TRC
Customer-Focused Solutions

STAGE II ENVIRONMENTAL RISK CHARACTERIZATION

Former General Electric (GE) Site
50 Fordham Road
Wilmington, Massachusetts
RTN 3-0518

Submitted to

Massachusetts Department of Environmental Protection
Bureau of Waste Site Cleanup
205A Lowell Street, Wilmington, Massachusetts

Prepared by

TRC Environmental Corporation
Boott Mills South, Foot of John Street
Lowell, Massachusetts 01850

TRC Project No. E9202-5206-02240

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1.0 INTRODUCTION

TRC Environmental Corporation (TRC) has conducted a Stage II Environmental Risk Characterization (ERC) as part of the on-going investigation and remediation activities at the former General Electric (GE) site (Site) located at 50 Fordham Road in Wilmington, Massachusetts (Figure 1-1). This Stage II ERC, together with a supplemental environmental sampling program, evaluates the existing ecological risk associated with the presence of several inorganic contaminants within surface waters, sediments and surface soils of a large wetland located adjacent to Outfalls 001 and 002 at the Site (i.e., the Wetlands Area AOC). The objective of the Stage II ERC is to evaluate and quantify, where appropriate, the current environmental risks that would prevail at the wetland area if no remedial actions were implemented and to determine whether or not a condition of "no significant risk" to the environment exists. If necessary, remedial actions will be recommended to reduce environmental risks to acceptable levels.

The Stage II ERC was conducted in accordance with the requirements of the Massachusetts Contingency Plan (MCP) 310 CMR 40 to provide a higher level evaluation of risk to the environment, and determine the scope of remedial activities, if necessary.

1.1 What is a Stage II Environmental Risk Characterization?

As outlined in 310 CMR 40.0995, a Method 3 ERC (commonly referred to as an ERC) is conducted for Sites where a release of contaminants potentially pose a risk to the environment. Specifically, the risk characterization must assess all chemical data, potential migration pathways, and evaluate risk to biota and habitats in the vicinity of the Site.

A Method 3 ERC must evaluate ecological parameters using a two-stage approach. The objective of a Stage I ERC is to identify and document conditions that would not necessitate a Stage II ERC. For example, situations where there is an absence of exposure pathways, or where there is readily apparent harm (and additional analysis would be redundant) would not necessitate a Stage II Characterization.

A Stage II ERC focuses on assessing ecological functions and the potential impacts, and calculating risk factors in accordance with standard ERC protocol.

MADEP has required that Stage II ERC be conducted for the outfalls 001 and 002 areas of concern. All procedures, methods and calculations are detailed in the following report.

1.2 Scope of Work

In January 2002, TRC submitted to MADEP a Scope of Work for a proposed Stage II Environmental Risk Characterization to be conducted on the wetlands at the Site. The Scope of Work proposed supplemental sampling of sediments at Outfalls 001 and 002, and of surface soils, vegetation, and invertebrates within the adjacent wetlands. Based on the previous data collected to date, TRC proposed to focus on copper, lead and zinc as the contaminants of potential concern.

Based on the MADEP Conditional Approval of the Stage II Scope of Work (MADEP, 2002a) and subsequent discussions with MADEP, TRC subsequently agreed to 1) add several additional metals as contaminants of potential concern (i.e., antimony, cadmium, nickel, and selenium); and 2) collect surface water samples at the two outfalls. The selection of the contaminants of potential concern at the Site is discussed further in Section 2.2 of this report.

The work contained herein follows current MADEP guidance for assessment of ecological risk at contaminated Sites and relies primarily on the following document:

- Massachusetts Department of Environmental Protection. *Guidance for Disposal Site Risk Characterization, Section 9.0 Method 3 – Environmental Risk Characterization.* Interim Final Policy WSC/ORS-95-141. April 1996.

Per this guidance, this Stage II ERC provides a summary of the results from previous environmental/ecological investigations (Section 1.0), a discussion of the problem formulation (Section 2.0), the site conceptual model (Section 3.0), the results of the supplemental environmental sampling (Section 4.0), the risk characterization for the impacted wetland area (Section 5.0), and a revised Site conceptual model (section 6.0). In addition to these required items, TRC has provided a risk/benefit analysis (section 7.0), and recommendations for future actions (Section 8.0).

1.3 Previous Environmental Investigations/Regulatory Actions

A synopsis of earlier investigations involving the collection of samples within the wetland area is presented below. This synopsis is focused on metal contamination, as these contaminants are the focal point of the Stage II ERC that was conducted within the wetland.

A Phase II Report was prepared by Goldberg-Zoino & Associates, Inc. (GZA) and submitted to MADEP in April 1990. As part of this Phase II investigation, one sediment sample each was collected from Outfalls 001 and 002 and analyzed for volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs). In general, low levels of VOCs and several phthalates were detected in the two sediment samples. However, no sediment or surface soil samples were collected from the adjacent wetlands and analyzed for metals. As part of this Phase II report, an Ecological Risk Characterization of the wetlands described the habitats present and potential ecological receptors that may inhabit the wetland cover types. Although significant risks to ecological receptors were not anticipated, additional sediment sampling of petroleum-related compounds was recommended to evaluate the risk posed by these contaminants (GZA, 1990).

A Phase II Supplemental Investigation was conducted by Wehran Engineering Corporation (Wehran) in November 1991. Five sediment samples (WL-1 through WL-5) were collected from the wetland near the edge of the paved parking area and downgradient of Outfall 001 at a depth of 0 to 2 feet and analyzed for VOCs, SVOCs and priority pollutant metals (Wehran, 1991). VOCs were detected at low levels while several petroleum-related contaminants were detected at elevated concentrations at sample location WL-5. In addition, several metals were detected

above ecological screening benchmarks (discussed in Section 2 of this ERC) associated with adverse effects to macrobenthic invertebrates and/or plants. These metals included arsenic, cadmium, copper, lead, nickel and zinc.

In December 1991, a Public Health and Ecological Risk Characterization Report was submitted to MADEP to supplement the Phase II Investigation (ADL, 1991). This report used the previous sediment/soil sampling results and four additional sediment/surface soil samples (WL-6 through WL-9) collected from the wetland located east of Outfalls 001 and 002. These additional samples were collected in November 1991 by Wehran and analyzed for various constituents including priority pollutant metals. All four of these samples were collected further east of samples WL-1 through WL-5. Sample WL-8 appears to have been located within an area of upland fill (Udorthents, wet substratum), whereas sample locations WL-6, WL-7, and WL-9 were within the Freetown muck soil type (Wehran, 1992). The Ecological Risk Characterization concluded that contaminants were not significantly impacting the wetlands (as represented by samples WL-6 through WL-9). Although the wetlands area immediately adjacent to the parking lot (referred to as the "drainage ditch" in the report and represented by samples WL-1 through WL-5) contained elevated levels of metals that may affect some plants, microbes and invertebrate species in this area, the low levels (as detected in WL-6 through WL-9) were not expected to pose a significant risk to the larger wetland complex adjacent to the Site.

A Second Supplemental Phase II Investigation was submitted to MADEP in December 1992 (Wehran, 1992). Although nine additional sediment/surface soil samples were collected within the wetland in the vicinity of Outfall 001, these samples were analyzed for total petroleum hydrocarbons (TPH) only. In October 1993, a Phase III Remedial Action Plan (RAP) was submitted to MADEP that recommended excavating and disposing of contaminated sediments (with elevated TPH levels) in the vicinity of Outfall 001 and Outfall 002. In November 1995, MADEP conditionally approved the sediment remediation activities near these outfalls until contaminants of concern approached background levels (if feasible).

In 1996, EMCON (formerly Wehran) conducted additional sediment sampling to update and more accurately delineate the extent of sediments in the vicinity of Outfalls 001 and 002 prior to initiating remediation activities. A total of 12 sediment/surface soil samples were collected adjacent and downgradient of Outfall 001 while 3 samples were collected near Outfall 002. TPH concentrations were noted to have decreased from the December 1992 sampling results although metals remained at elevated concentrations.

A qualitative ecological risk characterization was conducted as part of the 1996 study that involved: 1) the sampling of macroinvertebrates, and 2) a comparison of "impacted" sediment areas that may impact vertebrate indicator species to the total population of these indicator species that may inhabit the large wetland complex. Concentrations of several metals (notably copper and lead) were significantly elevated over sediment screening benchmarks. Copper was detected at concentrations ranging from 9 mg/kg to 1,800 mg/kg, while lead concentrations ranged from 21 mg/kg to 250 mg/kg. In addition, zinc was detected above its screening benchmark, with concentrations ranging from 25 mg/kg to 180 mg/kg. The results of this study were submitted to MADEP in January 1998 in a letter report that concluded that a condition of No Significant Risk existed at the outfalls (EMCON, 1998). This conclusion was based on

similarities between macroinvertebrate communities near the outfalls and within two "reference" locations. In addition, the area of impacted wetland comprised a small proportion of the total wetlands area, therefore, potential vertebrate receptors were unlikely to experience a significant reduction in their local subpopulations (defined as less than 20 percent decrease).

In December 1998, MADEP issued a written response to the qualitative ecological risk assessment requiring that either a quantitative Stage II Environmental Risk Characterization be conducted or that sediment remediation be undertaken (MADEP, 1998). A letter was submitted to MADEP in February 1999 by Lockheed Martin Corporation indicating that a Stage II Environmental Risk Characterization would be conducted. The letter also requested clarification regarding the scope of the investigation. In November 2001, MADEP replied that TRC could either proceed with remediating the sediments as previously approved, or conduct a Stage II Environmental Risk Characterization on the wetlands to address metal contaminants detected within previous sampling events. MADEP concluded that concentrations of TPH detected in the sediment samples are attributable to "normal" discharges of stormwater runoff and no further action was required for these constituents.

A compilation of the data collected to date is provided in TRC's Scope of Work- Stage II Environmental Risk Characterization (January 2002).

2.0 PROBLEM FORMULATION

2.1 Site Description/Characterization

The Site description presented within this section was obtained from previous documents such as the Phase II Report that included a description of the wetland located on the Site (GZA, 1990) as well as direct observations by TRC biologists during the field activities associated with the Stage II ERC.

The former GE Site located at 50 Fordham Road in Wilmington, Massachusetts is approximately 13 acres in size. The Site is located within an industrial park with a large wetland area present to the north and east, extending into the Town of North Reading, Massachusetts. Fordham Road abuts the Site to the west while another industrial property (Roadway Express) is located southeast of the Site. Upland portions of the Site consist primarily of buildings and parking areas and a small wastewater treatment plant. Two outfall structures (Outfall 001 and Outfall 002) discharge storm water runoff and non-contact cooling water into the wetlands near the eastern property boundary (Figure 2-1).

The wetlands that are the focus of this Stage II ERC can be characterized as the Palustrine wetlands system and contains forested, scrub-shrub, emergent and open water classes. Wetlands present on the Site represent forested wetlands (broad-leaved deciduous), scrub/shrub wetlands, and emergent wetlands and represent a small portion of the larger wetland complex located adjacent to the Site. The size of this large contiguous wetland area is approximately 85 acres (EMCON, 1998).

Prior to 1968, the Site and the wetland complex due east of the Site were re-worked and extensively mined for sand and gravel. As discussed in the Scope of Work for the Stage II ERC, aerial photographs of the wetland complex from 1954 and 1973 reveal the extensive disturbance. In fact, the presence of common reed, often associated with past disturbance in or adjacent to a wetland, is evident on the photographs as well as today during field inspections.
These mining and filling activities ultimately resulted in the development of extensive scarring and altered surface flow patterns.

Subsequent development of the properties surrounding the wetland complex have encircled the wetland with industrial park developments to the west, east, and south. These development have further altered the natural flow patterns of the wetland area.

As indicated on Figure 1-1, two small surface water bodies are located within the large wetland complex. The larger of these surface water bodies (Furbish Pond) has a poorly defined outlet that flows to the southwest, coming very close to the on-Site paved parking area before turning back to the east. The second small surface water body is characterized as an isolated ponded area located immediately north of an inactive water supply well formerly operated by the Town of North Reading (Stickney Well). Surface water flows within the large wetland complex are generally to the east and eventually discharge to the Ipswich River. The Ipswich River and its tributaries in the vicinity of the Site represent Class B High Quality Waters as classified by the MADEP. Class B waters are designated as a habitat for fish and wildlife and for primary and

secondary recreation. These waters are also suitable for public water supply with appropriate treatment.

The Natural Resources Conservation Service (formerly the Soil Conservation Service) has mapped the soils in Middlesex County. The large wetland complex present on and adjacent to the Site contains organic soil (Freetown muck) while the developed portions of the Site consist of the Urban Land and Udorthents soil types. The Freetown muck is characterized as very deep, very poorly drained soils in depressions or in low-lying areas. These soils consist of greater than 51 inches of highly decomposed organic matter (i.e. muck) that overlies the mineral soil. Slopes within this soil type range from 0 to 2 percent. The Udorthents and Urban Land soil types are characterized as being disturbed areas where the original soils have been altered. Urban Land refers specifically to disturbed areas where the soil characteristics have been altered or obscured by placement of structures and/or pavement. The buildings present on the Site are within the Urban Land soil type, while the parking lot adjacent to the wetlands is located within Urban Land (wet substratum) that likely represents soil fill material that was placed in wetlands.

Surface water flows from Outfalls 001 and 002 are to the east. However, a well-defined or distinct channel that conveys surface water flow is not evident in this area. Topography within the wetland is very flat with a pronounced micro-topography consisting of hummocks and hollows (see Figure 2-1). TRC determined the topography of the wetlands area by conducting a detailed site survey to the one-foot contour interval prior to initiating the proposed sampling program. The map prepared for the Site confirms that the general direction of surface water flow within this wetland is to the east.

The wetlands located immediately east of the parking area on the Site were originally delineated in the spring of 1996 by EMCON (EMCON, 1998) and approved by the North Reading Conservation Commission. TRC re-delineated the wetland boundary in August 2002 and their boundaries are depicted on Figure 2-1.

These wetlands contain primarily scrub-shrub and emergent wetlands adjacent to the parking area with forested wetlands located a short distance to the east. Vegetation within the wetlands consists of several invasive non-native plant species including glossy-leaved buckthorn (*Rhamnus alnifolia*), common reed (*Phragmites australis*), and purple loosestrife (*Lythrum salicaria*). The presence of common reed is often associated with past disturbance in or adjacent to a wetland. Other vegetation noted within the wetlands include red maple (*Acer rubrum*), grey birch (*Betula populifolia*), and scattered eastern white pine (*Pinus strobus*) in the tree overstory with sweet-pepperbush (*Clethra alnifolia*), buckthorn, willow (*Salix* sp.), highbush blueberry (*Vaccinium corymbosum*) and speckled alder (*Alnus rugosa*) in the dense shrub understory. The herbaceous layer consisted on common reed, purple loosestrife, cinnamon fern (*Osmunda cinnamomea*), spotted jewelweed (*Impatiens capensis*), skunk-cabbage (*Symplocarpus foetidus*), sensitive fern (*Onoclea sensibilis*), and shallow sedge (*Carex lurida*).

The forested, scrub-shrub and emergent wetlands potentially provide suitable habitat for a variety of wildlife species. The various vegetative strata within the forested portions of the wetland provide a wide range of foraging, breeding and cover sites that can be used by amphibians, reptiles, birds and mammals. Birds that breed or forage within the tree canopy or

shrub layer are likely to inhabit the wetland as are cavity nesting birds that typically use standing dead trees. The herbaceous vegetation, leaf litter, downed trees and branches also provide cover for other ground-nesting birds as well as various amphibians (e.g., frogs), reptiles (e.g., snakes) and small mammals (e.g., mice, voles and shrews). Larger mammalian species such as white-tailed deer, raccoon and striped skunk are also expected to forage within the wetland complex. The pools of water present at Outfall 001 and Outfall 002 provide habitat for several amphibian and reptilian species including various frogs and snakes. Many amphibian larvae (i.e., tadpoles) were noted at Outfall 002 during recent sampling conducted by TRC in summer 2002.

Based on the 2000-01 edition of the Massachusetts Natural Heritage Atlas, the large wetland complex is not reported to contain any rare wetlands wildlife, certified vernal pools, rare species or natural communities of high priority.

2.2 Selection of Contaminants of Concern (COCs)

In order to determine what contaminants are of potential concern to ecological receptors inhabiting the wetlands area, the concentrations of constituents detected within the previous sediment and surface soil samples were compared to screening benchmarks. These benchmarks represent constituent specific concentrations that are identified in the literature to be of concern to a specific ecological receptor group. For the wetlands area, which includes both sediment and surface soil samples, three screening benchmarks were used. The benchmarks selected are: 1) benthic invertebrate threshold and probable effect sediment concentrations (MacDonald, et al., 2000); 2) plant soil screening concentrations (USEPA, 2000); and 3) terrestrial invertebrate soil screening concentrations (USEPA, 2000). Detected concentrations of contaminants were also compared to background levels that are present within surface soils and sediments. Background concentrations for inorganic constituents within surface soils/sediment were obtained from MADEP (2002b).

Contaminants of Concern (COCs) identified within the wetland that may directly affect the benthic macroinvertebrate community, wetland plant community, and/or the wetland macroinvertebrate community include various inorganics. These constituents were previously detected (Wehran, 1992 and EMCON, 1998) within surface soils or sediments associated with Outfall 001 and/ or Outfall 002 above background levels and screening guidelines associated with adverse effects to various ecological receptor groups. The rationale for the selection of COCs for the Stage II ERC for each media is presented below and in Table 2-1.

2.2.1 Surface Soil

Two inorganic constituents (copper and zinc) were previously detected in sediment/surface soil samples above surface soil screening benchmarks associated with adverse effects to plants and/or terrestrial invertebrates (USEPA, 2000). Each of these contaminants was retained as a surface soil COC for the Stage II ERC. Four additional inorganics (antimony, lead, nickel and selenium) were detected above their respective background concentrations and retained as COCs since surface soil screening benchmarks are unavailable for these constituents. Cadmium was detected below its surface soil benchmarks but above its background concentration. Since cadmium has

the potential to bioaccumulate within the food chain (MADEP, 1996), this constituent was also retained as a surface soil COC for the Stage II ERC.

Aluminum, arsenic and mercury were detected below their respective background concentrations and were not retained as surface soil COCs. Beryllium and chromium were detected at concentrations below their respective surface soil benchmarks and were not retained as surface soil COCs for the Stage II ERC. Although chromium was detected in one sample at a concentration above its lowest surface soil screening benchmark this sample represents a sediment sample as it was collected immediately downgradient of Outfall 002. Silver and thallium were detected at a very low frequency (i.e., less than 10 percent of samples) within surface soil/sediment samples and were not retained as COCs.

In summary, antimony, cadmium, copper, lead, nickel, selenium and zinc were retained as surface soil COCs for the Stage II ERC while aluminum, arsenic, beryllium, chromium, mercury, silver and thallium were eliminated as COCs.

2.2.2 Sediment

Sediment is restricted to the aquatic habitats present in the immediate vicinity of Outfalls 001 and 002. Five inorganics (cadmium, copper, lead, nickel and zinc) were detected above both their sediment screening benchmark (the "threshold effect concentration" for benthic macroinvertebrates) and their background concentration. Therefore, each of these metals was retained as a sediment COC for the Stage II ERC.

Aluminum, arsenic, beryllium and mercury were detected at concentrations below their background levels and not retained as COCs. Silver and thallium were detected at a very low frequency (i.e., less than 10 percent of samples) within surface soil/sediment samples and were also not retained as COCs. Chromium was not detected above either its sediment screening benchmark or background concentration and was eliminated as a COC. Antimony and selenium were not detected in sediment samples and were not retained as COCs.

2.2.3 Surface Water

Previous sample results for surface water contaminants are unavailable. Therefore, surface water COCs were selected to be consistent with sediment COCs. This rationale appears reasonable given that aquatic habitats are very limited (immediate vicinity of Outfalls 001 and 002) and that the source(s) of both surface water and sediment COCs is likely to be the same. The surface water COCs include cadmium, copper, lead, nickel and zinc.

3.0 SITE CONCEPTUAL MODEL

The site conceptual model developed for the wetlands area is based primarily on the previous sampling results and assessments associated with Outfalls 001 and 002. In accordance with MCP guidelines, contaminants of concern, exposure pathways and assessment endpoints were incorporated by TRC directly into the site conceptual model presented below.

Although the source(s) of the metals within the wetland area have not been fully identified, past activities have apparently resulted in contamination of the wetland habitats in close proximity to Outfall 001 and Outfall 002. Important components of the ecological community within this wetland include plants, insects and other invertebrates, amphibians, reptiles, birds and mammals that represent a diverse assemblage of feeding guilds. The metals detected within the surface water, sediments and surface soils of the wetland may potentially affect ecological receptors directly via contact (e.g., benthic community inhabiting contaminated sediments) or may bioaccumulate within vegetation and invertebrates that are subsequently consumed by receptors occupying higher trophic levels within the wetland area.

Figure 3-1 presents a simplified conceptual model for the wetlands area. Primary and secondary ecological receptors and important exposure pathways are identified for both aquatic and non-aquatic (i.e., wetland) habitats present within the wetland assessment area.

3.1.1 Assessment Endpoints

Assessment endpoints are specific selected ecological characteristics (like diversity and growth) that are evaluated in the Stage II ERC. In accordance with the MCP, TRC selected assessment endpoints that provide:

- A clear operational definition;
- An ability to predict and measure a response;
- A susceptibility to COCs (i.e., an exposure pathway is present);
- Ecological relevance (i.e., important feature to ecological health of wetland); and,
- Relevance to program objectives (e.g., wetland species or community is meaningful and valued by society).

Table 3-1 presents the assessment endpoints that were selected for the Stage II ERC. The selected assessment endpoints represent both community level endpoints (e.g., benthic macroinvertebrate diversity and productivity) and population level endpoints (e.g., survival, growth and reproduction of particular guilds such as the local subpopulation of insectivorous birds). The selected assessment endpoints represent both primary trophic level and secondary level receptors as these species may be adversely affected either directly by the metal concentrations present within the sediments and soils or by foraging on plants or invertebrates that have bioaccumulated metals identified herein as COCs.

3.1.2 Measures of Effect

Measures of effect are measures used to evaluate responses of each assessment endpoint (MADEP, 1996). The measures of effect selected for the Stage II ERC are presented in Table 3-1. The selected parameters represent both community and population level measures. A brief discussion of the proposed measures of effect for each assessment endpoint is presented below.

Amphibian Community Diversity

This assessment endpoint will be evaluated by comparing the detected surface water concentrations of COCs within the aquatic habitats present at Outfalls 001 and 002 to applicable benchmarks protective of amphibian receptors (Pauli et al., 2000).

Benthic Macroinvertebrate Community Diversity and Productivity

The evaluation of this assessment endpoint will consider contaminant concentrations within the four sediment samples collected in the vicinity of Outfalls 001 and 002 where aquatic habitats are present. This endpoint will not be used to evaluate surface soil samples collected from non-aquatic habitats within the wetland area.

Sediment quality criteria and guidelines associated with effects on benthic biota will be compared to concentrations of contaminants detected within the sediments. Applicable criteria/guidelines that will be used for this evaluation include consensus-based threshold effects concentration (TEC) and probable effects concentration (PEC) developed for freshwater sediments (MacDonald et al., 2000).

Terrestrial Plant Community Diversity and Productivity

This assessment endpoint will evaluate potential impacts to the wetland plant community by evaluating contaminant concentrations within the surface soil and vegetation samples collected in the wetland area near Outfalls 001 and 002. Soil benchmarks developed from an evaluation of plant toxicity studies (related to soil contaminant concentrations) will be compared to surface soil concentrations of COCs. The soil plant benchmarks that will be used for the Stage II ERC are from USEPA (2000). In addition, plant tissue concentrations associated with phytotoxic effects will be compared to COC concentrations detected in vegetation samples collected from the wetland.

Terrestrial Macroinvertebrate Community Diversity and Productivity

The evaluation of this assessment endpoint will consider contaminant concentrations within the surface soil samples collected in the wetland area near Outfalls 001 and 002. Soil benchmarks developed from an evaluation of invertebrate toxicity studies (related to soil contaminant concentrations) will be compared to surface soil concentrations of COCs. The soil invertebrate benchmarks that will be used for the Stage II ERC are from USEPA (2000).

Mammalian Herbivore Survival, Growth, and Reproduction

The meadow vole (*Microtus pennsylvanicus*) was selected as the indicator species for assessing impacts from COCs to mammalian herbivores. The meadow vole represents a species with a small home range and has previously been reported to inhabit the wetlands area. An estimated exposure dose to the meadow vole was determined from life history parameters (USEPA, 1993) and measured metal contaminant concentrations within herbaceous vegetation collected from the wetland habitats present. The estimated metal exposure doses were compared to chronic mammalian toxicity reference values (TRVs) obtained from the literature.

Avian Insectivore Survival, Growth, and Reproduction

The marsh wren (*Cistothorus palustris*) was selected to evaluate potential effects of COCs on birds that consume invertebrates present within the wetland habitats. An estimated exposure dose was calculated for each COC using wren life history parameters (USEPA, 1993) and measured concentrations of COCs within invertebrates collected from the wetland. The exposure doses were then compared to avian chronic TRVs obtained from the literature.

Mammal Insectivore Survival and Reproduction

The short-tailed shrew (*Blarina brevicauda*) was selected to assess potential impacts to mammalian insectivores that consume invertebrates containing COCs within the wetland habitat. Estimated exposure doses of COCs to the shrew were calculated using life history parameters (USEPA, 1993) and measured concentrations of metals within invertebrates collected from the wetland. The estimated exposure doses were compared to chronic TRVs obtained from the literature.

4.0 SUPPLEMENTAL ENVIRONMENTAL SAMPLING

The objective of the Stage II ERC is to fully evaluate the risks from the presence of various metal contaminants to ecological receptors inhabiting the wetland located on and adjacent to the Site. As detailed in the Scope of Work prepared for the Stage II ERC (TRC, 2002) and based on additional discussions with MADEP, a variety of media and biota were sampled in order to support this risk assessment. The previous data was used to select the COCs. However, they were not used as part of this risk assessment. Surface water and sediment samples were collected from aquatic habitats in the immediate vicinity of Outfalls 001 and 002. Surface soil, vegetation and terrestrial invertebrate samples were collected from the terrestrial habitats provided within the large wetland complex adjacent and downgradient of both outfalls. All samples were collected by TRC on August 28, 29 and 30, 2002. These samples are discussed in greater detail in the following sections. Sample results, tabulated data and a data validation report are presented in Appendix A.

4.1 Surface Water/Sediment

One surface water sample and two sediment samples were collected from each of the two outfalls. One duplicate sediment sample was also collected for quality control/quality assurance purposes. Surface water samples were filtered in the field to represent dissolved metal concentrations. Sediment samples were collected as detailed within the Scope of Work for the Stage II ERC (TRC, 2002). The surface water and sediment samples were analyzed for selected COCs (i.e., cadmium, copper, lead, nickel and zinc) as discussed above. The locations of the surface water and sediment samples are depicted in Figure 2-1. All lab results are summarized in Appendix A. Risk results are discussed in detail in Section 5.0

4.2 Surface Soil

Nine surface soil samples were collected within the wetland downgradient of Outfall 001 and five samples were collected in the vicinity of Outfall 002 as detailed in the Scope of Work for the Stage II ERC (TRC, 2002). In addition, one surface soil sample was collected from a reference wetland location located upgradient of Outfalls 001 and 002. All samples were analyzed for COCs (i.e., antimony, cadmium, copper, lead, nickel, selenium and zinc) as discussed in Section 2.2. Samples were collected in accordance with the Scope of Work for the Stage II ERC (TRC, 2002).

In order to conservatively evaluate potential bioaccumulation of COCs, several samples were collected from locations within the wetland where previous sampling indicated the highest levels of COCs. All samples represent locations within the wetlands where non-aquatic habitats are present (i.e., standing water present intermittently and vegetation not comprised of plants rated as obligate wetland species per Reed, 1988). However, the selection of sampling locations considered depositional areas (i.e., hollows) within the wetland where surface water runoff from the outfalls was likely to be typically present during storm events. The locations of the surface soil samples are depicted on Figure 2-1. All lab results are summarized in Appendix A. Risk results are discussed in detail in Section 5.0

4.3 Vegetation

In order to determine bioaccumulation and subsequent food chain transfer to higher trophic level herbivorous receptors (e.g., meadow vole) that forage within the wetland habitats in the vicinity of Outfalls 001 and 002, vegetation was collected and analyzed for the same contaminants as selected for the wetland surface soils. Samples were collected in accordance with the Scope of Work for the Stage II ERC (TRC, 2002). A total of four herbaceous vegetation samples were collected from potentially contaminated areas within the wetland habitats near Outfall 001, while two plant tissue samples were collected for the wetland areas near Outfall 002. In addition, one vegetation sample was collected from a reference location. Vegetation samples were directed toward herbaceous species that may be consumed by voles and included such herbaceous species as spotted jewelweed (*Impatiens capensis*) or sensitive fern (*Onoclea sensibilis*). The locations of the vegetation samples are presented on Figure 2-1. All lab results are summarized in Appendix A. Risk results are discussed in detail in Section 5.0

4.4 Terrestrial Invertebrates

In order to determine bioaccumulation and subsequent food chain transfer to insectivorous receptors (e.g., short-tailed shrew and marsh wren) foraging within the wetland habitats in the vicinity of Outfalls 001 and 002, terrestrial macroinvertebrates were collected and analyzed for the same contaminants as selected for the wetland surface soils (i.e., antimony, cadmium, copper, lead, nickel, selenium and zinc). A total of four terrestrial invertebrate samples were collected from potentially contaminated areas within the wetland habitats near Outfall 001, while two invertebrate samples were collected for the wetland areas near Outfall 002. The locations of the terrestrial invertebrate samples are the same as those locations where plant tissue samples were collected. In addition, one terrestrial invertebrate sample was collected from a reference location in order to determine whether detected metal concentrations within invertebrates in the vicinity of Outfalls 001 and 002 are significantly elevated above naturally occurring background levels. Samples were collected in accordance with the Scope of Work for the Stage II ERC (TRC, 2002). In general, earthworms were the first terrestrial invertebrate of choice collected at a sample location if available. If earthworms were not present or scarce, additional invertebrates were collected including spiders, sowbugs, and/or centipedes. The locations of the terrestrial invertebrate samples are presented on Figure 2-1. All lab results are summarized in Appendix A. Risk results are discussed in detail in Section 5.0

5.0 RISK CHARACTERIZATION

5.1 Methodology

The analysis component of the risk assessment consists of assessing the exposure of the selected measurement receptors to the COCs (Exposure Assessment) and determining the toxicity of the COCs to the receptors (Toxicity Assessment).

5.1.1 Exposure Assessment

Exposure represents the contact (including ingestion) of a measurement receptor with a COC through the various exposure pathways identified in Section 2.4. Exposure to community measurement receptors (i.e., amphibians, benthic invertebrates, terrestrial vegetation and invertebrates) is simply represented by the concentrations of COCs within the media of concern that the particular community inhabits. Surface water (dissolved), sediment and surface soil contaminant concentrations (mean and maximum) for both Outfalls 001 and 002 are provided in Appendix A. These concentrations are assumed to represent exposure point concentrations for these community receptors.

Exposure to contaminants via the food chain is evaluated by modeling exposure to the selected indicator species or measurement receptors (meadow vole, short-tailed shrew, and marsh wren). The exposure scenarios developed in the Problem Formulation place measurement receptors within exposure pathways that are most likely to contribute to contaminant intake.

The meadow vole may be exposed to soil contaminants through direct ingestion and through consumption of vegetation that have accumulated contaminants through plant uptake. The marsh wren may consume contaminants directly through soil ingestion or indirectly via the consumption of invertebrates that are in direct contact with contaminated soil. The short-tailed shrew would be exposed to site contaminants through the ingestion of both vegetation and invertebrates that are in direct contact with contaminated soil. The purpose of the exposure assessment is to formulate these exposure pathways into algorithms that can predict an estimate of total exposure.

The methods and calculations required for quantification of exposure doses are described within this section. Exposure to contaminants at the site by the selected indicator species is estimated by the following equation:

$$ED = [(S_{conc} \times S_{diet}) + (P_{conc} \times P_{diet}) + (I_{conc} \times I_{diet})] (FIR) (AUF)$$

Where:

ED	=	Exposure Dose (mg/kg-body weight-day);
S_{conc}	=	Soil contaminant concentration (mg/kg);
S_{diet}	=	% of diet soil comprises;
P_{conc}	=	Plant contaminant concentration (mg/kg);
P_{diet}	=	% of diet plants comprise;

I_{conc} = Invertebrate contaminant concentration (mg/kg);
I_{diet} = % of diet invertebrates comprise;
FIR = Food ingestion rate (kg/kg-body weight-day); and,
AUF = Area use factor (% of home range comprised of habitat evaluated).

Dietary information for each of the three measurement receptor species was obtained from U.S. EPA Wildlife Exposure Factors Handbook (U.S. EPA, 1993). Specifically, food ingestion rates, dietary composition (relative percentage of vegetation and/or invertebrates in the diet as well as soil ingestion rates) and home ranges were obtained from these sources. Model inputs for the measurement receptor species are presented in Table 5-1.

Exposure doses to each of the three indicator species (i.e., meadow vole, short-tailed shrew and marsh wren) were estimated using the model parameters presented in Table 5-1 and COC concentrations (both mean and maximum) presented in Appendix A for surface soil/biota of concern. Exposure doses were estimated separately for receptors inhabiting wetlands in the vicinity of Outfall 001 and near Outfall 002. Mean and maximum exposure doses are presented in Appendix B.

5.1.2 Toxicity Assessment

Toxicity of COCs is assessed by the selection of appropriate toxicity reference values (TRVs) for each of the measurement receptors. Community-level TRVs are media specific (i.e., the concentration in surface water or sediment) while TRVs for wildlife receptor species are provided in terms of dose ingested. The selected TRVs for each receptor are identified and discussed below.

5.1.3 Amphibian TRVs

Amphibian larvae present within the ponded areas of surface water at the outfalls may be exposed to surface water COCs. A search of amphibian toxicity data for each COC present at these locations was conducted in the scientific literature. Available toxicity data are primarily limited to acute studies relating to mortality of immature (i.e., larvae) amphibians. The TRVs for amphibian larvae are presented in Table 5-2.

5.1.4 Benthic Invertebrate TRVs

Sediment quality benchmarks were obtained from MacDonald et al. (2000). Both the consensus-based threshold effect concentrations (TECs) and the consensus-based probable effect concentrations (PECs) were selected as TRVs for benthic invertebrates potentially inhabiting the aquatic habitats associated with Outfalls 001 and 002. The TECs represent concentrations below which toxic effects to benthic biota are unlikely to be observed while the PECs represent concentrations above which toxicity to benthic organisms are likely. The sediment TRVs selected for the benthic invertebrate community are presented in Table 5-3.

5.1.5 *Plant TRVs*

Plant soil TRVs relating to surface soil COC concentrations were provided by USEPA (2000) and represent the geometric mean of various literature studies (meeting acceptability criteria) concerning contaminant concentrations in soil and the effects (or lack of effects) on vegetation. Plant toxicity in the literature studies was generally expressed as the contaminant concentration that adversely affected 10 to 20 percent of the plants tested or the maximum acceptable threshold concentration (or the mean of the No Observed Effect Concentration). The surface soil TRVs available for the terrestrial plant community are presented in Table 5-4.

In addition to the plant soil TRVs discussed above, plant tissue concentrations associated with phytotoxicity are available for several COCs. These concentrations are available in the literature and represent tissue levels that are associated with adverse effects on vegetation survival or growth. The plant tissue TRVs selected for the plant community endpoint are also presented in Table 5-4.

5.1.6 *Terrestrial Invertebrate TRVs*

TRVs for terrestrial invertebrates were also provided by USEPA (2000) and represent the geometric mean of various literature studies (meeting acceptability criteria) concerning contaminant concentrations and effects (or lack of effects) on invertebrates. Literature studies relating to invertebrate toxicity generally reported the contaminant concentration that adversely affected 10 to 20 percent of the invertebrates tested or the maximum acceptable threshold concentration (or the mean of the No Observed Effect Concentration). The surface soil TRVs available for the terrestrial invertebrate community are presented in Table 5-4.

5.1.7 *Wildlife TRVs*

Wildlife toxicity reference values were selected to evaluate potential affects of the estimated exposure doses received by the selected avian and mammalian receptor species. Because toxicity data for the selected receptor species are unavailable, it is necessary to extrapolate toxicity data from other species, usually laboratory test animals. For mammals, the toxicity data from the test species is adjusted for the wildlife measurement receptors (i.e., meadow vole and short-tailed shrew) by using a body weight-scaling factor (per Sample et al., 1996). The existing scientific literature indicates that this physiological scaling factor is not appropriate for avian species.

The test endpoints for the laboratory species must be significant to the measurement receptor species under field conditions. Endpoints that were considered significant for this Stage II ERC included adverse effects on growth, reproduction, and survival that are most likely to result in adverse effects to wild populations of receptors. The lowest chronic No Observable Adverse Effect Level (NOAEL) and the chronic Lowest Observable Adverse Effect Level (LOAEL), if available, were selected for each COC. TRVs selected for each COC for mammals and birds are presented in Table 5-5.

