.111	1	0.111	7.57	0.319	0.347	0	0	0	0	0	0	0	0	0	0	0	0.347	5.00	0.0363	0.389	17	<0.01	5%	Pass
Burrowing Owl	Dibenzofuran	0.157	0.111	1	0.111	7.57	0.319	0.347	0	0	0	0	0	0	0	0	0	0	0	0.347	5.00	0.0363	0.389	17	<0.01	5%	Pass
Burrowing Owl	Dibenzofuran	0.157	0.111	1	0.111	7.57	0.319	0.347	0	0	0	0	0	0	0	0	0	0	0	0.347	5.00	0.0363	0.389	17	<0.01	5%	Pass
Burrowing Owl	Dibenzofuran	0.157	0.111	1	0.111	7.57	0.319	0.347	0	0	0	0	0	0	0	0	0	0	0	0.347	5.00	0.0363	0.389	17	<0.01	5%	Pass
Burrowing Owl	Dibenzofuran	0.157	0.111	1	0.111	7.57	0.319	0.347	0	0	0	0	0	0	0	0	0	0	0	0.347	5.00	0.0363	0.389	17	<0.01		

Table 16
 Initial Risk Estimation for Wildlife Exposed to Site Soils
 Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Receptor	Chemical	Body Weight (kg)	Dall Food Ingestion Rate (kg/day)	Area (ha)	Dall Food Ingestion Factor (b/d)	Small Mammals and Other Vertebrates				Soil Invertebrates				Terrestrial Plants				MOAEL TRV (mg/kg-d)	MOAEL HQ and Quotient	Detection Frequency (%)	Screening Risk Conclusions
						Percent of Diet	Soil to Tissue Transfer Factor	Tissue Concentration (mg/kg DW)	Food Intake (mg/kg-b)	Percent of Diet	Soil to Tissue Transfer Factor	Tissue Concentration (mg/kg DW)	Food Intake (mg/kg-b)	Percent of Diet	Soil to Tissue Transfer Factor	Tissue Concentration (mg/kg DW)	Food Intake (mg/kg-b)				
Burrowing Owl	Ethylbenzene	0.157	0.111	1	0.111	100	0.193	0.000251	0.000166	0	0	0	0.0000279	0.00130	5.00	0.00000722	0.0000351	10	<0.01	5%	Pass
Burrowing Owl	m,p-Xylene	0.157	0.111	1	0.111	100	0.748	0.00150	0.000166	0	0	0	0.000166	0.00200	5.00	0.0000111	0.000177	10	<0.01	5%	Uncertain
Burrowing Owl	Methylcyclohexane	0.157	0.111	1	0.111	100	0.853	0.00266	0.000266	0	0	0	0.000266	0.00246	5.00	0.0000178	0.000314	NSV	--	5%	Pass
Burrowing Owl	p-Xylene	0.157	0.111	1	0.111	100	0.774	0.00209	0.000232	0	0	0	0.000232	0.00270	5.00	0.0000150	0.000247	10	<0.01	14%	Uncertain
Burrowing Owl	Phenol	0.157	0.111	1	0.111	100	0.709	7.46	0.827	0	0	0	0.827	70.5	5.00	0.00595	0.885	NSV	--	0%	Pass
Burrowing Owl	Styrene	0.157	0.111	1	0.111	100	0.827	0.00215	0.000239	0	0	0	0.000239	0.00290	5.00	0.0000150	0.000247	NSV	--	14%	Uncertain
Burrowing Owl	1,2-Dichloroethane	0.157	0.111	1	0.111	100	0.700	0.00830	0.000700	0	0	0	0.000700	0.00800	5.00	0.0000500	0.000749	NSV	--	5%	Uncertain
Burrowing Owl	Toluene	0.157	0.111	1	0.111	100	0.875	0.0182	0.00182	0	0	0	0.00182	0.0187	5.00	0.000104	0.00192	17	<0.01	23%	Pass
Burrowing Owl	Trans-2,3-Dichlorobutene	0.157	0.111	1	0.111	100	0.698	0.000489	0.0000543	0	0	0	0.0000543	0.000700	5.00	0.00000389	0.000562	17	<0.01	5%	Pass
Burrowing Owl	Trans-2,3-Dichloropentene	0.157	0.111	1	0.111	100	0.468	0.000374	0.0000416	0	0	0	0.0000416	0.000800	5.00	0.00000444	0.000460	17	<0.01	5%	Pass
Burrowing Owl	Trichloroethylene (TCE)	0.157	0.111	1	0.111	100	0.339	0.000237	0.0000263	0	0	0	0.0000263	0.000700	5.00	0.00000389	0.000302	NSV	--	5%	Uncertain
Burrowing Owl	Trichlorofluoromethane	0.157	0.111	1	0.111	100	0.311	0.000342	0.0000380	0	0	0	0.0000380	0.00110	5.00	0.00000611	0.000441	NSV	--	5%	Uncertain
Burrowing Owl	1,1-Dichloroethane	0.157	0.111	1	0.111	100	1.32	0.000362	0.000202	0	0	0	0.000202	0.00120	5.00	0.00000666	0.000209	NSV	--	5%	Uncertain
Burrowing Owl	1,1,1-Trichloroethane	0.157	0.111	1	0.111	100	0.754	0.000904	0.000100	0	0	0	0.000100	0.00120	5.00	0.00000666	0.000107	NSV	--	5%	Uncertain
Burrowing Owl	1,1,2-Trichloroethane	0.157	0.111	1	0.111	100	0.754	0.000904	0.000100	0	0	0	0.000100	0.00120	5.00	0.00000666	0.000107	NSV	--	5%	Uncertain

Notes:
 kg = Kilograms
 mg/kg-bw/day = Kilograms per kilogram of body weight per day.
 EPIC = exposure point concentration
 MOAEL = no observed adverse effect level
 NSV = not statistically significant
 For the screening, it has been conservatively assumed that all chemical intake is absorbed by the receptor.
 Hazard quotients in bold exceeded one
 Hazard indices (HIs) calculated by summing HQs for detected analytes
 a) Food intake from small mammals = (daily food ingestion from site) X (fraction of diet as small mammals) X (soil to small mammal transfer factor) X (soil concentration).
 b) Food intake from birds = (daily food ingestion from site) X (fraction of diet as birds) X (soil to bird transfer factor) X (soil concentration).
 c) Food intake from insects = (daily food ingestion from site) X (fraction of diet as insects) X (soil to insect transfer factor) X (soil concentration).
 d) Total food intake = (food intake from small mammals and other vertebrates) + (food intake from terrestrial invertebrates) + (food intake from plants)
 e) Incident soil intake = (daily food ingestion from site) X (fraction of diet as soil) X (soil concentration).
 f) Total chemical intake = (total food intake) + (water intake) + (incident soil intake).
 NA = not applicable
 NSV = not statistically significant
 Exposure to TPH is only from abiotic media (soil and water); thus, there is no food component associated with exposure to TPH (Albers, 1995)

0.20 (dbs)

Table 17

Summary of Chemicals of Potential Ecological Concern after the Screening Risk Assessment
 Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Assessment/Measurement Endpoint #													
	1	2	3	3	3	3	3	3	4	5	6	7	8	9
	Plants	Insects	Ord's Kangaroo Rat	Townsend's Ground Squirrel	Herbivorous Mammals	Black-tailed Jackrabbit	Pronghorn	Insectivorous Mammal	Carnivorous Mammals	Herbivorous Birds	Sage Sparrow	Loggerhead Shrike	Western Meadowlark	Carnivorous Birds
1,3,5-Trinitrobenzene	P	P	P	P	P	P	P	P	P	P	P	P	P	P
1,3-Dinitrobenzene	P	P	Retain	Retain	Retain	Retain	Retain	Retain	Retain	P	P	P	P	P
2,4,6-Trinitrotoluene (TNT)	P	P	P	P	P	P	P	P	P	Retain	Retain	Retain	Retain	P
2,4-Dinitrophenol	Retain	Retain	U	U	U	U	U	U	U	U	U	U	U	U
2,4-Dinitrotoluene	P	P	P	P	P	P	P	P	P	P	P	Retain	Retain	Retain
2,6-Dinitrotoluene	Retain	P	Retain	Retain	Retain	Retain	Retain	Retain	P	Retain	Retain	Retain	Retain	Retain
2-Amino-4,6-Dinitrotoluene	P	P	P	P	P	P	P	P	P	P	Retain	Retain	Retain	Retain
2-Nitroaniline	U	U	U	U	U	U	U	U	U	U	U	U	U	U
2-Nitrophenol	Retain	Retain	U	U	U	U	U	U	U	U	U	U	U	U
2-Nitrotoluene	P	P	P	P	P	P	P	P	P	P	Retain	Retain	Retain	P
3-Nitroaniline	U	U	U	U	U	U	U	U	U	U	U	U	U	U
3-Nitrotoluene	P	P	P	P	P	P	P	P	P	P	Retain	Retain	Retain	P
4,6-Dinitro-2-methylphenol	U	U	U	U	U	U	U	U	U	U	U	U	U	U
4-Nitroaniline	U	U	U	U	U	U	U	U	U	U	U	U	U	U
4-Nitrophenol	Retain	Retain	U	U	U	U	U	U	U	U	U	U	U	U
4-Nitrotoluene	P	P	P	P	P	P	P	P	P	P	Retain	Retain	Retain	P
HMX	P	Retain	Retain	Retain	Retain	Retain	Retain	Retain	Retain	P	P	P	P	P
Nitrobenzene	Retain	Retain	U	U	U	U	U	U	U	Retain	Retain	Retain	Retain	Retain
Nitroglycerin	U	U	P	P	P	P	P	P	P	U	U	U	U	U
Nitroguanidine	U	U	U	U	U	U	U	U	U	U	U	U	U	U
PETN	U	U	P	P	P	P	P	P	P	U	U	U	U	U
Picric acid	U	U	U	U	U	U	U	U	U	U	U	U	U	U
RDX	P	P	Retain	P	Retain	Retain	Retain	Retain	P	Retain	Retain	Retain	Retain	P
Tetryl	P	U	P	P	P	P	P	P	P	U	U	U	U	U
<i>HI - Energetics</i>	P	Retain	Retain	Retain	Retain	Retain	Retain	Retain	Retain	P	Retain	Retain	Retain	Retain
Aluminum	Retain	U	Retain	Retain	Retain	Retain	Retain	Retain	Retain	P	P	Retain	Retain	Retain
Antimony	Retain	Retain	Retain	Retain	Retain	Retain	Retain	Retain	Retain	U	U	U	U	U
Arsenic	Retain	Retain	P	P	P	P	P	P	P	P	P	P	P	P
Barium	Retain	Retain	P	P	P	P	P	P	P	P	P	P	P	P
Beryllium	P	P	P	P	P	P	P	P	P	U	U	U	U	U
Cadmium	Retain	P	P	P	P	P	P	P	P	P	Retain	Retain	Retain	Retain
Carbon disulfide	U	U	U	U	U	U	U	U	U	U	U	U	U	U
Chromium	Retain	Retain	P	P	P	P	P	P	P	P	Retain	Retain	Retain	Retain

Table 17

Summary of Chemicals of Potential Ecological Concern after the Screening Risk Assessment
 Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Assessment/Measurement Endpoint #												
	1	2	3	3	3	3	3	4	5	6	7	8	9
	Plants	Insects	Ord's Kangaroo Rat	Townsend's Ground Squirrel	Herbivorous Mammals	Black-tailed Jackrabbit	Pronghorn	Insectivorous Mammal	Carnivorous Mammals	Herbivorous Birds	Insectivorous Birds	Omnivorous Birds	Carnivorous Birds
Cobalt	P	P	P	P	P	P	P	P	P	P	P	P	P
Copper	Retain	Retain	Retain	Retain	Retain	Retain	Retain	Retain	Retain	P	P	P	Retain
Iron	U	U	U	U	U	U	U	U	U	U	U	U	U
Lead	Retain	Retain	Retain	Retain	Retain	Retain	Retain	Retain	Retain	Retain	Retain	Retain	Retain
Magnesium	U	U	U	U	U	U	U	U	U	U	U	U	U
Manganese	Retain	U	P	P	P	P	P	P	P	P	P	P	P
Mercury	Retain	Retain	P	P	P	P	P	Retain	P	P	P	P	P
Molybdenum	Retain	U	Retain	Retain	Retain	Retain	Retain	Retain	Retain	P	P	P	P
Nickel	Retain	Retain	P	P	P	P	Retain	Retain	P	P	P	P	P
Nitrate	U	U	P	P	P	P	P	P	P	U	U	U	U
Perchlorate	P	Retain	Retain	Retain	Retain	Retain	Retain	P	P	Retain	P	P	P
Phosphorus	U	U	U	U	U	U	U	U	U	Retain	Retain	Retain	Retain
Selenium	Retain	P	Retain	P	Retain	Retain	Retain	Retain	P	P	P	P	P
Silver	Retain	U	P	P	P	P	Retain	Retain	P	U	U	U	U
Strontium	U	U	P	P	P	P	P	P	P	U	U	U	U
Thallium	Retain	P	P	P	P	P	Retain	Retain	P	P	P	P	P
Vanadium	Retain	U	P	P	P	P	Retain	Retain	P	P	P	P	P
Zinc	Retain	Retain	P	P	P	P	Retain	Retain	P	P	Retain	Retain	Retain
<i>HI - Inorganics</i>	Retain	Retain	Retain	Retain	Retain	Retain	Retain	Retain	Retain	Retain	Retain	Retain	Retain
2-Methylnaphthalene	Retain	Retain	Retain	Retain	Retain	Retain	Retain	Retain	Retain	P	Retain	Retain	P
Acenaphthene	P	P	P	P	P	P	P	P	P	P	P	P	P
Acenaphthylene	Retain	Retain	P	P	P	P	P	P	P	P	P	P	P
Anthracene	Retain	Retain	P	P	P	P	P	P	P	P	P	P	P
Benzo(a)anthracene	Retain	P	P	P	P	P	Retain	Retain	P	P	P	P	P
Benzo(a)pyrene	Retain	P	Retain	P	P	P	Retain	Retain	P	P	P	P	P
Benzo(b)fluoranthene	Retain	P	P	P	P	P	Retain	Retain	P	P	P	P	P
Benzo(g,h,i)perylene	Retain	P	Retain	Retain	Retain	Retain	Retain	Retain	P	P	P	P	P
Benzo(k)fluoranthene	Retain	P	Retain	P	P	P	Retain	Retain	P	P	P	P	P
Chrysene	Retain	P	P	P	P	P	Retain	Retain	P	U	U	U	U
Dibenzo(a,h)anthracene	Retain	P	P	P	P	P	Retain	Retain	P	P	P	P	P
Fluoranthene	P	P	P	P	P	P	P	P	P	P	P	P	P
Fluorene	Retain	Retain	Retain	Retain	Retain	Retain	Retain	P	P	P	P	P	P
Indeno(1,2,3-c,d)pyrene	Retain	Retain	P	P	P	P	Retain	Retain	P	P	P	P	P

Table 17

Summary of Chemicals of Potential Ecological Concern after the Screening Risk Assessment
 Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Assessment/Measurement Endpoint #												
	1	2	3	3	3	3	3	4	5	6	7	8	9
	Plants	Insects	Ord's Kangaroo Rat	Townsend's Ground Squirrel	Herbivorous Mammals	Insectivorous Mammal	Carnivorous Mammals	Herbivorous Birds	Insectivorous Birds	Omnivorous Birds	Carnivorous Birds		
Naphthalene	Retain	Retain	Retain	P	P	Pronghorn	Retain	Coyote	Sage Sparrow	Loggerhead Shrike	Western Meadowlark	Burrowing Owl	
Phenanthrene	Retain	Retain	P	P	P		P	P	P	P	P	P	
Pyrene	Retain	Retain	P	P	P		P	P	U	U	U	U	
TPH	Retain	Retain	Retain	Retain	Retain	Retain	Retain	Retain	Retain	Retain	Retain	Retain	
HI - PAHs	Retain	Retain	P	P	P		P	P	P	P	P	P	
HI - Petroleum	Retain	Retain	P	P	P		P	Retain	Retain	Retain	Retain	Retain	
2,4,5-Trichlorophenol	Retain	Retain	P	P	P		P	Retain	Retain	Retain	Retain	Retain	
2,4,6-Trichlorophenol	Retain	Retain	P	P	P		P	Retain	Retain	Retain	Retain	Retain	
2,4-Dichlorophenol	Retain	Retain	P	P	P		P	Retain	Retain	Retain	Retain	Retain	
2,4-Dimethylphenol	U	U	U	U	U		U	U	U	U	U	U	
2-Chloronaphthalene	U	U	U	U	U		U	U	U	U	U	U	
2-Methylphenol	U	U	P	P	P		P	P	U	U	U	U	
3,3-Dichlorobenzidine	U	U	U	U	U		U	U	U	U	U	U	
4-Chloro-3-methylphenol	U	U	U	U	U		U	U	U	U	U	U	
4-Chloroaniline	Retain	Retain	U	U	U		U	U	U	U	U	U	
4-Methylphenol	U	U	P	P	P		P	P	U	U	U	U	
Benzoic acid	U	U	U	U	U		U	U	U	P	P	P	
Benzylalcohol	U	U	U	U	U		U	U	U	U	U	U	
bis(2-Ethylhexyl)phthalate	P	P	P	P	P		P	P	P	Retain	Retain	Retain	
Butyl benzylphthalate	Retain	P	P	P	P		P	P	P	Retain	Retain	Retain	
Dibenzofuran	U	Retain	U	U	U		U	U	U	U	U	U	
Diethylphthalate	Retain	P	P	P	P		P	P	P	Retain	Retain	Retain	
Dimethylphthalate	Retain	P	P	P	P		P	P	Retain	Retain	Retain	Retain	
Di-n-butylphthalate	P	P	P	P	P		P	P	P	Retain	Retain	Retain	
Di-n-octylphthalate	Retain	P	P	P	P		P	P	Retain	Retain	Retain	Retain	
Hexachlorobenzene	Retain	U	P	P	P		P	Retain	P	Retain	Retain	P	
Hexachlorobutadiene	P	U	P	P	P		P	P	P	P	P	P	
Hexachlorocyclopentadiene	Retain	U	P	P	P		P	Retain	P	Retain	Retain	P	
Hexachloroethane	U	U	P	P	P		P	Retain	P	Retain	Retain	P	
Isophorone	U	U	U	U	U		U	U	U	U	U	U	
n-Nitroso-di-n-propylamine	U	Retain	U	U	U		U	U	U	U	U	U	
n-Nitrosodiphenylamine	U	Retain	U	U	U		U	U	U	U	U	U	
Pentachlorophenol	Retain	Retain	P	P	P		P	Retain	P	P	P	P	

Table 17

Summary of Chemicals of Potential Ecological Concern after the Screening Risk Assessment
 Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Assessment/Measurement Endpoint #												
	1	2	3	3	3	3	3	4	5	6	7	8	9
	Plants	Insects	Ord's Kangaroo Rat	Townsend's Ground Squirrel	Herbivorous Mammals	Insectivorous Mammal	Carnivorous Mammals	Herbivorous Birds	Insectivorous Birds	Omnivorous Birds	Carnivorous Birds		
HI - SVOCs	P	Retain	P	P	P	P	P	P	P	P	Retain	P	P
1,1,1,2-Tetrachloroethane	U	P	P	P	P	P	P	P	P	P	P	P	P
1,1,1-Trichloroethane	U	P	P	P	P	P	P	P	P	P	P	P	P
1,1,2,2-Tetrachloroethane	U	P	P	P	P	P	P	P	P	P	P	P	P
1,1,2-Trichloroethane	U	P	P	P	P	P	P	P	P	P	P	P	P
1,1-Dichloroethane	U	P	P	P	P	P	P	P	P	P	P	P	P
1,1-Dichloroethene	U	P	P	P	P	P	P	P	P	P	P	P	P
1,2,3-Trichlorobenzene	U	P	U	U	U	U	U	U	U	U	U	U	U
1,2,3-Trichloropropane	U	P	P	P	P	P	P	P	P	P	P	P	P
1,2,4-Trichlorobenzene	U	P	U	U	U	U	U	U	U	U	U	U	U
1,2-Dibromo-3-chloropropane	U	U	U	U	U	U	U	U	U	U	U	U	U
1,2-Dichlorobenzene	U	P	U	U	U	U	U	U	U	U	U	U	U
1,2-Dichloroethane	U	P	P	P	P	P	P	P	P	P	P	P	P
1,2-Dichloropropane	U	P	P	P	P	P	P	P	P	P	P	P	P
1,2-Ethylene Dibromide	U	U	U	U	U	U	U	U	U	U	U	U	U
1,3-Dichlorobenzene	U	P	U	U	U	U	U	U	U	U	U	U	U
1,4-Dichlorobenzene	U	P	U	U	U	U	U	U	U	U	U	U	U
2-Butanone	U	U	P	P	P	P	P	P	P	P	P	P	P
2-ChloroethylVinylEther	U	U	U	U	U	U	U	U	U	U	U	U	U
2-Chlorophenol	Retain	Retain	U	U	U	U	U	U	U	U	U	U	U
2-Hexanone	U	U	P	P	P	P	P	P	P	P	P	P	P
4-Bromophenylphenylether	U	U	U	U	U	U	U	U	U	U	U	U	U
4-Chlorophenylphenylether	U	U	U	U	U	U	U	U	U	U	U	U	U
4-Methyl-2-pentanone	U	U	P	P	P	P	P	P	P	P	P	P	P
Acetone	U	U	Retain	Retain	Retain	Retain	Retain	Retain	Retain	Retain	Retain	Retain	Retain
Benzene	P	P	P	P	P	P	P	P	P	P	P	P	P
Bis(2-chloroethoxy)methane	U	U	U	U	U	U	U	U	U	U	U	U	U
bis(2-chloroethyl)ether	U	U	U	U	U	U	U	U	U	U	U	U	U
bis(2-chloroisopropyl)ether	U	U	U	U	U	U	U	U	U	U	U	U	U
Bromodichloromethane	U	U	U	U	U	U	U	U	U	U	U	U	U
Bromoform	U	U	P	P	P	P	P	P	P	P	P	P	P
Bromomethane	U	U	P	P	P	P	P	P	P	P	P	P	P
Carbon tetrachloride	U	U	P	P	P	P	P	P	P	P	P	P	P

Table 17

Summary of Chemicals of Potential Ecological Concern after the Screening Risk Assessment
Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Assessment/Measurement Endpoint #											
	1	2	3	3	3	3	4	5	6	7	8	9
	Plants	Insects	Ord's Kangaroo Rat	Townsend's Ground Squirrel	Herbivorous Mammals	Insectivorous Mammal	Carnivorous Mammals	Herbivorous Birds	Insectivorous Birds	Omnivorous Birds	Carnivorous Birds	
Chlorobenzene	P	P	P	P	P	P	P	P	P	P	P	P
Chloroethane	U	P	P	P	P	P	P	P	P	P	P	P
Chloroform	U	P	P	P	P	P	P	P	U	U	U	U
Chloromethane	U	P	P	P	P	P	P	P	P	P	P	P
cis-1,2-Dichloroethene	U	P	P	P	P	P	P	P	P	P	P	P
cis-1,3-Dichloropropene	U	P	P	P	P	P	P	P	P	P	P	P
Dibromochloromethane	U	U	U	U	U	U	U	U	P	P	P	P
Dibromomethane	U	U	U	U	U	U	U	U	P	P	P	P
Dichlorodifluoromethane	U	U	U	U	U	U	U	U	P	P	P	P
Ethylbenzene	P	P	P	P	P	P	P	P	P	P	P	P
m,p-Xylene	P	P	P	P	P	P	P	P	P	P	P	P
Methylene chloride	U	U	P	P	P	P	P	P	U	U	U	U
o-Xylene	P	P	P	P	P	P	P	P	P	P	P	P
Phenol	Retain	Retain	P	P	P	Retain	P	U	U	U	U	U
Styrene	P	P	U	U	U	U	U	U	U	U	U	U
tert-ButylMethylEther	U	U	U	U	U	U	U	U	U	U	U	U
Tetrachloroethene	P	U	P	P	P	P	P	P	P	P	P	P
Toluene	P	P	P	P	P	P	P	P	P	P	P	P
Trans-1,2-Dichloroethene	U	P	P	P	P	P	P	P	P	P	P	P
Trans-1,3-Dichloropropene	U	P	P	P	P	P	P	P	P	P	P	P
Trichloroethylene (TCE)	U	U	P	P	P	P	P	P	U	U	U	U
Trichlorofluoromethane	U	U	U	U	U	U	U	U	U	U	U	U
Vinyl Acetate	U	U	U	U	U	U	U	U	U	U	U	U
Vinyl chloride	U	U	P	P	P	P	P	P	U	U	U	U
HI - VOCs	P	P	Retain	Retain	Retain	Retain	Retain	Retain	Retain	Retain	Retain	P

Notes:

Retain = screening value exceeded, chemical is retained for refined risk characterization

P = Pass - Screening value not exceeded and chemical passed screening evaluation; conclusion of no potential for risk; no further evaluation

U = Uncertain - uncertainty exists because no toxicological screening value was found for evaluating potential for risk

Table 18

Sample Designations for Surface Soil Collected from the TTU at the UTTR
Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Sample Location	Within TTU?	Background	Location Description	Site #	Sample Designation	Sampling Year	Number of Analytes
NR-226	NO	NO	Range land	-	habitat zone	2002	151
NR-227	NO	NO	Range land	-	habitat zone	2002	150
NR-228	YES	NO	Onsite - hazardous waste site	-	OB/OD operational area	2002	151
NR-229	YES	NO	Onsite - range land	-	habitat zone	2002	151
NR-230	YES	NO	Onsite - range land	-	habitat zone	2002	151
NR-231	YES	NO	Onsite - pad 2	2	OB/OD operational area	2002	151
NR-232	YES	NO	Onsite - range land	-	habitat zone	2002	151
NR-233	YES	NO	Onsite - range land	-	habitat zone	2002	151
NR-234	YES	NO	Onsite - range land	-	habitat zone	2002	151
NR-235	YES	NO	Onsite - range land	-	habitat zone	2002	151
NR-236	YES	NO	Onsite - range land	-	habitat zone	2002	151
NR-237	YES	NO	Onsite - range land	-	habitat zone	2002	151
NR-238	NO	YES	Background	-	background	2002	151
NR-239	NO	YES	Background	-	background	2002	151
NR-526	YES	NO	Onsite - range land	-	habitat zone	2004	151
NR-527	YES	NO	Onsite - range land	-	habitat zone	2004	151
NR-528	YES	NO	Onsite - range land	-	habitat zone	2004	151
NR-529	YES	NO	Onsite - range land	-	habitat zone	2004	151
NR-530	YES	NO	Onsite - range land	-	habitat zone	2004	151
NR-531	YES	NO	Onsite - burn pad	1	OB/OD operational area	2004	151
NR-532	YES	NO	Onsite - burn pad	1	OB/OD operational area	2004	151
NR-533	YES	NO	Onsite - main pad	2	OB/OD operational area	2004	151
NR-534	YES	NO	Onsite - main pad	2	OB/OD operational area	2004	151
NR-535	YES	NO	Onsite - main pad	2	OB/OD operational area	2004	151
NR-536	NO	YES	Background	-	background	2004	25
NR-537	NO	YES	Background	-	background	2004	25
SS1	YES	NO	Onsite - burn pad	1	OB/OD operational area	1991	36
SS2	YES	NO	Onsite - burn pad	1	OB/OD operational area	1991	36
SS3	YES	NO	Onsite - burn pad	1	OB/OD operational area	1991	36
SS4	YES	NO	Onsite - burn pad	1	OB/OD operational area	1991	36
SS5	YES	NO	Onsite - burn pan	3	OB/OD operational area	1991	36
SS6	YES	NO	Onsite - burn pan	3	OB/OD operational area	1991	36
SS7	YES	NO	Onsite - burn pan	3	OB/OD operational area	1991	36
SS8	YES	NO	Onsite - burn pan	3	OB/OD operational area	1991	36
SS9	YES	NO	Onsite - burn pan	3	OB/OD operational area	1991	36
SS10	YES	NO	Onsite - pad 1	2	OB/OD operational area	1991	36
SS11	YES	NO	Onsite - pad 1	2	OB/OD operational area	1991	36
SS12	YES	NO	Onsite - pad 2	2	OB/OD operational area	1991	36
SS13	YES	NO	Onsite - pad 2	2	OB/OD operational area	1991	36
SS14	YES	NO	Onsite - pad 3	2	OB/OD operational area	1991	36
SS15	YES	NO	Onsite - pad 3	2	OB/OD operational area	1991	36
SS16	YES	NO	Onsite - range land	-	habitat zone	1991	36
SS17	YES	NO	Onsite - range land	-	habitat zone	1991	36
SS18	YES	NO	Onsite - range land	-	habitat zone	1991	36
SS19	YES	NO	Onsite - range land	-	habitat zone	1991	36
SS20	YES	NO	Onsite - range land	-	habitat zone	1991	36
TTU-SS01S	YES	NO	Onsite - burn pan	3	OB/OD operational area	1989	84
TTU-SS02S	YES	NO	Onsite - burn pan	3	OB/OD operational area	1989	84
TTU-SS03S	YES	NO	Onsite - burn pan	3	OB/OD operational area	1989	84
TTU-SS04S(D)	YES	NO	Onsite - burn pan	3	OB/OD operational area	1989	84
TTU-SS05S	YES	NO	Onsite - burn pan	3	OB/OD operational area	1989	84
TTU-SS06S(BG)	YES	NO	Onsite - 150-200 yards SE of burn pan	-	habitat zone	1989	84

Notes:

Eco - Sample collected in ecological habitat

OB/OD - Sample collected in open burn/open detonation area where limited habitat represents an incomplete exposure pathway for ecological receptors.

Background - Sample collected outside of the UTTR Boundary

Samples NR-226 and NR-227 were not considered background samples due to their proximity to Site 2, Site 3, and an active firing range

Sample TTU-SS06S(BG) was considered background when sample collected, but is currently considered a site samples that is located within the TTU boundary near Site 3.

Sample TTU-SS04S(D) was included as a site sample as a conservative measure

Table 19

Summary Statistics for Combined Historical and Current Surface Soil Samples from Potential Habitat Locations at the TTU at the UTTR
Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Units	Det	n	DF (%)	Min DL	Max DL	Minimum Detected	Maximum Detected	Mean Concentration n1	Std Dev	UCL95	Appropriate Distribution	Habitat EPC	Basis
1,3,5-Trinitrobenzene	mg/Kg	0	15	0%	0.0150	0.210			0.0701	0.0454	--	--	0.105	0.5*MaxND
1,3-Dinitrobenzene	mg/Kg	0	15	0%	0.0350	0.160			0.0577	0.0283	--	--	0.0800	0.5*MaxND
2,4,6-Trinitrotoluene (TNT)	mg/Kg	0	20	0%	0.0490	3.00			0.415	0.643	--	--	1.50	0.5*MaxND
2,4-Dinitrophenol	mg/Kg	0	16	0%	0.123	1.80			0.184	0.198	--	--	0.900	0.5*MaxND
2,4-Dinitrotoluene	mg/Kg	0	21	0%	0.103	2.00			0.289	0.376	--	--	1.00	0.5*MaxND
2,6-Dinitrotoluene	mg/Kg	0	21	0%	0.100	3.00			0.421	0.619	--	--	1.50	0.5*MaxND
2-Amino-4,6-Dinitrotoluene	mg/Kg	0	15	0%	0.170	3.00			0.569	0.681	--	--	1.50	0.5*MaxND
2-Nitroaniline	mg/Kg	0	16	0%	0.0594	1.80			0.189	0.205	--	--	0.900	0.5*MaxND
2-Nitrophenol	mg/Kg	0	16	0%	0.0570	0.360			0.0575	0.0352	--	--	0.180	0.5*MaxND
2-Nitrotoluene	mg/Kg	0	15	0%	0.0470	0.280			0.0963	0.0517	--	--	0.140	0.5*MaxND
3-Nitroaniline	mg/Kg	0	16	0%	0.0479	1.80			0.370	0.285	--	--	0.900	0.5*MaxND
3-Nitrotoluene	mg/Kg	0	15	0%	0.0830	0.300			0.110	0.0473	--	--	0.150	0.5*MaxND
4,6-Dinitro-2-methylphenol	mg/Kg	0	16	0%	0.0432	1.80			0.175	0.208	--	--	0.900	0.5*MaxND
4-Nitroaniline	mg/Kg	0	16	0%	0.0500	1.80			0.177	0.206	--	--	0.900	0.5*MaxND
4-Nitrophenol	mg/Kg	0	16	0%	0.0761	1.80			0.175	0.203	--	--	0.900	0.5*MaxND
4-Nitrotoluene	mg/Kg	0	15	0%	0.101	0.380			0.140	0.0620	--	--	0.190	0.5*MaxND
HMX	mg/Kg	4	20	20%	0.100	3.00	0.310	3.60	0.810	1.12	3.30	Data are Non-parametric (0.05)	3.30	UCL
Nitrobenzene	mg/Kg	0	21	0%	0.0660	3.00			0.403	0.629	--	--	1.50	0.5*MaxND
Nitroglycerin	mg/Kg	0	19	0%	0.300	0.680			0.223	0.0676	--	--	0.340	0.5*MaxND
Nitroguanidine	mg/Kg	0	20	0%	0.0390	1.00			0.268	0.238	--	--	0.500	0.5*MaxND
PETN	mg/Kg	0	10	0%	0.580	1.00			0.407	0.0990	--	--	0.500	0.5*MaxND
Picric acid	mg/Kg	3	20	15%	0.000800	0.200	0.400	0.500	0.103	0.145	0.235	Data are Non-parametric (0.05)	0.235	UCL
RDX	mg/Kg	0	20	0%	0.0400	3.00			0.431	0.634	--	--	1.50	0.5*MaxND
Tetryl	mg/Kg	0	15	0%	0.0750	0.460			0.160	0.0871	--	--	0.230	0.5*MaxND
Aluminum	mg/Kg	21	21	100%			5390	17000	12200	3070	15300.00	Data are Non-parametric (0.05)	15300.00	UCL
Antimony	mg/Kg	14	16	88%	1.60	1.70	0.130	3.80	1.66	1.29	4.86	Data are Non-parametric (0.05)	3.80	Max Det
Arsenic	mg/Kg	16	21	76%	10	10	1.90	41.3	7.34	7.94	14.40	Data are Non-parametric (0.05)	14.4	UCL
Barium	mg/Kg	21	21	100%			152	336	212	35.5	255.00	Data are Non-parametric (0.05)	255.0	UCL
Beryllium	mg/Kg	16	21	76%	1.00	1.00	0.300	0.720	0.530	0.117	0.655	Data are Non-parametric (0.05)	0.655	UCL
Cadmium	mg/Kg	13	21	62%	0.120	1.00	0.340	3.00	0.649	0.606	1.23	Data are Non-parametric (0.05)	1.23	UCL
Calcium	mg/Kg	20	20	100%			154000	1560000	231000	429000	--	--	-	Not a COPEC
Carbon disulfide	mg/Kg	0	15	0%	0.000600	0.00160			0.000524	0.000124	--	--	0.000800	0.5*MaxND
Chloride	mg/Kg	16	20	80%	0.100	10.4	0.100	120000	6010	26800	--	--	-	Not a COPEC
Chromium	mg/Kg	21	21	100%			6.50	16	11.3	2.85	12.10	Data are Normal (0.05)	12.1	UCL
Cobalt	mg/Kg	15	16	94%	4.60	4.60	1.00	4.90	2.99	1.24	3.41	Data are Normal (0.05)	3.41	UCL
Copper	mg/Kg	20	21	95%	14.1	14.1	9.40	61	19.1	12	23.60	Data are Log-Normal (0.05)	23.6	UCL
Iron	mg/Kg	20	20	100%			5450	14000	10500	2400	13100.00	Data are Non-parametric (0.05)	13100.00	UCL
Lead	mg/Kg	20	21	95%	16.1	16.1	4.50	36	16.2	9.31	19.00	Data are Normal (0.05)	19.0	UCL
Magnesium	mg/Kg	20	20	100%			11500	24300	18300	3990	22700.00	Data are Non-parametric (0.05)	22700.00	UCL
Manganese	mg/Kg	7	21	100%			203	519	376	102	477.00	Data are Non-parametric (0.05)	477.00	UCL
Mercury	mg/Kg	21	21	33%	0.0200	0.110	0.00640	0.0300	0.0181	0.0117	0.0284	Data are Non-parametric (0.05)	0.0284	UCL
Molybdenum	mg/Kg	13	15	87%	0.300	0.300	0.600	1.30	0.847	0.345	1.00	Data are Normal (0.05)	1.00	UCL
Nickel	mg/Kg	21	21	100%			6.80	13.9	10.2	1.94	12.40	Data are Non-parametric (0.05)	12.4	UCL
Nitrate	mg/Kg	20	21	95%	2.50	2.50	0.00400	22.8	7.27	6.99	10.00	Data are Non-parametric (0.05)	10.0	UCL
Perchlorate	mg/Kg	5	15	33%	0.0106	0.112	0.0156	0.103	0.0232	0.0297	0.0537	Data are Non-parametric (0.05)	0.0537	UCL
Phosphorus	mg/Kg	5	5	100%			820	890	844	30.5	1320	Data are Non-parametric (0.05)	890	Max Det
Potassium	mg/Kg	20	20	100%			2090	6800	4580	1190	--	--	-	Not a COPEC
Selenium	mg/Kg	0	21	0%	0.210	10			1.77	1.88	--	--	5.00	0.5*MaxND
Silver	mg/Kg	1	21	5%	0.183	2.00	0.180	0.180	0.371	0.364	0.717	Data are Non-parametric (0.05)	0.180	Max Det
Sodium	mg/Kg	20	20	100%			274	1060	617	215	--	--	-	Not a COPEC

Table 19

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Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Units	Det	n	DF (%)	Min DL	Max DL	Minimum Detected	Maximum Detected	Mean Concentration n1	Std Dev	UCL95	Appropriate Distribution	Habitat EPC	Basis
Strontium Sulfate	mg/Kg	15	15	100%	0.500	0.500	244	460	343	72	442.00	Data are Non-parametric (0.05)	442.0	UCL
Thallium	mg/Kg	16	21	76%	5.00	5.00	0.150	0.550	0.816	0.968	1.67	Data are Non-parametric (0.05)	0.550	Max Det
Vanadium	mg/Kg	16	16	100%	9.90	9.90	9.90	25.7	17.3	4.04	18.70	Data are Non-parametric (0.05)	18.7	UCL
Zinc	mg/Kg	21	21	100%	29.7	29.7	29.7	67	49.7	9.98	60.80	Data are Non-parametric (0.05)	60.8	UCL
2-Methylnaphthalene	mg/Kg	0	16	0%	0.0801	0.360			0.0629	0.0324	--	--	0.180	0.5*MaxND
Acenaphthene	mg/Kg	0	5	0%	0.0693	0.0837			0.0380	0.00269	--	--	0.0418	0.5*MaxND
Acenaphthylene	mg/Kg	0	16	0%	0.0638	0.360			0.0595	0.0346	--	--	0.180	0.5*MaxND
Anthracene	mg/Kg	0	16	0%	0.0504	0.360			0.0581	0.0370	--	--	0.180	0.5*MaxND
Benzo(a)anthracene	mg/Kg	0	16	0%	0.0627	0.360			0.0632	0.0347	--	--	0.180	0.5*MaxND
Benzo(a)pyrene	mg/Kg	0	16	0%	0.0625	0.360			0.0609	0.0348	--	--	0.180	0.5*MaxND
Benzo(b)fluoranthene	mg/Kg	0	16	0%	0.106	0.360			0.0742	0.0297	--	--	0.180	0.5*MaxND
Benzo(g,h,i)perylene	mg/Kg	0	16	0%	0.0584	0.360			0.0593	0.0350	--	--	0.180	0.5*MaxND
Benzo(k)fluoranthene	mg/Kg	0	16	0%	0.0986	0.360			0.0697	0.0308	--	--	0.180	0.5*MaxND
Chrysene	mg/Kg	0	16	0%	0.0588	0.360			0.0605	0.0351	--	--	0.180	0.5*MaxND
Dibenz(a,h)anthracene	mg/Kg	0	16	0%	0.0765	0.360			0.0650	0.0326	--	--	0.180	0.5*MaxND
Fluoranthene	mg/Kg	1	16	6%	0.0596	0.360	0.144	0.144	0.0625	0.0412	0.107	Data are Non-parametric (0.05)	0.107	UCL
Fluorene	mg/Kg	0	16	0%	0.0660	0.360			0.0640	0.0344	--	--	0.180	0.5*MaxND
Indeno(1,2,3-c,d)pyrene	mg/Kg	0	16	0%	0.0736	0.360			0.0674	0.0331	--	--	0.180	0.5*MaxND
Naphthalene	mg/Kg	0	16	0%	0.000600	0.360			0.0117	0.0449	--	--	0.180	0.5*MaxND
Phenanthrene	mg/Kg	0	16	0%	0.0576	0.360			0.0590	0.0357	--	--	0.180	0.5*MaxND
Pyrene	mg/Kg	0	16	0%	0.0764	0.360			0.0763	0.0355	--	--	0.180	0.5*MaxND
TPH	mg/Kg	1	1	100%			20	20	20	NA	NA	--	20.0	Max Det
2,4,5-Trichlorophenol	mg/Kg	0	16	0%	0.0702	1.80			0.169	0.204	--	--	0.900	0.5*MaxND
2,4,6-Trichlorophenol	mg/Kg	0	16	0%	0.0792	0.360			0.0583	0.0329	--	--	0.180	0.5*MaxND
2,4-Dichlorophenol	mg/Kg	0	16	0%	0.0744	0.360			0.0635	0.0329	--	--	0.180	0.5*MaxND
2,4-Dimethylphenol	mg/Kg	0	16	0%	0.0739	0.360			0.0625	0.0332	--	--	0.180	0.5*MaxND
2-Chloronaphthalene	mg/Kg	0	16	0%	0.0729	0.360			0.0583	0.0334	--	--	0.180	0.5*MaxND
2-Methylphenol	mg/Kg	0	16	0%	0.0585	0.360			0.0596	0.0350	--	--	0.180	0.5*MaxND
3,3-Dichlorobenzidine	mg/Kg	0	16	0%	0.0547	0.720			0.107	0.0864	--	--	0.360	0.5*MaxND
4-Chloro-3-methylphenol	mg/Kg	0	16	0%	0.0776	0.360			0.0638	0.0326	--	--	0.180	0.5*MaxND
4-Chloroaniline	mg/Kg	0	16	0%	0.201	0.756			0.257	0.118	--	--	0.378	0.5*MaxND
4-Methylphenol	mg/Kg	0	16	0%	0.0691	0.360			0.0618	0.0341	--	--	0.180	0.5*MaxND
Benzoic acid	mg/Kg	0	16	0%	0.0780	1.80			0.194	0.202	--	--	0.900	0.5*MaxND
Benzylalcohol	mg/Kg	0	16	0%	0.0573	0.360			0.0655	0.0462	--	--	0.180	0.5*MaxND
bis(2-Ethylhexyl)phthalate	mg/Kg	0	16	0%	0.0751	0.164			0.0620	0.0183	--	--	0.0820	0.5*MaxND
Butyl benzylphthalate	mg/Kg	0	16	0%	0.0740	0.360			0.0659	0.0332	--	--	0.180	0.5*MaxND
Dibenzofuran	mg/Kg	0	16	0%	0.0691	0.360			0.0613	0.0337	--	--	0.180	0.5*MaxND
Diethylphthalate	mg/Kg	0	16	0%	0.0800	0.360			0.0675	0.0311	--	--	0.180	0.5*MaxND
Dimethylphthalate	mg/Kg	0	16	0%	0.0700	0.360			0.0600	0.0345	--	--	0.180	0.5*MaxND
Di-n-butylphthalate	mg/Kg	0	16	0%	0.0879	0.360			0.0658	0.0320	--	--	0.180	0.5*MaxND
Di-n-octylphthalate	mg/Kg	0	16	0%	0.0500	0.360			0.0519	0.0363	--	--	0.180	0.5*MaxND
Hexachlorobenzene	mg/Kg	0	16	0%	0.0611	0.360			0.0632	0.0349	--	--	0.180	0.5*MaxND
Hexachlorobutadiene	mg/Kg	0	16	0%	0.000800	0.360			0.0117	0.0449	--	--	0.180	0.5*MaxND
Hexachlorocyclopentadiene	mg/Kg	0	16	0%	0.0748	0.390			0.136	0.0679	--	--	0.195	0.5*MaxND
Hexachloroethane	mg/Kg	0	16	0%	0.0637	0.360			0.0623	0.0344	--	--	0.180	0.5*MaxND
Isophorone	mg/Kg	0	16	0%	0.0726	0.360			0.0620	0.0332	--	--	0.180	0.5*MaxND
n-Nitroso-di-n-propylamine	mg/Kg	0	16	0%	0.0638	0.360			0.0612	0.0343	--	--	0.180	0.5*MaxND
n-Nitrosodiphenylamine	mg/Kg	0	16	0%	0.0506	0.360			0.0625	0.0379	--	--	0.180	0.5*MaxND
Pentachlorophenol	mg/Kg	0	16	0%	0.0726	1.80			0.150	0.205	--	--	0.900	0.5*MaxND

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Analyte	Units	Det	n	DF (%)	Min DL	Max DL	Minimum Detected	Maximum Detected	Mean Concentration n1	Std Dev	UCL95	Appropriate Distribution	Habitat EPC	Basis
1,1,1,2-Tetrachloroethane	mg/Kg	0	15	0%	0.000600	0.00150			0.000466	0.000136	--	--	0.000750	0.5*MaxND
1,1,1-Trichloroethane	mg/Kg	0	15	0%	0.000680	0.00130			0.000500	0.0000781	--	--	0.000650	0.5*MaxND
1,1,2,2-Tetrachloroethane	mg/Kg	0	15	0%	0.000790	0.00140			0.000565	0.0000837	--	--	0.000700	0.5*MaxND
1,1,2-Trichloroethane	mg/Kg	0	15	0%	0.000640	0.00140			0.000490	0.0000970	--	--	0.000700	0.5*MaxND
1,1-Dichloroethane	mg/Kg	0	15	0%	0.000550	0.000900			0.000391	0.0000573	--	--	0.000450	0.5*MaxND
1,1-Dichloroethene	mg/Kg	0	15	0%	0.000450	0.00290			0.000620	0.0000388	--	--	0.00145	0.5*MaxND
1,2,3-Trichlorobenzene	mg/Kg	0	15	0%	0.000660	0.00110			0.000455	0.0000702	--	--	0.000500	0.5*MaxND
1,2,3-Trichloropropane	mg/Kg	0	15	0%	0.000780	0.00210			0.000614	0.000190	--	--	0.00105	0.5*MaxND
1,2,4-Trichlorobenzene	mg/Kg	0	16	0%	0.000620	0.360			0.0117	0.0449	--	--	0.180	0.5*MaxND
1,2-Dibromo-3-chloropropane	mg/Kg	0	15	0%	0.00230	0.0690			0.00212	0.000611	--	--	0.00345	0.5*MaxND
1,2-Dichlorobenzene	mg/Kg	0	16	0%	0.000700	0.360			0.0117	0.0449	--	--	0.180	0.5*MaxND
1,2-Dichloropropane	mg/Kg	0	15	0%	0.000630	0.00140			0.000477	0.0000988	--	--	0.000700	0.5*MaxND
1,2-Dichloropropane	mg/Kg	0	15	0%	0.000580	0.00110			0.000426	0.0000665	--	--	0.000550	0.5*MaxND
1,2-Ethylene Dibromide	mg/Kg	0	15	0%	0.000630	0.00190			0.000537	0.000172	--	--	0.000950	0.5*MaxND
1,3-Dichlorobenzene	mg/Kg	0	16	0%	0.000700	0.360			0.0118	0.0449	--	--	0.180	0.5*MaxND
1,4-Dichlorobenzene	mg/Kg	0	16	0%	0.000700	0.360			0.0117	0.0449	--	--	0.180	0.5*MaxND
2-Butanone	mg/Kg	1	15	7%	0.00392	0.00750	0.0123	0.0123	0.00340	0.00253	0.00455	Data are Log-Normal (0.05)	0.00455	UCL
2-ChloroethylVinylEther	mg/Kg	0	10	0%	0.00580	0.0119			0.00462	0.00114	--	--	0.00595	0.5*MaxND
2-Chlorophenol	mg/Kg	0	16	0%	0.0694	0.360			0.0565	0.00338	--	--	0.180	0.5*MaxND
2-Hexanone	mg/Kg	0	15	0%	0.00390	0.00780			0.00274	0.000644	--	--	0.00390	0.5*MaxND
4-Bromophenylphenylether	mg/Kg	0	16	0%	0.0599	0.360			0.0634	0.0353	--	--	0.180	0.5*MaxND
4-Chlorophenylphenylether	mg/Kg	0	16	0%	0.0704	0.360			0.0598	0.0339	--	--	0.180	0.5*MaxND
4-Methyl-2-pentanone	mg/Kg	0	15	0%	0.00391	0.00680			0.00271	0.000445	--	--	0.00340	0.5*MaxND
Acetone	mg/Kg	2	16	13%	0.00380	0.360	0.00410	0.0453	0.0168	0.0448	0.128	Data are Non-parametric (0.05)	0.0453	Max Det
Benzene	mg/Kg	1	15	7%	0.000630	0.00110	0.00116	0.00116	0.000478	0.000202	0.000570	Data are Log-Normal (0.05)	0.000570	UCL
Bis(2-chloroethoxy)methane	mg/Kg	0	15	0%	0.0754	0.148			0.0602	0.0143	--	--	0.0740	0.5*MaxND
bis(2-chloroisopropyl)ether	mg/Kg	0	16	0%	0.0587	0.360			0.0633	0.0389	--	--	0.180	0.5*MaxND
bis(2-chloroisopropyl)ether	mg/Kg	0	16	0%	0.0729	0.360			0.0608	0.0340	--	--	0.180	0.5*MaxND
Bromodichloromethane	mg/Kg	0	15	0%	0.000580	0.00130			0.000443	0.0000875	--	--	0.000650	0.5*MaxND
Bromoform	mg/Kg	0	15	0%	0.000500	0.00160			0.000419	0.000170	--	--	0.000800	0.5*MaxND
Bromomethane	mg/Kg	0	15	0%	0.000900	0.00200			0.000697	0.000125	--	--	0.00100	0.5*MaxND
Carbon tetrachloride	mg/Kg	0	15	0%	0.000650	0.00130			0.000488	0.0000777	--	--	0.000650	0.5*MaxND
Chlorobenzene	mg/Kg	0	15	0%	0.000680	0.00120			0.000470	0.0000754	--	--	0.000600	0.5*MaxND
Chloroethane	mg/Kg	0	15	0%	0.000630	0.00210			0.000577	0.000206	--	--	0.00105	0.5*MaxND
Chloroform	mg/Kg	0	15	0%	0.000610	0.00120			0.000438	0.0000878	--	--	0.000600	0.5*MaxND
Chloromethane	mg/Kg	0	15	0%	0.000700	0.00200			0.000585	0.000174	--	--	0.00100	0.5*MaxND
cis-1,2-Dichloroethane	mg/Kg	0	15	0%	0.000700	0.00130			0.000482	0.000108	--	--	0.000650	0.5*MaxND
cis-1,3-Dichloropropene	mg/Kg	0	15	0%	0.000600	0.00110			0.000444	0.000101	--	--	0.000550	0.5*MaxND
Dibromochloromethane	mg/Kg	0	15	0%	0.000560	0.00160			0.000455	0.000148	--	--	0.000800	0.5*MaxND
Dibromomethane	mg/Kg	0	15	0%	0.000590	0.00150			0.000437	0.000141	--	--	0.000750	0.5*MaxND
Dichlorodifluoromethane	mg/Kg	0	15	0%	0.000610	0.00150			0.000495	0.000111	--	--	0.000750	0.5*MaxND
Ethylbenzene	mg/Kg	0	15	0%	0.000700	0.00120			0.000471	0.0000823	--	--	0.000600	0.5*MaxND
m,p-Xylene	mg/Kg	0	15	0%	0.00110	0.00250			0.000890	0.000265	--	--	0.00125	0.5*MaxND
Methylene chloride	mg/Kg	0	15	0%	0.000680	0.00320			0.000740	0.000406	--	--	0.00160	0.5*MaxND
o-Xylene	mg/Kg	1	15	7%	0.000500	0.00120	0.00222	0.00222	0.000537	0.000485	0.00108	Data are Non-parametric (0.05)	0.00108	UCL
Phenol	mg/Kg	0	16	0%	0.0778	0.360			0.0645	0.0324	--	--	0.180	0.5*MaxND
Styrene	mg/Kg	2	15	13%	0.000600	0.00270	0.00160	0.00260	0.000739	0.000647	0.00140	Data are Non-parametric (0.05)	0.00140	UCL
tert-ButylMethylEther	mg/Kg	0	15	0%	0.000680	0.00170			0.000503	0.000156	--	--	0.000850	0.5*MaxND
Tetrachloroethene	mg/Kg	0	15	0%	0.000790	0.00130			0.000538	0.0000863	--	--	0.000650	0.5*MaxND
Toluene	mg/Kg	2	15	13%	0.000700	0.00110	0.00800	0.0187	0.00218	0.00497	0.0149	Data are Non-parametric (0.05)	0.0149	UCL

Table 19

Summary Statistics for Combined Historical and Current Surface Soil Samples from Potential Habitat Locations at the TTU at the UTTR
 Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Units	Det	n	DF (%)	Min DL	Max DL	Minimum Detected	Maximum Detected	Mean Concentration ¹	Std Dev	UCL95	Appropriate Distribution	Habitat EPC	Basis
Trans-1,2-Dichloroethene	mg/Kg	0	15	0%	0.000670	0.00120			0.000463	0.0000778	--	--	0.000600	0.5*MaxND
Trans-1,3-Dichloropropene	mg/Kg	0	15	0%	0.000700	0.00140			0.000498	0.0000975	--	--	0.000700	0.5*MaxND
Trichloroethylene (TCE)	mg/Kg	0	15	0%	0.000600	0.00110			0.000418	0.0000715	--	--	0.000550	0.5*MaxND
Trichlorofluoromethane	mg/Kg	0	15	0%	0.000510	0.00160			0.000477	0.000142	--	--	0.000800	0.5*MaxND
Vinyl Acetate	mg/Kg	0	15	0%	0.00109	0.00180			0.000717	0.000122	--	--	0.000900	0.5*MaxND
Vinyl chloride	mg/Kg	0	15	0%	0.000610	0.00170			0.000548	0.000136	--	--	0.000850	0.5*MaxND

Notes:

¹ includes 1/2 DL proxy Values for NDs

Data exclude samples collected at the OB/OD area (Table 24b)
 95UCLs for retained COPECs calculated with ProUCL 3.0.0.2

Table 20**Refined Chemical Biotransfer Factors for Inorganics and Selected Organics***Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment*

Analyte	Refined Plant BTF	Source for Plant BTFs	Refined Terrestrial Invertebrates BTF	Source for Terrestrial Invertebrate BTFs	Refined Small Mammal BTF	Source for Mammal BTFs
Aluminum	0.00287	A	0.043	C	0.073	E
Antimony	0.0102	A	0.0162	D	1.0	F
Arsenic	regression based		regression based		regression based	
Barium	0.10	B	0.09	C	0.057	E
Beryllium	0.010	B	0.045	C	0.41	E
Cadmium	regression based		regression based		regression based	
Chromium	0.040	B	0.306	C	0.085	G
Cobalt	0.00745	A	0.122	C	regression based	
Copper	regression based		regression based		regression based	
Iron	0.00425	A	0.04	C	regression based	
Lead	regression based		regression based		regression based	
Magnesium	0.810	A	0.169	C	0.993	E
Manganese	0.0792	A	regression based		0.079	E
Mercury	regression based		regression based		0.054	E
Molybdenum	0.400	B	0.953	C	1.0	F
Nickel	regression based		1.059	C	0.249	G
Selenium	regression based		regression based		regression based	
Silver	0.014	A	2.045	C	0.81	E
Strontium	1.1	B	0.087	C	1.0	F
Thallium	0.0040	B	0.0606	D	0.1124	E
Vanadium	0.00485	A	0.088	C	0.019	E
Zinc	regression based		regression based		regression based	
2,4,6-Trinitrotoluene (TNT)	1.710	H	0.058	H	0.000	I
2,4-Dinitrotoluene	0.376	H	3.710	H	1.050	J
2,6-Dinitrotoluene	3.140	H	3.160	H	1.100	J
HMX	regression based		0.313	H	2.130	J

Notes:

BTF = biotransfer factor

BTFs for COPECs not listed in this table are the same as those used in the screening analysis (Table 8)

A Median soil-to-plant transfer factors for inorganics are from soil-to-dry plant uptake factors presented by ORNL (2000)**B** Bechtel Jacobs, 1998 - median uptake factors**C** Sample et al., 1998a - median soil-to-earthworm uptake factors**D** Median uptake factors from ARAMS (Army Risk Assessment Modeling System; US Army, 2004)

Naphthalene data substituted for 2-methylnaphthalene.

E Sample et al., 1998b - median soil-to-mammal uptake factors**F** Bioaccumulation data were not available. A default value of 1 was assumed.**G** Sample et al, 1998 - Soil to small mammal bioaccumulation regression model presented in Table 9**H** Median BAFs calculated for the Army Risk Assessment Modelling System (2005)**I** USEPA 2005**J** USEPA 2000

Table 21
 Wilcoxon Rank Sum Comparison of Inorganics in TTU Soils to the Background Concentrations
 Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Site Sample Soil Statistics						Background Soil Statistics						Wilcoxon Rank Sum Result	p		
	det	n	DF (%)	Minimum (mg/kg)	Maximum (mg/kg)	Mean (mg/kg)	Standard Deviation	Det	n	DF (%)	Minimum (mg/kg)	Maximum (mg/kg)			Mean (mg/kg)	Standard Deviation
Aluminum	48	48	100%	5390	54000	13200	6950	54	54	100%	2080	21100	11900	3620	NS	0.8751
Antimony	22	28	79%	0.12	167	8.12	31.3	29	54	54%	0.00705	3.1	0.766	0.649	SS	0.0156
Arsenic	28	48	58%	1.9	41.3	6.46	5.34	54	54	100%	2.25	15.4	6.63	2.12	BS	0.0017
Barium	48	48	100%	110	640	206	72.9	54	54	100%	148	426	258	56.6	BS	<0.0001
Beryllium	23	48	48%	0.075	0.72	0.465	0.162	46	54	85%	0.00535	1.05	0.409	0.268	NS	0.4427
Cadmium	21	48	44%	0.055	32	1.25	4.56	35	54	65%	0.00292	0.71	0.203	0.185	SS	<0.0001
Chromium	48	48	100%	6.5	55.3	14.4	7.79	54	54	100%	2.32	20.9	12.7	3.66	NS	0.8253
Cobalt	22	28	79%	1	4.9	2.78	1.12	54	54	100%	0.678	6.06	3.53	1.06	BS	0.007
Copper	41	48	85%	0.5	18000	429	2590	54	54	100%	2.49	26.7	12.5	3.86	SS	<0.0001
Iron	42	42	100%	4510	15000	10600	2790	54	54	100%	1390	16200	10100	3190	NS	0.4914
Lead	40	48	83%	1	48000	1070	6920	54	54	100%	2.95	30.5	10.3	4.23	SS	0.0017
Magnesium	42	42	100%	9700	24300	16700	4000	54	54	100%	15500	167000	29800	21700	BS	<0.0001
Manganese	48	48	100%	120	519	318	116	54	54	100%	43.4	859	340	136	NS	0.5409
Mercury	13	48	27%	0.005	0.07	0.0223	0.0153	2	4	50%	0.01	0.0262	0.0178	0.00902	NS	0.9435
Molybdenum	20	22	91%	0.15	17	1.73	3.45	53	54	98%	0.073	4.91	0.824	0.771	SS	0.0025
Nickel	48	48	100%	6.7	41.3	11.3	5.83	54	54	100%	3	20.2	10.3	3.07	NS	0.6932
Phosphorus	20	20	100%	450	990	656	171	50	50	100%	198	1470	722	214	NS	0.1956
Selenium	0	48	0%	0.09	5	2.48	2.17	38	54	70%	0.00815	1.5	0.513	0.339	SS	<0.0001
Silver	4	48	8%	0.0855	4	0.608	0.643	25	54	46%	0.00572	0.23	0.0797	0.0545	SS	<0.0001
Strontium	22	22	100%	244	484	351	71.9	54	54	100%	211	3680	717	763	BS	0.0107
Thallium	26	48	54%	0.085	2.5	1.2	1.12	25	54	46%	0.0151	1.76	0.515	0.351	NS	0.1577
Vanadium	28	28	100%	9.9	25.7	16.7	3.42	54	54	100%	8.28	35.5	20.8	4.89	BS	<0.0001
Zinc	48	48	100%	29.7	2300	125	336	54	54	100%	6.37	78	38.3	13.4	SS	<0.0001

Notes:

¹ Summary statistics include 1/2 detection limit as a proxy value for non-detects.

DF = detection frequency

Bold and highlighted text are those COPECs with significantly greater site concentrations compared to background. These COPECs were retained for further characterization in the refined screening evaluation.