5.2 Risk Characterization Results

Potential risks to the selected measurement receptors from COCs detected in the media and biota of concern at the Site were evaluated by the quotient method which compares estimated exposure doses with applicable toxicity reference values (TRVs). This comparison (expressed as a hazard quotient) is calculated for each COC as follows:

$$HQ = ED/TRV$$

where:

HQ = Hazard Quotient;
ED = Exposure Dose (from Section 5.1.1); and,
TRV = Toxicity Reference Value (from Section 5.1.2).

If the calculated hazard quotient is less than one, then it is unlikely that that contaminant will result in an adverse effect on that measurement receptor. Conversely, a hazard quotient greater than one indicates that that particular measurement receptor may be at risk of an adverse effect from that contaminant. A total HQ is also calculated based on the sum of the COC-specific HQs to determine the risk from multiple stressors.

It is important to note that HQs provide only a general characterization of potential impacts to the local biota. A HQ less than one is indicative of non-risk, however, a HQ greater than unity does not in itself represent an unacceptable risk. Whether a contaminant is likely to cause or have caused an effect at the population level will be dependent upon other site-specific factors such as whether the mean or maximum exposure case exceeds the biological threshold, to what degree the threshold is exceeded, and how the contaminant is distributed across the Site.

5.2.1 Amphibian Larvae

Risk to amphibian larvae inhabiting the aquatic habitats associated with Outfalls 001 and 002 was evaluated. The evaluation compared detected concentrations of COCs within the surface water of the ponded areas at the two outfalls with amphibian toxicity benchmarks. The results of this evaluation are presented in Table 5-6.

Total HQs for both Outfall 001 and Outfall 002 are 0.8. The results indicate that amphibian larvae are not at an acute risk from the concentrations of surface water COCs detected at the outfalls.

5.2.2 Benthic Invertebrate Community

Risk to the benthic macroinvertebrate community from the detected COCs within the sediments of Outfalls 001 and 002 were assessed by comparing detected concentrations at each sediment sample location with benchmarks associated with effets to benthic biota. The results of this evaluation are presented in Table 5-7 and are depicted on Figure 5-1.

Sediment quality within each of the outfall sediment groupings is fairly similar. All five sediment COCs (i.e., cadmium, copper, lead, nickel and zinc) were detected above their

respective threshold effect concentration (TEC) within three of the four sediment samples. Only cadmium and lead were detected below the TEC at one of the sediment samples collected at Outfall 001. Copper, lead and nickel were detected at concentrations that exceed their probable effect concentration (PEC) at three of the four sediment sample locations. Results are discussed below for each of the outfall sediments.

Outfall 001

Comparing the detected concentrations with the TEC results in total HQs of 9 and 46 for the two sediment samples at this outfall. Only cadmium and lead were detected below their respective TECs at one of the two sample locations. Copper exceeded its TEC by a factor of 31 at one sample location (OU1-2-SED). Total HQs of 3 and 11, respectively, for the two samples were obtained when comparing detected sediment contaminant concentrations with their PECs. Copper was detected at a concentration 7 times its PEC at sample location OU1-2-SED. Lead and nickel also exceeded their respective PEC values by a factor of 1 to 2 at the outfall location. The exceedences of the PEC by these contaminants (i.e., copper, lead and nickel at OU1-2-SED and nickel at OU1-1-SED) indicate that sediment concentrations are above levels where adverse effects to the benthic macroinvertebrate community are generally noted. Overall, there exists a significant potential for detected concentrations of these metals to adversely effect the benthic macroinvertebrate community at Outfall 001.

Outfall 002

Total HQs of 37 and 93 were calculated for the two sediment samples at Outfall 002 when comparing detected concentrations to their respective TECs. Although all five COCs exceed their TECs at both sample locations, copper and lead generated the highest HQs as both these COCs have HQs greater than 10 at both sample locations. Copper and lead also contributed the greatest risk at each sample location when comparing detected concentrations to their respective PECs. Total HQs for the PECs at the two sampling locations are 9 and 22, respectively. Copper and lead contribute over 75 percent of the total risk at each of these sampling sites. Similar to Outfall 001, there exists a significant potential for detected concentrations of copper and lead to adversely effect the benthic macroinvertebrate community at Outfall 002.

5.2.3 Wetland Plant Community

Mean and maximum concentrations of surface soil COCs detected in the vicinity of Outfall 001 and Outfall 002 were compared to their respective plant soil and plant tissue TRVs. This comparison is provided in Tables 5-8 and 5-9, respectively. Results are depicted on Figures 5-2 (plant soil TRVs) and 5-3 (plant tissue TRVs). Plant soil TRVs are only available for two (cadmium and zinc) of the six COCs detected within surface soils located in the vicinity of Outfalls 001 and 002. The maximum detected concentrations of cadmium at both outfalls did not exceed its TRV. However, both mean and maximum zinc concentrations in surface soil samples at both outfalls exceed the plant soil TRV for zinc. Nickel and zinc concentrations in vegetation exceeded their respective plant tissue TRVs within the wetlands located adjacent to Outfalls 001 and/or 002. Maximum concentrations of copper and lead detected in vegetation at

both outfalls are below their respective plant tissue TRVs. A brief discussion of COC concentrations within surface soil and vegetation at each outfall is provided below.

Outfall 001

Detected concentrations of zinc within six of the nine surface soil samples collected in the vicinity of Outfall 001 exceed its plant soil TRV. The detected zinc concentrations at the three samples located nearest Outfall 001 (OU1-7-SS, OU1-8-SS and OU1-9-SS) were below the plant soil TRV while the six outer samples (OU1-1-SS through OU1-6-SS) contained zinc levels that were at or greater than the plant soil TRV. However, concentrations of zinc in vegetation samples were less than the reported plant tissue TRV for zinc (350 mg/kg dry weight as cited in Smith, 1993). Zinc concentrations in vegetation collected near Outfall 001 ranged from 10 to 21 mg/kg (wet weight). Assuming that plants contain 90 percent water content (Baes et al., 1984), the concentration of zinc in vegetation on a wet weight basis that is indicative of phytotoxicity would be 35 mg/kg. The concentrations of zinc detected in vegetation tissue samples collected near Outfall 001 ranged from 10 to 21 mg/kg. Therefore, it appears unlikely that vegetation located in the vicinity of Outfall 001 would be adversely affected by zinc soil concentrations. The highest nickel vegetation tissue concentration (1.1 mg/kg at OU1-4-VEG) slightly exceeds the lower range of the plant tissue TRV for nickel (range of 1 mg/kg to 10 mg/kg adjusted to wet weight basis). There exists a slight potential that nickel may result in adverse effects to vegetation at Outfall 001. However, it should be noted that signs of plant stress in the wetland community in the vicinity of Outfall 001 were not noted.

Outfall 002

Zinc concentrations at all five surface soil sample locations near this outfall contain zinc concentrations above its plant soil TRV. Concentrations of zinc were generally three to four times greater than the zinc plant soil TRV in surface soil samples near Outfall 002. Zinc concentrations in the two plant tissue samples collected near Outfall 002 ranged from 66 to 110 mg/kg (wet weight). As discussed above, the concentration of zinc in vegetation on a wet weight basis that is indicative of phytotoxicity is 35 mg/kg. Therefore, plants located in the vicinity of Outfall 002 may be adversely affected by zinc soil concentrations. The concentrations of nickel within the two vegetation samples at Outfall 002 (0.96 mg/kg and 1.7 mg/kg) slightly exceed the lower range of the plant tissue TRV for nickel (range of 1 mg/kg to 10 mg/kg adjusted to wet weight basis). There exists a slight potential that nickel may result in adverse effects to vegetation at Outfall 002.

The vegetation community within this area contains a considerable amount of common reed (*Phragmites australis*). This wetland grass species is often associated with disturbance including discharge of pollutants (e.g., road salt) or habitat alteration. In particular, bare patches of sand deposited in wetlands are believed to provide an important germination site for common reed (Marks et al., 1993). After becoming established, common reed often forms dense monotypic stands within wetlands. It is unclear whether the presence of common reed is related to its tolerance of elevated metals within surface soils of the wetland or is attributable to the substantial habitat alterations that have occurred within and/or adjacent to the large wetland complex present at the site.

and/or ?

5.2.4 *Terrestrial Invertebrate Community*

Mean and maximum detected concentrations of surface soil COCs in the vicinity of Outfalls 001 and 002 were compared to terrestrial invertebrate TRVs. This evaluation is provided in Table 5-10 and depicted on Figure 4-4. TRVs for terrestrial invertebrates are only available for three (cadmium, copper and zinc) of the six COCs detected within surface soils located in the vicinity of Outfalls 001 and 002. The maximum detected concentrations of cadmium within surface soils near both outfalls did not exceed its TRV, however, both mean and maximum copper and zinc concentrations in surface soil samples at both outfalls exceed their respective invertebrate TRVs. A brief discussion of copper and zinc concentrations at each outfall is provided below.

Outfall 001

Mean and maximum total HQs for terrestrial invertebrates are 20 and 73, respectively. Copper provides 85 percent of the total risk (see Table 5-10). Concentrations of copper and zinc at seven of the nine sample locations exceed their respective TRVs. Only samples OU1-8-SS and OU1-9-SS nearest the parking lot do not exceed either the copper or zinc invertebrate TRV. The detected concentrations of copper and zinc indicate that adverse effects to terrestrial invertebrates are possible in the vicinity of Outfall 001. Terrestrial invertebrates were collected at three of the seven locations where surface soil concentrations exceed the copper and zinc TRVs for terrestrial invertebrates. These three surface soil sample locations are OU1-3-SS (OU1-1-INV), OU1-4-SS (OU1-2-INV) and OU1-5-SS (OU1-3-INV)(see Figure 5-4). The invertebrates collected at these sample locations were primarily earthworms and sowbugs and is similar to the reference invertebrate community (REF-INV). Therefore, it is unclear whether the elevated concentrations of copper and zinc have resulted in adverse affects to the terrestrial invertebrate community inhabiting the wetlands in the vicinity of Outfall 001.

Outfall 002

The mean and maximum total HQs are 68 and 120, respectively. Copper provided over 90 percent of the total HQ while zinc provided the remainder. Copper concentrations at all five surface soil sample locations exceed the copper TRV by at least an order of magnitude. The detected zinc concentrations at all five samples also exceed its respective terrestrial invertebrate TRV. Invertebrates were collected at two of these sample locations (OU2-1-INV and OU2-2-INV) and consisted primarily of sowbugs, centipedes, spiders and beetles. These organisms are primarily associated with the surface litter of the soil while earthworms are generally associated with the surface soil layer. Earthworms are more likely to accumulate COCs contained within soil because they generally have a higher contact rate with the soil. Earthworms were not found at either of these sampling locations and may be reflective of the elevated metal concentrations or another unknown environmental variable.

5.2.5 *Wildlife Receptors*

The meadow vole, marsh wren and short-tailed shrew were selected to represent mammalian herbivores, avian insectivores, and mammalian insectivores, respectively. Potential risks from the ingestion of surface soil, vegetation and invertebrates within the Site wetlands near Outfalls

001 and 002 are evaluated by comparing the estimated exposure doses received by the indicator species with applicable chronic NOAEL and LOAEL toxicity values. Risk to each of these receptors within the vicinity of both outfalls is discussed in the following sections.

5.2.6 Meadow Vole (Herbivorous Mammal)

Risks to the herbivorous meadow vole from detected mean and maximum COC concentrations in surface soils and vegetation in the vicinity of Outfalls 001 and 002 are presented in Table 5-11. Results are discussed below.

Outfall 001

The mean total HQ for the NOAEL and LOAEL TRVs are both less than unity indicating adverse effects to the meadow vole from consuming vegetation and surface soil in the vicinity of Outfall 001 are unlikely. The maximum total HQ for the NOAEL TRV is 2 with copper the only COC with a HQ at or above unity. The copper HQ for the NOAEL TRV is 1. However, 95 percent of the estimated copper exposure dose is from soil ingestion with the remaining 5 percent from vegetation (see Appendix B). Risks to herbivorous mammals are not anticipated as they are unlikely to consume surface soil entirely in the vicinity of the maximum detected concentration.

Outfall 002

The total mean HQs for the NOAEL and LOAEL TRVs are 2 and 1, respectively. The mean estimated exposure dose of copper is the only COC that resulted in a NOAEL HQ above unity (HQ for copper is 1). Mean exposure doses of all COCs received by the meadow vole were below the chronic LOAEL TRV. Therefore, risks are not likely as the mean dose is similar to the NOAEL TRV which reflects no affect. Although the maximum detected concentration of copper has a HQ above unity for both the NOAEL and LOAEL TRVs, it is unrealistic to assume that foraging would be restricted for a significant period of time in the vicinity of maximum detected concentrations.

why ?

5.2.7 Marsh Wren (Insectivorous Bird)

Risks to the insectivorous marsh wren from COC concentrations within terrestrial invertebrates as well as from the ingestion of wetland surface soil are presented in Table 5-12. Results for each outfall are discussed below.

Outfall 001

The total mean HQs for the NOAEL and LOAEL TRVs are 24 and 4, respectively. Mean HQs for LOAEL TRVs slightly exceed unity for lead (HQ is 2) and copper (HQ is 1). Mean HQs for chronic NOAEL TRVs are greater than unity for lead (HQ is 17), zinc (HQ is 3) and copper (HQ is 1). Lead provides approximately 70 percent of the total risk based on the chronic NOAEL TRV. Lead and copper present the greatest risk to insectivorous birds foraging within the wetland in the vicinity of Outfall 001 as the mean estimated exposure doses received by these COCs exceeds both the chronic NOAEL and LOAEL TRVs. The majority of the estimated

copper and lead exposure doses received by the marsh wren are from the ingestion of invertebrates (see Appendix B). An impact from the ingestion of zinc is possible although the mean estimated exposure dose is less than the zinc LOAEL TRV.

Outfall 002

The estimated mean chronic NOAEL and LOAEL HQs for the marsh wren are 14 and 3, respectively. The mean estimated exposure dose of copper (HQ is 2) is the only COC that exceeds its respective LOAEL TRV. Mean estimated exposure doses of lead (HQ is 7), zinc (HQ is 4) and copper (HQ is 3) are the only COCs that exceed their NOAEL TRVs. These results suggest that insectivorous birds are potentially at risk from mean concentrations of copper within invertebrates and surface soils in the portion of the wetland located near Outfall 002. The ingestion of invertebrates and surface soil containing copper provided similar exposure to the marsh wren. Lead and zinc may also contribute to risk although this is uncertain as the mean exposure doses of these COCs are less than their respective LOAEL TRV.

5.2.8 Short-tailed Shrew (Insectivorous Mammal)

Risks to the short-tailed shrew at both outfalls from COC concentrations within terrestrial invertebrates and vegetation as well as from the ingestion of wetland surface soil are presented in Table 5-13. Results for each outfall are discussed below.

Outfall 001

The total mean HQs for the NOAEL and LOAEL TRVs are 4 and 2, respectively. Copper is the only COC that has an HQ that exceeds unity (HQs are 2 and 1 for NOAEL and LOAEL TRVs, respectively). The majority of the copper exposure dose is from the ingestion of terrestrial invertebrates (see Appendix B). Potential risks to insectivorous mammals inhabiting the wetland near Outfall 001 may occur from the detected concentrations of copper within surface soil and invertebrates. Although the maximum detected concentration of cadmium, lead and selenium have HQs above unity for the NOAEL TRV, it is unlikely that foraging would be restricted for a significant period of time in the vicinity of maximum detected concentrations. In addition, the maximum exposure doses of these COCs are less than their respective LOAEL TRVs.

Outfall 002

The total mean HQs for the NOAEL and LOAEL TRVs are 3 and 2, respectively. Copper is the only COC to have an HQ that exceeds unity (mean HQ is 2 for both NOAEL and LOAEL TRVs) for either mean or maximum exposure doses. The estimated copper exposure dose to the shrew is primarily from soil and invertebrate ingestion. These results suggest that risks to insectivorous mammals from ingestion of copper within surface soil and terrestrial invertebrates at the wetland in the vicinity of Outfall 002 are possible.

5.2.9 *Population Effects to Wildlife Receptors*

The analyses above indicate that insectivorous birds and mammals that inhabit the wetlands in the vicinity of Outfalls 001 and 002 are possible from several COCs (primarily copper with lead and zinc also contributing to risk to insectivorous birds). In order to determine whether these potential impacts may affect the local population of these receptors inhabiting the entire 85-acre wetland, additional analyses were conducted. Specifically, the potential effects of COCs to impact wildlife within the remaining portions of the wetland not located in the vicinity of the two outfalls was investigated.

The extent of contamination within the wetland located in the vicinity of Outfall 002 is expected to be limited to the sampling area and a short distance to the southeast (total area of approximately 30,000 square feet or 0.7 acres). As discussed previously, surface water flows from Outfall 002 are to the southeast where they would eventually merge with flows originating from Outfall 001. Therefore, the extent of contamination associated with Outfall 002 is restricted to the wetland area evaluated. However, surface water flows from Outfall 001 (as well as co-mingled flows originating from Outfall 002) may extend into the large wetland beyond the limits of the recent sampling.

In order to evaluate the potential for COCs to affect wildlife receptors located beyond the limits of the recent sampling it was assumed that the concentrations of COCs detected within the three outermost surface soil samples (OU1-1-SS, OU1-2-SS and OU1-3-SS) and biota (OU1-1-VEG and OU1-1-INV) associated with Outfall 001 extend throughout the remaining downgradient portions of the large wetland area. Risks to insectivorous birds and mammals from detected COC concentrations at these sampling locations were evaluated for the marsh wren and short-tailed shrew (assuming an Area Use Factor of 1). Results from this evaluation were compared to the potential risks from surface soil and biota sampling results obtained from the reference sample (REF-SS, REF-VEG and REF-INV) that is located upgradient from Outfall 002. The estimated exposure doses are presented in Appendix B and the results of this evaluation are presented in Table 5-14.

Marsh Wren

The total HQs for the chronic NOAEL and LOAEL TRVs for the outer portion of the wetland associated with Outfall 001 (conservatively assumed to represent conditions with the downgradient portions of the large wetland area) are 7 and 1, respectively. For the NOAEL TRV, lead and zinc HQs are greater than unity (lead HQ is 4 and zinc HQ is 2). No COCs have a HQ above unity for the LOAEL TRV. The total HQs for the reference wetland sampling locations are similar or exceed HQs associated with Outfall 001 (HQs for NOAEL and LOAEL TRVs are 9 and 1, respectively). Therefore, risks to the marsh wren in the remaining portions of the large wetland located downgradient of Outfalls 001 and 002 are expected to be low (above NOAEL TRV but below LOAEL TRV) and do not exceed risks associated with portions of the large wetland unaffected by Outfalls 001 and 002.

Short-tailed Shrew

The total mean HQs for the NOAEL and LOAEL TRVs are 2 and 0.9, respectively for the outer portion of the wetland associated with Outfall 001. No COCs have a mean HQ above unity for either the NOAEL or LOAEL TRV indicating a low potential for risk to insectivorous mammals. The reference sampling location showed similar results with total mean HQs for the NOAEL and LOAEL TRVs equal to 1 and 0.5, respectively. Within the reference wetland sample, no COCs have a mean HQ above unity for either the chronic NOAEL or LOAEL TRV.

Overall, potential risks to insectivorous birds and mammals (represented by the marsh wren and short-tailed shrew) are expected to be limited to the wetlands located in the vicinity of Outfall 001 and Outfall 002. The total extent of this area is approximately 1.7 acres (1 acre and 0.7 acres associated with Outfalls 001 and 002, respectively). This area represents approximately 2 percent of the 85-acre wetland complex. Since songbirds and small mammals have small territories that are actively defended, it is unlikely that many individuals other than those insectivorous birds and mammals that inhabit the wetlands in the vicinity of the two outfalls would forage within the impacted area. Therefore, the risk to the local population of these wildlife receptors is expected to be insignificant from the area of contamination associated with Outfalls 001 and 002.

5.2.10 Risk Summary

The following provides a review of the data and the associated conclusions regarding risk.

Amphibians

- Based on detected surface water concentrations, and the presence of numerous amphibian larvae within the aquatic habitat associated with Outfall 002, there is no risk to amphibians.

Benthic Macroinvertebrates

- Sediment concentrations of copper, lead, nickel and zinc detected at Outfalls 001 and 002 are the above Probable Effect Concentrations (PEC) associated with impacts to benthic macroinvertebrates (MacDonald et al., 2000). Therefore, the benthic macroinvertebrate communities within these limited areas of aquatic habitat may be adversely affected by these metals.
- Total area of impact for Outfalls 001 and 002 is approximately 100 square feet.

Plant Community

- Zinc concentrations in soil near Outfall 002 exceed the benchmark associated with an adverse impact to vegetation (US EPA, 2000).
- Zinc concentrations in plant tissue near Outfall 002 exceed the benchmark associated with adverse impact to vegetation (Smith, 1993).

- Note that these benchmarks are not species-specific to the plants sampled within the study area.
- Area of impact associated with Outfall 002 is approximately 0.2 acres.

Terrestrial Invertebrate Community

- Copper and zinc concentrations in soil near Outfalls 001 and 002 are above the benchmarks associated with adverse impacts to terrestrial invertebrates (US EPA, 2000).
  - ✓ The invertebrate community observed near Outfall 001 is similar to the invertebrates observed at the reference wetland sample location (REF-INV) obtained upgradient of Outfalls 001 and 002. Therefore, it appears that the copper and zinc present in the soil do not adversely affect the community.
  - ✓ The invertebrate community observed near Outfall 002 differs from the invertebrate community observed at the reference wetland sample location (REF-INV) (i.e. no earthworms noted near Outfall 002). This may be a manifestation of a stressed community.
- Area of impact associated with Outfall 002 is approximately 0.2 acres (i.e. same area that poses risk to the Plant Community).

Wildlife Community

- Mammalian herbivore (meadow vole) – Risk calculations indicate no significant risk near Outfalls 001 or 002 from detected concentrations in soil and plant tissue.
- Avian insectivores (marsh wren) – Risk calculations indicate a risk from:
  - Copper and lead found in soil and invertebrate tissue near Outfall 001.
  - Copper in soil and invertebrate tissue near Outfall 002
  - ✓ Therefore, avian insectivores inhabiting the wetlands may potentially be adversely affected by concentrations of copper detected within surface soils and invertebrates near both outfalls
  - ✓ Area of impact is approximately 0.7 acres at Outfall 002, and 1 acre at Outfall 001.
  - ✓ Using the levels of contaminants observed along the eastern-most area of wetlands sampled by TRC, the calculated risk for the remaining portions of the 85-acre wetland to avian insectivores is equal to or below the risk calculated at the reference wetland sample location (REF-SS and REF-INV). This indicates that there is no significant risk to these receptors in the remaining wetland.
  - ✓ When evaluating risk for the wetland as a whole (including the outfall impacts), no significant impacts are expected to the avian insectivores since less than 2% of the local population would be affected (i.e. population effects to these receptor groups are unlikely given the small area of contamination relative to the size of the wetland complex).

- Mammalian insectivores (short-tailed shrew) – Risk calculations indicate a risk from copper found in invertebrates near Outfalls 001 and 002.
    - ✓ Therefore, mammalian insectivores inhabiting the wetlands may potentially be adversely affected by concentrations of copper detected within surface soils and invertebrates near both outfalls.
    - ✓ Area of impact is approximately 0.7 acres at Outfall 002, and 1 acre at Outfall 001.
    - ✓ Using the levels of contaminants observed along the eastern-most area of wetlands sampled by TRC, the calculated risk for the remaining portions of 85-acre wetland to mammalian insectivores is equal to or below the risk calculated at the reference wetland sample location (REF-SS and REF-INV). This indicates that there is no significant risk to these receptors in the remaining wetland.
    - ✓ When evaluating risk for the wetland as a whole (including the outfall impacts), no significant impacts to the mammalian insectivores are expected since < 2% of local population would be affected (i.e. population effects to these receptor groups are unlikely given the small area of contamination relative to the size of the wetland complex).

6.0 REVISED SITE CONCEPTUAL MODEL

The site conceptual model presented in Section 3.0 is now revised using the new data as well as the risk characterization presented here.

The concentrations of the target analytes in the sediment and soil samples collected by TRC support the earlier model where the water drainage pathways have controlled the distribution of the COCs. As documented herein, the highest levels of COCs appear in the vicinity of Outfall 002. From here, flow patterns extend southward along the parking lot boundary to Outfall 001, and then extend eastward out into the wetland areas in North Reading. The observed levels of COCs reveal a parallel pattern, with generally decreasing concentrations along the flow pathway. Based on this data, TRC believes that additional sampling to constrain the nature and extent of the impact is not necessary.

Essentially, of the five overall assessment endpoints (amphibians, benthic macroinvertebrates, plant community, terrestrial invertebrate community, and wildlife community), conclusions of no significant risk were obtained for the amphibians and wildlife community, while potential significant risk has been determined for the benthic macroinvertebrates, plant community, and terrestrial invertebrate community.

In summary, the media and contaminants of concern that may cause significant environmental risk in the wetland are as follows:

- Copper, lead, nickel, and zinc in sediment at Outfalls 001 and 002 (potential significant risk to benthic macroinvertebrates)
- Copper and zinc in soil at Outfall 001 (potential significant risk to terrestrial invertebrates; potential significant risk to plant community limited to zinc).

6.1 Potential Areas of Concern

Using the data, trend analysis and risk characterization provided herein, the impacted sediment and soil areas can be defined as three potential areas of concern. These areas are outlined on Figure 6-1.

Area A

This areas corresponds to the impacted sediments at Outfall 002.

Area B

This area corresponds to the impacted sediments at Outfall 001.

Area C

This area corresponds the soils in the vicinity of Outfall 002 that have revealed a potential ecological risk due to elevated plant tissue and soil concentrations. This also corresponds to the area previously described as heavily scarred from past mining and filling practices. The area has undergone changes in surface drainage patterns, which likely flooded the cedar swamp, ultimately killing the trees in the area, and leaving an area with localized flooding and ponding

of water. Today it is a low-quality wetland characterized by invasive, non-native wetland plants with a sparse terrestrial invertebrate community. It is unclear at this time whether this is a solely the result of the previous alterations from the mining practices, a result of COC impacts, or a result of the COC impacts superimposed on the previously-disrupted area.

7.0 RISK/BENEFIT ANALYSIS

Based on the risk characterization results and conclusions, potential significant environmental risk is limited to soil and sediment for elevated metals concentrations in the Outfall 001 and 002 areas. Due to the nature and location of the contaminants responsible for potential significant risk, the remedial measures to address the wetlands are very limited. In fact, the only remedial options considered as viable solutions include soil/sediment removal by excavation, and no action (natural attenuation). For the no action solution, it was assumed that the existing contaminant levels would remain unchanged given that 1) metals do not naturally biodegrade, and 2) metals do not appear to be mobile in the wetland environment.

The no action and excavation alternatives were comparatively evaluated for two specific criteria: risk and benefit. The evaluation compared the risks of performing the alternative (such as wetland habitat destruction) with the benefits of the alternative (such as reduction of contaminant concentrations). This evaluation was performed for both the sediment and soil media with each of the five identified assessment endpoints (amphibians, benthic macroinvertebrates, plant community, terrestrial invertebrate community, and wildlife community). The results of this evaluation are summarized in Table 7-1.

7.1 Sediment

Risk to contaminants in sediment in Area A and B apply only to the benthic macroinvertebrates, so there is no change in risk levels (and therefore no additional benefit) to the other four assessment endpoints whether no action or excavation is performed in the sediments. Under the no action alternative, the risk levels remain unchanged and potential significant risk remains for benthic macroinvertebrates. Under the excavation alternative, the contaminants causing significant risk in the outfall sediments are removed. This would also cause a temporary disruption of the sediment ecosystem and likely destroy the existing benthic macroinvertebrates. It is presumed, however, that the benthic organisms would repopulate the remediation area in a relatively short time such that no long-term harm would result in the excavation. The overall excavation area for sediments in the outfalls is relatively small and sediment excavation would not be expected to significantly impact any other of the assessment endpoint ecosystems.

For sediment in Area A and Area B, the benefits are greater than the risks for sediment excavation versus no action.

7.2 Soil

Risks to contaminants in soil in Area C are potentially significant only to the plant and terrestrial invertebrate communities. A level of no significant risk is already present for the wildlife community. As such, there would be no change in risk levels (and therefore no additional benefit) for the amphibians, benthic macroinvertebrates, or wildlife community whether no action or excavation is performed in the soil. Under the no action alternative, potential significant risk remains for the plant and terrestrial invertebrate communities. Recall that it is unclear if actual significant risk is present in the plant community due to limitations in the

literature benchmark levels; the benchmarks are not species-specific and it is unknown whether any existing vegetation has been adversely impacted.

Under the excavation alternative, the contaminants causing the significant risk are removed. The area of removal would consist of approximately 0.2 acres in Area C (vicinity of Outfall 002). At an average depth of one foot, approximately 325 cubic yards of soil would be removed. Such a removal action could have a significant adverse impact on the wetland ecosystem, including the amphibians and wildlife communities that would not be achieving any benefit from the removal action. Habitat destruction would be expected and it is unknown as to what permanent effects would result from the habitat destruction. Furthermore, as presented in Section 5.2.10, the population effects to the receptor groups are unlikely given the small area of potential impact relative to the size of the entire 85-acre wetland complex.

For soil excavation, the risks to the wetland ecosystems are greater than the benefits achieved compared to the no action alternative.

Table 7-1
Risk/Benefit Analysis

Alternative	Amphibians		Benthic Macroinvertebrates		Plant Community		Terrestrial Invertebrates		Wildlife Community	
	Risk	Benefit	Risk	Benefit	Risk	Benefit	Risk	Benefit	Risk	Benefit
Sediment										
No Action	None. A condition of no significant risk already exists.	None. A condition of no significant risk already exists.	Potential significant risk remains.	No benefit as significant risk remains.	No change in risk levels as sediment contaminants do not impact plant community.	None. No change in risk levels as sediment contaminants do not impact plant community.	No change in risk levels as sediment contaminants do not impact terrestrial invertebrates.	None. No change in risk levels as sediment contaminants do not impact terrestrial invertebrates.	None. A condition of no significant risk already exists.	None. A condition of no significant risk already exists.
Excavation and Removal	Minimal risk due to very small area of disturbance.	None. A condition of no significant risk already exists.	Minimal risk due to very small area of disturbance. Community repopulation expected.	Significant risk eliminated for future community.	Minimal risk due to very small area of disturbance.	None. No change in risk levels as sediment contaminants do not impact plant community.	Minimal risk due to very small area of disturbance.	None. No change in risk levels as sediment contaminants do not impact terrestrial invertebrates.	Minimal risk due to very small area of disturbance.	None. A condition of no significant risk already exists.
Soil										
No Action	None. A condition of no significant risk already exists.	None. A condition of no significant risk already exists.	No change in risk levels as soil contaminants do not impact benthic macroinvertebrates.	None. No change in risk levels as soil contaminants do not impact benthic macroinvertebrates.	Potential significant risk remains.	No change in benefit as significant risk remains, although community remains undisturbed.	Potential significant risk remains.	No change in benefit as significant risk remains, although community remains undisturbed.	None. A condition of no significant risk already exists.	None. A condition of no significant risk already exists.
Excavation and Removal	Potential risk of substantial habitat destruction. Community repopulation may be different from original conditions.	None. A condition of no significant risk already exists.	Potential risk of substantial habitat destruction.	None. No change in risk levels as soil contaminants do not impact benthic macroinvertebrates.	Potential risk of substantial habitat destruction. Community repopulation may be different from original conditions.	Significant risk (if any) eliminated for future community. Minimal risk reduction achieved.	Potential risk of substantial habitat destruction. Community repopulation may be different from original conditions.	Significant risk eliminated for future community.	Potential risk of substantial habitat destruction. Community repopulation may be different from original conditions.	None. A condition of no significant risk already exists.

8.0 RECOMMENDATIONS FOR FUTURE ACTION

8.1 Options

Given the results of the risk/benefit analysis, TRC concludes and recommends that remediation via excavation and off-site disposal be performed for sediments in the Outfall 001 and 002 areas. Such remediation would eliminate future risk for the benthic macroinvertebrates without causing any significant impact to the wetland ecosystems due to the limited nature of sediment removal. What little ecosystem damage that would results from sediment removal would be naturally restored in a short period of time.

TRC does not recommend soil excavation and removal in the wetlands at Area C. The impacted area is approximately 0.2 acres and metals contamination only potentially impacts the plant and terrestrial invertebrate communities. No significant risk is already present for the ——— ? bioaccumulation food chain wildlife community and for amphibians. However, soil removal would potentially cause habitat destruction for all communities, even for communities (such as amphibians and wildlife) that would obtain no benefit from soil remediation. Furthermore, it is unclear whether this area has been adversely impacted by the detected levels of metals, or by past land disturbance activities that have occurred throughout and adjacent to the wetland complex. TRC believes soil remediation in the wetlands could cause more environmental and ecological damage than it would achieve risk reduction. In addition, MADEP has previously expressed concern regarding potential impacts to the wetland from site remediation activities (MADEP, 1996b), and have repeatedly voiced concern about minimizing adverse effects to the wetlands.

TRC recommends that sediment excavation in Outfalls 001 and 002 be performed as a Release Abatement Measure (RAM). Upon completion of the RAM, a partial Response Action Outcome Statement would be prepared for the Outfall 001 and 002 areas. This would conclude MCP response actions for this Operable Unit of the former GE site.

8.2 Schedule for Future Action

In order to perform the recommended work, TRC must file a Notice of Intent (NOI) with the Town of North Reading's Conservation Commission. This process will require 1) the preparation of a document outlining the work, and the proposed wetland mitigation and restoration plans, 2) a public hearing, and 3) final approval from the Conservation Commission prior to conducting the work. Therefore, at least three months will be needed to complete the NOI process before implementation.

As discussed previously in this document, amphibian larvae have been observed in the pooled water at outfalls 001 and 002. In order to minimize the destruction of the amphibian population in these areas, TRC recommends conducting the excavation of the impacted sediments during last winter/early spring 2004

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TABLES

Table 3-1
Assessment Endpoints and Measures of Effect for Wetland Area, Former GE Site, Wilmington/North Reading, Massachusetts

Assessment Endpoints	Measures of Effect
Reduction in Amphibian Community Diversity and Productivity	Comparison of surface water COC concentrations with effect levels reported in the literature associated with adverse effects to amphibians.
Reduction in Aquatic Macrobenthic Community Diversity and Productivity	Comparison of bulk sediment COC concentrations with sediment guidelines associated with adverse effects to benthic biota.
Reduction in Wetland (Terrestrial) Plant Community Diversity and Productivity	1) Comparison of bulk surface soil concentrations of COCs with surface soil screening levels associated with adverse effects to vegetation; and 2) Comparison of vegetation concentrations of COCs with plant tissue concentrations associated with adverse effects to vegetation.
Reduction in Wetland (Terrestrial) Macroinvertebrate Community Diversity and Productivity	Comparison of bulk surface soil concentrations of COCs with surface soil screening levels associated with adverse effects to terrestrial invertebrates.
Reduction in Mammalian Herbivore Survival/Reproduction/Growth	Comparison of estimated COC exposure doses received by meadow vole (from measured vegetation tissue concentrations) to chronic NOAEL and LOAEL effect levels reported in literature.
Reduction in Avian Insectivore Survival/Reproduction/Growth	Comparison of estimated COC exposure doses received by marsh wren (from measured terrestrial invertebrate tissue concentrations) to chronic NOAEL and LOAEL effect levels reported in literature.
Reduction in Mammalian Insectivore Survival/Reproduction/ Growth	Comparison of estimated COC exposure dose received by short-tailed shrew (from measured vegetation and terrestrial invertebrate tissue concentrations) to chronic NOAEL and LOAEL effect concentrations reported in literature.

NOAEL: No observable effect level
LOAEL: Low observable effect level

Table 5-1. Exposure Characterization Factors for Assessments of Wildlife Measurement Endpoints.

Measurement Receptor	Exposure Location	Daily Food Ingestion Rate (kg WW/kg/day)	Percent Diet Vegetation (%)	Percent Diet Invertebrates (%)	Percent Diet Soil (%)	Area Use Factor (1)	Reference
Meadow Vole	Outfall 001	0.35	98	0	2	1(2)	USEPA, 1993
	Outfall 002	0.35	98	0	2	1(2)	-
Marsh Wren	Outfall 001	0.67	0	98	2	1(3)	USEPA, 1993
	Outfall 002	0.67	0	98	2	1(3)	
Short-tailed Shrew	Outfall 001	0.62	12	86	2	1(4)	USEPA, 1993
	Outfall 002	0.62	12	86	2	0.7(4)	

Notes: (1) Area Use Factor based on affected environment at Outfall 001 > 1 acre and at Outfall 002 = 0.7 acres (30,000 sq. ft.)
(2) Home range of meadow vole = 0.1 acre
(3) Home range of marsh wren = 0.4 acre
(4) Home range of short-tailed shrew = 1.0 acre

Table 5-2. Amphibian Toxicity Reference Values (TRVs) for Surface Water COCs.

Parameter	TRV (ug/L)	Endpoint	Reference
Antimony	300	LC-50 - Toad embryo/larvae	Pauli et al., 2000
Cadmium	106	NOAEL - Salamander larvae toxicity	Pauli et al., 2000
Copper	20	NOAEL - Toad larvae development	Pauli et al., 2000
Lead	750	LOAEL - Frog larvae behavior	Pauli et al., 2000
Nickel	50	LC-50 - Toad embryo/larvae	Pauli et al., 2000
Zinc	100	NOAEL - Toad larvae development	Pauli et al., 2000

Table 5-3. Benthic Invertebrate Toxicity Reference Values for Sediment COCs.

Contaminant of Concern	TEC (mg/kg)	PEC (mg/kg)	Reference
Cadmium	1.0	5.0	MacDonald et al., 2000
Copper	31.6	149	MacDonald et al., 2000
Lead	35.8	128	MacDonald et al., 2000
Nickel	22.7	48.6	MacDonald et al., 2000
Zinc	121	459	MacDonald et al., 2000

Table 5-4. Plant and Invertebrate Toxicity Reference Values for Surface Soil COCs.

Contaminant of Concern	Plant Soil TRV (mg/kg)	Plant Tissue TRV (mg/kg)	Invertebrate TRV (mg/kg)	Reference
Antimony	NC	NC	NC	-
Cadmium	29	NC	110	USEPA, 2000
Copper	NC	100	61	Charman and Murphy, 1992 & USEPA, 2000
Lead	NC	30 - 300	NC	Smith, 1996
Nickel	NC	10 - 100	NC	Kabata-Pendias and Pendias, 1986
Selenium	NC	NC	NC	-
Zinc	190	350	120	USEPA, 2000 & Smith, 1993 & USEPA, 2000

Notes: All concentrations presented on dry weight basis
NC - No Criteria Available

Table 5-5. Toxicity Reference Values for Bird and Mammal Measurement Receptors.

COC	Study Duration	Endpoint	Test Species	Study NOAEL TRV	Study LOAEL TRV	Vole (a) NOAEL	Vole (a) LOAEL	Wren NOAEL	Wren LOAEL	Shrew (b) NOAEL	Shrew (b) LOAEL	Reference
Antimony	1 year - chronic	Mortality	Mouse	0.125	1.25	0.114	1.14	-	-	0.149	1.49	Sample et al., 1996
Cadmium	90 days - chronic	Reproduction	Mallard	1.45	20	-	-	1.45	20	-	-	Sample et al., 1996
	6 weeks - chronic	Reproduction	Rat	1	10	1.62	16.2	-	-	2.12	21.2	Sample et al., 1996
Copper	10 weeks - chronic	Growth, Mortality	Chicken	47	61.7	-	-	47	61.7	-	-	Sample et al., 1996
	357 days - chronic	Reproduction	Mink	11.7	15.14	25.5	33.6	-	-	33.4	44	Sample et al., 1996
Lead	12 weeks - chronic	Reproduction	Japanese Quail	1.13	11.3	-	-	1.13	11.3	-	-	Sample et al., 1996
	3 generations - chronic	Reproduction	Rat	8	80	13.4	134	-	-	17.6	176	Sample et al., 1996
Nickel	90 days - chronic	Growth, Mortality	Mallard	77.4	107	-	-	77.4	107	-	-	Sample et al., 1996
	3 generations - chronic	Reproduction	Rat	40	80	67	134	-	-	88	176	Sample et al., 1996
Selenium	78 days - chronic	Reproduction	Mallard	0.5	1.0	-	-	0.5	1.0	-	-	Sample et al., 1996
	1 year - chronic	Reproduction	Rat	0.2	0.33	0.34	0.55	-	-	0.44	0.72	Sample et al., 1996
Zinc	44 weeks - chronic	Reproduction	Chicken	14.5	131	-	-	14.5	131	-	-	Sample et al., 1996
	16 days gestation-chronic	Reproduction	Rat	160	320	269	537	-	-	352	703	Sample et al., 1996

Notes: All TRVs represent chronic levels expressed as mg COC/kg - BW/day.
(a) Adjusted for body weights of meadow vole and test species per Sample et al., 1996
(b) Adjusted for body weights of short-tailed shrew and test species per Sample et al., 1996

Table 5-6. Risk Summary for Amphibian Larvae, Outfalls 001 and 002.

Contaminant of Concern	Concentration (ug/L)		Amphibian TRV (ug/L)	Amphibian HQs	
	Outfall 001	Outfall 002		Outfall 001	Outfall 002
Antimony	0.00E+00	0.00E+00	3.00E+02	0.E+00	0.E+00
Cadmium	2.40E-01	2.40E-01	1.06E+02	2.E-03	2.E-03
Copper	1.30E+01	1.10E+01	2.00E+01	7.E-01	6.E-01
Lead	3.30E-01	1.20E+01	7.50E+02	4.E-04	2.E-02
Nickel	3.35E+00	1.80E+00	5.00E+01	7.E-02	4.E-02
Zinc	9.95E+00	2.10E+01	1.00E+02	1.E-01	2.E-01
			TOTAL HQ	8.E-01	8.E-01

Table 5-7. Risk Summary for Benthic Invertebrates and Sediment COCs, Outfalls 001 and 002.

Contaminant of Concern	Concentration (mg/kg)		TEC (mg/kg)	PEC (mg/kg)	TEC HQs		PEC HQs	
	Sample 1	Sample 2			Sample 1	Sample 2	Sample 1	Sample 2
Outfall 001	**OU1-1-SED**	**OU1-2-SED**						
Cadmium	4.05E-01	3.40E+00	1.00E+00	5.00E+00	4.E-01	3.E+00	8.E-02	7.E-01
Copper	7.70E+01	9.70E+02	3.16E+01	1.49E+02	2.E+00	3.1E+01	5.E-01	7.E+00
Lead	2.30E+01	2.20E+02	3.58E+01	1.28E+02	6.E-01	6.E+00	2.E-01	2.E+00
Nickel	8.40E+01	6.40E+01	2.27E+01	4.86E+01	4.E+00	3.E+00	2.E+00	1.E+00
Zinc	1.70E+02	4.10E+02	1.21E+02	4.59E+02	1.E+00	3.E+00	4.E-01	9.E-01
				TOTAL HQs	9.E+00	4.6E+01	3.E+00	1.1E+01
Outfall 002	**OU2-1-SED**	**OU2-2-SED**						
Cadmium	1.40E+00	4.20E+00	1.00E+00	5.00E+00	1.E+00	4.E+00	3.E-01	8.E-01
Copper	6.50E+02	1.90E+03	3.16E+01	1.49E+02	2.1E+01	6.0E+01	4.E+00	1.3E+01
Lead	3.80E+02	7.00E+02	3.58E+01	1.28E+02	1.1E+01	2.0E+01	3.E+00	5.E+00
Nickel	3.40E+01	6.60E+01	2.27E+01	4.86E+01	1.E+00	3.E+00	7.E-01	1.E+00
Zinc	3.30E+02	7.20E+02	1.21E+02	4.59E+02	3.E+00	6.E+00	7.E-01	2.E+00
				TOTAL HQs	3.7E+01	9.3E+01	9.E+00	2.2E+01

Notes: TEC - Threshold Effect Concentration
PEC - Probable Effect Concentration

Shaded values represent concentrations above benchmarks.

Toxicity Reference

Hazard Quotient

Table 5-8. Risk Summary for Plant Community, Surface Soils at Outfalls 001 and 002.

Contaminant of Concern	Concentration (mg/kg)		Plant TRV (mg/kg)	Plant HQs	
	Mean	Maximum		Mean	Maximum
Outfall 001					
Antimony	0.00E+00	0.00E+00	NC	0.E+00	0.E+00
Cadmium	3.65E+00	8.20E+00	29	1.E-01	3.E-01
Copper	1.04E+03	3.90E+03	NC	-	-
Lead	2.50E+02	4.20E+02	NC	-	-
Nickel	5.53E+01	1.30E+02	NC	-	-
Selenium	1.24E+00	2.00E+00	NC	-	-
Zinc	3.95E+02	1.10E+03	190	2.E+00	6.E+00
			TOTAL HQ	2.E+00	6.E+00
Outfall 002					
Antimony	0.00E+00	0.00E+00	NC	0.E+00	0.E+00
Cadmium	4.52E+00	6.80E+00	29	2.E-01	2.E-01
Copper	3.78E+03	6.70E+03	NC	-	-
Lead	4.54E+02	8.30E+02	NC	-	-
Nickel	4.76E+01	5.90E+01	NC	-	-
Selenium	1.76E+00	2.20E+00	NC	-	-
Zinc	6.86E+02	9.10E+02	190	4.E+00	5.E+00
			TOTAL HQ	4.E+00	5.E+00

$HQ = \frac{ED}{TRV}$

Table 5-9. Risk Summary for Plant Community, Vegetation at Outfalls 001 and 002.

Contaminant of Concern	Concentration (mg/kg)		Plant TRV (a) (mg/kg)	Plant HQs	
	Mean	Maximum		Mean	Maximum
Outfall 001					
Antimony	0.00E+00	0.00E+00	NC	0.E+00	0.E+00
Cadmium	1.48E-01	2.10E-01	NC	-	-
Copper	2.93E+00	3.90E+00	10	3.E-01	4.E-01
Lead	1.24E-01	3.20E-01	3	4.E-02	1.E-01
Nickel	8.08E-01	1.10E+00	1	8.E-01	1.E+00
Selenium	2.61E-02	4.80E-02	NC	-	-
Zinc	1.48E+01	2.10E+01	35	4.E-01	6.E-01
			TOTAL HQ	2.E+00	2.E+00
Outfall 002					
Antimony	0.00E+00	0.00E+00	NC	0.E+00	0.E+00
Cadmium	1.85E-02	2.90E-02	NC	-	-
Copper	3.65E+00	4.60E+00	10	4.E-01	5.E-01
Lead	1.25E-01	1.30E-01	3	4.E-02	4.E-02
Nickel	1.33E+00	1.70E+00	1	1.E+00	2.E+00
Selenium	7.68E-02	1.40E-01	NC	-	-
Zinc	8.80E+01	1.10E+02	35	3.E+00	3.E+00
			TOTAL HQ	4.E+00	5.E+00

Table 5-10. Risk Summary for Terrestrial Invertebrate Community, Outfalls 001 and 002.

Contaminant of Concern	Concentration (mg/kg)		Invertebrate TRV (mg/kg)	Invertebrate HQs	
	Mean	Maximum		Mean	Maximum
Outfall 001					
Antimony	0.00E+00	0.00E+00	NC	0.E+00	0.E+00
Cadmium	3.65E+00	8.20E+00	110	3.E-02	7.E-02
Copper	1.04E+03	3.90E+03	61	1.7E+01	6.4E+01
Lead	2.50E+02	4.20E+02	NC	-	-
Nickel	5.53E+01	1.30E+02	NC	-	-
Selenium	1.24E+00	2.00E+00	NC	-	-
Zinc	3.95E+02	1.10E+03	120	3.E+00	9.E+00
			TOTAL HQ	2.0E+01	7.3E+01
Outfall 002					
Antimony	0.00E+00	0.00E+00	NC	0.E+00	0.E+00
Cadmium	4.52E+00	6.80E+00	110	4.E-02	6.E-02
Copper	3.78E+03	6.70E+03	61	6.2E+01	1.1E+02
Lead	4.54E+02	8.30E+02	NC	-	-
Nickel	4.76E+01	5.90E+01	NC	-	-
Selenium	1.76E+00	2.20E+00	NC	-	-
Zinc	6.86E+02	9.10E+02	120	6.E+00	8.E+00
			TOTAL HQ	6.8E+01	1.2E+02

Table 5-11. Meadow Vole Risk - Outfall 001 and Outfall 002 Wetlands.

Contaminant of Concern	NOAEL TRV (mg/kg-BW/day)	LOAEL TRV (mg/kg-BW/day)	Mean Total Dose (mg/kg-BW/day)	Maximum Total Dose (mg/kg-BW/day)	Mean NOAEL HQ	Maximum NOAEL HQ	Mean LOAEL HQ	Maximum LOAEL HQ
Outfall 001								
Antimony	0.114	1.14	1.03E-02	1.68E-02	9.E-02	1.E-01	9.E-03	1.E-02
Cadmium	1.62	16.2	7.61E-02	1.29E-01	5.E-02	8.E-02	5.E-03	8.E-03
Copper	25.5	33.6	8.26E+00	2.86E+01	3.E-01	1.E+00	2.E-01	9.E-01
Lead	13.4	134	1.79E+00	3.05E+00	1.E-01	2.E-01	1.E-02	2.E-02
Nickel	67	134	6.64E-01	1.29E+00	1.E-02	2.E-02	5.E-03	1.E-02
Selenium	0.34	0.55	1.76E-02	3.05E-02	5.E-02	9.E-02	3.E-02	6.E-02
Zinc	269	537	7.83E+00	1.49E+01	3.E-02	6.E-02	1.E-02	3.E-02
				TOTAL HQS	7.E-01	2.E+00	3.E-01	1.E+00
Outfall 002								
Antimony	0.114	1.14	9.80E-03	1.12E-02	9.E-02	1.E-01	9.E-03	1.E-02
Cadmium	1.62	16.2	3.80E-02	5.75E-02	2.E-02	4.E-02	2.E-03	4.E-03
Copper	25.5	33.6	2.77E+01	4.85E+01	1.E+00	2.E+00	8.E-01	1.E+00
Lead	13.4	134	3.22E+00	5.85E+00	2.E-01	4.E-01	2.E-02	4.E-02
Nickel	67	134	7.89E-01	9.96E-01	1.E-02	1.E-02	6.E-03	7.E-03
Selenium	0.34	0.55	3.86E-02	6.34E-02	1.E-01	2.E-01	7.E-02	1.E-01
Zinc	269	537	3.50E+01	4.41E+01	1.E-01	2.E-01	7.E-02	8.E-02
				TOTAL HQS	2.E+00	3.E+00	1.E+00	2.E+00

Table 5-12. Marsh Wren Risk - Outfall 001 and Outfall 002 Wetlands.

Contaminant of Concern	NOAEL TRV (mg/kg-BW/day)	LOAEL TRV (mg/kg-BW/day)	Mean Total Dose (mg/kg-BW/day)	Maximum Total Dose (mg/kg-BW/day)	Mean NOAEL HQ	Maximum NOAEL HQ	Mean LOAEL HQ	Maximum LOAEL HQ
Outfall 001								
Antimony	-	-	1.96E-02	3.22E-02	-	-	-	-
Cadmium	1.45	20	1.37E+00	2.93E+00	9.E-01	2.E+00	7.E-02	1.E-01
Copper	47	61.7	6.63E+01	1.51E+02	1.E+00	3.E+00	1.E+00	2.E+00
Lead	1.13	11.3	1.96E+01	5.88E+01	1.7E+01	5.2E+01	2.E+00	5.E+00
Nickel	77.4	107	2.79E+00	4.63E+00	4.E-02	6.E-02	3.E-02	4.E-02
Selenium	0.5	1	3.96E-01	6.37E-01	8.E-01	1.E+00	4.E-01	6.E-01
Zinc	14.5	131	4.70E+01	7.45E+01	3.E+00	5.E+00	4.E-01	6.E-01
				TOTAL HQS	2.4E+01	6.4E+01	4.E+00	9.E+00
Outfall 002								
Antimony	-	-	1.88E-02	2.14E-02	-	-	-	-
Cadmium	1.45	20	8.81E-01	9.45E-01	6.E-01	7.E-01	4.E-02	5.E-02
Copper	47	61.7	1.18E+02	1.69E+02	3.E+00	4.E+00	2.E+00	3.E+00
Lead	1.13	11.3	7.86E+00	1.37E+01	7.E+00	1.2E+01	7.E-01	1.E+00
Nickel	77.4	107	1.24E+00	1.45E+00	2.E-02	2.E-02	1.E-02	1.E-02
Selenium	0.5	1	2.37E-01	2.86E-01	5.E-01	6.E-01	2.E-01	3.E-01
Zinc	14.5	131	5.61E+01	6.87E+01	4.E+00	5.E+00	4.E-01	5.E-01
				TOTAL HQS	1.4E+01	2.2E+01	3.E+00	5.E+00

Table 5-13. Short-tailed Shrew Risk - Outfall 001 and Outfall 002 Wetlands.

Contaminant of Concern	NOAEL TRV (mg/kg-BW/day)	LOAEL TRV (mg/kg-BW/day)	Mean Total Dose (mg/kg-BW/day)	Maximum Total Dose (mg/kg-BW/day)	Mean NOAEL HQ	Maximum NOAEL HQ	Mean LOAEL HQ	Maximum LOAEL HQ
Outfall 001								
Antimony	0.149	1.487	1.82E-02	2.98E-02	1.E-01	2.E-01	1.E-02	2.E-02
Cadmium	2.12	21.2	1.13E+00	2.41E+00	5.E-01	1.E+00	5.E-02	1.E-01
Copper	33.4	44	5.56E+01	1.29E+02	2.E+00	4.E+00	1.E+00	3.E+00
Lead	17.6	176	1.63E+01	4.84E+01	9.E-01	3.E+00	9.E-02	3.E-01
Nickel	88	176	2.41E+00	4.04E+00	3.E-02	5.E-02	1.E-02	2.E-02
Selenium	0.44	0.72	3.25E-01	5.24E-01	7.E-01	1.E+00	5.E-01	7.E-01
Zinc	352	703	3.99E+01	6.37E+01	1.E-01	2.E-01	6.E-02	9.E-02
				TOTAL HQS	4.E+00	9.E+00	2.E+00	4.E+00
Outfall 002								
Antimony	0.149	1.487	1.22E-02	1.39E-02	8.E-02	9.E-02	8.E-03	9.E-03
Cadmium	2.12	21.2	5.07E-01	5.46E-01	2.E-01	3.E-01	2.E-02	3.E-02
Copper	33.4	44	7.14E+01	1.03E+02	2.E+00	3.E+00	2.E+00	2.E+00
Lead	17.6	176	4.95E+00	8.70E+00	3.E-01	5.E-01	3.E-02	5.E-02
Nickel	88	176	8.22E-01	9.74E-01	9.E-03	1.E-02	5.E-03	6.E-03
Selenium	0.44	0.72	1.41E-01	1.72E-01	3.E-01	4.E-01	2.E-01	2.E-01
Zinc	352	703	3.72E+01	4.57E+01	1.E-01	1.E-01	5.E-02	7.E-02
				TOTAL HQS	3.E+00	4.E+00	2.E+00	3.E+00

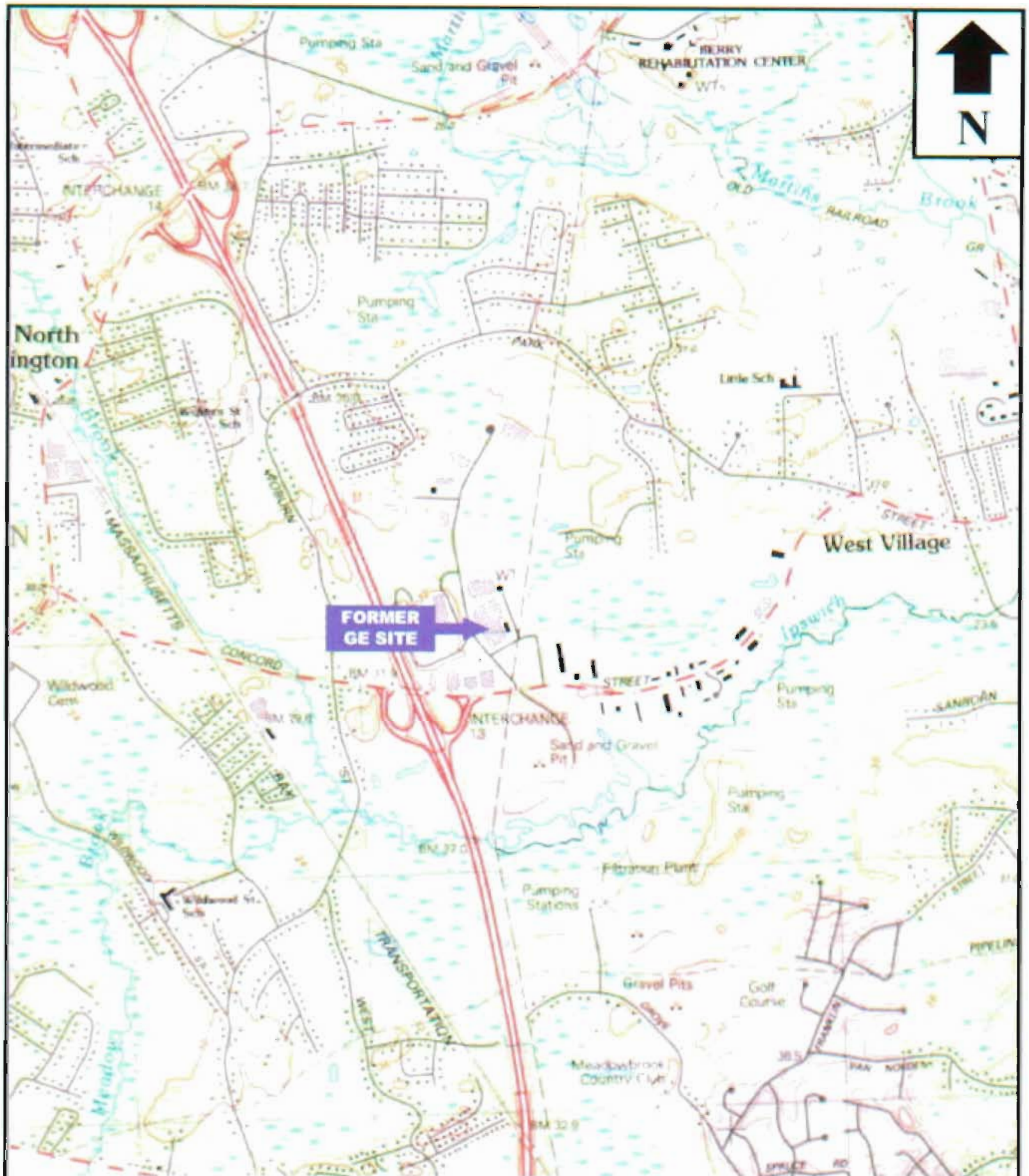
Table 5-14. Short-tailed Shrew and Marsh Wren Risk - Outer Outfall 001 Wetland and Reference Area Wetland.

Contaminant of Concern	NOAEL TRV (mg/kg-BW/day)	LOAEL TRV (mg/kg-BW/day)	Outfall 001 Total Dose (mg/kg-BW/day)	Reference Total Dose (mg/kg-BW/day)	Outfall 001 NOAEL HQ	Reference NOAEL HQ	Outfall 001 LOAEL HQ	Reference LOAEL HQ
Short-tailed Shrew								
Antimony	0.149	1.487	2.98E-02	2.48E-02	2.E-01	2.E-01	2.E-02	2.E-02
Cadmium	2.12	21.2	4.17E-01	2.40E-01	2.E-01	1.E-01	2.E-02	1.E-02
Copper	33.4	44	2.02E+01	2.93E+00	6.E-01	9.E-02	5.E-01	7.E-02
Lead	17.58	175.83	3.81E+00	5.70E+00	2.E-01	3.E-01	2.E-02	3.E-02
Nickel	87.91	175.83	1.34E+00	2.76E-01	2.E-02	3.E-03	8.E-03	2.E-03
Selenium	0.44	0.725	2.20E-01	2.53E-01	5.E-01	6.E-01	3.E-01	3.E-01
Zinc	351.7	703.3	2.92E+01	2.83E+01	8.E-02	8.E-02	4.E-02	4.E-02
				TOTAL HQS	2.E+00	1.E+00	9.E-01	5.E-01
Marsh Wren								
Antimony	-	-	3.22E-02	2.68E-02	-	-	-	-
Cadmium	1.45	20	4.91E-01	2.93E-01	3.E-01	2.E-01	2.E-02	1.E-02
Copper	47	61.7	2.36E+01	3.39E+00	5.E-01	7.E-02	4.E-01	5.E-02
Lead	1.13	11.3	4.21E+00	6.56E+00	4.E+00	6.E+00	4.E-01	6.E-01
Nickel	77.4	107	1.52E+00	3.07E-01	2.E-02	4.E-03	1.E-02	3.E-03
Selenium	0.5	1	2.63E-01	3.04E-01	5.E-01	6.E-01	3.E-01	3.E-01
Zinc	14.5	131	3.40E+01	3.41E+01	2.E+00	2.E+00	3.E-01	3.E-01
				TOTAL HQS	7.E+00	9.E+00	1.E+00	1.E+00

Table 7-1
Risk/Benefit Analysis

Alternative	Amphibians		Benthic Macroinvertebrates		Plant Community		Terrestrial Invertebrates		Wildlife Community	
	Risk	Benefit	Risk	Benefit	Risk	Benefit	Risk	Benefit	Risk	Benefit
6.1.1 Sediment										
No Action	None. A condition of no significant risk already exists.	None. A condition of no significant risk already exists.	Potential significant risk remains.	No benefit as significant risk remains.	No change in risk levels as sediment contaminants do not impact plant community.	None. No change in risk levels as sediment contaminants do not impact plant community.	No change in risk levels as sediment contaminants do not impact terrestrial invertebrates.	None. No change in risk levels as sediment contaminants do not impact terrestrial invertebrates.	None. A condition of no significant risk already exists.	None. A condition of no significant risk already exists.
Excavation and Removal	Minimal risk due to very small area of disturbance.	None. A condition of no significant risk already exists.	Minimal risk due to very small area of dusturbance. Community repopulation expected.	Significant risk eliminated for future community.	Minimal risk due to very small area of disturbance.	None. No change in risk levels as sediment contaminants do not impact plant community.	Minimal risk due to very small area of disturbance.	None. No change in risk levels as sediment contaminants do not impact terrestrial invertebrates.	Minimal risk due to very small area of disturbance.	None. A condition of no significant risk already exists.
6.1.2 Soil										
No Action	None. A condition of no significant risk already exists.	None. A condition of no significant risk already exists.	No change in risk levels as soil contaminants do not impact benthic macroinverte brates.	None. No change in risk levels as soil contaminants do not impact benthic macroinverte brates.	Potential significant risk remains.	No change in benefit as significant risk remains, although community remains undisturbed.	Potential significant risk remains.	No change in benefit as significant risk remains, although community remains undisturbed.	None. A condition of no significant risk already exists.	None. A condition of no significant risk already exists.
Excavation and Removal	Potential risk of substantial habitat destruction. Community repopulation may be different from original conditions.	None. A condition of no significant risk already exists.	Potential risk of substantial habitat destruction.	None. No change in risk levels as soil contaminants do not impact benthic macroinverte brates.	Potential risk of substantial habitat destruction. Community repopulation may be different from original conditions.	Significant risk (if any) eliminated for future community. Minimal risk reduction achieved.	Potential risk of substantial habitat destruction. Community repopulation may be different from original conditions.	Significant risk eliminated for future community.	Potential risk of substantial habitat destruction. Community repopulation may be different from original conditions.	None. A condition of no. significant risk already exists.

FIGURES



BASE MAP IS A PORTION OF THE FOLLOWING 7.5' x 15' USGS TOPOGRAPHIC QUADRANGLE: READING, MA 1987

0 1000 2000

Scale in Feet

QUADRANGLE LOCATION

E9202 ECO SCOPE TOPO

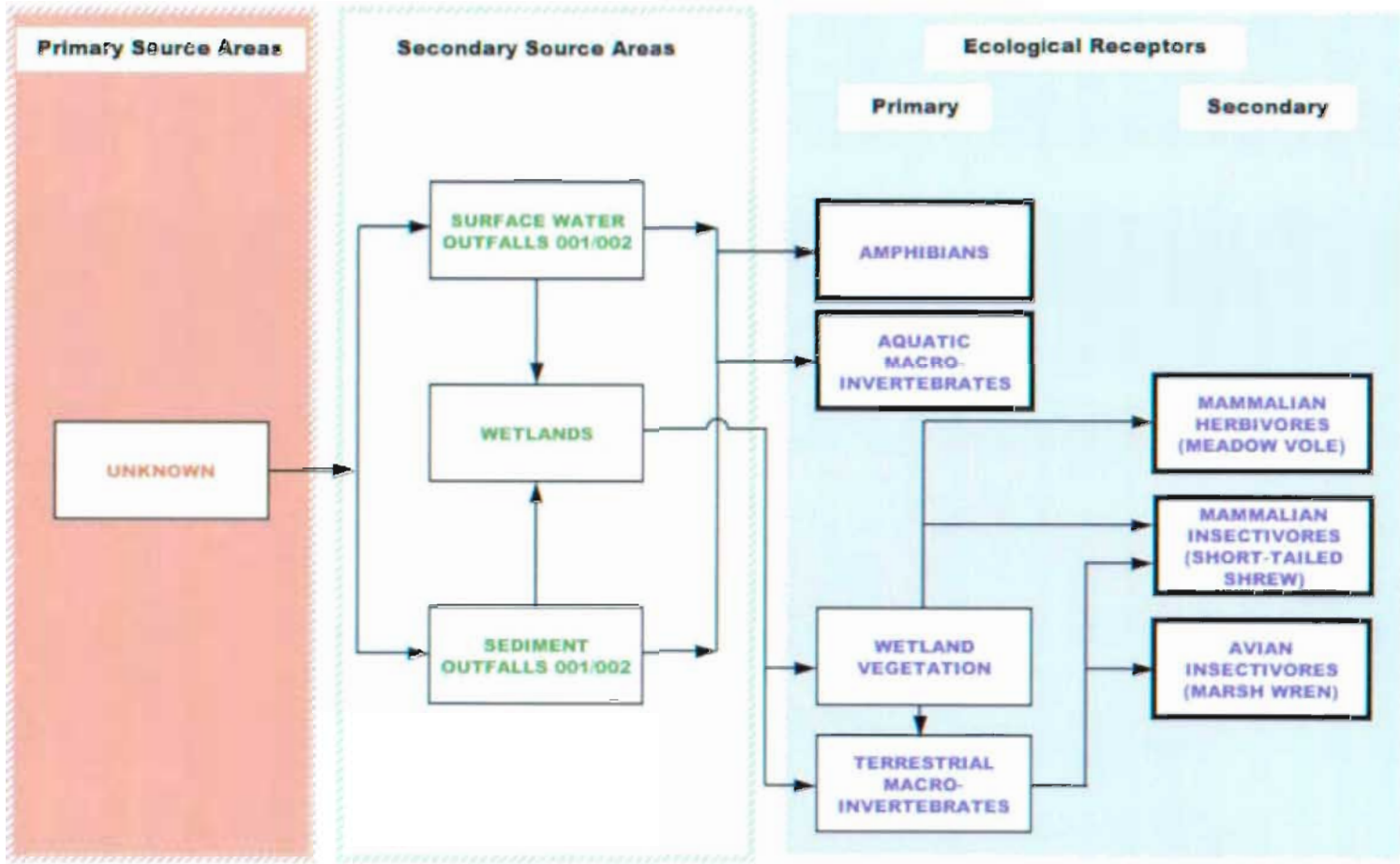
TRC

Boott Mills South
Foot of John Street
Lowell, MA 01852
(978) 970-5600

FORMER GE SITE
WILMINGTON/NORTH READING, MASSACHUSETTS

FIGURE 1-1
SITE LOCATION MAP

Date: 1/02	Project No. E9202



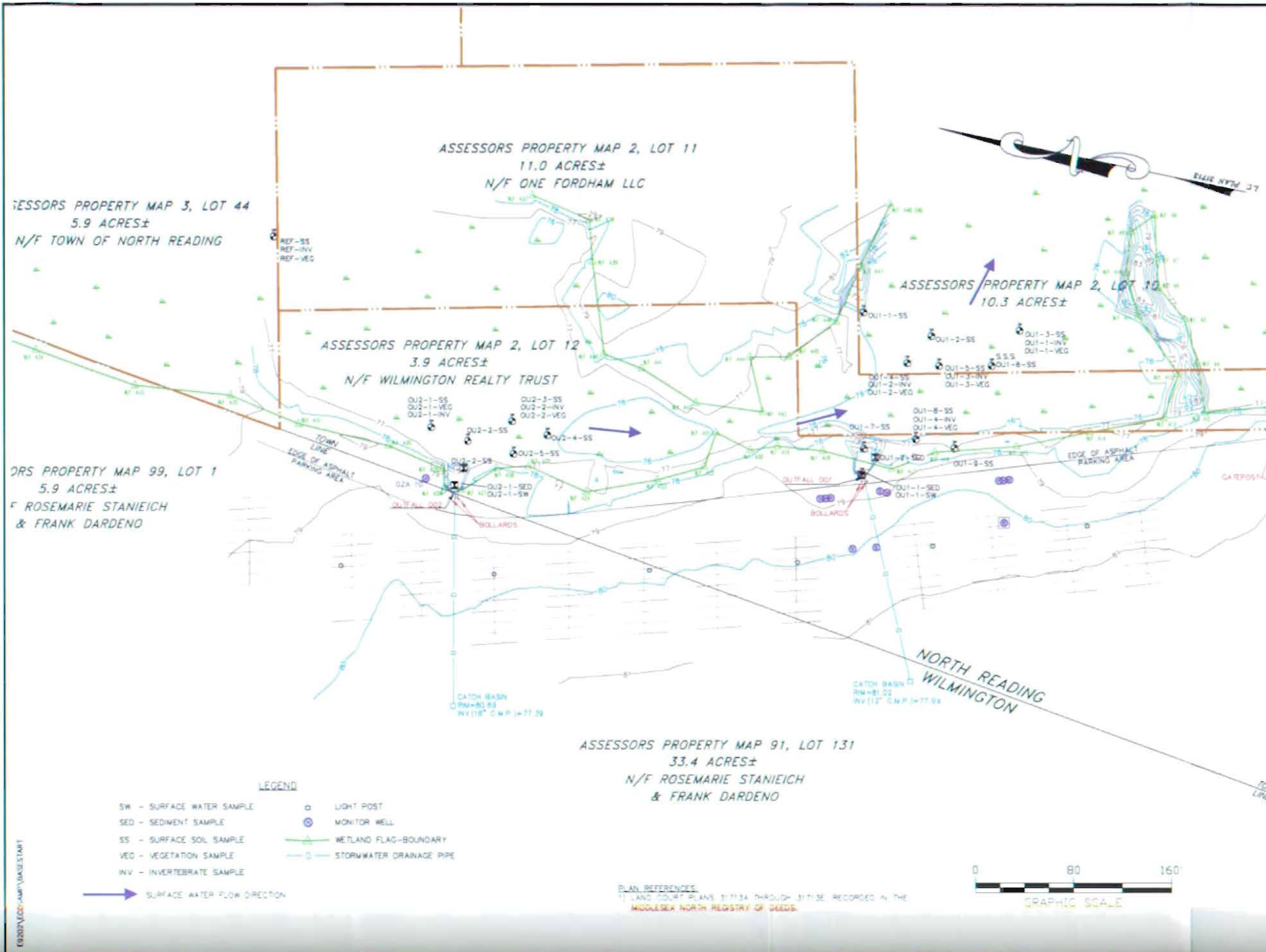
E9202E/CD_SCOPE/SITE MODEL

TRC
Boott Mills South
Foot of John Street
Lowell, MA 01852
(978) 970-5600

FORMER GE SITE
WILMINGTON/NORTH READING, MASSACHUSETTS

FIGURE 3-1
CONCEPTUAL MODEL - WETLAND AREA

Date: 1/03 | Project No. E9202



ASSESSORS PROPERTY MAP 2, LOT 11
11.0 ACRES±
N/F ONE FORDHAM LLC
ESSORS PROPERTY MAP 3, LOT 44
5.9 ACRES±
N/F TOWN OF NORTH READING
REF-SS
REF-INV
REF-VEG
ASSESSORS PROPERTY MAP 2, LOT 10
10.3 ACRES±
ASSESSORS PROPERTY MAP 2, LOT 12
3.9 ACRES±
N/F WILMINGTON REALTY TRUST
ORS PROPERTY MAP 99, LOT 1
5.9 ACRES±
ROSEMARIE STANIEICH
& FRANK DARDENO
CONCORD STREET
(PUBLIC - 60' WIDE)
OU1-1-SS
OU1-2-SS
OU1-3-SS
OU1-1-INV
OU1-1-VEG
OU1-5-SS
OU1-3-INV
OU1-3-VEG
OU1-6-SS
OU1-2-SS
OU1-2-INV
OU1-2-VEG
OU1-8-SS
OU1-4-INV
OU1-4-VEG
OU1-7-SS
OU1-9-SS
OU1-1-SED
OU1-1-SW
OU2-1-SS
OU2-1-VEG
OU2-1-INV
OU2-3-SS
OU2-2-INV
OU2-2-VEG
OU2-2-SS
OU2-4-SS
OU2-5-SS
OU2-1-SED
OU2-1-SW
OUTFALL 001
OUTFALL 002
BOLLARDS
GATEPOST
EDGE OF ASPHALT PARKING AREA
TOWN LINE
NORTH READING
WILMINGTON
CATCH BASIN
RIM=81.02
INV (12" C.M.P.)=77.9
CATCH BASIN
RIM=80.59
INV (18" C.M.P.)=77.39
ASSESSORS PROPERTY MAP 91, LOT 131
33.4 ACRES±
N/F ROSEMARIE STANIEICH
& FRANK DARDENO
LEGEND
SW - SURFACE WATER SAMPLE
SED - SEDIMENT SAMPLE
SS - SURFACE SOIL SAMPLE
VEG - VEGETATION SAMPLE
INV - INVERTEBRATE SAMPLE
SURFACE WATER FLOW DIRECTION
LIGHT POST
MONITOR WELL
WETLAND FLAG-BOUNDARY
STORMWATER DRAINAGE PIPE
PLAN REFERENCES:
1) LAND COURT PLANS 31713A THROUGH 31713E, RECORDED IN THE MIDDLESEX NORTH REGISTRY OF DEEDS.
0
80
160'
GRAPHIC SCALE
E9202\ECO-AMP\BASESTART