BS = significant difference between background and site data with background concentrations being greater

NS = no significant difference between background and site data

SS = significant difference between background and site data with site concentrations being greater

p - level of significance (0.05) based on the two tailed t-distribution

Table 22

Summary of the Refined Screening Evaluation for Plants
Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Anal te	Class	Detection Frequenc	n	Uncertain	No Risk	ND - Exceedances		Detected - Exceedances		LOEC Exceedance Frequency	Refined Risk Conclusion	Comments
						Possible	Probable	Possible	Probable			
2,4-Dinitrophenol	energetic	0%	28	0	24	1	3	0	0	0%	None	
2,6-Dinitrotoluene	energetic	0%	48	0	45	3	0	0	0	0%	None	
2-Nitrophenol	energetic	0%	28	0	24	4	0	0	0	0%	None	
4-Nitrophenol	energetic	0%	28	0	24	1	3	0	0	0%	None	
Nitrobenzene	energetic	0%	48	0	45	3	0	0	0	0%	None	
Antimony	inorganic	79%	28	0	8	6	0	11	3	11%	Possible	
Cadmium	inorganic	44%	48	0	47	0	0	1	0	0%	None	
Copper	inorganic	85%	48	0	7	4	0	33	4	8%	Possible	
Lead	inorganic	83%	48	0	43	0	1	1	3	6%	None	
Molybdenum	inorganic	91%	22	0	2	0	0	18	2	9%	Possible	
Perchlorate	inorganic	50%	22	0	22	0	0	0	0	0%	None	
Selenium	inorganic	0%	48	0	1	16	31	0	0	0%	Uncertain	Prob risk by ND
Silver	inorganic	8%	48	0	21	25	0	1	1	2%	Uncertain	Poss risk by ND
Zinc	inorganic	100%	48	0	0	0	0	16	32	67%	Probable	
2-Methylnaphthalene	PAH	14%	28	0	24	0	0	0	4	14%	None	
Acenaphthylene	PAH	0%	28	0	24	0	4	0	0	0%	None	
Anthracene	PAH	7%	28	0	24	0	2	0	2	7%	None	
Benzo(a)anthracene	PAH	0%	28	0	24	0	4	0	0	0%	None	
Benzo(a)pyrene	PAH	0%	28	0	24	0	4	0	0	0%	None	
Benzo(b)fluoranthene	PAH	0%	28	0	24	0	4	0	0	0%	None	
Benzo(g,h,i)perylene	PAH	0%	28	0	24	0	4	0	0	0%	None	
Benzo(k)fluoranthene	PAH	0%	28	0	24	0	4	0	0	0%	None	
Chrysene	PAH	0%	28	0	24	0	4	0	0	0%	None	
Dibenzo(a,h)anthracene	PAH	0%	28	0	24	0	4	0	0	0%	None	
Fluoranthene	PAH	4%	28	0	24	0	4	0	0	0%	None	
Fluorene	PAH	14%	28	0	24	0	0	1	3	11%	None	
Indeno(1,2,3-c,d)pyrene	PAH	0%	28	0	24	0	4	0	0	0%	None	
Naphthalene	PAH	25%	28	0	23	0	0	1	4	14%	None	
Phenanthrene	PAH	18%	28	0	24	0	0	0	4	14%	None	
Pyrene	PAH	0%	28	0	24	0	4	0	0	0%	None	
TPH	petroleum	100%	6	0	3	0	0	0	3	50%	Probable	
2,4,5-Trichlorophenol	SVOC	0%	28	0	24	1	3	0	0	0%	None	
2,4,6-Trichlorophenol	SVOC	0%	28	0	24	4	0	0	0	0%	None	
2,4-Dichlorophenol	SVOC	0%	28	0	24	4	0	0	0	0%	None	
4-Chloroaniline	SVOC	0%	28	0	24	4	0	0	0	0%	None	
Butyl benzylphthalate	SVOC	0%	28	0	25	3	0	0	0	0%	None	
Diethylphthalate	SVOC	0%	28	0	25	3	0	0	0	0%	None	
Dimethylphthalate	SVOC	0%	28	0	25	3	0	0	0	0%	None	

Table 22

Summary of the Refined Screening Evaluation for Plants
Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Class	Detection Frequency	n	Uncertain	No Risk	ND - Exceedances		Detected - Exceedances		LOEC Exceedance Frequency	Refined Risk Conclusion	Comments
						Possible	Probable	Possible	Probable			
Di-n-octylphthalate	SVOC	0%	28	0	25	3	0	0	0	0%	None	
Hexachlorobenzene	SVOC	0%	28	0	24	1	3	0	0	0%	None	
Hexachlorocyclopentadiene	SVOC	0%	28	0	24	1	3	0	0	0%	None	
Pentachlorophenol	SVOC	0%	28	0	24	4	0	0	0	0%	None	
2-Chlorophenol	VOC	0%	28	0	24	1	3	0	0	0%	None	
Phenol	VOC	0%	28	0	25	3	0	0	0	0%	None	

Notes:

Uncertainties are not shown in this table

ND - not detected

NOEC - no observed effect concentration

LOEC - lowest observed effect concentration

Uncertain - retained as an uncertainty

None - exposure concentration does not exceed the either toxicity value

Possible - Exposure exceeds the NOEC value but not the LOEC value

Probable - Exposure exceeds the LOEC value

Table 23

**Summary of the Refined Screening Evaluation for Plants within Ecological Habitat
Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment**

Analyte	Class	Detection Frequency	n	Uncertain	No Risk	ND - Exceedances		Detected - Exceedances		LOEC Exceedance Frequency	Refined Risk Conclusion	Comments
						Possible	Probable	Possible	Probable			
2,4-Dinitrophenol	energetic	0%	16	0	16	0	0	0	0	0%	None	
2,6-Dinitrotoluene	energetic	0%	21	0	21	0	0	0	0	0%	None	
2-Nitrophenol	energetic	0%	16	0	16	0	0	0	0	0%	None	
4-Nitrophenol	energetic	0%	16	0	16	0	0	0	0	0%	None	
Nitrobenzene	energetic	0%	21	0	21	0	0	0	0	0%	None	
Antimony	inorganic	88%	16	0	5	2	0	9	0	0%	Possible	
Cadmium	inorganic	62%	21	0	21	0	0	0	0	0%	None	
Copper	inorganic	95%	21	0	3	0	0	18	0	0%	Possible	
Lead	inorganic	95%	21	0	21	0	0	0	0	0%	None	
Molybdenum	inorganic	87%	15	0	2	0	0	13	0	0%	Possible	
Perchlorate	inorganic	33%	15	0	15	0	0	0	0	0%	None	
Selenium	inorganic	0%	21	0	0	7	14	0	0	0%	Uncertain	Prob risk by ND
Silver	inorganic	5%	21	0	15	6	0	0	0	0%	None	Poss risk by ND
Zinc	inorganic	100%	21	0	0	0	0	9	12	57%	Probable	
2-Methylnaphthalene	PAH	0%	16	0	16	0	0	0	0	0%	None	
Acenaphthylene	PAH	0%	16	0	16	0	0	0	0	0%	None	
Anthracene	PAH	0%	16	0	16	0	0	0	0	0%	None	
Benzo(a)anthracene	PAH	0%	16	0	16	0	0	0	0	0%	None	
Benzo(a)pyrene	PAH	0%	16	0	16	0	0	0	0	0%	None	
Benzo(b)fluoranthene	PAH	0%	16	0	16	0	0	0	0	0%	None	
Benzo(g,h,i)perylene	PAH	0%	16	0	16	0	0	0	0	0%	None	
Benzo(k)fluoranthene	PAH	0%	16	0	16	0	0	0	0	0%	None	
Chrysene	PAH	0%	16	0	16	0	0	0	0	0%	None	
Dibenzo(a,h)anthracene	PAH	0%	16	0	16	0	0	0	0	0%	None	
Fluoranthene	PAH	6%	16	0	16	0	0	0	0	0%	None	
Fluorene	PAH	0%	16	0	16	0	0	0	0	0%	None	
Indeno(1,2,3-c,d)pyrene	PAH	0%	16	0	16	0	0	0	0	0%	None	
Naphthalene	PAH	0%	16	0	16	0	0	0	0	0%	None	
Phenanthrene	PAH	0%	16	0	16	0	0	0	0	0%	None	
Pyrene	PAH	0%	16	0	16	0	0	0	0	0%	None	
TPH	petroleum	100%	1	0	1	0	0	0	0	0%	None	
2,4,5-Trichlorophenol	SVOC	0%	16	0	16	0	0	0	0	0%	None	
2,4,6-Trichlorophenol	SVOC	0%	16	0	16	0	0	0	0	0%	None	
2,4-Dichlorophenol	SVOC	0%	16	0	16	0	0	0	0	0%	None	
4-Chloroaniline	SVOC	0%	16	0	16	0	0	0	0	0%	None	
Butyl benzylphthalate	SVOC	0%	16	0	16	0	0	0	0	0%	None	
Diethylphthalate	SVOC	0%	16	0	16	0	0	0	0	0%	None	
Dimethylphthalate	SVOC	0%	16	0	16	0	0	0	0	0%	None	
Di-n-octylphthalate	SVOC	0%	16	0	16	0	0	0	0	0%	None	

Table 23

Summary of the Refined Screening Evaluation for Plants within Ecological Habitat Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Class	Detection Frequency	n	Uncertain	No Risk	ND - Exceedances		Detected - Exceedances		LOEC Exceedance Frequency	Refined Risk Conclusion	Comments
						Possible	Probable	Possible	Probable			
Hexachlorobenzene	SVOC	0%	16	0	16	0	0	0	0	0%	None	
Hexachlorocyclopentadiene	SVOC	0%	16	0	16	0	0	0	0	0%	None	
Pentachlorophenol	SVOC	0%	16	0	16	0	0	0	0	0%	None	
2-Chlorophenol	VOC	0%	16	0	16	0	0	0	0	0%	None	
Phenol	VOC	0%	16	0	16	0	0	0	0	0%	None	

Notes:

- Uncertainties are not shown in this table
- ND - not detected
- NOEC - no observed effect concentration
- LOEC - lowest observed effect concentration
- Uncertain - retained as an uncertainty
- None - exposure concentration does not exceed the either toxicity value
- Possible - Exposure exceeds the NOEC value but not the LOEC value
- Probable - Exposure exceeds the LOEC value

Table 24

Summary of the Refined Screening Evaluation for Soil Invertebrates
Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Class	Detection Frequency	n	Uncertain	None	ND - Exceedances		Detected - Exceedances		LOEC Exceedance Frequency	Refined Risk Conclusion	Comments
						Possible	Probable	Possible	Probable			
2,4-Dinitrophenol	energetic	0%	28	0	22	2	4	0	0	0%	None	
2,4-Dinitrotoluene	energetic	2%	48	0	48	0	0	0	0	0%	None	
2-Nitrophenol	energetic	0%	28	0	24	1	3	0	0	0%	None	
4-Nitrophenol	energetic	0%	28	0	22	2	4	0	0	0%	None	
HMX	energetic	31%	42	0	35	0	0	6	1	2%	None	
Nitrobenzene	energetic	0%	48	0	45	3	0	0	0	0%	None	
Antimony	inorganic	79%	28	0	27	0	0	1	0	0%	None	
Cadmium	inorganic	44%	48	0	48	0	0	0	0	0%	None	
Copper	inorganic	85%	48	0	1	6	0	32	9	19%	Possible	
Lead	inorganic	83%	48	0	47	0	0	0	1	2%	None	
Perchlorate	inorganic	50%	22	0	21	0	0	1	0	0%	None	
Zinc	inorganic	100%	48	0	0	0	0	44	4	8%	Possible	
2-Methylnaphthalene	PAH	14%	28	0	24	0	0	1	3	11%	None	
Acenaphthylene	PAH	0%	28	0	24	4	0	0	0	0%	None	
Anthracene	PAH	7%	28	0	24	1	1	2	0	0%	None	
Fluoranthene	PAH	4%	28	0	25	0	3	0	0	0%	None	
Fluorene	PAH	14%	28	0	24	0	0	1	3	11%	None	
Naphthalene	PAH	25%	28	0	24	0	0	1	3	11%	None	
Phenanthrene	PAH	18%	28	0	24	0	0	0	4	14%	None	
Pyrene	PAH	0%	28	0	24	0	4	0	0	0%	None	
TPH	petroleum	100%	6	0	2	0	0	0	4	67%	Probable	
2,4,5-Trichlorophenol	SVOC	0%	28	0	23	1	4	0	0	0%	None	
2,4,6-Trichlorophenol	SVOC	0%	28	0	24	1	3	0	0	0%	None	
2,4-Dichlorophenol	SVOC	0%	28	0	24	1	3	0	0	0%	None	
4-Chloroaniline	SVOC	0%	28	0	24	4	0	0	0	0%	None	
bis(2-Ethylhexyl)phthalate	SVOC	18%	28	28	0	0	0	0	0	0%	None	
Dibenzofuran	SVOC	14%	28	0	25	0	0	0	3	11%	None	
n-Nitroso-di-n-propylamine	SVOC	0%	28	0	24	4	0	0	0	0%	None	
n-Nitrosodiphenylamine	SVOC	0%	28	0	24	4	0	0	0	0%	None	
Pentachlorophenol	SVOC	0%	28	0	25	3	0	0	0	0%	None	
2-Chlorophenol	VOC	0%	28	0	24	1	3	0	0	0%	None	
Phenol	VOC	0%	28	0	24	4	0	0	0	0%	None	

Notes:

- ND - not detected
- NOEC - no observed effect concentration
- LOEC - lowest observed effect concentration
- Uncertain - retained as an uncertainty
- None - exposure concentration does not exceed the either toxicity value
- Possible - Exposure exceeds the NOEC value but not the LOEC value
- Probable - Exposure exceeds the LOEC value

Table 25

Summary of the Refined Screening Evaluation for Soil Invertebrates within Ecological Habitat
Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Class	Detection Frequency	n	Uncertain	None	ND - Exceedances		Detected - Exceedances		LOEC Exceedance Frequency	Risk Conclusion	Comments
						Possible	Probable	Possible	Probable			
2,4-Dinitrophenol	energetic	0%	16	0	15	1	0	0	0	0%	None	
2,4-Dinitrotoluene	energetic	0%	21	0	21	0	0	0	0	0%	None	
2-Nitrophenol	energetic	0%	16	0	16	0	0	0	0	0%	None	
4-Nitrophenol	energetic	0%	16	0	15	1	0	0	0	0%	None	
HMX	energetic	20%	20	0	18	0	0	2	0	0%	None	
Nitrobenzene	energetic	0%	21	0	21	0	0	0	0	0%	None	
Antimony	inorganic	88%	16	0	16	0	0	0	0	0%	None	
Cadmium	inorganic	62%	21	0	21	0	0	0	0	0%	None	
Copper	inorganic	95%	21	0	0	1	0	19	1	5%	Possible	
Lead	inorganic	95%	21	0	21	0	0	0	0	0%	None	
Perchlorate	inorganic	33%	15	0	15	0	0	0	0	0%	None	
Zinc	inorganic	100%	21	0	0	0	0	21	0	0%	Possible	
2-Methylnaphthalene	PAH	0%	16	0	16	0	0	0	0	0%	None	
Acenaphthylene	PAH	0%	16	0	16	0	0	0	0	0%	None	
Anthracene	PAH	0%	16	0	16	0	0	0	0	0%	None	
Fluoranthene	PAH	6%	16	0	16	0	0	0	0	0%	None	
Fluorene	PAH	0%	16	0	16	0	0	0	0	0%	None	
Naphthalene	PAH	0%	16	0	16	0	0	0	0	0%	None	
Phenanthrene	PAH	0%	16	0	16	0	0	0	0	0%	None	
Pyrene	PAH	0%	16	0	16	0	0	0	0	0%	None	
TPH	petroleum	100%	1	0	1	0	0	0	0	0%	None	
2,4,5-Trichlorophenol	SVOC	0%	16	0	15	1	0	0	0	0%	None	
2,4,6-Trichlorophenol	SVOC	0%	16	0	16	0	0	0	0	0%	None	
2,4-Dichlorophenol	SVOC	0%	16	0	16	0	0	0	0	0%	None	
4-Chloroaniline	SVOC	0%	16	0	16	0	0	0	0	0%	None	
bis(2-Ethylhexyl)phthalate	SVOC	0%	16	16	0	0	0	0	0	0%	None	
Dibenzofuran	SVOC	0%	16	0	16	0	0	0	0	0%	None	
n-Nitroso-di-n-propylamine	SVOC	0%	16	0	16	0	0	0	0	0%	None	
n-Nitrosodiphenylamine	SVOC	0%	16	0	16	0	0	0	0	0%	None	
Pentachlorophenol	SVOC	0%	16	0	16	0	0	0	0	0%	None	
2-Chlorophenol	VOC	0%	16	0	16	0	0	0	0	0%	None	
Phenol	VOC	0%	16	0	16	0	0	0	0	0%	None	

Notes:

- ND - not detected
- NOEC - no observed effect concentration
- LOEC - lowest observed effect concentration
- Uncertain - retained as an uncertainty
- None - exposure concentration does not exceed the either toxicity value
- Possible - Exposure exceeds the NOEC value but not the LOEC value
- Probable - Exposure exceeds the LOEC value

Table 26
Refined Risk Estimation for Wildlife Exposed to Site Soils
Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Receptor	Chemical	Dall Food Ingestion from Site (mg/d/yr)				Small Mammals and Other Vertebrates				Soil Invertebrates				Terrestrial Plants				LOELs H _d and Q _d	Dose Rate and Frequency (%) Risk Concentrations							
		Bod Weight (kg)	Area (ha)	F _{max}	F _{min}	Percent of Food	Soil to Tissue Factor	Percent of Tissue	Tissue Concentration (mg/kg)	Total Available (mg/kg)	Percent of Food	Soil to Tissue Factor	Percent of Tissue	Tissue Concentration (mg/kg)	Total Plant Food (mg/kg)	Percent of Food	Soil to Tissue Factor			Percent of Tissue	Tissue Concentration (mg/kg)	Total Chemical Intake (mg/kg/day)	H _d (mg/kg)	Q _d (mg/kg)		
																									Soil to Tissue F Factor	Percent of Tissue
Sage Sparrow	Toluene	0.019	0.026	1	0.026	0	0	0	0	0	0	100	0	0	0	100	0	0	0	0.000000	17.2	34.4	<0.01	23%	None	
Sage Sparrow	Trans,1,2-Dichloroethene	0.019	0.026	1	0.026	0	0	0	0	0	100	0	0	0	0	100	0	0	0	0.000000	17.2	34.4	<0.01	5%	None	
Loganhead Shrike	HI - VOCs	0.047	0.022	1	0.022	0	0	0	0	0	100	3.71	7.42	0	0	100	0	0	0	0.166	0.07	1.8	11	0.62	2%	Possible
Loganhead Shrike	2,4-Dichlorodioxane	0.047	0.022	1	0.022	0	0	0	0	0	100	3.16	6.32	0.740	0	0	100	0	0	0.740	0.07	1.8	11	0.41	0%	Uncertain
Loganhead Shrike	2-Amino-4,6-Dichlorodioxane	0.047	0.022	1	0.022	0	0	0	0	0	100	3.16	6.32	0.150	0	0	100	0	0	0.150	0.07	1.8	11	0.083	0%	Uncertain
Loganhead Shrike	2-Nitrodioxane	0.047	0.022	1	0.022	0	0	0	0	0	100	30.9	61.8	0.085	0	0	100	0	0	0.085	0.07	1.8	2.1	0.054	0%	Uncertain
Loganhead Shrike	4-Nitrodioxane	0.047	0.022	1	0.022	0	0	0	0	0	100	21.5	43.0	0.117	0	0	100	0	0	0.117	0.07	1.8	1.7	0.065	0%	Uncertain
Loganhead Shrike	HMX	0.047	0.022	1	0.022	0	0	0	0	0	100	0.313	0.626	0.0597	0	0	100	0	0	0.0597	0	0	0	<0.01	31%	None
Loganhead Shrike	Nitrobenzene	0.047	0.022	1	0.022	0	0	0	0	0	100	29.7	59.4	6.95	0	0	100	0	0	6.95	0.07	1.8	29	3.9	0%	Uncertain
Loganhead Shrike	ROX	0.047	0.022	1	0.022	0	0	0	0	0	100	1.95	3.9	1.95	0	0	100	0	0	1.95	0.07	1.8	8	1.1	0%	Uncertain
Loganhead Shrike	HI - Energetics	0.047	0.022	1	0.022	0	0	0	0	0	100	0.945	1.89	0	0	100	0	0	0	0.945	0.16	4.0	5.9	1.6	44%	Probable
Loganhead Shrike	Cadmium	0.047	0.022	1	0.022	0	0	0	0	0	100	46.2	92.4	1.07	0	0	100	0	0	1.07	0.16	4.0	15.9	4.3	85%	None
Loganhead Shrike	Copper	0.047	0.022	1	0.022	0	0	0	0	0	100	48.2	96.4	32.8	0	0	100	0	0	32.8	0.19	4.7	17.6	4.8	83%	None
Loganhead Shrike	Lead	0.047	0.022	1	0.022	0	0	0	0	0	100	0.953	1.91	0.105	0	0	100	0	0	0.105	0.16	4.0	1.8	0.24	6%	Uncertain
Loganhead Shrike	Manganese	0.047	0.022	1	0.022	0	0	0	0	0	100	0.953	1.91	0.058	0	0	100	0	0	0.058	0.16	4.0	0.8	0.11	1%	Uncertain
Loganhead Shrike	Zinc	0.047	0.022	1	0.022	0	0	0	0	0	100	0.953	1.91	0.029	0	0	100	0	0	0.029	0.16	4.0	0.59	0.08	100%	None
Loganhead Shrike	HI - Inorganics	0.047	0.022	1	0.022	0	0	0	0	0	100	29	58.0	62.8	0	0	100	0	0	62.8	0.23	5.8	20.9	5.6	14%	Possible
Loganhead Shrike	Acrylamide	0.047	0.022	1	0.022	0	0	0	0	0	100	2.42	4.84	0.200	0	0	100	0	0	0.200	0.23	5.8	1.1	0.14	7%	None
Loganhead Shrike	Hexachlorobenzene	0.047	0.022	1	0.022	0	0	0	0	0	100	0.953	1.91	0.076	0	0	100	0	0	0.076	0.23	5.8	0.5	0.06	0%	Uncertain
Loganhead Shrike	Polychlorobiphenyls	0.047	0.022	1	0.022	0	0	0	0	0	100	9.57	19.1	3.04	0	0	100	0	0	3.04	0.23	5.8	0.3	0.04	0%	Uncertain
Loganhead Shrike	Naphthalene	0.047	0.022	1	0.022	0	0	0	0	0	100	4.0	8.0	0.976	0	0	100	0	0	0.976	0.23	5.8	0.69	0.09	25%	None
Loganhead Shrike	Phenanthrene	0.047	0.022	1	0.022	0	0	0	0	0	100	1.72	3.44	1.88	0	0	100	0	0	1.88	0.23	5.8	0.35	0.04	18%	None
Loganhead Shrike	BPA	0.047	0.022	1	0.022	0	0	0	0	0	100	1.72	3.44	0	0	0	100	0	0	0	0.23	5.8	2.4	0.31	4%	Uncertain
Loganhead Shrike	HI - PAHs	0.047	0.022	1	0.022	0	0	0	0	0	100	0	0	0	0	0	100	0	0	0	0.23	5.8	2.4	0.31	4%	Uncertain
Loganhead Shrike	HI - PCBs	0.047	0.022	1	0.022	0	0	0	0	0	100	35.1	70.2	47.0	0	0	100	0	0	47.0	0.23	5.8	16.9	4.5	11%	Possible
Loganhead Shrike	2,4,6-Trichlorobenzene	0.047	0.022	1	0.022	0	0	0	0	0	100	35.1	70.2	39.1	0	0	100	0	0	39.1	0.23	5.8	16.9	4.5	11%	Possible
Loganhead Shrike	Hexachlorocyclopentadiene	0.047	0.022	1	0.022	0	0	0	0	0	100	35.1	70.2	31.2	0	0	100	0	0	31.2	0.23	5.8	16.9	4.5	11%	Possible
Loganhead Shrike	Diethylhexylphthalate	0.047	0.022	1	0.022	0	0	0	0	0	100	35.1	70.2	50.1	1.12	0	100	0	0	1.12	0.23	5.8	16.9	4.5	11%	Possible
Loganhead Shrike	Diethylphthalate	0.047	0.022	1	0.022	0	0	0	0	0	100	35.1	70.2	40.8	0.99	0	100	0	0	0.99	0.23	5.8	16.9	4.5	11%	Possible
Loganhead Shrike	Dibutylphthalate	0.047	0.022	1	0.022	0	0	0	0	0	100	35.1	70.2	35.3	0.74	0	100	0	0	0.74	0.23	5.8	16.9	4.5	11%	Possible
Loganhead Shrike	Dibutyladipate	0.047	0.022	1	0.022	0	0	0	0	0	100	38	76.0	36.0	0.91	0	100	0	0	0.91	0.23	5.8	16.9	4.5	11%	Possible
Loganhead Shrike	Di-nonylphthalate	0.047	0.022	1	0.022	0	0	0	0	0	100	30.8	61.6	32.3	0.71	0	100	0	0	0.71	0.23	5.8	16.9	4.5	11%	Possible
Loganhead Shrike	Hexachlorobenzene	0.047	0.022	1	0.022	0	0	0	0	0	100	40.2	80.4	9.42	0	0	100	0	0	9.42	0.23	5.8	1.7	0.2	0%	Uncertain
Loganhead Shrike	Hexachlorobiphenyls	0.047	0.022	1	0.022	0	0	0	0	0	100	38.5	77.0	0.000889	0	0	100	0	0	0.000889	0.23	5.8	0.56	0.07	4%	None
Loganhead Shrike	Hexachlorocyclopentadiene	0.047	0.022	1	0.022	0	0	0	0	0	100	38	76.0	8.33	0	0	100	0	0	8.33	0.23	5.8	2.3	0.3	4%	None
Loganhead Shrike	Hexachloroindole	0.047	0.022	1	0.022	0	0	0	0	0	100	38	76.0	8.30	0	0	100	0	0	8.30	0.23	5.8	2.3	0.3	4%	None
Western Meadowlark	HI - VOCs	0.103	0.020	1	0.020	0	0	0	0	0	100	3.71	7.42	0	0	100	0	0	0	0.147	0.20	5.0	1.0	0.62	2%	Possible
Western Meadowlark	2,4-Dichlorodioxane	0.103	0.020	1	0.020	0	0	0	0	0	100	3.16	6.32	0.058	0	0	100	0	0	0.058	0.20	5.0	1.0	0.62	2%	Possible
Western Meadowlark	2-Amino-4,6-Dichlorodioxane	0.103	0.020	1	0.020	0	0	0	0	0	100	30.9	61.8	0.150	0	0	100	0	0	0.150	0.20	5.0	1.0	0.62	2%	Possible
Western Meadowlark	2-Nitrodioxane	0.103	0.020	1	0.020	0	0	0	0	0	100	27.6	55.2	0.0858	0	0	100	0	0	0.0858	0.20	5.0	1.0	0.62	2%	Possible
Western Meadowlark	4-Nitrodioxane	0.103	0.020	1	0.020	0	0	0	0	0	100	27.6	55.2	0.104	0	0	100	0	0	0.104	0.20	5.0	1.0	0.62	2%	Possible
Western Meadowlark	HMX	0.103	0.020	1	0.020	0	0	0	0	0	100	0.313	0.626	0.0597	0	0	100	0	0	0.0597	0.20	5.0	1.0	0.62	2%	Possible
Western Meadowlark	Nitrobenzene	0.103	0.020	1	0.020	0	0	0	0	0	100	29.7	59.4	6.95	0	0	100	0	0	6.95	0.20	5.0	1.0	0.62	2%	Possible
Western Meadowlark	ROX	0.103	0.020	1	0.020	0	0	0	0	0	100	1.72	3.44	1.72	0	0	100	0	0	1.72	0.20	5.0	1.0	0.62	2%	Possible
Western Meadowlark	HI - Energetics	0.103	0.020	1	0.020	0	0	0	0	0	100	0.945	1.89	0	0	100	0	0	0	0.945	0.20	5.0	1.0	0.62	2%	Possible
Western Meadowlark	Cadmium	0.103	0.020	1	0.020	0	0	0	0	0	100	46.2	92.4	1.07	0	0	100	0	0	1.07	0.20	5.0	1.0	0.62	2%	Possible
Western Meadowlark	Copper	0.103	0.020	1	0.020	0	0	0	0	0	100	48.2	96.4	32.8	0	0	100	0	0	32.8	0.20	5.0	1.0	0.62	2%	Possible
Western Meadowlark	Lead	0.103	0.020	1	0.020	0	0	0	0	0	100	0.953	1.91	0.105	0	0	100	0	0	0.105	0.20	5.0	1.0			

Table 26
Refined Risk Estimation for Wildlife Exposed to Site Soils
Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Receptor	Chemical	Body Weight (kg)	Daily Food Ingestion (kg/day)	Soil to Tissue Factor	Small Mammals and Other Vertebrates			Soil Invertebrates			Terrestrial Plants			Incidental Soil Ingestion (mg/kg/day)	Percent of Body as Soil	Total Chemical Intake (mg/kg/day)	HRAEL TRV (mg/kg-h)	HRAEL HQ and Quotient	LOAEL HQ and Quotient	Deletion Frequency (%)	Risk Conclusions			
					Percent of Body	Total Invertebrate	Tissue Concentration	Percent of Body	Total Plant Food	Tissue Concentration	Percent of Body	Total Chemical Intake	HRAEL TRV									HRAEL HQ and Quotient	LOAEL HQ and Quotient	Deletion Frequency (%)
					(%)	(mg/kg-h)	(mg/kg)	(%)	(mg/kg-h)	(mg/kg)	(%)	(mg/kg-day)	(mg/kg-h)									(mg/kg-h)	(mg/kg-h)	(%)
Burrowing Owl	2-Amino-4,6-dimethylimidazo[5,1-f]s-triazole	0.157	0.111	1	0.111	100	2.13	1.77	0	0	0	0	0.196	1.50	5.00	0.00833	0.205	9	62.5	1.8	0.11	0%	Uncertain	
Burrowing Owl	HMX	0.157	0.111	1	0.111	100	2.13	1.77	0	0	0	0	1.92	8.12	5.00	0.0461	1.97	9	62.5	1.8	0.37	0%	Uncertain	
Burrowing Owl	Nonionics	0.157	0.111	1	0.111	100	0.525	5.51	0.672	0	0	0	0.672	30.5	5.00	0.0583	0.671	0.07	1.8	0.40	0.37	0%	Uncertain	
Burrowing Owl	HI - Energetics	0.157	0.111	1	0.111	100	0.525	5.51	0.672	0	0	0	0.672	30.5	5.00	0.0583	0.671	0.07	1.8	0.40	0.37	0%	Uncertain	
Burrowing Owl	Cadmium	0.157	0.111	1	0.111	100	0.525	1.81	0.201	0	0	0	0.201	7.80	5.00	0.0433	0.245	0.16	0.61	1.4	0.40	0.44%	Possible	
Burrowing Owl	Copper	0.157	0.111	1	0.111	100	0.525	26.7	2.85	0	0	0	2.85	4150	5.00	23.1	26.9	47	61.7	0.55	0.42	85%	None	
Burrowing Owl	Lead	0.157	0.111	1	0.111	100	0.525	66.1	7.24	0	0	0	7.24	11000	5.00	61.1	68.5	0.19	1.76	360	39	0.16	83%	Probable
Burrowing Owl	Molybdenum	0.157	0.111	1	0.111	100	0.525	4.93	0.548	0	0	0	0.548	4.93	5.00	0.0274	0.275	3.5	36.3	0.16	0.016	0%	None	
Burrowing Owl	Polychlorinated Biphenyls	0.157	0.111	1	0.111	100	0.525	0.93	0.103	0	0	0	0.103	0.93	5.00	0.0187	0.187	0.014	0.13	0.13	0.13	100%	Possible	
Burrowing Owl	Zinc	0.157	0.111	1	0.111	100	0.525	134	14.9	0	0	0	14.9	537	5.00	1.67	16.8	14.5	13.1	1.2	36.4	39.4	(depr)	Probable
Burrowing Owl	HI - Neurotoxic	0.157	0.111	1	0.111	100	0.525	0.554	0.0615	0	0	0	0.0615	30.5	5.00	0.0583	0.120	0.11	11	1.09	0.0709	0%	Uncertain	
Burrowing Owl	Dibenzofuran	0.157	0.111	1	0.111	100	0.329	3.48	0.383	0	0	0	0.383	30.5	5.00	0.0583	0.442	0.11	11	4.02	0.0402	0%	Uncertain	
Burrowing Owl	Dibenzodioxin	0.157	0.111	1	0.111	100	0.329	3.48	0.383	0	0	0	0.383	30.5	5.00	0.0583	0.442	0.11	11	4.02	0.0402	0%	Uncertain	
Burrowing Owl	Dibenzofuran	0.157	0.111	1	0.111	100	0.329	3.48	0.383	0	0	0	0.383	30.5	5.00	0.0583	0.442	0.11	11	4.02	0.0402	0%	Uncertain	
Burrowing Owl	Dibenzodioxin	0.157	0.111	1	0.111	100	0.329	3.48	0.383	0	0	0	0.383	30.5	5.00	0.0583	0.442	0.11	11	4.02	0.0402	0%	Uncertain	
Burrowing Owl	Di-nonylphthalate	0.157	0.111	1	0.111	100	0.361	4.00	0.444	0	0	0	0.444	30.5	5.00	0.0583	0.132	0.11	11	1.26	0.0720	0%	Uncertain	

Notes:
kg = kilograms
µg = micrograms per kilogram of body weight per day
EPC = exposure point concentration
LOAEL = lowest observed adverse effect level
MHI = monocyclic aromatic hydrocarbon
PMH = polycyclic aromatic hydrocarbon
TRV = toxicological reference value
For all screening, it has been conservatively assumed that all chemical intake is absorbed by the receptor.
Hazard Index (HI) calculated by summing HQs for detected analytes
a) Food Intake from small mammals = (daily food ingestion from site) X (fraction of diet as small mammals) X (soil to small mammal transfer factor) X (soil concentration).
b) Food Intake from terrestrial invertebrates = (daily food ingestion from site) X (fraction of diet as terrestrial invertebrates) X (soil to terrestrial invertebrate transfer factor) X (soil concentration).
c) Total food intake = (food intake from small mammals and other vertebrates) + (food intake from terrestrial invertebrates) + (food intake from plants).
d) Incidental soil intake = (daily food ingestion from site) X (fraction of diet as soil) X (soil concentration).
e) Total chemical intake = (total food intake) + (water intake) + (incidental soil intake).
NSV = no screening value available
Exposure to TPH is only from abiotic media (soil and water); thus, there is no food component associated with exposure to TPH (Abbers, 1996)

Table 27
 Refined Risk Estimation for Wildlife Exposed to Site Soils Within Habitat Areas
 Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Receptor	Chemical	Soil Invertebrates	Small Mammals and Other Vertebrates				Terrestrial Plants				MOAEL TRV (mg/kg-d)	LOAEL HQ and Quotient	MOAEL HQ and Quotient	Detection Frequency (%)	Risk Conclusions		
			Daily Food Ingestion (g/day)	Soil to Tissue Transfer Factor	Tissue Concentration (mg/kg DM)	Food Intake (mg/kg d)	Percent of Food Intake (mg/kg d)	Soil to Tissue Transfer Factor	Tissue Concentration (mg/kg DM)	Food Intake (mg/kg d)						Percent of Food Intake (mg/kg d)	Soil to Tissue Transfer Factor
Dirt/Kangaroo Rat	2,4-Dinitrophenols	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2,4-Dinitrophenols	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2,4-Dinitrophenols	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2,4-Dinitrophenols	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2,4-Dinitrophenols	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2,4-Dinitrophenols	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2,4-Dinitrophenols	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2,4-Dinitrophenols	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2,4-Dinitrophenols	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	2,4-Dinitrophenols	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dirt/Kangaroo Rat	Hexachlorocyclopentadiene	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hexachlorocyclopentadiene	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hexachlorocyclopentadiene	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hexachlorocyclopentadiene	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hexachlorocyclopentadiene	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hexachlorocyclopentadiene	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hexachlorocyclopentadiene	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hexachlorocyclopentadiene	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hexachlorocyclopentadiene	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hexachlorocyclopentadiene	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dirt/Kangaroo Rat	Hexachlorocyclopentadiene	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hexachlorocyclopentadiene	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hexachlorocyclopentadiene	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hexachlorocyclopentadiene	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hexachlorocyclopentadiene	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hexachlorocyclopentadiene	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hexachlorocyclopentadiene	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hexachlorocyclopentadiene	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hexachlorocyclopentadiene	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hexachlorocyclopentadiene	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Dirt/Kangaroo Rat	Hexachlorocyclopentadiene	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hexachlorocyclopentadiene	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hexachlorocyclopentadiene	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hexachlorocyclopentadiene	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hexachlorocyclopentadiene	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hexachlorocyclopentadiene	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Hexachlorocyclopentadiene	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Hexachlorocyclopentadiene	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Hexachlorocyclopentadiene	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	
	Hexachlorocyclopentadiene	0.052	0.111	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 27
 Refined Risk Estimation for Wildlife Exposed to Site Soils Within Habitat Areas
 Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Receptor	Chemical	Soil Invertebrates	Small Mammals and Other Vertebrates			Terrestrial Plants			MOAEL TRV (mg/kg-d)	LOAEL TRV (mg/kg-d)	MOAEL HQ and QM (mg/kg-d)	LOAEL HQ and QM (mg/kg-d)	Deviation Frequency (%)	Risk Conclusions						
			Dail Food Ingestion (mg/kg-d)	Percent of Soil to Tissue Transfer Factor	Food Intake (mg/kg-d)	Soil to Tissue Transfer Factor	Percent of Soil to Tissue Transfer Factor	Total Food Intake (mg/kg-d)							Percent of Soil to Tissue Transfer Factor	Total Food Intake (mg/kg-d)	Percent of Soil to Tissue Transfer Factor	Total Food Intake (mg/kg-d)	Percent of Soil to Tissue Transfer Factor	Total Food Intake (mg/kg-d)
Coyote	Cyanide	0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026						
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026						
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026						
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026						
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026						
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026						
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026					
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026					
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026					
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026					
Coyote	Hexachlorobenzene	0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026						
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026						
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026						
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026						
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026						
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026						
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026						
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026					
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026					
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026					
Coyote	Hexachlorocyclopentadiene	0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026						
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026						
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026						
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026						
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026						
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026						
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026						
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026					
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026					
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026					
Coyote	Hexachlorobenzene	0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026						
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026						
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026						
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026						
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026						
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026						
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026						
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026						
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026						
		0.019	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026	0.026						

Table 27
Refined Risk Estimation for Wildlife Exposed to Site Soils Within Habitat Areas
Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Receptor	Chemical	Bow Weight (kg)	Daily Food Intake (g/day)	Daily Food Intake (lb/day)	Area Use Factor	Small Mammals and Other Vertebrates			Soil Invertebrates			Terrestrial Plants			MOAEL TRV (mg/kg-d)	MOAEL TRV (mg/lb-d)	MOAEL TRV (mg/kg-d)	MOAEL TRV (mg/lb-d)	Total Chemical Intake (mg/kg-d)	Incidental Soil Intake (mg/kg-d)	Percent of Diet as Soil	Refined Habitat Soil EPC (mg/kg)	Percent of Diet as Soil	Total Food Intake (mg/kg-d)	Total Food Intake (mg/lb-d)	Soil to Tissue Transfer Factor	Percent of Diet	Tissue Concentration (mg/kg DM)	Total Invertebrate Food Intake (mg/kg-d)	Percent of Diet	Soil to Tissue Transfer Factor	Tissue Concentration (mg/kg DM)	Total Plant Food Intake (mg/kg-d)	Percent of Diet	Soil to Tissue Transfer Factor	Tissue Concentration (mg/kg DM)	Detection Frequency (%)	LOAEL HA and QMEL HA and QMEL	Risk Conclusions				
						Percent of Diet	Food Intake (mg/kg-d)	Soil to Tissue Transfer Factor	Tissue Concentration (mg/kg DM)	Food Intake (mg/kg-d)	Percent of Diet	Food Intake (mg/kg-d)	Soil to Tissue Transfer Factor	Tissue Concentration (mg/kg DM)																										Food Intake (mg/kg-d)	Percent of Diet	Food Intake (mg/kg-d)	Soil to Tissue Transfer Factor
Burrowing Owl	Chrysomelids	0.157	0.111	1	0.111	100	0.0586	0	0	0	0	0	0	0	0	0	0	0	0.00100	0	0.00	0.0025	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0%	0.078	0%				
Burrowing Owl	Chrysomelids	0.157	0.111	1	0.111	100	0.0586	0	0	0	0	0	0	0	0	0	0	0	0.00100	0	0.00	0.0025	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0%	0.078	0%

Notes:
 kg = kilograms, kilogram per kilogram of body weight per day.
 NA = not applicable.
 EPC = exposure point concentration.
 NSV = no screening value available.
 MOAEL = no observed adverse effect level.
 TRV = toxicity reference value.
 For the screening, it has been conservatively assumed that all chemical intake is absorbed by the receptor.
 Hazard quotient is calculated one.
 a) Food intake from terrestrial invertebrates = (daily food ingestion from site) X (fraction of diet as terrestrial invertebrates) X (soil to terrestrial invertebrate transfer factor) X (soil concentration).
 b) Food intake from small mammals = (daily food ingestion from site) X (fraction of diet as small mammal) X (soil to small mammal transfer factor) X (soil concentration).
 c) Food intake from terrestrial plants = (daily food ingestion from site) X (fraction of diet as terrestrial plant) X (soil to terrestrial plant transfer factor) X (soil concentration).
 d) Total food intake = (soil food intake + (terrestrial invertebrates + (small mammals + (terrestrial plants)). (soil food intake + (soil concentration).
 e) Total chemical intake = (soil food intake + (terrestrial invertebrates + (small mammals + (terrestrial plants)). (soil food intake + (soil concentration).
 Exposure to TRV is only from above intake (soil and water); thus, there is no food component associated with exposure to TRV (Athers, 1995).

Figures

Figure 1
Terrestrial Food Web Model
Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

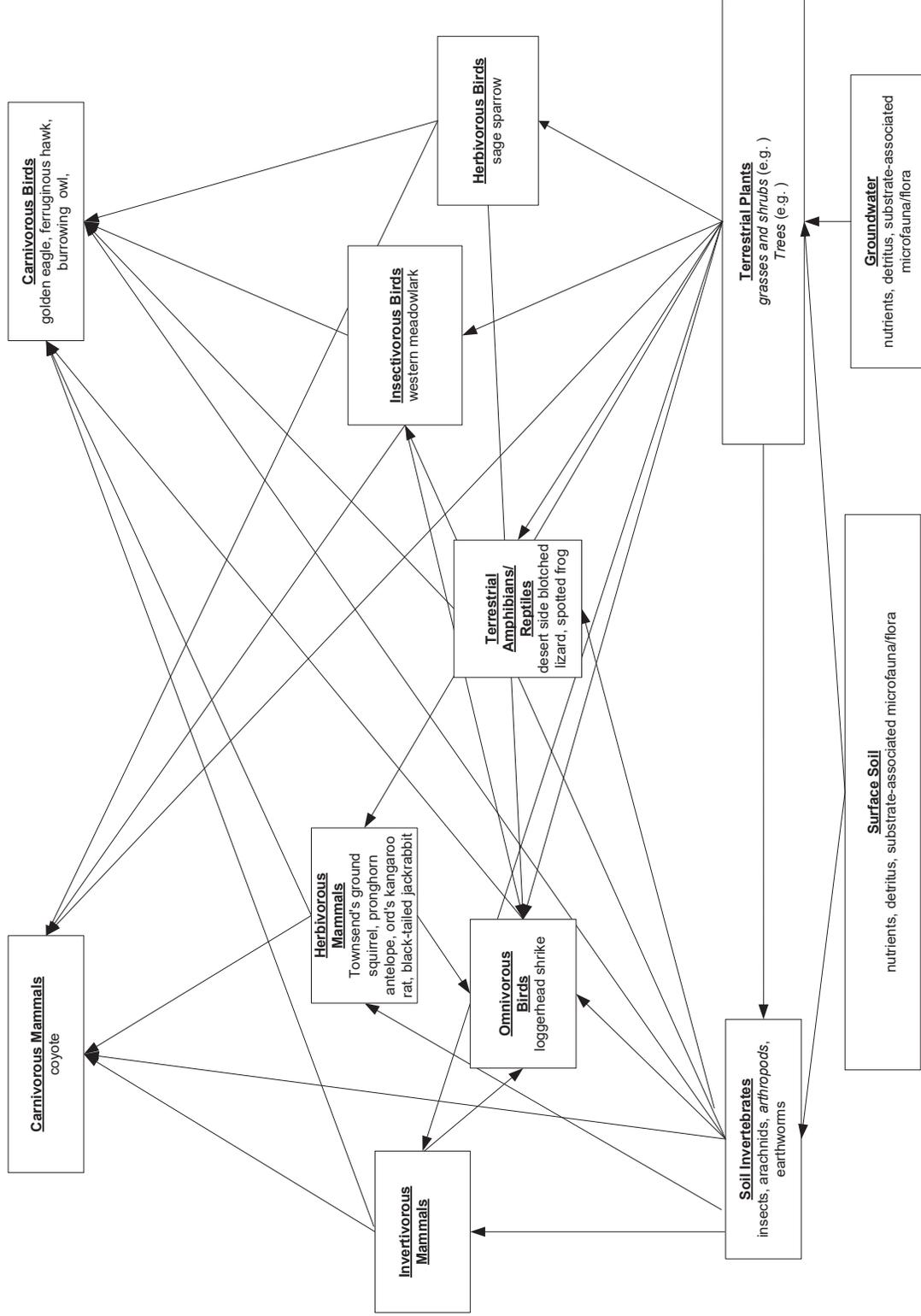
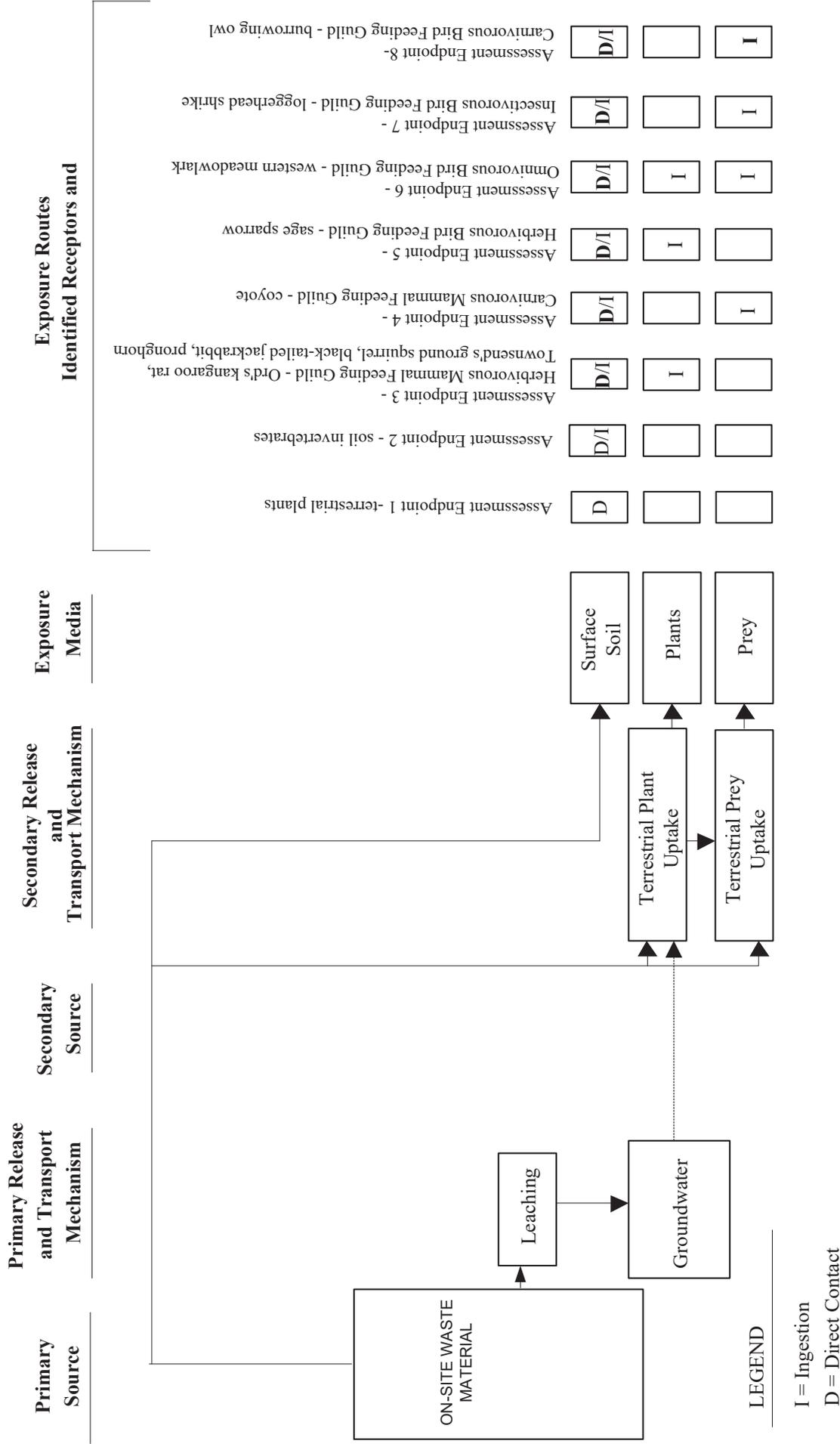


Figure 2
Ecological Conceptual Site Model
Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment



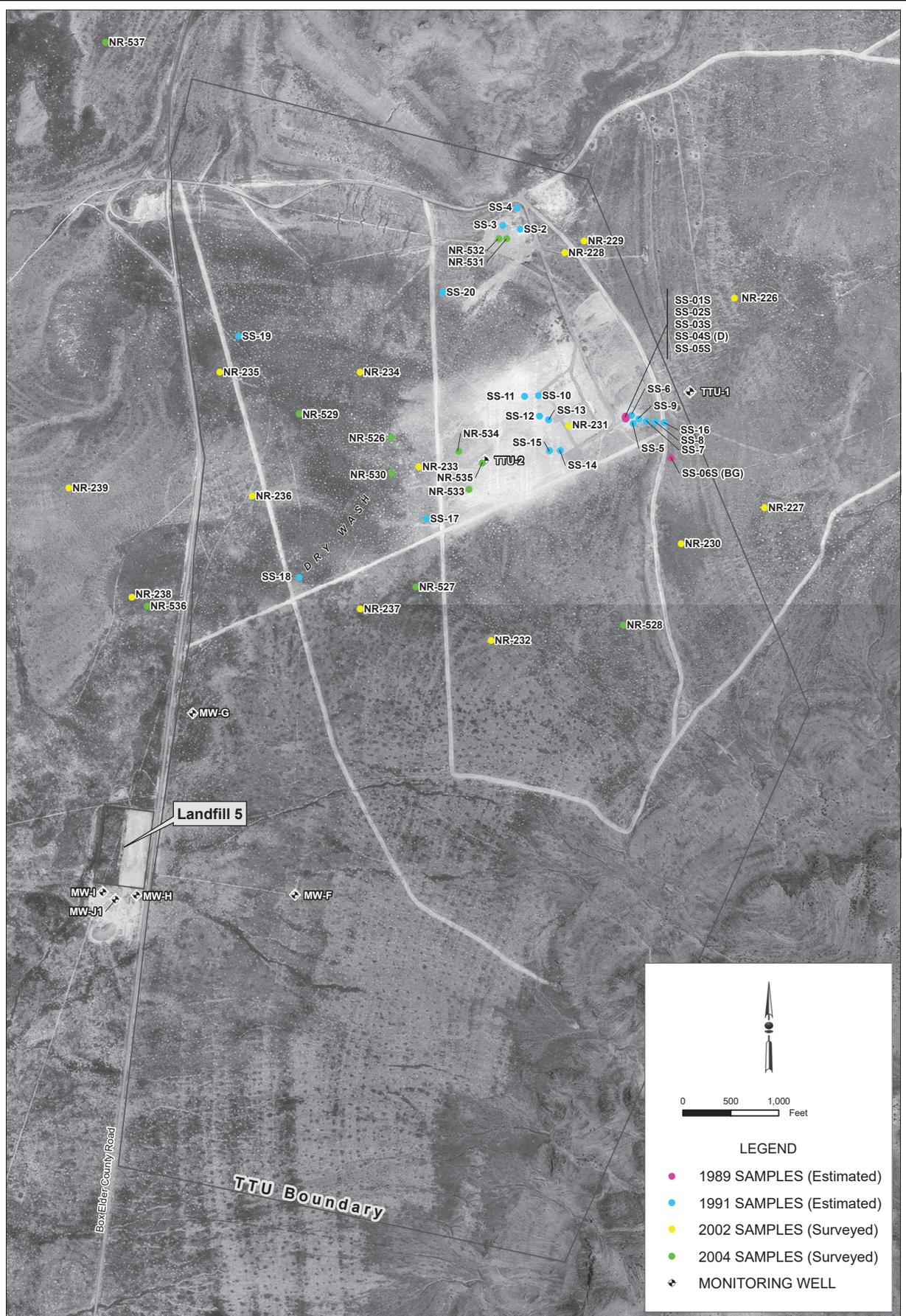


FIGURE 3
TTU SITE MAP
 ATTACHMENT 10A - THERMAL TREATMENT UNIT ECOLOGICAL RISK ASSESSMENT

Appendix A

Appendix A: Descriptions of Studies Used to Calculate NOAELs and LOAELs

Compound: Acenaphthene
Form: Not applicable
Reference: EPA, 2001
Test Species: Mouse
Body weight: 0.03 kg (EPA, 1988a)
Exposure Duration: 90 days (≥ 90 days = chronic)
Endpoint: Hepatotoxicity
Exposure Route: Oral gavage
Dosage: Three dose levels: 175, 350 and 700 mg/kg/d;
Calculations: Not applicable
Comments: Liver weight changes accompanied by microscopic alteration (cellular hypertrophy) were noted in both mid- and high-doses animals and seemed to be dose-dependent. Additionally, high-dose males and mid- and high-doses females showed significant increases in cholesterol levels. The LOAEL is 350 mg/kg/d based on hepatotoxicity; the NOAEL is 175 mg/kg/day.
Final NOAEL: 175 mg/kg/d
Final LOAEL: 350 mg/kg/d

Compound: Acetone
Form: not applicable
Reference: EPA, 1986c
Test Species: Rat
Body weight: 0.35 kg (EPA, 1988a)
Food Consumption: 0.028 kg/d (calculated using allometric equation from EPA, 1988a)
Study Duration: 90 days (<1 yr and not during a critical lifestage=subchronic).
Endpoint: Liver and kidney damage
Exposure Route: oral intubation
Dosage: three dose levels:
100, 500, and 2500 mg/kg/d;
NOAEL = 100 mg/kg/d
LOAEL = 500 mg/kg/d
Calculations: not applicable
Comments: Significant tubular degeneration of the kidneys and increases in kidney weights were observed at the 500 and 2500 mg/kg/d dose levels; liver weights were increased at the 2500 mg/kg/d level. Because no significant differences were observed at the 100 mg/kg/d dose level and the study considered exposure for 90 days and did not include critical lifestages (reproduction), this dose was considered to be a subchronic NOAEL. The 500 mg/kg/d dose was considered to be a subchronic LOAEL. Chronic

NOAEL and LOAEL values were estimated by multiplying the subchronic NOAEL and LOAEL by a subchronic to chronic uncertainty factor of 0.1.

Final NOAEL: 10 mg/kg/d

Final LOAEL: 50 mg/kg/d

Compound: Acetone
Form: Not applicable
Reference: Hill and Camardese, 1986
Test Species: Japanese Quail
 Body Weight: 0.60kg (from study)
 Food Consumption: 11.8 g (from study)
Exposure Duration: acute - single dose followed by 14 day observation
Endpoint: mortality, overt signs of toxicity
Exposure Route: oral gavage
Dosage: doses ranged from 10000 to 40000 mg/kg
Calculations:

$$NOAEL : \left(\frac{20000 \text{ mg Acetone}}{\text{kg food}} \times \frac{11.8 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ mg}} \right) / 0.60 \text{ kg BW} = 393.3 \text{ mg/kg/d}$$

Acute NOAEL: 393 mg/kg/d

Comments: No mortality observed at any dose level. LC50 of >40000mg/kg is reported. No overt signs of toxicity at concentrations of 40000 ppm. Because no signs of toxicity were observed at 40000 ppm, this dose was considered to be an acute NOAEL. A chronic NOAEL was estimated by multiplying the subchronic LOAEL by a subchronic to chronic uncertainty factor of 0.1.

Final NOAEL: 39.3 mg/kg/d

Final LOAEL: 393 mg/kg

Compound: Aluminum
Form: AlCl₃
Reference: Ondreicka et al., 1966
Test Species: Mouse
Exposure Duration: 3 generations (>1 yr and during a critical lifestage = chronic)
Endpoint: reproduction
Exposure Route: oral in water
Dosage: one dose level: 19.3 mg al/kg/d = LOAEL
Calculations: not applicable
Comments: While there were no effects on the number of litters or number of offspring per litter, growth of generation 2 and 3 was significantly reduced. Therefore, this dose was considered to be a chronic LOAEL. A chronic NOAEL was estimated by multiplying the chronic LOAEL by a LOAEL-NOAEL uncertainty factor of 0.1.

Final NOAEL: 1.93 mg/kg/d
Final LOAEL: 19.3 mg/kg/d

Compound: Aluminum
Form: Al₂(SO₄)₃
Reference: Carriere et al., 1986
Test Species: ringed dove
 0.155 kg body weight (Terres, 1980)
 Food consumption: 0.017 kg/d (calculated using allometric equation from Nagy, 1987)
Exposure Duration: 4 months (>10 week and during a critical lifestage = chronic)
Endpoint: reproduction
Exposure Route: oral in diet
Dosage: one dose level: 1000 ppm Al = NOAEL
Calculations:

$$NOAEL : \left(\frac{1000 \text{ mg Al}}{\text{kg food}} \times \frac{17 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ g}} \right) / 0.155 \text{ kg BW} = 109.7 \text{ mg / kg / d}$$

Comments: Because no significant differences were observed at the 1000 ppm dose and the study considered exposure over 4 months, including critical lifestages (reproduction), this dose was considered to be a chronic NOAEL.
Final NOAEL: 109.7mg/kg/d

Compound: Anthracene
Form: Not applicable
Reference: IRIS, 2001
Test Species: Mouse
 Body weight: 0.03 kg (EPA, 1988a)
Exposure Duration: 90 days (≥ 90 days = chronic)
Endpoint: Survival and pathology
Exposure Route: Oral gavage
Dosage: Three dose levels: 250, 500, and 1,000 mg/kg/d;
Calculations: Not applicable
Comments: Mortality, clinical signs, body weights, food consumption, ophthalmology findings, hematology and clinical chemistry results, organ weights, organ-to-body weight ratios, gross pathology, and histopathology were evaluated. No treatment-related effects were observed at the highest dose level.
Final NOAEL: 1,000 mg/kg/d

Compound: Antimony
Form: NA
Reference: EPA, 2003 (EcoSSL)
Test Species: NA
Exposure Duration: NA
Endpoint: Growth and reproduction
Exposure Route: NA

Dosage: NA

Calculations: NA

Comments: A total of 11 papers with 31 toxicity test results were included in the derivation of this EcoSSL. A geometric mean of the NOAEL values for growth and reproduction was calculated at 13.3 mg antimony/kg bw/day. However, this value is higher than the lowest bounded LOAEL for effects on reproduction, growth, or survival. Therefore, the TRV was considered equal to the highest bounded NOAEL below the lowest bounded LOAEL and is equal to 0.059 mg antimony/kg bw/day.

Final NOAEL: 0.059 mg/kg/d

Compound: Aromatic Hydrocarbon (AH) Mixture
Form: Aromatics - ethylbenzene, 1,2,3,4-tetrahydronaphthalene, dimethylnaphthalene, 2,3,3-trimethylindolenine, acenaphthylene, acenaphthene, phenanthrene, 2-methylbenzothiazole, dibenzothiophene, and 2,6-dimethylquinoline
Reference: Patton and Dieter, 1980
Test Species: Mallard
 Body weight: 1.23 kg (mean from control group graph in study)
 Food consumption: 100 g/d (Heinz et al., 1989)
Exposure Duration: 7 month (>10 wk = chronic)
Endpoint: growth
Exposure Route: oral diet
Dosage: three dose groups (1% mixture in diet)
 10000 ppm paraffin mixture only,
 9600 ppm paraffin and 400 ppm AH, and
 6000 ppm paraffin and 4000 ppm AH

Calculations:

$$NOAEL : \left(\frac{4000 \text{ mg AH Mix}}{\text{kg food}} \times \frac{100 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ g}} \right) / 1.23 \text{ kg BW} = 325.2 \text{ mg / kg / d}$$

Comments: Because no adverse effects were reported for paraffin and aromatic hydrocarbon mixtures and because no adverse effects were reported for the paraffin only dose, a dose of 4000 ppm was considered to be a chronic NOAEL for the aromatic hydrocarbon mixture.

Final NOAEL: 325.2 mg/kg/d

Compound: Arsenic
Form: Arsenate (H₃AsO₄)
Reference: Nemec et al., 1998
Test Species: rabbit
Exposure Duration: days 6-18 of gestation (critical life stage-chronic)
Endpoint: reproduction

Exposure Route: oral gavage
Dosage: 4 concentrations as arsenate (0,0.19, 0.75, and 3 mg/kg/day)
(H₃AsO₄ is 52.78% As by weight)
Calculations: NA
Comments: Reproductive and maternal effects were observed only at the highest dose. This resulted in mortality for 7 of 20 doses; no maternal mortality was observed at any other doses. Number of fetuses/litter decreased and fetal reabsorptions increased at the highest dose, but the differences were not statistically significant. Because the study considered exposure during a critical lifestage, the 1.58 mg/kg dose was considered to be a chronic LOAEL.
Final NOAEL: 0.396 mg/kg/d
Final NOAEL: 1.58 mg/kg/d

Compound: Arsenic
Form: Sodium arsenate
Reference: Stanley et al., 1994
Test Species: mallard
Body weight: 1 kg (Heinz et al., 1989)
Food Consumption: 0.1 kg/d (Heinz et al., 1989)
Exposure Duration: 4 wks prior to breeding, through nesting, incubation, and hatch, to 14 d post hatch (> 10 week and during critical lifestage=chronic)
Endpoint: reproduction
Exposure Route: oral in diet
Dosage: 4 dose levels (As concentrations measured in food)
0.26, 22, 93, and 403 mg/kg
Calculations:

$$\left(\frac{0.26 \text{ mg As}}{\text{kg food}} \times \frac{100 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ g}} \right) / 1 \text{ kg BW} = 0.026 \text{ mg / kg / d}$$

$$\left(\frac{22 \text{ mg As}}{\text{kg food}} \times \frac{100 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ g}} \right) / 1 \text{ kg BW} = 2.2 \text{ mg / kg / d}$$

$$\left(\frac{93 \text{ mg As}}{\text{kg food}} \times \frac{100 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ g}} \right) / 1 \text{ kg BW} = 9.3 \text{ mg / kg / d}$$

$$\left(\frac{403 \text{ mg As}}{\text{kg food}} \times \frac{100 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ g}} \right) / 1 \text{ kg BW} = 40.3 \text{ mg / kg / d}$$

Comments: Although As did not increase duckling mortality, As at 40.3 mg/kg/d significantly reduced duckling production. No reduction duckling production or other adverse effects were observed at the other dose levels. Because the study considered exposure over 10 weeks and through reproduction, the 40.3 mg/kg/d dose was considered to be a chronic LOAEL.

Final NOAEL: 9.3 mg/kg/d
Final LOAEL: 40.3 mg/kg/d

Compound: Barium
Form: Barium Chloride
Reference: NTP, 1994
Test Species: Rat
 Body weight: 0.35 kg (EPA, 1988a)
 Water Consumption: 0.022 L/d (from study)
Study Duration: 105 weeks (> 1 year = chronic)
Endpoint: nephrotoxicity
Exposure Route: Oral in water
Dosage: Three dose levels: 500, 1,250, and 2,500 ppm Ba (as barium chloride);
 Authors calculated exposures
 Males - 15, 30, and 60 mg/kg/d
 Females - 15, 45, and 75 mg/kg/d

Calculations: Not applicable
Comments: Although no kidney-related lesions were observed in any treatment, kidney weights were significantly increased in females at the 2,500 ppm level. The 2,500 ppm dose level was thus judged to represent a chronic LOAEL.
Final NOAEL: 45 mg/kg/d
Final LOAEL: 75 mg/kg/d

Compound: Barium
Form: Barium Hydroxide
Reference: Johnson et al., 1960
Test Species: 1-day old chicks
 Body weight: 0.121 kg (mean for males and females at 14 d; EPA, 1988a)
 Food Consumption: 0.0126 kg/d (calculated using allometric equation from EPA, 1988a)
Study Duration: 4 weeks (< 10 weeks = subchronic)
Endpoint: Mortality
Exposure Route: Oral in diet
Dosage: Eight dose levels: 250, 500, 1,000, 2,000, 4,000, 8,000, 16,000, and 32,000 ppm Ba (as barium hydroxide)
 NOAEL = 2,000 ppm

Calculations:

$$\left(\frac{2,000 \text{ mg Ba}}{\text{kg food}} \times \frac{12.6 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1,000 \text{ g}} \right) / 0.121 \text{ kg BW} = 208.26 \text{ mg / kg / d}$$

$$\left(\frac{4,000 \text{ mg Ba}}{\text{kg food}} \times \frac{12.6 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1,000 \text{ g}} \right) / 0.121 \text{ kg BW} = 416.53 \text{ mg / kg / d}$$

Comments: To estimate daily Ba intake throughout the 4 week study period, food consumption of 2-week-old chicks was calculated. While this value will over- and

underestimate food consumption by younger and older chicks, it was assumed to approximate food consumption throughout the entire 4 week study. While Barium exposures up to 2,000 ppm produced no mortality, chicks in the 4,000 to 32,000 ppm groups experienced 5% to 100% mortality. Because 2,000 ppm was the highest nonlethal dose, this dose was considered to be a subchronic NOAEL. The 4,000 ppm dose was considered to be a subchronic LOAEL. Chronic NOAELs and LOAELs were estimated by multiplying the subchronic NOAELs and LOAELs by a subchronic to chronic uncertainty factor of 0.1.

Final NOAEL: 20.8 mg/kg/d

Final LOAEL: 41.7 mg/kg/d

Compound: Benzene

Form: Not applicable

Reference: Wolf et al., 1956

Test Species: Rat

Body weight: 0.175 to 0.250 kg (from study)

Exposure Duration: 187 days (≥ 90 days = chronic)

Endpoint: Survival and pathology

Exposure Route: Oral gavage

Dosage: Four dose levels: 1, 10 50, and 100 mg/kg/d

Calculations: Not applicable

Comments: Mortality was not reported at any dose level. Benzene at 1 mg/kg/d had no effect, while leucopenia and erythrocytopenia was observed at 10 mg/kg/d and higher dose levels. Therefore, 1 and 10 mg/kg/d were considered the NOAEL and LOAEL, respectively. Dose was adjusted for gavage schedule (5 days/week) for a NOAEL of 0.7 mg/kg/d and a LOAEL of 7 mg/kg/d.

Final NOAEL: 0.7 mg/kg/d

Final LOAEL: 7 mg/kg/d

Compound: Benzo(a)pyrene (BaP)

Form: Not applicable

Reference: Mackenzie and Angevine, 1981

Test Species: Mouse

Body weight: 0.03 kg (EPA, 1988a)

Exposure Duration: Days 7-16 of gestation (during critical lifestage = chronic)

Endpoint: Reproduction

Exposure Route: Oral intubation

Dosage: Three dose levels: 10, 40, and 160 mg/kg/d; LOAEL

Calculations: Not applicable

Comments: BaP exposure at 160 mg/kg/d significantly reduced pregnancy rates and percentage of viable litters. Pup weights were significantly reduced by all three dose levels. Total sterility was observed in 97% of offspring in the 40 and 160 mg/kg/d groups and fertility was impaired among offspring in the 10 mg/kg/d group. While the BaP exposures evaluated in this study were of a short duration, they occurred during a critical lifestage. Therefore, the 10 mg/kg/d dose was considered to be a chronic LOAEL. A chronic NOAEL was estimated by multiplying the chronic LOAEL by a LOAEL-NOAEL uncertainty factor of 0.1.

Final NOAEL: 1 mg/kg/d

Final LOAEL: 10 mg/kg/d

Compound: Bis(2-ethylhexyl) Phthalate (BEHP)
Form: Not applicable
Reference: Peakall, 1974
Test Species: Ringed Dove
 Body weight: 0.155 kg (Terres, 1980)
 Food consumption: 0.0127 kg/d (calculated using allometric equation from Nagy, 1987)
Exposure Duration: 4 weeks (during critical lifestage = chronic)
Endpoint: reproduction
Exposure Route: oral diet
Dosage: one dose level:
 NOAEL = 10 ppm
Calculations:

$$NOAEL : \left(\frac{10 \text{ mg BEHP}}{\text{kg food}} \times \frac{17.27 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ g}} \right) / 0.155 \text{ kg BW} = 1.11 \text{ mg / kg / d}$$

Comments: No significant reproductive effects were observed among doves on diets containing 10 ppm Bis(2-ethylhexyl)Phthalate, and the study considered exposure over 4 weeks and during a critical lifestage. Therefore, the 10 ppm dose was considered to be a chronic NOAEL.

Final NOAEL: 1.1 mg/kg/d

Compound: Bis(2-ethylhexyl)Phthalate (BEHP)
Form: not applicable
Reference: Lamb et al., 1987
Test Species: Mouse
 Body weight: 0.03 kg (EPA, 1988a)
 Food Consumption: 0.0055 kg/d
 (calculated using allometric equation from EPA, 1988a)
Study Duration: 105 d (during critical lifestage = chronic)
Endpoint: reproduction
Exposure Route: oral in diet
Dosage: three dose levels:
 0.01%, 0.1% and 0.3% of diet;
 NOAEL = 0.01% = 100 mg/kg
 LOAEL = 0.1% = 1000 mg/kg

Calculations:

$$NOAEL : \left(\frac{100 \text{ mg BEHP}}{\text{kg food}} \times \frac{5.5 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ mg}} \right) / 0.03 \text{ kg BW} = 18.33 \text{ mg/kg/d}$$

$$LOAEL : \left(\frac{1000 \text{ mg BEHP}}{\text{kg food}} \times \frac{5.5 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ mg}} \right) / 0.03 \text{ kg BW} = 183.3 \text{ mg/kg/d}$$

Comments: While significant reproductive effects were observed among mice on diets containing 0.1% and 0.3% Bis(2-ethylhexyl)Phthalate, no adverse effects were observed among the 0.01% dose group. Because the study considered exposure during critical lifestage, the 0.01% dose was considered to be a chronic NOAEL. The 0.1% dose was considered to be a chronic LOAEL.

Final NOAEL: 18.3 mg/kg/d

Final LOAEL: 183 mg/kg/d

Compound: Cadmium
Form: NA
Reference: EPA, 2003 (EcoSSL)
Test Species: NA
Exposure Duration: NA
Endpoint: Growth and reproduction
Exposure Route: NA
Dosage: NA
Calculations: NA

Comments: A literature search was completed and 145 papers with mammalian toxicity data met the search criteria and were used to calculate the EcoSSL. A geometric mean of the NOAEL values for reproduction and growth was calculated at 1.86 mg/kg bw/day. However, this value is higher than the lowest bounded LOAEL for reproduction, growth, or mortality results. Therefore, the EcoSSL is equal to the highest bounded NOAEL below the lowest bounded LOAEL for reproduction, growth, or survival, and is equal to 0.770 mg cadmium/kg bw/day.

Final NOAEL: 0.77 mg/kg/d

Compound: Cadmium
Form: Cd SO₄
Reference: Leach et al., 1979
Test Species: white leghorn chickens
 Body weight: 1.55 kg (from EPA, 1988)
 Food Consumption: 0.077 kg/d (from study)
Study Duration: 1 year and during a critical lifestage =chronic
Endpoint: reproduction
Exposure Route: oral in diet
Dosage: four dose level:
 0.22, 3.22, 12.22, and 48.22 mg/kg Cd
Calculations:

$$\left(\frac{0.22 \text{ mg Cd}}{\text{kg food}} \times \frac{0.077 \text{ kg food}}{\text{day}} \right) / 1.55 \text{ kg BW} = 0.011 \text{ mg/kg/d}$$

$$\left(\frac{3.22 \text{ mg Cd}}{\text{kg food}} \times \frac{0.077 \text{ kg food}}{\text{day}} \right) / 1.55 \text{ kg BW} = 0.16 \text{ mg/kg/d}$$

$$\left(\frac{12.22 \text{ mg Cd}}{\text{kg food}} \times \frac{0.077 \text{ kg food}}{\text{day}} \right) / 1.55 \text{ kg BW} = 0.61 \text{ mg/kg/d}$$

$$\left(\frac{48.22 \text{ mg Cd}}{\text{kg food}} \times \frac{0.077 \text{ kg food}}{\text{day}} \right) / 1.55 \text{ kg BW} = 2.4 \text{ mg/kg/d}$$

Comments: Although egg weight and egg shell thickness was not affected by any diet, egg production was significantly reduced by among hens consuming diets containing 12 and 48 mg/kg Cd. Because the study considered exposure over 1 year, the 3.22 mg/kg Cd diet was considered to be a chronic NOAEL and the 12.22 mg/kg diet was considered to be a chronic LOAEL.

Final NOAEL: 0.16 mg/kg/d

Final LOAEL: 0.61 mg/kg/d

Compound: Carbon Tetrachloride
Form: not applicable
Reference: Alumot et al., 1976a
Test Species: Rat
 Body weight: 0.35 kg (EPA, 1988a)
 Food Consumption: 0.028 kg/d (calculated using allometric equation from EPA, 1988a)
Study Duration: 2 yr (>1 yr and during a critical lifestage = chronic).
Endpoint: reproduction
Exposure Route: oral in diet
Dosage: two dose levels:
 80 and 200 ppm;
 No effects observed at either dose level.

Calculations:

$$NOAEL : \left(\frac{200 \text{ mg CCl}_4}{\text{kg food}} \times \frac{28 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ mg}} \right) / 0.35 \text{ kg BW} = 16 \text{ mg/kg/d}$$

Comments: Because no significant differences were observed at either dose level and the study considered exposure throughout 2 years including critical lifestages (reproduction), the maximum dose was considered to be a chronic NOAEL.

Final NOAEL: 16 mg/kg/d

Compound: Chloroform
Form: not applicable
Reference: Palmer et al., 1979
Test Species: Rat
 Body weight: 0.35 kg (EPA, 1988a)
Study Duration: 13 wk (<1 yr and not during a critical lifestage = subchronic).
Endpoint: liver, kidney, gonad condition
Exposure Route: oral intubation
Dosage: four dose levels:

15, 30, 150, and 410 mg/kg/d; NOAEL = 150 mg/kg/d

Calculations: not applicable

Comments: Gonadal atrophy was observed among male and female rats receiving 410 mg/kg/d; therefore 150 mg/kg/d was considered to be a subchronic NOAEL. The 410 mg/kg/d dose was considered to be a subchronic LOAEL. To estimate the chronic NOAEL and LOAEL, the subchronic values was multiplied by a subchronic-chronic uncertainty factor of 0.1.

Final NOAEL: 15 mg/kg/d

Final LOAEL: 41 mg/kg/d

Compound: Chromium

Form: Cr⁺⁶ as K₂Cr₂O₄

Reference: MacKenzie et al., 1958

Test Species: Rat

Body weight: 0.35 kg (EPA, 1988a)

Water Consumption: 0.046 L/d (calculated using allometric equation from EPA, 1988a)

Study Duration: 1 yr

Endpoint: body weight and food consumption

Exposure Route: oral in water

Dosage: six dose levels:
0.45, 2.2, 4.5, 7.7, 11.2, and 25 ppm Cr⁺⁶ in water
No effects observed at any dose level

Calculations:

$$NOAEL : \left(\frac{25 \text{ mg Cr}}{\text{L water}} \times \frac{0.046 \text{ L water}}{\text{day}} \right) / 0.35 \text{ kg BW} = 3.28 \text{ mg/kg/d}$$

Comments: Because no significant differences were observed at any dose level studied and the study considered exposure over 1 year, the maximum dose was considered to be a chronic NOAEL.

Final NOAEL: 3.28 mg/kg/d

Compound: Chromium

Form: Cr⁺⁶

Reference: Steven et al., 1976 (cited in Eisler, 1986)

Test Species: Rat

Body weight: 0.35 kg (EPA, 1988a)

Water Consumption: 0.046 L/d (calculated using allometric equation from EPA, 1988a)

Study Duration: 3 months (<1 yr = subchronic)

Endpoint: mortality

Exposure Route: oral in water

Dosage: two dose levels:
134 and 1000 ppm Cr⁺⁶ in water; 1000 ppm = LOAEL

Calculations:

$$LOAEL : \left(\frac{1000 \text{ mgCr}}{L \text{ water}} \times \frac{0.046 L \text{ water}}{\text{day}} \right) / 0.35 \text{ kg BW} = 131.4 \text{ mg/kg/d}$$

Comments: Because the 1000 ppm dose was identified as the toxicity threshold, this dose was considered to be a subchronic LOAEL. A chronic LOAEL was estimated by multiplying the subchronic LOAEL by a subchronic-chronic uncertainty factor of 0.1.

Final LOAEL: 13.14 mg/kg/d

Compound: Chromium
Form: Cr⁺³ as CrK(SO₄)₂
Reference: Haseltine et al. , 1985
Test Species: Black duck
 Body weight: 1.25 kg (mean_{male+female}; Dunning, 1993)
 Food Consumption: Congeneric Mallard ducks, weighing 1 kg consume 100 g food/d (Heinz et al.1989). Therefore, it was assumed that a 1.25 kg black duck would consume 125 g food/d.
Study Duration: 10 mo. (>10 weeks and during a critical lifestage = chronic)
Endpoint: reproduction
Exposure Route: oral in diet
Dosage: two dose levels:
 10 and 50 ppm Cr⁺³ in diet; NOAEL = 10 ppm

$$NOAEL = \left(\frac{10 \text{ mg Cr}^{+3}}{\text{kg food}} \times \frac{125 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ g}} \right) / 1.25 \text{ kg BW} = 1 \text{ mg / kg / d}$$

$$LOAEL = \left(\frac{50 \text{ mg Cr}^{+3}}{\text{kg food}} \times \frac{125 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ g}} \right) / 1.25 \text{ kg BW} = 5 \text{ mg / kg / d}$$

Comments: While duckling survival was reduced at the 50 ppm dose level, no significant differences were observed at the 10 ppm Cr⁺³ dose level. Because the study considered exposure throughout a critical lifestage (reproduction), the dose 50 ppm dose was considered to be a chronic LOAEL and the dose 10 ppm dose was considered to be a chronic NOAEL.

Final NOAEL: 1 mg/kg/d

Final LOAEL: 5 mg/kg/d

Compound: Cobalt
Form: CoCl₂ - Cobalt (II) chloride
Reference: Paternain et al., 1988
Test Species: Rat
 240-280 g (260 g average body weight in this study)
Study Duration: Days 6-15 gestation (during critical lifestage = chronic)
Endpoint: Reproduction and development
Exposure Route: oral gavage

Dosage: 3 doses 25, 50, 100 mg/kg (CoCl₂); 45.4 % Co.
Calculations: NA
Comments: Significant reduction in weight gain and food consumption in addition to negative blood chemistry changes in mothers dosed 100 mg/kg/d. No significant teratogenic effects were observed; however, increased incidence of stunted fetuses/litter occurred at 50 and 100 mg/kg/d doses. An uncertainty factor of 0.1 was applied to the chronic LOAEL to determine a chronic NOEAL.
Final NOAEL: 1.35 mg/kg/d
Final LOAEL: 11.35 mg/kg/d

Compound: Copper
Form: Copper Sulfate
Reference: Aulerich et al., 1982
Test Species: Mink
 Body weight: 1.0 kg (EPA, 1993e)
 Food Consumption: 0.137 kg/d (Bleavins and Aulerich, 1981)
Study Duration: 357 d (during a critical lifestage = chronic)
Endpoint: reproduction
Exposure Route: oral in diet
Dosage: four dose levels:
 25, 50, 100, and 200 ppm Cu supplemental + 60.5 ppm Cu in base feed; NOAEL = 85.5 ppm Cu (supplement + base)
Calculations:

$$NOAEL : \left(\frac{85.5 \text{ mg Cu}}{\text{kg food}} \times \frac{137 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ mg}} \right) / 1.0 \text{ kg BW} = 11.71 \text{ mg/kg/d}$$

$$LOAEL : \left(\frac{110.5 \text{ mg Cu}}{\text{kg food}} \times \frac{137 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ mg}} \right) / 1.0 \text{ kg BW} = 15.14 \text{ mg/kg/d}$$

Comments: Consumption of 50, 100, and 200 ppm supplemental Cu increased the percentage mortality of mink kits. Kit survivorship among the 25 ppm supplemental Cu group was actual greater than the controls. Because this study was approximately one year in duration and considered exposure during reproduction, the 25 ppm supplemental Cu (85.5 ppm total Cu) dose was considered to be a chronic NOAEL and the 50 ppm supplemental Cu (110.5 ppm total Cu) dose was considered to be a chronic NOAEL.
Final NOAEL: 11.7 mg/kg/d
Final LOAEL: 15.14 mg/kg/d

Compound: Copper
Form: Copper oxide
Reference: Mehring et al., 1960

Test Species: 1 day old chicks
 Body weight: 0.534 kg (mean_{male+female} at 5 weeks; EPA, 1988)
 food consumption: 0.044 kg/d (calculated using allometric equation from EPA, 1988)

Exposure Duration: 10 weeks (10 weeks = chronic).

Endpoint: growth, mortality

Exposure Route: oral in diet

Dosage: 12 dose levels:
 26, 36.8, 52.0, 73.5, 104.0, 147.1, 208.0, 294.1, 403, 570, 749, and 1180 ppm total Cu; NOAEL = 570 ppm total Cu

Calculations:

$$\left(\frac{26 \text{ mg Cu}}{\text{kg food}} \times \frac{44 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ g}} \right) / 0.534 \text{ kg BW} = 2.14 \text{ mg / kg / d}$$

$$\left(\frac{36.8 \text{ mg Cu}}{\text{kg food}} \times \frac{44 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ g}} \right) / 0.534 \text{ kg BW} = 3.03 \text{ mg / kg / d}$$

$$\left(\frac{52 \text{ mg Cu}}{\text{kg food}} \times \frac{44 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ g}} \right) / 0.534 \text{ kg BW} = 4.28 \text{ mg/kg/d}$$

$$\left(\frac{73.5 \text{ mg Cu}}{\text{kg food}} \times \frac{44 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ g}} \right) / 0.534 \text{ kg BW} = 6.06 \text{ mg/kg/d}$$

$$\left(\frac{147.1 \text{ mg Cu}}{\text{kg food}} \times \frac{44 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ g}} \right) / 0.534 \text{ kg BW} = 12.12 \text{ mg / kg / d}$$

$$\left(\frac{208 \text{ mg Cu}}{\text{kg food}} \times \frac{44 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ g}} \right) / 0.534 \text{ kg BW} = 17.14 \text{ mg / kg / d}$$

$$\left(\frac{294.1 \text{ mg Cu}}{\text{kg food}} \times \frac{44 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ g}} \right) / 0.534 \text{ kg BW} = 24.23 \text{ mg / kg / d}$$

$$\left(\frac{403 \text{ mg Cu}}{\text{kg food}} \times \frac{44 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ g}} \right) / 0.534 \text{ kg BW} = 33.21 \text{ mg / kg / d}$$

$$\left(\frac{570 \text{ mg Cu}}{\text{kg food}} \times \frac{44 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ g}} \right) / 0.534 \text{ kg BW} = 46.97 \text{ mg / kg / d}$$

$$\left(\frac{749 \text{ mg Cu}}{\text{kg food}} \times \frac{44 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ g}} \right) / 0.534 \text{ kg BW} = 61.7 \text{ mg / kg / d}$$

$$\left(\frac{1180 \text{ mg Cu}}{\text{kg food}} \times \frac{44 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ g}} \right) / 0.534 \text{ kg BW} = 97.22 \text{ mg / kg / d}$$

Comments: While consumption of Cu up to 570 ppm had no effect of growth of chicks, 749 ppm Cu in the diet reduced growth by over 30% and produced 15% mortality. Because this study was 10 weeks in duration, the 570 and 749 ppm Cu doses were considered to be a chronic NOAEL and LOAEL, respectively. To estimate daily Cu intake throughout the 10 week study period, food consumption of 5-week-old chicks was calculated. While this value will over- and underestimate food consumption by younger and older chicks, it was assumed to approximate food consumption throughout the entire 10 week study.

Final NOAEL: 47 mg/kg/d

Final LOAEL: 61.7 mg/kg/d

Compound: *o*-Cresol (2-methylphenol)

Form: Not applicable

Reference: Hornshaw et al., 1986

Test Species: Mink

Body weight: 0.958 kg (mean of control females from study)

Food Consumption: 204 g/d (mean of all test groups in study because no differences among groups).

Study Duration: 6 months (during a critical lifestage = chronic)

Endpoint: Reproduction

Exposure Route: Oral in diet

Dosage: Three dose levels: 100, 400, and 1,600 ppm

Calculations:

$$NOAEL : \left(\frac{1,600 \text{ mg } o\text{-cresol}}{\text{kg food}} \times \frac{204 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1,000 \text{ g}} \right) / 0.958 \text{ kg BW} = 340 \text{ mg / kg / d}$$

Comments: No adverse effects were observed at any dose level. Because this study considered exposure during reproduction, the maximum dose was considered to be a chronic NOAEL.

Final NOAEL: 340 mg/kg/d

Compound: 1,2-Dichloroethane

Form: Not applicable

Reference: Alumot et al., 1976b

Test Species: Chicken

Body weight: 1.6 kg (mean_{male+female} from study)

Food Consumption: 0.11 kg/d (calculated using allometric equation from EPA, 1988)

Study Duration: 2 yr (>10 weeks and during a critical lifestage = chronic)

Endpoint: reproduction

Exposure Route: oral in diet

Dosage: two dose levels:

250 and 500 ppm; NOAEL = 250 ppm

$$NOAEL = \left(\frac{250 \text{ mg } 1,2\text{-Dichloroethane}}{\text{kg food}} \times \frac{110 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ g}} \right) / 1.6 \text{ kg BW} = 17.2 \text{ mg / kg / d}$$

$$LOAEL = \left(\frac{500 \text{ mg } 1,2\text{-Dichloroethane}}{\text{kg food}} \times \frac{110 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ g}} \right) / 1.6 \text{ kg BW} = 34.4 \text{ mg / kg / d}$$

Comments: While egg production was reduced at the 500 ppm dose level, no significant differences were observed at the 250 ppm dose level. Because the study considered exposure throughout 2 years including critical lifestages (reproduction), these doses were considered to be chronic NOAELs and LOAELs.

Final NOAEL: 17.2 mg/kg/d

Final LOAEL: 34.4 mg/kg/d

Compound: 1,2,-Dichloroethane

Form: not applicable

Reference: Lane et al., 1982

Test Species: Mouse

Body weight: 0.035 kg (from study)

Water Consumption: 6 mL/d (from study)

Study Duration: 2 generations (>1 yr and during a critical lifestage = chronic).

Endpoint: reproduction

Exposure Route: oral in water

Dosage: three dose levels:

5, 15, and 50 mg/kg/d

No effects observed at any dose level.

Calculations: not applicable

Comments: Because no significant differences were observed at any dose level and the study considered exposure throughout 2 generations including critical lifestages (reproduction), the maximum dose was considered to be a chronic NOAEL.

Final NOAEL: 50 mg/kg/d.

Compound: 1,1-Dichloroethylene

Form: not applicable

Reference: Quast et al., 1983

Test Species: dog (beagle)

Body weight: 10 kg (EPA, 1988a)

Study Duration: 97 d (<1 yr and not during a critical lifestage = subchronic).

Endpoint: mortality, body weight, blood chemistry, liver histology

Exposure Route: daily oral capsules

Dosage: three dose levels:

6.25, 12.5, and 25 mg/kg/d; NOAEL = 25 mg/kg/d

Calculations: not applicable

Comments: No adverse effects were observed among any of the treatments, therefore the maximum dose, 25 mg/kg/d was considered a subchronic NOAEL. A chronic NOAEL was estimated by multiplying the subchronic NOAEL by a subchronic-chronic uncertainty factor of 0.1.

Final NOAEL: 2.5 mg/kg/d

Compound: 1,2-Dichloroethylene

Form: not applicable

Reference: Bannes et al., 1985

Test Species: Mouse

Body weight: 0.03 kg (EPA, 1988a)

Study Duration: 90 d (<1 yr and not during a critical lifestage = subchronic).

Endpoint: body and organ weights, blood chemistry, hepatic function

Exposure Route: oral in water

Dosage: three dose levels:

16.8, 175, and 387 mg/kg/d (Males)

22.6, 224, and 452 mg/kg/d (Females)

NOAEL = 452 mg/kg/d

Calculations: not applicable

Comments: Exposure to 387 mg/kg/d 1,2-dichloroethylene reduced glutathione levels in males and all dose levels reduced aniline hydroxylase activity in females. No other treatment effects were observed. Because the relationship of enzyme levels to potential population effects is unknown and no other effects were observed, the maximum dose, 452 mg/kg/d was considered a subchronic NOAEL. To estimate the chronic NOAEL, the subchronic NOAEL was multiplied by a subchronic-chronic uncertainty factor of 0.1.

Final NOAEL: 45.2 mg/kg/d

Compound: Diethylphthalate (DEP)

Form: not applicable

Reference: Lamb et al., 1987

Test Species: Mouse

Body weight: 0.03 kg (EPA, 1988a)

Food Consumption: 0.0055 kg/d

(calculated using allometric equation from EPA, 1988a)

Study Duration: 105 d (during a critical lifestage = chronic)

Endpoint: reproduction

Exposure Route: oral in diet

Dosage: three dose levels:

0.25%, 1.25% and 2.5% of diet;

NOAEL = 2.5% = 25000 mg/kg

Calculations:

$$NOAEL : \left(\frac{25000 \text{ mg mg}}{\text{kg food}} \times \frac{5.5 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ mg}} \right) / 0.03 \text{ kg BW} = 4583 \text{ mg/kg/d}$$

Comments: No significant reproductive effects were observed among mice in any of the treatment groups. Because the study considered exposure during a critical lifestage, the maximum dose was considered to be a chronic NOAEL.

Final NOAEL: 4583 mg/kg/d

Compound: Di-n-butyl phthalate (DBP)
Form: not applicable
Reference: Lamb et al., 1987
Test Species: Mouse
 Body weight: 0.03 kg (EPA, 1988a)
 Food Consumption: 0.0055 kg/d
 (calculated using allometric equation from EPA, 1988a)
Study Duration: 105 d (during a critical lifestage = chronic)
Endpoint: reproduction
Exposure Route: oral in diet
Dosage: three dose levels:
 0.03%, 0.3% and 1% of diet;
 NOAEL = 0.3% = 3000 mg/kg

Calculations:

$$NOAEL : \left(\frac{3000 \text{ mg DBP}}{\text{kg food}} \times \frac{5.5 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ mg}} \right) / 0.03 \text{ kg BW} = 550 \text{ mg/kg/d}$$

$$LOAEL : \left(\frac{10000 \text{ mg DBP}}{\text{kg food}} \times \frac{5.5 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ mg}} \right) / 0.03 \text{ kg BW} = 1833 \text{ mg/kg/d}$$

Comments: While significant reproductive effects (reduced litters/pair, live pups/litter, etc.) were observed among mice on diet containing 1% DBP, no adverse effects were observed among either the 0.03% or 0.3% dose groups. Because the study considered exposure during a critical lifestage, these doses were considered to be chronic NOAELs and LOAELs.

Final NOAEL: 550 mg/kg/d

Final LOAEL: 1833 mg/kg/d

Compound: Di-n-butyl Phthalate (DBP)
Form: Not applicable
Reference: Peakall, 1974

Test Species: Ringed Dove
 Body weight: 0.155 kg (Terres, 1980)
 Food consumption: 0.0127 kg/d (calculated using allometric equation from Nagy, 1987)

Exposure Duration: 4 weeks (during critical lifestage = chronic)

Endpoint: reproduction

Exposure Route: oral diet

Dosage: one dose level:
 LOAEL = 10 ppm

Calculations:

$$LOAEL : \left(\frac{10 \text{ mg DBP}}{\text{kg food}} \times \frac{17.27 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ g}} \right) / 0.155 \text{ kg BW} = 1.11 \text{ mg / kg / d}$$

Comments: Eggshell thickness and water permeability of the shell was reduced among doves on diets containing 10 ppm DBP. Because the study considered exposure during a critical lifestage, the 10 ppm dose was considered to be a chronic LOAEL. A chronic NOAEL was estimated by multiplying the chronic LOAEL by a LOAEL-NOAEL uncertainty factor of 0.1.

Final NOAEL: 0.11 mg/kg/d

Final LOAEL: 1.1 mg/kg/d

Compound: Ethylbenzene

Form: Not applicable

Reference: Wolf et al., 1956

Test Species: Rat
 Body weight: 0.175 to 0.250 kg (from study)

Exposure Duration: 182 days (≥ 90 days = chronic)

Endpoint: Survival and pathology

Exposure Route: Oral gavage

Dosage: Four dose levels: 13.6, 136, 408, and 680 mg/kg/d

Calculations: Not applicable

Comments: Mortality was not reported at any dose level. Ethylbenzene at 136 mg/kg/d had no effect, while histopathological changes in the liver and kidney were observed at 408 mg/kg/d and 680 mg/kg/d. Therefore, 136 mg/kg/d and 408 mg/kg/d were considered the NOAEL and LOAEL, respectively. Dose was adjusted for gavage schedule (5 days/week) for a NOAEL of 97.1 mg/kg/d and a LOAEL of 291 mg/kg/d.

Final NOAEL: 291 mg/kg/d

Final LOAEL: 97.1 mg/kg/d

Compound: Fluoranthene

Form: Not applicable

Reference: IRIS, 2001

Test Species: Mouse
 Body weight: 0.03 kg (EPA, 1988a)

Exposure Duration: 13 weeks (≥ 90 days = chronic)
Endpoint: Nephropathy
Exposure Route: Oral gavage
Dosage: Three dose levels: 125, 250, and 500 mg/kg/d;
Calculations: Not applicable
Comments: All treated mice exhibited nephropathy, increased salivation, and increased liver enzyme levels in a dose-dependent manner. Mice exposed to 250 and 500 mg/kg/d had statistically increased SGPT values and increased absolute and relative liver weights. Compound-related microscopic liver lesions (indicated by pigmentation) were observed in 65 and 87.5% of the mid- and high-dose mice respectively.
Final NOAEL: 125 mg/kg/d
Final LOAEL: 250 mg/kg/d

Compound: Fluorene
Form: Not applicable
Reference: IRIS, 2001
Test Species: Mouse
 Body weight: 0.03 kg (EPA, 1988a)
Exposure Duration: 13 weeks (≥ 90 days = chronic)
Endpoint: Hematotoxicity
Exposure Route: Oral gavage
Dosage: Three dose levels: 125, 250, and 500 mg/kg/d;
Calculations: Not applicable
Comments: A significant decrease in red blood cell count and packed cell volume were observed in females treated with 250 mg/kg/d and in males and females treated at 500 mg/kg/d.
Final NOAEL: 125 mg/kg/d
Final LOAEL: 250 mg/kg/d

Compound: Hexachlorobenzene (BHC mixed isomers)
Form: not applicable
Reference: Grant et al., 1977
Test Species: Rat
 Body weight: 0.35 kg (EPA, 1988a)
 Food Consumption: 0.028 kg/d (calculated using allometric equation from EPA, 1988a)
Study Duration: 4 generations (>1 yr and during a critical lifestage = chronic)
Endpoint: reproduction
Exposure Route: oral in diet
Dosage: seven dose levels:
 10, 20, 40, 80, 160, 320, and 640 ppm; NOAEL = 20 ppm
Calculations:

$$NOAEL : \left(\frac{20 \text{ mg BHC}}{\text{kg food}} \times \frac{28 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ mg}} \right) / 0.35 \text{ kg BW} = 1.6 \text{ mg/kg/d}$$

$$LOAEL : \left(\frac{40 \text{ mg BHC}}{\text{kg food}} \times \frac{28 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ mg}} \right) / 0.35 \text{ kg BW} = 3.2 \text{ mg/kg/d}$$

Comments: Consumption of 320 ppm and 640 ppm BHC in the diet increased maternal mortality, 80 - 640 ppm BHC reduced litter sizes, and 40 - 320 ppm BHC reduced birth weights. Because no significant effects were observed in groups consuming 10 or 20 ppm BHC in their diet and the study considered exposure throughout four generations including critical lifestages (reproduction), the 20 ppm dose was considered to be a chronic NOAEL. The lowest dose to produce an adverse effect (40 ppm) was considered a chronic LOAEL.

Final NOAEL: 1.6 mg/kg/d

Final LOAEL: 3.2 mg/kg/d

Compound: JP-8 Jet Fuel

Form: Not applicable

Reference: Cooper and Mattie, 1996

Test Species: Rat

Body weight: 0.35 kg (EPA, 1988a)

Study Duration: Gestational days 6-15 (during a critical lifestage = chronic)

Endpoint: Reproduction

Exposure Route: Oral gavage

Dosage: Four dose levels: 500, 1,000, 1,500, 2,000 mg JP-8 jet fuel/kg/d

Calculations: Not applicable

Comments: Maternal and fetal weight gain were significantly reduced in rats dosed by oral gavage at the rate of 1500 mg/kg/day. Additionally, a dose-response increase in mortality was also reported. Because no significant differences were observed at the two lower dose levels and the study considered exposure throughout a critical lifestage (reproduction), the 1,000 mg/kg/day dose was considered to be a chronic NOAEL and the 1,500 mg/kg/day dose was considered to be a chronic LOAEL

Final NOAEL: 1000 mg/kg/d

Final LOAEL: 1500 mg/kg/d

Compound: Lead

Form: Lead acetate

Reference: Edens and Garlich, 1983

Test Species: Japanese Quail

Body weight: 0.15 kg (from study)

Food Consumption: 0.031 kg/d (from study)

Exposure Duration: 5 weeks (during a critical lifestage = chronic).

Endpoint: Reproduction

Exposure Route: Oral in diet

Dosage: Four dose levels: 0, 1, 10, and 100 ppm Pb; NOAEL = 1 ppm Pb

Exposures also reported as metabolic mass-based doses: 0.12, 1.11, and 9.69 mg Pb/BW^{0.75}/d

Doses in mg/kg/d calculated by multiplying each metabolic mass-based dose by ratio of dose-level-specific body mass (kg; from study) to dose-level-specific metabolic mass (kg^{0.75}) resulting in the following doses: 0.19, 1.78, and 15.65 mg/kg/d

Comments: While egg production was significantly reduced among birds consuming the 10 and 100 ppm Pb, egg production was not affected by the 1 ppm Pb dose. Because the study considered exposure throughout a critical lifestage (reproduction), these values were considered to be chronic LOAELs and NOAELs.

Final NOAEL: 0.19 mg/kg/d

Final LOAEL: 1.78 mg/kg/d

Compound: Manganese
Form: Manganese Oxide (Mn₃O₄)
Reference: Laskey et al., 1982
Test Species: Rat
 Body weight: 0.35 kg (EPA, 1988a)
 Food Consumption: 0.028 kg/d (calculated using allometric equation from EPA, 1988a)
Study Duration: through gestation for 224 d
 (during a critical lifestage = chronic)
Endpoint: reproduction
Exposure Route: oral in diet
Dosage: three dose levels:
 350, 1050, and 3500 ppm supplemented Mn + 50 ppm Mn in base diet;
 NOAEL = 1100 ppm

Calculations:

$$NOAEL : \left(\frac{1100 \text{ mg Mn}}{\text{kg food}} \times \frac{28 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ mg}} \right) / 0.35 \text{ kg BW} = 88 \text{ mg/kg/d}$$

$$LOAEL : \left(\frac{3550 \text{ mg Mn}}{\text{kg food}} \times \frac{28 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ mg}} \right) / 0.35 \text{ kg BW} = 284 \text{ mg/kg/d}$$

Comments: While the pregnancy percentage and fertility among rats consuming 3550 ppm Mn in their diet was significantly reduced, all other reproductive parameters (e.g., litter size, ovulations, resorptions, preimplantation death, fetal weights) were not affected. No effects were observed at lower Mn exposure levels. Therefore the 1100 ppm Mn dose was considered to be a chronic NOAEL and the 3550 ppm Mn dose was considered to be a chronic LOAEL.

Final NOAEL: 88 mg/kg/d

Final LOAEL: 284 mg/kg/d

Compound: Manganese
Form: Manganese oxide (Mn₃O₄)
Reference: Laskey and Edens, 1985
Test Species: Japanese Quail (males only, starting at 1 day old)
 Body weight: 0.072 kg (for 3 wk-old male quail; Shellenberger, 1978)
Study Duration: 75 d (>10 weeks = chronic)
Endpoint: growth, aggressive behavior
Exposure Route: oral in diet
Dosage: one dose level:
 5000 ppm supplemented Mn + 56 ppm Mn in base diet = NOAEL
Calculations: NA

Comments: While no reduction in growth was observed, aggressive behavior was 25% to 50% reduced relative to controls. Daily Mn consumption was reported to range from 575 mg/kg/day for adults at the end of the study and 977 mg/kg/d for 20 d-old birds. Because the study was >10 weeks in duration, the 977 mg/kg/d dose was considered to be a chronic NOAEL based on a growth endpoint and a chronic LOAEL based on a behavior endpoint. A chronic behavior NOAEL was estimated by applying an LOAEL-NOAEL UF of 0.1

Final NOAEL_{growth}: 977 mg/kg/d
Final NOAEL_{behavior}: 98 mg/kg/d
Final LOAEL_{behavior}: 977 mg/kg/d

Compound: Mercury
Form: Methyl Mercury Chloride (CH₃HgCl; 79.89% Hg)
Reference: Verschuuren et al., 1976
Test Species: Rat
 Body weight: 0.35 kg (EPA, 1988a)
 Food Consumption: 0.028 kg/d (calculated using allometric equation from EPA, 1988a)
Study Duration: 3 generations (>1 yr and during a critical lifestage = chronic)
Endpoint: reproduction
Exposure Route: oral in diet
Dosage: three dose levels:
 0.1, 0.5, and 2.5 ppm Methyl Mercury Chloride;
 NOAEL = 0.5 ppm Methyl Mercury Chloride
 0.7989 × 0.5 mg/kg = 0.399 mg Hg /kg
Calculations:

$$NOAEL : \left(\frac{0.399 \text{ mg Hg}}{\text{kg food}} \times \frac{28 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ mg}} \right) / 0.35 \text{ kg BW} = 0.032 \text{ mg/kg/d}$$

$$LOAEL : \left(\frac{1.99725 \text{ mg Hg}}{\text{kg food}} \times \frac{28 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ mg}} \right) / 0.35 \text{ kg BW} = 0.16 \text{ mg/kg/d}$$

Comments: While exposure to 2.5 ppm methyl mercury chloride reduced pup viability, adverse effects were not observed at lower doses. Because significant effects were not observed at the 0.5 ppm Methyl Mercury Chloride dose level, this dose was considered to be a chronic NOAEL. The 2.5 ppm Methyl Mercury Chloride dose level was considered to be a chronic LOAEL.

Final NOAEL: 0.032 mg/kg/d

Final LOAEL: 0.16 mg/kg/d

Compound: Mercury
Form: methyl mercury chloride/dicyandiamide
Reference: Heinz (1976) and Heinz and Hoffman (1998)
Test Species: mallard
 Body weight: 1 kg (Heinz et al., 1987)
 Food Consumption: 0.128 kg/d (from Heinz, 1979)
Exposure Duration: 2 generations (lowest doses), 2.5 months (highest dose) (during a critical lifestage = chronic).
Endpoint: reproduction
Exposure Route: oral in diet
Dosage: four dose levels:
 0, 0.53, 2.88, and 9.2 ppm Hg
Calculations:

$$\left(\frac{0.53 \text{ mg Hg}}{\text{kg food}} \times \frac{0.128 \text{ kg food}}{\text{day}} \right) / 1 \text{ kg BW} = 0.068 \text{ mg / kg / d}$$

$$\left(\frac{2.88 \text{ mg Hg}}{\text{kg food}} \times \frac{0.128 \text{ kg food}}{\text{day}} \right) / 1 \text{ kg BW} = 0.37 \text{ mg / kg / d}$$

$$\left(\frac{9.2 \text{ mg Hg}}{\text{kg food}} \times \frac{0.128 \text{ kg food}}{\text{day}} \right) / 1 \text{ kg BW} = 1.18 \text{ mg / kg / d}$$

Comments: Although duckling survival at 7 days was significantly reduced at the two highest dose levels, no significant difference was observed at the 0.068 mg/kg/d dose. Because exposure occurred during reproduction, the 0.37 mg/kg/d dose was considered to be a chronic LOAEL.

Final NOAEL: 0.068 mg/kg/d

Final LOAEL: 0.37 mg/kg/d

Compound: Methylene Chloride
Form: not applicable
Reference: NCA, 1982
Test Species: Rat
 Body weight: 0.35 kg (EPA, 1988a)
Study Duration: 2 yrs (>1 yr=chronic)
Endpoint: liver histology

Exposure Route: oral in water
Dosage: four dose levels:
 5.85, 50, 125, and 250 mg/kg/d; NOAEL = 5.85 mg/kg/d
Calculations: not applicable
Comments: While Methylene Chloride at 50 mg/kg/d or greater produced histological changes in the liver, no effects were observed at the 5.85 mg/kg/d dose level. Because the study was 2 yrs in duration, the 5.85 mg/kg/d dose was considered to be a chronic NOAEL. The 50 mg/kg/d dose was considered to be a chronic LOAEL.
Final NOAEL: 5.85 mg/kg/d
Final LOAEL: 50 mg/kg/d

Compound: 4-Methyl 2-Pentanone (Methyl Isobutyl Ketone)
Form: not applicable
Reference: Microbiological Associates, 1986 (obtained from Health Effects Assessment Summary Tables (HEAST; EPA, 1993f)
Test Species: Rat
 Body weight: 0.35 kg (EPA, 1988a)
Study Duration: 13 weeks
 (<1 yr and not during a critical lifestage=subchronic)
Endpoint: Liver and kidney function
Exposure Route: oral gavage
Dosage: one dose level stated in HEAST summary:
 250 mg/kg/d = NOAEL
Calculations: not applicable
Comments: Because the study was less than 1 year in duration and not considered exposure during a critical life stage, the 250 mg/kg/d dose was considered to be a subchronic NOAEL. A chronic NOAEL was estimated by multiplying the subchronic NOAEL by a subchronic-chronic uncertainty factor of 0.1
Final NOAEL: 25 mg/kg/d

Compound: Molybdenum
Form: Molybdate (MoO₄)
Reference: Schroeder and Mitchner, 1971
Test Species: Mouse
 Body weight: 0.03 kg (EPA, 1988a)
 Food Consumption: 0.0055 kg/d
 Water Consumption: 0.0075 L/d
 (calculated using allometric equation from EPA, 1988a)
Study Duration: 3 generations (> 1 yr and during critical lifestage=chronic)
Endpoint: reproduction
Exposure Route: oral in water
Dosage: one dose level:
 10 mg Mo/L + 0.45 mg/kg in diet = LOAEL

Calculations:

$$NOAEL : \left(\frac{10 \text{ mg Mo}}{\text{kg food}} \times \frac{7.5 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ mg}} \right) / 0.03 \text{ kg BW} = 2.5 \text{ mg/kg/d}$$

$$LOAEL : \left(\frac{0.45 \text{ mg Mo}}{\text{kg food}} \times \frac{7.5 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ mg}} \right) / 0.03 \text{ kg BW} = 0.0825 \text{ mg/kg/d}$$

$$\text{Total Exposure} = 2.5 \text{ mg/kg/d} + 0.0825 \text{ mg/kg/d} = 2.5825 \text{ mg/kg/d}$$

Comments: Because mice exposed to Mo displayed reduced reproductive success with a high incidence of runts, this dose was considered to be a chronic LOAEL. A chronic NOAEL was estimated by multiplying the chronic LOAEL by a LOAEL-NOAEL uncertainty factor of 0.1.

Final NOAEL: 0.26 mg/kg/d

Final LOAEL: 2.6 mg/kg/d

Compound: Naphthalene

Form: Not applicable

Reference: Wildlife International, 1985

Test Species: Bobwhite Quail

Body weight: 198.4 g (mean of control group from study)

Exposure Duration: Acute – single dose followed by 14-day observation

Endpoint: Mortality

Exposure Route: Oral gavage

Dosage: Six dose levels: 0, 292, 486, 810, 1,350, and 2,250 mg/kg

Calculations: Not applicable

Comments: Overt signs of toxicity were observed at 486 mg/kg dose and above. LD50 for naphthalene in bobwhite was determined to be 2,690 mg/kg (95% CI=1,571-57,063 mg/kg). A chronic NOAEL and LOAEL were estimated by applying uncertainty factors of 0.01 and 0.1, respectively.

Final LD50: 2690 mg/kg

Final NOAEL: 26.9 mg/kg/d

Final LOAEL: 269 mg/kg/d

Compound: Naphthalene

Form: Not applicable

Reference: Navarro et al., 1991

Test Species: Rat

Body weight: 0.24 kg (range, 0.21-0.27 kg) (mean of females in study)

Exposure Duration: Days 6-15 of gestation (during critical lifestage = chronic)

Endpoint: Reproduction

Exposure Route: Oral gavage

Dosage: Three dose levels: 50, 150, and 450 mg/kg/d

Calculations: Not applicable

Comments: Dams treated with 150 and 450 mg/kg/d experienced a respective 31 and 53% reduction in weight gain compared to control dams. Maternal body weight gain continued to be reduced post-treatment (day 15 through sacrifice on day 20). No effects in weight gain were observed in rats dosed with 50 mg/kg/d. No fetal effects were observed. Because maternal body weight gain was reduced and these effects were observed during a critical life-stage, 150 mg/kg/d was considered to be the chronic LOAEL. No adverse effects were observed at 50 mg/kg/d, therefore this was considered to be a chronic NOAEL.

Final NOAEL: 50 mg/kg/d

Final LOAEL: 150 mg/kg/d

Compound: No. 2 fuel oil

Reference: Szaro et al., 1981

Test Species: Mallard Duck

Body Weight: 1 kg (from Heinz et al., 1987)

Food Consumption: 100 g/d (from Heinz et al., 1987)

Study Duration: 18 wk (18 wk during a critical lifestage = chronic)

Endpoint: Mortality and growth

Exposure Route: Oral in diet

Dosage: Two dose levels: 0.5 and 5.0% (5,000 and 50,000 mg/kg) No. 2 fuel oil in food

Calculations:

$$NOAEL : \left(\frac{5,000 \text{ mg No.2 Fuel Oil}}{\text{Kg food}} \times \frac{100 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ g}} \right) / 1 \text{ kg BW} = 500 \text{ mg / kg / d}$$

$$LOAEL : \left(\frac{50,000 \text{ mg No.2 Fuel Oil}}{\text{Kg food}} \times \frac{100 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1,000 \text{ g}} \right) / 1 \text{ kg BW} = 5,000 \text{ mg / kg / d}$$

Comments: Growth was depressed in mallards receiving a diet containing 5% No. 2 fuel oil, and no mortality was related to oil ingestion. Other effects at the 5% dose included increased liver weights, decreased spleen weights, shorter running distances, and hyperactivity compared to control and 0.5% dosed birds. Because no significant differences were observed at the lower dose level and the study considered exposure throughout a critical lifestage (growth), the 0.5% dose was considered to be a chronic NOAEL and the 5% dose was considered to be a chronic LOAEL.

Final NOAEL: 500 mg/kg/d

Final LOAEL: 5000 mg/kg/d

Compound: Nickel

Form: Nickel Sulfate Hexahydrate

Reference: Ambrose et al., 1976

Test Species: Rat

Body weight: 0.35 kg (EPA, 1988a)

Food Consumption: 0.028 kg/d (calculated using allometric equation from EPA, 1988a)

Study Duration: 3 generations (>1 yr and during a critical lifestage = chronic)

Endpoint: reproduction
Exposure Route: oral in diet
Dosage: three dose levels:
 250, 500, and 1000 ppm Ni
 NOAEL = 500 ppm

Calculations:

$$NOAEL : \left(\frac{500 \text{ mg Ni}}{\text{kg food}} \times \frac{28 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ mg}} \right) / 0.35 \text{ kg BW} = 40 \text{ mg/kg/d}$$

$$LOAEL : \left(\frac{100 \text{ mg Ni}}{\text{kg food}} \times \frac{28 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ mg}} \right) / 0.35 \text{ kg BW} = 80 \text{ mg/kg/d}$$

Comments: While 1000 ppm Ni in the diet reduced offspring body weights, no adverse effects were observed in the other dose levels. Because this study considers exposures over multiple generations, the 500 ppm dose was considered to be a chronic NOAEL and the 1000 ppm dose was considered to be a chronic LOAEL..

Final NOAEL: 40 mg/kg/d

Final LOAEL: 80 mg/kg/d

Compound: Nickel
Form: Nickel Sulfate
Reference: Cain and Pafford, 1981
Test Species: Mallard Duckling
 Body weight: 0.782 kg (mean_{control male+female} at 28 and 60 days; from study)
 Food Consumption: Adult Mallard ducks, weighing 1 kg consume 100 g food/d (Heinz et al., 1989). Therefore, it was assumed that a 0.782 kg mallard duckling would consume 78.2 g food/d.
Study Duration: 90 d (>10 week = chronic)
Endpoint: mortality, growth, behavior
Exposure Route: oral in diet
Dosage: three dose levels:
 176, 774, and 1069 ppm Ni;
 NOAEL = 176 ppm

Calculations:

$$NOAEL : \left(\frac{176 \text{ mg Ni}}{\text{kg food}} \times \frac{78.2 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ g}} \right) / 0.782 \text{ kg BW} = 17.6 \text{ mg / kg / d}$$

$$LOAEL : \left(\frac{774 \text{ mg Ni}}{\text{kg food}} \times \frac{78.2 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ g}} \right) / 0.782 \text{ kg BW} = 77.4 \text{ mg / kg / d}$$

Comments: While consumption of up to 774 ppm Ni in diet resulted in a significant increase in tremors and joint edema, 176 ppm did not. Because the study considered exposure over 90 days, the 176 ppm dose was considered to be a chronic NOAEL and the 774 ppm dose was considered to be a chronic LOAEL. To estimate daily Ni intake throughout the 90 day study period, food consumption of 45-day-old ducklings was calculated. While this value will over- and underestimate food consumption by younger and older ducklings, it was assumed to approximate food consumption throughout the entire 90-day study.

Final NOAEL: 17.6 mg/kg/d

Final LOAEL: 77.4 mg/kg/d

Compound: Nitrate
Form: Potassium Nitrate
Reference: Sleight and Atallah, 1968
Test Species: Guinea pig
 Body weight: 0.86 kg (EPA, 1988a)
Study Duration: 143-204 days (during a critical lifestage=chronic)
Endpoint: reproduction
Exposure Route: oral in water
Dosage: four dose levels:
 12, 102, 507, and 1130 mg nitrate-Nitrogen kg/d;
 NOAEL = 507 mg/kg/d
Calculations: not applicable
Comments: While Nitrate at the 1130 mg/kg/d dose level reduced the number of live births, no adverse effects were observed at the other dose levels. Because the study considered exposure during reproduction, the 507 mg/kg/d dose was considered to be a chronic NOAEL and the 1130 mg/kg/d dose was considered to be a chronic LOAEL. .
Final NOAEL: 507 mg/kg/d
Final LOAEL: 1130 mg/kg/d

Compound: Perchlorate
Form: NH_4ClO_4
Reference: McNabb et al. 2003
Test Species: Bobwhite Quail
Exposure Duration: 2-8 weeks during sensitive period (3-4 days posthatch)
Endpoint: Thyroid hormone (T4) content
Exposure Route: drinking water
Dosage: 50 ug/L to 250 mg/L
Calculations: not applicable
Comments: Quail exposure to ammonium perchlorate (AP) in this study indicated trends but not significant differences in T4 content of the thyroid from controls at 50 ug/L over 2 weeks (NOAEL), and significant differences in several indices occurred at 500 ug/L (LOAEL) over 2 weeks. Drinking rates were not measured but estimated daily doses were determined as 3.85 ug/kg/d at the NOAEL and at 38.5

mg/kg/day at the LOAEL. Since these reported values are expressed as NH_4ClO_4 , the perchlorate ion dose was calculated based on a 84.6% composition of AP.

Final NOAEL: 3.26 ug/kg/d

Final LOAEL: 32.6 ug/kg/d

Compound: 2,4,6-Trinitrotoluene (TNT)
Form: Not Applicable
Reference: Johnson et al. 2000
Test Species: Northern Bobwhite (*Colinus virginianus*)
Exposure Duration: 90 days
Endpoint: mortality, blood hematological effects, and immunity
Exposure Route: oral dose in food
Dosage: 160 mg/kg and 3300 mg/kg
Calculations: Not Applicable
Comments: This evaluation of TNT toxicity for all avian and mammal studies based the reported NOAEL and LOAELs on a single study (Gogal et al. in Draft). These reported chronic values are applied.
Final NOAEL: 0.07 mg/kg/d
Final LOAEL: 1.8 mg/kg/d

Compound: 2,4,6-Trinitrotoluene (TNT)
Form: Not Applicable
Reference: Johnson et al. 2000
Test Species: Dog (beagle)
Exposure Duration: 13 week to 6 month
Endpoint: increased liver weight, physiology, decreased body weight.
Exposure Route: Not Applicable
Dosage: Not Applicable
Calculations: Not Applicable
Comments: This evaluation of TNT toxicity reported NOAEL and LOAELs from nine investigations. The lowest NOAEL and LOAEL values reported were adopted as wildlife screening values.
Final NOAEL: 2 mg/kg/d
Final LOAEL: 8 mg/kg/d

Compound: Pentachlorophenol (PCP)
Form: not applicable
Reference: Schwetz et al., 1978
Test Species: Rat
 Body weight: 0.35 kg (EPA, 1988a)
 Food Consumption: 0.028 kg/d (calculated using allometric equation from EPA, 1988a)
Study Duration: 62 d prior to mating, 15 d during mating, and through gestation and lactation (during a critical lifestage = chronic)
Endpoint: reproduction
Exposure Route: oral in diet
Dosage: two dose levels:

3 and 30 ppm; NOAEL = 3 ppm

Calculations:

$$NOAEL : \left(\frac{3 \text{ mg PCP}}{\text{kg food}} \times \frac{28 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ mg}} \right) / 0.35 \text{ kg BW} = 24 \text{ mg/kg/d}$$

$$LOAEL : \left(\frac{30 \text{ mg Ni}}{\text{kg food}} \times \frac{28 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ mg}} \right) / 0.35 \text{ kg BW} = 2.40 \text{ mg/kg/d}$$

Comments: While survival and growth were significantly reduced (<20% of controls) among rats consuming the 30 ppm PCP diet, no adverse effects were observed among rats on the 3 ppm diet. Because the study considered exposure during reproduction, the 3 ppm dose was considered to be a chronic NOAEL and the 30 ppm dose was considered a chronic LOAEL.

Final NOAEL: 0.24 mg/kg/d

Final LOAEL: 2.4 mg/kg/d

Compound: Pentachlorophenol (PCP)

Form: Not applicable

Reference: Nebeker et al., 1994

Test Species: Mallard ducklings (0.15 Kg BW)

Exposure Duration: 11 days (at critical lifestage = chronic)

Endpoint: Growth and Bioaccumulation

Exposure Route: Oral in diet (0.06 g/day)

Dosage: 25, 54.2, 105, 233.2, 423.2, and 961 ug/g

Calculations: Mean PCP in feed was reported for body weight LOAEL and NOAEL test concentrations. These concentrations were used to calculate final LOAEL and NOAEL values after the application of a sub-chronic to chronic uncertainty factor (0.1)

$$NOAEL : \left(\frac{423.2 \text{ mg PCP}}{\text{kg food}} \times \frac{0.06 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ g}} \right) / 0.15 \text{ kg BW} = 169.28 \text{ mg / kg / d}$$

$$LOAEL : \left(\frac{961 \text{ mg PCP}}{\text{kg food}} \times \frac{0.06 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ g}} \right) / 0.15 \text{ kg BW} = 384.4 \text{ mg / kg / d}$$

Comments:

Final LOAEL: 38.4 mg/kg/d

Final NOAEL: 16.9 mg/kg/d

Compound: Phenol

Form: Not applicable

Reference: Bishop et al., 1997

Test Species: Mouse

Exposure Duration: 347 days (during critical lifestage = chronic)
Endpoint: Reproduction
Exposure Route: Intraperitoneal
Dosage: One dose level: 350 mg/kg (1 i.p. injection prior to each of 17 breeding cycles)
Calculations: Normalized 17 doses of 350 mg/kg over 347 days
 17.1 mg/kg/d
Comments: No effects on reproductive performance were observed. Because injections were given at critical lifestage periods, a dose of 17.1 mg/kg/d was considered to be the chronic NOAEL.
Final NOAEL: 17.1 mg/kg/d

Compound: Phosphorus
Form: P₄
Reference: Sparling et al., 1997
Test Species: Mallards
Exposure Duration: 24 hour lethality, 7 day sublethal
Endpoint: mortality, organ function
Exposure Route: fed pelletized P₄
Dosage: 4-5 adult birds dosed with 2, 4, 5.2, 6.1, 7.1, 8.0, and 9.0 mg/kg
Calculations: Not Applicable
Comments: A chronic LOAEL was estimated from the reported acute sublethal liver necrosis (2.6 mg/kg) by multiplying by an acute to chronic uncertainty factor (0.1). The lowest reported NOAEL resulted from acute lethality tests dosed at 3.7 mg/kg. An acute to chronic uncertainty factor (0.1) and a lethal to sublethal uncertainty factor (0.1) were applied to determine a chronic NOAEL.
Final LOAEL: 0.26 mg/kg/d
Final NOAEL: 0.037mg/kg/d

Compound: Pyrene
Form: Not applicable
Reference: IRIS, 2001
Test Species: Mouse
 Body weight: 0.03 kg (EPA, 1988a)
Exposure Duration: 13 weeks (≥ 90 days = chronic)
Endpoint: Nephropathy
Exposure Route: Oral gavage
Dosage: Three dose levels: 75, 125, and 250 mg/kg/d;
Calculations: Not applicable
Comments: Nephropathy, characterized by multiple foci of renal tubular regeneration, often accompanied by interstitial lymphocytic infiltrates and/or foci of interstitial fibrosis, were present in higher numbers in female mice in the two higher dose groups. Relative and absolute kidney weights were also reduced in the two higher dosage groups.
Final NOAEL: 75 mg/kg/d
Final LOAEL: 125 mg/kg/d

Compound: Selenium
Form: Potassium Selenate (SeO₄)
Reference: Rosenfeld and Beath, 1954
Test Species: rat
 Body weight: 0.35 kg (EPA, 1988a)
 Water Consumption: 0.046 L/d
 (calculated using allometric equation from EPA, 1988a)
Study Duration: 1 year, through 2 generations (1 yr and during critical lifestage=chronic)
Endpoint: reproduction
Exposure Route: oral in water
Dosage: three dose levels:
 1.5, 2.5, and 7.5 mg Se/L
 2.5 mg/L = LOAEL

Calculations:

$$NOAEL : \left(\frac{1.5 \text{ mg Se}}{\text{L water}} \times \frac{46 \text{ mL water}}{\text{day}} \times \frac{1 \text{ L}}{1000 \text{ mL}} \right) / 0.35 \text{ kg BW} = 0.20 \text{ mg/kg/d}$$

$$NOAEL : \left(\frac{2.5 \text{ mg Se}}{\text{L water}} \times \frac{46 \text{ mL water}}{\text{day}} \times \frac{1 \text{ L}}{1000 \text{ mL}} \right) / 0.35 \text{ kg BW} = 0.33 \text{ mg/kg/d}$$

Comments: While no adverse effects on reproduction were observed among rats exposed to 1.5 mg Se/L in drinking water, the number of second-generation young was reduced by 50% among females in the 2.5 mg/L group. In the 7.5 mg/L group, fertility, juvenile growth, and survival were all reduced. Because the study considered exposure over multiple generations, the 1.5 and 2.5 mg/L doses were considered to be chronic NOAELs and LOAELs, respectively.

Final NOAEL: 0.20 mg/kg/d

Final LOAEL: 0.33 mg/kg/d

Compound: Selenium
Form: Selenomethionine
Reference: Heinz et al., 1989
Test Species: Mallard
 Body Weight: 1 kg (from study)
 Food Consumption: 100 g/d (from study)
Study Duration: 100 days (>10 wks and during critical lifestage=chronic)
Endpoint: reproduction
Exposure Route: oral in diet
Dosage: five dose levels:
 1, 2, 4, 8, and 16 ppm Se; 4 ppm = NOAEL
Calculations:

$$\left(\frac{4 \text{ mg Se}}{\text{kg food}} \times \frac{100 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ g}} \right) / 1 \text{ kg BW} = 0.4 \text{ mg / kg / d}$$

$$\left(\frac{8 \text{ mg Se}}{\text{kg food}} \times \frac{100 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ g}} \right) / 1 \text{ kg BW} = 0.8 \text{ mg / kg / d}$$

Comments: Consumption of 8 or 16 ppm Se in the diet as Selanomethionine resulted in a reduced duckling survival as compared to the 1, 2, or 4 ppm Se exposures. Because 4 ppm Se in the diet was the highest dose level that produced no adverse effects and the study considered exposure through reproduction, this dose was considered to be a chronic NOAEL. The 8 ppm Se dose was considered to be a chronic LOAEL

Final NOAEL: 0.4 mg/kg/d

Final LOAEL: 0.8 mg/kg/d

Compound: Strontium (stable)

Form: Strontium Chloride (55% Sr)

Reference: Skoryna, 1981

Test Species: Rat

Body weight: 0.35 kg (EPA, 1988a)

Study Duration: 3 yrs (>1 yr = chronic)

Endpoint: Body weight and bone changes

Exposure Route: oral in water

Dosage: three dose levels:

70, 147, and 263 mg Sr kg/d;

NOAEL = 263 mg/kg/d

Calculations: not applicable

Comments: No adverse effects were observed for any Sr dosage level. Therefore, because the study considered exposure over three years, the maximum dose was considered to be a chronic NOAEL.

Final NOAEL: 263 mg/kg/d

Compound: Thallium

Form: Thallium Sulfate

Reference: Formigli et al., 1986

Test Species: Rat

Body weight: 0.365 kg (from study)

Study Duration: 60 days

(<1 yr and not during a critical lifestage = subchronic)

Endpoint: reproduction (male testicular function)

Exposure Route: oral in water

Dosage: one dose level: 10 ppm Tl = LOAEL

Calculations: mean daily intake (from study) = 270 p Tl/rat

= 0.74 mg/kg/d

Comments: Because rats exposed to 10 ppm Tl in the diet displayed reduced sperm motility and the study considered exposures only for 60 d, this dose was considered to be a

subchronic LOAEL. A chronic NOAEL was estimated by multiplying the subchronic LOAEL by a subchronic-chronic uncertainty factor of 0.1 and a LOAEL-NOAEL uncertainty factor of 0.1.

Final NOAEL: 0.0074 mg/kg/d

Final LOAEL: 0.074 mg/kg/d

Compound: Thallium

Form: Tl_2SO_4

Reference: Bean and Hudson, 1976

Test Species: Golden eagles (3 immatures ranging from 2.8-4.6 kg)

Exposure Duration: single dose

Endpoint: lethality

Exposure Route: oral

Dosage: 60 and 120 mg/kg

Calculations: Not Applicable

Comments: Uncertainty factors for lethal to sublethal effects (0.1) and from acute to chronic effects (0.1) were applied to the reported acute NOEL (60 mg/kg) and acute lethal LOEL (120 mg/kg).

Final NOAEL: 0.6 mg/kg/d

Final LOAEL: 1.2 mg/kg/d

Compound: Toluene

Form: Not applicable

Reference: Gospe et al., 1994

Test Species: Rat

Body weight: 0.2 kg (mean from study)

Exposure Duration: Days 6-19 of gestation (during a critical lifestage = chronic)

Endpoint: Reproduction and growth

Exposure Route: Oral gavage

Dosage: 520 mg/kg/d

Calculations: Not applicable

Comments: Female rats dosed at 520 mg/kg/d during gestation experienced a 24% reduction in body weight gain, as well as reductions in placental weight. Fetal weights were reduced 9.4%. Fetal organ weights were less in the exposed group, with significant reductions on the weights of fetal liver and kidney. Toluene exposure did not produce any major fetal malformations and there were no significant neuropathologic findings. Because the study was conducted during a critical life-stage, 520 mg/kg/d was considered to be a chronic LOAEL. A chronic NOAEL was estimated by multiplying the chronic LOAEL by an uncertainty factor of 0.1.

Final NOAEL: 52 mg/kg/d

Final LOAEL: 520 mg/kg/d

Compound: 1,1,1-Trichloroethane

Form: not applicable

Reference: Lane et al., 1982

Test Species: Mouse

Body weight: 0.035 kg (from study)
 Water Consumption: 6 mL/d (from study)
Study Duration: 2 generations (>1 yr and during a critical lifestage = chronic)
Endpoint: reproduction
Exposure Route: oral in water
Dosage: three dose levels:
 100, 300, and 1000 mg/kg/d
 No effects observed at any dose level.
Calculations: not applicable
Comments: Because no significant differences were observed at any dose level and the study considered exposure throughout 2 generations including critical lifestages (reproduction), the maximum dose was considered to be a chronic NOAEL.
Final NOAEL: 1000 mg/kg/d.

Compound: 1,1,2,2-Tetrachloroethylene
Form: not applicable
Reference: Buben and O'Flaherty, 1985
Test Species: Mouse
 Body weight: 0.03 kg (EPA, 1988a)
Study Duration: 6 weeks
 (<1 yr and not during a critical lifestage = subchronic)
Endpoint: Hepatotoxicity
Exposure Route: oral gavage
Dosage: seven dose levels (administered daily 5 days/week for 6 weeks):
 20, 100, 200, 500, 1000, 1500, and 2000 mg/kg/d;
 NOAEL = 20 mg/kg/d
Calculations: not applicable
Comments: Because mice were exposed for 5 days/week, 7 day/week exposure were estimated by multiplying doses by 0.7 (5 days/7 days). Hepatotoxicity was observed at doses of 100 mg/kg/d or greater. Therefore, the 20 mg/kg/d dose was considered to be a subchronic NOAEL and the 100 mg/kg/d dose was considered to be a subchronic LOAEL. A chronic NOAEL was estimated by multiplying the subchronic NOAEL by a subchronic-chronic uncertainty factor of 0.1
Final NOAEL: 1.4 mg/kg/d
Final LOAEL: 7 mg/kg/d

Compound: Trichloroethylene (TCE)
Form: not applicable
Reference: Buben and O'Flaherty, 1985
Test Species: Mouse
 Body weight: 0.03 kg (EPA, 1988a)
Study Duration: 6 weeks
 (<1 yr and not during a critical lifestage = subchronic)
Endpoint: Hepatotoxicity

Exposure Route: oral gavage
Dosage: seven dose levels (administered daily 5 days/week for 6 weeks):
 100, 200, 400, 800, 1600, 2400, and 3200 mg/kg/d;
 LOAEL = 100 mg/kg/d
Calculations: not applicable
Comments: Because mice were exposed for 5 days/week, 7 day/week exposures were estimated by multiplying doses by 0.7 (5 days/7 days). Hepatotoxicity was observed at doses of 100 mg/kg/d or greater. Therefore, the 100 mg/kg/d dose was considered to be a subchronic LOAEL. A chronic NOAEL was estimated by multiplying the subchronic NOAEL by a subchronic-chronic uncertainty factor of 0.1 and a LOAEL-NOAEL uncertainty factor of 0.1.
Final NOAEL: 0.7 mg/kg/d
Final LOAEL: 7 mg/kg/d

Compound: Vanadium
Form: Sodium Metavanadate (NaVO_3 ; 41.78% V)
Reference: Domingo et al., 1986
Test Species: Rat
 Body weight (from study): 0.26 kg
Study Duration: 60 d prior to gestation, plus through gestation, delivery and lactation (during a critical lifestage = chronic)
Endpoint: reproduction
Exposure Route: oral intubation
Dosage: three dose levels:
 5, 10, and 20 mg NaVO_3 /kg/d; LOAEL=5 mg/kg/d
Calculations: LOAEL dosage of elemental V is:
 $0.4178 \times 5 \text{ mg NaVO}_3 / \text{kg/d}$ or 2.1 mg V/kg/d
Comments: Significant differences in reproductive parameters (e.g., no. dead young/litter, size and weight of offspring, etc.) were observed at all dose levels. Therefore, the lowest dose was considered to be a chronic LOAEL. To estimate the chronic NOAEL, the chronic LOAEL was multiplied by a LOAEL-NOAEL uncertainty factor of 0.1.
Final NOAEL: 0.21 mg V/kg/d
Final LOAEL: 2.1 mg V/kg/d

Compound: Vinyl Chloride
Form: not applicable
Reference: Feron et al., 1981
Test Species: Rat
 Body weight: 0.35 kg (EPA, 1988a)
Study Duration: lifetime (~144 wks)
Endpoint: longevity, mortality
Exposure Route: oral in diet
Dosage: three dose levels:
 1.7, 5.0, and 14.1 mg /kg/d; LOAEL= 1.7 mg/kg/d or

Calculations: not applicable

Comments: Significantly reduced survivorship was observed at all dose levels, therefore the 1.7 mg/kg/d dose level was considered to be a chronic LOAEL. To estimate the chronic NOAEL, the LOAEL was multiplied by a LOAEL-NOAEL uncertainty factor of 0.1.

Final NOAEL: 0.17 mg/kg/d

Final LOAEL: 1.7 mg/kg/d

Compound: Xylenes

Form: Xylene Mixture (60.2% m-xylene, 13.6% p-xylene, 17.0% ethylbenzene, and 9.1% o-xylene)

Reference: IRIS, 2002

Test Species: Rat

Body weight: 0.35 kg (EPA, 1988a)

Exposure Duration: 103 weeks (≥ 90 days = chronic)

Endpoint: Behavior, growth, and mortality

Exposure Route: Oral gavage

Dosage: Two dose levels: 250 and 500 mg/kg/d;

Calculations: Not applicable

Comments: There was a dose-related increase in mortality in male rats, and the increase significantly greater in the high-dose group compared with controls. Although increased mortality was observed at 250 mg/kg/day, the increase was not significant. Although many of the early deaths were caused by gavage error, the possibility that the rats were resisting gavage dosing because of behavioral effects of xylenes was not ruled out. Dose was adjusted for gavage schedule (5 days/week) for a NOAEL of 179 mg/kg/d (from 250 mg/kg/d) and a LOAEL of 357 mg/kg/d (from 500 mg/kg/d).

Final NOAEL: 179 mg/kg/d

Final LOAEL: 357 mg/kg/d

Compound: Xylenes

Form: mixed isomers

Reference: Hill and Camardese, 1986

Test Species: Japanese Quail

Body Weight: 0.60 kg (from study)

Food Consumption: 12.2 g (from study)

Exposure Duration: acute - single dose followed by 14 day observation

Endpoint: mortality, overt signs of toxicity

Exposure Route: oral gavage

Dosage: doses ranged from 5000 to 20000 mg/kg

Calculations:

$$\left(\frac{5000 \text{ mg Xylenes}}{\text{kg food}} \times \frac{12.2 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ mg}} \right) / 0.60 \text{ kg BW} = 101.7 \text{ mg/kg/d}$$

Comments: No mortality observed at any dose level. LC50 of >20000mg/kg is reported. No overt signs of toxicity at concentrations of 5000 ppm. Because no signs of toxicity were observed at 5000 ppm, this dose was considered to be an acute NOAEL. A 0.1 acute to chronic uncertainty factor was applied to estimate a chronic NOAEL.

Acute NOAEL: 101.7 mg/kg/d
Chronic NOAEL: 10.2 mg/kg/d

Compound: Zinc
Form: Zinc Oxide
Reference: Schlicker and Cox, 1968
Test Species: Rat
 Body weight: 0.35 kg (EPA, 1988a)
 Food Consumption: 0.028 kg/d (calculated using allometric equation from EPA, 1988a)
Study Duration: days 1 -16 of gestation (during a critical lifestage = chronic)
Endpoint: reproduction
Exposure Route: oral in diet
Dosage: two dose levels:
 2000, and 4000 ppm Zn; NOAEL = 2000 ppm

Calculations:

$$NOAEL : \left(\frac{2000 \text{ mg Zn}}{\text{kg food}} \times \frac{28 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ g}} \right) / 0.35 \text{ kg BW} = 160 \text{ mg/kg/d}$$

$$LOAEL : \left(\frac{4000 \text{ mg Zn}}{\text{kg food}} \times \frac{28 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ g}} \right) / 0.35 \text{ kg BW} = 320 \text{ mg/kg/d}$$

Comments: Rats exposed to 4000 ppm Zn in the diet displayed increased rates of fetal resorption and reduced fetal growth rates. Because no effects were observed at the 2000 ppm Zn dose rate and the exposure occurred during gestation (a critical lifestage), this dose was considered a chronic NOAEL. The 4000 ppm Zn dose was considered to be a chronic LOAEL.

Final NOAEL: 160 mg/kg/d
Final LOAEL: 320 mg/kg/d

Compound: Zinc
Form: Zinc Sulfate
Reference: Stahl et al., 1990
Test Species: White Leghorn Hens
 Body Weight: 1.935 kg (228 ppm dose; from study)
 1.766 kg (2028 ppm dose; from study)
 Food Consumption: 123 g/d (228 ppm dose; from study)
 0.114 (2028 ppm dose; from study)
Exposure Duration: 44 weeks (>10 wks and during critical lifestage=chronic)
Endpoint: reproduction
Exposure Route: oral in diet

Dosage: four dose levels:
0, 20, 200, and 2000 ppm supplemental Zn plus 28 ppm Zn in diet

Calculations:

$$\left(\frac{28 \text{ mg Zn}}{\text{kg food}} \times \frac{125 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ mg}} \right) / 1.900 \text{ kg BW} = 1.84 \text{ mg/kg/d}$$

$$\left(\frac{48 \text{ mg Zn}}{\text{kg food}} \times \frac{127 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ mg}} \right) / 1.963 \text{ kg BW} = 3.11 \text{ mg/kg/d}$$

$$\left(\frac{228 \text{ mg Zn}}{\text{kg food}} \times \frac{123 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ mg}} \right) / 1.935 \text{ kg BW} = 14.49 \text{ mg/kg/d}$$

$$\left(\frac{2028 \text{ mg Zn}}{\text{kg food}} \times \frac{114 \text{ g food}}{\text{day}} \times \frac{1 \text{ kg}}{1000 \text{ mg}} \right) / 1.766 \text{ kg BW} = 130.9 \text{ mg/kg/d}$$

Comments: While no adverse effects were observed among hens consuming 48 and 228 ppm Zn, egg hatchability was <20% of controls among hens consuming 2028 ppm zinc. Because the study was greater than 10 weeks in duration and considered exposure during reproduction, the 228 ppm dose was considered a chronic NOAEL and the 2028 ppm dose was considered a chronic LOAEL..

Final NOAEL: 14.5 mg/kg/d

Final LOAEL: 131 mg/kg/d

Appendix B

Appendix B. Background Soils Analysis

Four sets of background data were available for the Thermal Treatment Unit (TTU). Three sets (1997, 1998, and 2000 data) were reported by URS (2001), and another set that included 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 Utah Training and Test Range (UTTR)-North area (which includes the TTU): the combined amtoft, skumpah, and timpie-tooele soil formations and the playa-salt air soil formation. The full background data set including sampling location is presented in Table B-1.

The U.S. Environmental Protection Agency (EPA) provides methods for background comparisons in *Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites* (USEPA, 2002). In accordance with this guidance, TTU background concentrations of inorganic contaminants of potential ecological concern (COPECs) were statistically compared to on-site concentrations using the non-parametric Wilcoxon Rank Sum (WRS) test. Analyses were performed using the SAS software (SAS Institute, 1999). Results of the WRS tests for the TTU are presented in Table B-2. Additionally, box plots illustrating distributions of the background and on-site data are presented in Figures B-1 to B-13. Figure B-1 is a guide describing how data distributions are displayed in box plots.

Interpretation of the results of this comparison followed EPA (2002) recommendations. Namely, if the null hypothesis was accepted (i.e., there was no significant [$p > 0.05$] difference between background and on-site data), then it was concluded that the analyte was not elevated relative to background and it was dropped from further consideration as a COPEC for all receptors. COPECs with background concentrations that were significantly greater than site concentrations also were dropped from further consideration. Those COPECs with significantly greater site concentrations compared to background concentrations were retained for further evaluation.

Briefly, 23 COPECs had both on-site and background data available. On-site concentrations of eight COPECs (aluminum, beryllium, chromium, iron, manganese, mercury, nickel, and thallium) did not differ from background concentrations. Background concentrations were statistically greater than on-site concentrations for seven COPECs (arsenic, barium, cobalt, magnesium, phosphorus, strontium, and vanadium). These 15 COPECs were excluded from further evaluation. The remaining eight COPECs (antimony, cadmium, copper, lead, molybdenum, selenium, silver, and zinc) had greater on-site concentrations compared to background, and were carried forward for further evaluation in the refined screening assessment.

References:

SAS Institute 1999. SAS/STAT User's Guide, Version 8. SAS Institute, Cary, North Carolina.

United States Environmental Protection Agency (EPA). 2002. *Guidance for Comparing Background and Chemical Concentrations in Soil for CERCLA Sites*. EPA 540-R-01-003, OSWER 9285.7-41, Office of Emergency and Remedial Response, EPA, Washington, D.C. September.