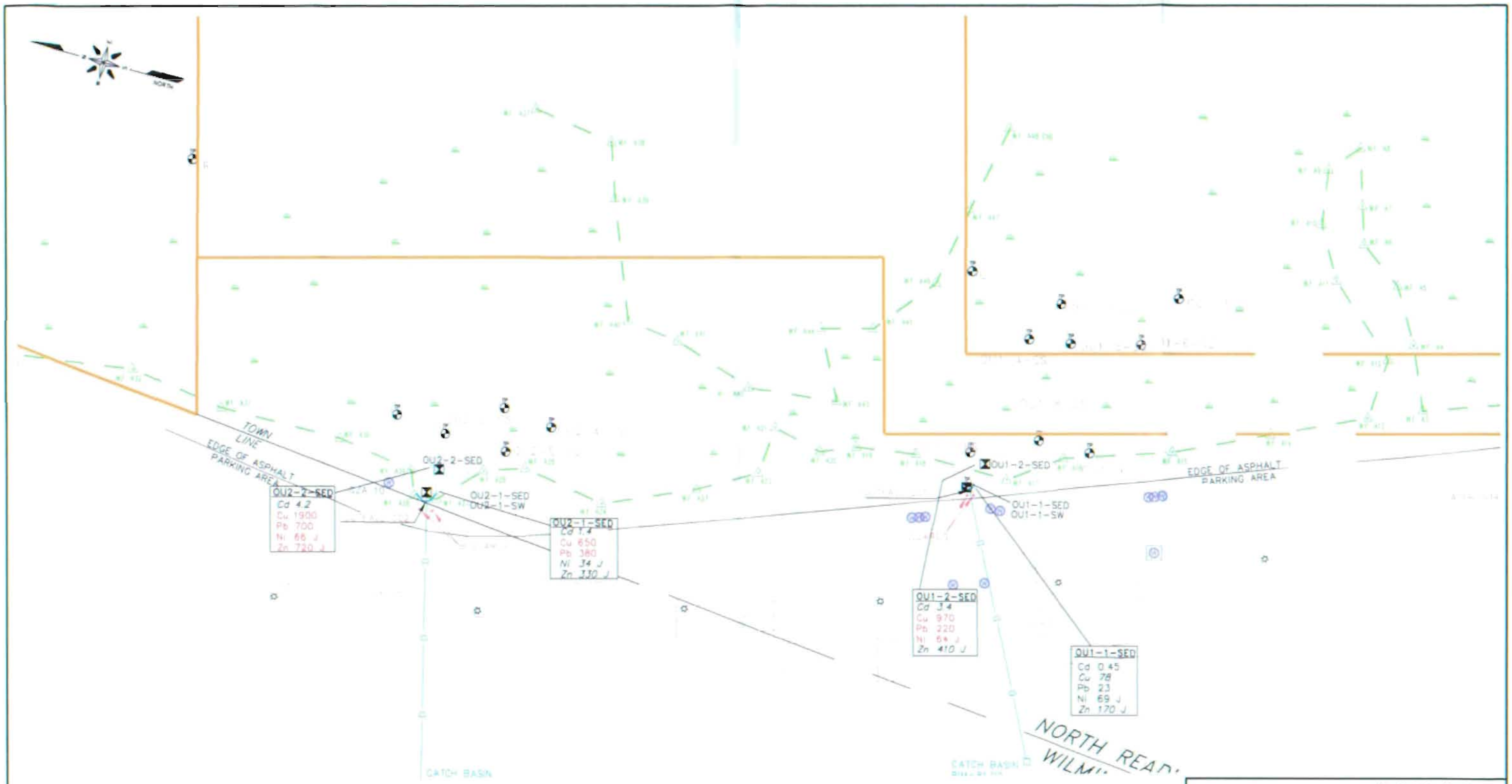
TRC Environmental Corporation

Boot Mills South
Foot of John Street
Lowell, MA 01852
(978) 970-5600

FORMER GE SITE
WILMINGTON/NORTH READING, MASSACHUSETTS

FIGURE 2-1
SITE WETLANDS, TOPOGRAPHY AND SAMPLE LOCATIONS

Date: 11/02 | Project No. E9202



E9202/ECO/AMP/SURFACE WATER

TRC

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(978) 970-5600

FORMER GE SITE
WILMINGTON/NORTH READING, MASSACHUSETTS

FIGURE 5-1
SEDIMENT RISK RESULTS
TO BENTHIC INVERTEBRATES

Date: JAN 2003 | Project No. E9202

REF-SS
Cd 0.79
Cu 42
Pb 240
Ni 8.7
Se 1.1
Zn 47 J

OU2-1-SS
Cd 5.9
Cu 1100
Pb 160
Ni 53
Se 2.2
Zn 910 J

OU2-2-SS
Cd 3
Cu 5600
Pb 830
Ni 59
Se 1.5
Zn 860 J

OU2-3-SS
Cd 6.8
Cu 4000
Pb 360
Ni 51
Se 2.2
Zn 620 J

OU2-4-SS
Cd 3.9
Cu 1500
Pb 180
Ni 32
Se 1
Zn 470 J

OU2-5-SS
Cd 3
Cu 6700
Pb 740
Ni 43
Se 1.9
Zn 570 J

OU1-7-SS
Cd 2.7
Cu 1500
Pb 410
Ni 71
Se 0.82
Zn 170 J

OU1-4-SS
Cd 8.2
Cu 1000
Pb 300
Ni 81
Se 1.8
Zn 710 J

OU1-1-SS
Cd 1.4
Cu 110
Pb 90
Ni 26
Se 2
Zn 190 J

OU1-2-SS
Cd 4.1
Cu 280
Pb 190
Ni 46
Se 1.4
Zn 530 J

OU1-3-SS
Cd 4.8
Cu 490
Pb 260
Ni 50
Se 1.7
Zn 310 J

OU1-5-SS
Cd 6.2
Cu 2000
Pb 290
Ni 130
Se 1.5
Zn 1100 J

OU1-6-SS
Cd 4.5
Cu 3900
Pb 420
Ni 52
Se 1.6
Zn 400 J

OU1-9-SS
Cd 0.37
Cu 21
Pb 26
Ni 18
Se 0.15 J
Zn 48 J

OU1-8-SS
Cd 0.56
Cu 34
Pb 260
Ni 23
Se 0.19 J
Zn 99 J

OU2-2-SED
OU2-1-SED
OU2-1-SW
OU1-2-SED
OU1-1-SED
OU1-1-SW

TOWN LINE
EDGE OF ASPHALT PARKING AREA
EDGE OF ASPHALT PARKING AREA
CATCH BASIN
CATCH BASIN
NORTH READ
WILMI

0 60' 120'
GRAPHIC SCALE

LEGEND

SW - SURFACE WATER SAMPLE
SED - SEDIMENT SAMPLE
SS - SURFACE SOIL SAMPLE
VEG - VEGETATION SAMPLE
INV - INVERTEBRATE SAMPLE

Cd - CADMIUM
Cu - COPPER
Pb - LEAD
Ni - NICKEL
Se - SELENIUM
Zn - ZINC

LIGHT POST
MONITOR WELL
WETLAND FLAG-BOUNDARY
STORMWATER DRAINAGE PIPE

NOTES:

1) ALL SURFACE SOIL CONCENTRATIONS IN mg/kg

2) ABOVE SOIL PLANT TOXICITY REFERENCE VALUE (PRV)
PRVs ONLY AVAILABLE FOR Cd AND Zn

E9202/EUDSAMP/PLANTED

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Lowell, MA 01852
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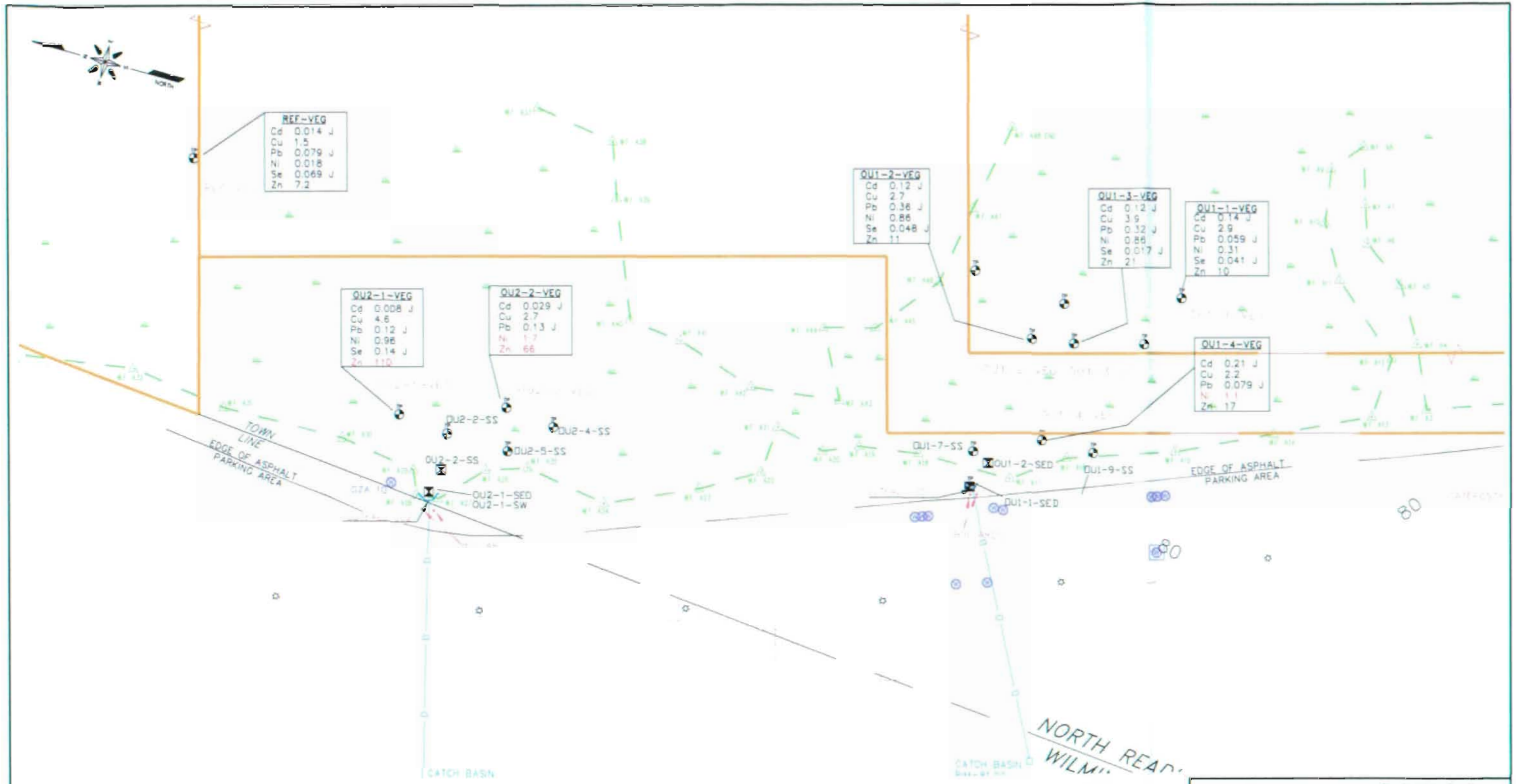
FORMER GE SITE
WILMINGTON/NORTH READING, MASSACHUSETTS

FIGURE 5-2
SURFACE SOIL RISK RESULTS
TO PLANTS

Date: JAN 2003 | Project No. E9202



E9202/EUS/AMP/VEGETATION

TRC

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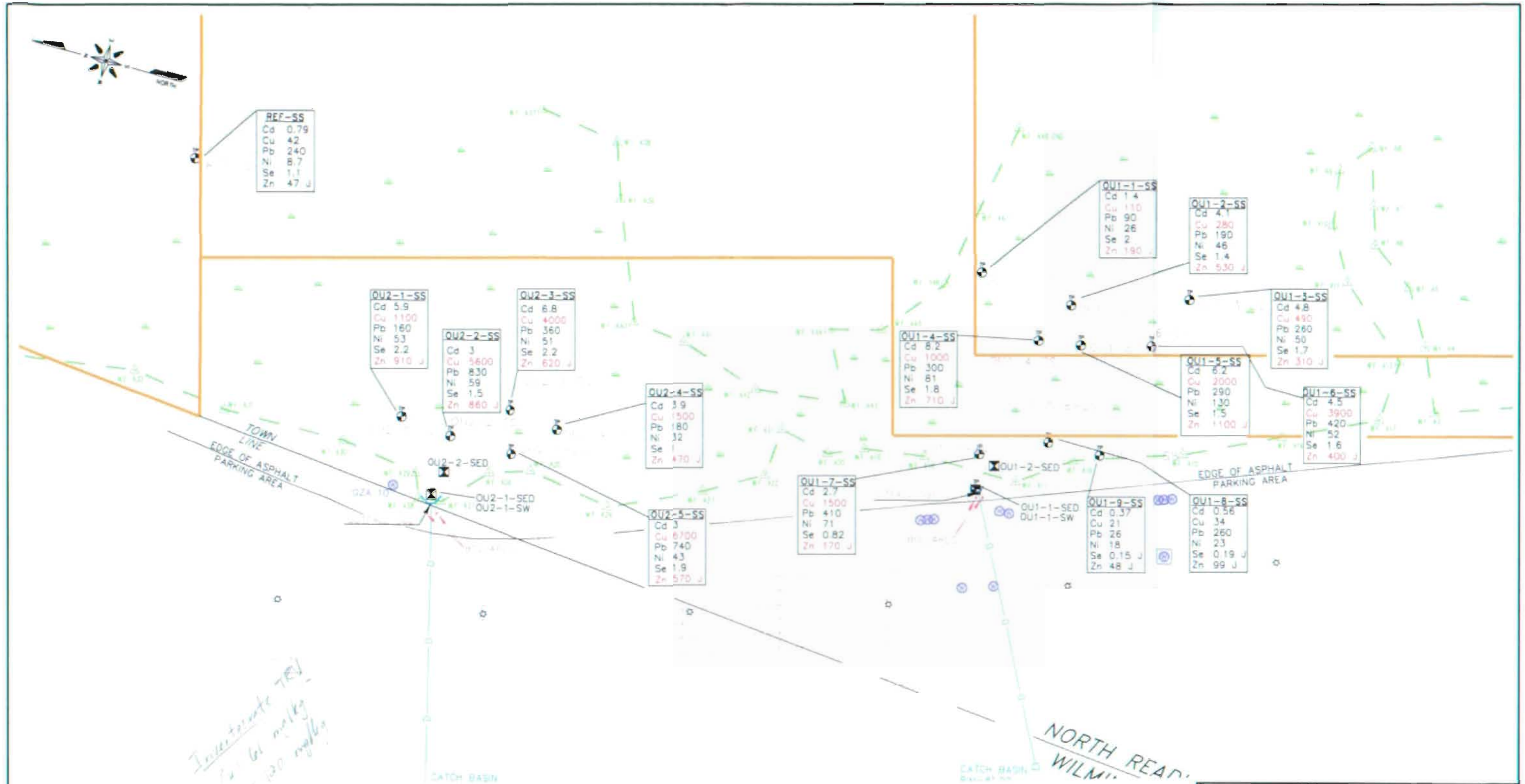
Foot of John Street
Lowell, MA 01852
(978) 970-5600

FORMER GE SITE
WILMINGTON/NORTH READING, MASSACHUSETTS

FIGURE 5-3
VEGETATION TISSUE RISK RESULTS

Date: JAN 2002 | Project No. E9202



E9202/LOCSAMP/DETECTED

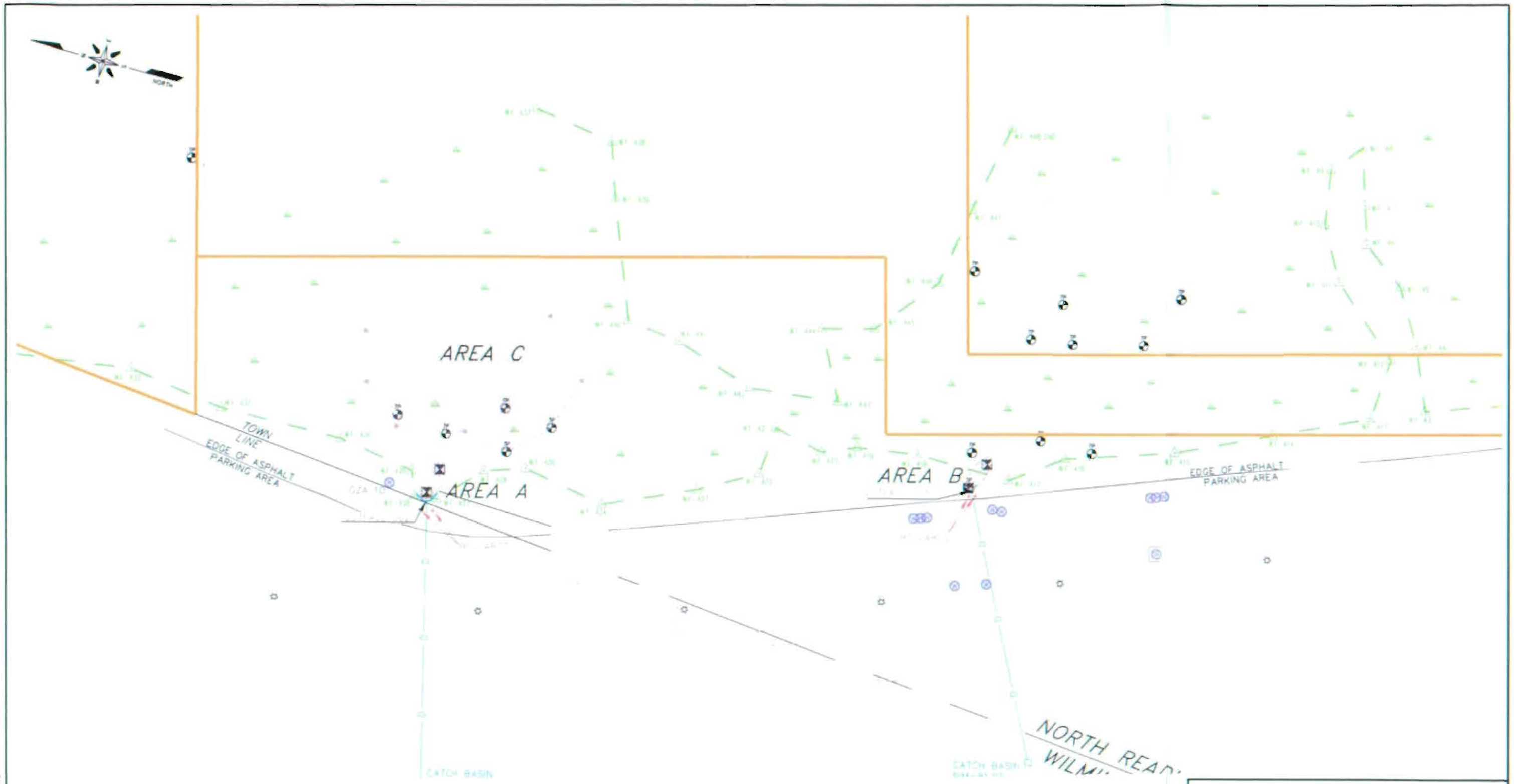
TRC

Boott Mills South
Foot of John Street
Lowell, MA 01852
(978) 970-5600

FORMER GE SITE
WILMINGTON/NORTH READING, MASSACHUSETTS

FIGURE 5-4
SURFACE SOIL RISK RESULTS
TO TERRESTRIAL INVERTEBRATES

Date: JAN 2003 | Project No. E9202



E9202 / COSAMP / AREASOFCONCERN.DWG

TRC

Boott Mills South
Foot of John Street
Lowell, MA 01852
(978) 970-5600

FORMER GE SITE
WILMINGTON/NORTH READING, MASSACHUSETTS

FIGURE 6-1
AREAS OF CONCERN

Date: JAN 2003 | Project No. E9202

APPENDIX A

SAMPLING RESULTS,
DATA VALIDATION MEMORANDUM,
QUALIFIED FORM Is,
AND
LABORATORY QC SUMMARY FORMS

Table A-1. Surface Water and Sediment Results - Outfall 001

Outfall 001 Parameter	Surface Water OU1-1-SW (ug/L)	Surface Water OU1-2-SW* (ug/L)	Sediment OU1-1-SED (mg/kg)	Sediment OU1-2-SED (mg/kg)	Sediment OU1-3-SED** (mg/kg)
Antimony	ND	ND	NA	NA	NA
Cadmium	0.24	0.24	0.45	3.4	0.36
Copper	13	13	78	970	76
Lead	0.33	0.33	23	220	23
Nickel	3.4	3.3	69 J	64 J	99 J
Zinc	10	9.9	170 J	410 J	170 J

Notes: * Duplicate Sample of OU1-1-SW
** Duplicate Sample of OU1-1-SED
ND - Not Detected
ND - Not Analyzed
J - Estimated Value

Table A-2. Surface Water and Sediment Results - Outfall 002

Outfall 002 Parameter	Surface Water OU2-1-SW (ug/L)	Sediment OU2-1-SED (mg/kg)	Sediment OU2-2-SED (mg/kg)
Antimony	ND	NA	NA
Cadmium	0.24	1.4	4.2
Copper	11	650	1900
Lead	12	380	700
Nickel	1.8	34 J	66 J
Zinc	21	330 J	720 J

Notes: ND - Not Detected
ND - Not Analyzed
J - Estimated Value

Table A-3. Surface Soil Results - Vicinity of Outfall 001

Parameter	OU1-1-SS (mg/kg)	OU1-2-SS (mg/kg)	OU1-3-SS (mg/kg)	OU1-4-SS (mg/kg)	OU1-5-SS (mg/kg)
Antimony	ND (1.4)	ND (2.4)	ND (2.1)	ND (1.9)	ND (1.8)
Cadmium	1.4	4.1	4.8	8.2	6.2
Copper	110	280	490	1000	2000
Lead	90	190	260	300	290
Nickel	26	46	50	81	130
Selenium	2	1.4	1.7	1.8	1.5
Zinc	190 J	530 J	310 J	710 J	1100 J

Parameter	OU1-6-SS (mg/kg)	OU1-7-SS (mg/kg)	OU1-8-SS (mg/kg)	OU1-9-SS (mg/kg)	OU1-10-SS* (mg/kg)
Antimony	ND (1.6)	ND (1.4)	ND (0.38)	ND (0.23)	ND (0.19)
Cadmium	4.5	2.7	0.56	0.37	0.37
Copper	3900	1500	34	21	23
Lead	420	410	260	26	29
Nickel	52	71	23	18	19
Selenium	1.6	0.82	0.19	0.15	0.086
Zinc	400 J	170 J	99 J	48 J	47 J

Notes: * Duplicate sample of OU1-9-SS
ND - Not Detected (Detection Limit)
J - Estimated Value

Table A-4. Surface Soil Results - Vicinity of Outfall 002

Parameter	OU2-1-SS (mg/kg)	OU2-2-SS (mg/kg)	OU2-3-SS (mg/kg)	OU2-4-SS (mg/kg)	OU2-5-SS (mg/kg)
Antimony	ND (1.6)	ND (1.5)	ND (1.3)	ND (1.1)	ND (1.5)
Cadmium	5.9	3	6.8	3.9	3
Copper	1100	5600	4000	1500	6700
Lead	160	830	360	180	740
Nickel	53	59	51	32	43
Selenium	2.2	1.5	2.2	1	1.9
Zinc	910 J	860 J	620 J	470 J	570 J

Notes: ND - Not Detected (Detection Limit)
J - Estimated Value

Table A-5. Plant Tissue Results - Vicinity of Outfall 001

Plant Species Parameter	OU1-1-VEG Sp. Jewelweed (mg/kg)	OU1-2-VEG Sp. Jewelweed (mg/kg)	OU1-3-VEG Sp. Jewelweed (mg/kg)	OU1-4-VEG Sp. Jewelweed (mg/kg)
Antimony	ND (0.018)	ND (0.017)	ND (0.02)	ND (0.017)
Cadmium	0.14 J	0.12 J	0.12 J	0.21 J
Copper	2.9	2.7	3.9	2.2
Lead	0.059 J	0.036 J	0.32 J	0.079 J
Nickel	0.31	0.86	0.96	1.1
Selenium	0.041 J	0.048 J	ND (0.017)	ND (0.014)
Zinc	10	11	21	17

Notes: ND - Not Detected (Detection Limit)
J - Estimated Value

Table A-6. Plant Tissue Results - Vicinity of Outfall 002

Plant Species Parameter	OU2-1-VEG P. Loosestrife (mg/kg)	OU2-2-VEG Sensitive Fern (mg/kg)
Antimony	ND (0.029)	ND (0.032)
Cadmium	0.008 J	0.029 J
Copper	4.6	2.7
Lead	0.12 J	0.13 J
Nickel	0.96	1.7
Selenium	0.14 J	ND (0.027)
Zinc	110	66

Notes: ND - Not Detected (Detection Limit)
J - Estimated Value

Table A-7. Plant Tissue Results - Reference Location

Plant Species Parameter	REF-VEG Sensitive Fern (mg/kg)
Antimony	ND (0.024)
Cadmium	0.014 J
Copper	1.5
Lead	0.079 J
Nickel	0.18
Selenium	0.069 J
Zinc	7.2

Notes: ND - Not Detected (Detection Limit)
J - Estimated Value

Table A-8. Invertebrate Tissue Results - Vicinity of Outfall 001

Parameter	OU1-1-INV (mg/kg)	OU1-2-INV (mg/kg)	OU1-3-INV (mg/kg)	OU1-4-INV (mg/kg)
Antimony	ND (0.026)	ND (0.026)	ND (0.32)	ND (0.021)
Cadmium	0.65	1.7	1.4	4.3
Copper	26 J	47 J	96 J	150 J
Lead	1.1 J	81 J	13 J	4 J
Nickel	1.3 J	4 J	4.4 J	2.8 J
Selenium	0.36 J	0.93 J	0.8 J	0.22 J
Zinc	41 J	91 J	57 J	65 J

Notes: ND - Not Detected (Detection Limit)
J - Estimated Value

Table A-9. Invertebrate Tissue Results - Vicinity of Outfall 002

Parameter	OU2-1-INV (mg/kg)	OU2-2-INV (mg/kg)
Antimony	ND (0.031)	ND (0.019)
Cadmium	1.3	1.2
Copper	86 J	120 J
Lead	4 J	1.4 J
Nickel	1 J	0.82 J
Selenium	0.39 J	0.26 J
Zinc	57 J	86 J

Notes: ND - Not Detected (Detection Limit)
J - Estimated Value

Table A-10. Invertebrate Tissue Results - Reference Location

Parameter	REF-INV (mg/kg)
Antimony	ND (0.018)
Cadmium	0.43
Copper	4.3 J
Lead	5.1 J
Nickel	0.29 J
Selenium	0.44 J
Zinc	51 J

Notes: ND - Not Detected (Detection Limit)
J - Estimated Value

TRC Environmental Corporation

Memo

To: Scott Heim

From: Lorie MacKinnon

CC: P. Macchiaroli

Date: 10/16/02

Re: Metals Data Validation Review: Surface Soil, Sediment, Terrestrial Invertebrate, Wetland Vegetation, and Surface Water Samples: Former GE Site, Wilmington, MA : Ecological Risk Assessment

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SUMMARY

Full validation was performed on the data for 16 surface soils, five sediments, seven terrestrial invertebrates, seven wetland vegetation samples, three surface waters, and one equipment blank sample collected for the Former GE Ecological Risk Assessment Project. The samples were collected on August 28, 29, and 30, 2002 and submitted to Woods Hole Group in Raynham, MA for analysis. The surface soils, equipment blank, wetland vegetation, and terrestrial invertebrate samples were analyzed for antimony, cadmium, copper, lead, nickel, selenium, and zinc; the sediment samples were analyzed for cadmium, copper, lead, nickel, and zinc; and the surface waters were analyzed for antimony, cadmium, copper, lead, nickel, and zinc. All analyses were performed using SW-846 method 6020A. Woods Hole Group reported the results under job number 0209002.

The sample results were assessed using the *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (2/94). Modification of the Functional Guidelines was done to accommodate the non-CLP methodology and requirements outlined in the *Scope of Work – Stage II Environmental Risk Characterization* (January, 2002).

In general, the data appear to be valid as reported and may be used for decision-making purposes. Selected data points were qualified as estimated because of nonconformance of certain quality control (QC) criteria. The positive results for antimony in samples OU1-1-SS, OU1-2-SS, OU1-3-SS, OU1-4-SS, OU1-5-SS, OU1-6-SS, OU1-8-SS, OU1-9-SS, OU1-10-SS, OU2-2-SS, OU2-1-SS, OU2-5-SS, OU2-3-SS, OU2-4-SS, OU1-1-SW, OU1-2-SW, and OU2-1-SW were qualified as nondetects due to method blank contamination. The positive results for antimony in samples OU1-7-SS and REF-SS and nickel in REF-SS were qualified as nondetects due to equipment blank contamination. Potential low bias exists for the selenium results in samples OU1-1-VEG, OU1-2-VEG, OU2-1-VEG, REF-VEG, OU1-3-VEG, OU1-4-VEG, OU2-2-VEG, OU1-1-INV, OU1-4-INV, OU2-2-INV, and OU2-1-INV due to negative bias seen in the instrument blank analysis.

Potential low bias exists for the antimony results in the surface soil samples and the copper results in the terrestrial invertebrate samples due to low recoveries of these analytes in the associated matrix spike analysis. Potential high bias exists for the zinc results in the terrestrial invertebrate samples due to a high recovery of this analyte in the associated matrix spike analysis.

Potential high bias exists for the positive lead and selenium results in the wetland vegetation and terrestrial invertebrate samples due to high recoveries of these analytes in the LCS analyses.

Potential uncertainty exists for the zinc results in the surface soil, sediment, and terrestrial invertebrate samples and the cadmium results in the wetland vegetation samples due to high percent differences (%Ds) for these analytes in the associated ICP serial dilution analysis.

Potential uncertainty exists for the following results due to high relative percent differences (RPDs) for these analytes in the laboratory duplicate analyses: results for nickel in the sediment samples, results for antimony in the wetland vegetation samples, and results for copper, nickel, and zinc in the terrestrial invertebrate samples.

The above-listed issues may have a minor impact on the data usability.

SAMPLES

Samples included in this review are listed below:

Surface Soils

OU1-1-SS, OU1-2-SS, OU1-3-SS, OU1-4-SS, OU1-5-SS, OU1-6-SS, OU1-7-SS, OU1-8-SS, OU1-9-SS, OU1-10-SS, OU2-2-SS, OU2-1-SS, OU2-5-SS, OU2-3-SS, OU2-4-SS, REF-SS
(field duplicate pair OU1-9-SS/OU1-10-SS)

Equipment Blank for evaluation of surface soils and sediments

Sediments

OU1-1-SED, OU1-3-SED, OU1-2-SED, OU2-1-SED, OU2-2-SED
(field duplicate pair OU1-1-SED/OU1-3-SED)

Wetland Vegetation Samples

OU1-1-VEG, OU1-2-VEG, OU1-3-VEG, OU1-4-VEG, OU2-1-VEG, OU2-2-VEG, REF-VEG

Terrestrial Invertebrate Samples

OU1-1-INV, OU1-2-INV, OU1-3-INV, OU1-4-INV, OU2-1-INV, OU2-2-INV, REF-INV

Surface Water Samples

OU1-1-SW, OU1-2-SW, OU2-1-SW
(field duplicate pair OU1-1-SW/OU1-2-SW)

REVIEW ELEMENTS

Sample data were reviewed for the following parameters:

- Agreement of analyses conducted with TRC requests
- Holding times and sample preservation
- Initial and continuing calibrations
- Internal standard areas
- Method blanks
- Inductively coupled plasma (ICP) interference check sample results
- Matrix spike (MS) results
- Laboratory control sample (LCS) results
- ICP serial dilution results
- Field duplicate results
- Laboratory duplicate results
- Quantitation limits and sample results

DISCUSSION

Agreement of Analyses Conducted with TRC Requests

Sample reports were checked to verify that the results corresponded to analytical requests as designated on the chain-of-custody and any correspondence between TRC and the laboratory. There were no discrepancies noted.

Holding Times and Sample Preservation

All samples were analyzed within the method-specified holding time. The cooler temperatures associated with all samples were within the acceptance criteria. All surface water samples were properly preserved.

Initial and Continuing Calibrations

The percent recoveries (%Rs) of all analytes in the initial and/or continuing calibration verification standards associated with samples were within the QC acceptance criteria.

Internal Standards

The %Rs of all internal standards in the QC samples and field samples were within the QC acceptance criteria.

Method Blanks

The presence of blank contamination indicates that false positives may exist for these analytes in the associated samples. An Action Level (AL) was established for analytes at 5x the concentration detected.

For positive contamination, sample results were qualified as follows:

- Sample results > quantitation limit (QL) but $\leq$ AL were qualified as nondetect (U) at the reported concentration.
- Sample results $\leq$ QL and < AL were qualified as nondetect (U) at the QL.
- Sample results > AL were not qualified.

For negative contamination, sample results were qualified as follows:

- Sample results > QL but $\leq$ AL were qualified as estimated (J) at the reported concentration.

- Nondetect sample results were qualified as estimated (UJ) at the QL.

The following tables summarize the ALs. Actual sample action levels vary due to sample analysis mass and percent solids.

ALs based on laboratory blanks:

Sediments

Analyte	Concentration (mg/kg)	Action Level (mg/kg)
Sediment –Copper	0.075	0.375
Sediment-Zinc	0.83	4.15

Surface Soils

Analyte	Concentration (mg/kg)	Action Level (mg/kg)
Surface soil-Antimony	0.20	1.0
Surface soil-Zinc	0.38	1.9

ALs based on equipment blank:

Analyte	Concentration/ Equivalent Soil Level	Action Level (mg/kg)
Antimony	6.9 µg/L/0.69 mg/kg	3.45
Lead	0.69 µg/L/0.069 mg/kg	0.35
Nickel	10 µg/L/1 mg/kg	5.0

Based on the action levels determined the following results were qualified as nondetects at the reported concentration due to laboratory blank contamination: antimony in samples OU1-1-SS, OU1-2-SS, OU1-3-SS, OU1-4-SS, OU1-5-SS, OU1-6-SS, OU1-8-SS, OU1-9-SS, OU1-10-SS, OU2-2-SS, OU2-1-SS, OU2-5-SS, OU2-3-SS, and OU2-4-SS. Based on the action levels determined the following results were qualified as nondetects at the reported concentration due to equipment blank contamination: antimony in samples OU1-7-SS and REF-SS and nickel in REF-SS.

Qualification of copper and zinc results in sediment samples was not required since all associated results exceeded the action levels. Qualification of zinc results in surface soil samples was not required since all associated results exceeded the action level. Qualification of lead results in surface soil and sediment samples was not required since all associated results exceeded the action level.

Wetland Vegetation and Terrestrial Invertebrate Samples

ALs based on laboratory blanks:

Analyte	Concentration (mg/kg)	Action Level (mg/kg)
Antimony	0.065	0.32
Selenium	-0.10	-0.50

Based on the action levels determined the following results were qualified as estimated (J/UJ) due to the negative bias seen in the instrument blank analysis: selenium in samples OU1-1-VEG, OU1-2-VEG, OU2-1-VEG, REF-VEG, OU1-3-VEG, OU1-4-VEG, OU2-2-VEG, OU1-1-INV, OU1-4-INV, OU2-2-INV, and OU2-1-INV. These results may be biased low.

Qualification of antimony results in wetland vegetation and terrestrial invertebrate samples was not required since antimony was not detected in any of the associated samples.

Surface Waters

ALs based on laboratory blanks:

Analyte	Concentration (ug/L)	Action Level (ug/L)
Antimony	0.44	2.2

Based on the action levels determined the following results were qualified as nondetects at the reported concentration due to laboratory blank contamination: antimony in samples OU1-1-SW, OU1-2-SW, and OU2-1-SW.

ICP Interference Check Sample Results

The %Rs of all analytes were within the QC acceptance criteria in the interference check sample analyses associated with all samples.

MS Results

Sample OU1-6-SS was designated for matrix spike analysis with the surface soil samples in this data set. The recovery of antimony (47%) in this matrix spike analysis was below the control limits. The nondetect results for antimony were qualified as estimated (UJ) in all surface soil samples.

Sample OU2-1-SED was designated for matrix spike analysis with the sediment samples in this data set. All criteria were met.

A matrix spike analysis was performed on sample OU1-3-VEG and was used to evaluate the wetland vegetation samples in the data set. All criteria were met.

A matrix spike analysis was performed on sample OU1-3-INV and was used to evaluate the terrestrial invertebrate samples in this data set. The recoveries of copper (0%) and zinc (157%) in this matrix spike analysis were outside of the control limits. Copper and zinc results were detected in all terrestrial invertebrate samples in this data set; these positive results were qualified as estimated (J).

Sample OU2-1-SW was designated for matrix spike analysis with the surface water samples in this data set. All criteria were met.

LCS Results

All criteria were met for the LCS analyses associated with the surface soil, sediment, and surface water samples.

The recoveries of lead (138%) and selenium (134%) were above the control limits in the LCS associated with the terrestrial invertebrate and wetland vegetation samples. The positive results for lead in all wetland vegetation and terrestrial invertebrate samples were qualified as estimated (J). The positive results for selenium in all terrestrial invertebrate samples and wetland vegetation samples OU1-1-VEG, OU1-2-VEG, OU2-1-VEG, and REF-VEG were qualified as estimated (J).

Form I
Total Metals

Woods Hole Group

Client: TRC Environmental
Project: Lockheed Eco Risk Assessment
Case: N/A SDG: N/A
Client ID: Equipment Blank
Matrix: Water

Lab Code: MA00030
ETR: 0209002
Lab ID: 0209002-01
Concentration Units: µg/L
Date Collected: 08/28/02
Date Received: 08/31/02

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Antimony	6.9		5.6	5	09/18/02	09/16/02	6020A	LMR
Cadmium	0.24	U	0.56	5	09/18/02	09/16/02	6020A	LMR
Copper	2.2	U	2.8	5	09/18/02	09/16/02	6020A	LMR
Lead	0.69		0.56	5	09/18/02	09/16/02	6020A	LMR
Nickel	10		2.8	5	09/18/02	09/16/02	6020A	LMR
Selenium	2.9	U	5.6	5	09/18/02	09/16/02	6020A	CLM
Zinc	6.7	U	56	5	09/18/02	09/16/02	6020A	LMR

U - The analyte was analyzed for but not detected at the sample specific level reported.
N/A - Not Applicable

375 Paramount Drive, Suite 2, Raynham, Massachusetts 02767, (508) 822-9300, Fax (508) 822-3288, whale@whgrp.com

Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU1-1-SW**
Matrix: **Water**

Lab Code: **MA00030**
ETR: **0209002**
Lab ID: **0209002-02**
Concentration Units: **µg/L**
Date Collected: **08/28/02**
Date Received: **08/31/02**

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Antimony	1.5 U J		5.6	5	09/18/02	09/16/02	6020A	LMR
Cadmium	0.24	U	0.56	5	09/18/02	09/16/02	6020A	LMR
Copper	13		2.8	5	09/18/02	09/16/02	6020A	LMR
Lead	0.33	U	0.56	5	09/18/02	09/16/02	6020A	LMR
Nickel	3.4		2.8	5	09/18/02	09/16/02	6020A	LMR
Zinc	10	J	56	5	09/18/02	09/16/02	6020A	LMR

J - Below CRDL, Project DL, or RL but greater than or = MDL.
U - The analyte was analyzed for but not detected at the sample specific level reported.
N/A - Not Applicable

09/20/02 09:27

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU1-2-SW**
Matrix: **Water**

Lab Code: **MA00030**
ETR: **0209002**
Lab ID: **0209002-03**
Concentration Units: **µg/L**
Date Collected: **08/28/02**
Date Received: **08/31/02**

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Antimony	0.49 U	U	5.6	5	09/18/02	09/16/02	6020A	LMR
Cadmium	0.24	U	0.56	5	09/18/02	09/16/02	6020A	LMR
Copper	13		2.8	5	09/18/02	09/16/02	6020A	LMR
Lead	0.33	U	0.56	5	09/18/02	09/16/02	6020A	LMR
Nickel	3.3		2.8	5	09/18/02	09/16/02	6020A	LMR
Zinc	9.9	J	56	5	09/18/02	09/16/02	6020A	LMR

J - Below CRDL, Project DL, or RL but greater than or = MDL.
U - The analyte was analyzed for but not detected at the sample specific level reported.
N/A - Not Applicable

09/20/02 09:27

Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU2-1-SW**
Matrix: **Water**

Lab Code: **MA00030**
ETR: **0209002**
Lab ID: **0209002-04**
Concentration Units: **µg/L**
Date Collected: **08/28/02**
Date Received: **08/31/02**

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Antimony	1.3 U J	J	5.6	5	09/18/02	09/16/02	6020A	LMR
Cadmium	0.24	U	0.56	5	09/18/02	09/16/02	6020A	LMR
Copper	11		2.8	5	09/18/02	09/16/02	6020A	LMR
Lead	12		0.56	5	09/18/02	09/16/02	6020A	LMR
Nickel	1.8	U	2.8	5	09/18/02	09/16/02	6020A	LMR
Zinc	21	J	56	5	09/18/02	09/16/02	6020A	LMR

J - Below CRDL, Project DL, or RL but greater than or = MDL.
U - The analyte was analyzed for but not detected at the sample specific level reported.
N/A - Not Applicable

09/20/02 09:28

Form I
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: N/A SDG: N/A
Client ID: **OU1-1-SS**
Matrix: **Soil**
Percent Solid: **18.1**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **0209002-10**
Concentration Units: **mg/Kg**
Date Collected: **08/28/02**
Date Received: **08/31/02**

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Antimony	1.4	UJ M	0.64	5	09/16/02	09/12/02	6020A	CLM
Cadmium	1.4		0.26	5	09/16/02	09/12/02	6020A	LMR
Copper	110		0.26	5	09/16/02	09/12/02	6020A	LMR
Lead	90		0.66	5	09/16/02	09/12/02	6020A	LMR
Nickel	26	J M	0.66	5	09/16/02	09/12/02	6020A	LMR
Selenium	2.0		0.66	5	09/16/02	09/12/02	6020A	LMR
Zinc	190	J E	2.6	5	09/16/02	09/12/02	6020A	LMR

E - Estimated due to Interference.
N - Spike recovery outside control limits.
N/A - Not Applicable

375 Paramount Drive, Suite 2, Raynham, Massachusetts 02767, (508) 822-9300, Fax (508) 822-3288, whale@whgrp.com

Form I
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU1-2-SS**
Matrix: **Soil**
Percent Solid: **14.3**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **0209002-11**
Concentration Units: **mg/Kg**
Date Collected: **08/28/02**
Date Received: **08/31/02**

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Antimony	2.4 UJ	M	0.73	5	09/16/02	09/12/02	6020A	CLM
Cadmium	4.1		0.40	5	09/16/02	09/12/02	6020A	LMR
Copper	280		0.40	5	09/16/02	09/12/02	6020A	LMR
Lead	190		1.0	5	09/16/02	09/12/02	6020A	LMR
Nickel	46	M	1.0	5	09/16/02	09/12/02	6020A	LMR
Selenium	1.4		1.0	5	09/16/02	09/12/02	6020A	LMR
Zinc	530 J	E	4.0	5	09/16/02	09/12/02	6020A	LMR

E - Estimated due to Interference.
N - Spike recovery outside control limits.
N/A - Not Applicable

375 Paramount Drive, Suite 2, Raynham, Massachusetts 02767, (508) 822-9300, Fax (508) 822-3288, whale@whgrp.com

Form I
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: N/A SDG: N/A
Client ID: **OU1-3-SS**
Matrix: **Soil**
Percent Solid: **13.7**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **0209002-14**
Concentration Units: **mg/Kg**
Date Collected: **08/28/02**
Date Received: **08/31/02**

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Antimony	2.1 UJ	N	0.78	5	09/16/02	09/12/02	6020A	CLM
Cadmium	4.8		0.42	5	09/16/02	09/12/02	6020A	LMR
Copper	490		0.42	5	09/16/02	09/12/02	6020A	LMR
Lead	260		1.0	5	09/16/02	09/12/02	6020A	LMR
Nickel	50 J		1.0	5	09/16/02	09/12/02	6020A	LMR
Selenium	1.7		1.0	5	09/16/02	09/12/02	6020A	LMR
Zinc	310 J	E	4.2	5	09/16/02	09/12/02	6020A	LMR

E - Estimated due to Interference.
N - Spike recovery outside control limits.
N/A - Not Applicable

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Form I
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: N/A SDG: N/A
Client ID: **OU1-4-SS**
Matrix: **Soil**
Percent Solid: **18.3**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **0209002-17**
Concentration Units: **mg/Kg**
Date Collected: **08/29/02**
Date Received: **08/31/02**

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Antimony	1.9	UJ N	0.50	5	09/16/02	09/12/02	6020A	CLM
Cadmium	8.2		0.29	5	09/16/02	09/12/02	6020A	LMR
Copper	1000		0.29	5	09/16/02	09/12/02	6020A	LMR
Lead	300		0.72	5	09/16/02	09/12/02	6020A	LMR
Nickel	81		0.72	5	09/16/02	09/12/02	6020A	LMR
Selenium	1.8		0.72	5	09/16/02	09/12/02	6020A	LMR
Zinc	710	J E	2.9	5	09/16/02	09/12/02	6020A	LMR

E - Estimated due to Interference.
N - Spike recovery outside control limits.
N/A - Not Applicable

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Form I
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU1-5-SS**
Matrix: **Soil**
Percent Solid: **14.3**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **0209002-20**
Concentration Units: **mg/Kg**
Date Collected: **08/29/02**
Date Received: **08/31/02**

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Antimony	1.8 UJ	N	0.62	5	09/16/02	09/12/02	6020A	CLM
Cadmium	6.2		0.27	5	09/16/02	09/12/02	6020A	LMR
Copper	2000		0.27	5	09/16/02	09/12/02	6020A	LMR
Lead	290		0.68	5	09/16/02	09/12/02	6020A	LMR
Nickel	130		0.68	5	09/16/02	09/12/02	6020A	LMR
Selenium	1.5		0.68	5	09/16/02	09/12/02	6020A	LMR
Zinc	1100 J	E	2.7	5	09/16/02	09/12/02	6020A	LMR

E - Estimated due to Interference.
N - Spike recovery outside control limits.
N/A - Not Applicable

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Form I
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU1-6-SS**
Matrix: **Soil**
Percent Solid: **13.9**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **0209002-21**
Concentration Units: **mg/Kg**
Date Collected: **08/29/02**
Date Received: **08/31/02**

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Antimony	1.6	UJ N	0.69	5	09/16/02	09/12/02	6020A	CLM
Cadmium	4.5		0.34	5	09/16/02	09/12/02	6020A	LMR
Copper	3900		0.34	5	09/16/02	09/12/02	6020A	LMR
Lead	420		0.86	5	09/16/02	09/12/02	6020A	LMR
Nickel	52	J N	0.86	5	09/16/02	09/12/02	6020A	LMR
Selenium	1.6		0.86	5	09/16/02	09/12/02	6020A	LMR
Zinc	400	J E	3.4	5	09/16/02	09/12/02	6020A	LMR

E - Estimated due to Interference.
N - Spike recovery outside control limits.
N/A - Not Applicable

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Form I
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU1-7-SS**
Matrix: **Soil**
Percent Solid: **34.5**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **0209002-22**
Concentration Units: **mg/Kg**
Date Collected: **08/29/02**
Date Received: **08/31/02**

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Antimony	1.4 UJ	N	0.28	5	09/16/02	09/12/02	6020A	CLM
Cadmium	2.7		0.15	5	09/16/02	09/12/02	6020A	LMR
Copper	1500		0.15	5	09/16/02	09/12/02	6020A	LMR
Lead	410		0.38	5	09/16/02	09/12/02	6020A	LMR
Nickel	71		0.38	5	09/16/02	09/12/02	6020A	LMR
Selenium	0.82		0.38	5	09/16/02	09/12/02	6020A	LMR
Zinc	170 J	E	1.5	5	09/16/02	09/12/02	6020A	LMR

E - Estimated due to Interference.
N - Spike recovery outside control limits.
N/A - Not Applicable

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Form I
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU1-8-SS**
Matrix: **Soil**
Percent Solid: **30.7**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **0209002-25**
Concentration Units: **mg/Kg**
Date Collected: **08/29/02**
Date Received: **08/31/02**

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Antimony	0.38 UJ	N	0.30	5	09/16/02	09/12/02	6020A	CLM
Cadmium	0.56		0.13	5	09/16/02	09/12/02	6020A	LMR
Copper	34		0.13	5	09/16/02	09/12/02	6020A	LMR
Lead	260		0.32	5	09/16/02	09/12/02	6020A	LMR
Nickel	23 J	N	0.32	5	09/16/02	09/12/02	6020A	LMR
Selenium	0.19	J	0.32	5	09/16/02	09/12/02	6020A	LMR
Zinc	99 J	N	1.3	5	09/16/02	09/12/02	6020A	LMR

J - Below CRDL, Project DL, or RL but greater than or = MDL.
E - Estimated due to Interference.
N - Spike recovery outside control limits.
N/A - Not Applicable

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Form I
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: N/A SDG: N/A
Client ID: **OU1-9-SS**
Matrix: **Soil**
Percent Solid: **53.9**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **0209002-26**
Concentration Units: **mg/Kg**
Date Collected: **08/29/02**
Date Received: **08/31/02**

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Antimony	0.23 UJ	N	0.15	5	09/16/02	09/12/02	6020A	CLM
Cadmium	0.37		0.095	5	09/16/02	09/12/02	6020A	LMR
Copper	21		0.095	5	09/16/02	09/12/02	6020A	LMR
Lead	26		0.24	5	09/16/02	09/12/02	6020A	LMR
Nickel	18 J*		0.24	5	09/16/02	09/12/02	6020A	LMR
Selenium	0.15	J	0.24	5	09/16/02	09/12/02	6020A	LMR
Zinc	48 J	E	0.95	5	09/16/02	09/12/02	6020A	LMR

J - Below CRDL, Project DL, or RL but greater than or = MDL.
E - Estimated due to Interference.
N - Spike recovery outside control limits.
N/A - Not Applicable

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Form I
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU1-10-SS**
Matrix: **Soil**
Percent Solid: **53.6**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **0209002-27**
Concentration Units: **mg/Kg**
Date Collected: **08/29/02**
Date Received: **08/31/02**

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Antimony	0.19	UJ N	0.14	5	09/16/02	09/12/02	6020A	CLM
Cadmium	0.37		0.086	5	09/16/02	09/12/02	6020A	LMR
Copper	23		0.086	5	09/16/02	09/12/02	6020A	LMR
Lead	29		0.21	5	09/16/02	09/12/02	6020A	LMR
Nickel	19		0.21	5	09/16/02	09/12/02	6020A	LMR
Selenium	0.086	U	0.21	5	09/16/02	09/12/02	6020A	LMR
Zinc	47	J N	0.86	5	09/16/02	09/12/02	6020A	LMR

E - Estimated due to Interference.
N - Spike recovery outside control limits.
U - The analyte was analyzed for but not detected at the sample specific level reported.
N/A - Not Applicable

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Form I
Total Metals

Client: TRC Environmental
Project: Lockheed Eco Risk Assessment
Case: N/A SDG: N/A
Client ID: OU2-2-SS
Matrix: Soil
Percent Solid: 23.4

Lab Code: M-MA030
ETR: 0209002
Lab ID: 0209002-28
Concentration Units: mg/Kg
Date Collected: 08/30/02
Date Received: 08/31/02

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Antimony	1.5	N	0.50	5	09/16/02	09/12/02	6020A	CLM
Cadmium	3.0		0.23	5	09/16/02	09/12/02	6020A	LMR
Copper	5600		0.23	5	09/16/02	09/12/02	6020A	LMR
Lead	830		0.57	5	09/16/02	09/12/02	6020A	LMR
Nickel	59		0.57	5	09/16/02	09/12/02	6020A	LMR
Selenium	1.5		0.57	5	09/16/02	09/12/02	6020A	LMR
Zinc	860	J	2.3	5	09/16/02	09/12/02	6020A	LMR

E - Estimated due to Interference.
N - Spike recovery outside control limits.
N/A - Not Applicable

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Form I
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: N/A SDG: N/A
Client ID: **OU2-1-SS**
Matrix: **Soil**
Percent Solid: **18.1**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **0209002-32**
Concentration Units: **mg/Kg**
Date Collected: **08/30/02**
Date Received: **08/31/02**

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Antimony	**1.6**	UJ N	0.53	5	09/16/02	09/12/02	6020A	CLM
Cadmium	**5.9**		0.25	5	09/16/02	09/12/02	6020A	LMR
Copper	**1100**		0.25	5	09/16/02	09/12/02	6020A	LMR
Lead	**160**		0.63	5	09/16/02	09/12/02	6020A	LMR
Nickel	**53**	J	0.63	5	09/16/02	09/12/02	6020A	LMR
Selenium	**2.2**		0.63	5	09/16/02	09/12/02	6020A	LMR
Zinc	**910**	J E	2.5	5	09/16/02	09/12/02	6020A	LMR

E - Estimated due to Interference.
N - Spike recovery outside control limits.
N/A - Not Applicable

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Form I
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU2-5-SS**
Matrix: **Soil**
Percent Solid: **16.3**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **0209002-33**
Concentration Units: **mg/Kg**
Date Collected: **08/30/02**
Date Received: **08/31/02**

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Antimony	1.5	UJ N	0.69	5	09/16/02	09/12/02	6020A	CLM
Cadmium	3.0		0.34	5	09/16/02	09/12/02	6020A	LMR
Copper	6700		0.34	5	09/16/02	09/12/02	6020A	LMR
Lead	740		0.84	5	09/16/02	09/12/02	6020A	LMR
Nickel	43	N	0.84	5	09/16/02	09/12/02	6020A	LMR
Selenium	1.9		0.84	5	09/16/02	09/12/02	6020A	LMR
Zinc	570	J N	3.4	5	09/16/02	09/12/02	6020A	LMR

E - Estimated due to Interference.
N - Spike recovery outside control limits.
N/A - Not Applicable

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Form I
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU2-3-SS**
Matrix: **Soil**
Percent Solid: **18.9**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **0209002-35**
Concentration Units: **mg/Kg**
Date Collected: **08/30/02**
Date Received: **08/31/02**

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Antimony	1.3 UJ	N	0.57	5	09/16/02	09/12/02	6020A	CLM
Cadmium	6.8		0.27	5	09/16/02	09/12/02	6020A	LMR
Copper	4000		0.27	5	09/16/02	09/12/02	6020A	LMR
Lead	360		0.66	5	09/16/02	09/12/02	6020A	LMR
Nickel	51 J	N	0.66	5	09/16/02	09/12/02	6020A	LMR
Selenium	2.2		0.66	5	09/16/02	09/12/02	6020A	LMR
Zinc	620 J	N	2.7	5	09/16/02	09/12/02	6020A	LMR

E - Estimated due to Interference.
N - Spike recovery outside control limits.
N/A - Not Applicable

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Form I
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: N/A SDG: N/A
Client ID: **OU2-4-SS**
Matrix: **Soil**
Percent Solid: **17.1**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **0209002-36**
Concentration Units: **mg/Kg**
Date Collected: **08/30/02**
Date Received: **08/31/02**

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Antimony	1.1 UJ	N	0.43	5	09/16/02	09/12/02	6020A	CLM
Cadmium	3.9		0.30	5	09/16/02	09/12/02	6020A	LMR
Copper	1500		0.30	5	09/16/02	09/12/02	6020A	LMR
Lead	180		0.75	5	09/16/02	09/12/02	6020A	LMR
Nickel	32	N [illegible]	0.75	5	09/16/02	09/12/02	6020A	LMR
Selenium	1.0		0.75	5	09/16/02	09/12/02	6020A	LMR
Zinc	470 J	N	3.0	5	09/16/02	09/12/02	6020A	LMR

E - Estimated due to Interference.
N - Spike recovery outside control limits.
N/A - Not Applicable

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Form I
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **REF-SS**
Matrix: **Soil**
Percent Solid: **17.6**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **0209002-39**
Concentration Units: **mg/Kg**
Date Collected: **08/30/02**
Date Received: **08/31/02**

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Antimony	2.0	UJ. N	0.46	5	09/16/02	09/12/02	6020A	CLM
Cadmium	0.79		0.28	5	09/16/02	09/12/02	6020A	LMR
Copper	42		0.28	5	09/16/02	09/12/02	6020A	LMR
Lead	240		0.69	5	09/16/02	09/12/02	6020A	LMR
Nickel	8.7	U J	0.69	5	09/16/02	09/12/02	6020A	LMR
Selenium	1.1		0.69	5	09/16/02	09/12/02	6020A	LMR
Zinc	47	J J	2.8	5	09/16/02	09/12/02	6020A	LMR

E - Estimated due to Interference.
N - Spike recovery outside control limits.
N/A - Not Applicable

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Form I
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU1-1-SED**
Matrix: **Sediment**
Percent Solid: **77.4**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **0209002-05**
Concentration Units: **mg/Kg**
Date Collected: **08/28/02**
Date Received: **08/31/02**

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Cadmium	0.45		0.059	5	09/16/02	09/12/02	6020A	LMR
Copper	78		0.059	5	09/16/02	09/12/02	6020A	LMR
Lead	23		0.15	5	09/16/02	09/12/02	6020A	LMR
Nickel	69	J	¤	0.15	5	09/16/02	09/12/02	6020A	LMR
Zinc	170	J	E	0.59	5	09/16/02	09/12/02	6020A	LMR

E - Estimated due to Interference.
N/A - Not Applicable
¤ - Duplicate outside control limits.

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Form I
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU1-3-SED**
Matrix: **Sediment**
Percent Solid: **78.6**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **0209002-06**
Concentration Units: **mg/Kg**
Date Collected: **08/28/02**
Date Received: **08/31/02**

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Cadmium	0.36		0.075	5	09/16/02	09/12/02	6020A	LMR
Copper	76		0.075	5	09/16/02	09/12/02	6020A	LMR
Lead	23		0.19	5	09/16/02	09/12/02	6020A	LMR
Nickel	99	J ✓	0.19	5	09/16/02	09/12/02	6020A	LMR
Zinc	170	J ✓	0.75	5	09/16/02	09/12/02	6020A	LMR

E - Estimated due to Interference.
N/A - Not Applicable
□ - Duplicate outside control limits.

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Form I
Total Metals

Woods Hole Group

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU1-2-SED**
Matrix: **Sediment**
Percent Solid: **20.4**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **0209002-07**
Concentration Units: **mg/Kg**
Date Collected: **08/28/02**
Date Received: **08/31/02**

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Cadmium	3.4		0.26	5	09/16/02	09/12/02	6020A	LMR
Copper	970		0.26	5	09/16/02	09/12/02	6020A	LMR
Lead	220		0.64	5	09/16/02	09/12/02	6020A	LMR
Nickel	64	J, ¤	0.64	5	09/16/02	09/12/02	6020A	LMR
Zinc	410	J, E	2.6	5	09/16/02	09/12/02	6020A	LMR

E - Estimated due to Interference.
N/A - Not Applicable
¤ - Duplicate outside control limits.

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Form I
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU2-1-SED**
Matrix: **Sediment**
Percent Solid: **38.5**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **0209002-08**
Concentration Units: **mg/Kg**
Date Collected: **08/28/02**
Date Received: **08/31/02**

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Cadmium	1.4		0.10	5	09/16/02	09/12/02	6020A	LMR
Copper	650		0.10	5	09/16/02	09/12/02	6020A	LMR
Lead	380		0.25	5	09/16/02	09/12/02	6020A	LMR
Nickel	34 J	¤	0.25	5	09/16/02	09/12/02	6020A	LMR
Zinc	330 J	E	1.0	5	09/16/02	09/12/02	6020A	LMR

E - Estimated due to Interference.
N/A - Not Applicable
¤ - Duplicate outside control limits.

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Form I
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU2-2-SED**
Matrix: **Sediment**
Percent Solid: **25.4**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **0209002-09**
Concentration Units: **mg/Kg**
Date Collected: **08/28/02**
Date Received: **08/31/02**

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Cadmium	4.2		0.13	5	09/16/02	09/12/02	6020A	LMR
Copper	1900		0.13	5	09/16/02	09/12/02	6020A	LMR
Lead	700		0.34	5	09/16/02	09/12/02	6020A	LMR
Nickel	66 J✓	¤	0.34	5	09/16/02	09/12/02	6020A	LMR
Zinc	720 J✓	E	1.3	5	09/16/02	09/12/02	6020A	LMR

E - Estimated due to Interference.
N/A - Not Applicable
¤ - Duplicate outside control limits.

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Form I
Total Metals

Woods Hole Group

Client: TRC Environmental
Project: Lockheed Eco Risk Assessment
Case: N/A SDG: N/A
Client ID: OU1-1-VEG
Matrix: Tissue
Percent Solid: 100.0

Lab Code: MA00030
ETR: 0209002
Lab ID: 0209002-12
Concentration Units: mg/Kg
Date Collected: 08/28/02
Date Received: 08/31/02

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Antimony	0.018 UJ	J	0.071	5	09/18/02	09/17/02	6020A	CLM
Cadmium	0.14 J	J	0.014	5	09/18/02	09/17/02	6020A	CLM
Copper	2.9		0.14	5	09/18/02	09/17/02	6020A	CLM
Lead	0.059 J	J	0.071	5	09/18/02	09/17/02	6020A	CLM
Nickel	0.31		0.071	5	09/18/02	09/17/02	6020A	CLM
Selenium	0.041 J	J	0.14	5	09/18/02	09/17/02	6020A	CLM
Zinc	10		0.57	5	09/18/02	09/17/02	6020A	CLM

J - Below CRDL, Project DL, or RL but greater than or = MDL.
E - Estimated due to Interference.
N - Spike recovery outside control limits.
U - The analyte was analyzed for but not detected at the sample specific level reported.
N/A - Not Applicable
¤ - Duplicate outside control limits.

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Form I
Total Metals

Woods Hole Group

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: N/A SDG: N/A
Client ID: **OU1-2-VEG**
Matrix: **Tissue**
Percent Solid: **100.0**

Lab Code: **MA00030**
ETR: **0209002**
Lab ID: **0209002-15**
Concentration Units: **mg/Kg**
Date Collected: **08/29/02**
Date Received: **08/31/02**

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Antimony	0.017	UJ	0.067	5	09/18/02	09/17/02	6020A	CLM
Cadmium	0.12	J	0.013	5	09/18/02	09/17/02	6020A	CLM
Copper	2.7		0.13	5	09/18/02	09/17/02	6020A	CLM
Lead	0.036	J	0.067	5	09/18/02	09/17/02	6020A	CLM
Nickel	0.86		0.067	5	09/18/02	09/17/02	6020A	CLM
Selenium	0.048	J	0.13	5	09/18/02	09/17/02	6020A	CLM
Zinc	11		0.54	5	09/18/02	09/17/02	6020A	CLM

J - Below CRDL, Project DL, or RL but greater than or = MDL.
E - Estimated due to Interference.
N - Spike recovery outside control limits.
U - The analyte was analyzed for but not detected at the sample specific level reported.
N/A - Not Applicable
¤ - Duplicate outside control limits.

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Form I
Total Metals

Client: TRC Environmental
Project: Lockheed Eco Risk Assessment
Case: N/A SDG: N/A
Client ID: OU1-3-VEG
Matrix: Tissue
Percent Solid: 100.0

Lab Code: M-MA030
ETR: 0209002
Lab ID: 0209002-18
Concentration Units: mg/Kg
Date Collected: 08/29/02
Date Received: 08/31/02

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Antimony	0.020	UJ J	0.076	5	09/18/02	09/17/02	6020A	CLM
Cadmium	0.12	J J	0.015	5	09/18/02	09/17/02	6020A	CLM
Copper	3.9		0.15	5	09/18/02	09/17/02	6020A	CLM
Lead	0.32	J J	0.076	5	09/18/02	09/17/02	6020A	CLM
Nickel	0.96		0.076	5	09/18/02	09/17/02	6020A	CLM
Selenium	0.017	UJ J	0.15	5	09/18/02	09/17/02	6020A	CLM
Zinc	21		0.61	5	09/18/02	09/17/02	6020A	CLM

E - Estimated due to Interference.
N - Spike recovery outside control limits.
U - The analyte was analyzed for but not detected at the sample specific level reported.
N/A - Not Applicable
¤ - Duplicate outside control limits.

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Form I
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU1-4-VEG**
Matrix: **Tissue**
Percent Solid: **100.0**

Lab Code: **MA00030**
ETR: **0209002**
Lab ID: **0209002-24**
Concentration Units: **mg/Kg**
Date Collected: **08/29/02**
Date Received: **08/31/02**

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Antimony	0.017	UJ	0.065	5	09/18/02	09/17/02	6020A	CLM
Cadmium	0.21	J	0.013	5	09/18/02	09/17/02	6020A	CLM
Copper	2.2		0.13	5	09/18/02	09/17/02	6020A	CLM
Lead	0.079	J	0.065	5	09/18/02	09/17/02	6020A	CLM
Nickel	1.1		0.065	5	09/18/02	09/17/02	6020A	CLM
Selenium	0.014	UJ	0.13	5	09/18/02	09/17/02	6020A	CLM
Zinc	17		0.52	5	09/18/02	09/17/02	6020A	CLM

E - Estimated due to Interference.
N - Spike recovery outside control limits.
U - The analyte was analyzed for but not detected at the sample specific level reported.
N/A - Not Applicable
¤ - Duplicate outside control limits.

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Form I
Total Metals

Client: TRC Environmental
Project: Lockheed Eco Risk Assessment
Case: N/A SDG: N/A
Client ID: OU2-1-VEG
Matrix: Tissue
Percent Solid: 100.0

Lab Code: MA00030
ETR: 0209002
Lab ID: 0209002-30
Concentration Units: mg/Kg
Date Collected: 08/30/02
Date Received: 08/31/02

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Antimony	0.029 UJ	U	0.11	5	09/18/02	09/17/02	6020A	CLM
Cadmium	0.008 J		0.022	5	09/18/02	09/17/02	6020A	CLM
Copper	4.6		0.22	5	09/18/02	09/17/02	6020A	CLM
Lead	0.12 J		0.11	5	09/18/02	09/17/02	6020A	CLM
Nickel	0.96		0.11	5	09/18/02	09/17/02	6020A	CLM
Selenium	0.14 J		0.22	5	09/18/02	09/17/02	6020A	CLM
Zinc	110		0.88	5	09/18/02	09/17/02	6020A	CLM

J - Below CRDL, Project DL, or RL but greater than or = MDL.
E - Estimated due to Interference.
N - Spike recovery outside control limits.
U - The analyte was analyzed for but not detected at the sample specific level reported.
N/A - Not Applicable
□ - Duplicate outside control limits.

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Form I
Total Metals

Client: TRC Environmental
Project: Lockheed Eco Risk Assessment
Case: N/A SDG: N/A
Client ID: OU2-2-VEG
Matrix: Tissue
Percent Solid: 100.0

Lab Code: MA00030
ETR: 0209002
Lab ID: 0209002-34
Concentration Units: mg/Kg
Date Collected: 08/30/02
Date Received: 08/31/02

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Antimony	0.032	UJ J V	0.12	5	09/18/02	09/17/02	6020A	CLM
Cadmium	0.029	J J	0.025	5	09/18/02	09/17/02	6020A	CLM
Copper	2.7		0.25	5	09/18/02	09/17/02	6020A	CLM
Lead	0.13	J J	0.12	5	09/18/02	09/17/02	6020A	CLM
Nickel	1.7	J	0.12	5	09/18/02	09/17/02	6020A	CLM
Selenium	0.027	UJ	0.25	5	09/18/02	09/17/02	6020A	CLM
Zinc	66		1.0	5	09/18/02	09/17/02	6020A	CLM

E - Estimated due to Interference.
N - Spike recovery outside control limits.
U - The analyte was analyzed for but not detected at the sample specific level reported.
N/A - Not Applicable
¤ - Duplicate outside control limits.

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Form I
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **REF-VEG**
Matrix: **Tissue**
Percent Solid: **100.0**

Lab Code: **MA00030**
ETR: **0209002**
Lab ID: **0209002-38**
Concentration Units: **mg/Kg**
Date Collected: **08/30/02**
Date Received: **08/31/02**

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Antimony	0.024	UJ J Ø	0.091	5	09/18/02	09/17/02	6020A	CLM
Cadmium	0.014	J J	0.018	5	09/18/02	09/17/02	6020A	CLM
Copper	1.5		0.18	5	09/18/02	09/17/02	6020A	CLM
Lead	0.079	J J	0.091	5	09/18/02	09/17/02	6020A	CLM
Nickel	0.18		0.091	5	09/18/02	09/17/02	6020A	CLM
Selenium	0.069	J J	0.18	5	09/18/02	09/17/02	6020A	CLM
Zinc	7.2		0.72	5	09/18/02	09/17/02	6020A	CLM

J - Below CRDL, Project DL, or RL but greater than or = MDL.
E - Estimated due to Interference.
N - Spike recovery outside control limits.
U - The analyte was analyzed for but not detected at the sample specific level reported.
N/A - Not Applicable
□ - Duplicate outside control limits.

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Form I
Total Metals

Woods Hole Group

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU1-1-INV**
Matrix: **Tissue**
Percent Solid: **100.0**

Lab Code: **MA00030**
ETR: **0209002**
Lab ID: **0209002-13**
Concentration Units: **mg/Kg**
Date Collected: **08/28/02**
Date Received: **08/31/02**

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Antimony	0.026	U	0.10	5	09/18/02	09/17/02	6020A	CLM
Cadmium	0.65		0.020	5	09/18/02	09/17/02	6020A	CLM
Copper	26	J	0.20	5	09/18/02	09/17/02	6020A	CLM
Lead	1.1	J	0.10	5	09/18/02	09/17/02	6020A	CLM
Nickel	1.3	J	0.10	5	09/18/02	09/17/02	6020A	CLM
Selenium	0.36	J	0.20	5	09/18/02	09/17/02	6020A	CLM
Zinc	41	J	0.81	5	09/18/02	09/17/02	6020A	CLM

E - Estimated due to Interference.
N - Spike recovery outside control limits.
U - The analyte was analyzed for but not detected at the sample specific level reported.
N/A - Not Applicable
□ - Duplicate outside control limits.

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Form I
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: N/A SDG: N/A
Client ID: **OU1-2-INV**
Matrix: **Tissue**
Percent Solid: **100.0**

Lab Code: **MA00030**
ETR: **0209002**
Lab ID: **0209002-16**
Concentration Units: **mg/Kg**
Date Collected: **08/29/02**
Date Received: **08/31/02**

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Antimony	0.026	U	0.098	5	09/18/02	09/17/02	6020A	CLM
Cadmium	1.7	E	0.020	5	09/18/02	09/17/02	6020A	CLM
Copper	47 J	¤N	0.20	5	09/18/02	09/17/02	6020A	CLM
Lead	81 J		0.098	5	09/18/02	09/17/02	6020A	CLM
Nickel	4.0 J	¤	0.098	5	09/18/02	09/17/02	6020A	CLM
Selenium	0.93 J	¤	0.20	5	09/18/02	09/17/02	6020A	CLM
Zinc	91 J	¤N	0.79	5	09/18/02	09/17/02	6020A	CLM

E - Estimated due to Interference.
N - Spike recovery outside control limits.
U - The analyte was analyzed for but not detected at the sample specific level reported.
N/A - Not Applicable
¤ - Duplicate outside control limits.

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Form I
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU1-3-INV**
Matrix: **Tissue**
Percent Solid: **100.0**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **0209002-19**
Concentration Units: **mg/Kg**
Date Collected: **08/29/02**
Date Received: **08/31/02**

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Antimony	0.032	U	0.12	5	09/18/02	09/17/02	6020A	CLM
Cadmium	1.4	J	0.025	5	09/18/02	09/17/02	6020A	CLM
Copper	96	J	0.25	5	09/18/02	09/17/02	6020A	CLM
Lead	13	J	0.12	5	09/18/02	09/17/02	6020A	CLM
Nickel	4.4	J	0.12	5	09/18/02	09/17/02	6020A	CLM
Selenium	0.80	J	0.25	5	09/18/02	09/17/02	6020A	CLM
Zinc	57	J	1.0	5	09/18/02	09/17/02	6020A	CLM

E - Estimated due to Interference.
N - Spike recovery outside control limits.
U - The analyte was analyzed for but not detected at the sample specific level reported.
N/A - Not Applicable
¤ - Duplicate outside control limits.

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Form I
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU1-4-INV**
Matrix: **Tissue**
Percent Solid: **100.0**

Lab Code: **MA00030**
ETR: **0209002**
Lab ID: **0209002-23**
Concentration Units: **mg/Kg**
Date Collected: **08/29/02**
Date Received: **08/31/02**

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Antimony	0.021	U	0.081	5	09/18/02	09/17/02	6020A	CLM
Cadmium	4.3		0.016	5	09/18/02	09/17/02	6020A	CLM
Copper	150	J	0.16	5	09/18/02	09/17/02	6020A	CLM
Lead	4.0	J	0.081	5	09/18/02	09/17/02	6020A	CLM
Nickel	2.8	J	0.081	5	09/18/02	09/17/02	6020A	CLM
Selenium	0.22	J	0.16	5	09/18/02	09/17/02	6020A	CLM
Zinc	65	J	0.64	5	09/18/02	09/17/02	6020A	CLM

E - Estimated due to Interference.
N - Spike recovery outside control limits.
U - The analyte was analyzed for but not detected at the sample specific level reported.
N/A - Not Applicable
□ - Duplicate outside control limits.