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Aluminum	AMTOF-01-1298-01	Background	Habitat	mg/kg	=	12300		1998
Aluminum	AMTOF-02-1298-01	Background	Habitat	mg/kg	=	10500		1998
Aluminum	AMTOF-03-1298-01	Background	Habitat	mg/kg	=	13600		1998
Aluminum	AMTOF-04-1298-01	Background	Habitat	mg/kg	=	15400		1998
Aluminum	AMTOF-05-1298-01	Background	Habitat	mg/kg	=	10600		1998
Aluminum	AMTOF-06-1298-01	Background	Habitat	mg/kg	=	12800		1998
Aluminum	NR-238	Background	Habitat	mg/Kg	=	14800		2002
Aluminum	NR-239	Background	Habitat	mg/Kg	=	10800		2002
Aluminum	NR-500-0800-01	Background	Habitat	mg/kg	=	12600		2000
Aluminum	NR-501-0800-01	Background	Habitat	mg/kg	=	9160		2000
Aluminum	NR-502-0800-01	Background	Habitat	mg/kg	=	13700		2000
Aluminum	NR-503-0800-01	Background	Habitat	mg/kg	=	13300		2000
Aluminum	NR-504-0800-01	Background	Habitat	mg/kg	=	12200		2000
Aluminum	NR-505-0800-01	Background	Habitat	mg/kg	=	14100		2000
Aluminum	NR-506-0800-01	Background	Habitat	mg/kg	=	12200		2000
Aluminum	NR-507-0800-01	Background	Habitat	mg/kg	=	11600		2000
Aluminum	NR-508-0800-01	Background	Habitat	mg/kg	=	11100		2000
Aluminum	NR-509-0800-01	Background	Habitat	mg/kg	=	10500		2000
Aluminum	NR-510-0800-01	Background	Habitat	mg/kg	=	7800		2000
Aluminum	NR-511-0800-01	Background	Habitat	mg/kg	=	11500		2000
Aluminum	NR-512-0800-01	Background	Habitat	mg/kg	=	15600		2000
Aluminum	NR-513-0800-01	Background	Habitat	mg/kg	=	12800		2000
Aluminum	NR-514-0800-01	Background	Habitat	mg/kg	=	12700		2000
Aluminum	NR-515-0800-01	Background	Habitat	mg/kg	=	2820		2000
Aluminum	NR-516-0800-01	Background	Habitat	mg/kg	=	13700		2000
Aluminum	NR-517-0800-01	Background	Habitat	mg/kg	=	7490		2000
Aluminum	NR-518-0800-01	Background	Habitat	mg/kg	=	2080		2000
Aluminum	NR-519-0800-01	Background	Habitat	mg/kg	=	6810		2000
Aluminum	NR-520-0800-01	Background	Habitat	mg/kg	=	7070		2000
Aluminum	NR-521-0800-01	Background	Habitat	mg/kg	=	5050		2000
Aluminum	NR-522-0800-01	Background	Habitat	mg/kg	=	11700		2000
Aluminum	NR-523-0800-01	Background	Habitat	mg/kg	=	9750		2000
Aluminum	NR-524-0800-01	Background	Habitat	mg/kg	=	7980		2000
Aluminum	NR-525-0800-01	Background	Habitat	mg/kg	=	6340		2000
Aluminum	NR-536	Background	Habitat	mg/Kg	B	15000		2004
Aluminum	NR-537	Background	Habitat	mg/Kg	B	17200		2004
Aluminum	UTNCBU-01-OCT97-01	Background	Habitat	mg/kg	=	12100		1997
Aluminum	UTNCBU-02-OCT97-01	Background	Habitat	mg/kg	=	11400		1997
Aluminum	UTNCBU-03-1298-01	Background	Habitat	mg/kg	=	15800		1998
Aluminum	UTNCBU-04-1298-01	Background	Habitat	mg/kg	=	15400		1998
Aluminum	UTNCBU-05-1298-01	Background	Habitat	mg/kg	=	11700		1998
Aluminum	UTNCBU-06-1298-01	Background	Habitat	mg/kg	=	11500		1998
Aluminum	UTNEB-03-1298-01	Background	Habitat	mg/kg	=	12700		1998
Aluminum	UTNEB-04-1298-01	Background	Habitat	mg/kg	=	17700		1998
Aluminum	UTNEB-05-1298-01	Background	Habitat	mg/kg	=	14100		1998
Aluminum	UTNEB-06-1298-01	Background	Habitat	mg/kg	=	12000		1998
Aluminum	UTNERB-01-OCT97-01	Background	Habitat	mg/kg	=	21100		1997
Aluminum	UTNERB-02-OCT97-01	Background	Habitat	mg/kg	=	18900		1997
Aluminum	UTNOCB-01-OCT97-01	Background	Habitat	mg/kg	=	14100		1997
Aluminum	UTNOCB-02-OCT97-01	Background	Habitat	mg/kg	=	13400		1997
Aluminum	UTNOCBG-03-1298-01	Background	Habitat	mg/kg	=	11100		1998
Aluminum	UTNOCBG-04-1298-01	Background	Habitat	mg/kg	=	10000		1998
Aluminum	UTNOCBG-05-1298-01	Background	Habitat	mg/kg	=	10800		1998

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Aluminum	UTNOCBG-06-1298-01	Background	Habitat	mg/kg	=	15300		1998
Aluminum	NR-226	OnSite	Habitat	mg/Kg	=	5390		2002
Aluminum	NR-227	OnSite	Habitat	mg/Kg	=	8350		2002
Aluminum	NR-228	OnSite	OB/OD	mg/Kg	=	10400		2002
Aluminum	NR-229	OnSite	Habitat	mg/Kg	=	14700		2002
Aluminum	NR-230	OnSite	Habitat	mg/Kg	=	13000		2002
Aluminum	NR-231	OnSite	OB/OD	mg/Kg	=	12800		2002
Aluminum	NR-232	OnSite	Habitat	mg/Kg	=	16800		2002
Aluminum	NR-233	OnSite	Habitat	mg/Kg	=	10500		2002
Aluminum	NR-234	OnSite	Habitat	mg/Kg	=	13200		2002
Aluminum	NR-235	OnSite	Habitat	mg/Kg	=	13600		2002
Aluminum	NR-236	OnSite	Habitat	mg/Kg	=	10700		2002
Aluminum	NR-237	OnSite	Habitat	mg/Kg	=	11100		2002
Aluminum	NR-526	OnSite	Habitat	mg/Kg	B	9050		2004
Aluminum	NR-527	OnSite	Habitat	mg/Kg	B	13500		2004
Aluminum	NR-528	OnSite	Habitat	mg/Kg	B	7720		2004
Aluminum	NR-529	OnSite	Habitat	mg/Kg	B	11800		2004
Aluminum	NR-530	OnSite	Habitat	mg/Kg	B	9540		2004
Aluminum	NR-531	OnSite	OB/OD	mg/Kg	B	10800		2004
Aluminum	NR-532	OnSite	OB/OD	mg/Kg	B	8600		2004
Aluminum	NR-533	OnSite	OB/OD	mg/Kg	B	10300		2004
Aluminum	NR-534	OnSite	OB/OD	mg/Kg	B	9290		2004
Aluminum	NR-535	OnSite	OB/OD	mg/Kg	B	10300		2004
Aluminum	SS1	OnSite	OB/OD	mg/Kg	=	11000		1991
Aluminum	SS10	OnSite	OB/OD	mg/Kg	=	14000		1991
Aluminum	SS11	OnSite	OB/OD	mg/Kg	=	17000		1991
Aluminum	SS12	OnSite	OB/OD	mg/Kg	=	20000		1991
Aluminum	SS13	OnSite	OB/OD	mg/Kg	=	17000		1991
Aluminum	SS14	OnSite	OB/OD	mg/Kg	=	20000		1991
Aluminum	SS15	OnSite	OB/OD	mg/Kg	=	18000		1991
Aluminum	SS16	OnSite	Habitat	mg/Kg	=	14000		1991
Aluminum	SS17	OnSite	Habitat	mg/Kg	=	14000		1991
Aluminum	SS18	OnSite	Habitat	mg/Kg	=	17000		1991
Aluminum	SS19	OnSite	Habitat	mg/Kg	=	12000		1991
Aluminum	SS2	OnSite	OB/OD	mg/Kg	=	7900		1991
Aluminum	SS20	OnSite	Habitat	mg/Kg	=	15000		1991
Aluminum	SS3	OnSite	OB/OD	mg/Kg	=	20000		1991
Aluminum	SS4	OnSite	OB/OD	mg/Kg	=	9600		1991
Aluminum	SS5	OnSite	OB/OD	mg/Kg	=	11000		1991
Aluminum	SS6	OnSite	OB/OD	mg/Kg	=	16000		1991
Aluminum	SS7	OnSite	OB/OD	mg/Kg	=	13000		1991
Aluminum	SS8	OnSite	OB/OD	mg/Kg	=	13000		1991
Aluminum	SS9	OnSite	OB/OD	mg/Kg	=	54000		1991
Aluminum	TTU-SS01S	OnSite	OB/OD	mg/Kg	=	7980		1989
Aluminum	TTU-SS02S	OnSite	OB/OD	mg/Kg	=	9280		1989
Aluminum	TTU-SS03S	OnSite	OB/OD	mg/Kg	=	9950		1989
Aluminum	TTU-SS04S(D)	OnSite	OB/OD	mg/Kg	=	8630		1989
Aluminum	TTU-SS05S	OnSite	OB/OD	mg/Kg	=	9340		1989
Aluminum	TTU-SS06S(BG)	OnSite	Habitat	mg/Kg	=	14600		1989
Antimony	AMTOF-01-1298-01	Background	Habitat	mg/kg	=	1.07		1998
Antimony	AMTOF-02-1298-01	Background	Habitat	mg/kg	=	1.23		1998
Antimony	AMTOF-03-1298-01	Background	Habitat	mg/kg	=	1.47		1998
Antimony	AMTOF-04-1298-01	Background	Habitat	mg/kg	=	1.82		1998

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Antimony	AMTOF-05-1298-01	Background	Habitat	mg/kg	=	1.19		1998
Antimony	AMTOF-06-1298-01	Background	Habitat	mg/kg	=	1.48		1998
Antimony	NR-238	Background	Habitat	mg/Kg	=	2.1		2002
Antimony	NR-239	Background	Habitat	mg/Kg	=	3.1		2002
Antimony	NR-500-0800-01	Background	Habitat	mg/kg	U	0.135	0.27	2000
Antimony	NR-501-0800-01	Background	Habitat	mg/kg	U	0.745	1.49	2000
Antimony	NR-502-0800-01	Background	Habitat	mg/kg	U	0.88	1.76	2000
Antimony	NR-503-0800-01	Background	Habitat	mg/kg	U	0.715	1.43	2000
Antimony	NR-504-0800-01	Background	Habitat	mg/kg	U	0.765	1.53	2000
Antimony	NR-505-0800-01	Background	Habitat	mg/kg	U	0.85	1.7	2000
Antimony	NR-506-0800-01	Background	Habitat	mg/kg	U	0.68	1.36	2000
Antimony	NR-507-0800-01	Background	Habitat	mg/kg	U	0.00705	0.0141	2000
Antimony	NR-508-0800-01	Background	Habitat	mg/kg	U	0.715	1.43	2000
Antimony	NR-509-0800-01	Background	Habitat	mg/kg	U	0.17	0.34	2000
Antimony	NR-510-0800-01	Background	Habitat	mg/kg	U	0.88	1.76	2000
Antimony	NR-511-0800-01	Background	Habitat	mg/kg	U	0.1925	0.385	2000
Antimony	NR-512-0800-01	Background	Habitat	mg/kg	U	0.056	0.112	2000
Antimony	NR-513-0800-01	Background	Habitat	mg/kg	U	0.615	1.23	2000
Antimony	NR-514-0800-01	Background	Habitat	mg/kg	U	0.103	0.206	2000
Antimony	NR-515-0800-01	Background	Habitat	mg/kg	U	0.895	1.79	2000
Antimony	NR-516-0800-01	Background	Habitat	mg/kg	U	0.2255	0.451	2000
Antimony	NR-517-0800-01	Background	Habitat	mg/kg	U	0.16	0.32	2000
Antimony	NR-518-0800-01	Background	Habitat	mg/kg	U	0.498	0.996	2000
Antimony	NR-519-0800-01	Background	Habitat	mg/kg	U	0.051	0.102	2000
Antimony	NR-520-0800-01	Background	Habitat	mg/kg	J	2.54		2000
Antimony	NR-521-0800-01	Background	Habitat	mg/kg	U	0.74	1.48	2000
Antimony	NR-522-0800-01	Background	Habitat	mg/kg	U	0.2785	0.557	2000
Antimony	NR-523-0800-01	Background	Habitat	mg/kg	U	0.1325	0.265	2000
Antimony	NR-524-0800-01	Background	Habitat	mg/kg	U	0.99	1.98	2000
Antimony	NR-525-0800-01	Background	Habitat	mg/kg	U	1.07	2.14	2000
Antimony	NR-536	Background	Habitat	mg/Kg	J	0.21		2004
Antimony	NR-537	Background	Habitat	mg/Kg	J	0.2		2004
Antimony	UTNCBU-01-OCT97-01	Background	Habitat	mg/kg	B	0.644		1997
Antimony	UTNCBU-02-OCT97-01	Background	Habitat	mg/kg	B	0.499		1997
Antimony	UTNCBU-03-1298-01	Background	Habitat	mg/kg	J	0.148		1998
Antimony	UTNCBU-04-1298-01	Background	Habitat	mg/kg	=	0.376		1998
Antimony	UTNCBU-05-1298-01	Background	Habitat	mg/kg	J	0.229		1998
Antimony	UTNCBU-06-1298-01	Background	Habitat	mg/kg	L	0.341		1998
Antimony	UTNEB-03-1298-01	Background	Habitat	mg/kg	=	0.422		1998
Antimony	UTNEB-04-1298-01	Background	Habitat	mg/kg	J	0.122		1998
Antimony	UTNEB-05-1298-01	Background	Habitat	mg/kg	=	0.4		1998
Antimony	UTNEB-06-1298-01	Background	Habitat	mg/kg	=	0.362		1998
Antimony	UTNERB-01-OCT97-01	Background	Habitat	mg/kg	B	0.85		1997
Antimony	UTNERB-02-OCT97-01	Background	Habitat	mg/kg	B	0.843		1997
Antimony	UTNOCB-01-OCT97-01	Background	Habitat	mg/kg	B	0.766		1997
Antimony	UTNOCB-02-OCT97-01	Background	Habitat	mg/kg	B	0.559		1997
Antimony	UTNOCBG-03-1298-01	Background	Habitat	mg/kg	L	1.39		1998
Antimony	UTNOCBG-04-1298-01	Background	Habitat	mg/kg	=	1.25		1998
Antimony	UTNOCBG-05-1298-01	Background	Habitat	mg/kg	=	1.55		1998
Antimony	UTNOCBG-06-1298-01	Background	Habitat	mg/kg	=	1.66		1998
Antimony	NR-226	OnSite	Habitat	mg/Kg	=	1.9		2002
Antimony	NR-227	OnSite	Habitat	mg/Kg	=	2.3		2002
Antimony	NR-228	OnSite	OB/OD	mg/Kg	=	2.2		2002

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Antimony	NR-229	OnSite	Habitat	mg/Kg	=	2.2		2002
Antimony	NR-230	OnSite	Habitat	mg/Kg	=	3.3		2002
Antimony	NR-231	OnSite	OB/OD	mg/Kg	=	2.8		2002
Antimony	NR-232	OnSite	Habitat	mg/Kg	=	2.5		2002
Antimony	NR-233	OnSite	Habitat	mg/Kg	U	0.8	1.6	2002
Antimony	NR-234	OnSite	Habitat	mg/Kg	=	2.4		2002
Antimony	NR-235	OnSite	Habitat	mg/Kg	=	2.5		2002
Antimony	NR-236	OnSite	Habitat	mg/Kg	=	3.8		2002
Antimony	NR-237	OnSite	Habitat	mg/Kg	=	3.2		2002
Antimony	NR-526	OnSite	Habitat	mg/Kg	J	0.21		2004
Antimony	NR-527	OnSite	Habitat	mg/Kg	J	0.16		2004
Antimony	NR-528	OnSite	Habitat	mg/Kg	J	0.17		2004
Antimony	NR-529	OnSite	Habitat	mg/Kg	J	0.19		2004
Antimony	NR-530	OnSite	Habitat	mg/Kg	J	0.13		2004
Antimony	NR-531	OnSite	OB/OD	mg/Kg	=	166.93		2004
Antimony	NR-532	OnSite	OB/OD	mg/Kg	=	18.7		2004
Antimony	NR-533	OnSite	OB/OD	mg/Kg	J	0.12		2004
Antimony	NR-534	OnSite	OB/OD	mg/Kg	J	0.16		2004
Antimony	NR-535	OnSite	OB/OD	mg/Kg	J	0.13		2004
Antimony	TTU-SS01S	OnSite	OB/OD	mg/Kg	U	0.85	1.7	1989
Antimony	TTU-SS02S	OnSite	OB/OD	mg/Kg	=	6.4		1989
Antimony	TTU-SS03S	OnSite	OB/OD	mg/Kg	U	0.85	1.7	1989
Antimony	TTU-SS04S(D)	OnSite	OB/OD	mg/Kg	U	0.85	1.7	1989
Antimony	TTU-SS05S	OnSite	OB/OD	mg/Kg	U	0.8	1.6	1989
Antimony	TTU-SS06S(BG)	OnSite	Habitat	mg/Kg	U	0.85	1.7	1989
Arsenic	AMTOF-01-1298-01	Background	Habitat	mg/kg	=	5.79		1998
Arsenic	AMTOF-02-1298-01	Background	Habitat	mg/kg	=	6.83		1998
Arsenic	AMTOF-03-1298-01	Background	Habitat	mg/kg	=	5.66		1998
Arsenic	AMTOF-04-1298-01	Background	Habitat	mg/kg	=	5.74		1998
Arsenic	AMTOF-05-1298-01	Background	Habitat	mg/kg	=	7.14		1998
Arsenic	AMTOF-06-1298-01	Background	Habitat	mg/kg	=	5.81		1998
Arsenic	NR-238	Background	Habitat	mg/Kg	=	7.7		2002
Arsenic	NR-239	Background	Habitat	mg/Kg	=	8.2		2002
Arsenic	NR-500-0800-01	Background	Habitat	mg/kg	=	5.27		2000
Arsenic	NR-501-0800-01	Background	Habitat	mg/kg	=	9.54		2000
Arsenic	NR-502-0800-01	Background	Habitat	mg/kg	=	5.69		2000
Arsenic	NR-503-0800-01	Background	Habitat	mg/kg	=	5.03		2000
Arsenic	NR-504-0800-01	Background	Habitat	mg/kg	=	4.91		2000
Arsenic	NR-505-0800-01	Background	Habitat	mg/kg	=	5.57		2000
Arsenic	NR-506-0800-01	Background	Habitat	mg/kg	=	9.18		2000
Arsenic	NR-507-0800-01	Background	Habitat	mg/kg	=	5.26		2000
Arsenic	NR-508-0800-01	Background	Habitat	mg/kg	=	6.23		2000
Arsenic	NR-509-0800-01	Background	Habitat	mg/kg	=	8.45		2000
Arsenic	NR-510-0800-01	Background	Habitat	mg/kg	=	6.66		2000
Arsenic	NR-511-0800-01	Background	Habitat	mg/kg	=	5.75		2000
Arsenic	NR-512-0800-01	Background	Habitat	mg/kg	=	5.82		2000
Arsenic	NR-513-0800-01	Background	Habitat	mg/kg	=	4.34		2000
Arsenic	NR-514-0800-01	Background	Habitat	mg/kg	=	6.86		2000
Arsenic	NR-515-0800-01	Background	Habitat	mg/kg	=	8.48		2000
Arsenic	NR-516-0800-01	Background	Habitat	mg/kg	=	6.75		2000
Arsenic	NR-517-0800-01	Background	Habitat	mg/kg	=	15.4		2000
Arsenic	NR-518-0800-01	Background	Habitat	mg/kg	=	9.6		2000
Arsenic	NR-519-0800-01	Background	Habitat	mg/kg	=	5.81		2000

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Arsenic	NR-520-0800-01	Background	Habitat	mg/kg	=	5.92		2000
Arsenic	NR-521-0800-01	Background	Habitat	mg/kg	=	6.99		2000
Arsenic	NR-522-0800-01	Background	Habitat	mg/kg	=	6.37		2000
Arsenic	NR-523-0800-01	Background	Habitat	mg/kg	=	2.25		2000
Arsenic	NR-524-0800-01	Background	Habitat	mg/kg	=	5.7		2000
Arsenic	NR-525-0800-01	Background	Habitat	mg/kg	=	4.22		2000
Arsenic	NR-536	Background	Habitat	mg/Kg	J	5		2004
Arsenic	NR-537	Background	Habitat	mg/Kg	J	6.6		2004
Arsenic	UTNCBU-01-OCT97-01	Background	Habitat	mg/kg	=	6.88		1997
Arsenic	UTNCBU-02-OCT97-01	Background	Habitat	mg/kg	=	6.52		1997
Arsenic	UTNCBU-03-1298-01	Background	Habitat	mg/kg	=	6.69		1998
Arsenic	UTNCBU-04-1298-01	Background	Habitat	mg/kg	=	6.51		1998
Arsenic	UTNCBU-05-1298-01	Background	Habitat	mg/kg	=	5.46		1998
Arsenic	UTNCBU-06-1298-01	Background	Habitat	mg/kg	=	5.46		1998
Arsenic	UTNEB-03-1298-01	Background	Habitat	mg/kg	=	5.35		1998
Arsenic	UTNEB-04-1298-01	Background	Habitat	mg/kg	=	7.16		1998
Arsenic	UTNEB-05-1298-01	Background	Habitat	mg/kg	=	6.08		1998
Arsenic	UTNEB-06-1298-01	Background	Habitat	mg/kg	=	5.92		1998
Arsenic	UTNERB-01-OCT97-01	Background	Habitat	mg/kg	=	12.1		1997
Arsenic	UTNERB-02-OCT97-01	Background	Habitat	mg/kg	=	12		1997
Arsenic	UTNOCB-01-OCT97-01	Background	Habitat	mg/kg	=	8.03		1997
Arsenic	UTNOCB-02-OCT97-01	Background	Habitat	mg/kg	=	6.58		1997
Arsenic	UTNOCBG-03-1298-01	Background	Habitat	mg/kg	=	5		1998
Arsenic	UTNOCBG-04-1298-01	Background	Habitat	mg/kg	=	5.11		1998
Arsenic	UTNOCBG-05-1298-01	Background	Habitat	mg/kg	=	5.04		1998
Arsenic	UTNOCBG-06-1298-01	Background	Habitat	mg/kg	=	5.44		1998
Arsenic	NR-226	OnSite	Habitat	mg/Kg	=	4.9		2002
Arsenic	NR-227	OnSite	Habitat	mg/Kg	=	5.2		2002
Arsenic	NR-228	OnSite	OB/OD	mg/Kg	=	9.8		2002
Arsenic	NR-229	OnSite	Habitat	mg/Kg	=	8.5		2002
Arsenic	NR-230	OnSite	Habitat	mg/Kg	=	7.4		2002
Arsenic	NR-231	OnSite	OB/OD	mg/Kg	=	7.9		2002
Arsenic	NR-232	OnSite	Habitat	mg/Kg	=	41.3		2002
Arsenic	NR-233	OnSite	Habitat	mg/Kg	=	1.9		2002
Arsenic	NR-234	OnSite	Habitat	mg/Kg	=	7.5		2002
Arsenic	NR-235	OnSite	Habitat	mg/Kg	=	7.5		2002
Arsenic	NR-236	OnSite	Habitat	mg/Kg	=	7.3		2002
Arsenic	NR-237	OnSite	Habitat	mg/Kg	=	8.4		2002
Arsenic	NR-526	OnSite	Habitat	mg/Kg	J	4.7		2004
Arsenic	NR-527	OnSite	Habitat	mg/Kg	J	5.1		2004
Arsenic	NR-528	OnSite	Habitat	mg/Kg	J	4.2		2004
Arsenic	NR-529	OnSite	Habitat	mg/Kg	J	4.7		2004
Arsenic	NR-530	OnSite	Habitat	mg/Kg	J	4.6		2004
Arsenic	NR-531	OnSite	OB/OD	mg/Kg	J	5.7		2004
Arsenic	NR-532	OnSite	OB/OD	mg/Kg	J	5.5		2004
Arsenic	NR-533	OnSite	OB/OD	mg/Kg	J	5		2004
Arsenic	NR-534	OnSite	OB/OD	mg/Kg	J	4.8		2004
Arsenic	NR-535	OnSite	OB/OD	mg/Kg	J	5.4		2004
Arsenic	SS1	OnSite	OB/OD	mg/Kg	U	5	10	1991
Arsenic	SS10	OnSite	OB/OD	mg/Kg	U	5	10	1991
Arsenic	SS11	OnSite	OB/OD	mg/Kg	U	5	10	1991
Arsenic	SS12	OnSite	OB/OD	mg/Kg	U	5	10	1991
Arsenic	SS13	OnSite	OB/OD	mg/Kg	U	5	10	1991

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Arsenic	SS14	OnSite	OB/OD	mg/Kg	U	5	10	1991
Arsenic	SS15	OnSite	OB/OD	mg/Kg	U	5	10	1991
Arsenic	SS16	OnSite	Habitat	mg/Kg	U	5	10	1991
Arsenic	SS17	OnSite	Habitat	mg/Kg	U	5	10	1991
Arsenic	SS18	OnSite	Habitat	mg/Kg	U	5	10	1991
Arsenic	SS19	OnSite	Habitat	mg/Kg	U	5	10	1991
Arsenic	SS2	OnSite	OB/OD	mg/Kg	U	5	10	1991
Arsenic	SS20	OnSite	Habitat	mg/Kg	U	5	10	1991
Arsenic	SS3	OnSite	OB/OD	mg/Kg	U	5	10	1991
Arsenic	SS4	OnSite	OB/OD	mg/Kg	U	5	10	1991
Arsenic	SS5	OnSite	OB/OD	mg/Kg	U	5	10	1991
Arsenic	SS6	OnSite	OB/OD	mg/Kg	U	5	10	1991
Arsenic	SS7	OnSite	OB/OD	mg/Kg	U	5	10	1991
Arsenic	SS8	OnSite	OB/OD	mg/Kg	U	5	10	1991
Arsenic	SS9	OnSite	OB/OD	mg/Kg	U	5	10	1991
Arsenic	TTU-SS01S	OnSite	OB/OD	mg/Kg	=	5.7		1989
Arsenic	TTU-SS02S	OnSite	OB/OD	mg/Kg	=	7		1989
Arsenic	TTU-SS03S	OnSite	OB/OD	mg/Kg	=	9.6		1989
Arsenic	TTU-SS04S(D)	OnSite	OB/OD	mg/Kg	=	7		1989
Arsenic	TTU-SS05S	OnSite	OB/OD	mg/Kg	=	7.4		1989
Arsenic	TTU-SS06S(BG)	OnSite	Habitat	mg/Kg	=	5.9		1989
Barium	AMTOF-01-1298-01	Background	Habitat	mg/kg	=	213		1998
Barium	AMTOF-02-1298-01	Background	Habitat	mg/kg	=	148		1998
Barium	AMTOF-03-1298-01	Background	Habitat	mg/kg	=	215		1998
Barium	AMTOF-04-1298-01	Background	Habitat	mg/kg	=	233		1998
Barium	AMTOF-05-1298-01	Background	Habitat	mg/kg	=	227		1998
Barium	AMTOF-06-1298-01	Background	Habitat	mg/kg	=	215		1998
Barium	NR-238	Background	Habitat	mg/Kg	=	212		2002
Barium	NR-239	Background	Habitat	mg/Kg	=	225		2002
Barium	NR-500-0800-01	Background	Habitat	mg/kg	=	240		2000
Barium	NR-501-0800-01	Background	Habitat	mg/kg	=	266		2000
Barium	NR-502-0800-01	Background	Habitat	mg/kg	=	239		2000
Barium	NR-503-0800-01	Background	Habitat	mg/kg	=	257		2000
Barium	NR-504-0800-01	Background	Habitat	mg/kg	=	242		2000
Barium	NR-505-0800-01	Background	Habitat	mg/kg	=	266		2000
Barium	NR-506-0800-01	Background	Habitat	mg/kg	=	275		2000
Barium	NR-507-0800-01	Background	Habitat	mg/kg	=	184		2000
Barium	NR-508-0800-01	Background	Habitat	mg/kg	=	218		2000
Barium	NR-509-0800-01	Background	Habitat	mg/kg	=	344		2000
Barium	NR-510-0800-01	Background	Habitat	mg/kg	=	158		2000
Barium	NR-511-0800-01	Background	Habitat	mg/kg	=	180		2000
Barium	NR-512-0800-01	Background	Habitat	mg/kg	=	187		2000
Barium	NR-513-0800-01	Background	Habitat	mg/kg	=	205		2000
Barium	NR-514-0800-01	Background	Habitat	mg/kg	=	223		2000
Barium	NR-515-0800-01	Background	Habitat	mg/kg	=	194		2000
Barium	NR-516-0800-01	Background	Habitat	mg/kg	=	339		2000
Barium	NR-517-0800-01	Background	Habitat	mg/kg	=	246		2000
Barium	NR-518-0800-01	Background	Habitat	mg/kg	=	270		2000
Barium	NR-519-0800-01	Background	Habitat	mg/kg	=	370		2000
Barium	NR-520-0800-01	Background	Habitat	mg/kg	=	313		2000
Barium	NR-521-0800-01	Background	Habitat	mg/kg	=	334		2000
Barium	NR-522-0800-01	Background	Habitat	mg/kg	=	336		2000
Barium	NR-523-0800-01	Background	Habitat	mg/kg	=	341		2000

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Barium	NR-524-0800-01	Background	Habitat	mg/kg	=	344		2000
Barium	NR-525-0800-01	Background	Habitat	mg/kg	=	309		2000
Barium	NR-536	Background	Habitat	mg/Kg	=	275		2004
Barium	NR-537	Background	Habitat	mg/Kg	=	244		2004
Barium	UTNCBU-01-OCT97-01	Background	Habitat	mg/kg	=	217		1997
Barium	UTNCBU-02-OCT97-01	Background	Habitat	mg/kg	=	288		1997
Barium	UTNCBU-03-1298-01	Background	Habitat	mg/kg	=	227		1998
Barium	UTNCBU-04-1298-01	Background	Habitat	mg/kg	=	221		1998
Barium	UTNCBU-05-1298-01	Background	Habitat	mg/kg	=	196		1998
Barium	UTNCBU-06-1298-01	Background	Habitat	mg/kg	=	208		1998
Barium	UTNEB-03-1298-01	Background	Habitat	mg/kg	=	426		1998
Barium	UTNEB-04-1298-01	Background	Habitat	mg/kg	=	255		1998
Barium	UTNEB-05-1298-01	Background	Habitat	mg/kg	=	263		1998
Barium	UTNEB-06-1298-01	Background	Habitat	mg/kg	=	270		1998
Barium	UTNERB-01-OCT97-01	Background	Habitat	mg/kg	=	270		1997
Barium	UTNERB-02-OCT97-01	Background	Habitat	mg/kg	=	316		1997
Barium	UTNOCB-01-OCT97-01	Background	Habitat	mg/kg	=	266		1997
Barium	UTNOCB-02-OCT97-01	Background	Habitat	mg/kg	=	237		1997
Barium	UTNOCBG-03-1298-01	Background	Habitat	mg/kg	=	274		1998
Barium	UTNOCBG-04-1298-01	Background	Habitat	mg/kg	=	283		1998
Barium	UTNOCBG-05-1298-01	Background	Habitat	mg/kg	=	277		1998
Barium	UTNOCBG-06-1298-01	Background	Habitat	mg/kg	=	332		1998
Barium	NR-226	OnSite	Habitat	mg/Kg	=	152		2002
Barium	NR-227	OnSite	Habitat	mg/Kg	=	187		2002
Barium	NR-228	OnSite	OB/OD	mg/Kg	=	180		2002
Barium	NR-229	OnSite	Habitat	mg/Kg	=	205		2002
Barium	NR-230	OnSite	Habitat	mg/Kg	=	247		2002
Barium	NR-231	OnSite	OB/OD	mg/Kg	=	212		2002
Barium	NR-232	OnSite	Habitat	mg/Kg	=	215		2002
Barium	NR-233	OnSite	Habitat	mg/Kg	=	204		2002
Barium	NR-234	OnSite	Habitat	mg/Kg	=	218		2002
Barium	NR-235	OnSite	Habitat	mg/Kg	=	222		2002
Barium	NR-236	OnSite	Habitat	mg/Kg	=	206		2002
Barium	NR-237	OnSite	Habitat	mg/Kg	=	192		2002
Barium	NR-526	OnSite	Habitat	mg/Kg	=	218		2004
Barium	NR-527	OnSite	Habitat	mg/Kg	=	228		2004
Barium	NR-528	OnSite	Habitat	mg/Kg	=	191		2004
Barium	NR-529	OnSite	Habitat	mg/Kg	=	336		2004
Barium	NR-530	OnSite	Habitat	mg/Kg	=	220		2004
Barium	NR-531	OnSite	OB/OD	mg/Kg	=	196		2004
Barium	NR-532	OnSite	OB/OD	mg/Kg	=	187		2004
Barium	NR-533	OnSite	OB/OD	mg/Kg	=	211		2004
Barium	NR-534	OnSite	OB/OD	mg/Kg	=	194		2004
Barium	NR-535	OnSite	OB/OD	mg/Kg	=	187		2004
Barium	SS1	OnSite	OB/OD	mg/Kg	=	140		1991
Barium	SS10	OnSite	OB/OD	mg/Kg	=	190		1991
Barium	SS11	OnSite	OB/OD	mg/Kg	=	240		1991
Barium	SS12	OnSite	OB/OD	mg/Kg	=	200		1991
Barium	SS13	OnSite	OB/OD	mg/Kg	=	640		1991
Barium	SS14	OnSite	OB/OD	mg/Kg	=	190		1991
Barium	SS15	OnSite	OB/OD	mg/Kg	=	200		1991
Barium	SS16	OnSite	Habitat	mg/Kg	=	230		1991
Barium	SS17	OnSite	Habitat	mg/Kg	=	210		1991

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Barium	SS18	OnSite	Habitat	mg/Kg	=	220		1991
Barium	SS19	OnSite	Habitat	mg/Kg	=	180		1991
Barium	SS2	OnSite	OB/OD	mg/Kg	=	110		1991
Barium	SS20	OnSite	Habitat	mg/Kg	=	190		1991
Barium	SS3	OnSite	OB/OD	mg/Kg	=	160		1991
Barium	SS4	OnSite	OB/OD	mg/Kg	=	170		1991
Barium	SS5	OnSite	OB/OD	mg/Kg	=	240		1991
Barium	SS6	OnSite	OB/OD	mg/Kg	=	220		1991
Barium	SS7	OnSite	OB/OD	mg/Kg	=	200		1991
Barium	SS8	OnSite	OB/OD	mg/Kg	=	200		1991
Barium	SS9	OnSite	OB/OD	mg/Kg	=	210		1991
Barium	TTU-SS01S	OnSite	OB/OD	mg/Kg	=	153		1989
Barium	TTU-SS02S	OnSite	OB/OD	mg/Kg	=	162		1989
Barium	TTU-SS03S	OnSite	OB/OD	mg/Kg	=	161		1989
Barium	TTU-SS04S(D)	OnSite	OB/OD	mg/Kg	=	136		1989
Barium	TTU-SS05S	OnSite	OB/OD	mg/Kg	=	159		1989
Barium	TTU-SS06S(BG)	OnSite	Habitat	mg/Kg	=	181		1989
Beryllium	AMTOF-01-1298-01	Background	Habitat	mg/kg	=	0.209		1998
Beryllium	AMTOF-02-1298-01	Background	Habitat	mg/kg	=	0.204		1998
Beryllium	AMTOF-03-1298-01	Background	Habitat	mg/kg	=	0.16		1998
Beryllium	AMTOF-04-1298-01	Background	Habitat	mg/kg	=	0.206		1998
Beryllium	AMTOF-05-1298-01	Background	Habitat	mg/kg	=	0.204		1998
Beryllium	AMTOF-06-1298-01	Background	Habitat	mg/kg	=	0.19		1998
Beryllium	NR-238	Background	Habitat	mg/Kg	=	0.65		2002
Beryllium	NR-239	Background	Habitat	mg/Kg	=	0.55		2002
Beryllium	NR-500-0800-01	Background	Habitat	mg/kg	=	0.562		2000
Beryllium	NR-501-0800-01	Background	Habitat	mg/kg	=	0.432		2000
Beryllium	NR-502-0800-01	Background	Habitat	mg/kg	=	0.606		2000
Beryllium	NR-503-0800-01	Background	Habitat	mg/kg	=	0.576		2000
Beryllium	NR-504-0800-01	Background	Habitat	mg/kg	=	0.525		2000
Beryllium	NR-505-0800-01	Background	Habitat	mg/kg	=	0.603		2000
Beryllium	NR-506-0800-01	Background	Habitat	mg/kg	=	0.565		2000
Beryllium	NR-507-0800-01	Background	Habitat	mg/kg	=	0.505		2000
Beryllium	NR-508-0800-01	Background	Habitat	mg/kg	=	0.502		2000
Beryllium	NR-509-0800-01	Background	Habitat	mg/kg	=	0.526		2000
Beryllium	NR-510-0800-01	Background	Habitat	mg/kg	=	0.393		2000
Beryllium	NR-511-0800-01	Background	Habitat	mg/kg	=	0.525		2000
Beryllium	NR-512-0800-01	Background	Habitat	mg/kg	=	0.689		2000
Beryllium	NR-513-0800-01	Background	Habitat	mg/kg	=	0.576		2000
Beryllium	NR-514-0800-01	Background	Habitat	mg/kg	=	0.537		2000
Beryllium	NR-515-0800-01	Background	Habitat	mg/kg	=	0.209		2000
Beryllium	NR-516-0800-01	Background	Habitat	mg/kg	=	0.732		2000
Beryllium	NR-517-0800-01	Background	Habitat	mg/kg	=	0.361		2000
Beryllium	NR-518-0800-01	Background	Habitat	mg/kg	=	0.179		2000
Beryllium	NR-519-0800-01	Background	Habitat	mg/kg	=	0.396		2000
Beryllium	NR-520-0800-01	Background	Habitat	mg/kg	=	0.368		2000
Beryllium	NR-521-0800-01	Background	Habitat	mg/kg	=	0.305		2000
Beryllium	NR-522-0800-01	Background	Habitat	mg/kg	=	0.568		2000
Beryllium	NR-523-0800-01	Background	Habitat	mg/kg	=	0.465		2000
Beryllium	NR-524-0800-01	Background	Habitat	mg/kg	=	0.46		2000
Beryllium	NR-525-0800-01	Background	Habitat	mg/kg	=	0.399		2000
Beryllium	NR-536	Background	Habitat	mg/Kg	J	0.79		2004
Beryllium	NR-537	Background	Habitat	mg/Kg	J	0.89		2004

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Beryllium	UTNCBU-01-OCT97-01	Background	Habitat	mg/kg	=	0.639		1997
Beryllium	UTNCBU-02-OCT97-01	Background	Habitat	mg/kg	=	0.582		1997
Beryllium	UTNCBU-03-1298-01	Background	Habitat	mg/kg	U	0.0067	0.0134	1998
Beryllium	UTNCBU-04-1298-01	Background	Habitat	mg/kg	U	0.0068	0.0136	1998
Beryllium	UTNCBU-05-1298-01	Background	Habitat	mg/kg	U	0.0058	0.0116	1998
Beryllium	UTNCBU-06-1298-01	Background	Habitat	mg/kg	U	0.00755	0.0151	1998
Beryllium	UTNEB-03-1298-01	Background	Habitat	mg/kg	U	0.0056	0.0112	1998
Beryllium	UTNEB-04-1298-01	Background	Habitat	mg/kg	U	0.00645	0.0129	1998
Beryllium	UTNEB-05-1298-01	Background	Habitat	mg/kg	U	0.00535	0.0107	1998
Beryllium	UTNEB-06-1298-01	Background	Habitat	mg/kg	U	0.00735	0.0147	1998
Beryllium	UTNERB-01-OCT97-01	Background	Habitat	mg/kg	=	1.05		1997
Beryllium	UTNERB-02-OCT97-01	Background	Habitat	mg/kg	=	0.885		1997
Beryllium	UTNOCB-01-OCT97-01	Background	Habitat	mg/kg	=	0.761		1997
Beryllium	UTNOCB-02-OCT97-01	Background	Habitat	mg/kg	=	0.773		1997
Beryllium	UTNOCBG-03-1298-01	Background	Habitat	mg/kg	=	0.16		1998
Beryllium	UTNOCBG-04-1298-01	Background	Habitat	mg/kg	=	0.22		1998
Beryllium	UTNOCBG-05-1298-01	Background	Habitat	mg/kg	J	0.0839		1998
Beryllium	UTNOCBG-06-1298-01	Background	Habitat	mg/kg	=	0.248		1998
Beryllium	NR-226	OnSite	Habitat	mg/Kg	=	0.3		2002
Beryllium	NR-227	OnSite	Habitat	mg/Kg	=	0.44		2002
Beryllium	NR-228	OnSite	OB/OD	mg/Kg	=	0.58		2002
Beryllium	NR-229	OnSite	Habitat	mg/Kg	=	0.71		2002
Beryllium	NR-230	OnSite	Habitat	mg/Kg	=	0.61		2002
Beryllium	NR-231	OnSite	OB/OD	mg/Kg	=	0.65		2002
Beryllium	NR-232	OnSite	Habitat	mg/Kg	=	0.7		2002
Beryllium	NR-233	OnSite	Habitat	mg/Kg	=	0.46		2002
Beryllium	NR-234	OnSite	Habitat	mg/Kg	=	0.68		2002
Beryllium	NR-235	OnSite	Habitat	mg/Kg	=	0.61		2002
Beryllium	NR-236	OnSite	Habitat	mg/Kg	=	0.57		2002
Beryllium	NR-237	OnSite	Habitat	mg/Kg	=	0.52		2002
Beryllium	NR-526	OnSite	Habitat	mg/Kg	J	0.45		2004
Beryllium	NR-527	OnSite	Habitat	mg/Kg	J	0.72		2004
Beryllium	NR-528	OnSite	Habitat	mg/Kg	J	0.44		2004
Beryllium	NR-529	OnSite	Habitat	mg/Kg	J	0.57		2004
Beryllium	NR-530	OnSite	Habitat	mg/Kg	J	0.55		2004
Beryllium	NR-531	OnSite	OB/OD	mg/Kg	J	0.28		2004
Beryllium	NR-532	OnSite	OB/OD	mg/Kg	J	0.28		2004
Beryllium	NR-533	OnSite	OB/OD	mg/Kg	J	0.55		2004
Beryllium	NR-534	OnSite	OB/OD	mg/Kg	J	0.47		2004
Beryllium	NR-535	OnSite	OB/OD	mg/Kg	J	0.48		2004
Beryllium	SS1	OnSite	OB/OD	mg/Kg	U	0.5	1	1991
Beryllium	SS10	OnSite	OB/OD	mg/Kg	U	0.5	1	1991
Beryllium	SS11	OnSite	OB/OD	mg/Kg	U	0.5	1	1991
Beryllium	SS12	OnSite	OB/OD	mg/Kg	U	0.5	1	1991
Beryllium	SS13	OnSite	OB/OD	mg/Kg	U	0.5	1	1991
Beryllium	SS14	OnSite	OB/OD	mg/Kg	U	0.5	1	1991
Beryllium	SS15	OnSite	OB/OD	mg/Kg	U	0.5	1	1991
Beryllium	SS16	OnSite	Habitat	mg/Kg	U	0.5	1	1991
Beryllium	SS17	OnSite	Habitat	mg/Kg	U	0.5	1	1991
Beryllium	SS18	OnSite	Habitat	mg/Kg	U	0.5	1	1991
Beryllium	SS19	OnSite	Habitat	mg/Kg	U	0.5	1	1991
Beryllium	SS2	OnSite	OB/OD	mg/Kg	U	0.5	1	1991
Beryllium	SS20	OnSite	Habitat	mg/Kg	U	0.5	1	1991

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Beryllium	SS3	OnSite	OB/OD	mg/Kg	U	0.5	1	1991
Beryllium	SS4	OnSite	OB/OD	mg/Kg	U	0.5	1	1991
Beryllium	SS5	OnSite	OB/OD	mg/Kg	U	0.5	1	1991
Beryllium	SS6	OnSite	OB/OD	mg/Kg	U	0.5	1	1991
Beryllium	SS7	OnSite	OB/OD	mg/Kg	U	0.5	1	1991
Beryllium	SS8	OnSite	OB/OD	mg/Kg	U	0.5	1	1991
Beryllium	SS9	OnSite	OB/OD	mg/Kg	U	0.5	1	1991
Beryllium	TTU-SS01S	OnSite	OB/OD	mg/Kg	U	0.085	0.17	1989
Beryllium	TTU-SS02S	OnSite	OB/OD	mg/Kg	U	0.075	0.15	1989
Beryllium	TTU-SS03S	OnSite	OB/OD	mg/Kg	U	0.085	0.17	1989
Beryllium	TTU-SS04S(D)	OnSite	OB/OD	mg/Kg	U	0.085	0.17	1989
Beryllium	TTU-SS05S	OnSite	OB/OD	mg/Kg	U	0.08	0.16	1989
Beryllium	TTU-SS06S(BG)	OnSite	Habitat	mg/Kg	=	0.3		1989
Bismuth	AMTOF-01-1298-01	Background	Habitat	mg/kg	U	0.1275	0.255	1998
Bismuth	AMTOF-02-1298-01	Background	Habitat	mg/kg	U	0.0955	0.191	1998
Bismuth	AMTOF-03-1298-01	Background	Habitat	mg/kg	J	0.0741		1998
Bismuth	AMTOF-04-1298-01	Background	Habitat	mg/kg	U	0.1225	0.245	1998
Bismuth	AMTOF-05-1298-01	Background	Habitat	mg/kg	U	0.1245	0.249	1998
Bismuth	AMTOF-06-1298-01	Background	Habitat	mg/kg	U	0.125	0.25	1998
Bismuth	NR-500-0800-01	Background	Habitat	mg/kg	J	0.436		2000
Bismuth	NR-501-0800-01	Background	Habitat	mg/kg	U	0.123	0.246	2000
Bismuth	NR-502-0800-01	Background	Habitat	mg/kg	J	0.481		2000
Bismuth	NR-503-0800-01	Background	Habitat	mg/kg	U	0.088	0.176	2000
Bismuth	NR-504-0800-01	Background	Habitat	mg/kg	U	0.116	0.232	2000
Bismuth	NR-505-0800-01	Background	Habitat	mg/kg	U	0.126	0.252	2000
Bismuth	NR-506-0800-01	Background	Habitat	mg/kg	U	0.089	0.178	2000
Bismuth	NR-507-0800-01	Background	Habitat	mg/kg	U	0.0975	0.195	2000
Bismuth	NR-508-0800-01	Background	Habitat	mg/kg	U	0.0324	0.0648	2000
Bismuth	NR-509-0800-01	Background	Habitat	mg/kg	U	0.106	0.212	2000
Bismuth	NR-510-0800-01	Background	Habitat	mg/kg	J	0.301		2000
Bismuth	NR-511-0800-01	Background	Habitat	mg/kg	J	0.329		2000
Bismuth	NR-512-0800-01	Background	Habitat	mg/kg	U	0.1055	0.211	2000
Bismuth	NR-513-0800-01	Background	Habitat	mg/kg	U	0.094	0.188	2000
Bismuth	NR-514-0800-01	Background	Habitat	mg/kg	U	0.1135	0.227	2000
Bismuth	NR-515-0800-01	Background	Habitat	mg/kg	U	0.022	0.044	2000
Bismuth	NR-516-0800-01	Background	Habitat	mg/kg	U	0.1255	0.251	2000
Bismuth	NR-517-0800-01	Background	Habitat	mg/kg	U	0.01945	0.0389	2000
Bismuth	NR-518-0800-01	Background	Habitat	mg/kg	U	0.0328	0.0656	2000
Bismuth	NR-519-0800-01	Background	Habitat	mg/kg	U	0.193	0.386	2000
Bismuth	NR-520-0800-01	Background	Habitat	mg/kg	U	0.03555	0.0711	2000
Bismuth	NR-521-0800-01	Background	Habitat	mg/kg	U	0.003625	0.00725	2000
Bismuth	NR-522-0800-01	Background	Habitat	mg/kg	U	0.0825	0.165	2000
Bismuth	NR-523-0800-01	Background	Habitat	mg/kg	U	0.124	0.248	2000
Bismuth	NR-524-0800-01	Background	Habitat	mg/kg	U	0.234	0.468	2000
Bismuth	NR-525-0800-01	Background	Habitat	mg/kg	U	0.2035	0.407	2000
Bismuth	UTNCBU-01-OCT97-01	Background	Habitat	mg/kg	U	0.0745	0.149	1997
Bismuth	UTNCBU-02-OCT97-01	Background	Habitat	mg/kg	U	0.2115	0.423	1997
Bismuth	UTNCBU-03-1298-01	Background	Habitat	mg/kg	U	0.218	0.436	1998
Bismuth	UTNCBU-04-1298-01	Background	Habitat	mg/kg	U	0.2385	0.477	1998
Bismuth	UTNCBU-05-1298-01	Background	Habitat	mg/kg	J	0.0411		1998
Bismuth	UTNCBU-06-1298-01	Background	Habitat	mg/kg	J	0.0757		1998
Bismuth	UTNEB-03-1298-01	Background	Habitat	mg/kg	J	0.206		1998
Bismuth	UTNEB-04-1298-01	Background	Habitat	mg/kg	U	0.259	0.518	1998

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Bismuth	UTNEB-05-1298-01	Background	Habitat	mg/kg	U	0.212	0.424	1998
Bismuth	UTNEB-06-1298-01	Background	Habitat	mg/kg	U	0.2185	0.437	1998
Bismuth	UTNERB-01-OCT97-01	Background	Habitat	mg/kg	U	0.2545	0.509	1997
Bismuth	UTNERB-02-OCT97-01	Background	Habitat	mg/kg	U	0.258	0.516	1997
Bismuth	UTNOCB-01-OCT97-01	Background	Habitat	mg/kg	U	0.233	0.466	1997
Bismuth	UTNOCB-02-OCT97-01	Background	Habitat	mg/kg	U	0.196	0.392	1997
Bismuth	UTNOCBG-03-1298-01	Background	Habitat	mg/kg	U	0.237	0.474	1998
Bismuth	UTNOCBG-04-1298-01	Background	Habitat	mg/kg	U	0.227	0.454	1998
Bismuth	UTNOCBG-05-1298-01	Background	Habitat	mg/kg	U	0.2195	0.439	1998
Bismuth	UTNOCBG-06-1298-01	Background	Habitat	mg/kg	U	0.1635	0.327	1998
Boron	AMTOF-01-1298-01	Background	Habitat	mg/kg	=	32.1		1998
Boron	AMTOF-02-1298-01	Background	Habitat	mg/kg	=	23.1		1998
Boron	AMTOF-03-1298-01	Background	Habitat	mg/kg	=	33.6		1998
Boron	AMTOF-04-1298-01	Background	Habitat	mg/kg	=	39.5		1998
Boron	AMTOF-05-1298-01	Background	Habitat	mg/kg	=	28.6		1998
Boron	AMTOF-06-1298-01	Background	Habitat	mg/kg	=	32.4		1998
Boron	NR-500-0800-01	Background	Habitat	mg/kg	=	45.3		2000
Boron	NR-501-0800-01	Background	Habitat	mg/kg	=	73		2000
Boron	NR-502-0800-01	Background	Habitat	mg/kg	=	55.6		2000
Boron	NR-503-0800-01	Background	Habitat	mg/kg	=	67.3		2000
Boron	NR-504-0800-01	Background	Habitat	mg/kg	=	93.6		2000
Boron	NR-505-0800-01	Background	Habitat	mg/kg	=	124		2000
Boron	NR-506-0800-01	Background	Habitat	mg/kg	=	53.6		2000
Boron	NR-507-0800-01	Background	Habitat	mg/kg	=	24.7		2000
Boron	NR-508-0800-01	Background	Habitat	mg/kg	=	28.5		2000
Boron	NR-509-0800-01	Background	Habitat	mg/kg	=	29.3		2000
Boron	NR-510-0800-01	Background	Habitat	mg/kg	=	14.8		2000
Boron	NR-511-0800-01	Background	Habitat	mg/kg	=	25.1		2000
Boron	NR-512-0800-01	Background	Habitat	mg/kg	=	28.2		2000
Boron	NR-513-0800-01	Background	Habitat	mg/kg	=	31.7		2000
Boron	NR-514-0800-01	Background	Habitat	mg/kg	=	147		2000
Boron	NR-515-0800-01	Background	Habitat	mg/kg	=	170		2000
Boron	NR-516-0800-01	Background	Habitat	mg/kg	=	27.5		2000
Boron	NR-517-0800-01	Background	Habitat	mg/kg	=	619		2000
Boron	NR-518-0800-01	Background	Habitat	mg/kg	=	118		2000
Boron	NR-519-0800-01	Background	Habitat	mg/kg	=	55.7		2000
Boron	NR-520-0800-01	Background	Habitat	mg/kg	=	57.1		2000
Boron	NR-521-0800-01	Background	Habitat	mg/kg	=	55.5		2000
Boron	NR-522-0800-01	Background	Habitat	mg/kg	=	54.8		2000
Boron	NR-523-0800-01	Background	Habitat	mg/kg	=	23.1		2000
Boron	NR-524-0800-01	Background	Habitat	mg/kg	=	37.7		2000
Boron	NR-525-0800-01	Background	Habitat	mg/kg	=	27.1		2000
Boron	UTNCBU-01-OCT97-01	Background	Habitat	mg/kg	=	46.7		1997
Boron	UTNCBU-02-OCT97-01	Background	Habitat	mg/kg	=	41.5		1997
Boron	UTNCBU-03-1298-01	Background	Habitat	mg/kg	=	45.3		1998
Boron	UTNCBU-04-1298-01	Background	Habitat	mg/kg	=	47.7		1998
Boron	UTNCBU-05-1298-01	Background	Habitat	mg/kg	=	32.9		1998
Boron	UTNCBU-06-1298-01	Background	Habitat	mg/kg	=	28		1998
Boron	UTNEB-03-1298-01	Background	Habitat	mg/kg	=	32.4		1998
Boron	UTNEB-04-1298-01	Background	Habitat	mg/kg	=	54.3		1998
Boron	UTNEB-05-1298-01	Background	Habitat	mg/kg	=	53.3		1998
Boron	UTNEB-06-1298-01	Background	Habitat	mg/kg	=	34.6		1998
Boron	UTNERB-01-OCT97-01	Background	Habitat	mg/kg	=	169		1997

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Sample Data for Inorganics in TTU Background and Site Soils
 Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Boron	UTNERB-02-OCT97-01	Background	Habitat	mg/kg	=	101		1997
Boron	UTNOCB-01-OCT97-01	Background	Habitat	mg/kg	=	71.6		1997
Boron	UTNOCB-02-OCT97-01	Background	Habitat	mg/kg	=	145		1997
Boron	UTNOCBG-03-1298-01	Background	Habitat	mg/kg	=	34.6		1998
Boron	UTNOCBG-04-1298-01	Background	Habitat	mg/kg	=	48.3		1998
Boron	UTNOCBG-05-1298-01	Background	Habitat	mg/kg	=	40.8		1998
Boron	UTNOCBG-06-1298-01	Background	Habitat	mg/kg	=	52		1998
Cadmium	AMTOF-01-1298-01	Background	Habitat	mg/kg	=	0.347		1998
Cadmium	AMTOF-02-1298-01	Background	Habitat	mg/kg	=	0.384		1998
Cadmium	AMTOF-03-1298-01	Background	Habitat	mg/kg	=	0.263		1998
Cadmium	AMTOF-04-1298-01	Background	Habitat	mg/kg	=	0.162		1998
Cadmium	AMTOF-05-1298-01	Background	Habitat	mg/kg	=	0.288		1998
Cadmium	AMTOF-06-1298-01	Background	Habitat	mg/kg	=	0.247		1998
Cadmium	NR-238	Background	Habitat	mg/Kg	=	0.71		2002
Cadmium	NR-239	Background	Habitat	mg/Kg	=	0.67		2002
Cadmium	NR-500-0800-01	Background	Habitat	mg/kg	U	0.01285	0.0257	2000
Cadmium	NR-501-0800-01	Background	Habitat	mg/kg	U	0.017	0.034	2000
Cadmium	NR-502-0800-01	Background	Habitat	mg/kg	U	0.012	0.024	2000
Cadmium	NR-503-0800-01	Background	Habitat	mg/kg	J	0.0336		2000
Cadmium	NR-504-0800-01	Background	Habitat	mg/kg	U	0.002915	0.00583	2000
Cadmium	NR-505-0800-01	Background	Habitat	mg/kg	U	0.0195	0.039	2000
Cadmium	NR-506-0800-01	Background	Habitat	mg/kg	J	0.0976		2000
Cadmium	NR-507-0800-01	Background	Habitat	mg/kg	J	0.107		2000
Cadmium	NR-508-0800-01	Background	Habitat	mg/kg	U	0.0117	0.0234	2000
Cadmium	NR-509-0800-01	Background	Habitat	mg/kg	J	0.0575		2000
Cadmium	NR-510-0800-01	Background	Habitat	mg/kg	J	0.148		2000
Cadmium	NR-511-0800-01	Background	Habitat	mg/kg	=	0.296		2000
Cadmium	NR-512-0800-01	Background	Habitat	mg/kg	J	0.0626		2000
Cadmium	NR-513-0800-01	Background	Habitat	mg/kg	J	0.134		2000
Cadmium	NR-514-0800-01	Background	Habitat	mg/kg	U	0.02015	0.0403	2000
Cadmium	NR-515-0800-01	Background	Habitat	mg/kg	U	0.02055	0.0411	2000
Cadmium	NR-516-0800-01	Background	Habitat	mg/kg	U	0.02585	0.0517	2000
Cadmium	NR-517-0800-01	Background	Habitat	mg/kg	U	0.01945	0.0389	2000
Cadmium	NR-518-0800-01	Background	Habitat	mg/kg	U	0.01835	0.0367	2000
Cadmium	NR-519-0800-01	Background	Habitat	mg/kg	U	0.02665	0.0533	2000
Cadmium	NR-520-0800-01	Background	Habitat	mg/kg	U	0.02715	0.0543	2000
Cadmium	NR-521-0800-01	Background	Habitat	mg/kg	U	0.02175	0.0435	2000
Cadmium	NR-522-0800-01	Background	Habitat	mg/kg	U	0.02205	0.0441	2000
Cadmium	NR-523-0800-01	Background	Habitat	mg/kg	U	0.02105	0.0421	2000
Cadmium	NR-524-0800-01	Background	Habitat	mg/kg	U	0.0323	0.0646	2000
Cadmium	NR-525-0800-01	Background	Habitat	mg/kg	U	0.0278	0.0556	2000
Cadmium	NR-536	Background	Habitat	mg/Kg	UB	0.095	0.19	2004
Cadmium	NR-537	Background	Habitat	mg/Kg	J	0.35		2004
Cadmium	UTNCBU-01-OCT97-01	Background	Habitat	mg/kg	=	0.26		1997
Cadmium	UTNCBU-02-OCT97-01	Background	Habitat	mg/kg	=	0.249		1997
Cadmium	UTNCBU-03-1298-01	Background	Habitat	mg/kg	=	0.466		1998
Cadmium	UTNCBU-04-1298-01	Background	Habitat	mg/kg	=	0.5		1998
Cadmium	UTNCBU-05-1298-01	Background	Habitat	mg/kg	=	0.311		1998
Cadmium	UTNCBU-06-1298-01	Background	Habitat	mg/kg	=	0.318		1998
Cadmium	UTNEB-03-1298-01	Background	Habitat	mg/kg	=	0.448		1998
Cadmium	UTNEB-04-1298-01	Background	Habitat	mg/kg	=	0.523		1998
Cadmium	UTNEB-05-1298-01	Background	Habitat	mg/kg	=	0.446		1998
Cadmium	UTNEB-06-1298-01	Background	Habitat	mg/kg	=	0.35		1998

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Cadmium	UTNERB-01-OCT97-01	Background	Habitat	mg/kg	=	0.239		1997
Cadmium	UTNERB-02-OCT97-01	Background	Habitat	mg/kg	=	0.267		1997
Cadmium	UTNOCB-01-OCT97-01	Background	Habitat	mg/kg	=	0.242		1997
Cadmium	UTNOCB-02-OCT97-01	Background	Habitat	mg/kg	=	0.427		1997
Cadmium	UTNOCBG-03-1298-01	Background	Habitat	mg/kg	=	0.269		1998
Cadmium	UTNOCBG-04-1298-01	Background	Habitat	mg/kg	=	0.218		1998
Cadmium	UTNOCBG-05-1298-01	Background	Habitat	mg/kg	=	0.217		1998
Cadmium	UTNOCBG-06-1298-01	Background	Habitat	mg/kg	=	0.376		1998
Cadmium	NR-226	OnSite	Habitat	mg/Kg	=	0.73		2002
Cadmium	NR-227	OnSite	Habitat	mg/Kg	=	0.6		2002
Cadmium	NR-228	OnSite	OB/OD	mg/Kg	=	0.78		2002
Cadmium	NR-229	OnSite	Habitat	mg/Kg	=	0.57		2002
Cadmium	NR-230	OnSite	Habitat	mg/Kg	=	0.92		2002
Cadmium	NR-231	OnSite	OB/OD	mg/Kg	=	0.83		2002
Cadmium	NR-232	OnSite	Habitat	mg/Kg	=	0.83		2002
Cadmium	NR-233	OnSite	Habitat	mg/Kg	=	0.34		2002
Cadmium	NR-234	OnSite	Habitat	mg/Kg	=	0.8		2002
Cadmium	NR-235	OnSite	Habitat	mg/Kg	=	0.83		2002
Cadmium	NR-236	OnSite	Habitat	mg/Kg	=	0.81		2002
Cadmium	NR-237	OnSite	Habitat	mg/Kg	=	0.59		2002
Cadmium	NR-526	OnSite	Habitat	mg/Kg	UB	0.1	0.2	2004
Cadmium	NR-527	OnSite	Habitat	mg/Kg	U	0.06	0.12	2004
Cadmium	NR-528	OnSite	Habitat	mg/Kg	J	0.38		2004
Cadmium	NR-529	OnSite	Habitat	mg/Kg	UB	0.09	0.18	2004
Cadmium	NR-530	OnSite	Habitat	mg/Kg	U	0.07	0.14	2004
Cadmium	NR-531	OnSite	OB/OD	mg/Kg	J	0.27		2004
Cadmium	NR-532	OnSite	OB/OD	mg/Kg	J	0.55		2004
Cadmium	NR-533	OnSite	OB/OD	mg/Kg	U	0.06	0.12	2004
Cadmium	NR-534	OnSite	OB/OD	mg/Kg	U	0.055	0.11	2004
Cadmium	NR-535	OnSite	OB/OD	mg/Kg	U	0.06	0.12	2004
Cadmium	SS1	OnSite	OB/OD	mg/Kg	U	0.5	1	1991
Cadmium	SS10	OnSite	OB/OD	mg/Kg	U	0.5	1	1991
Cadmium	SS11	OnSite	OB/OD	mg/Kg	U	0.5	1	1991
Cadmium	SS12	OnSite	OB/OD	mg/Kg	U	0.5	1	1991
Cadmium	SS13	OnSite	OB/OD	mg/Kg	U	0.5	1	1991
Cadmium	SS14	OnSite	OB/OD	mg/Kg	U	0.5	1	1991
Cadmium	SS15	OnSite	OB/OD	mg/Kg	U	0.5	1	1991
Cadmium	SS16	OnSite	Habitat	mg/Kg	=	3		1991
Cadmium	SS17	OnSite	Habitat	mg/Kg	U	0.5	1	1991
Cadmium	SS18	OnSite	Habitat	mg/Kg	U	0.5	1	1991
Cadmium	SS19	OnSite	Habitat	mg/Kg	U	0.5	1	1991
Cadmium	SS2	OnSite	OB/OD	mg/Kg	U	0.5	1	1991
Cadmium	SS20	OnSite	Habitat	mg/Kg	U	0.5	1	1991
Cadmium	SS3	OnSite	OB/OD	mg/Kg	U	0.5	1	1991
Cadmium	SS4	OnSite	OB/OD	mg/Kg	U	0.5	1	1991
Cadmium	SS5	OnSite	OB/OD	mg/Kg	U	0.5	1	1991
Cadmium	SS6	OnSite	OB/OD	mg/Kg	U	0.5	1	1991
Cadmium	SS7	OnSite	OB/OD	mg/Kg	U	0.5	1	1991
Cadmium	SS8	OnSite	OB/OD	mg/Kg	U	0.5	1	1991
Cadmium	SS9	OnSite	OB/OD	mg/Kg	=	32		1991
Cadmium	TTU-SS01S	OnSite	OB/OD	mg/Kg	U	0.42	0.84	1989
Cadmium	TTU-SS02S	OnSite	OB/OD	mg/Kg	=	2.1		1989
Cadmium	TTU-SS03S	OnSite	OB/OD	mg/Kg	=	0.98		1989

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Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Cadmium	TTU-SS04S(D)	OnSite	OB/OD	mg/Kg	U	0.435	0.87	1989
Cadmium	TTU-SS05S	OnSite	OB/OD	mg/Kg	=	0.83		1989
Cadmium	TTU-SS06S(BG)	OnSite	Habitat	mg/Kg	=	0.9		1989
Chromium	AMTOF-01-1298-01	Background	Habitat	mg/kg	=	13.3		1998
Chromium	AMTOF-02-1298-01	Background	Habitat	mg/kg	=	17.2		1998
Chromium	AMTOF-03-1298-01	Background	Habitat	mg/kg	=	14.6		1998
Chromium	AMTOF-04-1298-01	Background	Habitat	mg/kg	=	15.7		1998
Chromium	AMTOF-05-1298-01	Background	Habitat	mg/kg	=	10.6		1998
Chromium	AMTOF-06-1298-01	Background	Habitat	mg/kg	=	13.4		1998
Chromium	NR-238	Background	Habitat	mg/Kg	=	14.3		2002
Chromium	NR-239	Background	Habitat	mg/Kg	=	9.6		2002
Chromium	NR-500-0800-01	Background	Habitat	mg/kg	=	12.9		2000
Chromium	NR-501-0800-01	Background	Habitat	mg/kg	=	9.24		2000
Chromium	NR-502-0800-01	Background	Habitat	mg/kg	=	14.5		2000
Chromium	NR-503-0800-01	Background	Habitat	mg/kg	=	13.6		2000
Chromium	NR-504-0800-01	Background	Habitat	mg/kg	=	12.1		2000
Chromium	NR-505-0800-01	Background	Habitat	mg/kg	=	14.3		2000
Chromium	NR-506-0800-01	Background	Habitat	mg/kg	=	13		2000
Chromium	NR-507-0800-01	Background	Habitat	mg/kg	=	13		2000
Chromium	NR-508-0800-01	Background	Habitat	mg/kg	=	11.9		2000
Chromium	NR-509-0800-01	Background	Habitat	mg/kg	=	14.1		2000
Chromium	NR-510-0800-01	Background	Habitat	mg/kg	=	9.21		2000
Chromium	NR-511-0800-01	Background	Habitat	mg/kg	=	14.6		2000
Chromium	NR-512-0800-01	Background	Habitat	mg/kg	=	16		2000
Chromium	NR-513-0800-01	Background	Habitat	mg/kg	=	14.8		2000
Chromium	NR-514-0800-01	Background	Habitat	mg/kg	=	14.6		2000
Chromium	NR-515-0800-01	Background	Habitat	mg/kg	=	3.09		2000
Chromium	NR-516-0800-01	Background	Habitat	mg/kg	=	15.1		2000
Chromium	NR-517-0800-01	Background	Habitat	mg/kg	=	7.05		2000
Chromium	NR-518-0800-01	Background	Habitat	mg/kg	=	2.32		2000
Chromium	NR-519-0800-01	Background	Habitat	mg/kg	=	7.5		2000
Chromium	NR-520-0800-01	Background	Habitat	mg/kg	=	7.59		2000
Chromium	NR-521-0800-01	Background	Habitat	mg/kg	=	5.26		2000
Chromium	NR-522-0800-01	Background	Habitat	mg/kg	=	13.3		2000
Chromium	NR-523-0800-01	Background	Habitat	mg/kg	=	13.1		2000
Chromium	NR-524-0800-01	Background	Habitat	mg/kg	=	8.98		2000
Chromium	NR-525-0800-01	Background	Habitat	mg/kg	=	6.97		2000
Chromium	NR-536	Background	Habitat	mg/Kg	=	12.5		2004
Chromium	NR-537	Background	Habitat	mg/Kg	=	14.2		2004
Chromium	UTNCBU-01-OCT97-01	Background	Habitat	mg/kg	=	11.8		1997
Chromium	UTNCBU-02-OCT97-01	Background	Habitat	mg/kg	=	11.5		1997
Chromium	UTNCBU-03-1298-01	Background	Habitat	mg/kg	=	16.1		1998
Chromium	UTNCBU-04-1298-01	Background	Habitat	mg/kg	=	16.1		1998
Chromium	UTNCBU-05-1298-01	Background	Habitat	mg/kg	=	12		1998
Chromium	UTNCBU-06-1298-01	Background	Habitat	mg/kg	=	12.2		1998
Chromium	UTNEB-03-1298-01	Background	Habitat	mg/kg	=	14.2		1998
Chromium	UTNEB-04-1298-01	Background	Habitat	mg/kg	=	18.4		1998
Chromium	UTNEB-05-1298-01	Background	Habitat	mg/kg	=	14.7		1998
Chromium	UTNEB-06-1298-01	Background	Habitat	mg/kg	=	13.4		1998
Chromium	UTNERB-01-OCT97-01	Background	Habitat	mg/kg	=	20.9		1997
Chromium	UTNERB-02-OCT97-01	Background	Habitat	mg/kg	=	19.2		1997
Chromium	UTNOCB-01-OCT97-01	Background	Habitat	mg/kg	=	16.9		1997
Chromium	UTNOCB-02-OCT97-01	Background	Habitat	mg/kg	=	13.1		1997

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Chromium	UTNOCBG-03-1298-01	Background	Habitat	mg/kg	=	12		1998
Chromium	UTNOCBG-04-1298-01	Background	Habitat	mg/kg	=	10.8		1998
Chromium	UTNOCBG-05-1298-01	Background	Habitat	mg/kg	=	11.8		1998
Chromium	UTNOCBG-06-1298-01	Background	Habitat	mg/kg	=	16		1998
Chromium	NR-226	OnSite	Habitat	mg/Kg	=	7		2002
Chromium	NR-227	OnSite	Habitat	mg/Kg	=	8.1		2002
Chromium	NR-228	OnSite	OB/OD	mg/Kg	=	10.1		2002
Chromium	NR-229	OnSite	Habitat	mg/Kg	=	13.2		2002
Chromium	NR-230	OnSite	Habitat	mg/Kg	=	11.8		2002
Chromium	NR-231	OnSite	OB/OD	mg/Kg	=	11.8		2002
Chromium	NR-232	OnSite	Habitat	mg/Kg	=	15.9		2002
Chromium	NR-233	OnSite	Habitat	mg/Kg	=	9.8		2002
Chromium	NR-234	OnSite	Habitat	mg/Kg	=	12.5		2002
Chromium	NR-235	OnSite	Habitat	mg/Kg	=	12.9		2002
Chromium	NR-236	OnSite	Habitat	mg/Kg	=	10.1		2002
Chromium	NR-237	OnSite	Habitat	mg/Kg	=	10.6		2002
Chromium	NR-526	OnSite	Habitat	mg/Kg	=	7.6		2004
Chromium	NR-527	OnSite	Habitat	mg/Kg	=	10.7		2004
Chromium	NR-528	OnSite	Habitat	mg/Kg	=	6.5		2004
Chromium	NR-529	OnSite	Habitat	mg/Kg	=	10.3		2004
Chromium	NR-530	OnSite	Habitat	mg/Kg	=	7.5		2004
Chromium	NR-531	OnSite	OB/OD	mg/Kg	=	55.3		2004
Chromium	NR-532	OnSite	OB/OD	mg/Kg	=	18.3		2004
Chromium	NR-533	OnSite	OB/OD	mg/Kg	=	8.7		2004
Chromium	NR-534	OnSite	OB/OD	mg/Kg	=	8.4		2004
Chromium	NR-535	OnSite	OB/OD	mg/Kg	=	8.5		2004
Chromium	SS1	OnSite	OB/OD	mg/Kg	=	13		1991
Chromium	SS10	OnSite	OB/OD	mg/Kg	=	15		1991
Chromium	SS11	OnSite	OB/OD	mg/Kg	=	18		1991
Chromium	SS12	OnSite	OB/OD	mg/Kg	=	18		1991
Chromium	SS13	OnSite	OB/OD	mg/Kg	=	14		1991
Chromium	SS14	OnSite	OB/OD	mg/Kg	=	17		1991
Chromium	SS15	OnSite	OB/OD	mg/Kg	=	16		1991
Chromium	SS16	OnSite	Habitat	mg/Kg	=	15		1991
Chromium	SS17	OnSite	Habitat	mg/Kg	=	13		1991
Chromium	SS18	OnSite	Habitat	mg/Kg	=	16		1991
Chromium	SS19	OnSite	Habitat	mg/Kg	=	12		1991
Chromium	SS2	OnSite	OB/OD	mg/Kg	=	18		1991
Chromium	SS20	OnSite	Habitat	mg/Kg	=	14		1991
Chromium	SS3	OnSite	OB/OD	mg/Kg	=	30		1991
Chromium	SS4	OnSite	OB/OD	mg/Kg	=	17		1991
Chromium	SS5	OnSite	OB/OD	mg/Kg	=	25		1991
Chromium	SS6	OnSite	OB/OD	mg/Kg	=	18		1991
Chromium	SS7	OnSite	OB/OD	mg/Kg	=	22		1991
Chromium	SS8	OnSite	OB/OD	mg/Kg	=	15		1991
Chromium	SS9	OnSite	OB/OD	mg/Kg	=	14		1991
Chromium	TTU-SS01S	OnSite	OB/OD	mg/Kg	=	9.7		1989
Chromium	TTU-SS02S	OnSite	OB/OD	mg/Kg	=	23.6		1989
Chromium	TTU-SS03S	OnSite	OB/OD	mg/Kg	=	10.8		1989
Chromium	TTU-SS04S(D)	OnSite	OB/OD	mg/Kg	=	8.3		1989
Chromium	TTU-SS05S	OnSite	OB/OD	mg/Kg	=	9		1989
Chromium	TTU-SS06S(BG)	OnSite	Habitat	mg/Kg	=	12.6		1989
Cobalt	AMTOF-01-1298-01	Background	Habitat	mg/kg	=	3.83		1998

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Cobalt	AMTOF-02-1298-01	Background	Habitat	mg/kg	=	3.57		1998
Cobalt	AMTOF-03-1298-01	Background	Habitat	mg/kg	=	4.01		1998
Cobalt	AMTOF-04-1298-01	Background	Habitat	mg/kg	=	4.18		1998
Cobalt	AMTOF-05-1298-01	Background	Habitat	mg/kg	=	5.22		1998
Cobalt	AMTOF-06-1298-01	Background	Habitat	mg/kg	=	3.75		1998
Cobalt	NR-238	Background	Habitat	mg/Kg	=	4.5		2002
Cobalt	NR-239	Background	Habitat	mg/Kg	=	3.6		2002
Cobalt	NR-500-0800-01	Background	Habitat	mg/kg	=	4.01		2000
Cobalt	NR-501-0800-01	Background	Habitat	mg/kg	=	2.58		2000
Cobalt	NR-502-0800-01	Background	Habitat	mg/kg	=	4.22		2000
Cobalt	NR-503-0800-01	Background	Habitat	mg/kg	=	4.02		2000
Cobalt	NR-504-0800-01	Background	Habitat	mg/kg	=	3.52		2000
Cobalt	NR-505-0800-01	Background	Habitat	mg/kg	=	4.2		2000
Cobalt	NR-506-0800-01	Background	Habitat	mg/kg	=	3.96		2000
Cobalt	NR-507-0800-01	Background	Habitat	mg/kg	=	3.23		2000
Cobalt	NR-508-0800-01	Background	Habitat	mg/kg	=	3.52		2000
Cobalt	NR-509-0800-01	Background	Habitat	mg/kg	=	4.54		2000
Cobalt	NR-510-0800-01	Background	Habitat	mg/kg	=	3.1		2000
Cobalt	NR-511-0800-01	Background	Habitat	mg/kg	=	3.67		2000
Cobalt	NR-512-0800-01	Background	Habitat	mg/kg	=	4.68		2000
Cobalt	NR-513-0800-01	Background	Habitat	mg/kg	=	4		2000
Cobalt	NR-514-0800-01	Background	Habitat	mg/kg	=	3.58		2000
Cobalt	NR-515-0800-01	Background	Habitat	mg/kg	J	0.837		2000
Cobalt	NR-516-0800-01	Background	Habitat	mg/kg	=	6.06		2000
Cobalt	NR-517-0800-01	Background	Habitat	mg/kg	=	1.86		2000
Cobalt	NR-518-0800-01	Background	Habitat	mg/kg	J	0.678		2000
Cobalt	NR-519-0800-01	Background	Habitat	mg/kg	=	2.07		2000
Cobalt	NR-520-0800-01	Background	Habitat	mg/kg	=	2.11		2000
Cobalt	NR-521-0800-01	Background	Habitat	mg/kg	=	1.6		2000
Cobalt	NR-522-0800-01	Background	Habitat	mg/kg	=	3.37		2000
Cobalt	NR-523-0800-01	Background	Habitat	mg/kg	=	2.36		2000
Cobalt	NR-524-0800-01	Background	Habitat	mg/kg	=	2.1		2000
Cobalt	NR-525-0800-01	Background	Habitat	mg/kg	=	1.88		2000
Cobalt	NR-536	Background	Habitat	mg/Kg	J	3.1		2004
Cobalt	NR-537	Background	Habitat	mg/Kg	=	5.2		2004
Cobalt	UTNCBU-01-OCT97-01	Background	Habitat	mg/kg	=	3.03		1997
Cobalt	UTNCBU-02-OCT97-01	Background	Habitat	mg/kg	=	2.78		1997
Cobalt	UTNCBU-03-1298-01	Background	Habitat	mg/kg	=	4.22		1998
Cobalt	UTNCBU-04-1298-01	Background	Habitat	mg/kg	=	4.08		1998
Cobalt	UTNCBU-05-1298-01	Background	Habitat	mg/kg	=	3.21		1998
Cobalt	UTNCBU-06-1298-01	Background	Habitat	mg/kg	=	3.22		1998
Cobalt	UTNEB-03-1298-01	Background	Habitat	mg/kg	=	3.7		1998
Cobalt	UTNEB-04-1298-01	Background	Habitat	mg/kg	=	4.76		1998
Cobalt	UTNEB-05-1298-01	Background	Habitat	mg/kg	=	3.44		1998
Cobalt	UTNEB-06-1298-01	Background	Habitat	mg/kg	=	3.36		1998
Cobalt	UTNERB-01-OCT97-01	Background	Habitat	mg/kg	=	5.02		1997
Cobalt	UTNERB-02-OCT97-01	Background	Habitat	mg/kg	=	4.17		1997
Cobalt	UTNOCB-01-OCT97-01	Background	Habitat	mg/kg	=	3.42		1997
Cobalt	UTNOCB-02-OCT97-01	Background	Habitat	mg/kg	=	3.79		1997
Cobalt	UTNOCBG-03-1298-01	Background	Habitat	mg/kg	=	3.74		1998
Cobalt	UTNOCBG-04-1298-01	Background	Habitat	mg/kg	=	3.93		1998
Cobalt	UTNOCBG-05-1298-01	Background	Habitat	mg/kg	=	3.61		1998
Cobalt	UTNOCBG-06-1298-01	Background	Habitat	mg/kg	=	4.65		1998

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Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Cobalt	NR-226	OnSite	Habitat	mg/Kg	=	1.9		2002
Cobalt	NR-227	OnSite	Habitat	mg/Kg	=	3		2002
Cobalt	NR-228	OnSite	OB/OD	mg/Kg	=	3.9		2002
Cobalt	NR-229	OnSite	Habitat	mg/Kg	=	4.9		2002
Cobalt	NR-230	OnSite	Habitat	mg/Kg	=	3.6		2002
Cobalt	NR-231	OnSite	OB/OD	mg/Kg	=	4.4		2002
Cobalt	NR-232	OnSite	Habitat	mg/Kg	=	4.8		2002
Cobalt	NR-233	OnSite	Habitat	mg/Kg	=	2.6		2002
Cobalt	NR-234	OnSite	Habitat	mg/Kg	=	4.2		2002
Cobalt	NR-235	OnSite	Habitat	mg/Kg	=	3.7		2002
Cobalt	NR-236	OnSite	Habitat	mg/Kg	=	3.9		2002
Cobalt	NR-237	OnSite	Habitat	mg/Kg	=	3.9		2002
Cobalt	NR-526	OnSite	Habitat	mg/Kg	J	1.7		2004
Cobalt	NR-527	OnSite	Habitat	mg/Kg	J	3.4		2004
Cobalt	NR-528	OnSite	Habitat	mg/Kg	J	1.5		2004
Cobalt	NR-529	OnSite	Habitat	mg/Kg	J	1.5		2004
Cobalt	NR-530	OnSite	Habitat	mg/Kg	J	1		2004
Cobalt	NR-531	OnSite	OB/OD	mg/Kg	J	1.1		2004
Cobalt	NR-532	OnSite	OB/OD	mg/Kg	J	1.6		2004
Cobalt	NR-533	OnSite	OB/OD	mg/Kg	J	2.7		2004
Cobalt	NR-534	OnSite	OB/OD	mg/Kg	J	1.9		2004
Cobalt	NR-535	OnSite	OB/OD	mg/Kg	J	2.6		2004
Cobalt	TTU-SS01S	OnSite	OB/OD	mg/Kg	U	2.35	4.7	1989
Cobalt	TTU-SS02S	OnSite	OB/OD	mg/Kg	U	2.1	4.2	1989
Cobalt	TTU-SS03S	OnSite	OB/OD	mg/Kg	U	2.4	4.8	1989
Cobalt	TTU-SS04S(D)	OnSite	OB/OD	mg/Kg	U	2.45	4.9	1989
Cobalt	TTU-SS05S	OnSite	OB/OD	mg/Kg	U	2.3	4.6	1989
Cobalt	TTU-SS06S(BG)	OnSite	Habitat	mg/Kg	U	2.3	4.6	1989
Copper	AMTOF-01-1298-01	Background	Habitat	mg/kg	=	13		1998
Copper	AMTOF-02-1298-01	Background	Habitat	mg/kg	=	11.3		1998
Copper	AMTOF-03-1298-01	Background	Habitat	mg/kg	=	12.7		1998
Copper	AMTOF-04-1298-01	Background	Habitat	mg/kg	=	13.9		1998
Copper	AMTOF-05-1298-01	Background	Habitat	mg/kg	=	14		1998
Copper	AMTOF-06-1298-01	Background	Habitat	mg/kg	=	15.1		1998
Copper	NR-238	Background	Habitat	mg/Kg	=	17.1		2002
Copper	NR-239	Background	Habitat	mg/Kg	=	15.4		2002
Copper	NR-500-0800-01	Background	Habitat	mg/kg	=	12.8		2000
Copper	NR-501-0800-01	Background	Habitat	mg/kg	=	9.21		2000
Copper	NR-502-0800-01	Background	Habitat	mg/kg	=	13.4		2000
Copper	NR-503-0800-01	Background	Habitat	mg/kg	=	12.3		2000
Copper	NR-504-0800-01	Background	Habitat	mg/kg	=	10.7		2000
Copper	NR-505-0800-01	Background	Habitat	mg/kg	=	11.9		2000
Copper	NR-506-0800-01	Background	Habitat	mg/kg	=	12.2		2000
Copper	NR-507-0800-01	Background	Habitat	mg/kg	=	10.3		2000
Copper	NR-508-0800-01	Background	Habitat	mg/kg	=	10.6		2000
Copper	NR-509-0800-01	Background	Habitat	mg/kg	=	14.1		2000
Copper	NR-510-0800-01	Background	Habitat	mg/kg	=	10.6		2000
Copper	NR-511-0800-01	Background	Habitat	mg/kg	=	12.9		2000
Copper	NR-512-0800-01	Background	Habitat	mg/kg	=	14.9		2000
Copper	NR-513-0800-01	Background	Habitat	mg/kg	=	12.6		2000
Copper	NR-514-0800-01	Background	Habitat	mg/kg	=	11.7		2000
Copper	NR-515-0800-01	Background	Habitat	mg/kg	=	2.77		2000
Copper	NR-516-0800-01	Background	Habitat	mg/kg	=	19.3		2000

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Copper	NR-517-0800-01	Background	Habitat	mg/kg	=	6.25		2000
Copper	NR-518-0800-01	Background	Habitat	mg/kg	=	2.49		2000
Copper	NR-519-0800-01	Background	Habitat	mg/kg	=	6.81		2000
Copper	NR-520-0800-01	Background	Habitat	mg/kg	=	9.26		2000
Copper	NR-521-0800-01	Background	Habitat	mg/kg	=	7.04		2000
Copper	NR-522-0800-01	Background	Habitat	mg/kg	=	15.9		2000
Copper	NR-523-0800-01	Background	Habitat	mg/kg	=	9.63		2000
Copper	NR-524-0800-01	Background	Habitat	mg/kg	=	12.4		2000
Copper	NR-525-0800-01	Background	Habitat	mg/kg	=	9.21		2000
Copper	NR-536	Background	Habitat	mg/Kg	B	19.2		2004
Copper	NR-537	Background	Habitat	mg/Kg	B	26.7		2004
Copper	UTNCBU-01-OCT97-01	Background	Habitat	mg/kg	=	10.2		1997
Copper	UTNCBU-02-OCT97-01	Background	Habitat	mg/kg	=	8.84		1997
Copper	UTNCBU-03-1298-01	Background	Habitat	mg/kg	=	14.6		1998
Copper	UTNCBU-04-1298-01	Background	Habitat	mg/kg	=	14.6		1998
Copper	UTNCBU-05-1298-01	Background	Habitat	mg/kg	=	10.4		1998
Copper	UTNCBU-06-1298-01	Background	Habitat	mg/kg	=	11.3		1998
Copper	UTNEB-03-1298-01	Background	Habitat	mg/kg	=	12.4		1998
Copper	UTNEB-04-1298-01	Background	Habitat	mg/kg	=	16.8		1998
Copper	UTNEB-05-1298-01	Background	Habitat	mg/kg	=	13.8		1998
Copper	UTNEB-06-1298-01	Background	Habitat	mg/kg	=	12.8		1998
Copper	UTNERB-01-OCT97-01	Background	Habitat	mg/kg	=	15.9		1997
Copper	UTNERB-02-OCT97-01	Background	Habitat	mg/kg	=	14		1997
Copper	UTNOCB-01-OCT97-01	Background	Habitat	mg/kg	=	12.9		1997
Copper	UTNOCB-02-OCT97-01	Background	Habitat	mg/kg	=	12.8		1997
Copper	UTNOCBG-03-1298-01	Background	Habitat	mg/kg	=	13.9		1998
Copper	UTNOCBG-04-1298-01	Background	Habitat	mg/kg	=	11.4		1998
Copper	UTNOCBG-05-1298-01	Background	Habitat	mg/kg	=	13.7		1998
Copper	UTNOCBG-06-1298-01	Background	Habitat	mg/kg	=	15.4		1998
Copper	NR-226	OnSite	Habitat	mg/Kg	=	9.4		2002
Copper	NR-227	OnSite	Habitat	mg/Kg	=	11.1		2002
Copper	NR-228	OnSite	OB/OD	mg/Kg	=	16.6		2002
Copper	NR-229	OnSite	Habitat	mg/Kg	=	15.4		2002
Copper	NR-230	OnSite	Habitat	mg/Kg	=	18.6		2002
Copper	NR-231	OnSite	OB/OD	mg/Kg	=	18.8		2002
Copper	NR-232	OnSite	Habitat	mg/Kg	=	20		2002
Copper	NR-233	OnSite	Habitat	mg/Kg	=	10.4		2002
Copper	NR-234	OnSite	Habitat	mg/Kg	=	20.7		2002
Copper	NR-235	OnSite	Habitat	mg/Kg	=	24.4		2002
Copper	NR-236	OnSite	Habitat	mg/Kg	=	20		2002
Copper	NR-237	OnSite	Habitat	mg/Kg	=	13.4		2002
Copper	NR-526	OnSite	Habitat	mg/Kg	J	61		2004
Copper	NR-527	OnSite	Habitat	mg/Kg	B	19.7		2004
Copper	NR-528	OnSite	Habitat	mg/Kg	B	13.2		2004
Copper	NR-529	OnSite	Habitat	mg/Kg	B	18.5		2004
Copper	NR-530	OnSite	Habitat	mg/Kg	B	9.4		2004
Copper	NR-531	OnSite	OB/OD	mg/Kg	B	77.6		2004
Copper	NR-532	OnSite	OB/OD	mg/Kg	B	16.8		2004
Copper	NR-533	OnSite	OB/OD	mg/Kg	B	10.9		2004
Copper	NR-534	OnSite	OB/OD	mg/Kg	B	9.6		2004
Copper	NR-535	OnSite	OB/OD	mg/Kg	B	10.2		2004
Copper	SS1	OnSite	OB/OD	mg/Kg	=	6		1991
Copper	SS10	OnSite	OB/OD	mg/Kg	=	52		1991

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Copper	SS11	OnSite	OB/OD	mg/Kg	=	38		1991
Copper	SS12	OnSite	OB/OD	mg/Kg	=	79		1991
Copper	SS13	OnSite	OB/OD	mg/Kg	=	49		1991
Copper	SS14	OnSite	OB/OD	mg/Kg	=	25		1991
Copper	SS15	OnSite	OB/OD	mg/Kg	=	12		1991
Copper	SS16	OnSite	Habitat	mg/Kg	=	42		1991
Copper	SS17	OnSite	Habitat	mg/Kg	=	15		1991
Copper	SS18	OnSite	Habitat	mg/Kg	=	15		1991
Copper	SS19	OnSite	Habitat	mg/Kg	=	18		1991
Copper	SS2	OnSite	OB/OD	mg/Kg	U	0.5	1	1991
Copper	SS20	OnSite	Habitat	mg/Kg	=	19		1991
Copper	SS3	OnSite	OB/OD	mg/Kg	=	18000		1991
Copper	SS4	OnSite	OB/OD	mg/Kg	=	19		1991
Copper	SS5	OnSite	OB/OD	mg/Kg	=	410		1991
Copper	SS6	OnSite	OB/OD	mg/Kg	=	59		1991
Copper	SS7	OnSite	OB/OD	mg/Kg	=	950		1991
Copper	SS8	OnSite	OB/OD	mg/Kg	=	30		1991
Copper	SS9	OnSite	OB/OD	mg/Kg	=	140		1991
Copper	TTU-SS01S	OnSite	OB/OD	mg/Kg	U	39	78	1989
Copper	TTU-SS02S	OnSite	OB/OD	mg/Kg	U	47.35	94.7	1989
Copper	TTU-SS03S	OnSite	OB/OD	mg/Kg	U	7.65	15.3	1989
Copper	TTU-SS04S(D)	OnSite	OB/OD	mg/Kg	U	41.3	82.6	1989
Copper	TTU-SS05S	OnSite	OB/OD	mg/Kg	U	41.85	83.7	1989
Copper	TTU-SS06S(BG)	OnSite	Habitat	mg/Kg	U	7.05	14.1	1989
Iron	AMTOF-01-1298-01	Background	Habitat	mg/kg	=	11500		1998
Iron	AMTOF-02-1298-01	Background	Habitat	mg/kg	=	10300		1998
Iron	AMTOF-03-1298-01	Background	Habitat	mg/kg	=	12500		1998
Iron	AMTOF-04-1298-01	Background	Habitat	mg/kg	=	12900		1998
Iron	AMTOF-05-1298-01	Background	Habitat	mg/kg	=	10400		1998
Iron	AMTOF-06-1298-01	Background	Habitat	mg/kg	=	11500		1998
Iron	NR-238	Background	Habitat	mg/Kg	=	12300		2002
Iron	NR-239	Background	Habitat	mg/Kg	=	10000		2002
Iron	NR-500-0800-01	Background	Habitat	mg/kg	=	11200		2000
Iron	NR-501-0800-01	Background	Habitat	mg/kg	=	6630		2000
Iron	NR-502-0800-01	Background	Habitat	mg/kg	=	11600		2000
Iron	NR-503-0800-01	Background	Habitat	mg/kg	=	11000		2000
Iron	NR-504-0800-01	Background	Habitat	mg/kg	=	9880		2000
Iron	NR-505-0800-01	Background	Habitat	mg/kg	=	12800		2000
Iron	NR-506-0800-01	Background	Habitat	mg/kg	=	12100		2000
Iron	NR-507-0800-01	Background	Habitat	mg/kg	=	9730		2000
Iron	NR-508-0800-01	Background	Habitat	mg/kg	=	10500		2000
Iron	NR-509-0800-01	Background	Habitat	mg/kg	=	10600		2000
Iron	NR-510-0800-01	Background	Habitat	mg/kg	=	8150		2000
Iron	NR-511-0800-01	Background	Habitat	mg/kg	=	10300		2000
Iron	NR-512-0800-01	Background	Habitat	mg/kg	=	13500		2000
Iron	NR-513-0800-01	Background	Habitat	mg/kg	=	11600		2000
Iron	NR-514-0800-01	Background	Habitat	mg/kg	=	10000		2000
Iron	NR-515-0800-01	Background	Habitat	mg/kg	=	1900		2000
Iron	NR-516-0800-01	Background	Habitat	mg/kg	=	13700		2000
Iron	NR-517-0800-01	Background	Habitat	mg/kg	=	5320		2000
Iron	NR-518-0800-01	Background	Habitat	mg/kg	=	1390		2000
Iron	NR-519-0800-01	Background	Habitat	mg/kg	=	4950		2000
Iron	NR-520-0800-01	Background	Habitat	mg/kg	=	5430		2000

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Iron	NR-521-0800-01	Background	Habitat	mg/kg	=	3370		2000
Iron	NR-522-0800-01	Background	Habitat	mg/kg	=	8550		2000
Iron	NR-523-0800-01	Background	Habitat	mg/kg	=	7070		2000
Iron	NR-524-0800-01	Background	Habitat	mg/kg	=	5640		2000
Iron	NR-525-0800-01	Background	Habitat	mg/kg	=	4610		2000
Iron	NR-536	Background	Habitat	mg/Kg	B	13800		2004
Iron	NR-537	Background	Habitat	mg/Kg	B	15900		2004
Iron	UTNCBU-01-OCT97-01	Background	Habitat	mg/kg	=	9530		1997
Iron	UTNCBU-02-OCT97-01	Background	Habitat	mg/kg	=	8730		1997
Iron	UTNCBU-03-1298-01	Background	Habitat	mg/kg	=	11700		1998
Iron	UTNCBU-04-1298-01	Background	Habitat	mg/kg	=	11400		1998
Iron	UTNCBU-05-1298-01	Background	Habitat	mg/kg	=	9030		1998
Iron	UTNCBU-06-1298-01	Background	Habitat	mg/kg	=	9000		1998
Iron	UTNEB-03-1298-01	Background	Habitat	mg/kg	=	9990		1998
Iron	UTNEB-04-1298-01	Background	Habitat	mg/kg	=	13900		1998
Iron	UTNEB-05-1298-01	Background	Habitat	mg/kg	=	10300		1998
Iron	UTNEB-06-1298-01	Background	Habitat	mg/kg	=	9340		1998
Iron	UTNERB-01-OCT97-01	Background	Habitat	mg/kg	=	16200		1997
Iron	UTNERB-02-OCT97-01	Background	Habitat	mg/kg	=	13400		1997
Iron	UTNOCB-01-OCT97-01	Background	Habitat	mg/kg	=	11800		1997
Iron	UTNOCB-02-OCT97-01	Background	Habitat	mg/kg	=	12400		1997
Iron	UTNOCBG-03-1298-01	Background	Habitat	mg/kg	=	10600		1998
Iron	UTNOCBG-04-1298-01	Background	Habitat	mg/kg	=	9970		1998
Iron	UTNOCBG-05-1298-01	Background	Habitat	mg/kg	=	10100		1998
Iron	UTNOCBG-06-1298-01	Background	Habitat	mg/kg	=	13100		1998
Iron	NR-226	OnSite	Habitat	mg/Kg	=	5450		2002
Iron	NR-227	OnSite	Habitat	mg/Kg	=	8210		2002
Iron	NR-228	OnSite	OB/OD	mg/Kg	=	9440		2002
Iron	NR-229	OnSite	Habitat	mg/Kg	=	12700		2002
Iron	NR-230	OnSite	Habitat	mg/Kg	=	11000		2002
Iron	NR-231	OnSite	OB/OD	mg/Kg	=	11400		2002
Iron	NR-232	OnSite	Habitat	mg/Kg	=	13400		2002
Iron	NR-233	OnSite	Habitat	mg/Kg	=	8410		2002
Iron	NR-234	OnSite	Habitat	mg/Kg	=	12100		2002
Iron	NR-235	OnSite	Habitat	mg/Kg	=	10800		2002
Iron	NR-236	OnSite	Habitat	mg/Kg	=	10100		2002
Iron	NR-237	OnSite	Habitat	mg/Kg	=	10300		2002
Iron	NR-526	OnSite	Habitat	mg/Kg	B	7100		2004
Iron	NR-527	OnSite	Habitat	mg/Kg	B	13000		2004
Iron	NR-528	OnSite	Habitat	mg/Kg	B	7550		2004
Iron	NR-529	OnSite	Habitat	mg/Kg	B	9890		2004
Iron	NR-530	OnSite	Habitat	mg/Kg	B	8430		2004
Iron	NR-531	OnSite	OB/OD	mg/Kg	B	6570		2004
Iron	NR-532	OnSite	OB/OD	mg/Kg	B	4510		2004
Iron	NR-533	OnSite	OB/OD	mg/Kg	B	9360		2004
Iron	NR-534	OnSite	OB/OD	mg/Kg	B	8170		2004
Iron	NR-535	OnSite	OB/OD	mg/Kg	B	9160		2004
Iron	SS1	OnSite	OB/OD	mg/Kg	=	9600		1991
Iron	SS10	OnSite	OB/OD	mg/Kg	=	12000		1991
Iron	SS11	OnSite	OB/OD	mg/Kg	=	14000		1991
Iron	SS12	OnSite	OB/OD	mg/Kg	=	14000		1991
Iron	SS13	OnSite	OB/OD	mg/Kg	=	12000		1991
Iron	SS14	OnSite	OB/OD	mg/Kg	=	15000		1991

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Iron	SS15	OnSite	OB/OD	mg/Kg	=	14000		1991
Iron	SS16	OnSite	Habitat	mg/Kg	=	12000		1991
Iron	SS17	OnSite	Habitat	mg/Kg	=	13000		1991
Iron	SS18	OnSite	Habitat	mg/Kg	=	13000		1991
Iron	SS19	OnSite	Habitat	mg/Kg	=	10000		1991
Iron	SS2	OnSite	OB/OD	mg/Kg	=	6100		1991
Iron	SS20	OnSite	Habitat	mg/Kg	=	14000		1991
Iron	SS3	OnSite	OB/OD	mg/Kg	=	6900		1991
Iron	SS4	OnSite	OB/OD	mg/Kg	=	7800		1991
Iron	SS5	OnSite	OB/OD	mg/Kg	=	15000		1991
Iron	SS6	OnSite	OB/OD	mg/Kg	=	14000		1991
Iron	SS7	OnSite	OB/OD	mg/Kg	=	14000		1991
Iron	SS8	OnSite	OB/OD	mg/Kg	=	11000		1991
Iron	SS9	OnSite	OB/OD	mg/Kg	=	11000		1991
Lead	AMTOF-01-1298-01	Background	Habitat	mg/kg	=	13.2		1998
Lead	AMTOF-02-1298-01	Background	Habitat	mg/kg	=	8.56		1998
Lead	AMTOF-03-1298-01	Background	Habitat	mg/kg	=	11.2		1998
Lead	AMTOF-04-1298-01	Background	Habitat	mg/kg	=	10.5		1998
Lead	AMTOF-05-1298-01	Background	Habitat	mg/kg	=	13		1998
Lead	AMTOF-06-1298-01	Background	Habitat	mg/kg	=	12.8		1998
Lead	NR-238	Background	Habitat	mg/Kg	=	13.8		2002
Lead	NR-239	Background	Habitat	mg/Kg	=	15.9		2002
Lead	NR-500-0800-01	Background	Habitat	mg/kg	=	9.5		2000
Lead	NR-501-0800-01	Background	Habitat	mg/kg	=	7.76		2000
Lead	NR-502-0800-01	Background	Habitat	mg/kg	=	10.4		2000
Lead	NR-503-0800-01	Background	Habitat	mg/kg	=	10		2000
Lead	NR-504-0800-01	Background	Habitat	mg/kg	=	8.3		2000
Lead	NR-505-0800-01	Background	Habitat	mg/kg	=	9.52		2000
Lead	NR-506-0800-01	Background	Habitat	mg/kg	=	10.2		2000
Lead	NR-507-0800-01	Background	Habitat	mg/kg	=	8.21		2000
Lead	NR-508-0800-01	Background	Habitat	mg/kg	=	8.5		2000
Lead	NR-509-0800-01	Background	Habitat	mg/kg	=	11		2000
Lead	NR-510-0800-01	Background	Habitat	mg/kg	=	12		2000
Lead	NR-511-0800-01	Background	Habitat	mg/kg	=	14.1		2000
Lead	NR-512-0800-01	Background	Habitat	mg/kg	=	11.7		2000
Lead	NR-513-0800-01	Background	Habitat	mg/kg	=	10.1		2000
Lead	NR-514-0800-01	Background	Habitat	mg/kg	=	10.2		2000
Lead	NR-515-0800-01	Background	Habitat	mg/kg	=	5.42		2000
Lead	NR-516-0800-01	Background	Habitat	mg/kg	=	14		2000
Lead	NR-517-0800-01	Background	Habitat	mg/kg	=	2.95		2000
Lead	NR-518-0800-01	Background	Habitat	mg/kg	=	5.04		2000
Lead	NR-519-0800-01	Background	Habitat	mg/kg	=	6.8		2000
Lead	NR-520-0800-01	Background	Habitat	mg/kg	=	7.81		2000
Lead	NR-521-0800-01	Background	Habitat	mg/kg	=	5.71		2000
Lead	NR-522-0800-01	Background	Habitat	mg/kg	=	11.6		2000
Lead	NR-523-0800-01	Background	Habitat	mg/kg	=	5.44		2000
Lead	NR-524-0800-01	Background	Habitat	mg/kg	=	9		2000
Lead	NR-525-0800-01	Background	Habitat	mg/kg	=	7.33		2000
Lead	NR-536	Background	Habitat	mg/Kg	=	19.9		2004
Lead	NR-537	Background	Habitat	mg/Kg	=	30.5		2004
Lead	UTNCBU-01-OCT97-01	Background	Habitat	mg/kg	=	6.6		1997
Lead	UTNCBU-02-OCT97-01	Background	Habitat	mg/kg	=	5.99		1997
Lead	UTNCBU-03-1298-01	Background	Habitat	mg/kg	=	11		1998

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Lead	UTNCBU-04-1298-01	Background	Habitat	mg/kg	=	11.2		1998
Lead	UTNCBU-05-1298-01	Background	Habitat	mg/kg	=	8.28		1998
Lead	UTNCBU-06-1298-01	Background	Habitat	mg/kg	=	10		1998
Lead	UTNEB-03-1298-01	Background	Habitat	mg/kg	=	10.8		1998
Lead	UTNEB-04-1298-01	Background	Habitat	mg/kg	=	12.8		1998
Lead	UTNEB-05-1298-01	Background	Habitat	mg/kg	=	8.55		1998
Lead	UTNEB-06-1298-01	Background	Habitat	mg/kg	=	11.9		1998
Lead	UTNERB-01-OCT97-01	Background	Habitat	mg/kg	=	8.55		1997
Lead	UTNERB-02-OCT97-01	Background	Habitat	mg/kg	=	7.19		1997
Lead	UTNOCB-01-OCT97-01	Background	Habitat	mg/kg	=	5.34		1997
Lead	UTNOCB-02-OCT97-01	Background	Habitat	mg/kg	=	6.66		1997
Lead	UTNOCBG-03-1298-01	Background	Habitat	mg/kg	=	13.8		1998
Lead	UTNOCBG-04-1298-01	Background	Habitat	mg/kg	=	11.5		1998
Lead	UTNOCBG-05-1298-01	Background	Habitat	mg/kg	=	15.9		1998
Lead	UTNOCBG-06-1298-01	Background	Habitat	mg/kg	=	10.6		1998
Lead	NR-226	OnSite	Habitat	mg/Kg	=	5.6		2002
Lead	NR-227	OnSite	Habitat	mg/Kg	=	9.1		2002
Lead	NR-228	OnSite	OB/OD	mg/Kg	=	12.5		2002
Lead	NR-229	OnSite	Habitat	mg/Kg	=	6.5		2002
Lead	NR-230	OnSite	Habitat	mg/Kg	=	20.5		2002
Lead	NR-231	OnSite	OB/OD	mg/Kg	=	9		2002
Lead	NR-232	OnSite	Habitat	mg/Kg	=	16.9		2002
Lead	NR-233	OnSite	Habitat	mg/Kg	=	4.5		2002
Lead	NR-234	OnSite	Habitat	mg/Kg	=	14.1		2002
Lead	NR-235	OnSite	Habitat	mg/Kg	=	16.3		2002
Lead	NR-236	OnSite	Habitat	mg/Kg	=	17.8		2002
Lead	NR-237	OnSite	Habitat	mg/Kg	=	10.5		2002
Lead	NR-526	OnSite	Habitat	mg/Kg	=	9.7		2004
Lead	NR-527	OnSite	Habitat	mg/Kg	=	17.5		2004
Lead	NR-528	OnSite	Habitat	mg/Kg	=	15.8		2004
Lead	NR-529	OnSite	Habitat	mg/Kg	=	11.8		2004
Lead	NR-530	OnSite	Habitat	mg/Kg	=	6		2004
Lead	NR-531	OnSite	OB/OD	mg/Kg	=	3.2		2004
Lead	NR-532	OnSite	OB/OD	mg/Kg	=	2.8		2004
Lead	NR-533	OnSite	OB/OD	mg/Kg	=	6.9		2004
Lead	NR-534	OnSite	OB/OD	mg/Kg	=	6.3		2004
Lead	NR-535	OnSite	OB/OD	mg/Kg	=	6.2		2004
Lead	SS1	OnSite	OB/OD	mg/Kg	=	12		1991
Lead	SS10	OnSite	OB/OD	mg/Kg	=	36		1991
Lead	SS11	OnSite	OB/OD	mg/Kg	=	30		1991
Lead	SS12	OnSite	OB/OD	mg/Kg	=	67		1991
Lead	SS13	OnSite	OB/OD	mg/Kg	=	300		1991
Lead	SS14	OnSite	OB/OD	mg/Kg	=	24		1991
Lead	SS15	OnSite	OB/OD	mg/Kg	=	19		1991
Lead	SS16	OnSite	Habitat	mg/Kg	=	34		1991
Lead	SS17	OnSite	Habitat	mg/Kg	=	36		1991
Lead	SS18	OnSite	Habitat	mg/Kg	=	29		1991
Lead	SS19	OnSite	Habitat	mg/Kg	=	28		1991
Lead	SS2	OnSite	OB/OD	mg/Kg	U	1	2	1991
Lead	SS20	OnSite	Habitat	mg/Kg	=	22		1991
Lead	SS3	OnSite	OB/OD	mg/Kg	=	34		1991
Lead	SS4	OnSite	OB/OD	mg/Kg	U	1	2	1991
Lead	SS5	OnSite	OB/OD	mg/Kg	=	48000		1991

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Lead	SS6	OnSite	OB/OD	mg/Kg	=	80		1991
Lead	SS7	OnSite	OB/OD	mg/Kg	=	1500		1991
Lead	SS8	OnSite	OB/OD	mg/Kg	=	65		1991
Lead	SS9	OnSite	OB/OD	mg/Kg	=	140		1991
Lead	TTU-SS01S	OnSite	OB/OD	mg/Kg	U	12.4	24.8	1989
Lead	TTU-SS02S	OnSite	OB/OD	mg/Kg	U	405.5	811	1989
Lead	TTU-SS03S	OnSite	OB/OD	mg/Kg	U	80	160	1989
Lead	TTU-SS04S(D)	OnSite	OB/OD	mg/Kg	U	55.5	111	1989
Lead	TTU-SS05S	OnSite	OB/OD	mg/Kg	U	9.25	18.5	1989
Lead	TTU-SS06S(BG)	OnSite	Habitat	mg/Kg	U	8.05	16.1	1989
Magnesium	AMTOF-01-1298-01	Background	Habitat	mg/kg	=	22700		1998
Magnesium	AMTOF-02-1298-01	Background	Habitat	mg/kg	=	16900		1998
Magnesium	AMTOF-03-1298-01	Background	Habitat	mg/kg	=	24200		1998
Magnesium	AMTOF-04-1298-01	Background	Habitat	mg/kg	=	24200		1998
Magnesium	AMTOF-05-1298-01	Background	Habitat	mg/kg	=	18800		1998
Magnesium	AMTOF-06-1298-01	Background	Habitat	mg/kg	=	22500		1998
Magnesium	NR-238	Background	Habitat	mg/Kg	=	21700		2002
Magnesium	NR-239	Background	Habitat	mg/Kg	=	22100		2002
Magnesium	NR-500-0800-01	Background	Habitat	mg/kg	=	27600		2000
Magnesium	NR-501-0800-01	Background	Habitat	mg/kg	=	40400		2000
Magnesium	NR-502-0800-01	Background	Habitat	mg/kg	=	31600		2000
Magnesium	NR-503-0800-01	Background	Habitat	mg/kg	=	28200		2000
Magnesium	NR-504-0800-01	Background	Habitat	mg/kg	=	27800		2000
Magnesium	NR-505-0800-01	Background	Habitat	mg/kg	=	21800		2000
Magnesium	NR-506-0800-01	Background	Habitat	mg/kg	=	21100		2000
Magnesium	NR-507-0800-01	Background	Habitat	mg/kg	=	17500		2000
Magnesium	NR-508-0800-01	Background	Habitat	mg/kg	=	22300		2000
Magnesium	NR-509-0800-01	Background	Habitat	mg/kg	=	15500		2000
Magnesium	NR-510-0800-01	Background	Habitat	mg/kg	=	18600		2000
Magnesium	NR-511-0800-01	Background	Habitat	mg/kg	=	18800		2000
Magnesium	NR-512-0800-01	Background	Habitat	mg/kg	=	19700		2000
Magnesium	NR-513-0800-01	Background	Habitat	mg/kg	=	16400		2000
Magnesium	NR-514-0800-01	Background	Habitat	mg/kg	=	38000		2000
Magnesium	NR-515-0800-01	Background	Habitat	mg/kg	=	39700		2000
Magnesium	NR-516-0800-01	Background	Habitat	mg/kg	=	22600		2000
Magnesium	NR-517-0800-01	Background	Habitat	mg/kg	B	167000		2000
Magnesium	NR-518-0800-01	Background	Habitat	mg/kg	=	21100		2000
Magnesium	NR-519-0800-01	Background	Habitat	mg/kg	=	25000		2000
Magnesium	NR-520-0800-01	Background	Habitat	mg/kg	B	83800		2000
Magnesium	NR-521-0800-01	Background	Habitat	mg/kg	=	24200		2000
Magnesium	NR-522-0800-01	Background	Habitat	mg/kg	=	34300		2000
Magnesium	NR-523-0800-01	Background	Habitat	mg/kg	=	41700		2000
Magnesium	NR-524-0800-01	Background	Habitat	mg/kg	=	26400		2000
Magnesium	NR-525-0800-01	Background	Habitat	mg/kg	=	17900		2000
Magnesium	NR-536	Background	Habitat	mg/Kg	B	29000		2004
Magnesium	NR-537	Background	Habitat	mg/Kg	B	31800		2004
Magnesium	UTNCBU-01-OCT97-01	Background	Habitat	mg/kg	=	32700		1997
Magnesium	UTNCBU-02-OCT97-01	Background	Habitat	mg/kg	=	29500		1997
Magnesium	UTNCBU-03-1298-01	Background	Habitat	mg/kg	=	36900		1998
Magnesium	UTNCBU-04-1298-01	Background	Habitat	mg/kg	=	35700		1998
Magnesium	UTNCBU-05-1298-01	Background	Habitat	mg/kg	=	29800		1998
Magnesium	UTNCBU-06-1298-01	Background	Habitat	mg/kg	=	28200		1998
Magnesium	UTNEB-03-1298-01	Background	Habitat	mg/kg	=	21800		1998

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Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Magnesium	UTNEB-04-1298-01	Background	Habitat	mg/kg	=	29700		1998
Magnesium	UTNEB-05-1298-01	Background	Habitat	mg/kg	=	32300		1998
Magnesium	UTNEB-06-1298-01	Background	Habitat	mg/kg	=	26800		1998
Magnesium	UTNERB-01-OCT97-01	Background	Habitat	mg/kg	=	38700		1997
Magnesium	UTNERB-02-OCT97-01	Background	Habitat	mg/kg	=	37700		1997
Magnesium	UTNOCB-01-OCT97-01	Background	Habitat	mg/kg	=	16500		1997
Magnesium	UTNOCB-02-OCT97-01	Background	Habitat	mg/kg	=	23100		1997
Magnesium	UTNOCBG-03-1298-01	Background	Habitat	mg/kg	=	20600		1998
Magnesium	UTNOCBG-04-1298-01	Background	Habitat	mg/kg	=	20200		1998
Magnesium	UTNOCBG-05-1298-01	Background	Habitat	mg/kg	=	19300		1998
Magnesium	UTNOCBG-06-1298-01	Background	Habitat	mg/kg	=	24700		1998
Magnesium	NR-226	OnSite	Habitat	mg/Kg	=	11500		2002
Magnesium	NR-227	OnSite	Habitat	mg/Kg	=	15700		2002
Magnesium	NR-228	OnSite	OB/OD	mg/Kg	=	17800		2002
Magnesium	NR-229	OnSite	Habitat	mg/Kg	=	22900		2002
Magnesium	NR-230	OnSite	Habitat	mg/Kg	=	19800		2002
Magnesium	NR-231	OnSite	OB/OD	mg/Kg	=	20600		2002
Magnesium	NR-232	OnSite	Habitat	mg/Kg	=	22300		2002
Magnesium	NR-233	OnSite	Habitat	mg/Kg	=	12200		2002
Magnesium	NR-234	OnSite	Habitat	mg/Kg	=	24300		2002
Magnesium	NR-235	OnSite	Habitat	mg/Kg	=	20900		2002
Magnesium	NR-236	OnSite	Habitat	mg/Kg	=	20100		2002
Magnesium	NR-237	OnSite	Habitat	mg/Kg	=	17200		2002
Magnesium	NR-526	OnSite	Habitat	mg/Kg	B	12200		2004
Magnesium	NR-527	OnSite	Habitat	mg/Kg	B	22500		2004
Magnesium	NR-528	OnSite	Habitat	mg/Kg	B	13900		2004
Magnesium	NR-529	OnSite	Habitat	mg/Kg	B	17600		2004
Magnesium	NR-530	OnSite	Habitat	mg/Kg	B	14200		2004
Magnesium	NR-531	OnSite	OB/OD	mg/Kg	B	11000		2004
Magnesium	NR-532	OnSite	OB/OD	mg/Kg	B	10800		2004
Magnesium	NR-533	OnSite	OB/OD	mg/Kg	B	14200		2004
Magnesium	NR-534	OnSite	OB/OD	mg/Kg	B	11800		2004
Magnesium	NR-535	OnSite	OB/OD	mg/Kg	B	11000		2004
Magnesium	SS1	OnSite	OB/OD	mg/Kg	=	15000		1991
Magnesium	SS10	OnSite	OB/OD	mg/Kg	=	16000		1991
Magnesium	SS11	OnSite	OB/OD	mg/Kg	=	22000		1991
Magnesium	SS12	OnSite	OB/OD	mg/Kg	=	19000		1991
Magnesium	SS13	OnSite	OB/OD	mg/Kg	=	19000		1991
Magnesium	SS14	OnSite	OB/OD	mg/Kg	=	18000		1991
Magnesium	SS15	OnSite	OB/OD	mg/Kg	=	19000		1991
Magnesium	SS16	OnSite	Habitat	mg/Kg	=	17000		1991
Magnesium	SS17	OnSite	Habitat	mg/Kg	=	22000		1991
Magnesium	SS18	OnSite	Habitat	mg/Kg	=	20000		1991
Magnesium	SS19	OnSite	Habitat	mg/Kg	=	17000		1991
Magnesium	SS2	OnSite	OB/OD	mg/Kg	=	9700		1991
Magnesium	SS20	OnSite	Habitat	mg/Kg	=	22000		1991
Magnesium	SS3	OnSite	OB/OD	mg/Kg	=	13000		1991
Magnesium	SS4	OnSite	OB/OD	mg/Kg	=	14000		1991
Magnesium	SS5	OnSite	OB/OD	mg/Kg	=	14000		1991
Magnesium	SS6	OnSite	OB/OD	mg/Kg	=	19000		1991
Magnesium	SS7	OnSite	OB/OD	mg/Kg	=	14000		1991
Magnesium	SS8	OnSite	OB/OD	mg/Kg	=	14000		1991
Magnesium	SS9	OnSite	OB/OD	mg/Kg	=	13000		1991

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Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Manganese	AMTOF-01-1298-01	Background	Habitat	mg/kg	=	436		1998
Manganese	AMTOF-02-1298-01	Background	Habitat	mg/kg	=	313		1998
Manganese	AMTOF-03-1298-01	Background	Habitat	mg/kg	=	456		1998
Manganese	AMTOF-04-1298-01	Background	Habitat	mg/kg	=	429		1998
Manganese	AMTOF-05-1298-01	Background	Habitat	mg/kg	=	386		1998
Manganese	AMTOF-06-1298-01	Background	Habitat	mg/kg	=	395		1998
Manganese	NR-238	Background	Habitat	mg/Kg	=	432		2002
Manganese	NR-239	Background	Habitat	mg/Kg	=	464		2002
Manganese	NR-500-0800-01	Background	Habitat	mg/kg	=	356		2000
Manganese	NR-501-0800-01	Background	Habitat	mg/kg	=	196		2000
Manganese	NR-502-0800-01	Background	Habitat	mg/kg	=	364		2000
Manganese	NR-503-0800-01	Background	Habitat	mg/kg	=	338		2000
Manganese	NR-504-0800-01	Background	Habitat	mg/kg	=	296		2000
Manganese	NR-505-0800-01	Background	Habitat	mg/kg	=	371		2000
Manganese	NR-506-0800-01	Background	Habitat	mg/kg	=	331		2000
Manganese	NR-507-0800-01	Background	Habitat	mg/kg	=	305		2000
Manganese	NR-508-0800-01	Background	Habitat	mg/kg	=	335		2000
Manganese	NR-509-0800-01	Background	Habitat	mg/kg	=	351		2000
Manganese	NR-510-0800-01	Background	Habitat	mg/kg	=	322		2000
Manganese	NR-511-0800-01	Background	Habitat	mg/kg	=	389		2000
Manganese	NR-512-0800-01	Background	Habitat	mg/kg	=	403		2000
Manganese	NR-513-0800-01	Background	Habitat	mg/kg	=	370		2000
Manganese	NR-514-0800-01	Background	Habitat	mg/kg	=	314		2000
Manganese	NR-515-0800-01	Background	Habitat	mg/kg	=	60.1		2000
Manganese	NR-516-0800-01	Background	Habitat	mg/kg	=	859		2000
Manganese	NR-517-0800-01	Background	Habitat	mg/kg	=	138		2000
Manganese	NR-518-0800-01	Background	Habitat	mg/kg	=	43.4		2000
Manganese	NR-519-0800-01	Background	Habitat	mg/kg	=	183		2000
Manganese	NR-520-0800-01	Background	Habitat	mg/kg	=	183		2000
Manganese	NR-521-0800-01	Background	Habitat	mg/kg	=	131		2000
Manganese	NR-522-0800-01	Background	Habitat	mg/kg	=	223		2000
Manganese	NR-523-0800-01	Background	Habitat	mg/kg	=	229		2000
Manganese	NR-524-0800-01	Background	Habitat	mg/kg	=	142		2000
Manganese	NR-525-0800-01	Background	Habitat	mg/kg	=	106		2000
Manganese	NR-536	Background	Habitat	mg/Kg	=	517		2004
Manganese	NR-537	Background	Habitat	mg/Kg	=	602		2004
Manganese	UTNCBU-01-OCT97-01	Background	Habitat	mg/kg	=	287		1997
Manganese	UTNCBU-02-OCT97-01	Background	Habitat	mg/kg	=	274		1997
Manganese	UTNCBU-03-1298-01	Background	Habitat	mg/kg	=	396		1998
Manganese	UTNCBU-04-1298-01	Background	Habitat	mg/kg	=	396		1998
Manganese	UTNCBU-05-1298-01	Background	Habitat	mg/kg	=	309		1998
Manganese	UTNCBU-06-1298-01	Background	Habitat	mg/kg	=	318		1998
Manganese	UTNEB-03-1298-01	Background	Habitat	mg/kg	=	421		1998
Manganese	UTNEB-04-1298-01	Background	Habitat	mg/kg	=	400		1998
Manganese	UTNEB-05-1298-01	Background	Habitat	mg/kg	=	386		1998
Manganese	UTNEB-06-1298-01	Background	Habitat	mg/kg	=	320		1998
Manganese	UTNERB-01-OCT97-01	Background	Habitat	mg/kg	=	361		1997
Manganese	UTNERB-02-OCT97-01	Background	Habitat	mg/kg	=	326		1997
Manganese	UTNOCB-01-OCT97-01	Background	Habitat	mg/kg	=	246		1997
Manganese	UTNOCB-02-OCT97-01	Background	Habitat	mg/kg	=	317		1997
Manganese	UTNOCBG-03-1298-01	Background	Habitat	mg/kg	=	418		1998
Manganese	UTNOCBG-04-1298-01	Background	Habitat	mg/kg	=	478		1998
Manganese	UTNOCBG-05-1298-01	Background	Habitat	mg/kg	=	455		1998

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Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Manganese	UTNOCBG-06-1298-01	Background	Habitat	mg/kg	=	468		1998
Manganese	NR-226	OnSite	Habitat	mg/Kg	=	204		2002
Manganese	NR-227	OnSite	Habitat	mg/Kg	=	377		2002
Manganese	NR-228	OnSite	OB/OD	mg/Kg	=	376		2002
Manganese	NR-229	OnSite	Habitat	mg/Kg	=	481		2002
Manganese	NR-230	OnSite	Habitat	mg/Kg	=	519		2002
Manganese	NR-231	OnSite	OB/OD	mg/Kg	=	420		2002
Manganese	NR-232	OnSite	Habitat	mg/Kg	=	458		2002
Manganese	NR-233	OnSite	Habitat	mg/Kg	=	204		2002
Manganese	NR-234	OnSite	Habitat	mg/Kg	=	429		2002
Manganese	NR-235	OnSite	Habitat	mg/Kg	=	430		2002
Manganese	NR-236	OnSite	Habitat	mg/Kg	=	458		2002
Manganese	NR-237	OnSite	Habitat	mg/Kg	=	308		2002
Manganese	NR-526	OnSite	Habitat	mg/Kg	=	218		2004
Manganese	NR-527	OnSite	Habitat	mg/Kg	=	451		2004
Manganese	NR-528	OnSite	Habitat	mg/Kg	=	333		2004
Manganese	NR-529	OnSite	Habitat	mg/Kg	=	305		2004
Manganese	NR-530	OnSite	Habitat	mg/Kg	=	203		2004
Manganese	NR-531	OnSite	OB/OD	mg/Kg	=	171		2004
Manganese	NR-532	OnSite	OB/OD	mg/Kg	=	125		2004
Manganese	NR-533	OnSite	OB/OD	mg/Kg	=	225		2004
Manganese	NR-534	OnSite	OB/OD	mg/Kg	J	191		2004
Manganese	NR-535	OnSite	OB/OD	mg/Kg	=	190		2004
Manganese	SS1	OnSite	OB/OD	mg/Kg	=	270		1991
Manganese	SS10	OnSite	OB/OD	mg/Kg	=	290		1991
Manganese	SS11	OnSite	OB/OD	mg/Kg	=	480		1991
Manganese	SS12	OnSite	OB/OD	mg/Kg	=	440		1991
Manganese	SS13	OnSite	OB/OD	mg/Kg	=	350		1991
Manganese	SS14	OnSite	OB/OD	mg/Kg	=	360		1991
Manganese	SS15	OnSite	OB/OD	mg/Kg	=	410		1991
Manganese	SS16	OnSite	Habitat	mg/Kg	=	400		1991
Manganese	SS17	OnSite	Habitat	mg/Kg	=	490		1991
Manganese	SS18	OnSite	Habitat	mg/Kg	=	430		1991
Manganese	SS19	OnSite	Habitat	mg/Kg	=	390		1991
Manganese	SS2	OnSite	OB/OD	mg/Kg	=	140		1991
Manganese	SS20	OnSite	Habitat	mg/Kg	=	460		1991
Manganese	SS3	OnSite	OB/OD	mg/Kg	=	120		1991
Manganese	SS4	OnSite	OB/OD	mg/Kg	=	200		1991
Manganese	SS5	OnSite	OB/OD	mg/Kg	=	320		1991
Manganese	SS6	OnSite	OB/OD	mg/Kg	=	410		1991
Manganese	SS7	OnSite	OB/OD	mg/Kg	=	330		1991
Manganese	SS8	OnSite	OB/OD	mg/Kg	=	310		1991
Manganese	SS9	OnSite	OB/OD	mg/Kg	=	280		1991
Manganese	TTU-SS01S	OnSite	OB/OD	mg/Kg	=	181		1989
Manganese	TTU-SS02S	OnSite	OB/OD	mg/Kg	=	219		1989
Manganese	TTU-SS03S	OnSite	OB/OD	mg/Kg	=	189		1989
Manganese	TTU-SS04S(D)	OnSite	OB/OD	mg/Kg	=	139		1989
Manganese	TTU-SS05S	OnSite	OB/OD	mg/Kg	=	219		1989
Manganese	TTU-SS06S(BG)	OnSite	Habitat	mg/Kg	=	345		1989
Mercury	NR-238	Background	Habitat	mg/Kg	U	0.01	0.02	2002
Mercury	NR-239	Background	Habitat	mg/Kg	U	0.01	0.02	2002
Mercury	NR-536	Background	Habitat	mg/Kg	B	0.0262		2004
Mercury	NR-537	Background	Habitat	mg/Kg	B	0.025		2004

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Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Mercury	NR-226	OnSite	Habitat	mg/Kg	U	0.01	0.02	2002
Mercury	NR-227	OnSite	Habitat	mg/Kg	U	0.01	0.02	2002
Mercury	NR-228	OnSite	OB/OD	mg/Kg	U	0.01	0.02	2002
Mercury	NR-229	OnSite	Habitat	mg/Kg	U	0.01	0.02	2002
Mercury	NR-230	OnSite	Habitat	mg/Kg	=	0.03		2002
Mercury	NR-231	OnSite	OB/OD	mg/Kg	U	0.01	0.02	2002
Mercury	NR-232	OnSite	Habitat	mg/Kg	U	0.01	0.02	2002
Mercury	NR-233	OnSite	Habitat	mg/Kg	U	0.01	0.02	2002
Mercury	NR-234	OnSite	Habitat	mg/Kg	=	0.03		2002
Mercury	NR-235	OnSite	Habitat	mg/Kg	U	0.01	0.02	2002
Mercury	NR-236	OnSite	Habitat	mg/Kg	U	0.01	0.02	2002
Mercury	NR-237	OnSite	Habitat	mg/Kg	U	0.01	0.02	2002
Mercury	NR-526	OnSite	Habitat	mg/Kg	B	0.0087		2004
Mercury	NR-527	OnSite	Habitat	mg/Kg	B	0.0206		2004
Mercury	NR-528	OnSite	Habitat	mg/Kg	B	0.0152		2004
Mercury	NR-529	OnSite	Habitat	mg/Kg	B	0.0085		2004
Mercury	NR-530	OnSite	Habitat	mg/Kg	B	0.0064		2004
Mercury	NR-531	OnSite	OB/OD	mg/Kg	B	0.0065		2004
Mercury	NR-532	OnSite	OB/OD	mg/Kg	B	0.005		2004
Mercury	NR-533	OnSite	OB/OD	mg/Kg	B	0.0086		2004
Mercury	NR-534	OnSite	OB/OD	mg/Kg	B	0.0073		2004
Mercury	NR-535	OnSite	OB/OD	mg/Kg	B	0.0071		2004
Mercury	SS1	OnSite	OB/OD	mg/Kg	U	0.025	0.05	1991
Mercury	SS10	OnSite	OB/OD	mg/Kg	U	0.025	0.05	1991
Mercury	SS11	OnSite	OB/OD	mg/Kg	U	0.025	0.05	1991
Mercury	SS12	OnSite	OB/OD	mg/Kg	U	0.025	0.05	1991
Mercury	SS13	OnSite	OB/OD	mg/Kg	=	0.07		1991
Mercury	SS14	OnSite	OB/OD	mg/Kg	U	0.025	0.05	1991
Mercury	SS15	OnSite	OB/OD	mg/Kg	U	0.025	0.05	1991
Mercury	SS16	OnSite	Habitat	mg/Kg	U	0.025	0.05	1991
Mercury	SS17	OnSite	Habitat	mg/Kg	U	0.025	0.05	1991
Mercury	SS18	OnSite	Habitat	mg/Kg	U	0.025	0.05	1991
Mercury	SS19	OnSite	Habitat	mg/Kg	U	0.025	0.05	1991
Mercury	SS2	OnSite	OB/OD	mg/Kg	U	0.025	0.05	1991
Mercury	SS20	OnSite	Habitat	mg/Kg	U	0.025	0.05	1991
Mercury	SS3	OnSite	OB/OD	mg/Kg	U	0.025	0.05	1991
Mercury	SS4	OnSite	OB/OD	mg/Kg	U	0.025	0.05	1991
Mercury	SS5	OnSite	OB/OD	mg/Kg	U	0.025	0.05	1991
Mercury	SS6	OnSite	OB/OD	mg/Kg	U	0.025	0.05	1991
Mercury	SS7	OnSite	OB/OD	mg/Kg	U	0.025	0.05	1991
Mercury	SS8	OnSite	OB/OD	mg/Kg	U	0.025	0.05	1991
Mercury	SS9	OnSite	OB/OD	mg/Kg	U	0.025	0.05	1991
Mercury	TTU-SS01S	OnSite	OB/OD	mg/Kg	U	0.045	0.09	1989
Mercury	TTU-SS02S	OnSite	OB/OD	mg/Kg	U	0.005	0.01	1989
Mercury	TTU-SS03S	OnSite	OB/OD	mg/Kg	U	0.055	0.11	1989
Mercury	TTU-SS04S(D)	OnSite	OB/OD	mg/Kg	U	0.055	0.11	1989
Mercury	TTU-SS05S	OnSite	OB/OD	mg/Kg	U	0.055	0.11	1989
Mercury	TTU-SS06S(BG)	OnSite	Habitat	mg/Kg	U	0.055	0.11	1989
Molybdenum	AMTOF-01-1298-01	Background	Habitat	mg/kg	=	0.679		1998
Molybdenum	AMTOF-02-1298-01	Background	Habitat	mg/kg	=	0.685		1998
Molybdenum	AMTOF-03-1298-01	Background	Habitat	mg/kg	=	0.696		1998
Molybdenum	AMTOF-04-1298-01	Background	Habitat	mg/kg	=	0.612		1998
Molybdenum	AMTOF-05-1298-01	Background	Habitat	mg/kg	=	0.658		1998

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils
 Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Molybdenum	AMTOF-06-1298-01	Background	Habitat	mg/kg	=	0.494		1998
Molybdenum	NR-238	Background	Habitat	mg/Kg	=	1.1		2002
Molybdenum	NR-239	Background	Habitat	mg/Kg	=	0.85		2002
Molybdenum	NR-500-0800-01	Background	Habitat	mg/kg	J	0.748		2000
Molybdenum	NR-501-0800-01	Background	Habitat	mg/kg	J	0.242		2000
Molybdenum	NR-502-0800-01	Background	Habitat	mg/kg	J	0.523		2000
Molybdenum	NR-503-0800-01	Background	Habitat	mg/kg	J	0.517		2000
Molybdenum	NR-504-0800-01	Background	Habitat	mg/kg	J	0.509		2000
Molybdenum	NR-505-0800-01	Background	Habitat	mg/kg	J	0.921		2000
Molybdenum	NR-506-0800-01	Background	Habitat	mg/kg	=	1.2		2000
Molybdenum	NR-507-0800-01	Background	Habitat	mg/kg	J	0.381		2000
Molybdenum	NR-508-0800-01	Background	Habitat	mg/kg	J	0.692		2000
Molybdenum	NR-509-0800-01	Background	Habitat	mg/kg	=	3.34		2000
Molybdenum	NR-510-0800-01	Background	Habitat	mg/kg	J	0.623		2000
Molybdenum	NR-511-0800-01	Background	Habitat	mg/kg	J	0.465		2000
Molybdenum	NR-512-0800-01	Background	Habitat	mg/kg	J	0.373		2000
Molybdenum	NR-513-0800-01	Background	Habitat	mg/kg	=	0.895		2000
Molybdenum	NR-514-0800-01	Background	Habitat	mg/kg	J	0.575		2000
Molybdenum	NR-515-0800-01	Background	Habitat	mg/kg	J	0.247		2000
Molybdenum	NR-516-0800-01	Background	Habitat	mg/kg	=	4.91		2000
Molybdenum	NR-517-0800-01	Background	Habitat	mg/kg	J	0.5		2000
Molybdenum	NR-518-0800-01	Background	Habitat	mg/kg	J	0.13		2000
Molybdenum	NR-519-0800-01	Background	Habitat	mg/kg	U	0.073	0.146	2000
Molybdenum	NR-520-0800-01	Background	Habitat	mg/kg	J	0.23		2000
Molybdenum	NR-521-0800-01	Background	Habitat	mg/kg	J	0.422		2000
Molybdenum	NR-522-0800-01	Background	Habitat	mg/kg	J	0.662		2000
Molybdenum	NR-523-0800-01	Background	Habitat	mg/kg	J	0.719		2000
Molybdenum	NR-524-0800-01	Background	Habitat	mg/kg	J	0.577		2000
Molybdenum	NR-525-0800-01	Background	Habitat	mg/kg	J	0.589		2000
Molybdenum	NR-536	Background	Habitat	mg/Kg	J	0.98		2004
Molybdenum	NR-537	Background	Habitat	mg/Kg	J	0.8		2004
Molybdenum	UTNCBU-01-OCT97-01	Background	Habitat	mg/kg	=	0.587		1997
Molybdenum	UTNCBU-02-OCT97-01	Background	Habitat	mg/kg	B	0.352		1997
Molybdenum	UTNCBU-03-1298-01	Background	Habitat	mg/kg	B	0.527		1998
Molybdenum	UTNCBU-04-1298-01	Background	Habitat	mg/kg	B	0.399		1998
Molybdenum	UTNCBU-05-1298-01	Background	Habitat	mg/kg	B	0.409		1998
Molybdenum	UTNCBU-06-1298-01	Background	Habitat	mg/kg	B	0.513		1998
Molybdenum	UTNEB-03-1298-01	Background	Habitat	mg/kg	B	0.598		1998
Molybdenum	UTNEB-04-1298-01	Background	Habitat	mg/kg	B	0.616		1998
Molybdenum	UTNEB-05-1298-01	Background	Habitat	mg/kg	B	0.501		1998
Molybdenum	UTNEB-06-1298-01	Background	Habitat	mg/kg	B	0.538		1998
Molybdenum	UTNERB-01-OCT97-01	Background	Habitat	mg/kg	=	1.04		1997
Molybdenum	UTNERB-02-OCT97-01	Background	Habitat	mg/kg	=	0.701		1997
Molybdenum	UTNOCB-01-OCT97-01	Background	Habitat	mg/kg	=	1.37		1997
Molybdenum	UTNOCB-02-OCT97-01	Background	Habitat	mg/kg	=	1.62		1997
Molybdenum	UTNOCBG-03-1298-01	Background	Habitat	mg/kg	=	0.966		1998
Molybdenum	UTNOCBG-04-1298-01	Background	Habitat	mg/kg	=	1.88		1998
Molybdenum	UTNOCBG-05-1298-01	Background	Habitat	mg/kg	=	1.81		1998
Molybdenum	UTNOCBG-06-1298-01	Background	Habitat	mg/kg	=	1.45		1998
Molybdenum	NR-226	OnSite	Habitat	mg/Kg	U	0.15	0.3	2002
Molybdenum	NR-227	OnSite	Habitat	mg/Kg	U	0.15	0.3	2002
Molybdenum	NR-228	OnSite	OB/OD	mg/Kg	=	0.75		2002
Molybdenum	NR-229	OnSite	Habitat	mg/Kg	=	0.92		2002

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Molybdenum	NR-230	OnSite	Habitat	mg/Kg	=	1		2002
Molybdenum	NR-231	OnSite	OB/OD	mg/Kg	=	1.3		2002
Molybdenum	NR-232	OnSite	Habitat	mg/Kg	=	0.86		2002
Molybdenum	NR-233	OnSite	Habitat	mg/Kg	=	1.3		2002
Molybdenum	NR-234	OnSite	Habitat	mg/Kg	=	0.9		2002
Molybdenum	NR-235	OnSite	Habitat	mg/Kg	=	1		2002
Molybdenum	NR-236	OnSite	Habitat	mg/Kg	=	1.3		2002
Molybdenum	NR-237	OnSite	Habitat	mg/Kg	=	1.2		2002
Molybdenum	NR-526	OnSite	Habitat	mg/Kg	J	0.77		2004
Molybdenum	NR-527	OnSite	Habitat	mg/Kg	J	0.8		2004
Molybdenum	NR-528	OnSite	Habitat	mg/Kg	J	0.6		2004
Molybdenum	NR-529	OnSite	Habitat	mg/Kg	J	1		2004
Molybdenum	NR-530	OnSite	Habitat	mg/Kg	J	0.75		2004
Molybdenum	NR-531	OnSite	OB/OD	mg/Kg	B	17		2004
Molybdenum	NR-532	OnSite	OB/OD	mg/Kg	J	2.8		2004
Molybdenum	NR-533	OnSite	OB/OD	mg/Kg	J	1.1		2004
Molybdenum	NR-534	OnSite	OB/OD	mg/Kg	J	1.3		2004
Molybdenum	NR-535	OnSite	OB/OD	mg/Kg	J	1.1		2004
Nickel	AMTOF-01-1298-01	Background	Habitat	mg/kg	=	11.9		1998
Nickel	AMTOF-02-1298-01	Background	Habitat	mg/kg	=	16.3		1998
Nickel	AMTOF-03-1298-01	Background	Habitat	mg/kg	=	11.7		1998
Nickel	AMTOF-04-1298-01	Background	Habitat	mg/kg	=	11.8		1998
Nickel	AMTOF-05-1298-01	Background	Habitat	mg/kg	=	12		1998
Nickel	AMTOF-06-1298-01	Background	Habitat	mg/kg	=	10.8		1998
Nickel	NR-238	Background	Habitat	mg/Kg	=	11.9		2002
Nickel	NR-239	Background	Habitat	mg/Kg	=	10.7		2002
Nickel	NR-500-0800-01	Background	Habitat	mg/kg	=	10.5		2000
Nickel	NR-501-0800-01	Background	Habitat	mg/kg	=	7.29		2000
Nickel	NR-502-0800-01	Background	Habitat	mg/kg	=	11.5		2000
Nickel	NR-503-0800-01	Background	Habitat	mg/kg	=	10.5		2000
Nickel	NR-504-0800-01	Background	Habitat	mg/kg	=	9.01		2000
Nickel	NR-505-0800-01	Background	Habitat	mg/kg	=	10.6		2000
Nickel	NR-506-0800-01	Background	Habitat	mg/kg	=	10.8		2000
Nickel	NR-507-0800-01	Background	Habitat	mg/kg	=	9.28		2000
Nickel	NR-508-0800-01	Background	Habitat	mg/kg	=	10.2		2000
Nickel	NR-509-0800-01	Background	Habitat	mg/kg	=	13.3		2000
Nickel	NR-510-0800-01	Background	Habitat	mg/kg	=	8.8		2000
Nickel	NR-511-0800-01	Background	Habitat	mg/kg	=	11.3		2000
Nickel	NR-512-0800-01	Background	Habitat	mg/kg	=	12.4		2000
Nickel	NR-513-0800-01	Background	Habitat	mg/kg	=	11.5		2000
Nickel	NR-514-0800-01	Background	Habitat	mg/kg	=	10.1		2000
Nickel	NR-515-0800-01	Background	Habitat	mg/kg	=	3.14		2000
Nickel	NR-516-0800-01	Background	Habitat	mg/kg	=	20.2		2000
Nickel	NR-517-0800-01	Background	Habitat	mg/kg	=	6.08		2000
Nickel	NR-518-0800-01	Background	Habitat	mg/kg	=	3		2000
Nickel	NR-519-0800-01	Background	Habitat	mg/kg	=	6.12		2000
Nickel	NR-520-0800-01	Background	Habitat	mg/kg	=	6.76		2000
Nickel	NR-521-0800-01	Background	Habitat	mg/kg	=	5.42		2000
Nickel	NR-522-0800-01	Background	Habitat	mg/kg	=	10.7		2000
Nickel	NR-523-0800-01	Background	Habitat	mg/kg	=	9.27		2000
Nickel	NR-524-0800-01	Background	Habitat	mg/kg	=	7.5		2000
Nickel	NR-525-0800-01	Background	Habitat	mg/kg	=	5.56		2000
Nickel	NR-536	Background	Habitat	mg/Kg	=	13.3		2004