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Form I
Total Metals

Client: TRC Environmental
Project: Lockheed Eco Risk Assessment
Case: N/A SDG: N/A
Client ID: OU2-2-INV
Matrix: Tissue
Percent Solid: 100.0

Lab Code: MA00030
ETR: 0209002
Lab ID: 0209002-29
Concentration Units: mg/Kg
Date Collected: 08/30/02
Date Received: 08/31/02

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Antimony	0.019	U	0.072	5	09/18/02	09/17/02	6020A	CLM
Cadmium	1.2		0.014	5	09/18/02	09/17/02	6020A	CLM
Copper	120 J		0.14	5	09/18/02	09/17/02	6020A	CLM
Lead	1.4 J		0.072	5	09/18/02	09/17/02	6020A	CLM
Nickel	0.82 J		0.072	5	09/18/02	09/17/02	6020A	CLM
Selenium	0.26 J		0.14	5	09/18/02	09/17/02	6020A	CLM
Zinc	86 J		0.58	5	09/18/02	09/17/02	6020A	CLM

E - Estimated due to Interference.
N - Spike recovery outside control limits.
U - The analyte was analyzed for but not detected at the sample specific level reported.
N/A - Not Applicable
¤ - Duplicate outside control limits.

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Form I
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU2-1-INV**
Matrix: **Tissue**
Percent Solid: **100.0**

Lab Code: **MA00030**
ETR: **0209002**
Lab ID: **0209002-31**
Concentration Units: **mg/Kg**
Date Collected: **08/30/02**
Date Received: **08/31/02**

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Antimony	0.031	U	0.12	5	09/18/02	09/17/02	6020A	CLM
Cadmium	1.3		0.024	5	09/18/02	09/17/02	6020A	CLM
Copper	86 J		0.24	5	09/18/02	09/17/02	6020A	CLM
Lead	4.0 J		0.12	5	09/18/02	09/17/02	6020A	CLM
Nickel	1.0 J	¤	0.12	5	09/18/02	09/17/02	6020A	CLM
Selenium	0.39 J	¤	0.24	5	09/18/02	09/17/02	6020A	CLM
Zinc	57 J		0.94	5	09/18/02	09/17/02	6020A	CLM

E - Estimated due to Interference.
N - Spike recovery outside control limits.
U - The analyte was analyzed for but not detected at the sample specific level reported.
N/A - Not Applicable
¤ - Duplicate outside control limits.

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Form I
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **REF-INV**
Matrix: **Tissue**
Percent Solid: **100.0**

Lab Code: **MA00030**
ETR: **0209002**
Lab ID: **0209002-37**
Concentration Units: **mg/Kg**
Date Collected: **08/30/02**
Date Received: **08/31/02**

Parameter	Result	Qualifier	Reporting Limit	Dilution	Date Analyzed	Date Prepared	Analytical Method	Analyst
Antimony	0.018	U	0.070	5	09/18/02	09/17/02	6020A	CLM
Cadmium	0.43	J	0.014	5	09/18/02	09/17/02	6020A	CLM
Copper	4.3	J	0.14	5	09/18/02	09/17/02	6020A	CLM
Lead	5.1	J	0.070	5	09/18/02	09/17/02	6020A	CLM
Nickel	0.29	J	0.070	5	09/18/02	09/17/02	6020A	CLM
Selenium	0.44	J	0.14	5	09/18/02	09/17/02	6020A	CLM
Zinc	51	J	0.56	5	09/18/02	09/17/02	6020A	CLM

E - Estimated due to Interference.
N - Spike recovery outside control limits.
U - The analyte was analyzed for but not detected at the sample specific level reported.
N/A - Not Applicable
¤ - Duplicate outside control limits.

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CASE NARRATIVE

Woods Hole Group Environmental Laboratories

ETR: 0209002
Project: Lockheed Eco Risk Assessment

All analyses were performed according to Woods Hole Group's documented Standard Operating Procedures (SOPs), within holding time and with appropriate quality control measures except where noted. Blank correction of results is not performed in the laboratory for any parameter. Tissue samples are reported on a wet weight basis unless otherwise noted.

This data package includes total metals results for the following samples:

Client Sample ID	Laboratory Sample ID
OU1-1-VEG	0209002-12
OU1-1-INV	0209002-13
OU1-2-VEG	0209002-15
OU1-2-INV	0209002-16
OU1-3-VEG	0209002-18
OU1-3-INV	0209002-19
OU1-4-INV	0209002-23
OU1-4-VEG	0209002-24
OU2-2-INV	0209002-29
OU2-1-VEG	0209002-30
OU2-2-INV	0209002-31
OU2-2-VEG	0209002-34
REF-INV	0209002-37
REF-VEG	0209002-38

Metals

Tissue samples associated with this data package were prepared by microwave digestion and analyzed by ICP MS (Method 6020).

Results for two tissue types, plants and invertebrates, are reported in this data package. A QC sample representing each matrix type was prepared. Sample OU1-3-VEG (Lab ID 0209002-18) representing plants and sample OU1-3-INV (Lab ID 0209002-19) representing invertebrates were each prepared with a matrix duplicate and a matrix spike. A preparation blank, tissue LCS and LFB were also prepared for batch quality control. The tissue LCS is a certified reference material (DORM2) supplied by the National Research Council Canada.

A serial dilution was performed on the QC samples to indicate analytical interference. Qualifiers are applied to all samples in the data package for any QC failures. All instrumental and preparation batch QC measures were within method acceptance criteria except the following:

1. Cadmium: The percent difference between the sample result and the serial dilution was 13% for sample OU1-3-VEG (Lab ID 0209002-18). The percent difference is higher than the 10% method acceptance limit. All results are flagged (E) as estimated values.

2. Copper: The RPD between matrix duplicates for sample OU1-3-INV (Lab ID 0209002-19) was 38% and higher than the 20% method acceptance limit. All results are flagged (¤) to indicate this QC failure. There was no recovery of the matrix spike added to sample OU1-3-INV (Lab ID 0209002-19). All results are flagged (N) to indicate this QC failure.
3. Lead: Recovery of lead from the tissue LCS was 138% and outside of the 80% - 120% laboratory acceptance limits. The true value of this standard is below reporting limits for lead. All matrix spike recoveries and the LFB recovery was within method acceptance limits.
4. Nickel: The RPD between matrix duplicates for sample OU1-3-INV (Lab ID 0209002-19) was 25% and higher than the 20% method acceptance limit. All results are flagged (¤) to indicate this QC failure.
5. Selenium: The RPD between matrix duplicates for sample OU1-3-INV (Lab ID 0209002-19) was 25% and higher than the 20% method acceptance limit. All results are flagged (¤) to indicate this QC failure. Recovery of selenium from the tissue LCS was 134% and outside of the 80% - 120% laboratory acceptance limits. All matrix spike recoveries and the LFB recovery was within method acceptance limits.
6. Zinc: The RPD between matrix duplicates for sample OU1-3-INV (Lab ID 0209002-19) was 37% and higher than the 20% method acceptance limit. All results are flagged (¤) to indicate this QC failure. The recovery of zinc from the matrix spike added to sample OU1-3-INV (Lab ID 0209002-19) was 157% and outside of the 75% - 125% method acceptance limits. All results are flagged (N) to indicate this QC failure. The percent difference between the sample result and the serial dilution was 16% for sample OU1-3-INV (Lab ID 0209002-19). This value is higher than the 10% method acceptance limit. All results are flagged, "E", as estimated values.

The enclosed results of analyses are representative of the samples as received by the laboratory. Woods Hole Group makes no representations or certifications as to the method of sample collection, sample identification, or transporting/handling procedures used prior to the receipt of samples by Woods Hole Group. To the best of my knowledge, the information contained in this report is accurate and complete.

Approved by: Edith Hutchinson Date: 9/23/02

Woods Hole Group Environmental Laboratories

Woods Hole Group Environmental Laboratories 375 Paramount Drive, Suite 2, Raynham, MA 02767-5150 Ph: 508-822-9300

Form IIa
Initial and Continuing Calibration Verification

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Sequence: **M091802D**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **See Below**
Concentration Units: **µg/L**
Instrument: **ICP MS**

	Initial Calibration ICV0918 16:59			Continuing Calibration CCV0918 17:33			CCV0918 18:07		
Parameter	**True**	**Found**	**% Rec**	**True**	**Found**	**% Rec**	**Found**	**% Rec**	**Limit**
Antimony	50.0	47.45	95.0	50.0	46.40	93.0	48.03	96.0	90-110
Cadmium	50.0	47.21	94.0	50.0	46.82	94.0	46.91	94.0	90-110
Copper	50.0	48.34	97.0	50.0	47.69	95.0	47.60	95.0	90-110
Lead	50.0	47.63	95.0	50.0	47.02	94.0	46.85	94.0	90-110
Nickel	50.0	46.68	93.0	50.0	45.51	91.0	46.30	93.0	90-110
Selenium	50.0	47.21	94.0	50.0	46.36	93.0	46.23	92.0	90-110
Zinc	50.0	47.07	94.0	50.0	47.03	94.0	46.90	94.0	90-110

N/A - Not Applicable

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Form IIa
Initial and Continuing Calibration Verification

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: N/A SDG: N/A
Sequence: **M091802D**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **See Below**
Concentration Units: **µg/L**
Instrument: **ICP MS**

	Initial Calibration			Continuing Calibration					
					CCV0918 18:29		CCV0918 18:46		
Parameter	True	Found	% Rec	True	Found	% Rec	Found	% Rec	Limit
Antimony				50.0	46.92	94.0	47.45	95.0	90-110
Cadmium				50.0	47.50	95.0	46.98	94.0	90-110
Copper				50.0	48.29	97.0	47.60	95.0	90-110
Lead				50.0	46.45	93.0	47.38	95.0	90-110
Nickel				50.0	47.42	95.0	46.60	93.0	90-110
Selenium				50.0	45.06	90.0	45.48	91.0	90-110
Zinc				50.0	46.67	93.0	47.44	95.0	90-110

N/A - Not Applicable

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Form IIa
Initial and Continuing Calibration Verification

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Sequence: **M091802D**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **See Below**
Concentration Units: **µg/L**
Instrument: **ICP MS**

	Initial Calibration			Continuing Calibration CCV0918 18:54				
Parameter	**True**	**Found**	**% Rec**	**True**	**Found**	**% Rec**		**Limit**
Antimony				50.0	47.86	96.0		90-110
Cadmium				50.0	47.40	95.0		90-110
Copper				50.0	46.96	94.0		90-110
Lead				50.0	46.46	93.0		90-110
Nickel				50.0	46.39	93.0		90-110
Selenium				50.0	46.08	92.0		90-110
Zinc				50.0	46.25	93.0		90-110

N/A - Not Applicable

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Form III
Blanks

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Sequence: **M091802D**

Lab Code: **MA00030**
ETR: **0209002**
Lab ID: **See Below**
Concentration Units: **µg/L**
Instrument: **ICP MS**

Parameter	ICB0918 17:02		091702PBS1 £		CCB0918 17:35		CCB0918 18:09		CCB0918 18:32	
Antimony	0.40	J	0.032	U	0.30	J	0.30	J	0.31	J
Cadmium	0.0095	U	0.0020	U	0.0095	U	0.0095	U	0.0095	U
Copper	0.72	U	0.18	U	0.72	U	0.72	U	0.72	U
Lead	0.10	U	0.025	U	0.10	U	0.10	U	0.10	U
Nickel	0.13	U	0.034	U	0.13	U	0.13	U	0.13	U
Selenium	0.11	U	0.027	U	-0.3	J	-0.4	J	-0.4	J
Zinc	3.3	U	0.84	U	3.3	U	3.3	U	3.3	U

J - Below CRDL, Project DL, or RL but greater than or = MDL.
U - The analyte was analyzed for but not detected at the sample specific level reported.
N/A - Not Applicable
£ - Concentration Units: mg/Kg

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Form III
Blanks

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Sequence: **M091802D**

Lab Code: **MA00030**
ETR: **0209002**
Lab ID: **See Below**
Concentration Units: **µg/L**
Instrument: **ICP MS**

Parameter	CCB0918 18:49		CCB0918 18:57	
Antimony	0.13	J	0.15	J
Cadmium	0.0095	U	0.0095	U
Copper	0.72	U	0.72	U
Lead	0.10	U	0.10	U
Nickel	0.13	U	0.13	U
Selenium	-0.6	J	-0.5	J
Zinc	3.3	U	3.3	U

J - Below CRDL, Project DL, or RL but greater than or = MDL.
U - The analyte was analyzed for but not detected at the sample specific level reported.
N/A - Not Applicable

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Form IV
Interference Check Sample
Initial

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Sequence: **M091802D**

Lab Code: **MA00030**
ETR: **0209002**
Lab ID: **See Below**
Concentration Units: **µg/L**
Instrument: **ICP MS**

	ICSA0918 17:04				ICSAB0918 17:07*			
Parameter	True	Found	Percent Recovery	Recovery Limits	True	Found	Percent Recovery	Recovery Limits
Antimony		0			20	20	101	80-120
Cadmium		1			20	21	99	80-120
Copper		1			20	21	101	80-120
Lead		0			20	20	99	80-120
Nickel		1			20	20	96	80-120
Selenium		0			20	20	101	80-120
Zinc		2			20	23	106	80-120

N/A - Not Applicable

* - ICSAB recoveries corrected for concentrations measured in ICSA (excluding interference elements).

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Form V
Matrix Spike - Low
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU1-3-VEG**
Matrix: **Tissue**
Percent Solid: **100.0**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **See Below**
Concentration Units: **mg/Kg**
Date Collected: **08/29/02**
Date Received: **08/31/02**

Lab ID:		0209002-18	0209002-18		
	Spiked	Sample	Matrix Spike		% Recovery
Parameter	Conc.	Conc.	Conc.	% Recovery	Limits
Antimony	1.5	0.020 U	1.5	93	75-125
Cadmium	1.5	0.12	1.6	96	75-125
Lead	1.5	0.32	2.1	110	75-125
Nickel	1.5	0.96	2.6	104	75-125
Selenium	1.5	0.017 U	1.5	92	75-125

U - The analyte was analyzed for but not detected at the sample specific level reported.
N/A - Not Applicable

Concentrations reported as calculated values, which includes rounding for significant figures. Percent recoveries and RPD values are calculated from the unrounded results.

09/19/02 15:58

Form V
Matrix Spike - High
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU1-3-VEG**
Matrix: **Tissue**
Percent Solid: **100.0**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **See Below**
Concentration Units: **mg/Kg**
Date Collected: **08/29/02**
Date Received: **08/31/02**

Lab ID:		0209002-18		0209002-18	
	Spiked	Sample	Matrix Spike		% Recovery
Parameter	Conc.	Conc.	Conc.	% Recovery	Limits
Copper	25	3.9	29	101	75-125
Zinc	25	21	44	95	75-125

N/A - Not Applicable

Concentrations reported as calculated values, which includes rounding for significant figures. Percent recoveries and RPD values are calculated from the unrounded results.

09/19/02 15:59

Form V
Matrix Spike - High
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU1-3-INV**
Matrix: **Tissue**
Percent Solid: **100.0**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **See Below**
Concentration Units: **mg/Kg**
Date Collected: **08/29/02**
Date Received: **08/31/02**

Lab ID:		0209002-19	0209002-19		
	Spiked	Sample	Matrix Spike		% Recovery
Parameter	Conc.	Conc.	Conc.	% Recovery	Limits
Antimony	59	0.032 U	53	89	75-125
Cadmium	29	1.4	29	92	75-125
Copper	59	96	94	0N	75-125
Lead	59	13	78	111	75-125
Nickel	59	4.4	61	96	75-125
Selenium	59	0.80	56	93	75-125
Zinc	59	57	150	157N	75-125

N - Spike recovery outside control limits.
U - The analyte was analyzed for but not detected at the sample specific level reported.
N/A - Not Applicable

Concentrations reported as calculated values, which includes rounding for significant figures. Percent recoveries and RPD values are calculated from the unrounded results.

09/19/02 16:11

Form VI
Duplicate
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU1-3-VEG**
Matrix: **Tissue**
Percent Solid: **100.0**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **0209002-18 DUP**
Concentration Units: **mg/Kg**
Date Collected: **08/29/02**
Date Received: **08/31/02**

Parameter	Sample Result	Duplicate Result	Percent RPD	RPD Limit
Antimony	0.02 U	0.21	X	20
Cadmium	0.12	0.14	12	20
Copper	3.9	3.7	5	20
Lead	0.32	0.31	4	20
Nickel	0.96	0.98	2	20
Selenium	0.017 U	0.012 U	N/A	20
Zinc	21	23	7	20

U - The analyte was analyzed for but not detected at the sample specific level reported.
X - It is not possible to calculate RPD, one result is below the detection limit, the other is above reporting limit.
N/A - Not Applicable

Concentrations reported as calculated values, which includes rounding for significant figures. RPD values are reported based on the unrounded calculated result.

09/19/02 15:58

Form VI
Duplicate
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU1-3-INV**
Matrix: **Tissue**
Percent Solid: **100.0**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **0209002-19 DUP**
Concentration Units: **mg/Kg**
Date Collected: **08/29/02**
Date Received: **08/31/02**

Parameter	Sample Result	Duplicate Result	Percent RPD	RPD Limit
Antimony	0.032 U	0.032 U	N/A	20
Cadmium	1.4	1.3	12	20
Copper	96	66	38¤	20
Lead	13	14	7	20
Nickel	4.4	3.4	25¤	20
Selenium	0.8	0.99	21¤	20
Zinc	57	83	37¤	20

¤ - RPD is greater than 20%
U - The analyte was analyzed for but not detected at the sample specific level reported.
N/A - Not Applicable

Concentrations reported as calculated values, which includes rounding for significant figures. RPD values are reported based on the unrounded calculated result.

09/19/02 16:11

Form VII
Laboratory Control Sample
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **Laboratory Control Sample**
Matrix: **Tissue**
Percent Solid: **100.0**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **091702S1DORM2**
Concentration Units: **mg/Kg**
Date Collected: **N/A**
Date Received: **N/A**

Parameter	Conc.	% Recovery	% Recovery Limits
Cadmium	0.046	107	80-120
Copper	2.2	95	80-120
Lead	0.090 J	138¥	80-120
Nickel	16	83	80-120
Selenium	1.9	134¥	80-120
Zinc	22	85	80-120

¥ - Outside control limits.
J - Below CRDL, Project DL, or RL but greater than or = MDL.
N/A - Not Applicable

Laboratory Control Sample Source: DORM 2

Concentrations reported as calculated values, which includes rounding for significant figures. Percent recoveries and RPD values are calculated from the unrounded results.

09/19/02 16:21

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Form VII
Lab Fortified Blank High
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **Lab Fortified Blank High**
Matrix: **Water**

Lab Code: **MA00030**
ETR: **0209002**
Lab ID: **091702LFBH**
Concentration Units: **µg/L**
Date Collected: **N/A**
Date Received: **N/A**

Parameter	Conc.	% Recovery	% Recovery Limits
Antimony	950	95	80-120
Cadmium	470	94	80-120
Copper	960	96	80-120
Lead	970	97	80-120
Nickel	980	98	80-120
Selenium	900	90	80-120
Zinc	910	91	80-120

N/A - Not Applicable

Concentrations reported as calculated values, which includes rounding for significant figures. Percent recoveries and RPD values are calculated from the unrounded results.

09/19/02 16:54

Form IX
Serial Dilution
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU1-3-VEG**
Matrix: **Tissue**
Percent Solid: **100.0**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **0209002-18 SD**
Concentration Units: **mg/Kg**
Date Collected: **08/29/02**
Date Received: **08/31/02**

Parameter	Sample Result	Duplicate Result	Percent Difference	Limit
Antimony	0.02 U	0.098 U	N/A	10
Cadmium	0.12	0.14	13E	10
Copper	3.9	4.0	4	10
Lead	0.32	0.33 J	2	10
Nickel	0.96	0.93	4	10
Selenium	0.017 U	0.083 U	N/A	10
Zinc	21	25	19	10

J - Below CRDL, Project DL, or RL but greater than or = MDL.
E - Estimated due to Interference.
U - The analyte was analyzed for but not detected at the sample specific level reported.
N/A - Not Applicable

Concentrations reported as calculated values, which includes rounding for significant figures. RPD values are reported based on the unrounded calculated result.

09/19/02 15:58

Form IX
Serial Dilution
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU1-3-INV**
Matrix: **Tissue**
Percent Solid: **100.0**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **0209002-19 SD**
Concentration Units: **mg/Kg**
Date Collected: **08/29/02**
Date Received: **08/31/02**

Parameter	Sample Result	Duplicate Result	Percent Difference	Limit
Antimony	0.032 U	0.16 U	N/A	10
Cadmium	1.4	1.6	8	10
Copper	96	97	1	10
Lead	13	13	4	10
Nickel	4.4	4.2	5	10
Selenium	0.8	0.31 J	61	10
Zinc	57	66	16E	10

J - Below CRDL, Project DL, or RL but greater than or = MDL.
E - Estimated due to Interference.
U - The analyte was analyzed for but not detected at the sample specific level reported.
N/A - Not Applicable

Concentrations reported as calculated values, which includes rounding for significant figures. RPD values are reported based on the unrounded calculated result.

09/19/02 16:10

Form X
Method Detection Limits (Annually)

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**

Lab Code: **MA00030**
ETR: **0209002**
Instrument: **ICP MS**
Date: 01/01/02

Parameter	Mass (amμ)	Background	RL (μg/L)	MDL (μg/L)
Antimony	121.00		0.50	0.13
Cadmium	114.00		0.10	0.0095
Copper	63.00		1.0	0.72
Lead	208.00		0.50	0.10
Nickel	60.00		0.50	0.13
Selenium	82.00		1.0	0.11
Zinc	66.00		4.0	3.3

N/A - Not Applicable
RL - Reporting Limit

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Form XII
ICP Linear Ranges (Annually)

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: N/A SDG: N/A

Lab Code: **MA00030**
ETR: **0209002**
Instrument: **ICP MS**
Date: 02/01/02

Parameter	Integration Time (seconds)	Concentration (µg/L)
Antimony	N/A	5000
Cadmium	N/A	5000
Copper	N/A	5000
Lead	N/A	5000
Nickel	N/A	5000
Selenium	N/A	5000
Zinc	N/A	5000

N/A - Not Applicable

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Form XIII
Preparation Log

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**

Lab Code: **MA00030**
ETR: **0209002**

Method: ~~**3050:1T**~~ 3051
CM 9/19/02

Client ID	Lab ID	Preparation Date	Weight (g)	Final Volume (ml)
Lab Fortified Blank Low	091702LFBL	9/17/2002	1	50
Laboratory Control Sample	091702S1DORM2	9/17/2002	0.57	50
OU1-1-INV	0209002-13	9/17/2002	1.23	50
OU1-1-VEG	0209002-12	9/17/2002	1.76	50
OU1-2-INV	0209002-16	9/17/2002	1.27	50
OU1-2-VEG	0209002-15	9/17/2002	1.87	50
OU1-3-INV	0209002-19	9/17/2002	1	50
OU1-3-INV	0209002-19 DUP	9/17/2002	1	50
OU1-3-INV	0209002-19 MSH	9/17/2002	0.85	50
OU1-3-VEG	0209002-18	9/17/2002	1.65	50
OU1-3-VEG	0209002-18 DUP	9/17/2002	2.2	50
OU1-3-VEG	0209002-18 MSH	9/17/2002	2.02	50
OU1-3-VEG	0209002-18 MSL	9/17/2002	1.26	50
OU1-4-INV	0209002-23	9/17/2002	1.55	50
OU1-4-VEG	0209002-24	9/17/2002	1.93	50
OU2-1-INV	0209002-31	9/17/2002	1.06	50
OU2-1-VEG	0209002-30	9/17/2002	1.14	50
OU2-2-INV	0209002-29	9/17/2002	1.74	50
OU2-2-VEG	0209002-34	9/17/2002	1	50
Preparation Blank	091702PBS1	9/17/2002	1	50
REF-INV	0209002-37	9/17/2002	1.78	50
REF-VEG	0209002-38	9/17/2002	1.38	50

N/A - Not Applicable

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Form XIV
Analysis Run Log

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**

Lab Code: **MA00030**
ETR: **0209002**

Sequence: **M091802D**
Instrument: **ICP MS**
End Date: 09/18/2002 18:57

Start Date: 09/18/2002 16:45

Client ID	Lab ID	Dil	Analysis Time	Sb	Cd	Cu	Pb	Ni	Se	Zn
Blank	Blank0918 16:45 B	1	04:45 PM	X	X	X	X	X	X	X
Initial Calibration	STD10918 16:47 IC	1	04:47 PM	X	X	X	X	X	X	X
Initial Calibration	STD20918 16:50 IC	1	04:50 PM	X	X	X	X	X	X	X
Initial Calibration	STD30918 16:53 IC	1	04:53 PM	X	X	X	X	X	X	X
Initial Calibration	STD40918 16:56 IC	1	04:56 PM	X	X	X	X	X	X	X
ICV	ICV0918 16:59 ICV	1	04:59 PM	X	X	X	X	X	X	X
ICB	ICB0918 17:02 ICB	1	05:02 PM	X	X	X	X	X	X	X
ICSA5	ICSA0918 17:04 ICSA	1	05:04 PM	X	X	X	X	X	X	X
ICSAB5	ICSAB0918 17:07 ICSAB	1	05:07 PM	X	X	X	X	X	X	X
Preparation Blank	091702PBS1 PB	5	05:10 PM	X	X	X	X	X	X	X
LFBL	091702LFBL LFBL	5	05:13 PM							
LFBH	091702LFBH LFBH	5	05:16 PM	X	X	X	X	X	X	X
DORM 2	091702S1DORM2 D 2	5	05:18 PM		X	X	X	X	X	X
OU1-1-VEG	0209002-12	5	05:21 PM	X	X	X	X	X	X	X
OU1-1-INV	0209002-13	5	05:24 PM	X	X	X	X	X	X	X
OU1-2-VEG	0209002-15	5	05:27 PM	X	X	X	X	X	X	X
OU1-2-INV	0209002-16	5	05:30 PM	X	X	X	X	X	X	X
CCV	CCV0918 17:33 CCV	1	05:33 PM	X	X	X	X	X	X	X
CCB	CCB0918 17:35 CCB	1	05:35 PM	X	X	X	X	X	X	X
OU1-3-VEG	0209002-18	5	05:38 PM	X	X	X	X	X	X	X
OU1-3-VEG	0209002-18 SD	5	05:41 PM	X	X	X	X	X	X	X
OU1-3-VEG	0209002-18 DUP	5	05:44 PM	X	X	X	X	X	X	X
OU1-3-VEG	0209002-18 MSL	5	05:47 PM	X	X		X	X	X	
OU1-3-VEG	0209002-18 MSH	5	05:50 PM			X				X
OU1-3-INV	0209002-19	5	05:53 PM	X	X	X	X	X	X	X
OU1-3-INV	0209002-19 SD	5	05:55 PM	X	X	X	X	X	X	X
OU1-3-INV	0209002-19 DUP	5	05:58 PM	X	X	X	X	X	X	X
OU1-3-INV	0209002-19 MSH	5	06:01 PM	X	X	X	X	X	X	X
OU1-4-INV	0209002-23	5	06:04 PM	X	X	X	X	X	X	X
CCV	CCV0918 18:07 CCV	1	06:07 PM	X	X	X	X	X	X	X
CCB	CCB0918 18:09 CCB	1	06:09 PM	X	X	X	X	X	X	X
OU1-4-VEG	0209002-24	5	06:12 PM	X	X	X	X	X	X	X
OU2-2-INV	0209002-29	5	06:15 PM	X	X	X	X	X	X	X
OU2-1-VEG	0209002-30	5	06:18 PM	X	X	X	X	X	X	X
OU2-1-INV	0209002-31	5	06:21 PM	X	X	X	X	X	X	X
OU2-2-VEG	0209002-34	5	06:23 PM	X	X	X	X	X	X	X
REF-INV	0209002-37	5	06:26 PM	X	X	X	X	X	X	X

N/A - Not Applicable
Dil - Dilution

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Form XIV
Analysis Run Log

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**

Lab Code: **MA00030**
ETR: **0209002**

Sequence: **M091802D**
Instrument: **ICP MS**
End Date: 09/18/2002 18:57

Start Date: 09/18/2002 16:45

Client ID	Lab ID	Dil	Analysis Time	Sb	Cd	Cu	Pb	Ni	Se	Zn
CCV	CCV0918 18:29 CCV	1	06:29 PM	X	X	X	X	X	X	X
CCB	CCB0918 18:32 CCB	1	06:32 PM	X	X	X	X	X	X	X
CCV	CCV0918 18:46 CCV	1	06:46 PM	X	X	X	X	X	X	X
CCB	CCB0918 18:49 CCB	1	06:49 PM	X	X	X	X	X	X	X
REF-VEG	0209002-38	5	06:52 PM	X	X	X	X	X	X	X
CCV	CCV0918 18:54 CCV	1	06:54 PM	X	X	X	X	X	X	X
CCB	CCB0918 18:57 CCB	1	06:57 PM	X	X	X	X	X	X	X

N/A - Not Applicable
Dil - Dilution

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Form XVI
Internal Standards Relative Intensity Summary

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**

Lab Code: **MA00030**
ETR: **0209002**
Sequence: **M091802D**

Start Date: 09/18/2002 16:45 **End Date:** 09/18/2002 18:57

Client ID	Lab ID	Analysis Time	Ge	In	Tb
Blank	Blank0918 16:45	04:45 PM	100.00	100.00	100.00
Initial Calibration	STD10918 16:47	04:47 PM	98.76	97.82	102.47
Initial Calibration	STD20918 16:50	04:50 PM	96.54	97.55	99.58
Initial Calibration	STD30918 16:53	04:53 PM	98.53	96.95	98.60
Initial Calibration	STD40918 16:56	04:56 PM	94.36	94.55	95.75
ICV	ICV0918 16:59	04:59 PM	97.58	97.02	98.92
ICB	ICB0918 17:02	05:02 PM	97.69	97.35	99.12
ICSA	ICSA0918 17:04	05:04 PM	92.21	89.72	94.27
ICSAB	ICSAB0918 17:07	05:07 PM	94.02	92.70	95.62
Preparation Blank	091702PBS1	05:10 PM	100.42	99.50	103.25
Lab Fortified Blank Low	091702LFBL	05:13 PM	99.15	98.89	100.86
Lab Fortified Blank High	091702LFBH	05:16 PM	98.44	98.41	100.28
Laboratory Control Sample	091702S1DORM2	05:18 PM	101.43	101.09	103.80
OU1-1-VEG	0209002-12 SAM	05:21 PM	101.79	101.22	102.52
OU1-1-INV	0209002-13 SAM	05:24 PM	104.04	101.10	106.07
OU1-2-VEG	0209002-15 SAM	05:27 PM	105.25	100.96	105.17
OU1-2-INV	0209002-16 SAM	05:30 PM	100.83	99.63	102.27
CCV	CCV0918 17:33	05:33 PM	94.50	93.99	95.09
CCB	CCB0918 17:35	05:35 PM	94.82	94.60	95.33
OU1-3-VEG	0209002-18 SAM	05:38 PM	99.08	95.67	99.26
OU1-3-VEG	0209002-18 SD	05:41 PM	93.75	90.94	95.16
OU1-3-VEG	0209002-18 DUP	05:44 PM	102.60	99.70	103.14
OU1-3-VEG	0209002-18 MSL	05:47 PM	100.69	98.28	100.97
OU1-3-VEG	0209002-18 MSH	05:50 PM	99.42	98.25	102.79
OU1-3-INV	0209002-19 SAM	05:53 PM	98.01	99.28	100.81
OU1-3-INV	0209002-19 SD	05:55 PM	93.57	92.49	93.04
OU1-3-INV	0209002-19 DUP	05:58 PM	96.80	96.82	98.48
OU1-3-INV	0209002-19 MSH	06:01 PM	96.58	97.60	97.28
OU1-4-INV	0209002-23 SAM	06:04 PM	97.54	95.55	97.04
CCV	CCV0918 18:07	06:07 PM	89.03	88.60	90.75
CCB	CCB0918 18:09	06:09 PM	90.23	89.08	90.18
OU1-4-VEG	0209002-24 SAM	06:12 PM	96.30	96.97	97.69
OU2-2-INV	0209002-29 SAM	06:15 PM	97.73	97.56	96.65
OU2-1-VEG	0209002-30 SAM	06:18 PM	96.21	96.09	95.70
OU2-1-INV	0209002-31 SAM	06:21 PM	95.15	94.35	96.21
OU2-2-VEG	0209002-34 SAM	06:23 PM	95.79	94.08	96.42
REF-INV	0209002-37 SAM	06:26 PM	94.32	96.06	95.81

N/A - Not Applicable

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Form XVI
Internal Standards Relative Intensity Summary

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**

Lab Code: **MA00030**
ETR: **0209002**
Sequence: **M091802D**

Start Date: 09/18/2002 16:45 **End Date:** 09/18/2002 18:57

Client ID	Lab ID	Analysis Time	Ge	In	Tb
CCV	CCV0918 18:29	06:29 PM	87.16	87.45	89.80
CCB	CCB0918 18:32	06:32 PM	86.24	87.21	88.19
CCV	CCV0918 18:46	06:46 PM	83.81	84.44	84.53
CCB	CCB0918 18:49	06:49 PM	84.54	86.20	86.95
REF-VEG	0209002-38 SAM	06:52 PM	90.24	90.69	92.90
CCV	CCV0918 18:54	06:54 PM	86.85	85.14	87.36
CCB	CCB0918 18:57	06:57 PM	84.77	83.30	85.61

N/A - Not Applicable

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CASE NARRATIVE

Woods Hole Group Environmental Laboratories

ETR: 0209002
Project: Lockheed Eco Risk Assessment

All analyses were performed according to Woods Hole Group's documented Standard Operating Procedures (SOPs), within holding time and with appropriate quality control measures except where noted. Blank correction of results is not performed in the laboratory for any parameter. Soil/sediment samples are reported on a dry weight basis unless otherwise noted.

This data package includes total metals results for the following samples:

Client Sample ID	Laboratory Sample ID
OU1-1-SED	0209002-05
OU1-3-SED	0209002-06
OU1-2-SED	0209002-07
OU2-1-SED	0209002-08
OU2-2-SED	0209002-09

Metals

Sediment samples associated with this data package were prepared by hotplate digestion and analyzed by ICP MS (Method 6020).

Specified reporting limits for some samples were not met because of the low percent solid of the sample yielding a low dry weight digested. All of these samples contained measurable analyte concentrations above the reporting limit.

Sample OU2-1-SED (Lab ID 0209002-08) was prepared in duplicate with a matrix spike, preparation blank and soil LCS for batch quality control. A serial dilution was performed on the QC sample to indicate analytical interference. All instrumental and preparation batch QC measures were within method acceptance criteria except the following:

1. Nickel: The RPD between duplicates was 25% and higher than the 20% method acceptance limit. All results are flagged, "¤", to indicate this QC failure.
2. Zinc: The RPD between the sample result and the serial dilution was 14% and higher than the 10% method acceptance limit. All results are flagged, "E", as estimated values.

The enclosed results of analyses are representative of the samples as received by the laboratory. Woods Hole Group makes no representations or certifications as to the method of sample collection, sample identification, or transporting/handling procedures used prior to the receipt of samples by Woods Hole Group. To the best of my knowledge, the information contained in this report is accurate and complete.

Approved by: _____ Date: 9/23/02
Woods Hole Group Environmental Laboratories

Woods Hole Group Environmental Laboratories 375 Paramount Drive, Suite 2, Raynham, MA 02767-5150 Ph: 508-822-9300

Form IIa
Initial and Continuing Calibration Verification

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: N/A SDG: N/A
Sequence: **m091602**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **See Below**
Concentration Units: **µg/L**
Instrument: **ICP MS**

	Initial Calibration ICV0916 12:52			Continuing Calibration CCV0916 13:24			CCV0916 13:38		
Parameter	**True**	**Found**	**% Rec**	**True**	**Found**	**% Rec**	**Found**	**% Rec**	**Limit**
Cadmium	50.0	48.15	96.0	50.0	47.13	94.0	46.73	93.0	90-110
Copper	50.0	47.89	96.0	50.0	48.62	97.0	50.30	101.0	90-110
Lead	50.0	49.11	98.0	50.0	51.39	103.0	54.10	108.0	90-110
Nickel	50.0	46.19	92.0	50.0	46.68	93.0	47.39	95.0	90-110
Zinc	50.0	47.60	95.0	50.0	46.90	94.0	49.57	99.0	90-110

Initial and Continuing Calibration Source: Inorganic Ventures and SPEX

N/A - Not Applicable

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Form III
Blanks

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Sequence: **m091602**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **See Below**
Concentration Units: **µg/L**
Instrument: **ICP MS**

Parameter	ICB0916 12:54		091202PBS1 £		CCB0916 13:27		CCB0916 13:40	
Cadmium	0.11	U	0.055	U	0.11	U	0.11	U
Copper	0.13	U	0.070	U	0.13	U	0.15	J
Lead	0.44	U	0.22	U	0.44	U	0.44	U
Nickel	0.21	U	0.11	U	0.21	U	0.21	U
Zinc	0.55	U	0.83	J	0.55	U	0.55	U

J - Below CRDL, Project DL, or RL but greater than or = MDL.
U - The analyte was analyzed for but not detected at the sample specific level reported.
N/A - Not Applicable
£ - Concentration Units: mg/Kg

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Form IV
Interference Check Sample
Initial

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Sequence: **m091602**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **See Below**
Concentration Units: **µg/L**
Instrument: **ICP MS**

	ICSA0916 12:57				ICSAB0916 13:00*			
Parameter	True	Found	Percent Recovery	Recovery Limits	True	Found	Percent Recovery	Recovery Limits
Cadmium		1			20	20	98	80-120
Copper		1			20	21	102	80-120
Lead		0			20	22	108	80-120
Nickel		1			20	20	96	80-120
Zinc		2			20	21	96	80-120

N/A - Not Applicable

* - ICSAB recoveries corrected for concentrations measured in ICSA (excluding interference elements).