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Nickel	NR-537	Background	Habitat	mg/Kg	=	15.7		2004
Nickel	UTNCBU-01-OCT97-01	Background	Habitat	mg/kg	=	9.16		1997
Nickel	UTNCBU-02-OCT97-01	Background	Habitat	mg/kg	=	8.13		1997
Nickel	UTNCBU-03-1298-01	Background	Habitat	mg/kg	=	11.4		1998
Nickel	UTNCBU-04-1298-01	Background	Habitat	mg/kg	=	10.9		1998
Nickel	UTNCBU-05-1298-01	Background	Habitat	mg/kg	=	8.31		1998
Nickel	UTNCBU-06-1298-01	Background	Habitat	mg/kg	=	8.21		1998
Nickel	UTNEB-03-1298-01	Background	Habitat	mg/kg	=	8.93		1998
Nickel	UTNEB-04-1298-01	Background	Habitat	mg/kg	=	13.2		1998
Nickel	UTNEB-05-1298-01	Background	Habitat	mg/kg	=	9.45		1998
Nickel	UTNEB-06-1298-01	Background	Habitat	mg/kg	=	8.48		1998
Nickel	UTNERB-01-OCT97-01	Background	Habitat	mg/kg	=	15.8		1997
Nickel	UTNERB-02-OCT97-01	Background	Habitat	mg/kg	=	12.3		1997
Nickel	UTNOCB-01-OCT97-01	Background	Habitat	mg/kg	=	12.2		1997
Nickel	UTNOCB-02-OCT97-01	Background	Habitat	mg/kg	=	11.3		1997
Nickel	UTNOCBG-03-1298-01	Background	Habitat	mg/kg	=	9.49		1998
Nickel	UTNOCBG-04-1298-01	Background	Habitat	mg/kg	=	9.42		1998
Nickel	UTNOCBG-05-1298-01	Background	Habitat	mg/kg	=	9.2		1998
Nickel	UTNOCBG-06-1298-01	Background	Habitat	mg/kg	=	12.3		1998
Nickel	NR-226	OnSite	Habitat	mg/Kg	=	6.8		2002
Nickel	NR-227	OnSite	Habitat	mg/Kg	=	9.3		2002
Nickel	NR-228	OnSite	OB/OD	mg/Kg	=	11.4		2002
Nickel	NR-229	OnSite	Habitat	mg/Kg	=	12.8		2002
Nickel	NR-230	OnSite	Habitat	mg/Kg	=	9.7		2002
Nickel	NR-231	OnSite	OB/OD	mg/Kg	=	11.4		2002
Nickel	NR-232	OnSite	Habitat	mg/Kg	=	13		2002
Nickel	NR-233	OnSite	Habitat	mg/Kg	=	9.6		2002
Nickel	NR-234	OnSite	Habitat	mg/Kg	=	13		2002
Nickel	NR-235	OnSite	Habitat	mg/Kg	=	11		2002
Nickel	NR-236	OnSite	Habitat	mg/Kg	=	10.5		2002
Nickel	NR-237	OnSite	Habitat	mg/Kg	=	10.4		2002
Nickel	NR-526	OnSite	Habitat	mg/Kg	=	8.6		2004
Nickel	NR-527	OnSite	Habitat	mg/Kg	=	12.2		2004
Nickel	NR-528	OnSite	Habitat	mg/Kg	=	8.5		2004
Nickel	NR-529	OnSite	Habitat	mg/Kg	=	9.6		2004
Nickel	NR-530	OnSite	Habitat	mg/Kg	=	8.9		2004
Nickel	NR-531	OnSite	OB/OD	mg/Kg	=	41.3		2004
Nickel	NR-532	OnSite	OB/OD	mg/Kg	=	10		2004
Nickel	NR-533	OnSite	OB/OD	mg/Kg	=	9.2		2004
Nickel	NR-534	OnSite	OB/OD	mg/Kg	=	9.1		2004
Nickel	NR-535	OnSite	OB/OD	mg/Kg	=	10		2004
Nickel	SS1	OnSite	OB/OD	mg/Kg	=	8		1991
Nickel	SS10	OnSite	OB/OD	mg/Kg	=	8		1991
Nickel	SS11	OnSite	OB/OD	mg/Kg	=	12		1991
Nickel	SS12	OnSite	OB/OD	mg/Kg	=	11		1991
Nickel	SS13	OnSite	OB/OD	mg/Kg	=	9		1991
Nickel	SS14	OnSite	OB/OD	mg/Kg	=	10		1991
Nickel	SS15	OnSite	OB/OD	mg/Kg	=	11		1991
Nickel	SS16	OnSite	Habitat	mg/Kg	=	9		1991
Nickel	SS17	OnSite	Habitat	mg/Kg	=	9		1991
Nickel	SS18	OnSite	Habitat	mg/Kg	=	11		1991
Nickel	SS19	OnSite	Habitat	mg/Kg	=	7		1991
Nickel	SS2	OnSite	OB/OD	mg/Kg	=	9		1991

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Nickel	SS20	OnSite	Habitat	mg/Kg	=	10		1991
Nickel	SS3	OnSite	OB/OD	mg/Kg	=	19		1991
Nickel	SS4	OnSite	OB/OD	mg/Kg	=	8		1991
Nickel	SS5	OnSite	OB/OD	mg/Kg	=	31		1991
Nickel	SS6	OnSite	OB/OD	mg/Kg	=	11		1991
Nickel	SS7	OnSite	OB/OD	mg/Kg	=	17		1991
Nickel	SS8	OnSite	OB/OD	mg/Kg	=	8		1991
Nickel	SS9	OnSite	OB/OD	mg/Kg	=	9		1991
Nickel	TTU-SS01S	OnSite	OB/OD	mg/Kg	=	9		1989
Nickel	TTU-SS02S	OnSite	OB/OD	mg/Kg	=	10.2		1989
Nickel	TTU-SS03S	OnSite	OB/OD	mg/Kg	=	7.5		1989
Nickel	TTU-SS04S(D)	OnSite	OB/OD	mg/Kg	=	6.7		1989
Nickel	TTU-SS05S	OnSite	OB/OD	mg/Kg	=	10.4		1989
Nickel	TTU-SS06S(BG)	OnSite	Habitat	mg/Kg	=	13.9		1989
Nitrate	NR-238	Background	Habitat	mg/Kg	=	16		2002
Nitrate	NR-239	Background	Habitat	mg/Kg	=	5.1		2002
Nitrate	NR-226	OnSite	Habitat	mg/Kg	=	3.8		2002
Nitrate	NR-227	OnSite	Habitat	mg/Kg	=	3.45		2002
Nitrate	NR-228	OnSite	OB/OD	mg/Kg	=	7.7		2002
Nitrate	NR-229	OnSite	Habitat	mg/Kg	=	1.1		2002
Nitrate	NR-230	OnSite	Habitat	mg/Kg	=	12.2		2002
Nitrate	NR-231	OnSite	OB/OD	mg/Kg	=	10.5		2002
Nitrate	NR-232	OnSite	Habitat	mg/Kg	=	12.2		2002
Nitrate	NR-233	OnSite	Habitat	mg/Kg	=	3.2		2002
Nitrate	NR-234	OnSite	Habitat	mg/Kg	=	15.5		2002
Nitrate	NR-235	OnSite	Habitat	mg/Kg	=	7.7		2002
Nitrate	NR-236	OnSite	Habitat	mg/Kg	=	15.9		2002
Nitrate	NR-237	OnSite	Habitat	mg/Kg	=	10.8		2002
Nitrate	NR-526	OnSite	Habitat	mg/Kg	J	22.8		2004
Nitrate	NR-527	OnSite	Habitat	mg/Kg	B	9		2004
Nitrate	NR-528	OnSite	Habitat	mg/Kg	B	9.1		2004
Nitrate	NR-529	OnSite	Habitat	mg/Kg	B	19.2		2004
Nitrate	NR-530	OnSite	Habitat	mg/Kg	UB	1.25	2.5	2004
Nitrate	NR-531	OnSite	OB/OD	mg/Kg	UB	0.85	1.7	2004
Nitrate	NR-532	OnSite	OB/OD	mg/Kg	UB	1.2	2.4	2004
Nitrate	NR-533	OnSite	OB/OD	mg/Kg	B	2.9		2004
Nitrate	NR-534	OnSite	OB/OD	mg/Kg	J	13.1		2004
Nitrate	NR-535	OnSite	OB/OD	mg/Kg	UB	1.05	2.1	2004
Nitrate	SS1	OnSite	OB/OD	mg/Kg	=	0.007		1991
Nitrate	SS10	OnSite	OB/OD	mg/Kg	=	0.009		1991
Nitrate	SS11	OnSite	OB/OD	mg/Kg	=	0.015		1991
Nitrate	SS12	OnSite	OB/OD	mg/Kg	=	0.043		1991
Nitrate	SS13	OnSite	OB/OD	mg/Kg	=	0.11		1991
Nitrate	SS14	OnSite	OB/OD	mg/Kg	=	0.007		1991
Nitrate	SS15	OnSite	OB/OD	mg/Kg	=	0.006		1991
Nitrate	SS16	OnSite	Habitat	mg/Kg	=	0.004		1991
Nitrate	SS17	OnSite	Habitat	mg/Kg	=	0.011		1991
Nitrate	SS18	OnSite	Habitat	mg/Kg	=	0.01		1991
Nitrate	SS19	OnSite	Habitat	mg/Kg	=	0.008		1991
Nitrate	SS2	OnSite	OB/OD	mg/Kg	=	0.009		1991
Nitrate	SS20	OnSite	Habitat	mg/Kg	=	0.008		1991
Nitrate	SS3	OnSite	OB/OD	mg/Kg	=	0.009		1991
Nitrate	SS4	OnSite	OB/OD	mg/Kg	=	0.045		1991

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Nitrate	SS5	OnSite	OB/OD	mg/Kg	=	0.013		1991
Nitrate	SS6	OnSite	OB/OD	mg/Kg	=	0.009		1991
Nitrate	SS7	OnSite	OB/OD	mg/Kg	=	0.026		1991
Nitrate	SS8	OnSite	OB/OD	mg/Kg	=	0.015		1991
Nitrate	SS9	OnSite	OB/OD	mg/Kg	=	0.007		1991
Nitrate	TTU-SS01S	OnSite	OB/OD	mg/Kg	=	1.5		1989
Nitrate	TTU-SS02S	OnSite	OB/OD	mg/Kg	=	1.6		1989
Nitrate	TTU-SS03S	OnSite	OB/OD	mg/Kg	=	1.8		1989
Nitrate	TTU-SS04S(D)	OnSite	OB/OD	mg/Kg	=	1.6		1989
Nitrate	TTU-SS05S	OnSite	OB/OD	mg/Kg	=	8.5		1989
Nitrate	TTU-SS06S(BG)	OnSite	Habitat	mg/Kg	=	5.4		1989
Phosphorus	AMTOF-01-1298-01	Background	Habitat	mg/kg	=	1130		1998
Phosphorus	AMTOF-02-1298-01	Background	Habitat	mg/kg	=	1470		1998
Phosphorus	AMTOF-03-1298-01	Background	Habitat	mg/kg	=	1040		1998
Phosphorus	AMTOF-04-1298-01	Background	Habitat	mg/kg	=	988		1998
Phosphorus	AMTOF-05-1298-01	Background	Habitat	mg/kg	=	868		1998
Phosphorus	AMTOF-06-1298-01	Background	Habitat	mg/kg	=	1030		1998
Phosphorus	NR-500-0800-01	Background	Habitat	mg/kg	B	728		2000
Phosphorus	NR-501-0800-01	Background	Habitat	mg/kg	B	575		2000
Phosphorus	NR-502-0800-01	Background	Habitat	mg/kg	B	825		2000
Phosphorus	NR-503-0800-01	Background	Habitat	mg/kg	B	794		2000
Phosphorus	NR-504-0800-01	Background	Habitat	mg/kg	B	754		2000
Phosphorus	NR-505-0800-01	Background	Habitat	mg/kg	B	772		2000
Phosphorus	NR-506-0800-01	Background	Habitat	mg/kg	B	668		2000
Phosphorus	NR-507-0800-01	Background	Habitat	mg/kg	B	682		2000
Phosphorus	NR-508-0800-01	Background	Habitat	mg/kg	B	719		2000
Phosphorus	NR-509-0800-01	Background	Habitat	mg/kg	B	713		2000
Phosphorus	NR-510-0800-01	Background	Habitat	mg/kg	B	612		2000
Phosphorus	NR-511-0800-01	Background	Habitat	mg/kg	B	767		2000
Phosphorus	NR-512-0800-01	Background	Habitat	mg/kg	B	719		2000
Phosphorus	NR-513-0800-01	Background	Habitat	mg/kg	B	762		2000
Phosphorus	NR-514-0800-01	Background	Habitat	mg/kg	B	774		2000
Phosphorus	NR-515-0800-01	Background	Habitat	mg/kg	B	230		2000
Phosphorus	NR-516-0800-01	Background	Habitat	mg/kg	B	669		2000
Phosphorus	NR-517-0800-01	Background	Habitat	mg/kg	B	519		2000
Phosphorus	NR-518-0800-01	Background	Habitat	mg/kg	B	198		2000
Phosphorus	NR-519-0800-01	Background	Habitat	mg/kg	B	356		2000
Phosphorus	NR-520-0800-01	Background	Habitat	mg/kg	B	575		2000
Phosphorus	NR-521-0800-01	Background	Habitat	mg/kg	B	328		2000
Phosphorus	NR-522-0800-01	Background	Habitat	mg/kg	B	575		2000
Phosphorus	NR-523-0800-01	Background	Habitat	mg/kg	B	697		2000
Phosphorus	NR-524-0800-01	Background	Habitat	mg/kg	B	492		2000
Phosphorus	NR-525-0800-01	Background	Habitat	mg/kg	B	431		2000
Phosphorus	UTNCBU-01-OCT97-01	Background	Habitat	mg/kg	=	639		1997
Phosphorus	UTNCBU-02-OCT97-01	Background	Habitat	mg/kg	=	658		1997
Phosphorus	UTNCBU-03-1298-01	Background	Habitat	mg/kg	=	820		1998
Phosphorus	UTNCBU-04-1298-01	Background	Habitat	mg/kg	=	862		1998
Phosphorus	UTNCBU-05-1298-01	Background	Habitat	mg/kg	=	722		1998
Phosphorus	UTNCBU-06-1298-01	Background	Habitat	mg/kg	=	621		1998
Phosphorus	UTNEB-03-1298-01	Background	Habitat	mg/kg	=	821		1998
Phosphorus	UTNEB-04-1298-01	Background	Habitat	mg/kg	=	885		1998
Phosphorus	UTNEB-05-1298-01	Background	Habitat	mg/kg	=	790		1998
Phosphorus	UTNEB-06-1298-01	Background	Habitat	mg/kg	=	726		1998

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Phosphorus	UTNERB-01-OCT97-01	Background	Habitat	mg/kg	=	738		1997
Phosphorus	UTNERB-02-OCT97-01	Background	Habitat	mg/kg	=	719		1997
Phosphorus	UTNOCB-01-OCT97-01	Background	Habitat	mg/kg	=	659		1997
Phosphorus	UTNOCB-02-OCT97-01	Background	Habitat	mg/kg	=	835		1997
Phosphorus	UTNOCBG-03-1298-01	Background	Habitat	mg/kg	=	820		1998
Phosphorus	UTNOCBG-04-1298-01	Background	Habitat	mg/kg	=	764		1998
Phosphorus	UTNOCBG-05-1298-01	Background	Habitat	mg/kg	=	753		1998
Phosphorus	UTNOCBG-06-1298-01	Background	Habitat	mg/kg	=	799		1998
Phosphorus	SS1	OnSite	OB/OD	mg/Kg	=	460		1991
Phosphorus	SS10	OnSite	OB/OD	mg/Kg	=	460		1991
Phosphorus	SS11	OnSite	OB/OD	mg/Kg	=	730		1991
Phosphorus	SS12	OnSite	OB/OD	mg/Kg	=	590		1991
Phosphorus	SS13	OnSite	OB/OD	mg/Kg	=	500		1991
Phosphorus	SS14	OnSite	OB/OD	mg/Kg	=	660		1991
Phosphorus	SS15	OnSite	OB/OD	mg/Kg	=	750		1991
Phosphorus	SS16	OnSite	Habitat	mg/Kg	=	860		1991
Phosphorus	SS17	OnSite	Habitat	mg/Kg	=	820		1991
Phosphorus	SS18	OnSite	Habitat	mg/Kg	=	830		1991
Phosphorus	SS19	OnSite	Habitat	mg/Kg	=	820		1991
Phosphorus	SS2	OnSite	OB/OD	mg/Kg	=	450		1991
Phosphorus	SS20	OnSite	Habitat	mg/Kg	=	890		1991
Phosphorus	SS3	OnSite	OB/OD	mg/Kg	=	990		1991
Phosphorus	SS4	OnSite	OB/OD	mg/Kg	=	470		1991
Phosphorus	SS5	OnSite	OB/OD	mg/Kg	=	500		1991
Phosphorus	SS6	OnSite	OB/OD	mg/Kg	=	700		1991
Phosphorus	SS7	OnSite	OB/OD	mg/Kg	=	570		1991
Phosphorus	SS8	OnSite	OB/OD	mg/Kg	=	570		1991
Phosphorus	SS9	OnSite	OB/OD	mg/Kg	=	500		1991
Selenium	AMTOF-01-1298-01	Background	Habitat	mg/kg	=	0.585		1998
Selenium	AMTOF-02-1298-01	Background	Habitat	mg/kg	=	1.07		1998
Selenium	AMTOF-03-1298-01	Background	Habitat	mg/kg	=	0.546		1998
Selenium	AMTOF-04-1298-01	Background	Habitat	mg/kg	=	0.335		1998
Selenium	AMTOF-05-1298-01	Background	Habitat	mg/kg	=	0.379		1998
Selenium	AMTOF-06-1298-01	Background	Habitat	mg/kg	=	0.449		1998
Selenium	NR-238	Background	Habitat	mg/Kg	U	1.15	2.3	2002
Selenium	NR-239	Background	Habitat	mg/Kg	U	1.05	2.1	2002
Selenium	NR-500-0800-01	Background	Habitat	mg/kg	J	0.355		2000
Selenium	NR-501-0800-01	Background	Habitat	mg/kg	J	0.696		2000
Selenium	NR-502-0800-01	Background	Habitat	mg/kg	J	0.498		2000
Selenium	NR-503-0800-01	Background	Habitat	mg/kg	J	0.511		2000
Selenium	NR-504-0800-01	Background	Habitat	mg/kg	J	0.44		2000
Selenium	NR-505-0800-01	Background	Habitat	mg/kg	J	0.493		2000
Selenium	NR-506-0800-01	Background	Habitat	mg/kg	J	0.617		2000
Selenium	NR-507-0800-01	Background	Habitat	mg/kg	J	0.645		2000
Selenium	NR-508-0800-01	Background	Habitat	mg/kg	J	0.388		2000
Selenium	NR-509-0800-01	Background	Habitat	mg/kg	J	0.778		2000
Selenium	NR-510-0800-01	Background	Habitat	mg/kg	J	0.64		2000
Selenium	NR-511-0800-01	Background	Habitat	mg/kg	J	0.54		2000
Selenium	NR-512-0800-01	Background	Habitat	mg/kg	J	0.476		2000
Selenium	NR-513-0800-01	Background	Habitat	mg/kg	J	0.451		2000
Selenium	NR-514-0800-01	Background	Habitat	mg/kg	J	0.768		2000
Selenium	NR-515-0800-01	Background	Habitat	mg/kg	J	0.702		2000
Selenium	NR-516-0800-01	Background	Habitat	mg/kg	J	0.699		2000

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection	Sample
							Limit	Year
Selenium	NR-517-0800-01	Background	Habitat	mg/kg	U	0.2205	0.441	2000
Selenium	NR-518-0800-01	Background	Habitat	mg/kg	J	0.806		2000
Selenium	NR-519-0800-01	Background	Habitat	mg/kg	J	1.05		2000
Selenium	NR-520-0800-01	Background	Habitat	mg/kg	U	0.297	0.594	2000
Selenium	NR-521-0800-01	Background	Habitat	mg/kg	J	0.872		2000
Selenium	NR-522-0800-01	Background	Habitat	mg/kg	J	0.934		2000
Selenium	NR-523-0800-01	Background	Habitat	mg/kg	J	0.755		2000
Selenium	NR-524-0800-01	Background	Habitat	mg/kg	J	1.5		2000
Selenium	NR-525-0800-01	Background	Habitat	mg/kg	J	1.32		2000
Selenium	NR-536	Background	Habitat	mg/Kg	U	0.345	0.69	2004
Selenium	NR-537	Background	Habitat	mg/Kg	U	0.35	0.7	2004
Selenium	UTNCBU-01-OCT97-01	Background	Habitat	mg/kg	BJ	0.162		1997
Selenium	UTNCBU-02-OCT97-01	Background	Habitat	mg/kg	U	0.1325	0.265	1997
Selenium	UTNCBU-03-1298-01	Background	Habitat	mg/kg	U	0.0865	0.173	1998
Selenium	UTNCBU-04-1298-01	Background	Habitat	mg/kg	J	0.00815		1998
Selenium	UTNCBU-05-1298-01	Background	Habitat	mg/kg	U	0.0745	0.149	1998
Selenium	UTNCBU-06-1298-01	Background	Habitat	mg/kg	U	0.097	0.194	1998
Selenium	UTNEB-03-1298-01	Background	Habitat	mg/kg	U	0.072	0.144	1998
Selenium	UTNEB-04-1298-01	Background	Habitat	mg/kg	U	0.083	0.166	1998
Selenium	UTNEB-05-1298-01	Background	Habitat	mg/kg	U	0.069	0.138	1998
Selenium	UTNEB-06-1298-01	Background	Habitat	mg/kg	U	0.0945	0.189	1998
Selenium	UTNERB-01-OCT97-01	Background	Habitat	mg/kg	U	0.1595	0.319	1997
Selenium	UTNERB-02-OCT97-01	Background	Habitat	mg/kg	U	0.13	0.26	1997
Selenium	UTNOCB-01-OCT97-01	Background	Habitat	mg/kg	=	0.52		1997
Selenium	UTNOCB-02-OCT97-01	Background	Habitat	mg/kg	B	0.56		1997
Selenium	UTNOCBG-03-1298-01	Background	Habitat	mg/kg	=	0.405		1998
Selenium	UTNOCBG-04-1298-01	Background	Habitat	mg/kg	=	0.537		1998
Selenium	UTNOCBG-05-1298-01	Background	Habitat	mg/kg	=	0.381		1998
Selenium	UTNOCBG-06-1298-01	Background	Habitat	mg/kg	=	0.413		1998
Selenium	NR-226	OnSite	Habitat	mg/Kg	U	1.05	2.1	2002
Selenium	NR-227	OnSite	Habitat	mg/Kg	U	0.105	0.21	2002
Selenium	NR-228	OnSite	OB/OD	mg/Kg	U	1	2	2002
Selenium	NR-229	OnSite	Habitat	mg/Kg	U	1.05	2.1	2002
Selenium	NR-230	OnSite	Habitat	mg/Kg	U	1.05	2.1	2002
Selenium	NR-231	OnSite	OB/OD	mg/Kg	U	1	2	2002
Selenium	NR-232	OnSite	Habitat	mg/Kg	U	1	2	2002
Selenium	NR-233	OnSite	Habitat	mg/Kg	U	1	2	2002
Selenium	NR-234	OnSite	Habitat	mg/Kg	U	1.1	2.2	2002
Selenium	NR-235	OnSite	Habitat	mg/Kg	U	1.05	2.1	2002
Selenium	NR-236	OnSite	Habitat	mg/Kg	U	1.05	2.1	2002
Selenium	NR-237	OnSite	Habitat	mg/Kg	U	1.05	2.1	2002
Selenium	NR-526	OnSite	Habitat	mg/Kg	U	0.315	0.63	2004
Selenium	NR-527	OnSite	Habitat	mg/Kg	U	0.345	0.69	2004
Selenium	NR-528	OnSite	Habitat	mg/Kg	U	0.335	0.67	2004
Selenium	NR-529	OnSite	Habitat	mg/Kg	U	0.36	0.72	2004
Selenium	NR-530	OnSite	Habitat	mg/Kg	U	0.38	0.76	2004
Selenium	NR-531	OnSite	OB/OD	mg/Kg	U	0.3	0.6	2004
Selenium	NR-532	OnSite	OB/OD	mg/Kg	U	0.29	0.58	2004
Selenium	NR-533	OnSite	OB/OD	mg/Kg	U	0.325	0.65	2004
Selenium	NR-534	OnSite	OB/OD	mg/Kg	U	0.315	0.63	2004
Selenium	NR-535	OnSite	OB/OD	mg/Kg	U	0.325	0.65	2004
Selenium	SS1	OnSite	OB/OD	mg/Kg	U	5	10	1991
Selenium	SS10	OnSite	OB/OD	mg/Kg	U	5	10	1991

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Selenium	SS11	OnSite	OB/OD	mg/Kg	U	5	10	1991
Selenium	SS12	OnSite	OB/OD	mg/Kg	U	5	10	1991
Selenium	SS13	OnSite	OB/OD	mg/Kg	U	5	10	1991
Selenium	SS14	OnSite	OB/OD	mg/Kg	U	5	10	1991
Selenium	SS15	OnSite	OB/OD	mg/Kg	U	5	10	1991
Selenium	SS16	OnSite	Habitat	mg/Kg	U	5	10	1991
Selenium	SS17	OnSite	Habitat	mg/Kg	U	5	10	1991
Selenium	SS18	OnSite	Habitat	mg/Kg	U	5	10	1991
Selenium	SS19	OnSite	Habitat	mg/Kg	U	5	10	1991
Selenium	SS2	OnSite	OB/OD	mg/Kg	U	5	10	1991
Selenium	SS20	OnSite	Habitat	mg/Kg	U	5	10	1991
Selenium	SS3	OnSite	OB/OD	mg/Kg	U	5	10	1991
Selenium	SS4	OnSite	OB/OD	mg/Kg	U	5	10	1991
Selenium	SS5	OnSite	OB/OD	mg/Kg	U	5	10	1991
Selenium	SS6	OnSite	OB/OD	mg/Kg	U	5	10	1991
Selenium	SS7	OnSite	OB/OD	mg/Kg	U	5	10	1991
Selenium	SS8	OnSite	OB/OD	mg/Kg	U	5	10	1991
Selenium	SS9	OnSite	OB/OD	mg/Kg	U	5	10	1991
Selenium	TTU-SS01S	OnSite	OB/OD	mg/Kg	U	0.8	1.6	1989
Selenium	TTU-SS02S	OnSite	OB/OD	mg/Kg	U	0.75	1.5	1989
Selenium	TTU-SS03S	OnSite	OB/OD	mg/Kg	U	0.85	1.7	1989
Selenium	TTU-SS04S(D)	OnSite	OB/OD	mg/Kg	U	0.85	1.7	1989
Selenium	TTU-SS05S	OnSite	OB/OD	mg/Kg	U	0.09	0.18	1989
Selenium	TTU-SS06S(BG)	OnSite	Habitat	mg/Kg	U	0.85	1.7	1989
Silicon	AMTOF-01-1298-01	Background	Habitat	mg/kg	=	310		1998
Silicon	AMTOF-02-1298-01	Background	Habitat	mg/kg	=	196		1998
Silicon	AMTOF-03-1298-01	Background	Habitat	mg/kg	=	252		1998
Silicon	AMTOF-04-1298-01	Background	Habitat	mg/kg	=	354		1998
Silicon	AMTOF-05-1298-01	Background	Habitat	mg/kg	=	370		1998
Silicon	AMTOF-06-1298-01	Background	Habitat	mg/kg	=	307		1998
Silicon	NR-500-0800-01	Background	Habitat	mg/kg	=	269		2000
Silicon	NR-501-0800-01	Background	Habitat	mg/kg	=	228		2000
Silicon	NR-502-0800-01	Background	Habitat	mg/kg	=	412		2000
Silicon	NR-503-0800-01	Background	Habitat	mg/kg	=	354		2000
Silicon	NR-504-0800-01	Background	Habitat	mg/kg	=	229		2000
Silicon	NR-505-0800-01	Background	Habitat	mg/kg	=	327		2000
Silicon	NR-506-0800-01	Background	Habitat	mg/kg	=	277		2000
Silicon	NR-507-0800-01	Background	Habitat	mg/kg	=	356		2000
Silicon	NR-508-0800-01	Background	Habitat	mg/kg	=	129		2000
Silicon	NR-509-0800-01	Background	Habitat	mg/kg	=	274		2000
Silicon	NR-510-0800-01	Background	Habitat	mg/kg	=	252		2000
Silicon	NR-511-0800-01	Background	Habitat	mg/kg	=	282		2000
Silicon	NR-512-0800-01	Background	Habitat	mg/kg	=	381		2000
Silicon	NR-513-0800-01	Background	Habitat	mg/kg	=	291		2000
Silicon	NR-514-0800-01	Background	Habitat	mg/kg	=	200		2000
Silicon	NR-515-0800-01	Background	Habitat	mg/kg	=	871		2000
Silicon	NR-516-0800-01	Background	Habitat	mg/kg	=	325		2000
Silicon	NR-517-0800-01	Background	Habitat	mg/kg	=	238		2000
Silicon	NR-518-0800-01	Background	Habitat	mg/kg	=	369		2000
Silicon	NR-519-0800-01	Background	Habitat	mg/kg	=	394		2000
Silicon	NR-520-0800-01	Background	Habitat	mg/kg	=	296		2000
Silicon	NR-521-0800-01	Background	Habitat	mg/kg	=	325		2000
Silicon	NR-522-0800-01	Background	Habitat	mg/kg	=	330		2000

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Silicon	NR-523-0800-01	Background	Habitat	mg/kg	=	329		2000
Silicon	NR-524-0800-01	Background	Habitat	mg/kg	=	427		2000
Silicon	NR-525-0800-01	Background	Habitat	mg/kg	=	291		2000
Silicon	UTNCBU-01-OCT97-01	Background	Habitat	mg/kg	=	310		1997
Silicon	UTNCBU-02-OCT97-01	Background	Habitat	mg/kg	=	204		1997
Silicon	UTNCBU-03-1298-01	Background	Habitat	mg/kg	=	281		1998
Silicon	UTNCBU-04-1298-01	Background	Habitat	mg/kg	=	271		1998
Silicon	UTNCBU-05-1298-01	Background	Habitat	mg/kg	=	297		1998
Silicon	UTNCBU-06-1298-01	Background	Habitat	mg/kg	=	163		1998
Silicon	UTNEB-03-1298-01	Background	Habitat	mg/kg	=	233		1998
Silicon	UTNEB-04-1298-01	Background	Habitat	mg/kg	=	281		1998
Silicon	UTNEB-05-1298-01	Background	Habitat	mg/kg	=	256		1998
Silicon	UTNEB-06-1298-01	Background	Habitat	mg/kg	=	297		1998
Silicon	UTNERB-01-OCT97-01	Background	Habitat	mg/kg	=	315		1997
Silicon	UTNERB-02-OCT97-01	Background	Habitat	mg/kg	=	266		1997
Silicon	UTNOCB-01-OCT97-01	Background	Habitat	mg/kg	=	342		1997
Silicon	UTNOCB-02-OCT97-01	Background	Habitat	mg/kg	=	279		1997
Silicon	UTNOCBG-03-1298-01	Background	Habitat	mg/kg	=	294		1998
Silicon	UTNOCBG-04-1298-01	Background	Habitat	mg/kg	=	202		1998
Silicon	UTNOCBG-05-1298-01	Background	Habitat	mg/kg	=	265		1998
Silicon	UTNOCBG-06-1298-01	Background	Habitat	mg/kg	=	215		1998
Silver	AMTOF-01-1298-01	Background	Habitat	mg/kg	J	0.109		1998
Silver	AMTOF-02-1298-01	Background	Habitat	mg/kg	=	0.102		1998
Silver	AMTOF-03-1298-01	Background	Habitat	mg/kg	J	0.105		1998
Silver	AMTOF-04-1298-01	Background	Habitat	mg/kg	J	0.0302		1998
Silver	AMTOF-05-1298-01	Background	Habitat	mg/kg	J	0.0158		1998
Silver	AMTOF-06-1298-01	Background	Habitat	mg/kg	J	0.0755		1998
Silver	NR-238	Background	Habitat	mg/Kg	U	0.21	0.42	2002
Silver	NR-239	Background	Habitat	mg/Kg	U	0.19	0.38	2002
Silver	NR-500-0800-01	Background	Habitat	mg/kg	U	0.03495	0.0699	2000
Silver	NR-501-0800-01	Background	Habitat	mg/kg	U	0.0385	0.077	2000
Silver	NR-502-0800-01	Background	Habitat	mg/kg	U	0.0456	0.0912	2000
Silver	NR-503-0800-01	Background	Habitat	mg/kg	U	0.03715	0.0743	2000
Silver	NR-504-0800-01	Background	Habitat	mg/kg	U	0.03955	0.0791	2000
Silver	NR-505-0800-01	Background	Habitat	mg/kg	U	0.0441	0.0882	2000
Silver	NR-506-0800-01	Background	Habitat	mg/kg	U	0.0351	0.0702	2000
Silver	NR-507-0800-01	Background	Habitat	mg/kg	U	0.0447	0.0894	2000
Silver	NR-508-0800-01	Background	Habitat	mg/kg	U	0.0371	0.0742	2000
Silver	NR-509-0800-01	Background	Habitat	mg/kg	U	0.04405	0.0881	2000
Silver	NR-510-0800-01	Background	Habitat	mg/kg	U	0.0456	0.0912	2000
Silver	NR-511-0800-01	Background	Habitat	mg/kg	U	0.03735	0.0747	2000
Silver	NR-512-0800-01	Background	Habitat	mg/kg	U	0.0425	0.085	2000
Silver	NR-513-0800-01	Background	Habitat	mg/kg	U	0.03175	0.0635	2000
Silver	NR-514-0800-01	Background	Habitat	mg/kg	U	0.04665	0.0933	2000
Silver	NR-515-0800-01	Background	Habitat	mg/kg	U	0.04645	0.0929	2000
Silver	NR-516-0800-01	Background	Habitat	mg/kg	U	0.0585	0.117	2000
Silver	NR-517-0800-01	Background	Habitat	mg/kg	U	0.044	0.088	2000
Silver	NR-518-0800-01	Background	Habitat	mg/kg	U	0.0415	0.083	2000
Silver	NR-519-0800-01	Background	Habitat	mg/kg	U	0.0605	0.121	2000
Silver	NR-520-0800-01	Background	Habitat	mg/kg	U	0.0615	0.123	2000
Silver	NR-521-0800-01	Background	Habitat	mg/kg	U	0.0492	0.0984	2000
Silver	NR-522-0800-01	Background	Habitat	mg/kg	U	0.0499	0.0998	2000
Silver	NR-523-0800-01	Background	Habitat	mg/kg	U	0.0476	0.0952	2000

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Silver	NR-524-0800-01	Background	Habitat	mg/kg	U	0.073	0.146	2000
Silver	NR-525-0800-01	Background	Habitat	mg/kg	U	0.063	0.126	2000
Silver	NR-536	Background	Habitat	mg/Kg	U	0.094	0.188	2004
Silver	NR-537	Background	Habitat	mg/Kg	J	0.23		2004
Silver	UTNCBU-01-OCT97-01	Background	Habitat	mg/kg	BJ	0.0245		1997
Silver	UTNCBU-02-OCT97-01	Background	Habitat	mg/kg	BJ	0.00572		1997
Silver	UTNCBU-03-1298-01	Background	Habitat	mg/kg	B	0.16		1998
Silver	UTNCBU-04-1298-01	Background	Habitat	mg/kg	B	0.164		1998
Silver	UTNCBU-05-1298-01	Background	Habitat	mg/kg	B	0.0896		1998
Silver	UTNCBU-06-1298-01	Background	Habitat	mg/kg	B	0.102		1998
Silver	UTNEB-03-1298-01	Background	Habitat	mg/kg	B	0.203		1998
Silver	UTNEB-04-1298-01	Background	Habitat	mg/kg	B	0.162		1998
Silver	UTNEB-05-1298-01	Background	Habitat	mg/kg	B	0.114		1998
Silver	UTNEB-06-1298-01	Background	Habitat	mg/kg	B	0.115		1998
Silver	UTNERB-01-OCT97-01	Background	Habitat	mg/kg	J	0.0666		1997
Silver	UTNERB-02-OCT97-01	Background	Habitat	mg/kg	BJ	0.0591		1997
Silver	UTNOCB-01-OCT97-01	Background	Habitat	mg/kg	BJ	0.0536		1997
Silver	UTNOCB-02-OCT97-01	Background	Habitat	mg/kg	=	0.161		1997
Silver	UTNOCBG-03-1298-01	Background	Habitat	mg/kg	J	0.0862		1998
Silver	UTNOCBG-04-1298-01	Background	Habitat	mg/kg	=	0.109		1998
Silver	UTNOCBG-05-1298-01	Background	Habitat	mg/kg	J	0.0921		1998
Silver	UTNOCBG-06-1298-01	Background	Habitat	mg/kg	=	0.175		1998
Silver	NR-226	OnSite	Habitat	mg/Kg	U	0.195	0.39	2002
Silver	NR-227	OnSite	Habitat	mg/Kg	U	0.19	0.38	2002
Silver	NR-228	OnSite	OB/OD	mg/Kg	U	0.18	0.36	2002
Silver	NR-229	OnSite	Habitat	mg/Kg	U	0.19	0.38	2002
Silver	NR-230	OnSite	Habitat	mg/Kg	U	0.19	0.38	2002
Silver	NR-231	OnSite	OB/OD	mg/Kg	U	0.185	0.37	2002
Silver	NR-232	OnSite	Habitat	mg/Kg	U	0.18	0.36	2002
Silver	NR-233	OnSite	Habitat	mg/Kg	U	0.185	0.37	2002
Silver	NR-234	OnSite	Habitat	mg/Kg	U	0.195	0.39	2002
Silver	NR-235	OnSite	Habitat	mg/Kg	U	0.19	0.38	2002
Silver	NR-236	OnSite	Habitat	mg/Kg	U	0.195	0.39	2002
Silver	NR-237	OnSite	Habitat	mg/Kg	U	0.19	0.38	2002
Silver	NR-526	OnSite	Habitat	mg/Kg	J	0.18		2004
Silver	NR-527	OnSite	Habitat	mg/Kg	U	0.0935	0.187	2004
Silver	NR-528	OnSite	Habitat	mg/Kg	U	0.0915	0.183	2004
Silver	NR-529	OnSite	Habitat	mg/Kg	U	0.0975	0.195	2004
Silver	NR-530	OnSite	Habitat	mg/Kg	U	0.104	0.208	2004
Silver	NR-531	OnSite	OB/OD	mg/Kg	J	0.17		2004
Silver	NR-532	OnSite	OB/OD	mg/Kg	J	0.22		2004
Silver	NR-533	OnSite	OB/OD	mg/Kg	U	0.088	0.176	2004
Silver	NR-534	OnSite	OB/OD	mg/Kg	U	0.0855	0.171	2004
Silver	NR-535	OnSite	OB/OD	mg/Kg	U	0.089	0.178	2004
Silver	SS1	OnSite	OB/OD	mg/Kg	U	1	2	1991
Silver	SS10	OnSite	OB/OD	mg/Kg	U	1	2	1991
Silver	SS11	OnSite	OB/OD	mg/Kg	U	1	2	1991
Silver	SS12	OnSite	OB/OD	mg/Kg	U	1	2	1991
Silver	SS13	OnSite	OB/OD	mg/Kg	U	1	2	1991
Silver	SS14	OnSite	OB/OD	mg/Kg	U	1	2	1991
Silver	SS15	OnSite	OB/OD	mg/Kg	U	1	2	1991
Silver	SS16	OnSite	Habitat	mg/Kg	U	1	2	1991
Silver	SS17	OnSite	Habitat	mg/Kg	U	1	2	1991

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Silver	SS18	OnSite	Habitat	mg/Kg	U	1	2	1991
Silver	SS19	OnSite	Habitat	mg/Kg	U	1	2	1991
Silver	SS2	OnSite	OB/OD	mg/Kg	U	1	2	1991
Silver	SS20	OnSite	Habitat	mg/Kg	U	1	2	1991
Silver	SS3	OnSite	OB/OD	mg/Kg	U	1	2	1991
Silver	SS4	OnSite	OB/OD	mg/Kg	U	1	2	1991
Silver	SS5	OnSite	OB/OD	mg/Kg	U	1	2	1991
Silver	SS6	OnSite	OB/OD	mg/Kg	U	1	2	1991
Silver	SS7	OnSite	OB/OD	mg/Kg	U	1	2	1991
Silver	SS8	OnSite	OB/OD	mg/Kg	U	1	2	1991
Silver	SS9	OnSite	OB/OD	mg/Kg	U	1	2	1991
Silver	TTU-SS01S	OnSite	OB/OD	mg/Kg	U	0.335	0.67	1989
Silver	TTU-SS02S	OnSite	OB/OD	mg/Kg	=	4		1989
Silver	TTU-SS03S	OnSite	OB/OD	mg/Kg	U	0.34	0.68	1989
Silver	TTU-SS04S(D)	OnSite	OB/OD	mg/Kg	U	0.35	0.7	1989
Silver	TTU-SS05S	OnSite	OB/OD	mg/Kg	U	0.33	0.66	1989
Silver	TTU-SS06S(BG)	OnSite	Habitat	mg/Kg	U	0.33	0.66	1989
Strontium	AMTOF-01-1298-01	Background	Habitat	mg/kg	=	308		1998
Strontium	AMTOF-02-1298-01	Background	Habitat	mg/kg	=	267		1998
Strontium	AMTOF-03-1298-01	Background	Habitat	mg/kg	=	354		1998
Strontium	AMTOF-04-1298-01	Background	Habitat	mg/kg	=	351		1998
Strontium	AMTOF-05-1298-01	Background	Habitat	mg/kg	=	359		1998
Strontium	AMTOF-06-1298-01	Background	Habitat	mg/kg	=	343		1998
Strontium	NR-238	Background	Habitat	mg/Kg	=	231		2002
Strontium	NR-239	Background	Habitat	mg/Kg	=	290		2002
Strontium	NR-500-0800-01	Background	Habitat	mg/kg	B	304		2000
Strontium	NR-501-0800-01	Background	Habitat	mg/kg	B	1300		2000
Strontium	NR-502-0800-01	Background	Habitat	mg/kg	B	660		2000
Strontium	NR-503-0800-01	Background	Habitat	mg/kg	B	598		2000
Strontium	NR-504-0800-01	Background	Habitat	mg/kg	B	614		2000
Strontium	NR-505-0800-01	Background	Habitat	mg/kg	B	278		2000
Strontium	NR-506-0800-01	Background	Habitat	mg/kg	B	456		2000
Strontium	NR-507-0800-01	Background	Habitat	mg/kg	B	293		2000
Strontium	NR-508-0800-01	Background	Habitat	mg/kg	B	354		2000
Strontium	NR-509-0800-01	Background	Habitat	mg/kg	B	448		2000
Strontium	NR-510-0800-01	Background	Habitat	mg/kg	B	315		2000
Strontium	NR-511-0800-01	Background	Habitat	mg/kg	B	283		2000
Strontium	NR-512-0800-01	Background	Habitat	mg/kg	B	211		2000
Strontium	NR-513-0800-01	Background	Habitat	mg/kg	B	248		2000
Strontium	NR-514-0800-01	Background	Habitat	mg/kg	B	601		2000
Strontium	NR-515-0800-01	Background	Habitat	mg/kg	B	2290		2000
Strontium	NR-516-0800-01	Background	Habitat	mg/kg	B	461		2000
Strontium	NR-517-0800-01	Background	Habitat	mg/kg	B	213		2000
Strontium	NR-518-0800-01	Background	Habitat	mg/kg	B	2650		2000
Strontium	NR-519-0800-01	Background	Habitat	mg/kg	B	2000		2000
Strontium	NR-520-0800-01	Background	Habitat	mg/kg	B	834		2000
Strontium	NR-521-0800-01	Background	Habitat	mg/kg	B	2420		2000
Strontium	NR-522-0800-01	Background	Habitat	mg/kg	B	1400		2000
Strontium	NR-523-0800-01	Background	Habitat	mg/kg	B	605		2000
Strontium	NR-524-0800-01	Background	Habitat	mg/kg	B	3090		2000
Strontium	NR-525-0800-01	Background	Habitat	mg/kg	B	3680		2000
Strontium	NR-536	Background	Habitat	mg/Kg	=	343		2004
Strontium	NR-537	Background	Habitat	mg/Kg	=	307		2004

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Strontium	UTNCBU-01-OCT97-01	Background	Habitat	mg/kg	=	379		1997
Strontium	UTNCBU-02-OCT97-01	Background	Habitat	mg/kg	=	439		1997
Strontium	UTNCBU-03-1298-01	Background	Habitat	mg/kg	=	535		1998
Strontium	UTNCBU-04-1298-01	Background	Habitat	mg/kg	=	533		1998
Strontium	UTNCBU-05-1298-01	Background	Habitat	mg/kg	=	458		1998
Strontium	UTNCBU-06-1298-01	Background	Habitat	mg/kg	=	945		1998
Strontium	UTNEB-03-1298-01	Background	Habitat	mg/kg	=	518		1998
Strontium	UTNEB-04-1298-01	Background	Habitat	mg/kg	=	558		1998
Strontium	UTNEB-05-1298-01	Background	Habitat	mg/kg	=	627		1998
Strontium	UTNEB-06-1298-01	Background	Habitat	mg/kg	=	568		1998
Strontium	UTNERB-01-OCT97-01	Background	Habitat	mg/kg	=	467		1997
Strontium	UTNERB-02-OCT97-01	Background	Habitat	mg/kg	=	603		1997
Strontium	UTNOCB-01-OCT97-01	Background	Habitat	mg/kg	=	391		1997
Strontium	UTNOCB-02-OCT97-01	Background	Habitat	mg/kg	=	459		1997
Strontium	UTNOCBG-03-1298-01	Background	Habitat	mg/kg	=	361		1998
Strontium	UTNOCBG-04-1298-01	Background	Habitat	mg/kg	=	398		1998
Strontium	UTNOCBG-05-1298-01	Background	Habitat	mg/kg	=	368		1998
Strontium	UTNOCBG-06-1298-01	Background	Habitat	mg/kg	=	370		1998
Strontium	NR-226	OnSite	Habitat	mg/Kg	=	333		2002
Strontium	NR-227	OnSite	Habitat	mg/Kg	=	321		2002
Strontium	NR-228	OnSite	OB/OD	mg/Kg	=	266		2002
Strontium	NR-229	OnSite	Habitat	mg/Kg	=	244		2002
Strontium	NR-230	OnSite	Habitat	mg/Kg	=	304		2002
Strontium	NR-231	OnSite	OB/OD	mg/Kg	=	283		2002
Strontium	NR-232	OnSite	Habitat	mg/Kg	=	246		2002
Strontium	NR-233	OnSite	Habitat	mg/Kg	=	402		2002
Strontium	NR-234	OnSite	Habitat	mg/Kg	=	322		2002
Strontium	NR-235	OnSite	Habitat	mg/Kg	=	334		2002
Strontium	NR-236	OnSite	Habitat	mg/Kg	=	248		2002
Strontium	NR-237	OnSite	Habitat	mg/Kg	=	358		2002
Strontium	NR-526	OnSite	Habitat	mg/Kg	=	460		2004
Strontium	NR-527	OnSite	Habitat	mg/Kg	=	292		2004
Strontium	NR-528	OnSite	Habitat	mg/Kg	=	416		2004
Strontium	NR-529	OnSite	Habitat	mg/Kg	=	456		2004
Strontium	NR-530	OnSite	Habitat	mg/Kg	=	404		2004
Strontium	NR-531	OnSite	OB/OD	mg/Kg	=	484		2004
Strontium	NR-532	OnSite	OB/OD	mg/Kg	=	386		2004
Strontium	NR-533	OnSite	OB/OD	mg/Kg	=	401		2004
Strontium	NR-534	OnSite	OB/OD	mg/Kg	=	387		2004
Strontium	NR-535	OnSite	OB/OD	mg/Kg	=	371		2004
Sulfur	AMTOF-01-1298-01	Background	Habitat	mg/kg	=	334		1998
Sulfur	AMTOF-02-1298-01	Background	Habitat	mg/kg	=	244		1998
Sulfur	AMTOF-03-1298-01	Background	Habitat	mg/kg	=	330		1998
Sulfur	AMTOF-04-1298-01	Background	Habitat	mg/kg	=	391		1998
Sulfur	AMTOF-05-1298-01	Background	Habitat	mg/kg	=	383		1998
Sulfur	AMTOF-06-1298-01	Background	Habitat	mg/kg	=	386		1998
Sulfur	NR-500-0800-01	Background	Habitat	mg/kg	B	277		2000
Sulfur	NR-501-0800-01	Background	Habitat	mg/kg	B	1160		2000
Sulfur	NR-502-0800-01	Background	Habitat	mg/kg	B	640		2000
Sulfur	NR-503-0800-01	Background	Habitat	mg/kg	B	440		2000
Sulfur	NR-504-0800-01	Background	Habitat	mg/kg	B	382		2000
Sulfur	NR-505-0800-01	Background	Habitat	mg/kg	=	450		2000
Sulfur	NR-506-0800-01	Background	Habitat	mg/kg	B	424		2000

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Sulfur	NR-507-0800-01	Background	Habitat	mg/kg	B	255		2000
Sulfur	NR-508-0800-01	Background	Habitat	mg/kg	B	284		2000
Sulfur	NR-509-0800-01	Background	Habitat	mg/kg	B	610		2000
Sulfur	NR-510-0800-01	Background	Habitat	mg/kg	B	265		2000
Sulfur	NR-511-0800-01	Background	Habitat	mg/kg	B	261		2000
Sulfur	NR-512-0800-01	Background	Habitat	mg/kg	B	242		2000
Sulfur	NR-513-0800-01	Background	Habitat	mg/kg	B	266		2000
Sulfur	NR-514-0800-01	Background	Habitat	mg/kg	B	535		2000
Sulfur	NR-515-0800-01	Background	Habitat	mg/kg	B	3660		2000
Sulfur	NR-516-0800-01	Background	Habitat	mg/kg	B	1290		2000
Sulfur	NR-517-0800-01	Background	Habitat	mg/kg	B	3320		2000
Sulfur	NR-518-0800-01	Background	Habitat	mg/kg	=	3070		2000
Sulfur	NR-519-0800-01	Background	Habitat	mg/kg	=	2890		2000
Sulfur	NR-520-0800-01	Background	Habitat	mg/kg	=	2890		2000
Sulfur	NR-521-0800-01	Background	Habitat	mg/kg	=	4020		2000
Sulfur	NR-522-0800-01	Background	Habitat	mg/kg	=	4010		2000
Sulfur	NR-523-0800-01	Background	Habitat	mg/kg	=	2250		2000
Sulfur	NR-524-0800-01	Background	Habitat	mg/kg	=	2910		2000
Sulfur	NR-525-0800-01	Background	Habitat	mg/kg	=	4720		2000
Sulfur	UTNCBU-01-OCT97-01	Background	Habitat	mg/kg	=	329		1997
Sulfur	UTNCBU-02-OCT97-01	Background	Habitat	mg/kg	=	356		1997
Sulfur	UTNCBU-03-1298-01	Background	Habitat	mg/kg	=	424		1998
Sulfur	UTNCBU-04-1298-01	Background	Habitat	mg/kg	=	468		1998
Sulfur	UTNCBU-05-1298-01	Background	Habitat	mg/kg	=	351		1998
Sulfur	UTNCBU-06-1298-01	Background	Habitat	mg/kg	=	403		1998
Sulfur	UTNEB-03-1298-01	Background	Habitat	mg/kg	=	482		1998
Sulfur	UTNEB-04-1298-01	Background	Habitat	mg/kg	=	582		1998
Sulfur	UTNEB-05-1298-01	Background	Habitat	mg/kg	=	527		1998
Sulfur	UTNEB-06-1298-01	Background	Habitat	mg/kg	=	433		1998
Sulfur	UTNERB-01-OCT97-01	Background	Habitat	mg/kg	=	1100		1997
Sulfur	UTNERB-02-OCT97-01	Background	Habitat	mg/kg	=	673		1997
Sulfur	UTNOCB-01-OCT97-01	Background	Habitat	mg/kg	=	648		1997
Sulfur	UTNOCB-02-OCT97-01	Background	Habitat	mg/kg	=	741		1997
Sulfur	UTNOCBG-03-1298-01	Background	Habitat	mg/kg	=	384		1998
Sulfur	UTNOCBG-04-1298-01	Background	Habitat	mg/kg	=	350		1998
Sulfur	UTNOCBG-05-1298-01	Background	Habitat	mg/kg	=	371		1998
Sulfur	UTNOCBG-06-1298-01	Background	Habitat	mg/kg	=	351		1998
Tellurium	AMTOF-01-1298-01	Background	Habitat	mg/kg	J	0.419		1998
Tellurium	AMTOF-02-1298-01	Background	Habitat	mg/kg	J	0.171		1998
Tellurium	AMTOF-03-1298-01	Background	Habitat	mg/kg	J	0.255		1998
Tellurium	AMTOF-04-1298-01	Background	Habitat	mg/kg	J	0.36		1998
Tellurium	AMTOF-05-1298-01	Background	Habitat	mg/kg	J	0.444		1998
Tellurium	AMTOF-06-1298-01	Background	Habitat	mg/kg	J	0.279		1998
Tellurium	NR-500-0800-01	Background	Habitat	mg/kg	U	0.1515	0.303	2000
Tellurium	NR-501-0800-01	Background	Habitat	mg/kg	U	0.167	0.334	2000
Tellurium	NR-502-0800-01	Background	Habitat	mg/kg	U	0.198	0.396	2000
Tellurium	NR-503-0800-01	Background	Habitat	mg/kg	U	0.161	0.322	2000
Tellurium	NR-504-0800-01	Background	Habitat	mg/kg	U	0.1715	0.343	2000
Tellurium	NR-505-0800-01	Background	Habitat	mg/kg	U	0.191	0.382	2000
Tellurium	NR-506-0800-01	Background	Habitat	mg/kg	U	0.1525	0.305	2000
Tellurium	NR-507-0800-01	Background	Habitat	mg/kg	U	0.194	0.388	2000
Tellurium	NR-508-0800-01	Background	Habitat	mg/kg	U	0.161	0.322	2000
Tellurium	NR-509-0800-01	Background	Habitat	mg/kg	U	0.191	0.382	2000

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Tellurium	NR-510-0800-01	Background	Habitat	mg/kg	U	0.198	0.396	2000
Tellurium	NR-511-0800-01	Background	Habitat	mg/kg	U	0.162	0.324	2000
Tellurium	NR-512-0800-01	Background	Habitat	mg/kg	U	0.1845	0.369	2000
Tellurium	NR-513-0800-01	Background	Habitat	mg/kg	U	0.1375	0.275	2000
Tellurium	NR-514-0800-01	Background	Habitat	mg/kg	U	0.2025	0.405	2000
Tellurium	NR-515-0800-01	Background	Habitat	mg/kg	U	0.2015	0.403	2000
Tellurium	NR-516-0800-01	Background	Habitat	mg/kg	U	0.2535	0.507	2000
Tellurium	NR-517-0800-01	Background	Habitat	mg/kg	U	0.191	0.382	2000
Tellurium	NR-518-0800-01	Background	Habitat	mg/kg	U	0.18	0.36	2000
Tellurium	NR-519-0800-01	Background	Habitat	mg/kg	U	0.2615	0.523	2000
Tellurium	NR-520-0800-01	Background	Habitat	mg/kg	U	0.266	0.532	2000
Tellurium	NR-521-0800-01	Background	Habitat	mg/kg	U	0.2135	0.427	2000
Tellurium	NR-522-0800-01	Background	Habitat	mg/kg	U	0.2165	0.433	2000
Tellurium	NR-523-0800-01	Background	Habitat	mg/kg	U	0.2065	0.413	2000
Tellurium	NR-524-0800-01	Background	Habitat	mg/kg	U	0.317	0.634	2000
Tellurium	NR-525-0800-01	Background	Habitat	mg/kg	U	0.451	0.902	2000
Tellurium	UTNCBU-01-OCT97-01	Background	Habitat	mg/kg	U	0.372	0.744	1997
Tellurium	UTNCBU-02-OCT97-01	Background	Habitat	mg/kg	U	0.376	0.752	1997
Tellurium	UTNCBU-03-1298-01	Background	Habitat	mg/kg	=	0.506		1998
Tellurium	UTNCBU-04-1298-01	Background	Habitat	mg/kg	=	0.704		1998
Tellurium	UTNCBU-05-1298-01	Background	Habitat	mg/kg	=	0.712		1998
Tellurium	UTNCBU-06-1298-01	Background	Habitat	mg/kg	=	0.349		1998
Tellurium	UTNEB-03-1298-01	Background	Habitat	mg/kg	=	0.769		1998
Tellurium	UTNEB-04-1298-01	Background	Habitat	mg/kg	=	0.549		1998
Tellurium	UTNEB-05-1298-01	Background	Habitat	mg/kg	=	0.627		1998
Tellurium	UTNEB-06-1298-01	Background	Habitat	mg/kg	J	0.12		1998
Tellurium	UTNERB-01-OCT97-01	Background	Habitat	mg/kg	U	0.4525	0.905	1997
Tellurium	UTNERB-02-OCT97-01	Background	Habitat	mg/kg	U	0.3695	0.739	1997
Tellurium	UTNOCB-01-OCT97-01	Background	Habitat	mg/kg	U	0.414	0.828	1997
Tellurium	UTNOCB-02-OCT97-01	Background	Habitat	mg/kg	U	0.3485	0.697	1997
Tellurium	UTNOCBG-03-1298-01	Background	Habitat	mg/kg	B	0.617		1998
Tellurium	UTNOCBG-04-1298-01	Background	Habitat	mg/kg	B	0.45		1998
Tellurium	UTNOCBG-05-1298-01	Background	Habitat	mg/kg	B	0.661		1998
Tellurium	UTNOCBG-06-1298-01	Background	Habitat	mg/kg	B	0.526		1998
Thallium	AMTOF-01-1298-01	Background	Habitat	mg/kg	J	0.259		1998
Thallium	AMTOF-02-1298-01	Background	Habitat	mg/kg	J	0.317		1998
Thallium	AMTOF-03-1298-01	Background	Habitat	mg/kg	=	0.523		1998
Thallium	AMTOF-04-1298-01	Background	Habitat	mg/kg	=	0.475		1998
Thallium	AMTOF-05-1298-01	Background	Habitat	mg/kg	=	0.352		1998
Thallium	AMTOF-06-1298-01	Background	Habitat	mg/kg	=	0.435		1998
Thallium	NR-238	Background	Habitat	mg/Kg	=	0.32		2002
Thallium	NR-239	Background	Habitat	mg/Kg	=	0.34		2002
Thallium	NR-500-0800-01	Background	Habitat	mg/kg	U	0.55	1.1	2000
Thallium	NR-501-0800-01	Background	Habitat	mg/kg	U	0.605	1.21	2000
Thallium	NR-502-0800-01	Background	Habitat	mg/kg	U	0.72	1.44	2000
Thallium	NR-503-0800-01	Background	Habitat	mg/kg	U	0.585	1.17	2000
Thallium	NR-504-0800-01	Background	Habitat	mg/kg	U	0.62	1.24	2000
Thallium	NR-505-0800-01	Background	Habitat	mg/kg	U	0.695	1.39	2000
Thallium	NR-506-0800-01	Background	Habitat	mg/kg	U	0.555	1.11	2000
Thallium	NR-507-0800-01	Background	Habitat	mg/kg	U	0.705	1.41	2000
Thallium	NR-508-0800-01	Background	Habitat	mg/kg	U	0.585	1.17	2000
Thallium	NR-509-0800-01	Background	Habitat	mg/kg	U	0.695	1.39	2000
Thallium	NR-510-0800-01	Background	Habitat	mg/kg	U	0.72	1.44	2000

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection	Sample
							Limit	Year
Thallium	NR-511-0800-01	Background	Habitat	mg/kg	U	0.59	1.18	2000
Thallium	NR-512-0800-01	Background	Habitat	mg/kg	U	0.67	1.34	2000
Thallium	NR-513-0800-01	Background	Habitat	mg/kg	=	0.999		2000
Thallium	NR-514-0800-01	Background	Habitat	mg/kg	U	0.735	1.47	2000
Thallium	NR-515-0800-01	Background	Habitat	mg/kg	U	0.73	1.46	2000
Thallium	NR-516-0800-01	Background	Habitat	mg/kg	U	0.92	1.84	2000
Thallium	NR-517-0800-01	Background	Habitat	mg/kg	U	0.04635	0.0927	2000
Thallium	NR-518-0800-01	Background	Habitat	mg/kg	U	0.605	1.21	2000
Thallium	NR-519-0800-01	Background	Habitat	mg/kg	U	0.1175	0.235	2000
Thallium	NR-520-0800-01	Background	Habitat	mg/kg	U	1.1	2.2	2000
Thallium	NR-521-0800-01	Background	Habitat	mg/kg	U	1.76	3.52	2000
Thallium	NR-522-0800-01	Background	Habitat	mg/kg	U	0.895	1.79	2000
Thallium	NR-523-0800-01	Background	Habitat	mg/kg	U	0.85	1.7	2000
Thallium	NR-524-0800-01	Background	Habitat	mg/kg	U	1.305	2.61	2000
Thallium	NR-525-0800-01	Background	Habitat	mg/kg	U	0.76	1.52	2000
Thallium	NR-536	Background	Habitat	mg/Kg	J	0.24		2004
Thallium	NR-537	Background	Habitat	mg/Kg	J	0.28		2004
Thallium	UTNCBU-01-OCT97-01	Background	Habitat	mg/kg	BJ	0.123		1997
Thallium	UTNCBU-02-OCT97-01	Background	Habitat	mg/kg	BJ	0.142		1997
Thallium	UTNCBU-03-1298-01	Background	Habitat	mg/kg	J	0.144		1998
Thallium	UTNCBU-04-1298-01	Background	Habitat	mg/kg	J	0.178		1998
Thallium	UTNCBU-05-1298-01	Background	Habitat	mg/kg	J	0.0425		1998
Thallium	UTNCBU-06-1298-01	Background	Habitat	mg/kg	J	0.0151		1998
Thallium	UTNEB-03-1298-01	Background	Habitat	mg/kg	U	0.1705	0.341	1998
Thallium	UTNEB-04-1298-01	Background	Habitat	mg/kg	U	0.1965	0.393	1998
Thallium	UTNEB-05-1298-01	Background	Habitat	mg/kg	U	0.1625	0.325	1998
Thallium	UTNEB-06-1298-01	Background	Habitat	mg/kg	U	0.223	0.446	1998
Thallium	UTNERB-01-OCT97-01	Background	Habitat	mg/kg	=	1.2		1997
Thallium	UTNERB-02-OCT97-01	Background	Habitat	mg/kg	B	0.566		1997
Thallium	UTNOCB-01-OCT97-01	Background	Habitat	mg/kg	BJ	0.223		1997
Thallium	UTNOCB-02-OCT97-01	Background	Habitat	mg/kg	BJ	0.236		1997
Thallium	UTNOCBG-03-1298-01	Background	Habitat	mg/kg	=	0.558		1998
Thallium	UTNOCBG-04-1298-01	Background	Habitat	mg/kg	J	0.189		1998
Thallium	UTNOCBG-05-1298-01	Background	Habitat	mg/kg	J	0.279		1998
Thallium	UTNOCBG-06-1298-01	Background	Habitat	mg/kg	=	0.515		1998
Thallium	NR-226	OnSite	Habitat	mg/Kg	=	0.21		2002
Thallium	NR-227	OnSite	Habitat	mg/Kg	=	0.17		2002
Thallium	NR-228	OnSite	OB/OD	mg/Kg	=	0.34		2002
Thallium	NR-229	OnSite	Habitat	mg/Kg	=	0.3		2002
Thallium	NR-230	OnSite	Habitat	mg/Kg	=	0.4		2002
Thallium	NR-231	OnSite	OB/OD	mg/Kg	=	0.35		2002
Thallium	NR-232	OnSite	Habitat	mg/Kg	=	0.55		2002
Thallium	NR-233	OnSite	Habitat	mg/Kg	=	0.34		2002
Thallium	NR-234	OnSite	Habitat	mg/Kg	=	0.35		2002
Thallium	NR-235	OnSite	Habitat	mg/Kg	=	0.29		2002
Thallium	NR-236	OnSite	Habitat	mg/Kg	=	0.32		2002
Thallium	NR-237	OnSite	Habitat	mg/Kg	=	0.32		2002
Thallium	NR-526	OnSite	Habitat	mg/Kg	J	0.28		2004
Thallium	NR-527	OnSite	Habitat	mg/Kg	J	0.22		2004
Thallium	NR-528	OnSite	Habitat	mg/Kg	J	0.15		2004
Thallium	NR-529	OnSite	Habitat	mg/Kg	J	0.26		2004
Thallium	NR-530	OnSite	Habitat	mg/Kg	J	0.24		2004
Thallium	NR-531	OnSite	OB/OD	mg/Kg	J	0.11		2004

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Thallium	NR-532	OnSite	OB/OD	mg/Kg	J	0.11		2004
Thallium	NR-533	OnSite	OB/OD	mg/Kg	J	0.21		2004
Thallium	NR-534	OnSite	OB/OD	mg/Kg	J	0.42		2004
Thallium	NR-535	OnSite	OB/OD	mg/Kg	J	0.21		2004
Thallium	SS1	OnSite	OB/OD	mg/Kg	U	2.5	5	1991
Thallium	SS10	OnSite	OB/OD	mg/Kg	U	2.5	5	1991
Thallium	SS11	OnSite	OB/OD	mg/Kg	U	2.5	5	1991
Thallium	SS12	OnSite	OB/OD	mg/Kg	U	2.5	5	1991
Thallium	SS13	OnSite	OB/OD	mg/Kg	U	2.5	5	1991
Thallium	SS14	OnSite	OB/OD	mg/Kg	U	2.5	5	1991
Thallium	SS15	OnSite	OB/OD	mg/Kg	U	2.5	5	1991
Thallium	SS16	OnSite	Habitat	mg/Kg	U	2.5	5	1991
Thallium	SS17	OnSite	Habitat	mg/Kg	U	2.5	5	1991
Thallium	SS18	OnSite	Habitat	mg/Kg	U	2.5	5	1991
Thallium	SS19	OnSite	Habitat	mg/Kg	U	2.5	5	1991
Thallium	SS2	OnSite	OB/OD	mg/Kg	U	2.5	5	1991
Thallium	SS20	OnSite	Habitat	mg/Kg	U	2.5	5	1991
Thallium	SS3	OnSite	OB/OD	mg/Kg	U	2.5	5	1991
Thallium	SS4	OnSite	OB/OD	mg/Kg	U	2.5	5	1991
Thallium	SS5	OnSite	OB/OD	mg/Kg	U	2.5	5	1991
Thallium	SS6	OnSite	OB/OD	mg/Kg	U	2.5	5	1991
Thallium	SS7	OnSite	OB/OD	mg/Kg	U	2.5	5	1991
Thallium	SS8	OnSite	OB/OD	mg/Kg	U	2.5	5	1991
Thallium	SS9	OnSite	OB/OD	mg/Kg	U	2.5	5	1991
Thallium	TTU-SS01S	OnSite	OB/OD	mg/Kg	=	0.22		1989
Thallium	TTU-SS02S	OnSite	OB/OD	mg/Kg	=	0.22		1989
Thallium	TTU-SS03S	OnSite	OB/OD	mg/Kg	U	0.085	0.17	1989
Thallium	TTU-SS04S(D)	OnSite	OB/OD	mg/Kg	U	0.085	0.17	1989
Thallium	TTU-SS05S	OnSite	OB/OD	mg/Kg	=	0.42		1989
Thallium	TTU-SS06S(BG)	OnSite	Habitat	mg/Kg	=	0.24		1989
Tin	AMTOF-01-1298-01	Background	Habitat	mg/kg	=	1.15		1998
Tin	AMTOF-02-1298-01	Background	Habitat	mg/kg	=	0.798		1998
Tin	AMTOF-03-1298-01	Background	Habitat	mg/kg	=	1.18		1998
Tin	AMTOF-04-1298-01	Background	Habitat	mg/kg	=	1.23		1998
Tin	AMTOF-05-1298-01	Background	Habitat	mg/kg	=	0.942		1998
Tin	AMTOF-06-1298-01	Background	Habitat	mg/kg	=	1.3		1998
Tin	NR-500-0800-01	Background	Habitat	mg/kg	JB	0.475		2000
Tin	NR-501-0800-01	Background	Habitat	mg/kg	JB	0.427		2000
Tin	NR-502-0800-01	Background	Habitat	mg/kg	JB	0.663		2000
Tin	NR-503-0800-01	Background	Habitat	mg/kg	JB	0.427		2000
Tin	NR-504-0800-01	Background	Habitat	mg/kg	JB	0.54		2000
Tin	NR-505-0800-01	Background	Habitat	mg/kg	JB	0.444		2000
Tin	NR-506-0800-01	Background	Habitat	mg/kg	JB	0.383		2000
Tin	NR-507-0800-01	Background	Habitat	mg/kg	JB	0.486		2000
Tin	NR-508-0800-01	Background	Habitat	mg/kg	JB	0.258		2000
Tin	NR-509-0800-01	Background	Habitat	mg/kg	JB	0.519		2000
Tin	NR-510-0800-01	Background	Habitat	mg/kg	JB	0.428		2000
Tin	NR-511-0800-01	Background	Habitat	mg/kg	JB	0.406		2000
Tin	NR-512-0800-01	Background	Habitat	mg/kg	JB	0.481		2000
Tin	NR-513-0800-01	Background	Habitat	mg/kg	JB	0.349		2000
Tin	NR-514-0800-01	Background	Habitat	mg/kg	JB	0.468		2000
Tin	NR-515-0800-01	Background	Habitat	mg/kg	JB	0.404		2000
Tin	NR-516-0800-01	Background	Habitat	mg/kg	JB	0.754		2000

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Tin	NR-517-0800-01	Background	Habitat	mg/kg	JB	0.432		2000
Tin	NR-518-0800-01	Background	Habitat	mg/kg	JB	0.537		2000
Tin	NR-519-0800-01	Background	Habitat	mg/kg	JB	0.622		2000
Tin	NR-520-0800-01	Background	Habitat	mg/kg	JB	0.663		2000
Tin	NR-521-0800-01	Background	Habitat	mg/kg	JB	0.586		2000
Tin	NR-522-0800-01	Background	Habitat	mg/kg	JB	0.78		2000
Tin	NR-523-0800-01	Background	Habitat	mg/kg	JB	0.591		2000
Tin	NR-524-0800-01	Background	Habitat	mg/kg	JB	0.752		2000
Tin	NR-525-0800-01	Background	Habitat	mg/kg	JB	0.636		2000
Tin	UTNCBU-01-OCT97-01	Background	Habitat	mg/kg	J	0.624		1997
Tin	UTNCBU-02-OCT97-01	Background	Habitat	mg/kg	J	0.591		1997
Tin	UTNCBU-03-1298-01	Background	Habitat	mg/kg	=	1.01		1998
Tin	UTNCBU-04-1298-01	Background	Habitat	mg/kg	=	0.964		1998
Tin	UTNCBU-05-1298-01	Background	Habitat	mg/kg	=	0.465		1998
Tin	UTNCBU-06-1298-01	Background	Habitat	mg/kg	=	0.551		1998
Tin	UTNEB-03-1298-01	Background	Habitat	mg/kg	=	0.709		1998
Tin	UTNEB-04-1298-01	Background	Habitat	mg/kg	=	1.28		1998
Tin	UTNEB-05-1298-01	Background	Habitat	mg/kg	=	0.925		1998
Tin	UTNEB-06-1298-01	Background	Habitat	mg/kg	=	0.509		1998
Tin	UTNERB-01-OCT97-01	Background	Habitat	mg/kg	J	1.28		1997
Tin	UTNERB-02-OCT97-01	Background	Habitat	mg/kg	J	0.975		1997
Tin	UTNOCB-01-OCT97-01	Background	Habitat	mg/kg	J	0.799		1997
Tin	UTNOCB-02-OCT97-01	Background	Habitat	mg/kg	J	0.828		1997
Tin	UTNOCBG-03-1298-01	Background	Habitat	mg/kg	=	0.991		1998
Tin	UTNOCBG-04-1298-01	Background	Habitat	mg/kg	=	0.83		1998
Tin	UTNOCBG-05-1298-01	Background	Habitat	mg/kg	=	0.902		1998
Tin	UTNOCBG-06-1298-01	Background	Habitat	mg/kg	=	0.807		1998
Titanium	AMTOF-01-1298-01	Background	Habitat	mg/kg	=	446		1998
Titanium	AMTOF-02-1298-01	Background	Habitat	mg/kg	=	300		1998
Titanium	AMTOF-03-1298-01	Background	Habitat	mg/kg	=	417		1998
Titanium	AMTOF-04-1298-01	Background	Habitat	mg/kg	=	487		1998
Titanium	AMTOF-05-1298-01	Background	Habitat	mg/kg	=	399		1998
Titanium	AMTOF-06-1298-01	Background	Habitat	mg/kg	=	432		1998
Titanium	NR-500-0800-01	Background	Habitat	mg/kg	=	360		2000
Titanium	NR-501-0800-01	Background	Habitat	mg/kg	=	220		2000
Titanium	NR-502-0800-01	Background	Habitat	mg/kg	=	392		2000
Titanium	NR-503-0800-01	Background	Habitat	mg/kg	=	378		2000
Titanium	NR-504-0800-01	Background	Habitat	mg/kg	=	365		2000
Titanium	NR-505-0800-01	Background	Habitat	mg/kg	=	422		2000
Titanium	NR-506-0800-01	Background	Habitat	mg/kg	=	340		2000
Titanium	NR-507-0800-01	Background	Habitat	mg/kg	=	338		2000
Titanium	NR-508-0800-01	Background	Habitat	mg/kg	=	319		2000
Titanium	NR-509-0800-01	Background	Habitat	mg/kg	=	285		2000
Titanium	NR-510-0800-01	Background	Habitat	mg/kg	=	226		2000
Titanium	NR-511-0800-01	Background	Habitat	mg/kg	=	308		2000
Titanium	NR-512-0800-01	Background	Habitat	mg/kg	=	385		2000
Titanium	NR-513-0800-01	Background	Habitat	mg/kg	=	331		2000
Titanium	NR-514-0800-01	Background	Habitat	mg/kg	=	372		2000
Titanium	NR-515-0800-01	Background	Habitat	mg/kg	=	81.6		2000
Titanium	NR-516-0800-01	Background	Habitat	mg/kg	=	385		2000
Titanium	NR-517-0800-01	Background	Habitat	mg/kg	=	229		2000
Titanium	NR-518-0800-01	Background	Habitat	mg/kg	=	59.7		2000
Titanium	NR-519-0800-01	Background	Habitat	mg/kg	=	161		2000

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Titanium	NR-520-0800-01	Background	Habitat	mg/kg	=	167		2000
Titanium	NR-521-0800-01	Background	Habitat	mg/kg	=	113		2000
Titanium	NR-522-0800-01	Background	Habitat	mg/kg	=	266		2000
Titanium	NR-523-0800-01	Background	Habitat	mg/kg	=	240		2000
Titanium	NR-524-0800-01	Background	Habitat	mg/kg	=	185		2000
Titanium	NR-525-0800-01	Background	Habitat	mg/kg	=	155		2000
Titanium	UTNCBU-01-OCT97-01	Background	Habitat	mg/kg	=	337		1997
Titanium	UTNCBU-02-OCT97-01	Background	Habitat	mg/kg	=	336		1997
Titanium	UTNCBU-03-1298-01	Background	Habitat	mg/kg	=	409		1998
Titanium	UTNCBU-04-1298-01	Background	Habitat	mg/kg	=	429		1998
Titanium	UTNCBU-05-1298-01	Background	Habitat	mg/kg	=	220		1998
Titanium	UTNCBU-06-1298-01	Background	Habitat	mg/kg	=	224		1998
Titanium	UTNEB-03-1298-01	Background	Habitat	mg/kg	=	281		1998
Titanium	UTNEB-04-1298-01	Background	Habitat	mg/kg	=	497		1998
Titanium	UTNEB-05-1298-01	Background	Habitat	mg/kg	=	377		1998
Titanium	UTNEB-06-1298-01	Background	Habitat	mg/kg	=	235		1998
Titanium	UTNERB-01-OCT97-01	Background	Habitat	mg/kg	=	501		1997
Titanium	UTNERB-02-OCT97-01	Background	Habitat	mg/kg	=	493		1997
Titanium	UTNOCB-01-OCT97-01	Background	Habitat	mg/kg	=	392		1997
Titanium	UTNOCB-02-OCT97-01	Background	Habitat	mg/kg	=	345		1997
Titanium	UTNOCBG-03-1298-01	Background	Habitat	mg/kg	H	349		1998
Titanium	UTNOCBG-04-1298-01	Background	Habitat	mg/kg	=	334		1998
Titanium	UTNOCBG-05-1298-01	Background	Habitat	mg/kg	=	351		1998
Titanium	UTNOCBG-06-1298-01	Background	Habitat	mg/kg	=	300		1998
Tungsten	AMTOF-01-1298-01	Background	Habitat	mg/kg	U	0.147	0.294	1998
Tungsten	AMTOF-02-1298-01	Background	Habitat	mg/kg	U	0.11	0.22	1998
Tungsten	AMTOF-03-1298-01	Background	Habitat	mg/kg	U	0.1365	0.273	1998
Tungsten	AMTOF-04-1298-01	Background	Habitat	mg/kg	U	0.1415	0.283	1998
Tungsten	AMTOF-05-1298-01	Background	Habitat	mg/kg	U	0.1435	0.287	1998
Tungsten	AMTOF-06-1298-01	Background	Habitat	mg/kg	U	0.144	0.288	1998
Tungsten	NR-500-0800-01	Background	Habitat	mg/kg	UB	0.2045	0.409	2000
Tungsten	NR-501-0800-01	Background	Habitat	mg/kg	UB	0.225	0.45	2000
Tungsten	NR-502-0800-01	Background	Habitat	mg/kg	UB	0.267	0.534	2000
Tungsten	NR-503-0800-01	Background	Habitat	mg/kg	UB	0.2175	0.435	2000
Tungsten	NR-504-0800-01	Background	Habitat	mg/kg	UB	0.2315	0.463	2000
Tungsten	NR-505-0800-01	Background	Habitat	mg/kg	UB	0.258	0.516	2000
Tungsten	NR-506-0800-01	Background	Habitat	mg/kg	UB	0.2055	0.411	2000
Tungsten	NR-507-0800-01	Background	Habitat	mg/kg	UB	0.2615	0.523	2000
Tungsten	NR-508-0800-01	Background	Habitat	mg/kg	UB	0.132	0.264	2000
Tungsten	NR-509-0800-01	Background	Habitat	mg/kg	UB	0.258	0.516	2000
Tungsten	NR-510-0800-01	Background	Habitat	mg/kg	UB	0.267	0.534	2000
Tungsten	NR-511-0800-01	Background	Habitat	mg/kg	UB	0.2185	0.437	2000
Tungsten	NR-512-0800-01	Background	Habitat	mg/kg	UB	0.2485	0.497	2000
Tungsten	NR-513-0800-01	Background	Habitat	mg/kg	UB	0.186	0.372	2000
Tungsten	NR-514-0800-01	Background	Habitat	mg/kg	UB	0.273	0.546	2000
Tungsten	NR-515-0800-01	Background	Habitat	mg/kg	UB	0.2715	0.543	2000
Tungsten	NR-516-0800-01	Background	Habitat	mg/kg	UB	0.342	0.684	2000
Tungsten	NR-517-0800-01	Background	Habitat	mg/kg	UB	0.2575	0.515	2000
Tungsten	NR-518-0800-01	Background	Habitat	mg/kg	UB	0.243	0.486	2000
Tungsten	NR-519-0800-01	Background	Habitat	mg/kg	UB	0.3525	0.705	2000
Tungsten	NR-520-0800-01	Background	Habitat	mg/kg	UB	0.3595	0.719	2000
Tungsten	NR-521-0800-01	Background	Habitat	mg/kg	UB	0.288	0.576	2000
Tungsten	NR-522-0800-01	Background	Habitat	mg/kg	UB	0.292	0.584	2000

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection	Sample
							Limit	Year
Tungsten	NR-523-0800-01	Background	Habitat	mg/kg	UB	0.2785	0.557	2000
Tungsten	NR-524-0800-01	Background	Habitat	mg/kg	UB	0.4275	0.855	2000
Tungsten	NR-525-0800-01	Background	Habitat	mg/kg	UB	0.158	0.316	2000
Tungsten	UTNCBU-01-OCT97-01	Background	Habitat	mg/kg	BJ	0.0623		1997
Tungsten	UTNCBU-02-OCT97-01	Background	Habitat	mg/kg	U	0.895	1.79	1997
Tungsten	UTNCBU-03-1298-01	Background	Habitat	mg/kg	BJ	0.629		1998
Tungsten	UTNCBU-04-1298-01	Background	Habitat	mg/kg	BJ	0.323		1998
Tungsten	UTNCBU-05-1298-01	Background	Habitat	mg/kg	BJ	0.338		1998
Tungsten	UTNCBU-06-1298-01	Background	Habitat	mg/kg	BJ	0.114		1998
Tungsten	UTNEB-03-1298-01	Background	Habitat	mg/kg	BJ	0.331		1998
Tungsten	UTNEB-04-1298-01	Background	Habitat	mg/kg	BJ	0.0279		1998
Tungsten	UTNEB-05-1298-01	Background	Habitat	mg/kg	BJ	0.103		1998
Tungsten	UTNEB-06-1298-01	Background	Habitat	mg/kg	BJ	0.0978		1998
Tungsten	UTNERB-01-OCT97-01	Background	Habitat	mg/kg	BJ	0.116		1997
Tungsten	UTNERB-02-OCT97-01	Background	Habitat	mg/kg	BJ	0.233		1997
Tungsten	UTNOCB-01-OCT97-01	Background	Habitat	mg/kg	BJ	0.197		1997
Tungsten	UTNOCB-02-OCT97-01	Background	Habitat	mg/kg	U	0.83	1.66	1997
Tungsten	UTNOCBG-03-1298-01	Background	Habitat	mg/kg	U	0.3555	0.711	1998
Tungsten	UTNOCBG-04-1298-01	Background	Habitat	mg/kg	U	0.3405	0.681	1998
Tungsten	UTNOCBG-05-1298-01	Background	Habitat	mg/kg	U	0.3295	0.659	1998
Tungsten	UTNOCBG-06-1298-01	Background	Habitat	mg/kg	U	0.245	0.49	1998
Vanadium	AMTOF-01-1298-01	Background	Habitat	mg/kg	=	21.1		1998
Vanadium	AMTOF-02-1298-01	Background	Habitat	mg/kg	=	23.9		1998
Vanadium	AMTOF-03-1298-01	Background	Habitat	mg/kg	=	24		1998
Vanadium	AMTOF-04-1298-01	Background	Habitat	mg/kg	=	25.2		1998
Vanadium	AMTOF-05-1298-01	Background	Habitat	mg/kg	=	17.8		1998
Vanadium	AMTOF-06-1298-01	Background	Habitat	mg/kg	=	21.7		1998
Vanadium	NR-238	Background	Habitat	mg/Kg	=	22.8		2002
Vanadium	NR-239	Background	Habitat	mg/Kg	=	17.3		2002
Vanadium	NR-500-0800-01	Background	Habitat	mg/kg	=	20.9		2000
Vanadium	NR-501-0800-01	Background	Habitat	mg/kg	=	17.9		2000
Vanadium	NR-502-0800-01	Background	Habitat	mg/kg	=	22.8		2000
Vanadium	NR-503-0800-01	Background	Habitat	mg/kg	=	21.6		2000
Vanadium	NR-504-0800-01	Background	Habitat	mg/kg	=	20.9		2000
Vanadium	NR-505-0800-01	Background	Habitat	mg/kg	=	22.2		2000
Vanadium	NR-506-0800-01	Background	Habitat	mg/kg	=	20.4		2000
Vanadium	NR-507-0800-01	Background	Habitat	mg/kg	=	18.2		2000
Vanadium	NR-508-0800-01	Background	Habitat	mg/kg	=	18.9		2000
Vanadium	NR-509-0800-01	Background	Habitat	mg/kg	=	21.7		2000
Vanadium	NR-510-0800-01	Background	Habitat	mg/kg	=	14.9		2000
Vanadium	NR-511-0800-01	Background	Habitat	mg/kg	=	19.1		2000
Vanadium	NR-512-0800-01	Background	Habitat	mg/kg	=	22.5		2000
Vanadium	NR-513-0800-01	Background	Habitat	mg/kg	=	19.1		2000
Vanadium	NR-514-0800-01	Background	Habitat	mg/kg	=	22.4		2000
Vanadium	NR-515-0800-01	Background	Habitat	mg/kg	=	8.28		2000
Vanadium	NR-516-0800-01	Background	Habitat	mg/kg	=	26.9		2000
Vanadium	NR-517-0800-01	Background	Habitat	mg/kg	=	16.4		2000
Vanadium	NR-518-0800-01	Background	Habitat	mg/kg	=	9.48		2000
Vanadium	NR-519-0800-01	Background	Habitat	mg/kg	=	14.9		2000
Vanadium	NR-520-0800-01	Background	Habitat	mg/kg	=	14.4		2000
Vanadium	NR-521-0800-01	Background	Habitat	mg/kg	=	11.6		2000
Vanadium	NR-522-0800-01	Background	Habitat	mg/kg	=	23.3		2000
Vanadium	NR-523-0800-01	Background	Habitat	mg/kg	=	20.1		2000

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils
 Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Vanadium	NR-524-0800-01	Background	Habitat	mg/kg	=	17.5		2000
Vanadium	NR-525-0800-01	Background	Habitat	mg/kg	=	12.5		2000
Vanadium	NR-536	Background	Habitat	mg/Kg	=	19.5		2004
Vanadium	NR-537	Background	Habitat	mg/Kg	=	21.9		2004
Vanadium	UTNCBU-01-OCT97-01	Background	Habitat	mg/kg	=	21.3		1997
Vanadium	UTNCBU-02-OCT97-01	Background	Habitat	mg/kg	=	20.5		1997
Vanadium	UTNCBU-03-1298-01	Background	Habitat	mg/kg	=	25.6		1998
Vanadium	UTNCBU-04-1298-01	Background	Habitat	mg/kg	=	25.7		1998
Vanadium	UTNCBU-05-1298-01	Background	Habitat	mg/kg	=	20.6		1998
Vanadium	UTNCBU-06-1298-01	Background	Habitat	mg/kg	=	21.1		1998
Vanadium	UTNEB-03-1298-01	Background	Habitat	mg/kg	=	23.8		1998
Vanadium	UTNEB-04-1298-01	Background	Habitat	mg/kg	=	28		1998
Vanadium	UTNEB-05-1298-01	Background	Habitat	mg/kg	=	23.9		1998
Vanadium	UTNEB-06-1298-01	Background	Habitat	mg/kg	=	23.2		1998
Vanadium	UTNERB-01-OCT97-01	Background	Habitat	mg/kg	=	35.5		1997
Vanadium	UTNERB-02-OCT97-01	Background	Habitat	mg/kg	=	33.2		1997
Vanadium	UTNOCB-01-OCT97-01	Background	Habitat	mg/kg	=	25.5		1997
Vanadium	UTNOCB-02-OCT97-01	Background	Habitat	mg/kg	=	20.7		1997
Vanadium	UTNOCBG-03-1298-01	Background	Habitat	mg/kg	J	19.6		1998
Vanadium	UTNOCBG-04-1298-01	Background	Habitat	mg/kg	=	18.3		1998
Vanadium	UTNOCBG-05-1298-01	Background	Habitat	mg/kg	=	19.6		1998
Vanadium	UTNOCBG-06-1298-01	Background	Habitat	mg/kg	=	24.3		1998
Vanadium	NR-226	OnSite	Habitat	mg/Kg	=	9.9		2002
Vanadium	NR-227	OnSite	Habitat	mg/Kg	=	13.6		2002
Vanadium	NR-228	OnSite	OB/OD	mg/Kg	=	15.6		2002
Vanadium	NR-229	OnSite	Habitat	mg/Kg	=	21.5		2002
Vanadium	NR-230	OnSite	Habitat	mg/Kg	=	19.9		2002
Vanadium	NR-231	OnSite	OB/OD	mg/Kg	=	19.8		2002
Vanadium	NR-232	OnSite	Habitat	mg/Kg	=	25.7		2002
Vanadium	NR-233	OnSite	Habitat	mg/Kg	=	18.8		2002
Vanadium	NR-234	OnSite	Habitat	mg/Kg	=	18.8		2002
Vanadium	NR-235	OnSite	Habitat	mg/Kg	=	20.3		2002
Vanadium	NR-236	OnSite	Habitat	mg/Kg	=	16.4		2002
Vanadium	NR-237	OnSite	Habitat	mg/Kg	=	18.7		2002
Vanadium	NR-526	OnSite	Habitat	mg/Kg	=	12.9		2004
Vanadium	NR-527	OnSite	Habitat	mg/Kg	=	17.8		2004
Vanadium	NR-528	OnSite	Habitat	mg/Kg	=	11.3		2004
Vanadium	NR-529	OnSite	Habitat	mg/Kg	=	16.2		2004
Vanadium	NR-530	OnSite	Habitat	mg/Kg	=	15		2004
Vanadium	NR-531	OnSite	OB/OD	mg/Kg	=	14.1		2004
Vanadium	NR-532	OnSite	OB/OD	mg/Kg	=	11.8		2004
Vanadium	NR-533	OnSite	OB/OD	mg/Kg	=	17.5		2004
Vanadium	NR-534	OnSite	OB/OD	mg/Kg	=	16		2004
Vanadium	NR-535	OnSite	OB/OD	mg/Kg	=	19.2		2004
Vanadium	TTU-SS01S	OnSite	OB/OD	mg/Kg	=	14.9		1989
Vanadium	TTU-SS02S	OnSite	OB/OD	mg/Kg	=	16.5		1989
Vanadium	TTU-SS03S	OnSite	OB/OD	mg/Kg	=	16.4		1989
Vanadium	TTU-SS04S(D)	OnSite	OB/OD	mg/Kg	=	13.1		1989
Vanadium	TTU-SS05S	OnSite	OB/OD	mg/Kg	=	17		1989
Vanadium	TTU-SS06S(BG)	OnSite	Habitat	mg/Kg	=	19.2		1989
Zinc	AMTOF-01-1298-01	Background	Habitat	mg/kg	=	47		1998
Zinc	AMTOF-02-1298-01	Background	Habitat	mg/kg	=	48.5		1998
Zinc	AMTOF-03-1298-01	Background	Habitat	mg/kg	=	48.3		1998

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Zinc	AMTOF-04-1298-01	Background	Habitat	mg/kg	=	49.2		1998
Zinc	AMTOF-05-1298-01	Background	Habitat	mg/kg	=	40.8		1998
Zinc	AMTOF-06-1298-01	Background	Habitat	mg/kg	=	45.2		1998
Zinc	NR-238	Background	Habitat	mg/Kg	=	53.2		2002
Zinc	NR-239	Background	Habitat	mg/Kg	=	45.3		2002
Zinc	NR-500-0800-01	Background	Habitat	mg/kg	B	41.2		2000
Zinc	NR-501-0800-01	Background	Habitat	mg/kg	B	23.9		2000
Zinc	NR-502-0800-01	Background	Habitat	mg/kg	B	45.3		2000
Zinc	NR-503-0800-01	Background	Habitat	mg/kg	B	39.5		2000
Zinc	NR-504-0800-01	Background	Habitat	mg/kg	B	34		2000
Zinc	NR-505-0800-01	Background	Habitat	mg/kg	B	44.5		2000
Zinc	NR-506-0800-01	Background	Habitat	mg/kg	B	41.5		2000
Zinc	NR-507-0800-01	Background	Habitat	mg/kg	B	38.3		2000
Zinc	NR-508-0800-01	Background	Habitat	mg/kg	B	37.8		2000
Zinc	NR-509-0800-01	Background	Habitat	mg/kg	B	39.4		2000
Zinc	NR-510-0800-01	Background	Habitat	mg/kg	B	33.3		2000
Zinc	NR-511-0800-01	Background	Habitat	mg/kg	B	44.5		2000
Zinc	NR-512-0800-01	Background	Habitat	mg/kg	B	50.7		2000
Zinc	NR-513-0800-01	Background	Habitat	mg/kg	B	46.6		2000
Zinc	NR-514-0800-01	Background	Habitat	mg/kg	B	37.4		2000
Zinc	NR-515-0800-01	Background	Habitat	mg/kg	B	8.83		2000
Zinc	NR-516-0800-01	Background	Habitat	mg/kg	B	52.3		2000
Zinc	NR-517-0800-01	Background	Habitat	mg/kg	B	13.2		2000
Zinc	NR-518-0800-01	Background	Habitat	mg/kg	=	6.37		2000
Zinc	NR-519-0800-01	Background	Habitat	mg/kg	=	17.6		2000
Zinc	NR-520-0800-01	Background	Habitat	mg/kg	=	18.1		2000
Zinc	NR-521-0800-01	Background	Habitat	mg/kg	=	12		2000
Zinc	NR-522-0800-01	Background	Habitat	mg/kg	=	34.2		2000
Zinc	NR-523-0800-01	Background	Habitat	mg/kg	=	29		2000
Zinc	NR-524-0800-01	Background	Habitat	mg/kg	=	22.6		2000
Zinc	NR-525-0800-01	Background	Habitat	mg/kg	=	17.8		2000
Zinc	NR-536	Background	Habitat	mg/Kg	=	61.1		2004
Zinc	NR-537	Background	Habitat	mg/Kg	=	78		2004
Zinc	UTNCBU-01-OCT97-01	Background	Habitat	mg/kg	=	32.6		1997
Zinc	UTNCBU-02-OCT97-01	Background	Habitat	mg/kg	=	28.5		1997
Zinc	UTNCBU-03-1298-01	Background	Habitat	mg/kg	=	42.2		1998
Zinc	UTNCBU-04-1298-01	Background	Habitat	mg/kg	=	40.9		1998
Zinc	UTNCBU-05-1298-01	Background	Habitat	mg/kg	=	30.1		1998
Zinc	UTNCBU-06-1298-01	Background	Habitat	mg/kg	=	30.1		1998
Zinc	UTNEB-03-1298-01	Background	Habitat	mg/kg	=	34.2		1998
Zinc	UTNEB-04-1298-01	Background	Habitat	mg/kg	=	50.4		1998
Zinc	UTNEB-05-1298-01	Background	Habitat	mg/kg	=	36.9		1998
Zinc	UTNEB-06-1298-01	Background	Habitat	mg/kg	=	32.2		1998
Zinc	UTNERB-01-OCT97-01	Background	Habitat	mg/kg	=	54		1997
Zinc	UTNERB-02-OCT97-01	Background	Habitat	mg/kg	=	43.4		1997
Zinc	UTNOCB-01-OCT97-01	Background	Habitat	mg/kg	=	48.4		1997
Zinc	UTNOCB-02-OCT97-01	Background	Habitat	mg/kg	=	44.3		1997
Zinc	UTNOCBG-03-1298-01	Background	Habitat	mg/kg	=	42.9		1998
Zinc	UTNOCBG-04-1298-01	Background	Habitat	mg/kg	=	38.9		1998
Zinc	UTNOCBG-05-1298-01	Background	Habitat	mg/kg	=	40.5		1998
Zinc	UTNOCBG-06-1298-01	Background	Habitat	mg/kg	=	51.1		1998
Zinc	NR-226	OnSite	Habitat	mg/Kg	=	29.7		2002
Zinc	NR-227	OnSite	Habitat	mg/Kg	=	38.8		2002

Table B-1

Sample Data for Inorganics in TTU Background and Site Soils

Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Location	Type	Habitat	Units	Qualifier	Result	Detection Limit	Sample Year
Zinc	NR-228	OnSite	OB/OD	mg/Kg	=	51.9		2002
Zinc	NR-229	OnSite	Habitat	mg/Kg	=	54.7		2002
Zinc	NR-230	OnSite	Habitat	mg/Kg	=	55.5		2002
Zinc	NR-231	OnSite	OB/OD	mg/Kg	=	52.7		2002
Zinc	NR-232	OnSite	Habitat	mg/Kg	=	57.5		2002
Zinc	NR-233	OnSite	Habitat	mg/Kg	=	36.4		2002
Zinc	NR-234	OnSite	Habitat	mg/Kg	=	59.2		2002
Zinc	NR-235	OnSite	Habitat	mg/Kg	=	53.2		2002
Zinc	NR-236	OnSite	Habitat	mg/Kg	=	48.8		2002
Zinc	NR-237	OnSite	Habitat	mg/Kg	=	42		2002
Zinc	NR-526	OnSite	Habitat	mg/Kg	=	42		2004
Zinc	NR-527	OnSite	Habitat	mg/Kg	=	60.1		2004
Zinc	NR-528	OnSite	Habitat	mg/Kg	=	39.8		2004
Zinc	NR-529	OnSite	Habitat	mg/Kg	=	58.2		2004
Zinc	NR-530	OnSite	Habitat	mg/Kg	=	33.5		2004
Zinc	NR-531	OnSite	OB/OD	mg/Kg	=	583		2004
Zinc	NR-532	OnSite	OB/OD	mg/Kg	=	82.7		2004
Zinc	NR-533	OnSite	OB/OD	mg/Kg	=	37.1		2004
Zinc	NR-534	OnSite	OB/OD	mg/Kg	=	33.6		2004
Zinc	NR-535	OnSite	OB/OD	mg/Kg	=	35.6		2004
Zinc	SS1	OnSite	OB/OD	mg/Kg	=	43		1991
Zinc	SS10	OnSite	OB/OD	mg/Kg	=	61		1991
Zinc	SS11	OnSite	OB/OD	mg/Kg	=	63		1991
Zinc	SS12	OnSite	OB/OD	mg/Kg	=	75		1991
Zinc	SS13	OnSite	OB/OD	mg/Kg	=	68		1991
Zinc	SS14	OnSite	OB/OD	mg/Kg	=	61		1991
Zinc	SS16	OnSite	Habitat	mg/Kg	=	67		1991
Zinc	SS17	OnSite	Habitat	mg/Kg	=	55		1991
Zinc	SS18	OnSite	Habitat	mg/Kg	=	55		1991
Zinc	SS19	OnSite	Habitat	mg/Kg	=	51		1991
Zinc	SS2	OnSite	OB/OD	mg/Kg	=	34		1991
Zinc	SS20	OnSite	Habitat	mg/Kg	=	57		1991
Zinc	SS3	OnSite	OB/OD	mg/Kg	=	60		1991
Zinc	SS4	OnSite	OB/OD	mg/Kg	=	36		1991
Zinc	SS5	OnSite	OB/OD	mg/Kg	=	2300		1991
Zinc	SS6	OnSite	OB/OD	mg/Kg	=	130		1991
Zinc	SS7	OnSite	OB/OD	mg/Kg	=	490		1991
Zinc	SS8	OnSite	OB/OD	mg/Kg	=	63		1991
Zinc	SS9	OnSite	OB/OD	mg/Kg	=	240		1991
Zinc	TTU-SS01S	OnSite	OB/OD	mg/Kg	=	60.7		1989
Zinc	TTU-SS02S	OnSite	OB/OD	mg/Kg	=	88.7		1989
Zinc	TTU-SS03S	OnSite	OB/OD	mg/Kg	=	59.7		1989
Zinc	TTU-SS04S(D)	OnSite	OB/OD	mg/Kg	=	43.2		1989
Zinc	TTU-SS05S	OnSite	OB/OD	mg/Kg	=	66.8		1989
Zinc	TTU-SS06S(BG)	OnSite	Habitat	mg/Kg	=	48.3		1989

B - found in blank

J - estimated value

H - high, qualified result within acceptable range

L - low, qualified result within acceptable range

R - unusable

U - below detection

Table B-2

Wilcoxon Rank Sum Comparison of Inorganics in TTU Soils to the Background Concentrations.
Attachment 10A - Thermal Treatment Unit, Ecological Risk Assessment

Analyte	Site Sample Soil Statistics						Background Soil Statistics						Wilcoxon Rank Sum Result	p
	n	DF (%)	Minimum (mg/kg)	Maximum (mg/kg)	Mean (mg/kg)	Standard Deviation	n	DF (%)	Minimum (mg/kg)	Maximum (mg/kg)	Mean (mg/kg)	Standard Deviation		
Aluminum	48	100%	5390.00	54000.00	13223.33	6954.98	54	100%	2080	21100	11900	3620	NS	0.8751
Antimony	28	79%	0.12	166.93	8.12	31.33	54	54%	0.00705	3.10	0.766	0.649	SS	0.156
Arsenic	48	58%	1.90	41.30	6.46	5.34	54	100%	2.25	15.4	6.63	2.12	BS	0.0017
Barium	48	100%	110.00	640.00	206.25	72.94	54	100%	148	426	258	56.6	BS	<0.0001
Beryllium	48	48%	0.08	0.72	0.47	0.16	54	85%	0.00535	1.05	0.409	0.268	NS	0.4427
Cadmium	48	44%	0.06	32.00	1.25	4.56	54	65%	0.00292	0.710	0.203	0.185	SS	<0.0001
Chromium	48	100%	6.50	55.30	14.37	7.79	54	100%	2.32	20.9	12.7	3.66	NS	0.8253
Cobalt	28	79%	1.00	4.90	2.78	1.12	54	100%	0.678	6.06	3.53	1.06	BS	0.007
Copper	48	85%	0.50	18000.00	429.34	2594.12	54	100%	2.49	26.7	12.5	3.86	SS	<0.0001
Iron	42	100%	4510.00	15000.00	10605.95	2786.58	54	100%	1390	16200	10100	3190	NS	0.4914
Lead	48	83%	1.00	48000.00	1067.88	6921.79	54	100%	2.95	30.5	10.3	4.23	SS	0.0017
Magnesium	42	100%	9700.00	24300.00	16695.24	4003.90	54	100%	15500	167000	29800	21700	BS	<0.0001
Manganese	48	100%	120.00	519.00	317.67	115.60	54	100%	43.4	859	340	136	NS	0.5409
Mercury	48	27%	0.01	0.07	0.02	0.02	4	50%	0.0100	0.0262	0.0178	0.00902	NS	0.9435
Molybdenum	22	91%	0.15	17.00	1.73	3.45	54	98%	0.0730	4.91	0.824	0.771	SS	0.0025
Nickel	48	100%	6.70	41.30	11.27	5.83	54	100%	3.00	20.2	10.3	3.07	NS	0.6932
Phosphorus	20	100%	450.00	990.00	656.00	170.80	50	100%	198	1470	722	214	NS	0.1956
Selenium	48	0%	0.09	5.00	2.48	2.17	54	70%	0.00815	1.50	0.513	0.339	SS	<0.0001
Silver	48	8%	0.09	4.00	0.61	0.64	54	46%	0.00572	0.230	0.0797	0.0545	SS	<0.0001
Strontium	22	100%	244.00	484.00	350.82	71.94	54	100%	211	3680	717	763	BS	0.0107
Thallium	48	54%	0.09	2.50	1.20	1.12	54	46%	0.0151	1.76	0.515	0.351	NS	0.1577
Vanadium	28	100%	9.90	25.70	16.71	3.42	54	100%	8.28	35.5	20.8	4.89	BS	<0.0001
Zinc	48	100%	29.70	2300.00	125.38	336.37	54	100%	6.37	78	38.3	13.4	SS	<0.0001

Notes:

¹ Summary statistics include 1/2 detection limit as a proxy value for non-detects.

DF = detection frequency

Bold and highlighted text are those COPECs with significantly greater site concentrations compared to background. These COPECs were retained for further characterization in the refined screening evaluation.

BS = significant difference between background and site data with background concentrations being greater

NS = no significant difference between background and site data

SS = significant difference between background and site data with site concentrations being greater

p - level of significance (0.05) based on the two tailed t-distribution

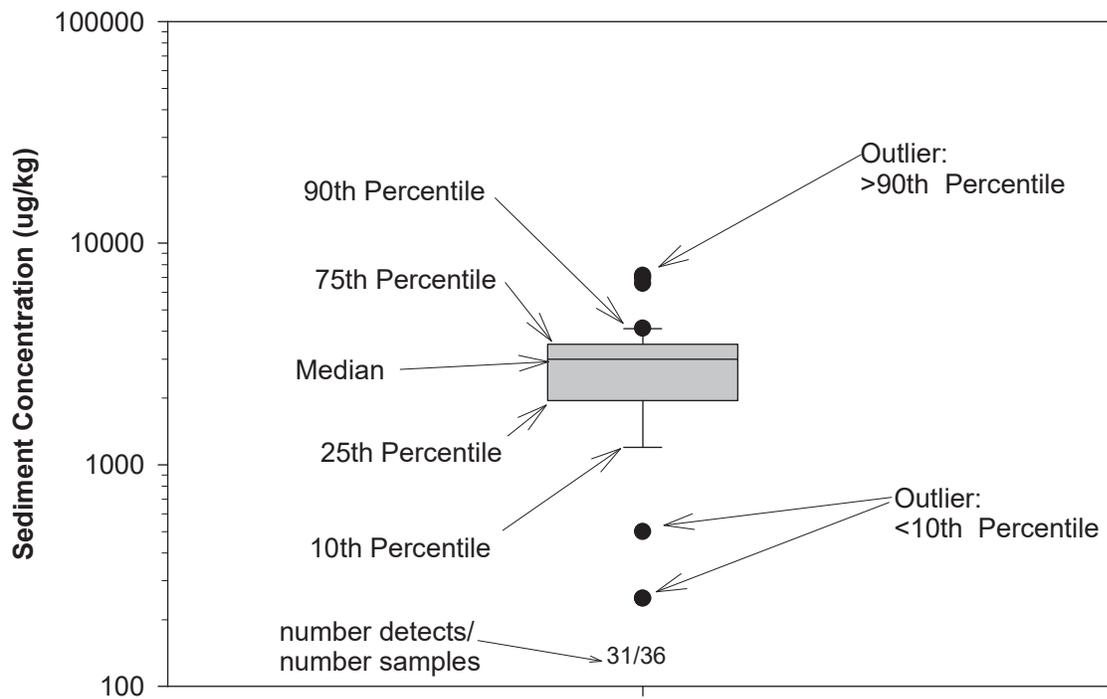


Figure B-1. Example box plot diagram displaying a graphical representation of underlying data distribution.

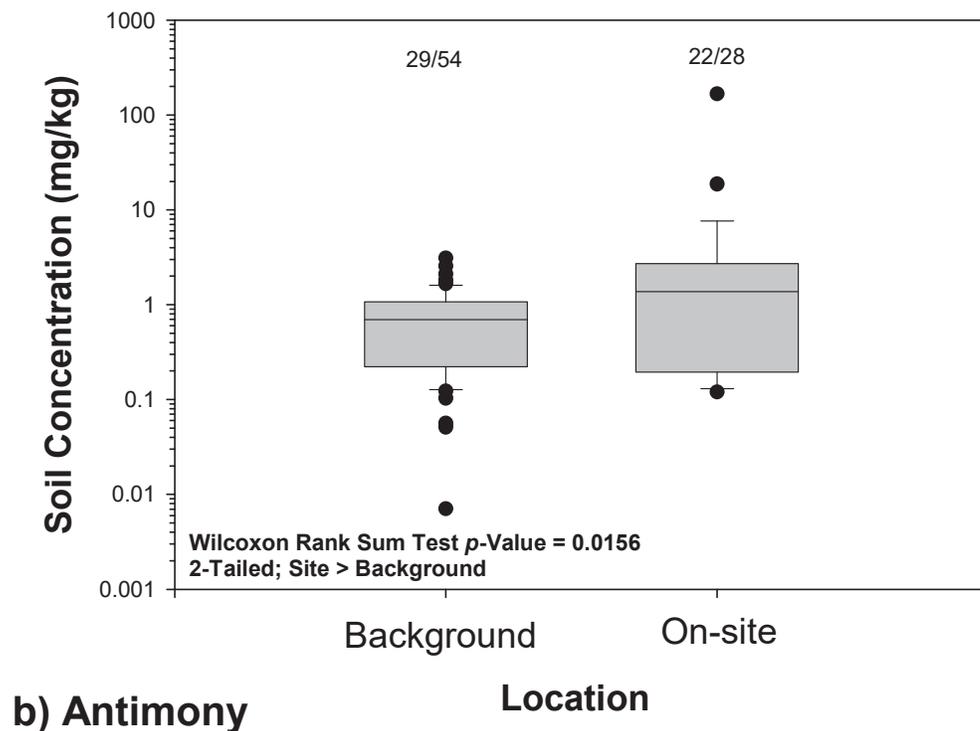
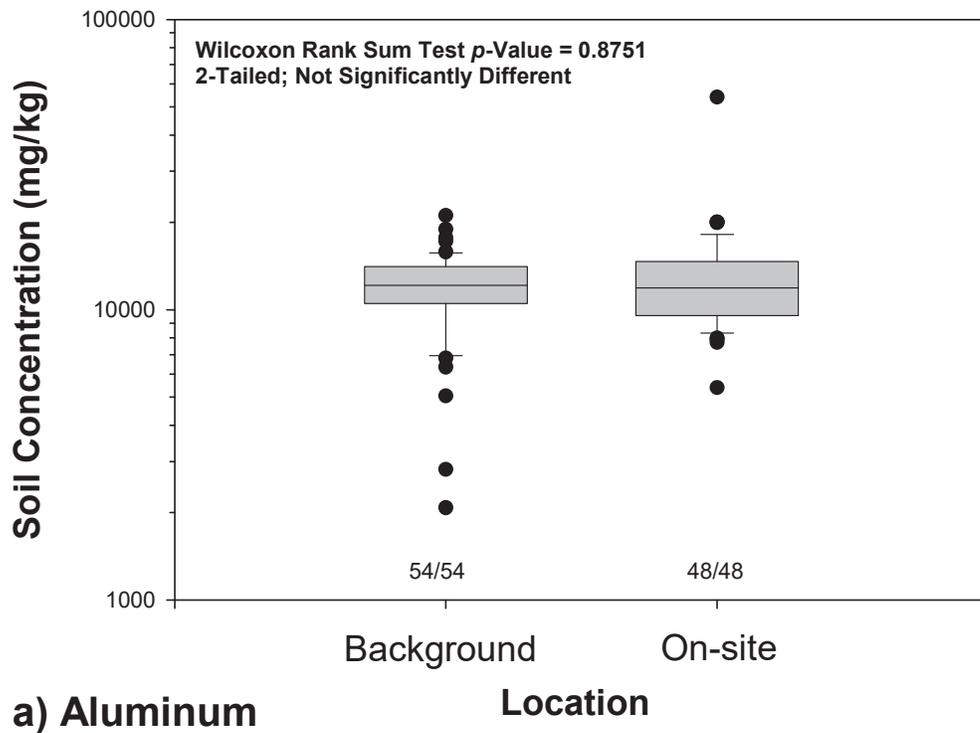
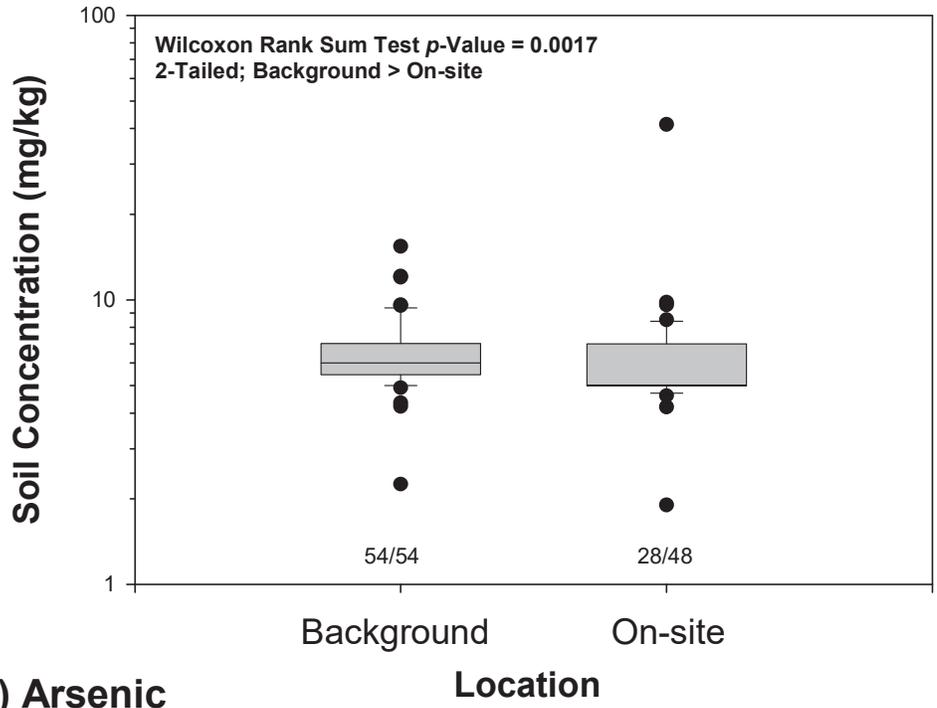
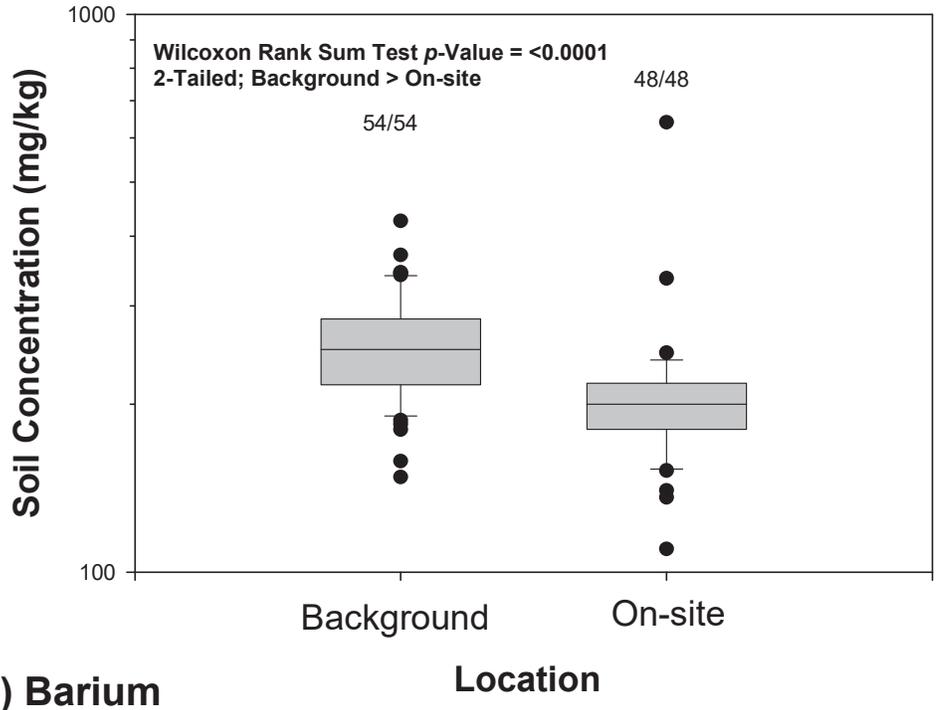


Figure B-2. Comparison of distributions of on-site and background concentrations of a) aluminum and b) antimony at the Thermal Treatment Unit, Hill Air Force Base, Utah. On-site data includes samples through 2004.

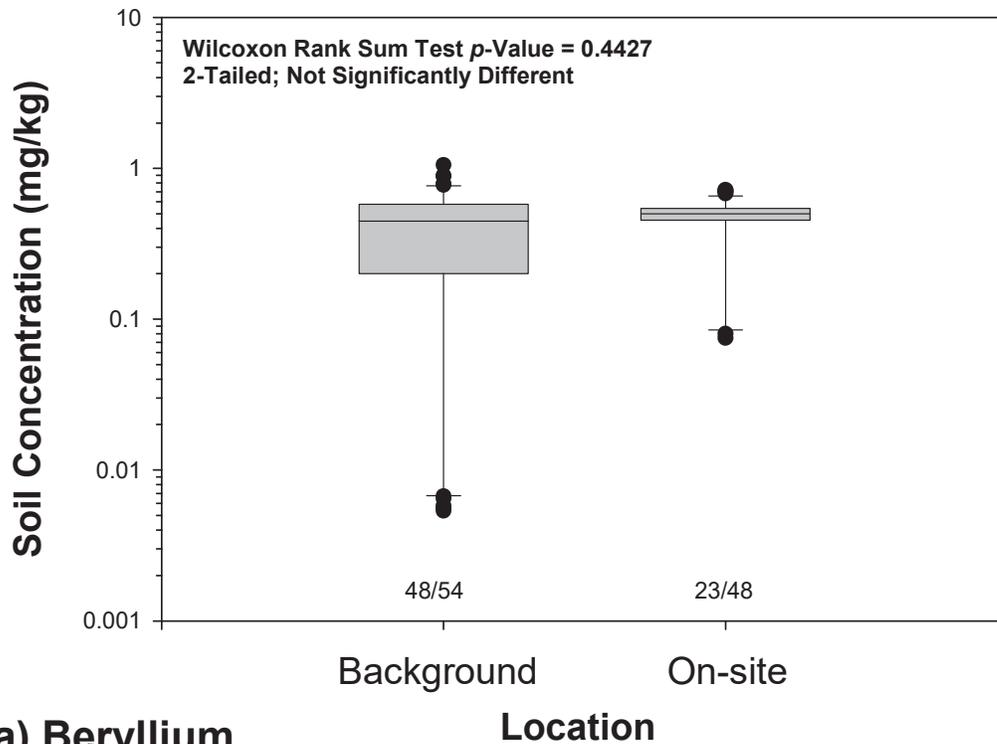


a) Arsenic

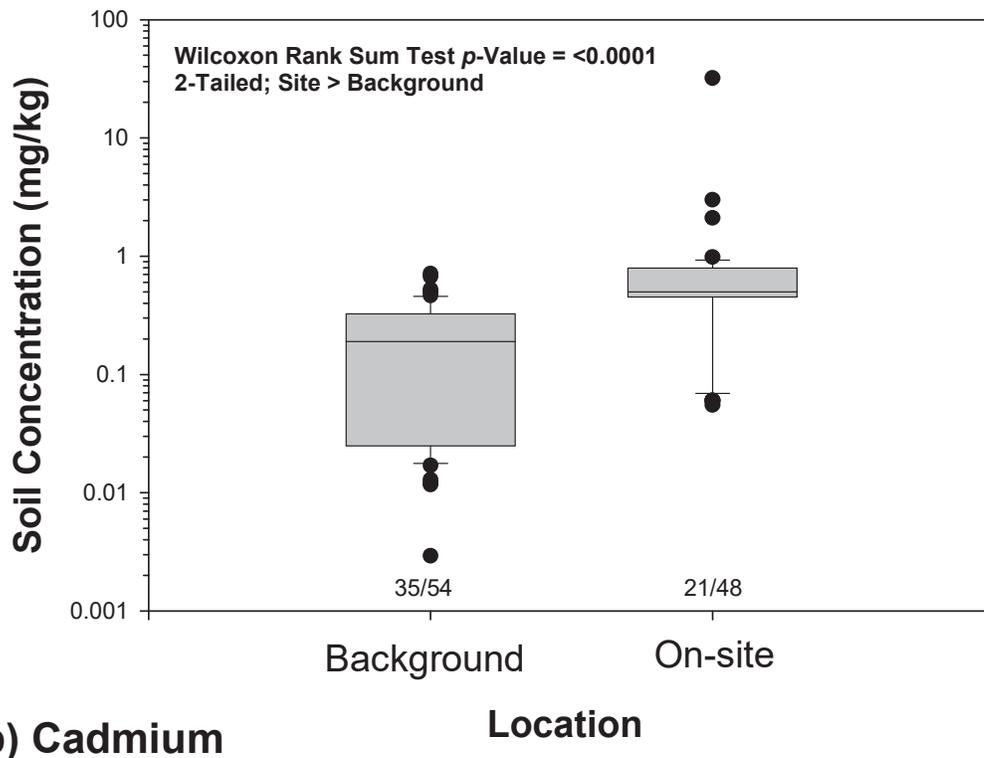


b) Barium

Figure B-3. Comparison of distributions of on-site and background concentrations of a) arsenic and b) barium at the Thermal Treatment Unit, Hill Air Force Base, Utah. On-site data includes samples through 2004.



a) Beryllium



b) Cadmium

Figure B-4. Comparison of distributions of on-site and background concentrations of a) beryllium and b) cadmium at the Thermal Treatment Unit, Hill Air Force Base, Utah. On-site data includes samples through 2004.

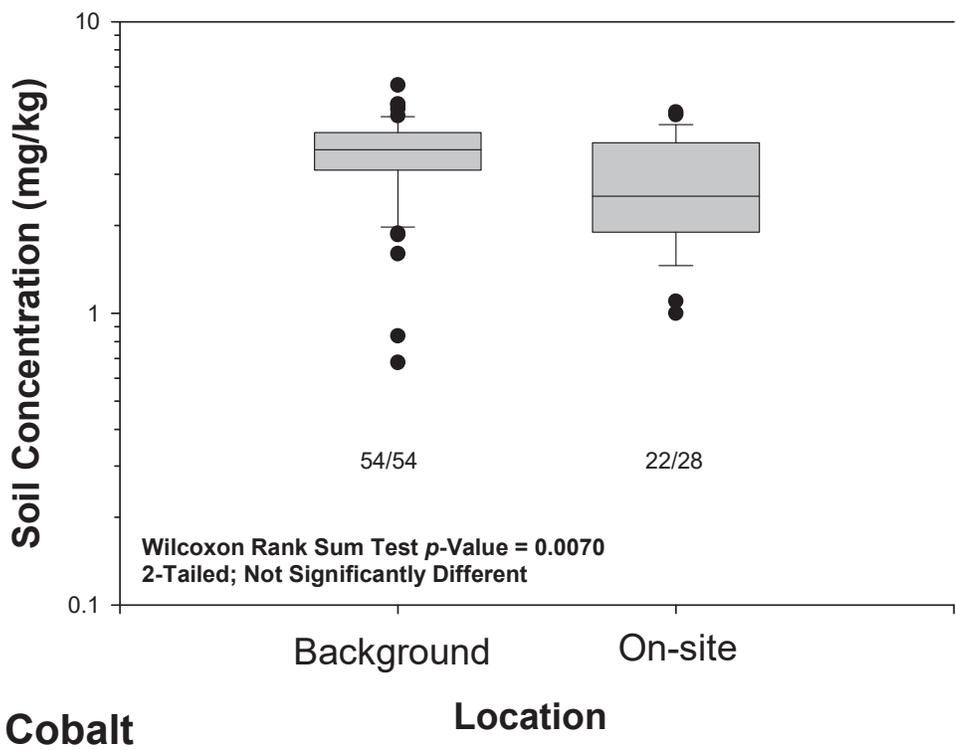
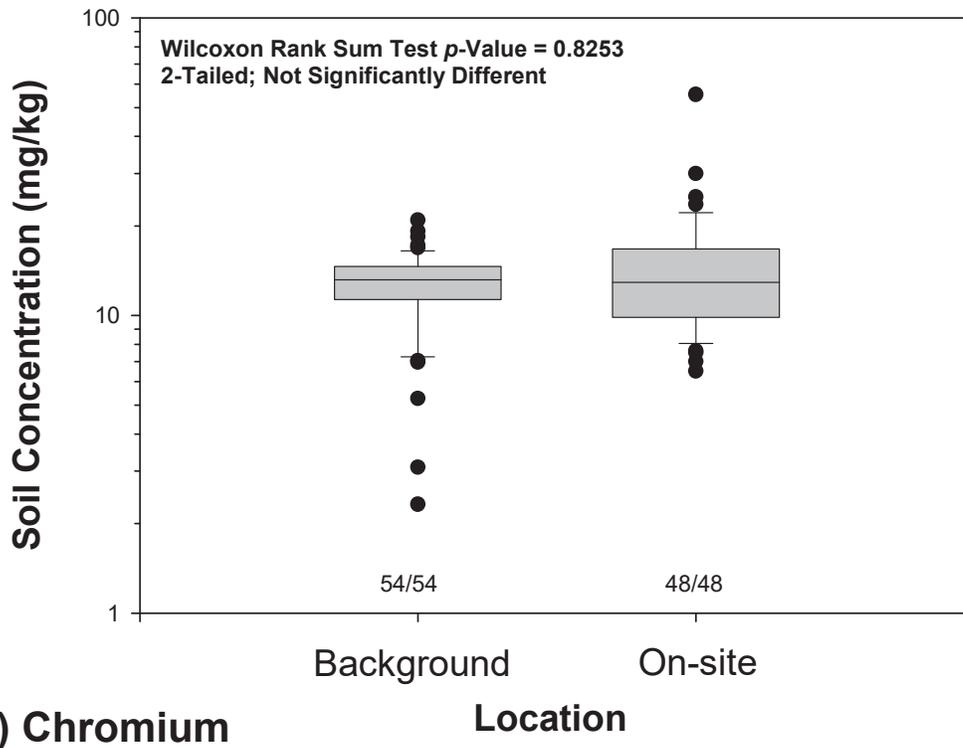
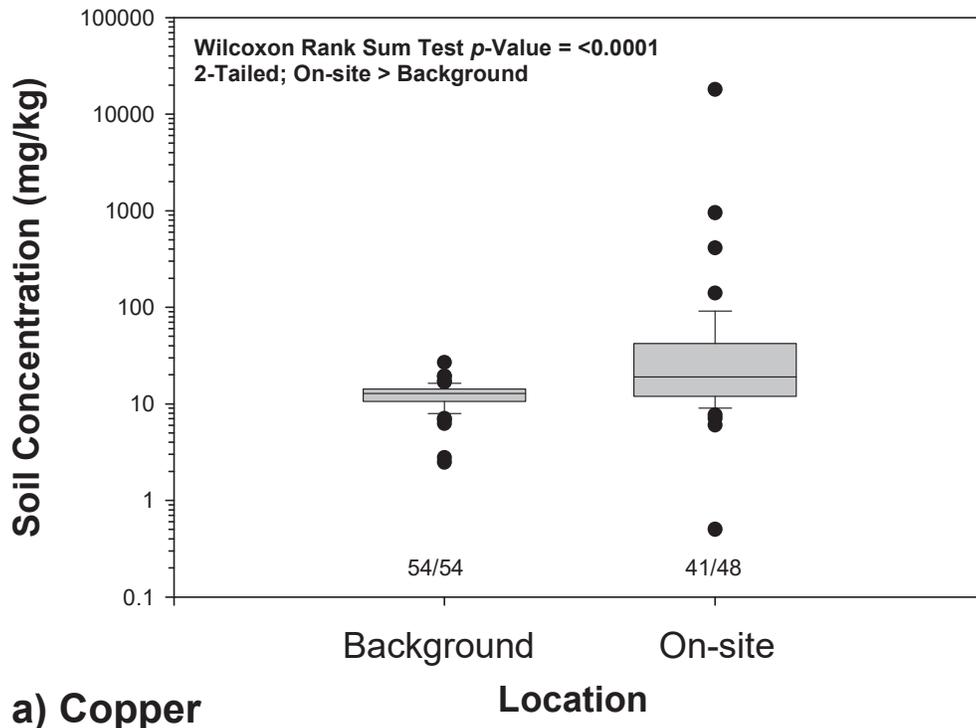
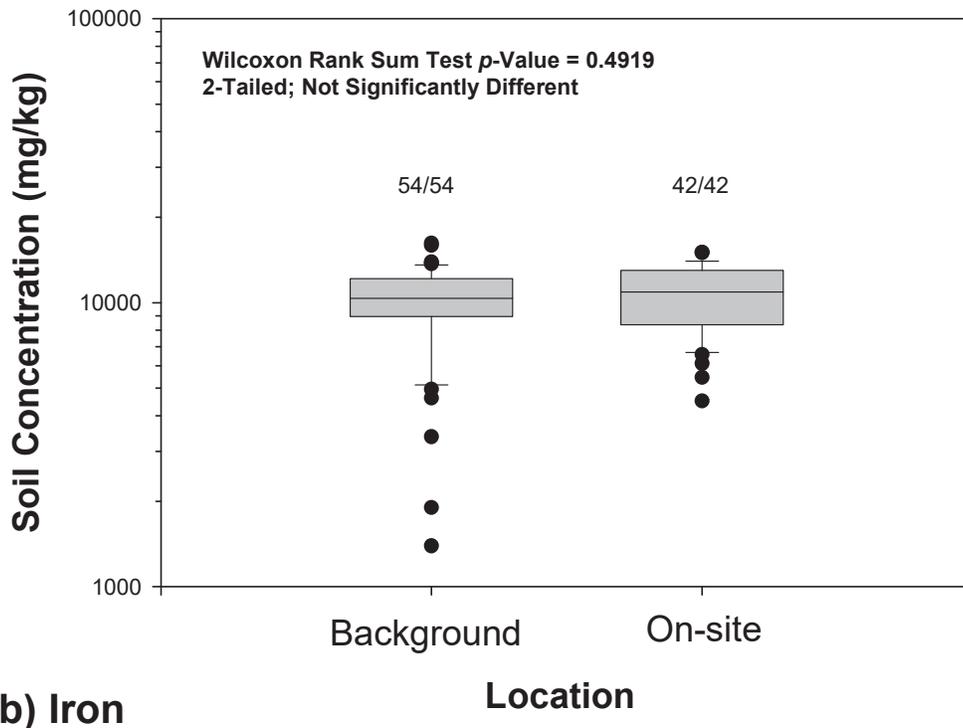


Figure B-5. Comparison of distributions of on-site and background concentrations of a) chromium and b) cobalt at the Thermal Treatment Unit, Hill Air Force Base, Utah. On-site data includes samples through 2004.



a) Copper



b) Iron

Figure B-6. Comparison of distributions of on-site and background concentrations of a) copper and b) iron at the Thermal Treatment Unit, Hill Air Force Base, Utah. On-site data includes samples through 2004.

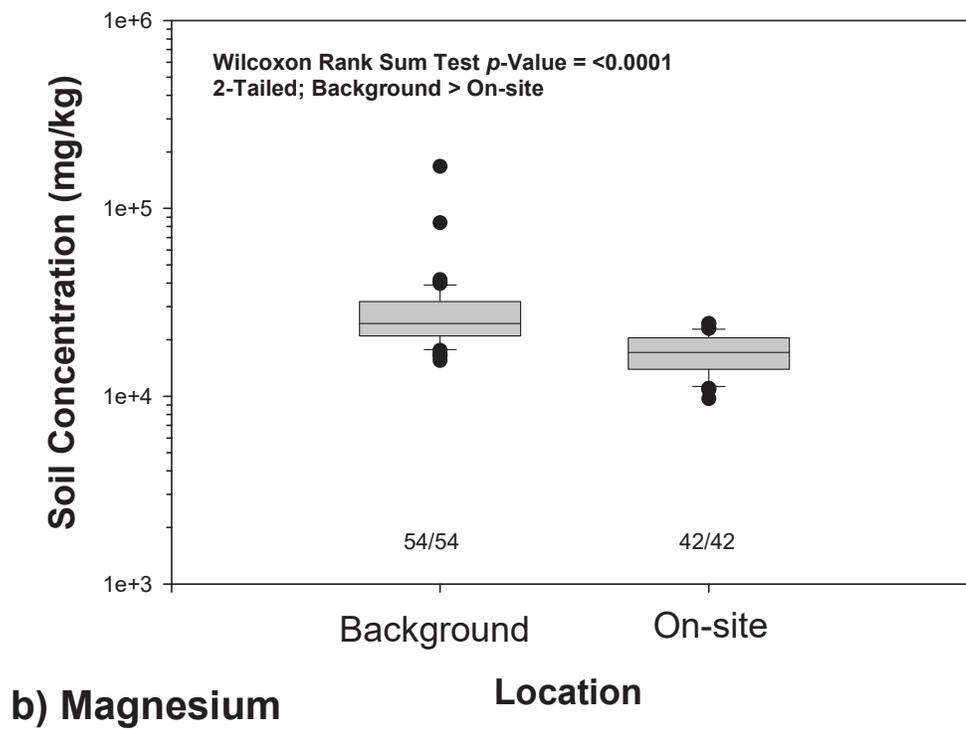
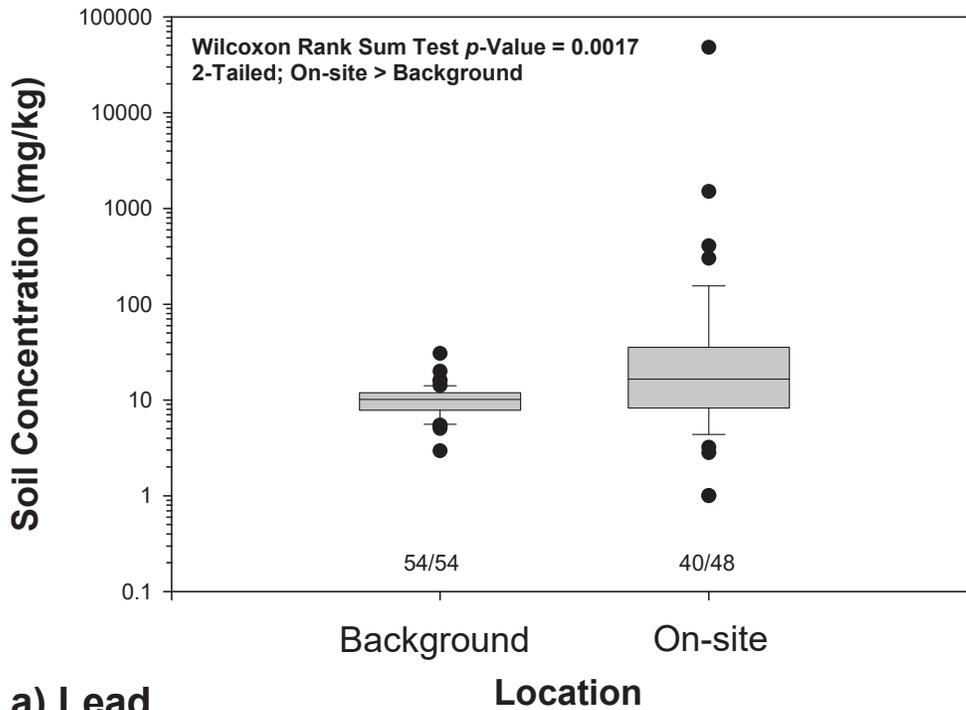
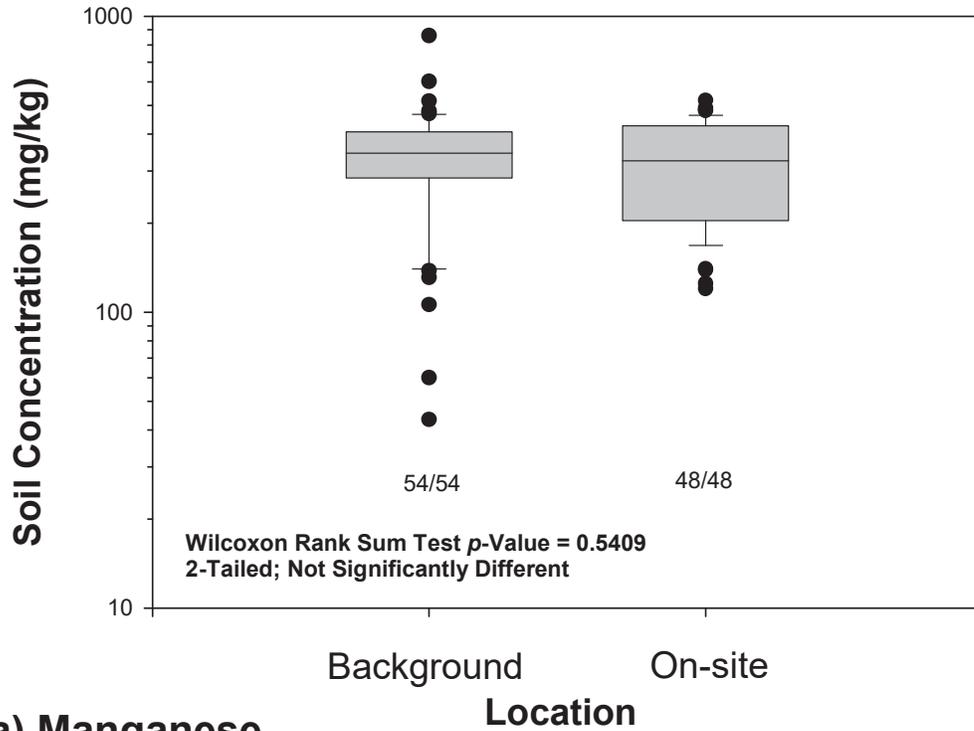
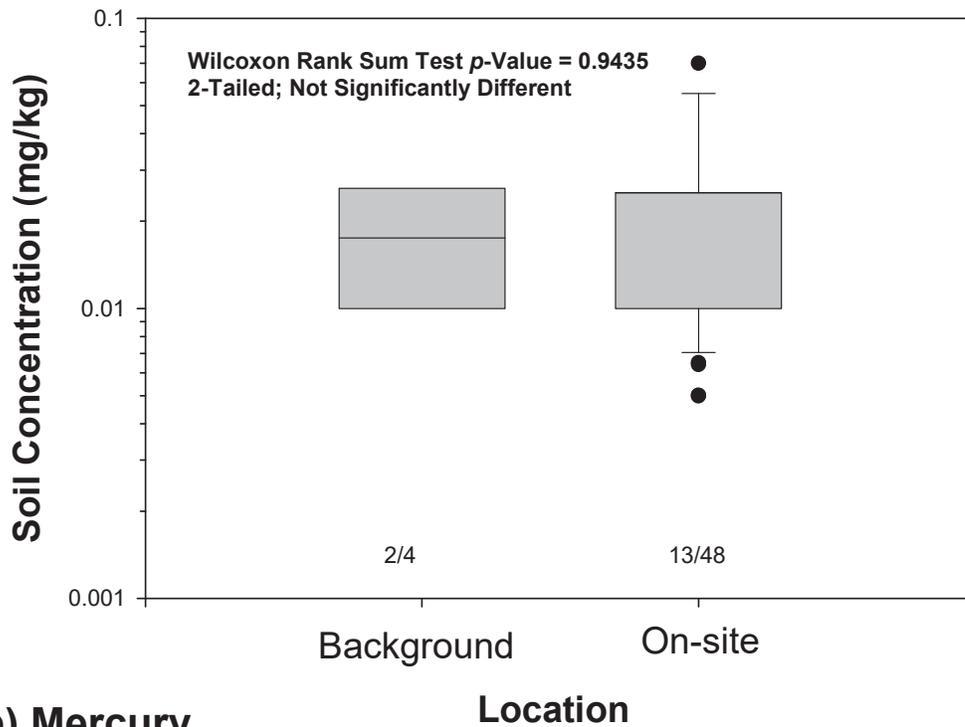


Figure B-7. Comparison of distributions of on-site and background concentrations of a) lead and b) magnesium at the Thermal Treatment Unit, Hill Air Force Base, Utah. On-site data includes samples through 2004.