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Form V
Matrix Spike - Low
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU2-1-SED**
Matrix: **Sediment**
Percent Solid: **38.5**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **See Below**
Concentration Units: **mg/Kg**
Date Collected: **08/28/02**
Date Received: **08/31/02**

Lab ID:		0209002-08	0209002-08		
	Spiked	Sample	Matrix Spike		% Recovery
Parameter	Conc.	Conc.	Conc.	% Recovery	Limits
Cadmium	5.0	1.4	6.8	107	75-125

N/A - Not Applicable

Concentrations reported as calculated values, which includes rounding for significant figures. Percent recoveries and RPD values are calculated from the unrounded results.

09/18/02 16:13

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Form V
Matrix Spike - High
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU2-1-SED**
Matrix: **Sediment**
Percent Solid: **38.5**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **See Below**
Concentration Units: **mg/Kg**
Date Collected: **08/28/02**
Date Received: **08/31/02**

Lab ID:		0209002-08	0209002-08		
Parameter	Spiked Conc.	Sample Conc.	Matrix Spike Conc.	% Recovery	% Recovery Limits
Copper	454	650	1100	96	75-125
Lead	454	380	860	107	75-125
Nickel	454	34	440	90	75-125
Zinc	454	330	730	87	75-125

N/A - Not Applicable

Concentrations reported as calculated values, which includes rounding for significant figures. Percent recoveries and RPD values are calculated from the unrounded results.

09/18/02 16:13

375 Paramount Drive, Suite 2, Raynham, Massachusetts 02767, (508) 822-9300, Fax (508) 822-3288, whale@whgrp.com

Form VI
Duplicate
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU2-1-SED**
Matrix: **Sediment**
Percent Solid: **38.5**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **0209002-08 DUP**
Concentration Units: **mg/Kg**
Date Collected: **08/28/02**
Date Received: **08/31/02**

Parameter	Sample Result	Duplicate Result	Percent RPD	RPD Limit
Cadmium	1.4	1.6	18	20
Copper	650	730	11	20
Lead	380	410	9	20
Nickel	34	43	25¤	20
Zinc	330	380	15	20

¤ - RPD is greater than 20%
N/A - Not Applicable

Concentrations reported as calculated values, which includes rounding for significant figures. RPD values are reported based on the unrounded calculated result.

09/18/02 16:12

Form VII
Laboratory Control Sample
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **Laboratory Control Sample**
Matrix: **Sediment**
Percent Solid: **100.0**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **091202S1LCSD035**
Concentration Units: **mg/Kg**
Date Collected: **N/A**
Date Received: **N/A**

Parameter	Conc.	% Recovery	% Recovery Limits
Cadmium	120	95	80-120
Copper	92	97	80-120
Lead	160	96	77-123
Nickel	160	90	78-122
Zinc	230	90	77-123

N/A - Not Applicable

Laboratory Control Sample Source: ERA D035

Concentrations reported as calculated values, which includes rounding for significant figures. Percent recoveries and RPD values are calculated from the unrounded results.

09/18/02 16:12

Form IX
Serial Dilution
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU2-1-SED**
Matrix: **Sediment**
Percent Solid: **38.5**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **0209002-08 SD**
Concentration Units: **mg/Kg**
Date Collected: **08/28/02**
Date Received: **08/31/02**

Parameter	Sample Result	Duplicate Result	Percent Difference	Limit
Cadmium	1.4	1.4	3	10
Copper	650	680	4	10
Lead	380	390	3	10
Nickel	34	33	0	10
Zinc	330	380	14E	10

E - Estimated due to Interference.
N/A - Not Applicable

Concentrations reported as calculated values, which includes rounding for significant figures. RPD values are reported based on the unrounded calculated result.

09/18/02 16:13

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Form X
Method Detection Limits (Annually)

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**

Lab Code: **M-MA030**
ETR: **0209002**
Instrument: **ICP MS**
Date: 01/01/02

Parameter	Mass (amμ)	Background	RL (μg/L)	MDL (μg/L)
Cadmium	114.00		0.20	0.11
Copper	63.00		0.20	0.13
Lead	208.00		0.50	0.44
Nickel	60.00		0.50	0.21
Zinc	66.00		2.0	0.55

N/A - Not Applicable
RL - Reporting Limit

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Form XII
ICP Linear Ranges (Annually)

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**

Lab Code: **M-MA030**
ETR: **0209002**
Instrument: **ICP MS**
Date: 02/01/02

Parameter	Integration Time (seconds)	Concentration (µg/L)
Cadmium	N/A	5000
Copper	N/A	5000
Lead	N/A	5000
Nickel	N/A	5000
Zinc	N/A	5000

N/A - Not Applicable

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Form XIII
Preparation Log

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**

Lab Code: **M-MA030**
ETR: **0209002**
Method: **3050:2T**

Client ID	Lab ID	Preparation Date	Weight (g)	Final Volume (ml)
Laboratory Control Sample	091202S1LCSD035	9/12/2002	1.04	100
OU1-1-SED	0209002-05	9/12/2002	2.18	100
OU1-2-SED	0209002-07	9/12/2002	1.92	100
OU1-3-SED	0209002-06	9/12/2002	1.69	100
OU2-1-SED	0209002-08	9/12/2002	2.55	100
OU2-1-SED	0209002-08 DUP	9/12/2002	2.69	100
OU2-1-SED	0209002-08 MSH	9/12/2002	2.29	100
OU2-1-SED	0209002-08 MSL	9/12/2002	2.04	100
OU2-2-SED	0209002-09	9/12/2002	2.92	100
Preparation Blank	091202PBS1	9/12/2002	1	100

N/A - Not Applicable

09/18/02 16:22

Form XIV
Analysis Run Log

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: N/A SDG: N/A

Lab Code: **M-MA030**
ETR: **0209002**

Sequence: **m091602**
Instrument: **ICP MS**
End Date: 09/16/2002 13:40

Start Date: 09/16/2002 12:38

Client ID	Lab ID	Dil	Analysis Time	Cd	Cu	Pb	Ni	Zn
Blank	Blank0916 12:38 B	1	12:38 PM	X	X	X	X	X
Initial Calibration	STD10916 12:41 IC	1	12:41 PM	X	X	X	X	X
Initial Calibration	STD20916 12:44 IC	1	12:44 PM	X	X	X	X	X
Initial Calibration	STD30916 12:46 IC	1	12:46 PM	X	X	X	X	X
Initial Calibration	STD40916 12:49 IC	1	12:49 PM	X	X	X	X	X
ICV	ICV0916 12:52 ICV	1	12:52 PM	X	X	X	X	X
ICB	ICB0916 12:54 ICB	1	12:54 PM	X	X	X	X	X
ICSA5	ICSA0916 12:57 ICSA	1	12:57 PM	X	X	X	X	X
ICSAB5	ICSAB0916 13:00 ICSAB	1	01:00 PM	X	X	X	X	X
Preparation Blank	091202PBS1 PB	5	01:02 PM	X	X	X	X	X
ERA D035	091202S1LCSD035 D035	5	01:05 PM	X	X	X	X	X
OU1-1-SED	0209002-05	5	01:08 PM	X	X	X	X	X
OU1-3-SED	0209002-06	5	01:10 PM	X	X	X	X	X
OU1-2-SED	0209002-07	5	01:13 PM	X	X	X	X	X
OU2-1-SED	0209002-08	5	01:16 PM	X	X	X	X	X
OU2-1-SED	0209002-08 SD	5	01:19 PM	X	X	X	X	X
OU2-1-SED	0209002-08 DUP	5	01:21 PM	X	X	X	X	X
CCV	CCV0916 13:24 CCV	1	01:24 PM	X	X	X	X	X
CCB	CCB0916 13:27 CCB	1	01:27 PM	X	X	X	X	X
OU2-1-SED	0209002-08 MSL	5	01:29 PM	X				
OU2-1-SED	0209002-08 MSH	5	01:32 PM		X	X	X	X
OU2-2-SED	0209002-09	5	01:35 PM	X	X	X	X	X
CCV	CCV0916 13:38 CCV	1	01:38 PM	X	X	X	X	X
CCB	CCB0916 13:40 CCB	1	01:40 PM	X	X	X	X	X

N/A - Not Applicable
Dil - Dilution

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Form XVI
Internal Standards Relative Intensity Summary

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: N/A SDG: N/A

Lab Code: **M-MA030**
ETR: **0209002**
Sequence: **m091602**

Start Date: 09/16/2002 12:38 **End Date:** 09/16/2002 13:40

Client ID	Lab ID	Analysis Time	Ge	In	Tb
Blank	Blank0916 12:38	12:38 PM	100.00	100.00	100.00
Initial Calibration	STD10916 12:41	12:41 PM	96.79	100.97	99.70
Initial Calibration	STD20916 12:44	12:44 PM	96.99	100.18	100.14
Initial Calibration	STD30916 12:46	12:46 PM	101.29	102.78	102.91
Initial Calibration	STD40916 12:49	12:49 PM	102.39	103.33	102.63
ICV	ICV0916 12:52	12:52 PM	106.46	103.44	103.54
ICB	ICB0916 12:54	12:54 PM	100.29	103.33	100.99
ICSA	ICSA0916 12:57	12:57 PM	93.61	95.87	98.08
ICSAB	ICSAB0916 13:00	01:00 PM	90.81	93.16	95.71
Preparation Blank	091202PBS1	01:02 PM	88.78	96.56	97.79
Laboratory Control Sample	091202S1LCSD035	01:05 PM	93.53	97.60	101.48
OU1-1-SED	0209002-05 SAM	01:08 PM	96.48	96.20	101.91
OU1-3-SED	0209002-06 SAM	01:10 PM	87.56	101.63	96.73
OU1-2-SED	0209002-07 SAM	01:13 PM	92.29	95.66	101.07
OU2-1-SED	0209002-08 SAM	01:16 PM	93.91	96.30	101.07
OU2-1-SED	0209002-08 SD	01:19 PM	89.29	94.36	97.21
OU2-1-SED	0209002-08 DUP	01:21 PM	87.81	94.60	98.50
CCV	CCV0916 13:24	01:24 PM	89.66	92.52	96.22
CCB	CCB0916 13:27	01:27 PM	85.96	91.80	94.65
OU2-1-SED	0209002-08 MSL	01:29 PM	90.54	92.22	100.54
OU2-1-SED	0209002-08 MSH	01:32 PM	88.51	95.44	99.65
OU2-2-SED	0209002-09 SAM	01:35 PM	84.92	91.21	97.02
CCV	CCV0916 13:38	01:38 PM	84.81	89.43	94.07
CCB	CCB0916 13:40	01:40 PM	85.04	89.70	94.12

N/A - Not Applicable

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CASE NARRATIVE

Woods Hole Group Environmental Laboratories

ETR: 0209002
Project: Lockheed Eco Risk Assessment

All analyses were performed according to Woods Hole Group's documented Standard Operating Procedures (SOPs), within holding time and with appropriate quality control measures except where noted. Blank correction of results is not performed in the laboratory for any parameter. Soil/sediment samples are reported on a dry weight basis unless otherwise noted.

This data package includes total metals results for the following samples:

Client Sample ID	Laboratory Sample ID
Equipment Blank	0209002-1
OU1-1-SW	0209002-2
OU1-2-SW	0209002-3
OU2-1-SW	0209002-4

Metals

Water samples associated with this data package were prepared by microwave digestion and analyzed by ICP MS (Method 6020).

Sample OU2-1-Sw (Lab ID 0209002-04) was prepared in duplicate with a matrix spike, preparation blank and LCS for batch quality control. A serial dilution was performed on the QC sample to indicate analytical interference. All instrumental and preparation batch QC measures were within method acceptance criteria.

The enclosed results of analyses are representative of the samples as received by the laboratory. Woods Hole Group makes no representations or certifications as to the method of sample collection, sample identification, or transporting/handling procedures used prior to the receipt of samples by Woods Hole Group. To the best of my knowledge, the information contained in this report is accurate and complete.

Approved by: Edith Hatcheson Date: 9/23/02
Woods Hole Group Environmental Laboratories

Form IIa

Initial and Continuing Calibration Verification

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Sequence: **M091802B**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **See Below**
Concentration Units: **µg/L**
Instrument: **ICP MS**

	Initial Calibration ICV0918 14:43			Continuing Calibration CCV0918 15:17			CCV0918 15:31		
Parameter	**True**	**Found**	**% Rec**	**True**	**Found**	**% Rec**	**Found**	**% Rec**	**Limit**
Antimony	50.0	48.00	96.0	50.0	47.65	95.0	46.76	94.0	90-110
Cadmium	50.0	47.57	95.0	50.0	48.13	96.0	47.99	96.0	90-110
Copper	50.0	48.85	98.0	50.0	46.96	94.0	48.44	97.0	90-110
Lead	50.0	48.21	96.0	50.0	48.43	97.0	48.56	97.0	90-110
Nickel	50.0	48.40	97.0	50.0	48.62	97.0	48.41	97.0	90-110
Zinc	50.0	47.36	95.0	50.0	46.23	92.0	47.42	95.0	90-110

N/A - Not Applicable

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Woods Hole Group

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Sequence: **M091802C**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **See Below**
Concentration Units: **µg/L**
Instrument: **ICP MS**

	Initial Calibration ICV0918 15:52			Continuing Calibration CCV0918 16:20			CCV0918 16:32		
Parameter	**True**	**Found**	**% Rec**	**True**	**Found**	**% Rec**	**Found**	**% Rec**	**Limit**
Selenium	50.0	46.32	93.0	50.0	46.39	93.0	45.85	92.0	90-110

N/A - Not Applicable

09/18/02 17:02

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Woods Hole Group

Client: TRC Environmental
Project: Lockheed Eco Risk Assessment
Case: N/A SDG: N/A
Sequence: M091802B

Lab Code: M-MA030
ETR: 0209002
Lab ID: See Below
Concentration Units: µg/L
Instrument: ICP MS

Parameter	ICB0918 14:46		091602PBW2		CCB0918 15:20		CCB0918 15:34	
Antimony	0.43	J	0.44	J	0.34	J	0.35	J
Cadmium	0.044	U	0.24	U	0.044	U	0.044	U
Copper	0.40	U	2.2	U	0.40	U	0.40	U
Lead	0.059	U	0.33	U	0.059	U	0.059	U
Nickel	0.33	U	1.8	U	0.33	U	0.33	U
Zinc	1.2	U	6.7	U	1.2	U	1.2	U

J - Below CRDL, Project DL, or RL but greater than or = MDL.
U - The analyte was analyzed for but not detected at the sample specific level reported.
N/A - Not Applicable

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Woods Hole Group

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Sequence: **M091802C**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **See Below**
Concentration Units: **µg/L**
Instrument: **ICP MS**

Parameter	ICB0918 15:54		091602PBW2		CCB0918 16:22		CCB0918 16:34	
Selenium	0.53	U	2.9	U	0.53	U	0.53	U

U - The analyte was analyzed for but not detected at the sample specific level reported.
N/A - Not Applicable

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Initial

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: N/A SDG: N/A
Sequence: **M091802B**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **See Below**
Concentration Units: **µg/L**
Instrument: **ICP MS**

Parameter	ICSA0918 14:48 True	Found	Percent Recovery	Recovery Limits	ICSAB0918 14:51* True	Found	Percent Recovery	Recovery Limits
Antimony		0			20	21	102	80-120
Cadmium		1			20	21	102	80-120
Copper		1			20	21	100	80-120
Lead		0			20	21	102	80-120
Nickel		1			20	21	101	80-120
Zinc		2			20	24	107	80-120

N/A - Not Applicable

* - ICSAB recoveries corrected for concentrations measured in ICSA (excluding interference elements).

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Initial

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Sequence: **M091802C**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **See Below**
Concentration Units: **µg/L**
Instrument: **ICP MS**

	ICSA0918 15:57				ICSAB0918 15:59*			
Parameter	True	Found	Percent Recovery	Recovery Limits	True	Found	Percent Recovery	Recovery Limits
Selenium		0			20	20	100	80-120

N/A - Not Applicable

* - ICSAB recoveries corrected for concentrations measured in ICSA (excluding interference elements).

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Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU2-1-SW**
Matrix: **Water**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **See Below**
Concentration Units: **µg/L**
Date Collected: **08/28/02**
Date Received: **08/31/02**

Lab ID:		0209002-04		0209002-04		
	Spiked	Sample		Matrix Spike		% Recovery
Parameter	**Conc.**	**Conc.**		**Conc.**	**% Recovery**	**Limits**
Antimony	44	1.3	J	48	105	75-125
Cadmium	44	0.24	U	46	104	75-125
Copper	44	11		57	103	75-125
Lead	44	12		59	105	75-125
Nickel	44	1.8	U	49	109	75-125
Zinc	44	21	J	57	81	75-125

J - Below CRDL, Project DL, or RL but greater than or = MDL.
U - The analyte was analyzed for but not detected at the sample specific level reported.
N/A - Not Applicable

Concentrations reported as calculated values, which includes rounding for significant figures. Percent recoveries and RPD values are calculated from the unrounded results.

09/18/02 16:58

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Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU2-1-SW**
Matrix: **Water**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **0209002-04 DUP**
Concentration Units: **µg/L**
Date Collected: **08/28/02**
Date Received: **08/31/02**

Parameter	Sample Result		Duplicate Result		Percent RPD	RPD Limit
Antimony	1.3	J	1.4	J	3	20
Cadmium	0.24	U	0.24	U	N/A	20
Copper	11		12		1	20
Lead	12		11		4	20
Nickel	1.8	U	1.8	U	N/A	20
Zinc	21	J	11	J	65	20

J - Below CRDL, Project DL, or RL but greater than or = MDL.
U - The analyte was analyzed for but not detected at the sample specific level reported.
N/A - Not Applicable

Concentrations reported as calculated values, which includes rounding for significant figures. RPD values are reported based on the unrounded calculated result.

09/18/02 16:58

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Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **Laboratory Control Sample - Low**
Matrix: **Water**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **091602LCSLW2**
Concentration Units: **µg/L**
Date Collected: **N/A**
Date Received: **N/A**

Parameter	Conc.		% Recovery	% Recovery Limits
Antimony	44		99	80-120
Cadmium	46		103	80-120
Copper	47		106	80-120
Lead	48		108	80-120
Nickel	47		106	80-120
Selenium	41		92	80-120
Zinc	46	J	104	80-120

J - Below CRDL, Project DL, or RL but greater than or = MDL.
N/A - Not Applicable

Concentrations reported as calculated values, which includes rounding for significant figures. Percent recoveries and RPD values are calculated from the unrounded results.

09/18/02 17:10

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Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU2-1-SW**
Matrix: **Water**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **0209002-04 SD**
Concentration Units: **µg/L**
Date Collected: **08/28/02**
Date Received: **08/31/02**

Parameter	Sample Result		Duplicate Result		Percent Difference	Limit
Antimony	1.3	J	1.6	U	X	10
Cadmium	0.24	U	1.2	U	N/A	10
Copper	11		11	J	1	10
Lead	12		12		3	10
Nickel	1.8	U	9.2	U	N/A	10
Zinc	21	J	33	U	X	10

J - Below CRDL, Project DL, or RL but greater than or = MDL.
U - The analyte was analyzed for but not detected at the sample specific level reported.
X - It is not possible to calculate RPD, one result is below the detection limit, the other is above reporting limit.
N/A - Not Applicable

Concentrations reported as calculated values, which includes rounding for significant figures. RPD values are reported based on the unrounded calculated result.

09/18/02 16:58

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Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: N/A SDG: N/A

Lab Code: **MA00030**
ETR: **0209002**
Instrument: **ICP MS**
Date: 01/01/02

Parameter	Mass (amμ)	Background	RL (μg/L)	MDL (μg/L)
Antimony	121.00		1.0	0.059
Cadmium	114.00		0.10	0.044
Copper	63.00		0.50	0.40
Lead	208.00		0.10	0.059
Nickel	60.00		0.50	0.33
Zinc	66.00		10.0	1.2

N/A - Not Applicable
RL - Reporting Limit

09/20/02 09:32

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Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**

Lab Code: **M-MA030**
ETR: **0209002**
Instrument: **ICP MS**
Date: 02/01/02

Parameter	Integration Time (seconds)	Concentration (µg/L)
Antimony	N/A	5000
Cadmium	N/A	5000
Copper	N/A	5000
Lead	N/A	5000
Nickel	N/A	5000
Selenium	N/A	5000
Zinc	N/A	5000

N/A - Not Applicable

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Preparation Log

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**

Lab Code: **M-MA030**
ETR: **0209002**
Method: **3015**

Client ID	Lab ID	Preparation Date	Initial Volume (ml)	Final Volume (ml)
Equipment Blank	0209002-01	9/16/2002	45	50
Laboratory Control Sample - High	091602LCSHW2	9/16/2002	45	50
Laboratory Control Sample - Low	091602LCSLW2	9/16/2002	45	50
OU1-1-SW	0209002-02	9/16/2002	45	50
OU1-2-SW	0209002-03	9/16/2002	45	50
OU2-1-SW	0209002-04	9/16/2002	45	50
OU2-1-SW	0209002-04 DUP	9/16/2002	45	50
OU2-1-SW	0209002-04 MSH	9/16/2002	45	50
OU2-1-SW	0209002-04 MSL	9/16/2002	45	50
Preparation Blank	091602PBW2	9/16/2002	45	50

N/A - Not Applicable

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Woods Hole Group

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**

Lab Code: **M-MA030**
ETR: **0209002**

Sequence: **M091802B**
Instrument: **ICP MS**
End Date: 09/18/2002 15:34

Start Date: 09/18/2002 14:29

Client ID	Lab ID	Dil	Analysis Time	Sb	Cd	Cu	Pb	Ni	Zn
Blank	Blank0918 14:29 B	1	02:29 PM	X	X	X	X	X	X
Initial Calibration	STD10918 14:31 IC	1	02:31 PM	X	X	X	X	X	X
Initial Calibration	STD20918 14:34 IC	1	02:34 PM	X	X	X	X	X	X
Initial Calibration	STD30918 14:37 IC	1	02:37 PM	X	X	X	X	X	X
Initial Calibration	STD40918 14:40 IC	1	02:40 PM	X	X	X	X	X	X
ICV	ICV0918 14:43 ICV	1	02:43 PM	X	X	X	X	X	X
ICB	ICB0918 14:46 ICB	1	02:46 PM	X	X	X	X	X	X
ICSA5	ICSA0918 14:48 ICSA	1	02:48 PM	X	X	X	X	X	X
ICSAB5	ICSAB0918 14:51 ICSAB	1	02:51 PM	X	X	X	X	X	X
Preparation Blank	091602PBW2 PB	5	02:54 PM	X	X	X	X	X	X
LCS Low	091602LCSLW2 LCSL	5	02:57 PM	X	X	X	X	X	X
LCS High	091602LCSHW2 LCSH	5	03:00 PM						
Equipment Blank	0209002-01	5	03:03 PM	X	X	X	X	X	X
OU1-1-SW	0209002-02	5	03:05 PM	X	X	X	X	X	X
OU1-2-SW	0209002-03	5	03:08 PM	X	X	X	X	X	X
OU2-1-SW	0209002-04	5	03:11 PM	X	X	X	X	X	X
OU2-1-SW	0209002-04 SD	5	03:14 PM	X	X	X	X	X	X
CCV	CCV0918 15:17 CCV	1	03:17 PM	X	X	X	X	X	X
CCB	CCB0918 15:20 CCB	1	03:20 PM	X	X	X	X	X	X
OU2-1-SW	0209002-04 DUP	5	03:22 PM	X	X	X	X	X	X
OU2-1-SW	0209002-04 MSL	5	03:25 PM	X	X	X	X	X	X
OU2-1-SW	0209002-04 MSH	5	03:28 PM						
CCV	CCV0918 15:31 CCV	1	03:31 PM	X	X	X	X	X	X
CCB	CCB0918 15:34 CCB	1	03:34 PM	X	X	X	X	X	X

N/A - Not Applicable
Dil - Dilution

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Form XIV

Analysis Run Log

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**

Lab Code: **M-MA030**
ETR: **0209002**

Sequence: **M091802C**
Instrument: **ICP MS**
End Date: 09/18/2002 16:34

Start Date: 09/18/2002 15:40

Client ID	Lab ID	Dil	Analysis Time	Se
Blank	Blank0918 15:40 B	1	03:40 PM	X
Initial Calibration	STD10918 15:42 IC	1	03:42 PM	X
Initial Calibration	STD20918 15:45 IC	1	03:45 PM	X
Initial Calibration	STD30918 15:47 IC	1	03:47 PM	X
Initial Calibration	STD40918 15:49 IC	1	03:49 PM	X
ICV	ICV0918 15:52 ICV	1	03:52 PM	X
ICB	ICB0918 15:54 ICB	1	03:54 PM	X
ICSA5	ICSA0918 15:57 ICSA	1	03:57 PM	X
ICSAB5	ICSAB0918 15:59 ICSAB	1	03:59 PM	X
Preparation Blank	091602PBW2 PB	5	04:01 PM	X
LCS Low	091602LCSLW2 LCSL	5	04:04 PM	X
LCS High	091602LCSHW2 LCSH	5	04:06 PM	
Equipment Blank	0209002-01	5	04:08 PM	X
OU1-1-SW	0209002-02	5	04:11 PM	
OU1-2-SW	0209002-03	5	04:13 PM	
OU2-1-SW	0209002-04	5	04:15 PM	
OU2-1-SW	0209002-04 SD	5	04:18 PM	
CCV	CCV0918 16:20 CCV	1	04:20 PM	X
CCB	CCB0918 16:22 CCB	1	04:22 PM	X
OU2-1-SW	0209002-04 DUP	5	04:25 PM	
OU2-1-SW	0209002-04 MSL	5	04:27 PM	
OU2-1-SW	0209002-04 MSH	5	04:30 PM	
CCV	CCV0918 16:32 CCV	1	04:32 PM	X
CCB	CCB0918 16:34 CCB	1	04:34 PM	X

N/A - Not Applicable
Dil - Dilution

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Form XVI
Internal Standards Relative Intensity Summary

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**

Lab Code: **M-MA030**
ETR: **0209002**
Sequence: **M091802B**

Start Date: **09/18/2002 14:29** **End Date:** **09/18/2002 15:34**

Client ID	Lab ID	Analysis Time	Ge	In	Tb
Blank	Blank0918 14:29	02:29 PM	100.00	100.00	100.00
Initial Calibration	STD10918 14:31	02:31 PM	102.77	101.81	101.82
Initial Calibration	STD20918 14:34	02:34 PM	101.78	100.64	99.18
Initial Calibration	STD30918 14:37	02:37 PM	101.58	103.47	99.87
Initial Calibration	STD40918 14:40	02:40 PM	100.94	100.95	100.65
ICV	ICV0918 14:43	02:43 PM	100.37	102.62	101.29
ICB	ICB0918 14:46	02:46 PM	103.64	101.69	102.17
ICSA	ICSA0918 14:48	02:48 PM	98.26	96.78	97.13
ICSAB	ICSAB0918 14:51	02:51 PM	97.97	96.18	96.65
Preparation Blank	091602PBW2	02:54 PM	102.82	104.48	101.85
Laboratory Control Sample	091602LCSLW2	02:57 PM	102.91	101.68	101.40
Laboratory Control Sample	091602LCSHW2	03:00 PM	102.82	103.96	101.95
Equipment Blank	0209002-01 SAM	03:03 PM	102.10	100.89	100.78
OU1-1-SW	0209002-02 SAM	03:05 PM	102.76	99.81	98.75
OU1-2-SW	0209002-03 SAM	03:08 PM	102.58	101.36	101.13
OU2-1-SW	0209002-04 SAM	03:11 PM	103.10	102.88	101.05
OU2-1-SW	0209002-04 SD	03:14 PM	101.88	100.63	100.99
CCV	CCV0918 15:17	03:17 PM	103.16	101.56	101.50
CCB	CCB0918 15:20	03:20 PM	100.52	101.92	100.34
OU2-1-SW	0209002-04 DUP	03:22 PM	102.72	101.22	101.70
OU2-1-SW	0209002-04 MSL	03:25 PM	102.94	102.90	101.00
OU2-1-SW	0209002-04 MSH	03:28 PM	104.18	103.29	103.79
CCV	CCV0918 15:31	03:31 PM	101.45	102.52	100.65
CCB	CCB0918 15:34	03:34 PM	100.79	100.62	99.79

N/A - Not Applicable

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Internal Standards Relative Intensity Summary

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**

Lab Code: **M-MA030**
ETR: **0209002**
Sequence: **M091802C**

Start Date: 09/18/2002 15:40

End Date: 09/18/2002 16:34

Client ID	Lab ID	Analysis Time	Ge
Blank	Blank0918 15:40	03:40 PM	100.00
Initial Calibration	STD10918 15:42	03:42 PM	100.82
Initial Calibration	STD20918 15:45	03:45 PM	101.62
Initial Calibration	STD30918 15:47	03:47 PM	102.55
Initial Calibration	STD40918 15:49	03:49 PM	100.19
ICV	ICV0918 15:52	03:52 PM	99.60
ICB	ICB0918 15:54	03:54 PM	101.69
ICSA	ICSA0918 15:57	03:57 PM	100.07
ICSAB	ICSAB0918 15:59	03:59 PM	99.29
Preparation Blank	091602PBW2	04:01 PM	103.06
Laboratory Control Sample	091602LCSLW2	04:04 PM	102.41
Laboratory Control Sample	091602LCSHW2	04:06 PM	102.83
Equipment Blank	0209002-01 SAM	04:08 PM	102.81
OU1-1-SW	0209002-02 SAM	04:11 PM	104.51
OU1-2-SW	0209002-03 SAM	04:13 PM	104.38
OU2-1-SW	0209002-04 SAM	04:15 PM	104.77
OU2-1-SW	0209002-04 SD	04:18 PM	102.10
CCV	CCV0918 16:20	04:20 PM	101.49
CCB	CCB0918 16:22	04:22 PM	99.65
OU2-1-SW	0209002-04 DUP	04:25 PM	101.50
OU2-1-SW	0209002-04 MSL	04:27 PM	100.37
OU2-1-SW	0209002-04 MSH	04:30 PM	99.48
CCV	CCV0918 16:32	04:32 PM	100.23
CCB	CCB0918 16:34	04:34 PM	99.74

N/A - Not Applicable

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CASE NARRATIVE

Woods Hole Group Environmental Laboratories

ETR: 0209002
Project: Lockheed Eco Risk Assessment

All analyses were performed according to Woods Hole Group's documented Standard Operating Procedures (SOPs), within holding time and with appropriate quality control measures except where noted. Blank correction of results is not performed in the laboratory for any parameter. Soil/sediment samples are reported on a dry weight basis unless otherwise noted.

This data package includes total metals results for the following samples:

Client Sample ID	Laboratory Sample ID
OU1-1-SS	0209002-10
OU1-2-SS	0209002-11
OU1-3-SS	0209002-14
OU1-4-SS	0209002-17
OU1-5-SS	0209002-20
OU1-6-SS	0209002-21
OU1-7-SS	0209002-22
OU1-8-SS	0209002-25
OU1-9-SS	0209002-26
OU1-10-SS	0209002-27
OU2-2-SS	0209002-28
OU2-1-SS	0209002-32
OU2-5-SS	0209002-33
OU2-3-SS	0209002-35
OU2-4-SS	0209002-36
REF-SS	0209002-39

Metals

Soil samples associated with this data package were prepared by hotplate digestion and analyzed by ICP MS (Method 6020). Samples analyzed for antimony were prepared by hot plate digestion utilizing hydrochloric acid to better maintain this analyte in solution.

Specified reporting limits for some samples were not met because of the low percent solid of the sample yielding a low dry weight digested. All of these samples contained measurable analyte concentrations above the reporting limit.

Sample OU1-6-SS (Lab ID 0209002-21) was prepared in duplicate with a matrix spike, preparation blank and soil LCS for batch quality control. A serial dilution was performed on the QC sample to indicate analytical interference. All instrumental and preparation batch QC measures were within method acceptance criteria except the following:

1. Antimony: Recovery of antimony from the matrix spike sample was 47% and outside of the 75% - 125% acceptance range. A post-digest spike was added to the sample from which a recovery of 108% was determined. Recovery of antimony from the LCS was within limits supplied by the manufacturer. All results are flagged, "N", to indicate this QC failure.
2. Zinc: The RPD between the sample result and the serial dilution was 12% and higher than the 10% method acceptance limit. All results are flagged, "E", as estimated values.

The enclosed results of analyses are representative of the samples as received by the laboratory. Woods Hole Group makes no representations or certifications as to the method of sample collection, sample identification, or transporting/handling procedures used prior to the receipt of samples by Woods Hole Group. To the best of my knowledge, the information contained in this report is accurate and complete.

Approved by: Edith Hutchinson Date: 9/23/02
Woods Hole Group Environmental Laboratories

Form IIa
Initial and Continuing Calibration Verification

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: N/A SDG: N/A
Sequence: **M091602A**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **See Below**
Concentration Units: **µg/L**
Instrument: **ICP MS**

	Initial Calibration			Continuing Calibration					
		ICV0916 14:18			CCV0916 14:51		CCV0916 15:24		
Parameter	**True**	**Found**	**% Rec**	**True**	**Found**	**% Rec**	**Found**	**% Rec**	**Limit**
Cadmium	50.0	48.62	97.0	50.0	48.15	96.0	48.49	97.0	90-110
Copper	50.0	49.27	99.0	50.0	48.43	97.0	48.41	97.0	90-110
Lead	50.0	47.82	96.0	50.0	49.42	99.0	49.87	100.0	90-110
Nickel	50.0	50.60	101.0	50.0	49.60	99.0	49.11	98.0	90-110
Selenium	50.0	49.61	99.0	50.0	48.23	96.0	49.34	99.0	90-110
Zinc	50.0	48.27	97.0	50.0	49.12	98.0	49.06	98.0	90-110

Initial and Continuing Calibration Source: Inorganic Ventures and SPEX

N/A - Not Applicable

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Form IIa
Initial and Continuing Calibration Verification

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Sequence: **M091602A**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **See Below**
Concentration Units: **µg/L**
Instrument: **ICP MS**

	Initial Calibration			Continuing Calibration CCV0916 15:41				
Parameter	**True**	**Found**	**% Rec**	**True**	**Found**	**% Rec**		**Limit**
Cadmium				50.0	48.45	97.0		90-110
Copper				50.0	48.95	98.0		90-110
Lead				50.0	49.39	99.0		90-110
Nickel				50.0	50.10	100.0		90-110
Selenium				50.0	49.53	99.0		90-110
Zinc				50.0	48.57	97.0		90-110

Initial and Continuing Calibration Source: Inorganic Ventures and SPEX

N/A - Not Applicable

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Form IIa
Initial and Continuing Calibration Verification

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Sequence: **M091602D**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **See Below**
Concentration Units: **µg/L**
Instrument: **ICP MS**

	Initial Calibration			Continuing Calibration					
	ICV0916 19:04			CCV0916 19:32			CCV0916 20:00		
Parameter	**True**	**Found**	**% Rec**	**True**	**Found**	**% Rec**	**Found**	**% Rec**	**Limit**
Antimony	50.0	48.50	97.0	50.0	47.25	94.0	46.83	94.0	90-110

Initial and Continuing Calibration Source: Inorganic Ventures and SPEX

N/A - Not Applicable

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Form IIa
Initial and Continuing Calibration Verification

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Sequence: **M091602D**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **See Below**
Concentration Units: **µg/L**
Instrument: **ICP MS**

	Initial Calibration			Continuing Calibration CCV0916 20:14				
Parameter	**True**	**Found**	**% Rec**	**True**	**Found**	**% Rec**		**Limit**
Antimony				50.0	46.33	93.0		90-110

Initial and Continuing Calibration Source: Inorganic Ventures and SPEX

N/A - Not Applicable

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Form IIa
Initial and Continuing Calibration Verification

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Sequence: **M091702C**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **See Below**
Concentration Units: **µg/L**
Instrument: **ICP MS**

	Initial Calibration ICV0917 15:00			Continuing Calibration CCV0917 15:12				
Parameter	**True**	**Found**	**% Rec**	**True**	**Found**	**% Rec**		**Limit**
Antimony	50.0	48.77	98.0	50.0	49.30	99.0		90-110

Initial and Continuing Calibration Source: Inorganic Ventures and SPEX

N/A - Not Applicable

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Form III
Blanks

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Sequence: **M091602A**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **See Below**
Concentration Units: **µg/L**
Instrument: **ICP MS**

Parameter	ICB0916 14:20		091202PBS2 £		CCB0916 14:54		CCB0916 15:27		CCB0916 15:44	
Cadmium	0.11	U	0.055	U	0.11	U	0.11	U	0.11	U
Copper	0.13	U	0.070	U	0.13	U	0.13	U	0.13	U
Lead	0.44	U	0.22	U	0.44	U	0.44	U	0.44	U
Nickel	0.21	U	0.11	U	0.21	U	0.21	U	0.21	U
Selenium	0.20	U	0.10	U	0.20	U	0.20	U	0.20	U
Zinc	0.55	U	0.38	J	0.55	U	0.55	U	0.55	U

J - Below CRDL, Project DL, or RL but greater than or = MDL.
U - The analyte was analyzed for but not detected at the sample specific level reported.
N/A - Not Applicable
£ - Concentration Units: mg/Kg

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Form III
Blanks

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Sequence: **M091602D**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **See Below**
Concentration Units: **µg/L**
Instrument: **ICP MS**

Parameter	ICB0916 19:06		091202PBS3 £		CCB0916 19:34		CCB0916 20:02		CCB0916 20:16	
Antimony	0.41	J	0.20	U	0.40	U	0.40	U	0.40	U

J - Below CRDL, Project DL, or RL but greater than or = MDL.
U - The analyte was analyzed for but not detected at the sample specific level reported.
N/A - Not Applicable
£ - Concentration Units: mg/Kg

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Form III
Blanks

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Sequence: **M091702C**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **See Below**
Concentration Units: **µg/L**
Instrument: **ICP MS**

Parameter	ICB0917 15:02		CCB0917 15:14	
Antimony	0.42	J	0.40	U

J - Below CRDL, Project DL, or RL but greater than or = MDL.
U - The analyte was analyzed for but not detected at the sample specific level reported.
N/A - Not Applicable

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Form IV
Interference Check Sample
Initial

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Sequence: **M091602A**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **See Below**
Concentration Units: **µg/L**
Instrument: **ICP MS**

	ICSA0916 14:23				ICSAB0916 14:26*			
Parameter	**True**	**Found**	**Percent Recovery**	**Recovery Limits**	**True**	**Found**	**Percent Recovery**	**Recovery Limits**
Cadmium		1			20	21	103	80-120
Copper		1			20	21	101	80-120
Lead		0			20	20	101	80-120
Nickel		1			20	21	102	80-120
Selenium		0			20	21	105	80-120
Zinc		2			20	22	101	80-120

N/A - Not Applicable

* - ICSAB recoveries corrected for concentrations measured in ICSA (excluding interference elements).