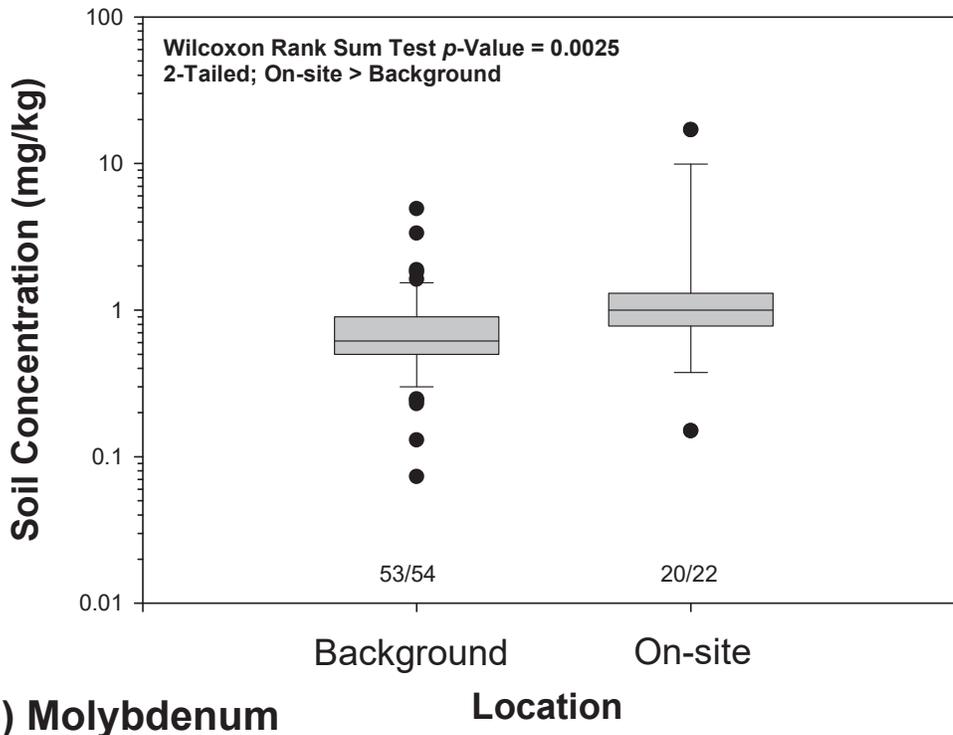


a) Manganese

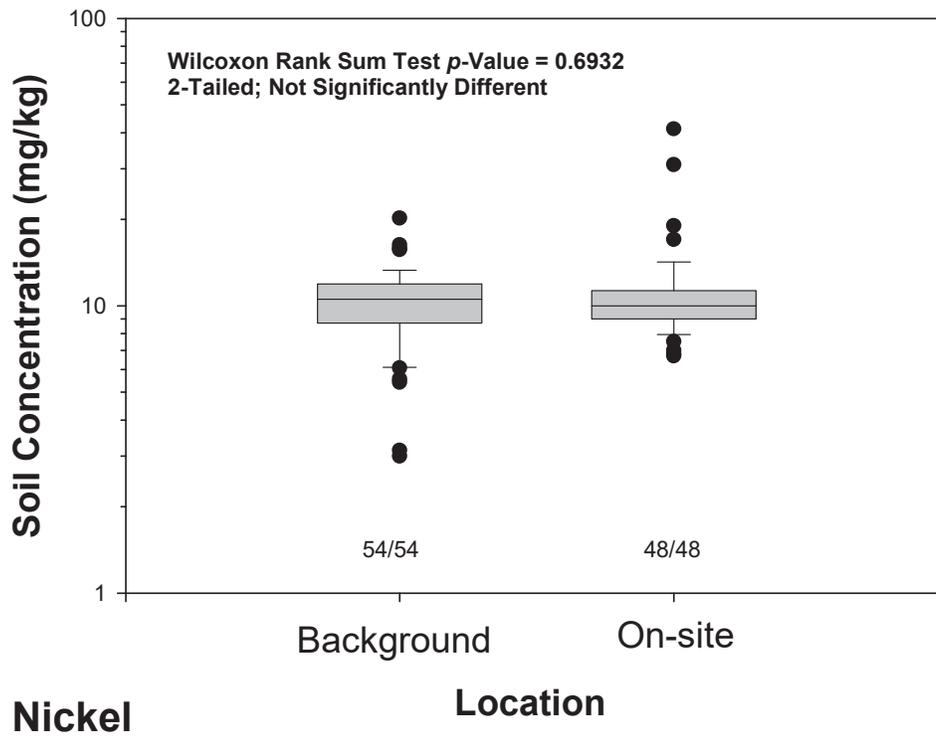


b) Mercury

Figure B-8. Comparison of distributions of on-site and background concentrations of a) manganese and b) mercury at the Thermal Treatment Unit, Hill Air Force Base, Utah. On-site data includes samples through 2004.



a) Molybdenum



b) Nickel

Figure B-9. Comparison of distributions of on-site and background concentrations of a) molybdenum and b) nickel at the Thermal Treatment Unit, Hill Air Force Base, Utah. On-site data includes samples through 2004.

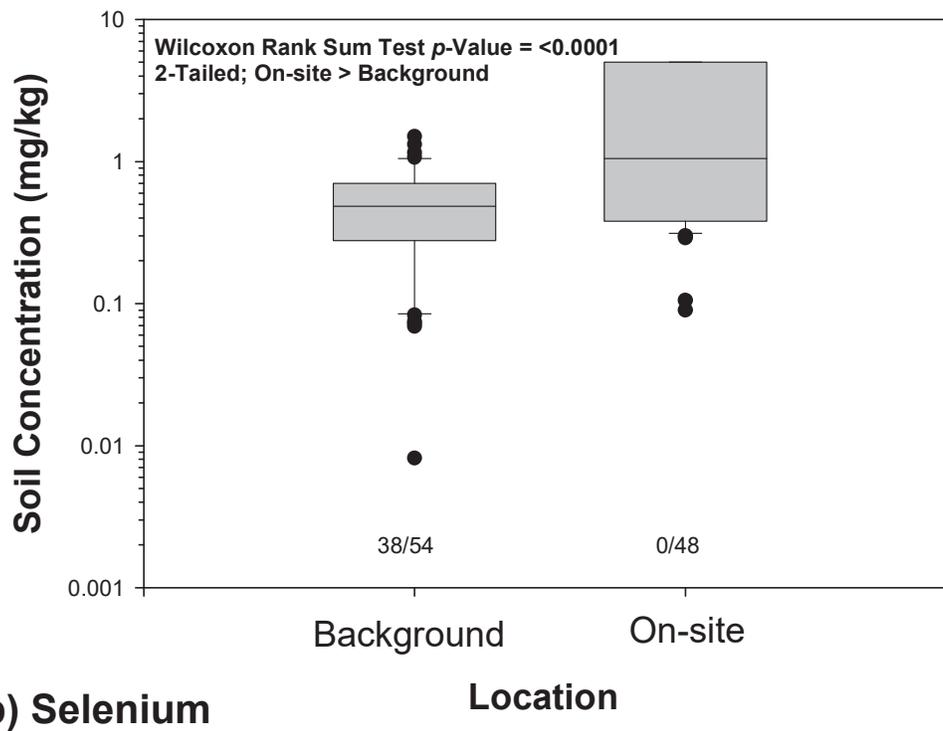
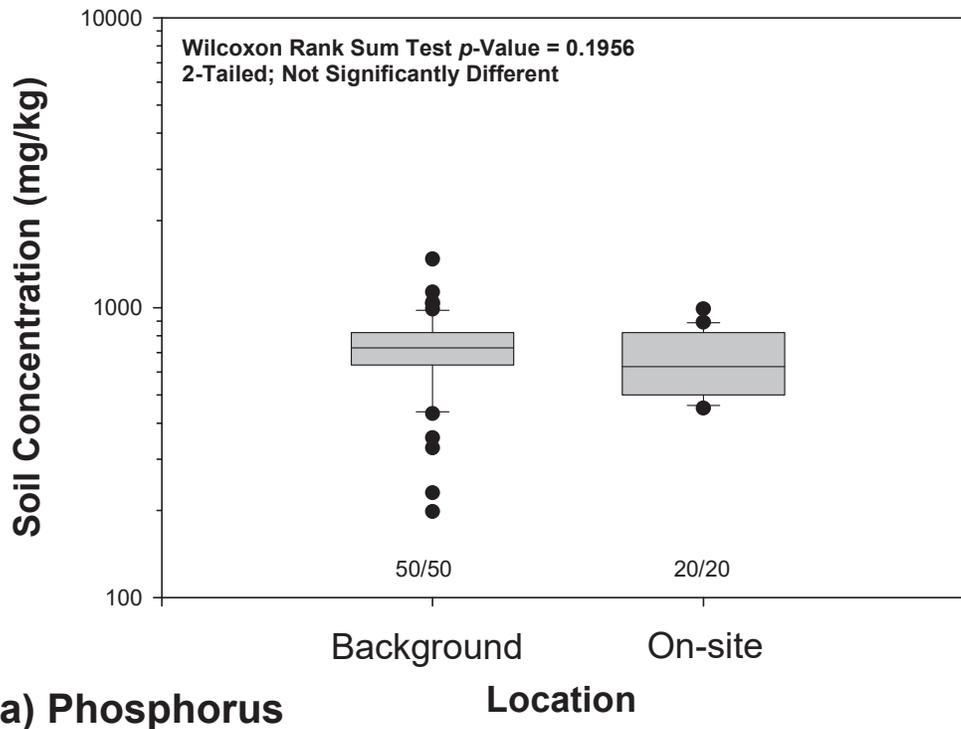
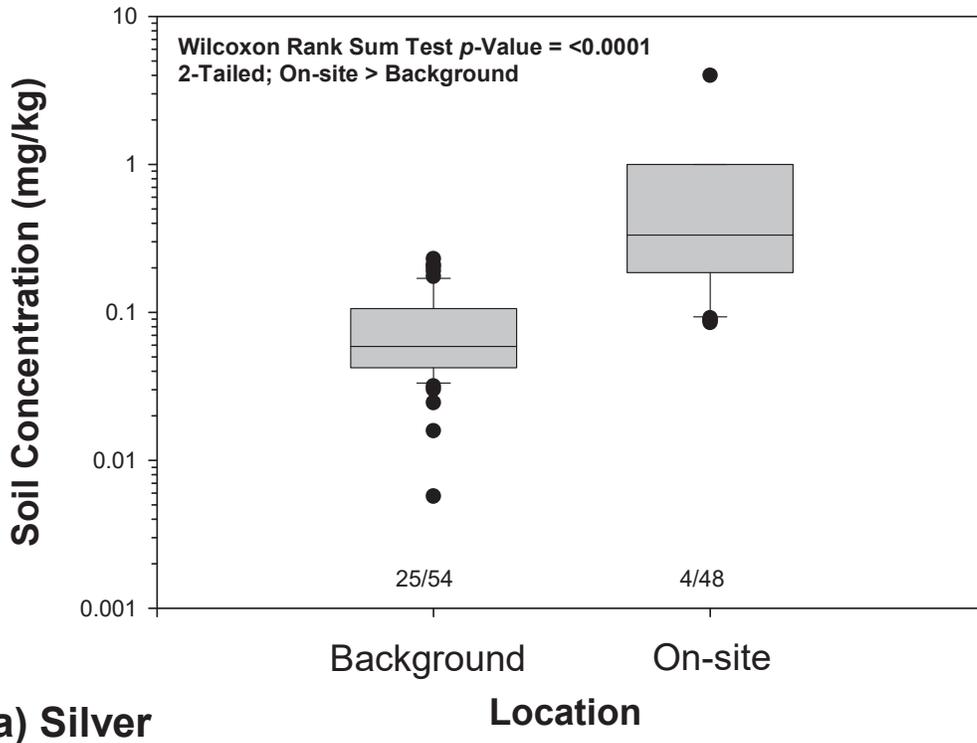
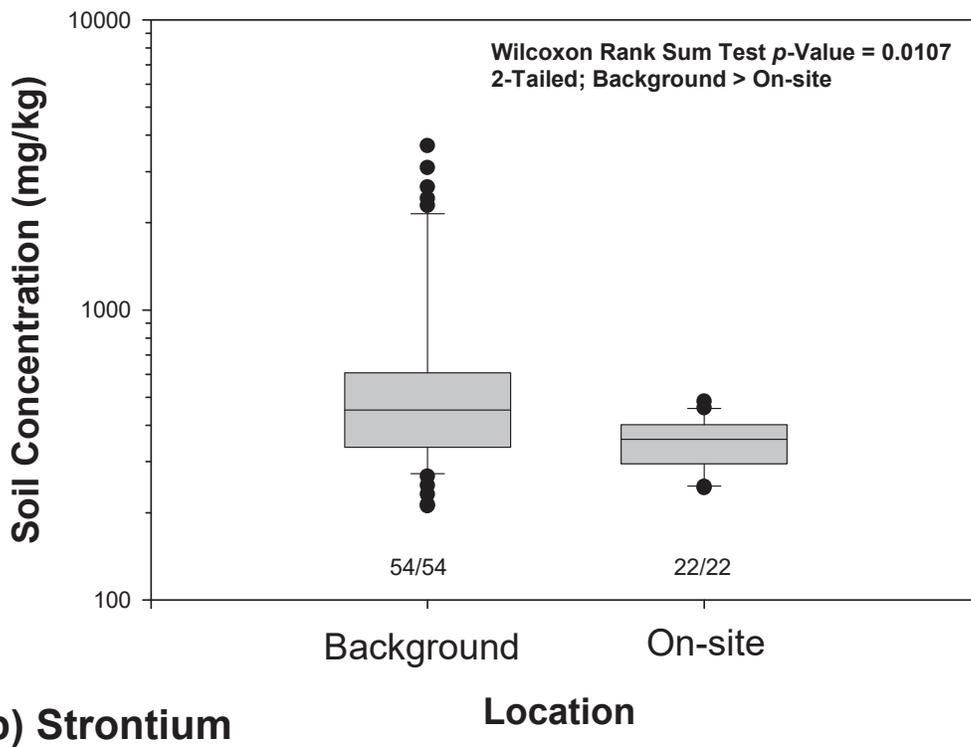


Figure B-10. Comparison of distributions of on-site and background concentrations of a) phosphorus and b) selenium at the Thermal Treatment Unit, Hill Air Force Base, Utah. On-site data includes samples through 2004.

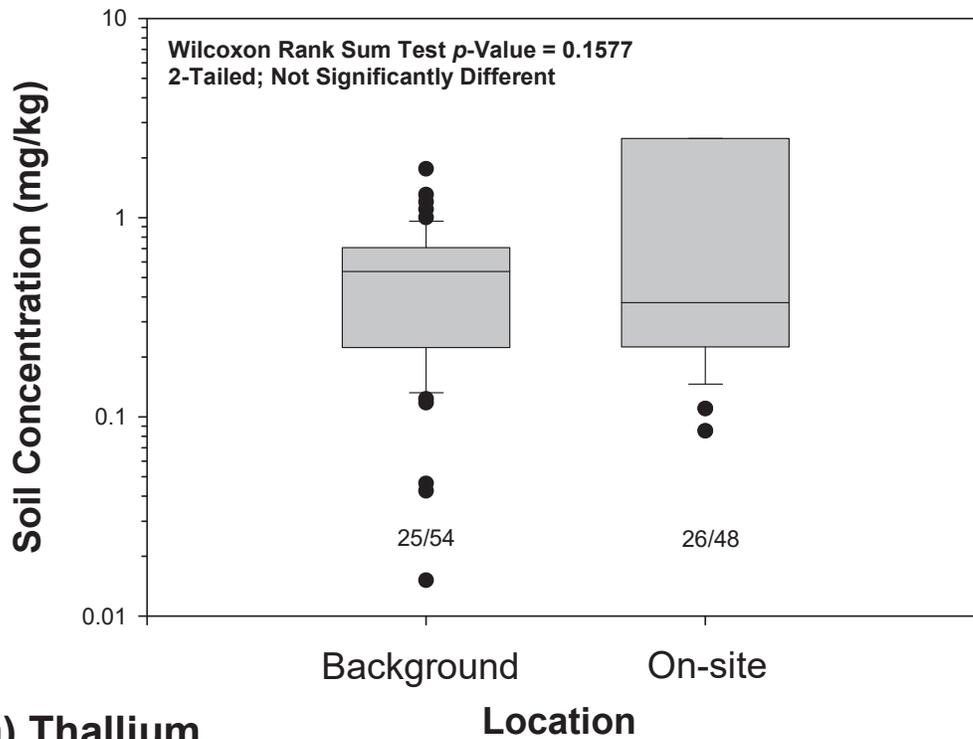


a) Silver

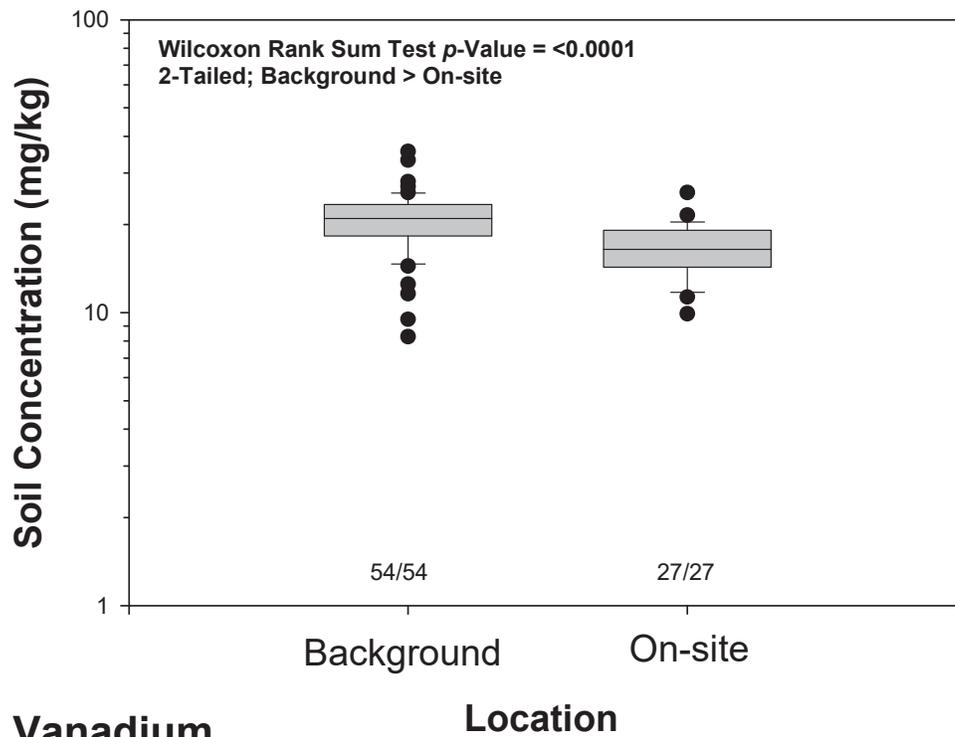


b) Strontium

Figure B-11. Comparison of distributions of on-site and background concentrations of a) silver and b) strontium at the Thermal Treatment Unit, Hill Air Force Base, Utah. On-site data includes samples through 2004.



a) Thallium



b) Vanadium

Figure B-12. Comparison of distributions of on-site and background concentrations of a) thallium and b) vanadium at the Thermal Treatment Unit, Hill Air Force Base, Utah. On-site data includes samples through 2004.

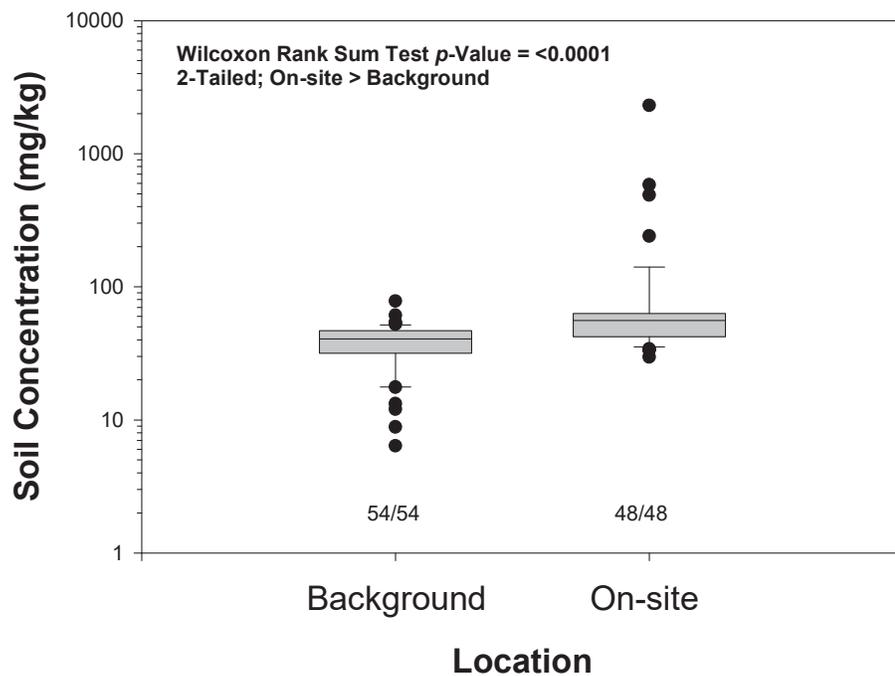


Figure B-13. Comparison of distributions of on-site and background concentrations of zinc at the Thermal Treatment Unit, Hill Air Force Base, Utah. On-site data includes samples through 2004.

Appendix C



Hill Air Force Base, Utah

75 CEG/CEIE

Final
Utah Test and Training Range Thermal Treatment Unit
2022 Ecological Risk Screen Evaluation

Contract No.: W9123822C0011

January 2023

FINAL

Utah Test and Training Range Thermal
Treatment Unit
2022 Ecological Risk Screen Evaluation
Contract No.: W9123822C0011

Prepared for:

Hill Air Force Base
75 CEG/CEIE
Environmental Branch
Civil Engineer Group

January 2023

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Executive Summary

ES.0.0.1 Hill Air Force Base has been conducting open burn/open denotation operations at the Utah Test and Training Range-North (U.S. Environmental Protection Agency Identification Number UT 0570090001) Thermal Treatment Unit (TTU) under a Resource Conservation and Recovery Act Part B permit issued by the Utah Department of Environmental Quality. Section II.F.2 of the permit requires a 5-year evaluation of ecological risks.

ES.0.0.2 Data collected from soil in 2019 and 2021 were evaluated to determine if potential risks to ecological receptors were consistent with the original 2005 evaluation (CH2M HILL, 2005) and any of the subsequent updates completed in 2007, 2011, 2013, and 2018 (CH2M Hill, 2007, 2011, 2013, 2018), or if new risks were present. Chemical concentrations detected in soil in 2019 and 2021 were compared to the maximum detected concentrations from all previous sampling events to determine if additional chemicals required evaluation. Nitroglycerin had higher maximum detected concentrations than previously sampled and was retained for evaluation of potential risk to terrestrial receptors. The initial screen used the maximum detected concentrations in soil and no observed effect concentrations/no observed adverse effect levels to estimate potential toxicity to terrestrial plants, terrestrial invertebrates, birds, or mammals. The initial screening and produced hazard quotients greater than 1 for terrestrial invertebrates. Hazard quotients were less than 1 for terrestrial plants and mammals. Toxicity reference values were not available for birds; however, studies indicate that nitroglycerin is not toxic to birds under environmental conditions (Williams et al., 2015).

ES.0.0.3 Data from 2019 and 2021 were evaluated on a sample-by-sample basis for potential risks from nitroglycerin to terrestrial invertebrates in the refined screen. Of the 14 samples collected (including 2 field duplicates), 1 sample showed nitroglycerin concentrations exceeding the no observed effect concentration. However, there were no exceedances of the lowest observed effect concentration. Potential risk to terrestrial invertebrates is considered low, especially given the active use of the site, therefore nitroglycerin was not retained as a chemical of ecological concern.

ES.0.0.4 The overall conclusion of the evaluation of 2019 and 2021 data is that potential risks to ecological receptors are within range of previously measured results and no analytes are retained as chemicals of ecological concern.

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Acronyms and Abbreviations

--	not available
µg/L	microgram(s) per liter
BAF	bioaccumulation factor
CH2M HILL	CH2M HILL, Inc.
COPEC	chemical of potential ecological concern
det	detects
DW	dry weight
EPA	U.S. Environmental Protection Agency
ERA	ecological risk assessment
HMX	cyclotetramethylene tetranitramine
HQ	hazard quotient
LOAEL	lowest observed adverse effect level
LOEC	lowest observed effect concentration
kg	kilogram(s)
kg/kg/d	kilogram(s) per kilogram per day
mg/kg	milligram(s) per kilogram
mg/kgbw-d	milligram(s) per kilogram per body weight per day
mg/kg/d	milligram(s) per kilogram per day
MIDAS	Munitions Items Disposition Action System database
n	number of samples
N/A	not applicable
ND	not detected
NOAEL	no observed adverse effect level
NOEC	no observed effect concentration
NSV	no screening value available
PAH	polynuclear aromatic hydrocarbon
RCRA	Resource Conservation and Recovery Act
PETN	pentaerythrite trinitromine
RDX	cyclotrimethylene trinitromine
SLERA	screening-level ecological risk assessment
SVOC	semivolatile organic compound
TPH	total petroleum hydrocarbon
TRV	toxicity reference value
TTU	Thermal Treatment Unit
UDEQ	Utah Department of Environmental Quality
VOC	volatile organic compound

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General

1.0.0.1 Hill Air Force Base has been conducting open burn/open denotation operations at the Utah Test and Training Range-North (U.S. Environmental Protection Agency [EPA] identification [ID] Number UT 0570090001) Thermal Treatment Unit (TTU) under a Resource Conservation and Recovery Act Part B permit issued by the Utah Department of Environmental Quality (UDEQ). Section II.F.2 of the permit requires an evaluation of ecological risks every 5 years. A screening-level ecological risk assessment (SLERA) was completed and submitted in 2005 (CH2M HILL, 2005) with subsequent evaluations in 2007, 2009, 2011, 2013, and 2018 (CH2M HILL, 2007, 2009, 2011, 2013, and 2018).

1.0.0.2 The risk assessment must be evaluated every 5 years with the biennial soil sampling data. This SLERA was conducted using procedures outlined in the *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments* (EPA, 1997) and incorporates site data collected in 2019 and 2021.

1.0.0.3 This evaluation of the completeness and accuracy of the Ecological Risk Assessment (ERA) (Attachment 10A of the permit) has been prepared and is being submitted to UDEQ as required by Condition II.F of the Resource Conservation and Recovery Act (RCRA) permit. This evaluation includes a review of the chemicals in Attachment 10A (ecological risk) with respect to updates in the Munitions Items Disposition Action System database (MIDAS) or other relevant emission data; a review of the toxicity information in Attachment 10A; and any new or updated toxicity data. This 2022 evaluation includes a review of the environmental sampling data acquired since the last evaluation and discusses how the new data affect the risk assessments in Attachment 10A.

1.0.0.4 No new waste streams have been included in TTU operations since the 2013 risk assessment evaluations were performed and waste streams such as small munitions and dunnage have been halted. The burn pan used to treat those waste streams has been removed. Missile or rocket motors such as the Polaris (A-3) and Antares IIB x-259 have been treated at the TTU and were addressed in the last evaluation. These are not new waste streams and are consistent with the Hazard Class 1.1, double base propellant (non-lead bearing) waste stream that comprises the majority of the TTU workload. It should be noted that there are no more Polaris A-3 motors known to be in inventory or awaiting disposal.

1.1 Evaluation of the Risk Assessments

1.1.0.1 This evaluation of the completeness and accuracy of the ERA (Attachment 10A of the permit) has been prepared and is being submitted to UDEQ as required by Condition II.F of the RCRA permit. This evaluation includes a review of the chemicals in Attachment 10A (ecological risk) with respect to updates in the MIDAS database or other relevant emission data; a review of the toxicity information in Attachment 10A; and any new or updated toxicity data. This 2022 evaluation includes a review of the environmental sampling data acquired since the last evaluation and discusses how the new data affect the risk assessments in Attachment 10A.

1.1.0.2 The treatment of a single MOAB by OD on the TTU was reported as a new waste stream in the 2020 Waste Characterization Technical Memo. The MOAB weapon system can use either tritonal or H-6 explosive fill. While the MOAB weapon system is identified as a new waste stream since 2018, the ingredients of both tritonal and H-6 explosives are included in the historic and current waste streams treated at the TTU.

1.1.0.3 The conclusions of the 2005 SLERA (CH2M HILL) were that potential for risks from chemicals in soil over the entire TTU site could not be excluded for zinc to plants; total petroleum hydrocarbons (TPH) to plants and invertebrates; and cyclotetramethylene tetranitramine (HMX), antimony, cadmium, copper,

lead, perchlorate, 2-methylnaphthalene, fluorene, total polynuclear aromatic hydrocarbons (PAHs), and acetone to one or more wildlife receptors. Samples driving the potential for risks to receptors were generally associated with open burning/open detonation areas and did not represent the potential for risks in the surrounding wildlife habitat areas of the site due to incomplete exposure pathways.

1.1.0.4 One outcome of the 2005 SLERA was that soil samples would be collected at the conclusion of disposal activities each year to monitor any changes in contaminant concentrations and distribution due to TTU operations. Additional soil data have been collected annually starting in 2005 and analyzed for energetics and metals. These additional data are evaluated relative to the previous onsite data and the results of the 2005 and subsequent SLERAs to determine whether risk conclusions could potentially change as a result of the new data. Because the most recent data (2005 to present) have been collected as composite samples as opposed to discrete samples, they were not pooled with data from 2004 and earlier (which were discrete samples). Rather, the post-2004 data were evaluated independently. Annual soil sampling was conducted from 2004 to 2013 with biennial sampling conducted since 2013 (in 2015, 2017, 2019, and 2021). SLERA evaluations were conducted every 2 years from 2007 to 2013 and are now being performed every 5 years.

1.1.0.5 The 2007 SLERA evaluation (based on 2005-2006 data) and the 2009 SLERA evaluation (based on 2007-2008 data) concluded that cadmium, chromium, and vanadium in soil exceed the target hazard quotient (HQ) of 1 for terrestrial plants, terrestrial invertebrates, or some small mammals. The 2011 SLERA evaluation (based on 2009 to 2010 data) concluded that mercury in soil exceeded the target HQ of 1 for plants and invertebrates; however, none of these data are different from background (in the case of chromium, mercury, and vanadium) or display only minimal levels of exceedance (cadmium). The 2013 SLERA evaluation (based on 2011 and 2012 data) concluded that RDX in soil exceeded target HQs for mammals, but potential risks were driven by a single slightly elevated detect. The 2018 SLERA evaluation (based on 2013, 2015, and 2017 data) concluded that perchlorate posed a limited risk to terrestrial invertebrates, however, only one sample (2013) exceeded the previous site maximum.

In addition, a single sample from 2008 was analyzed for dioxin/dibenzofuran congeners. No exceedance of the tetrachlorodibenzodioxin toxic equivalency quotient was observed for this sample for any receptor. It should be noted that the sampling efforts conducted from 2013 to present focused on metals and energetic compounds. The 2005 SLERA identified TPH, acetone, and PAHs in soil as potential risk drivers. The absence of new data for these other analytes precludes any new conclusions; consequently, they are still considered potential risk drivers.

The overall conclusion of the 2007, 2009, 2011, 2013 and 2018 SLERA evaluations is that calculated ecological risk is not greater than that estimated previously for the TTU or is not considered to be unacceptable.

1.1.0.6 Surface water was not evaluated in any of the earlier SLERAs (2005 through 2009). A heavy rain event in August 2012 resulted in the accumulation of surface water runoff in one of the detonation craters. The presence of surface water in the crater provided a complete exposure pathway for aquatic organisms including aquatic plants (e.g., algae) and aquatic invertebrates (e.g., water boatman, water skippers, snails, and insect nymphs) that may reside in standing water. Surface water may also provide a complete exposure pathway for birds and mammals as a drinking water source. Surface water was collected from the crater in 2012 and evaluated for potential risks in the 2013 SLERA. No accumulations of surface water have been observed at the site since 2013. Therefore, surface water was not evaluated in the 2018 SLERA or this 2022 SLERA.

1.1.0.7 This report summarizes the SLERA evaluation performed based on the newest data (2019 and 2021) from the TTU.

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Approach

2.0.0.1 Rather than performing the SLERA anew for all analytes and receptors with the most recent data collected (2019 and 2021), a multistep process was used to identify and evaluate potential risks for data collected after the previous SLERA update. Four criteria were considered:

- Identification of analytes that require evaluation of potential risks to ecological receptors.
 - Comparison of maximum detected concentrations from 2019 and 2021 versus the maximum site detection from all previous sampling events (2005 through 2017). Maximum detected concentrations in the 2019 and 2021 data greater than those observed in the previous data suggest the potential for a changed risk conclusion.
 - Analyte was retained as a potential risk driver during the original 2005 SLERA or any subsequent SLERA updates.
- Comparison of 2019 and 2021 data to background concentrations (performed only for metals with new maximum detected concentrations exceeding previous maximums):
 - Concentrations of inorganic analytes that are not statistically significantly different from background concentrations generally indicate ambient levels and are not considered further in the evaluation.
 - If 2019 and 2021 concentrations are not different from background, the likelihood that they represent site-associated contamination and, thus, potential risk is low.
- Initial screen of analytes for potential risk for ecological receptors using maximum detected concentrations and no observed effect concentrations (terrestrial plants and invertebrates) and no observed adverse effect levels (birds and mammals).
 - All analytes judged to require further evaluation were screened using the methods previously employed in the initial SLERA (CH2M HILL, 2005). Exposure and toxicity assumptions were reviewed and updated as needed to ensure the SLERA used the most recent information.
 - If hazard quotients for the initial screen are below 1, potential risk to that receptor is considered low and analyte is not retained for any further evaluation.
 - If hazard quotients in the initial screen exceed 1, potential risk for that receptor may exist and analytes are retained for further evaluation in the refined screen.
- Refined screen of analytes with hazard quotients exceeding 1 under the initial screen.
 - Refined risk estimates for terrestrial plants or invertebrates are based on the sample-specific results and the low observed ecological concentration.
 - Refined risk estimates for birds and mammals are based on the 95 percent upper confidence level and the low observed adverse effect concentration.

2.0.0.2 Results for each step are evaluated to determine if there are any new risk drivers or if any further evaluation is needed at this time.

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Results

3.1 Selection of Analytes for Additional Evaluation

3.1.0.1 Comparison of maximum detected concentrations for analytes evaluated in soil from 2019 and 2021 to the maximum detected concentrations of all previous years combined are presented in Table 3-1. Nitroglycerin was the only analyte with a maximum detected concentration greater than the site maximum from all previous sampling events.

3.1.0.2 A summary of risk drivers from each of the previous SLERA updates is presented in Table 3-2 along with the one analyte noted in the preceding section with greater maximum detects in 2019 and 2021 sampling events. Analytes requiring further evaluation were identified using the criteria outlined in Section 2.

- Nitroglycerin – Retained for further evaluation in this 2018 SLERA update since maximum detected concentrations are greater than previous data.
- Antimony, cadmium, chromium, copper, lead, vanadium, zinc, and perchlorate – Additional evaluation of these analytes in this 2022 SLERA update was not warranted since the maximum detected concentrations for 2019 and 2021 were below previously measured levels. These analytes continue to be retained as risk drivers on the basis of their previous SLERA results.
- Mercury and RDX – Additional evaluation of these analytes in this 2022 SLERA update was not warranted since the maximum detected concentrations for 2019 and 2021 were below previously measured levels. These analytes were retained on the basis of their previous SLERA updates.
- Acetone, dioxins/dibenzofurans, 2-methylnaphthalene, fluorene, total PAHs, and TPHs – New data were not collected during 2013 through 2017 sampling events. These analytes continue to be retained as risk drivers on the basis of their previous SLERA results.

3.2 Initial Screen

3.2.0.1 Methods and parameters employed to perform the SLERAs submitted in 2005 (CH2M HILL, 2005), 2007 (CH2M HILL, 2007), 2009 (CH2M HILL, 2009), 2011 (CH2M HILL, 2011), 2013 (CH2M HILL, 2013), and 2018 (CH2M HILL, 2018) were applied to the 2019 and 2021 soils data. Screening values for terrestrial plants, terrestrial invertebrates, birds, and mammals for the retained analytes were reviewed and updated where new toxicity values were available from reputable sources. Toxicity benchmarks and values are summarized in Tables 3-3 through 3-6. Bioaccumulation factors used to estimate contaminant uptake into food items for birds and mammals are presented in Table 3-7. Parameters for estimation of dietary exposures for birds and mammals are summarized in Table 3-8. The initial screens for each receptor used the maximum detected concentrations of retained analytes, uptake factors, and no observed effect concentrations (NOECs) or no observed adverse effect levels (NOAELs) as summarized in the following sections.

3.2.0.2 Terrestrial Plants and Invertebrates. Initial risk screens for terrestrial plants and invertebrates are presented in Table 3-9. The no observed effect concentration (NOEC) HQs for nitroglycerin exceeded 1 for terrestrial invertebrates and it was retained for further evaluation in the refined screen. Nitroglycerin NOEC HQs were less than 1 for terrestrial plants and it was not retained for further evaluation for this receptor group.

3.2.0.3 Birds and Mammals. Initial screens for birds and mammals are presented in Table 3-10. Risk estimates for birds and mammals include uptake from incidental ingestion of soil and ingestion of dietary items (forage or prey) that may have accumulated chemicals of potential ecological concern (COPECs) from soil. The no observed adverse effect level (NOAEL) HQs for mammals did not exceed 1 for nitroglycerin. Toxicity reference values were not available for birds however, studies indicate that nitroglycerin is not toxic to birds under environmental conditions (Williams et al., 2015).

3.3 Refined Screen

3.3.0.1 Methods and parameters employed to perform the SLERAs submitted in 2005 (CH2M HILL, 2005), 2007 (CH2M HILL, 2007), 2009 (CH2M HILL, 2009), 2011 (CH2M HILL, 2011), 2013 (CH2M HILL, 2013), and 2018 (CH2M HILL, 2018) were used to perform the refined screen. Analyte/receptor combinations that were retained at the conclusion of the initial screen were evaluated in the refined screen. For the 2019 and 2021 data, refinement was limited to nitroglycerin exposure to terrestrial invertebrates. The refined evaluation for terrestrial invertebrates is a point-by-point comparison of sample results against the NOEC and the lowest observed effect concentration (LOEC) due to the limited mobility of this receptor group. Toxicity benchmarks for terrestrial invertebrates were summarized in Table 3-4.

3.3.0.2 Terrestrial Invertebrates. The refined risk screen for terrestrial invertebrates potentially exposed to nitroglycerin is presented in Table 3-11. Nitroglycerin was only detected in 3 of 14 samples of which only 1 sample had concentrations exceeding the NOEC. None of the detected concentrations exceeded the LOEC. Potential risks to terrestrial invertebrates are considered low. Nitroglycerin was not retained as a chemical of ecological concern.

Table 3-1. Comparison of New (2019-2021) and Historical (1989 through 2017) Analytical Results
Thermal Treatment Unit 2022 Ecological Risk Screening Evaluation

Analyte Type	Analyte	Units	Site Maximum - All Years (1989 through 2017)	2019-2021 Data			New Maximum > Previous Site Maximum (All Years)?
				Number of Detects	Number of Samples	Maximum Detect	
Soil							
Metals	Aluminum	mg/kg	54000 (1991)	14	14	18000	No
Metals	Antimony	mg/kg	166.93 (2004)	8	14	0.66	No
Metals	Arsenic	mg/kg	41.3 (2002)	14	14	7	No
Metals	Barium	mg/kg	640 (1991)	14	14	270	No
Metals	Beryllium	mg/kg	0.98 (2007)	14	14	0.73	No
Metals	Cadmium	mg/kg	32 (1991)	14	14	0.67	No
Metals	Chromium	mg/kg	100 (2005)	14	14	15	No
Metals	Cobalt	mg/kg	4.9 (2002)	14	14	4.2	No
Metals	Copper	mg/kg	18000 (1991)	14	14	18	No
Metals	Iron	mg/kg	15000 (2004)	14	14	13000	No
Metals	Lead	mg/kg	48000 (1991)	14	14	17	No
Metals	Manganese	mg/kg	519 (2002)	14	14	500	No
Metals	Mercury	mg/kg	0.46 (2009)	10	14	0.015	No
Metals	Molybdenum	mg/kg	56 (2007)	14	14	2.8	No
Metals	Nickel	mg/kg	41.3 (2004)	14	14	12	No
Metals	Phosphate	mg/kg	1.8 (2007)	N/A	N/A	N/A	N/A
Metals	Selenium	mg/kg	5 (1991)	14	14	0.23	No
Metals	Silver	mg/kg	4 (1989)	14	14	0.23	No
Metals	Strontium	mg/kg	650 (2011)	14	14	420	No
Metals	Thallium	mg/kg	2.5 (1991)	14	14	0.22	No
Metals	Vanadium	mg/kg	28 (2005)	14	14	24	No
Metals	Zinc	mg/kg	2300 (1991)	14	14	48	No
Inorganic	Perchlorate	mg/kg	81 (2013)	13	14	9.6	No
Energetic	1,3,5-Trinitrobenzene	mg/kg	0.2 (2005RA)	0	14	<0.014	No
Energetic	1,3-Dinitrobenzene	mg/kg	No Detections (0.2 used)	0	14	<0.017	No
Energetic	2,4,6-Trinitrotoluene	mg/kg	2.2 (2013)	0	14	<0.031	No
Energetic	2,4-Dinitrotoluene	mg/kg	10.5 (1989)	3	14	0.76	No
Energetic	2,6-Dinitrotoluene	mg/kg	10.5 (1989)	1	14	0.019	No

Table 3-1. Comparison of New (2019-2021) and Historical (1989 through 2017) Analytical Results
Thermal Treatment Unit 2022 Ecological Risk Screening Evaluation

Analyte Type	Analyte	Units	Site Maximum - All Years (1989 through 2017)			2019-2021 Data			New Maximum > Previous Site Maximum (All Years)?
			Number of Detects	Number of Samples	Maximum Detect	Number of Detects	Number of Samples	Maximum Detect	
Energetic	2-Amino-4,6-dinitrotoluene	mg/kg	0	14	<0.033	0	14	<0.033	No
Energetic	2-Nitrotoluene	mg/kg	0	14	<0.047	0	14	<0.047	No
Energetic	3-Nitrotoluene	mg/kg	0	14	<0.064	0	14	<0.064	No
Energetic	4-Amino-2,6-dinitrotoluene	mg/kg	0	7	<0.03	0	7	<0.03	No
Energetic	4-Nitrotoluene	mg/kg	0	7	<0.037	0	7	<0.037	No
Energetic	HMX	mg/kg	4	14	1.1	4	14	1.1	No
Energetic	Nitrobenzene	mg/kg	0	14	<0.085	0	14	<0.085	No
Energetic	Nitroglycerin	mg/kg	3	14	15	3	14	15	Yes
Energetic	Nitroguanidine	mg/kg	0	14	<0.02	0	14	<0.02	No
Energetic	PETN	mg/kg	0	14	<0.49	0	14	<0.49	No
Energetic	Picric Acid	mg/kg	0	14	<0.056	0	14	<0.056	No
Energetic	RDX	mg/kg	1	14	0.052	1	14	0.052	No
Energetic	Tetryl	mg/kg	0	14	<0.044	0	14	<0.044	No

Notes:

µg/L = microgram(s) per liter
 HMX = cydotetramethylenetetranitramine
 N/A = not applicable, no new data to compare
 PAH = polynuclear aromatic hydrocarbon
 PETN = pentaerythrite trinitromine
 RDX = cyclotrimethylene trinitromine

2005RA=2005 Risk Assessment

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Table 3-2. Summary of Selection Criteria for Determination Whether to Revise Screening Evaluation Using 2019–2021 Data
Thermal Treatment Unit 2022 Ecological Risk Screening Evaluation

Analyte Group	Chemical of Potential Ecological Concern ^a	2019–2021 Data Summary										Rationale	
		Analyte was Retained in 2005 ERA?	Analyte was Retained in 2007 ERA?	Analyte was Retained in 2009 ERA?	Analyte was Retained in 2011 ERA?	Analyte was Retained in 2013 ERA?	Analyte was Retained in 2018 ERA?	2013–2017 Data Contain New Maximum Concentration?	Update Ecological Risk Screen?				
Soil													
GenChem	Sulfate	No	No	No	No	No	No	No	No	No	No	No	2019–2021 data within range of existing data; no change to conclusions.
Inorganic	Perchlorate	Yes—Wildlife	No	No	No	No	No	No	Yes—Soil Inverts	No	No	No	2019–2021 data within range of existing data; no change to conclusions.
Metals	Antimony	Yes—Wildlife	No	No	No	No	No	No	No	No	No	No	2019–2021 data within range of existing data; no change to conclusions.
Metals	Cadmium	Yes—Wildlife	Yes—Wildlife	Yes—Wildlife	No	No	No	No	No	No	No	No	2019–2021 data within range of existing data; no change to conclusions.
Metals	Chromium	No	Yes—Plants and Soil Inverts	Yes—Plants and Soil Inverts	No	No	No	No	No	No	No	No	2019–2021 data within range of existing data; no change to conclusions.
Metals	Copper	Yes—Wildlife	No	No	No	No	No	No	No	No	No	No	2019–2021 data within range of existing data; no change to conclusions.
Metals	Lead	Yes—Wildlife	No	No	No	No	No	No	No	No	No	No	2019–2021 data within range of existing data; no change to conclusions.
Metals	Mercury	No	No	No	Yes—Plants and Soil Inverts	No	No	No	No	No	No	No	2019–2021 data within range of existing data; no change to conclusions.
Metals	Vanadium	No	Yes—Plants	Yes—Plants	No	No	No	No	No	No	No	No	2019–2021 data within range of existing data; no change to conclusions.
Metals	Zinc	Yes—Plants only	No	No	No	No	No	No	No	No	No	No	2019–2021 data within range of existing data; no change to conclusions.
Energetic	2,4,6-Trinitrotoluene	No	No	No	No	No	No	No	No	No	No	No	2019–2021 data within range of existing data; no change to conclusions.
Energetic	HMX	Yes—Wildlife	No	No	No	No	No	No	No	No	No	No	2019–2021 data within range of existing data; no change to conclusions.
Energetic	Nitroglycerin	No	No	No	No	No	No	No	No	No	Yes	Yes	2019–2021 data contain new maximum concentration; higher maximum may indicate increased risk estimates and therefore requires evaluation
Energetic	RDX	No	No	No	No	No	Yes—Wildlife	No	No	No	No	No	2019–2021 data within range of existing data; no change to conclusions.
PAH	2-Methyl Naphthalene	Yes—Wildlife	Yes—Wildlife	Yes—Wildlife	N/A	N/A	N/A	No	No	No	N/A	N/A	No new data; initial conclusions are unchanged.
PAH	Fluorene	Yes—Wildlife	Yes—Wildlife	Yes—Wildlife	N/A	N/A	N/A	No	No	No	N/A	N/A	No new data; initial conclusions are unchanged.
PAH	Total PAH	Yes—Wildlife	Yes—Wildlife	Yes—Wildlife	N/A	N/A	N/A	No	No	No	N/A	N/A	No new data; initial conclusions are unchanged.
TPH	TPH	Yes—Plants and Wildlife	Yes—Plants and Wildlife	Yes—Plants and Wildlife	N/A	N/A	N/A	No	No	No	N/A	N/A	No new data; initial conclusions are unchanged.
VOC	Acetone	Yes—Wildlife	Yes—Wildlife	Yes—Wildlife	N/A	N/A	N/A	No	No	No	N/A	N/A	No new data; initial conclusions are unchanged.

Table 3-2. Summary of Selection Criteria for Determination Whether to Revise Screening Evaluation Using 2019–2021 Data
Thermal Treatment Unit 2022 Ecological Risk Screening Evaluation

Analyte Group	Chemical of Potential Ecological Concern ^a	2019–2021 Data Summary							Rationale	
		Analyte was Retained in 2005 ERA?	Analyte was Retained in 2007 ERA?	Analyte was Retained in 2009 ERA?	Analyte was Retained in 2011 ERA?	Analyte was Retained in 2013 ERA?	Analyte was Retained in 2018 ERA?	2013–2017 Data Contain New Maximum Concentration?		Update Ecological Risk Screen?

Notes:

^a Chemicals of potential ecological concern (COPECs) are those analytes that were retained for further evaluation in historic SLERAs or for which a new maximum detect has been measured. All other detected analytes are considered to be within range of existing data and do not require additional evaluation.

ERA = ecological risk assessment

COPEC = chemical of potential ecological concern

HMX = cyclotetramethylenetetranitramine

N/A = not applicable

PAH = polynuclear aromatic hydrocarbon

RDX = cyclotrimethylene trinitromine

TPH = total petroleum hydrocarbon

VOC = volatile organic compound

Table 3-3. Ecological Screening Benchmarks for Terrestrial Plants Exposed to Soil
Thermal Treatment Unit 2022 Ecological Risk Screening Evaluation

Chemical Group	COPEC	Surrogate	Reference	No Effect Benchmark		Low Effect Benchmark	
				Uncertainty Factor ^a	Normalized NOEC (mg/kg)	Uncertainty Factor ^b	Normalized LOEC (mg/kg)
Energetic	Nitroglycerin	N/A	LANL, 2020	1	2.1	1	2.10

Notes:

LOEC = lowest observed effect concentration

mg/kg = milligram(s) per kilogram

N/A = not applicable

NOEC = no observed effect concentration

NSV = no screening value available

Uncertainty factors were applied as follows:

^a Conversion to chronic NOEC

LOEC to NOEC = 0.1

Subchronic to chronic = 0.1

EC50 to chronic = 0.01

Acute to chronic = 0.01

^b Conversion to chronic LOEC

Subchronic to chronic = 0.1

EC50 to chronic = 0.1

Acute to chronic = 0.1

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Table 3-4. Ecological Screening Benchmarks for Terrestrial Invertebrates Exposed to Soil
Thermal Treatment Unit 2022 Ecological Risk Screening Evaluation

Chemical Group	COPEC	Surrogate	Reference	No Effect Benchmark		Low Effect Benchmark	
				Uncertainty Factor ^a	Normalized NOEC (mg/kg)	Uncertainty Factor ^b	Normalized LOEC (mg/kg)
Energetic	Nitroglycerin	N/A	LANL, 2020	1	13	1	130

Notes:

LOEC = lowest observed effect concentration
 mg/kg = milligram(s) per kilogram
 N/A = not applicable
 NOEC = no observed effect concentration
 NSV = no screening value available

Uncertainty factors were applied as follows:

^a Conversion to chronic NOEC
 LOEC to NOEC = 0.1
 Subchronic to chronic = 0.1
 EC50 to chronic = 0.01
 Acute to chronic = 0.01

^b Conversion to chronic LOEC
 Subchronic to chronic = 0.1
 EC50 to chronic = 0.1
 Acute to chronic = 0.1

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Table 3-5. Toxicity Reference Values for Birds
Thermal Treatment Unit 2022 Ecological Risk Screening Evaluation

Chemical Group	COPEC	Surrogate	Reference	No Effect TRV ^a		Low Effect TRV ^a	
				Uncertainty Factor ^b	Normalized NOAEL TRV (mg/kgbw-d)	Uncertainty Factor ^b	Normalized LOAEL TRV (mg/kgbw-d)
Energetic	Nitroglycerin	--	--	--	NSV	--	NSV

Notes:

-- = not available
 LOAEL = lowest observed adverse effect level
 mg/kgbw-d = milligram(s) per kilogram per body weight per day
 N/A = not applicable
 NOAEL = no observed adverse effect level
 NSV = no screening value available
 TRV = toxicity reference value

Selection of TRVs and application of uncertainty factors was performed in accordance with EPA (1997) as described in footnotes 2 and 3.

^a The following preferences were used when selecting studies:

NOAEL endpoints were given preference over LOAEL endpoints when both were available. Studies with LD50s as endpoints were only selected when studies for sublethal effects were not available. Chronic studies were selected over subchronic studies, and subchronic studies were selected over acute studies when multiple studies of varying duration were available for selection. Studies with reproduction as the endpoint were selected before studies with mortality as the endpoint, which were selected before studies with growth as the endpoint, which were selected before studies with systemic effects as the endpoint. Studies with the most complete information and therefore the least resulting uncertainty were given preference in study selection. Studies from surrogate chemicals were only selected when no other study for a particular contaminant of potential ecological concern was found.

^b Uncertainty factors were used to adjust all measured effect concentrations to chronic NOAELs and chronic LOAELs as follows:

NOAEL to LOAEL = 0.1
 Subchronic to chronic = 0.1
 LD50 to chronic = 0.01
 Subacute to chronic = 0.01
 Acute to chronic = 0.01

where:

Chronic = >12 weeks or during critical lifestage
 Subchronic = 4–12 weeks
 Subacute = <4 weeks, multiple doses
 Acute = only one dose

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Table 3-6. Toxicity Reference Values for Mammals
Thermal Treatment Unit 2022 Ecological Risk Screening Evaluation

Chemical Group	COPEC	Surrogate	Reference	No Effect TRV ^a		Low Effect TRV ^a	
				Uncertainty Factor ^b	Normalized NOAEL TRV (mg/kgbw-d)	Uncertainty Factor ^b	Normalized LOAEL TRV (mg/kgbw-d)
Energetic	Nitroglycerin	N/A	LANL, 2020	1	96.4	1	1020

Notes:

LOAEL = lowest observed adverse effect level
 mg/kgbw-d = milligram(s) per kilogram per body weight per day
 N/A = not applicable
 NOAEL = no observed adverse effect level
 NSV = no screening value available
 TRV = toxicity reference value

Selection of TRVs and application of uncertainty factors was performed in accordance with EPA (1997) as described in footnotes 2 and 3.

^a The following preferences were used when selecting studies:

NOAEL endpoints were given preference over LOAEL endpoints when both were available. Studies with LD50s as endpoints were only selected when studies for sublethal effects were not available. Chronic studies were selected over subchronic studies, and subchronic studies were selected over acute studies when multiple studies of varying duration were available for selection. Studies with reproduction as the endpoint were selected before studies with mortality as the endpoint, which were selected before studies with growth as the endpoint, which were selected before studies with systemic effects as the endpoint. Studies with the most complete information and therefore the least resulting uncertainty were given preference in study selection. Studies from surrogate chemicals were only selected when no other study for a particular contaminant of potential ecological concern was found.

^b Uncertainty factors were used to adjust all measured effect concentrations to chronic NOAELs and chronic LOAELs as follows:

NOAEL to LOAEL = 0.1
 Subchronic to chronic = 0.1
 LD50 to chronic = 0.01
 Subacute to chronic = 0.01
 Acute to chronic = 0.01
 where:
 Chronic = >12 weeks or during critical life stage
 Subchronic = 4–12 weeks
 Subacute = <4 weeks, multiple doses
 Acute = only one dose

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Table 3-7. Chemical Uptake for Dietary Items
Thermal Treatment Unit 2022 Ecological Risk Screening Evaluation

Chemical Group	Analyte	Plant		Terrestrial Invertebrates		Small Mammal	
		BAF	Source	BAF	Source	BAF	Source
Energetic	Nitroglycerin	13.3	LANL, 2020	0.347	LANL, 2020	0.116	LANL, 2020

Notes:

- BAF = bioaccumulation factor
- N/A = not applicable; applies to uptake factors for analytes without toxicity reference values for the given receptor
- All bioaccumulation factors are expressed as dry weight.
- Full references can be found in the reference section of the main body of the ecological risk assessment.

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Table 3-8. Exposure Parameters for Selected Wildlife Receptors of Concern
Thermal Treatment Unit 2022 Ecological Risk Screening Evaluation

Species	Body weight			Food Ingestion Rate ^a			Dietary Composition (fraction)				
	Receptor Guild	kg	Reference	kg/kg/d dry weight	Reference	Plants	Terrestrial Invertebrates	Small Mammals and Other Vertebrates	Reference ⁽¹⁾	Soil	Reference ⁽¹⁾
Birds											
Burrowing Owl	Carnivore	0.157	Average of males and females in Colorado from Haug et al., 1993, in Sample et al., 1997	0.0163	Nagy, 2001	--	--	1	Assumed 71 percent invertebrates/29 percent vertebrates in diet—Gleason and Craig, 1979)	0.05	Thomsen, 1971, in Sample et al., 1997
Loggerhead Shrike	Insectivore	0.047	Yosef, 1996	0.0148	Nagy, 2001	--	1	--	Assumed 66 percent invertebrates and 34 percent vertebrates in diet—Burton, 1990, in Yosef, 1996)	0	Species does not generally forage near ground
Sage Sparrow											
	Herbivore	0.019	Average of male and female data from Bonneville Basin, Utah, in Martin and Carlson, 1998	0.0197	Nagy, 2001	1	--	--	Assumed 87 percent plants and 13 percent invertebrates—winter diet in lower Colorado river reported in Martin and Carlson, 1998)	0.02	Measure of conservatism
Western Meadowlark											
	Invertebrate	0.103	Average of values in Sample et al., 1997	0.0116	Nagy, 2001	--	1	--	Assumed 100 percent (98 percent insects in Rotenberry, 1980)	0.02	Measure of conservatism
Mammals											
Black-tailed Jackrabbit	Herbivore	2.1	Goodwin and Currie, 1965, in Sample et al., 1997	0.0085	Nagy, 2001	1	--	--	Sample et al., 1997	0.063	Arthur and Gates (1988) in Sample et al., 1997
Coyote	Carnivore	10.33	Average of values from California and Arizona presented in Sample et al., 1997	0.0003	Nagy, 2001	--	--	1	Assumed 99 percent vertebrate diet in Sperry, 1934)	0.028	Used Red Fox Data from Beyer et al., 1994
Grasshopper Mouse											
	Invertebrate	0.041	Harriman, 1973	0.0033	Nagy, 2001	--	1	--	Bailey and Sperry, 1929	0.13	Talmage and Walton, 1993
Ord's Kangaroo Rat											
	Herbivore	0.052	Jones, 1985	0.0031	Nagy, 2001	1	--	--	Garrison and Best, 1990	0.02	Measure of conservatism
Pronghorn											
	Herbivore	49	Smith and Beale, 1974	0.0026	Nagy, 2001	1	--	--	Beale and Smith, 1970	0.02	Measure of conservatism
Townsend's Ground Squirrel											
	Herbivore	0.325	Rickart, 1987	0.0020	Nagy, 2001	1	--	--	Rickart, 1987	0.02	Measure of conservatism

Notes:

kg = kilogram(s)
 kg/kg/d dry weight = kilogram(s) per kilogram body weight per day in dry weight

^a Nagy (2001) food intake regression equation based on dry matter --> $F[(\text{kg}_{\text{food}}/\text{kg}_{\text{body}}/\text{day}) = a(\text{grams body weight})^b / \text{grams body weight}]$

Group	a	b
carnivorous birds	0.849	0.663
passerine birds	0.63	0.683
carnivorous mammals	0.153	0.834
herbivorous mammals	0.859	0.628
rodentia	0.332	0.774

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Table 3-9. Risk Screening for Terrestrial Plants and Invertebrates

Thermal Treatment Unit 2022 Ecological Risk Screening Evaluation

Chemical Group	Analyte	2019-2021 Data			Terrestrial Plants			Terrestrial Invertebrates	
		Number of Detects	Number of Samples	Maximum Detect (mg/kg)	Plant NOEC (mg/kg)	Plant HQ	Soil Invertebrate NOEC (mg/kg)	Soil Invertebrate HQ	
Energetic	Nitroglycerin	3	14	15	21	<1	13	1.2	

Notes:

-- = not available

HQ = hazard quotient

mg/kg = milligram(s) per kilogram

NOEC = no observed effect concentration

NSV = no screening value

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Table 3-10. Risk Screening Evaluation for Birds and Mammals
Thermal Treatment Unit 2022 Ecological Risk Screening Evaluation

Analyte Type	Analyte	det	n	Maximum Detect	2019-2021 Data (mg/kg)				Estimated Concentrations in Biota (mg/kg DW)				Receptor Exposure Factors				Daily Dosage				Screening Risk Estimate	
					Bioaccumulation Factors/Regression Models				Receptor Exposure Factors				Dietary Composition				Daily Dosage				NOAEL TRV	NOAEL HQ Uncertainty
					Plant BAF	Invert BAF	Mammal BAF	Small Mammal	Species	Body Weight (kg)	Food Ingestion Rate (kg/kg/d)	Plant	Invert	Mammal	Soil	Plant	Invert	Mammal	Soil	Plant		
Energetic	Nitroglycerin	3	14	15	13.3	0.347	0.116	2.0E+02	5.2E+00	1.7E+00	Burrowing Owl	0.157	0.0163	--	--	1	0.05	2.8E-02	8.1E-04	2.9E-02	NSV	Uncertainty
Energetic	Nitroglycerin	3	14	15	13.3	0.347	0.116	2.0E+02	5.2E+00	1.7E+00	Loggerhead Shrike	0.047	0.0148	--	--	1	0	7.7E-02	0.0E+00	7.7E-02	NSV	Uncertainty
Energetic	Nitroglycerin	3	14	15	13.3	0.347	0.116	2.0E+02	5.2E+00	1.7E+00	Sage Sparrow	0.019	0.0197	1	--	--	0.02	3.9E-04	3.9E-04	3.9E+00	NSV	Uncertainty
Energetic	Nitroglycerin	3	14	15	13.3	0.347	0.116	2.0E+02	5.2E+00	1.7E+00	Western Meadowlark	0.103	0.0116	--	--	1	0.02	6.0E-02	2.3E-04	6.1E-02	NSV	Uncertainty
Energetic	Nitroglycerin	3	14	15	13.3	0.347	0.116	2.0E+02	5.2E+00	1.7E+00	Black-tailed Jackrabbit	2.100	0.0085	1	--	--	0.063	1.7E+00	5.4E-04	1.7E+00	96.4	<1
Energetic	Nitroglycerin	3	14	15	13.3	0.347	0.116	2.0E+02	5.2E+00	1.7E+00	Coyote	10.3	0.0003	--	--	1	0.028	5.7E-04	9.2E-06	5.8E-04	96.4	<1
Energetic	Nitroglycerin	3	14	15	13.3	0.347	0.116	2.0E+02	5.2E+00	1.7E+00	Grasshopper	0.041	0.0033	--	--	1	0.13	1.7E-02	4.2E-04	1.7E-02	96.4	<1
Energetic	Nitroglycerin	3	14	15	13.3	0.347	0.116	2.0E+02	5.2E+00	1.7E+00	Mouse	0.052	0.0031	1	--	--	0.02	6.2E-01	6.2E-05	6.2E-01	96.4	<1
Energetic	Nitroglycerin	3	14	15	13.3	0.347	0.116	2.0E+02	5.2E+00	1.7E+00	Ord's Kangaroo Rat	48.8	0.0026	1	--	--	0.02	5.3E-01	5.3E-05	5.3E-01	96.4	<1
Energetic	Nitroglycerin	3	14	15	13.3	0.347	0.116	2.0E+02	5.2E+00	1.7E+00	Pronghorn	0.325	0.0020	1	--	--	0.02	4.1E-01	4.1E-05	4.1E-01	96.4	<1
											Townsend's Ground Squirrel											

Notes:

- BAF = bioaccumulation factor
- det = detects
- DW = dry weight
- HQ = hazard quotient
- kg = kilogram(s)
- kg-bw/d dry weight = kilogram per body weight per day dry weight
- mg/kg = milligram(s) per kilogram
- mg/kg/d = milligram(s) per kilogram per day
- n = number of samples
- N/A = not applicable
- NOAEL = no observed adverse effect level
- NSV = no screening TRV
- TRV = toxicity reference value

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Table 3-11. Point-by-Point Risk Estimation for Soil Invertebrates
Thermal Treatment Unit 2022 Ecological Risk Screening Evaluation

Chemical Group	COPEC	Sample Year	Sample ID	Sample Type	Result (mg/kg)	Qualifier	Detect	NOEC Screen			LOEC Screen		
								NOEC (mg/kg)	NOEC HQ	LOEC (mg/kg)	LOEC HQ	NOEC (mg/kg)	NOEC HQ
Energetic	Nitroglycerin	2019	TTU-644-2019	N	15		Y	13	1.2	130	<1	<1	
Energetic	Nitroglycerin	2021	TTU-644-2021	N	2.6	J	Y	13	<1	130	<1	<1	
Energetic	Nitroglycerin	2019	TTU-520-2019	N	2.3		Y	13	<1	130	<1	<1	
Energetic	Nitroglycerin	2021	TTU-115-2021	N	0.21	UJ	N	13	ND	130	ND	ND	
Energetic	Nitroglycerin	2019	TTU-215-2019	N	0.21	U	N	13	ND	130	ND	ND	
Energetic	Nitroglycerin	2019	TTU-215-2019-2	FD	0.21	U	N	13	ND	130	ND	ND	
Energetic	Nitroglycerin	2019	TTU-215-2021	N	0.21	UJ	N	13	ND	130	ND	ND	
Energetic	Nitroglycerin	2021	TTU-219-2021	N	0.21	UJ	N	13	ND	130	ND	ND	
Energetic	Nitroglycerin	2021	TTU-219-2021-FD	FD	0.21	UJ	N	13	ND	130	ND	ND	
Energetic	Nitroglycerin	2021	TTU-391-2021	N	0.21	UJ	N	13	ND	130	ND	ND	
Energetic	Nitroglycerin	2019	TTU-50-2021	N	0.21	UJ	N	13	ND	130	ND	ND	
Energetic	Nitroglycerin	2019	TTU-521-2019	N	0.21	U	N	13	ND	130	ND	ND	
Energetic	Nitroglycerin	2019	TTU-552-2019	N	0.21	U	N	13	ND	130	ND	ND	
Energetic	Nitroglycerin	2019	TTU-553-2019	N	0.21	U	N	13	ND	130	ND	ND	

Notes:

COPEC = chemical of potential ecological concern

HQ = hazard quotient

LOEC = lowest observed effect concentration

mg/kg = milligram(s) per kilogram

ND = not detected in this sample

NOEC = no observed effect concentration

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Summary and Conclusions

4.0.0.1 Soil data from the 2019 and 2021 sampling events at the TTU were evaluated to determine the current status of potential ecological risks. New data (2019 and 2021) were compared with previously collected data to identify newly detected analytes, analytes with higher maximum concentrations than previous sampling events, or exceeding background data, where applicable. Nitroglycerin in soil was retained for further evaluation in this SLERA. No accumulations of surface water have been observed at the site since 2013. Therefore, surface water was not evaluated in this 2022 SLERA. Methods and parameters employed to perform the SLERA submitted in 2005 (CH2M HILL, 2005), updated as appropriate, were applied to the 2019 and 2021 data. The results are as follows:

- Initial screen based on maximum concentrations and NOECs/NOAELs:
 - HQs exceeded 1 for nitroglycerin for terrestrial invertebrates only. This analyte/receptor pair were retained for further evaluation in the refined screen.
 - NOAELs for birds were not available for nitroglycerin indicating some uncertainty in the potential toxicity of this analyte. However, nitroglycerin is not considered toxic to birds in environmental settings (Williams et al., 2015).
- Refined screen for terrestrial invertebrates based on point-by-point comparison against the NOEC and LOEC.
 - HQs exceeded 1 at the NOEC for 1 of 14 samples.
 - HQs were less than 1 at the LOEC for all samples.
 - Only one sample had a nitroglycerin concentration exceeding previous data.

4.0.0.2 The 2019 and 2021 data do not indicate significant potential for site-related ecological risks at the TTU. The maximum detected concentration of nitroglycerin exceeded the NOEC for terrestrial invertebrates and was retained for further evaluation in the refined screen. Point-by-point evaluation indicated that only 1 sample had a nitroglycerin concentration exceeding the NOEC. This was also the only concentration exceeding the previous maximum detected concentration. There were no detections exceeding the LOEC. Potential risks due to nitroglycerin are considered low. Nitroglycerin was not retained as a chemical of environmental concern.

It should be noted that the sampling efforts after 2012 focused on metals and energetic compounds. The 2005 SLERA identified TPH, acetone, and PAHs as potential risk and the 2009 SLERA identified dioxin/furans as potential risk drivers. The absence of new data for these other analytes precludes any new conclusions. Consequently, these analytes are still considered potential risk drivers. The overall conclusion of the evaluation of 2019 and 2021 data is that current potential risks to ecological receptors are not greater than those estimated previously for the TTU.

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