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Form IV
Interference Check Sample
Initial

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Sequence: **M091702C**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **See Below**
Concentration Units: **µg/L**
Instrument: **ICP MS**

	ICSA0917 15:05				ICSAB0917 15:07*			
Parameter	**True**	**Found**	**Percent Recovery**	**Recovery Limits**	**True**	**Found**	**Percent Recovery**	**Recovery Limits**
Antimony		0			20	22	108	80-120

N/A - Not Applicable

* - ICSAB recoveries corrected for concentrations measured in ICSA (excluding interference elements).

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Form V
Matrix Spike - Low
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU1-6-SS**
Matrix: **Soil**
Percent Solid: **13.9**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **See Below**
Concentration Units: **mg/Kg**
Date Collected: **08/29/02**
Date Received: **08/31/02**

Lab ID:		0209002-21	0209002-21		
	Spiked	Sample	Matrix Spike		% Recovery
Parameter	Conc.	Conc.	Conc.	% Recovery	Limits
Antimony	11	1.6	6.6	47N	75-125

N - Spike recovery outside control limits.
N/A - Not Applicable

Concentrations reported as calculated values, which includes rounding for significant figures. Percent recoveries and RPD values are calculated from the unrounded results.

09/18/02 15:32

375 Paramount Drive, Suite 2, Raynham, Massachusetts 02767, (508) 822-9300, Fax (508) 822-3288, whale@whgrp.com

Form V
Matrix Spike - High
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU1-6-SS**
Matrix: **Soil**
Percent Solid: **13.9**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **See Below**
Concentration Units: **mg/Kg**
Date Collected: **08/29/02**
Date Received: **08/31/02**

Lab ID:		0209002-21	0209002-21		
Parameter	**Spiked Conc.**	**Sample Conc.**	**Matrix Spike Conc.**	**% Recovery**	**% Recovery Limits**
Cadmium	669	4.5	610	91	75-125
Copper	1338	3900	5100	87	75-125
Lead	1338	420	1700	97	75-125
Nickel	1338	52	1300	95	75-125
Selenium	1338	1.6	1300	95	75-125
Zinc	1338	400	1600	87	75-125

N/A - Not Applicable

Concentrations reported as calculated values, which includes rounding for significant figures. Percent recoveries and RPD values are calculated from the unrounded results.

09/18/02 15:31

375 Paramount Drive, Suite 2, Raynham, Massachusetts 02767, (508) 822-9300, Fax (508) 822-3288, whale@whgrp.com

Form V
Post Digestion Spike
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU1-6-SS**
Matrix: **Soil**
Percent Solid: **13.9**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **0209002-21**
Concentration Units: **mg/Kg**
Date Collected: **08/29/02**
Date Received: **08/31/02**

Lab ID:		0209002-21	0209002-21		
Parameter	Spiked Conc.	Sample Conc.	Post Digestion Spike Conc.	% Recovery	% Recovery Limits
Antimony	14	1.6	16	108	75-125

N/A - Not Applicable

Concentrations reported as calculated values, which includes rounding for significant figures. Percent recoveries and RPD values are calculated from the unrounded results.

09/18/02 15:32

375 Paramount Drive, Suite 2, Raynham, Massachusetts 02767, (508) 822-9300, Fax (508) 822-3288, whale@whgrp.com

Form VI
Duplicate
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU1-6-SS**
Matrix: **Soil**
Percent Solid: **13.9**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **0209002-21 DUP**
Concentration Units: **mg/Kg**
Date Collected: **08/29/02**
Date Received: **08/31/02**

Parameter	Sample Result	Duplicate Result	Percent RPD	RPD Limit
Antimony	**1.6**	**1.7**	5	20
Cadmium	**4.5**	**5.0**	11	20
Copper	**3900**	**3800**	3	20
Lead	**420**	**440**	3	20
Nickel	**52**	**56**	8	20
Selenium	**1.6**	**1.5**	5	20
Zinc	**400**	**420**	5	20

N/A - Not Applicable

Concentrations reported as calculated values, which includes rounding for significant figures. RPD values are reported based on the unrounded calculated result.

09/18/02 15:30

375 Paramount Drive, Suite 2, Raynham, Massachusetts 02767, (508) 822-9300, Fax (508) 822-3288, whale@whgrp.com

Form VII
Laboratory Control Sample
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **Laboratory Control Sample**
Matrix: **Soil**
Percent Solid: **100.0**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **091202S2LCSD035**
Concentration Units: **mg/Kg**
Date Collected: **N/A**
Date Received: **N/A**

Parameter	Conc.	% Recovery	% Recovery Limits
Cadmium	130	103	80-120
Copper	99	104	80-120
Lead	170	98	77-123
Nickel	180	102	78-122
Selenium	110	110	74-126
Zinc	270	106	77-123

N/A - Not Applicable

Laboratory Control Sample Source: ERA D035

Concentrations reported as calculated values, which includes rounding for significant figures. Percent recoveries and RPD values are calculated from the unrounded results.

09/18/02 15:28

Form VII
Laboratory Control Sample
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **Laboratory Control Sample**
Matrix: **Soil**
Percent Solid: **100.0**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **091202S3LCSD035**
Concentration Units: **mg/Kg**
Date Collected: **N/A**
Date Received: **N/A**

Parameter	Conc.	% Recovery	% Recovery Limits
Antimony	16	47	0-228

N/A - Not Applicable

Laboratory Control Sample Source: ERA D035

Concentrations reported as calculated values, which includes rounding for significant figures. Percent recoveries and RPD values are calculated from the unrounded results.

09/18/02 15:33

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Form IX
Serial Dilution
Total Metals

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**
Client ID: **OU1-6-SS**
Matrix: **Soil**
Percent Solid: **13.9**

Lab Code: **M-MA030**
ETR: **0209002**
Lab ID: **0209002-21 SD**
Concentration Units: **mg/Kg**
Date Collected: **08/29/02**
Date Received: **08/31/02**

Parameter	Sample Result	Duplicate Result		Percent Difference	Limit
Antimony	1.6	2.8	U	X	10
Cadmium	4.5	4.7		6	10
Copper	3900	3900		0	10
Lead	420	440		3	10
Nickel	52	53		3	10
Selenium	1.6	1.7	U	X	10
Zinc	400	450		12E	10

E - Estimated due to Interference.
U - The analyte was analyzed for but not detected at the sample specific level reported.
X - It is not possible to calculate RPD, one result is below the detection limit, the other is above reporting limit.
N/A - Not Applicable

Concentrations reported as calculated values, which includes rounding for significant figures. RPD values are reported based on the unrounded calculated result.

09/18/02 15:32

Form X
Method Detection Limits (Annually)

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: N/A SDG: N/A

Lab Code: **M-MA030**
ETR: **0209002**
Instrument: **ICP MS**
Date: 01/01/02

Parameter	Mass (amμ)	Background	RL (μg/L)	MDL (μg/L)
Antimony	121.00		0.50	0.40
Cadmium	114.00		0.20	0.11
Copper	63.00		0.20	0.13
Lead	208.00		0.50	0.44
Nickel	60.00		0.50	0.21
Selenium	82.00		0.50	0.20
Zinc	66.00		2.0	0.55

N/A - Not Applicable
RL - Reporting Limit

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Form XII
ICP Linear Ranges (Annually)

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**

Lab Code: **M-MA030**
ETR: **0209002**
Instrument: **ICP MS**
Date: 02/01/02

Parameter	Integration Time (seconds)	Concentration (µg/L)
Antimony	N/A	5000
Cadmium	N/A	5000
Copper	N/A	5000
Lead	N/A	5000
Nickel	N/A	5000
Selenium	N/A	5000
Zinc	N/A	5000

N/A - Not Applicable

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Form XIII
Preparation Log

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: N/A SDG: N/A

Lab Code: **M-MA030**
ETR: **0209002**
Method: **3050:2T**

Client ID	Lab ID	Preparation Date	Weight (g)	Final Volume (ml)
Laboratory Control Sample	091202S2LCSD035	9/12/2002	1.03	100
OU1-1-SS	0209002-10	9/12/2002	2.09	100
OU1-10-SS	0209002-27	9/12/2002	2.18	100
OU1-2-SS	0209002-11	9/12/2002	1.74	100
OU1-3-SS	0209002-14	9/12/2002	1.74	100
OU1-4-SS	0209002-17	9/12/2002	1.91	100
OU1-5-SS	0209002-20	9/12/2002	2.57	100
OU1-6-SS	0209002-21	9/12/2002	2.09	100
OU1-6-SS	0209002-21 DUP	9/12/2002	1.98	100
OU1-6-SS	0209002-21 MSH	9/12/2002	2.15	100
OU1-6-SS	0209002-21 MSL	9/12/2002	2.28	100
OU1-7-SS	0209002-22	9/12/2002	1.9	100
OU1-8-SS	0209002-25	9/12/2002	2.55	100
OU1-9-SS	0209002-26	9/12/2002	1.95	100
OU2-1-SS	0209002-32	9/12/2002	2.19	100
OU2-2-SS	0209002-28	9/12/2002	1.89	100
OU2-3-SS	0209002-35	9/12/2002	1.99	100
OU2-4-SS	0209002-36	9/12/2002	1.96	100
OU2-5-SS	0209002-33	9/12/2002	1.83	100
Preparation Blank	091202PBS2	9/12/2002	1	100
REF-SS	0209002-39	9/12/2002	2.06	100

N/A - Not Applicable

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Form XIII
Preparation Log

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**

Lab Code: **M-MA030**
ETR: **0209002**
Method: **3050:1T**

Client ID	Lab ID	Preparation Date	Weight (g)	Final Volume (ml)
Laboratory Control Sample	091202S3LCSD035	9/12/2002	1	100
OU1-1-SS	0209002-10	9/12/2002	2.15	100
OU1-10-SS	0209002-27	9/12/2002	3.3	100
OU1-2-SS	0209002-11	9/12/2002	2.39	100
OU1-3-SS	0209002-14	9/12/2002	2.35	100
OU1-4-SS	0209002-17	9/12/2002	2.73	100
OU1-5-SS	0209002-20	9/12/2002	2.81	100
OU1-6-SS	0209002-21	9/12/2002	2.61	100
OU1-6-SS	0209002-21 DUP	9/12/2002	2.32	100
OU1-6-SS	0209002-21 MSL	9/12/2002	2.71	100
OU1-6-SS	0209002-21 PDS	9/12/2002	2.61	100
OU1-7-SS	0209002-22	9/12/2002	2.62	100
OU1-8-SS	0209002-25	9/12/2002	2.7	100
OU1-9-SS	0209002-26	9/12/2002	3.14	100
OU2-1-SS	0209002-32	9/12/2002	2.61	100
OU2-2-SS	0209002-28	9/12/2002	2.12	100
OU2-3-SS	0209002-35	9/12/2002	2.32	100
OU2-4-SS	0209002-36	9/12/2002	3.38	100
OU2-5-SS	0209002-33	9/12/2002	2.23	100
Preparation Blank	091202PBS3	9/12/2002	1	100
REF-SS	0209002-39	9/12/2002	3.06	100
~~Laboratory Control Sample~~	~~091602S3LCSD035~~	~~9/16/2002~~	~~1.02~~	~~100~~
Preparation Blank	091602PBS3	9/16/2002	1	100

CM 9/19/02

N/A - Not Applicable

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Form XIV
Analysis Run Log

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**

Lab Code: **M-MA030**
ETR: **0209002**

Sequence: **M091602A**
Instrument: **ICP MS**
End Date: 09/16/2002 15:44

Start Date: 09/16/2002 14:04

Client ID	Lab ID	Dil	Analysis Time	Cd	Cu	Pb	Ni	Se	Zn
Blank	Blank0916 14:04 B	1	02:04 PM	X	X	X	X	X	X
Initial Calibration	STD10916 14:06 IC	1	02:06 PM	X	X	X	X	X	X
Initial Calibration	STD20916 14:09 IC	1	02:09 PM	X	X	X	X	X	X
Initial Calibration	STD30916 14:12 IC	1	02:12 PM	X	X	X	X	X	X
Initial Calibration	STD40916 14:15 IC	1	02:15 PM	X	X	X	X	X	X
ICV	ICV0916 14:18 ICV	1	02:18 PM	X	X	X	X	X	X
ICB	ICB0916 14:20 ICB	1	02:20 PM	X	X	X	X	X	X
ICSA5	ICSA0916 14:23 ICSA	1	02:23 PM	X	X	X	X	X	X
ICSAB5	ICSAB0916 14:26 ICSAB	1	02:26 PM	X	X	X	X	X	X
Preparation Blank	091202PBS2 PB	5	02:29 PM	X	X	X	X	X	X
ERA D035	091202S2LCSD035 D035	5	02:31 PM	X	X	X	X	X	X
OU1-1-SS	0209002-10	5	02:34 PM	X	X	X	X	X	X
OU1-2-SS	0209002-11	5	02:37 PM	X	X	X	X	X	X
OU1-3-SS	0209002-14	5	02:40 PM	X	X	X	X	X	X
OU1-4-SS	0209002-17	5	02:43 PM	X	X	X	X	X	X
OU1-5-SS	0209002-20	5	02:45 PM	X	X	X	X	X	X
OU1-6-SS	0209002-21	5	02:48 PM	X	X	X	X	X	X
CCV	CCV0916 14:51 CCV	1	02:51 PM	X	X	X	X	X	X
CCB	CCB0916 14:54 CCB	1	02:54 PM	X	X	X	X	X	X
OU1-6-SS	0209002-21 SD	5	02:57 PM	X	X	X	X	X	X
OU1-6-SS	0209002-21 DUP	5	02:59 PM	X	X	X	X	X	X
OU1-6-SS	0209002-21 MSL	5	03:02 PM						
OU1-6-SS	0209002-21 MSH	5	03:05 PM	X	X	X	X	X	X
OU1-7-SS	0209002-22	5	03:08 PM	X	X	X	X	X	X
OU1-8-SS	0209002-25	5	03:11 PM	X	X	X	X	X	X
OU1-9-SS	0209002-26	5	03:13 PM	X	X	X	X	X	X
OU1-10-SS	0209002-27	5	03:16 PM	X	X	X	X	X	X
OU2-2-SS	0209002-28	5	03:19 PM	X	X	X	X	X	X
OU2-1-SS	0209002-32	5	03:22 PM	X	X	X	X	X	X
CCV	CCV0916 15:24 CCV	1	03:24 PM	X	X	X	X	X	X
CCB	CCB0916 15:27 CCB	1	03:27 PM	X	X	X	X	X	X
OU2-5-SS	0209002-33	5	03:30 PM	X	X	X	X	X	X
OU2-3-SS	0209002-35	5	03:33 PM	X	X	X	X	X	X
OU2-4-SS	0209002-36	5	03:36 PM	X	X	X	X	X	X
REF-SS	0209002-39	5	03:38 PM	X	X	X	X	X	X
CCV	CCV0916 15:41 CCV	1	03:41 PM	X	X	X	X	X	X
CCB	CCB0916 15:44 CCB	1	03:44 PM	X	X	X	X	X	X

N/A - Not Applicable
Dil - Dilution

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Form XIV
Analysis Run Log

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**

Lab Code: **M-MA030**
ETR: **0209002**

Sequence: **M091602D**
Instrument: **ICP MS**
End Date: 09/16/2002 20:16

Start Date: 09/16/2002 18:52

Client ID	Lab ID	Dil	Analysis Time	Sb
Blank	Blank0916 18:52 B	1	06:52 PM	X
Initial Calibration	STD10916 18:54 IC	1	06:54 PM	X
Initial Calibration	STD20916 18:57 IC	1	06:57 PM	X
Initial Calibration	STD30916 18:59 IC	1	06:59 PM	X
Initial Calibration	STD40916 19:01 IC	1	07:01 PM	X
ICV	ICV0916 19:04 ICV	1	07:04 PM	X
ICB	ICB0916 19:06 ICB	1	07:06 PM	X
ICSA5	ICSA0916 19:08 ICSA	1	07:08 PM	X
ICSAB5	ICSAB0916 19:11 ICSAB	1	07:11 PM	X
Preparation Blank	091202PBS3 PB	5	07:13 PM	X
ERA D035	091202S3LCSD035 D035	5	07:15 PM	X
OU1-1-SS	0209002-10	5	07:18 PM	X
OU1-2-SS	0209002-11	5	07:20 PM	X
OU1-3-SS	0209002-14	5	07:22 PM	X
OU1-4-SS	0209002-17	5	07:25 PM	X
OU1-5-SS	0209002-20	5	07:27 PM	X
OU1-6-SS	0209002-21	5	07:29 PM	X
CCV	CCV0916 19:32 CCV	1	07:32 PM	X
CCB	CCB0916 19:34 CCB	1	07:34 PM	X
OU1-6-SS	0209002-21 SD	5	07:36 PM	X
OU1-6-SS	0209002-21 DUP	5	07:39 PM	X
OU1-6-SS	0209002-21 MSL	5	07:41 PM	X
OU1-6-SS	0209002-21 PDS	5	07:43 PM	
OU1-7-SS	0209002-22	5	07:46 PM	X
OU1-8-SS	0209002-25	5	07:48 PM	X
OU1-9-SS	0209002-26	5	07:50 PM	X
OU1-10-SS	0209002-27	5	07:53 PM	X
OU2-2-SS	0209002-28	5	07:55 PM	X
OU2-1-SS	0209002-32	5	07:57 PM	X
CCV	CCV0916 20:00 CCV	1	08:00 PM	X
CCB	CCB0916 20:02 CCB	1	08:02 PM	X
OU2-5-SS	0209002-33	5	08:04 PM	X
OU2-3-SS	0209002-35	5	08:07 PM	X
OU2-4-SS	0209002-36	5	08:09 PM	X
REF-SS	0209002-39	5	08:11 PM	X
CCV	CCV0916 20:14 CCV	1	08:14 PM	X
CCB	CCB0916 20:16 CCB	1	08:16 PM	X

N/A - Not Applicable
Dil - Dilution

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Form XIV
Analysis Run Log

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: N/A SDG: N/A

Lab Code: **M-MA030**
ETR: **0209002**

Sequence: **M091702C**
Instrument: **ICP MS**
End Date: 09/17/2002 15:14

Start Date: 09/17/2002 14:48

Client ID	Lab ID	Dil	Analysis Time	Sb
Blank	Blank0917 14:48 B	1	02:48 PM	X
Initial Calibration	STD10917 14:51 IC	1	02:51 PM	X
Initial Calibration	STD20917 14:53 IC	1	02:53 PM	X
Initial Calibration	STD30917 14:55 IC	1	02:55 PM	X
Initial Calibration	STD40917 14:58 IC	1	02:58 PM	X
ICV	ICV0917 15:00 ICV	1	03:00 PM	X
ICB	ICB0917 15:02 ICB	1	03:02 PM	X
ICSA5	ICSA0917 15:05 ICSA	1	03:05 PM	X
ICSAB5	ICSAB0917 15:07 ICSAB	1	03:07 PM	X
OU1-6-SS	0209002-21 PDS	5	03:09 PM	X
CCV	CCV0917 15:12 CCV	1	03:12 PM	X
CCB	CCB0917 15:14 CCB	1	03:14 PM	X

N/A - Not Applicable
Dil - Dilution

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Form XVI
Internal Standards Relative Intensity Summary

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: N/A SDG: N/A

Lab Code: **M-MA030**
ETR: **0209002**
Sequence: **M091602A**

Start Date: 09/16/2002 14:04 **End Date:** 09/16/2002 15:44

Client ID	Lab ID	Analysis Time	Ge	In	Tb
Blank	Blank0916 14:04	02:04 PM	100.00	100.00	100.00
Initial Calibration	STD10916 14:06	02:06 PM	102.12	104.04	104.65
Initial Calibration	STD20916 14:09	02:09 PM	101.91	103.30	103.41
Initial Calibration	STD30916 14:12	02:12 PM	100.33	103.51	103.94
Initial Calibration	STD40916 14:15	02:15 PM	105.90	105.43	103.91
ICV	ICV0916 14:18	02:18 PM	109.04	107.74	108.17
ICB	ICB0916 14:20	02:20 PM	106.50	106.12	104.03
ICSA	ICSA0916 14:23	02:23 PM	100.65	99.21	99.88
ICSAB	ICSAB0916 14:26	02:26 PM	97.98	96.69	101.56
Preparation Blank	091202PBS2	02:29 PM	100.18	100.87	103.94
Laboratory Control Sample	091202S2LCSD035	02:31 PM	98.39	100.83	104.43
OU1-1-SS	0209002-10 SAM	02:34 PM	102.97	102.76	107.62
OU1-2-SS	0209002-11 SAM	02:37 PM	105.25	105.52	109.52
OU1-3-SS	0209002-14 SAM	02:40 PM	104.04	104.82	107.85
OU1-4-SS	0209002-17 SAM	02:43 PM	101.66	102.29	105.91
OU1-5-SS	0209002-20 SAM	02:45 PM	100.45	102.25	107.00
OU1-6-SS	0209002-21 SAM	02:48 PM	99.07	103.08	106.51
CCV	CCV0916 14:51	02:51 PM	97.42	98.85	102.18
CCB	CCB0916 14:54	02:54 PM	98.07	96.90	101.43
OU1-6-SS	0209002-21 SD	02:57 PM	96.49	99.53	101.02
OU1-6-SS	0209002-21 DUP	02:59 PM	99.22	100.93	105.58
OU1-6-SS	0209002-21 MSL	03:02 PM	99.66	100.15	107.12
OU1-6-SS	0209002-21 MSH	03:05 PM	100.65	98.43	106.85
OU1-7-SS	0209002-22 SAM	03:08 PM	96.96	98.65	101.50
OU1-8-SS	0209002-25 SAM	03:11 PM	96.69	98.13	101.43
OU1-9-SS	0209002-26 SAM	03:13 PM	95.97	97.48	100.43
OU1-10-SS	0209002-27 SAM	03:16 PM	95.60	96.38	100.58
OU2-2-SS	0209002-28 SAM	03:19 PM	103.86	103.35	111.77
OU2-1-SS	0209002-32 SAM	03:22 PM	100.02	99.47	102.89
CCV	CCV0916 15:24	03:24 PM	96.71	98.85	99.92
CCB	CCB0916 15:27	03:27 PM	95.25	97.13	101.38
OU2-5-SS	0209002-33 SAM	03:30 PM	100.65	103.22	106.73
OU2-3-SS	0209002-35 SAM	03:33 PM	97.87	101.54	105.42
OU2-4-SS	0209002-36 SAM	03:36 PM	96.93	98.72	102.30
REF-SS	0209002-39 SAM	03:38 PM	94.18	95.38	97.89
CCV	CCV0916 15:41	03:41 PM	94.36	94.69	99.23
CCB	CCB0916 15:44	03:44 PM	94.31	94.91	99.51

N/A - Not Applicable

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Form XVI
Internal Standards Relative Intensity Summary

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: N/A SDG: N/A

Lab Code: **M-MA030**
ETR: **0209002**
Sequence: **M091602D**

Start Date: 09/16/2002 18:52

End Date: 09/16/2002 20:16

Client ID	Lab ID	Analysis Time	In
Blank	Blank0916 18:52	06:52 PM	100.00
Initial Calibration	STD10916 18:54	06:54 PM	98.55
Initial Calibration	STD20916 18:57	06:57 PM	98.19
Initial Calibration	STD30916 18:59	06:59 PM	101.17
Initial Calibration	STD40916 19:01	07:01 PM	99.71
ICV	ICV0916 19:04	07:04 PM	98.79
ICB	ICB0916 19:06	07:06 PM	103.35
ICSA	ICSA0916 19:08	07:08 PM	94.86
ICSAB	ICSAB0916 19:11	07:11 PM	92.03
Laboratory Control Sample	091202S3LCSD035	07:15 PM	90.58
OU1-1-SS	0209002-10 SAM	07:18 PM	90.00
OU1-2-SS	0209002-11 SAM	07:20 PM	89.98
OU1-3-SS	0209002-14 SAM	07:22 PM	88.23
OU1-4-SS	0209002-17 SAM	07:25 PM	89.68
OU1-5-SS	0209002-20 SAM	07:27 PM	89.72
OU1-6-SS	0209002-21 SAM	07:29 PM	88.49
CCV	CCV0916 19:32	07:32 PM	92.93
CCB	CCB0916 19:34	07:34 PM	96.89
OU1-6-SS	0209002-21 SD	07:36 PM	92.58
OU1-6-SS	0209002-21 DUP	07:39 PM	89.15
OU1-6-SS	0209002-21 MSL	07:41 PM	89.37
OU1-6-SS	0209002-21 PDS	07:43 PM	89.76
OU1-7-SS	0209002-22 SAM	07:46 PM	89.40
OU1-8-SS	0209002-25 SAM	07:48 PM	90.16
OU1-9-SS	0209002-26 SAM	07:50 PM	88.36
OU1-10-SS	0209002-27 SAM	07:53 PM	88.58
OU2-2-SS	0209002-28 SAM	07:55 PM	88.39
OU2-1-SS	0209002-32 SAM	07:57 PM	90.90
CCV	CCV0916 20:00	08:00 PM	97.33
CCB	CCB0916 20:02	08:02 PM	97.80
OU2-5-SS	0209002-33 SAM	08:04 PM	90.29
OU2-3-SS	0209002-35 SAM	08:07 PM	77.23
OU2-4-SS	0209002-36 SAM	08:09 PM	92.77
REF-SS	0209002-39 SAM	08:11 PM	95.00
CCV	CCV0916 20:14	08:14 PM	100.87
CCB	CCB0916 20:16	08:16 PM	100.77

N/A - Not Applicable

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Form XVI
Internal Standards Relative Intensity Summary

Client: **TRC Environmental**
Project: **Lockheed Eco Risk Assessment**
Case: **N/A** SDG: **N/A**

Lab Code: **M-MA030**
ETR: **0209002**
Sequence: **M091702C**

Start Date: **09/17/2002 14:48**

End Date: **09/17/2002 15:14**

Client ID	Lab ID	Analysis Time	In
Blank	Blank0917 14:48	02:48 PM	100.00
Initial Calibration	STD10917 14:51	02:51 PM	99.12
Initial Calibration	STD20917 14:53	02:53 PM	100.20
Initial Calibration	STD30917 14:55	02:55 PM	99.47
Initial Calibration	STD40917 14:58	02:58 PM	96.06
ICV	ICV0917 15:00	03:00 PM	97.80
ICB	ICB0917 15:02	03:02 PM	97.50
ICSA	ICSA0917 15:05	03:05 PM	93.39
ICSAB	ICSAB0917 15:07	03:07 PM	92.28
OU1-6-SS	0209002-21 PDS	03:09 PM	89.59
CCV	CCV0917 15:12	03:12 PM	92.69
CCB	CCB0917 15:14	03:14 PM	94.08

N/A - Not Applicable

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Chain-of-Custody Record

Woods Hole Group

375 Paramount Drive
Raynham, MA 02767

TEL: (508) 822-9300
FAX: (508) 822-3288

1209002

PAGE 1 OF 3

COMPANY INFORMATION

Name: TRC Environmental
Address: Boott Mills South
Foot of John Street
Lowell, MA 01852
Telephone: (978) 970-5600
Facsimile: (978) 453-1995
Contact Name: Liz Denly

COMPANY'S PROJECT INFORMATION

Regulatory Protocol: _____
For the State of: ~~Logan~~ MA
Project Name: Former GE Site
Project Number: E9202-5102-04240
P.O. #: _____
Sampler Name(s): TJW, SH

SHIPPING INFORMATION

Carrier: FedEx
Airbill Number: 836655774717
Date Shipped: 8/30/02
8/31/02
Quote #: _____

(TAT IS IN BUSINESS ~~DAYS~~)
CIRCLE TAT: (10 Day) 5 Day 3 Day 48 Hr 24 Hr Other
(IF OTHER NOTE BELOW)

SAMPLE CONTAINERS (NOTE 4)

PRESERVATIVE	HNO3 4°C	4°C								
CONTAINER TYPE	poly	glass								
VOLUME	1L	8oz								

WHG LAB #	SAMPLE ID (NOTE 1)	COLLECTION DATE	COLLECTION TIME	COMPOSITE OR GRAB	MATRIX	ANALYSIS/REMARKS (NOTES 2, 3)	SAMPLER(S) INTIALS	NUMBER OF CONTAINERS					
1	Equipment Blank	8/28/02	1015	G	LW	Metals-Sb, Cd, Cu, Pb, Ni, Zn, Se	TJW, SH	1					
2	OU1-1-SW	8/28/02	1030	G	SW	Metals[2]	TJW, SH	1					
3	OU2-2-SW	8/28/02	1030	G	SW	Metals[1]	TJW, SH	1					
4	OU2-1-SW	8/28/02	1045	G	SW	Metals[1] MS/DUP	TJW, SH	1					
5	OU1-1-SED	8/28/02	1110	C	SED	Metals[2]	TJW, SH		1				
6	OU1-3-SED	8/28/02	1110	C	SED	Metals[2]	TJW, SH		1				
7	OU1-2-SED	8/28/02	1120	C	SED	Metals[2]	TJW, SH		1				
8	OU2-1-SED	8/28/02	1135	C	SED	Metals[2] MS/DUP	TJW, SH		2				
9	OU2-2-SED	8/28/02	1145	C	SED	Metals[2]	TJW, SH		1				
10	OU1-1-SS	8/28/02	1335	G	SS0.1	Metals[3]	TJW, SH		1				

Relinquished by: (signature)	DATE	TIME	Received by: (signature)
[signature]	8/30/02	1430	FED EX
Relinquished by: (signature)	DATE	TIME	Received by: (signature)
FED EX	8/31/02	11:00	[signature]
Relinquished by: (signature)	DATE	TIME	Received for Laboratory by: (signature)

NOTES TO SAMPLER(S): (1) Limit Sample Identification to 6 characters, if possible; (2) Indicate designated Lab Q.C. sample and type (e.g.; MS/MSD/REP) and provide sufficient sample; (3) Field duplicates are separate sample; (4) e.g.; 40ml/glass/H2SO4

Notes to Lab: ~~Sample OU2-1-SW is an MS/DUP~~ TJW

1 Metals Analysis – Sb, Cd, Cu, Pb, Ni, Zn
2 Metals Analysis – Cd, Cu, Pb, Ni, Zn
3 Metals Analysis – Sb, Cd, Cu, Pb, Ni, Se, Zn

130/135

Chain of Custody Record

Woods Hole Group

375 Paramount Drive
Raynham, MA 02767

TEL: (508) 822-9300
FAX: (508) 822-3288

0209002

COMPANY INFORMATION

Name: IRC Environmental
Address: Boott Mills South
Foot of John street
Lowell, MA 01852
Telephone: (978) 970-5600
Facsimile: (978) 453-1995
Contact Name: Liz Deily

COMPANY'S PROJECT INFORMATION

Regulatory Protocol:
For the State of:
Project Name: Former GE
Project Number: E9202-6702-022
P.O. #
Sampler Name(s): TBW SH

SHIPPING INFORMATION

Carrier: Fed Ex
Airbill Number: 836655774717
Date Shipped:
Quote #:

(TAT IS IN BUSINESS DAYS) (IF OTHER NOTE BELOW)
CIRCLE TAT: (10 Day) 5 Day 3 Day 48 Hr 24 Hr Other

SAMPLE CONTAINERS (NOTE 4)

	PRESERVATIVE	CONTAINER TYPE	VOLUME
	4°C	glass	8oz

WHG LAB #	SAMPLE ID (NOTE 1)	COLLECTION DATE	COLLECTION TIME	COMPOSITE OR GRAB	MATRIX	ANALYSIS/REMARKS (NOTES 2, 3)	SAMPLER(S) INITIALS	NUMBER OF CONTAINERS
11	OU1-2-SS	8/28/02	1345	G	SS soil	Metals [3]	TBW, SH	1
12	OU1-1-VEG	8/28/02	1415	G	plant tissue	Metals [4]	TBW, SH	1
13	OU1-1-INV	8/28/02	1530	G	tissue	Metals [4]	TBW, SH	1
14	OU1-3-SS	8/28/02	1555	G	SS soil	Metals [3]	TBW, SH	1
15	OU1-2-VEG	8/29/02	0930	G	plant tissue	Metals [4]	TBW+SH	1
16	OU1-2-INV	8/29/02	1000	G	tissue	Metals [4]	TBW+SH	1
17	OU1-4-SS	8/29/02	1005	G	SS soil	Metals [3]	TBW+SH	1
18	OU1-3-VEG	8/29/02	1030	G	plant tissue	Metals [4]	TBW+SH	1
19	OU1-3-INV	8/29/02	1045	G	tissue	Metals [4]	TBW+SH	1
20	OU1-5-SS	8/29/02	1050	G	SS soil	Metals [3]	TBW+SH	1

Relinquished by: (signature)	DATE	TIME	Received by: (signature)
[signature]	8/30/02	1430	FED EX
Relinquished by: (signature)	DATE	TIME	Received by: (signature)
FED EX	8/31/02	11:00	[signature]
Relinquished by: (signature)	DATE	TIME	Received for Laboratory by: (signature)

NOTES TO SAMPLER(S): (1) Limit Sample Identification to 6 characters, if possible; (2) Indicate designated Lab Q.C. sample and type (e.g.; MS/MSD/REP) and provide sufficient sample; (3) Field duplicates are separate sample; (4) e.g.; 40ml/glass/H_2SO_4

Notes to Lab:
[3] Metals analysis - Sb, Cd, Cu, Pb, Ni, Se, Zn
[4] Metals Analysis - Sb, Cd, Cu, Pb, Ni, Se, Zn

We cannot accept verbal changes. Please Fax written changes to (508) 822-3288

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Chain-of-Custody Record

Woods Hole Group

375 Paramount Drive
Raynham, MA 02767

TEL: (508) 822-9300
FAX: (508) 822-3288

0209002

COMPANY INFORMATION

Name: IRC Environmental
Address: Booth Mills South
Foot of John Street
Lowell, MA 01
Telephone: (978) 970 5600
Facsimile: (978) 453-1995
Contact Name: Liz Denly

COMPANY'S PROJECT INFORMATION

Regulatory Protocol:
For the State of:
Project Name: Former GE
Project Number: E9202-5102
P.O. #
Sampler Name(s): TSW, SH

SHIPPING INFORMATION

Carrier: Fed Ex
Airbill Number: 836655774717
Date Shipped: 8/30/02
Quote #:

(TAT IS IN BUSINESS DAYS) (IF OTHER NOTE BELOW)
CIRCLE TAT: (10 Day) 5 Day 3 Day 48 Hr 24 Hr Other

SAMPLE CONTAINERS (NOTE 4)

PRESERVATIVE: 4°C
CONTAINER TYPE: glass
VOLUME: 8oz

WHG LAB #	SAMPLE ID (NOTE 1)	COLLECTION DATE	COLLECTION TIME	COMPOSITE OR GRAB	MATRIX	ANALYSIS/REMARKS (NOTES 2, 3)	SAMPLER(S) INITIALS	NUMBER OF CONTAINERS
21	OU2-6-SS dup	8/30/02	1100	G	SSoil	Metals 3 MS/DUP	TSW SH	2
22	OU1-7-SS	8/30/02	1145	G	SSoil	Metals 3	TSW SH	1
23	OU2-4-INV	8/30/02	1215	G	Tissue	Metals 4	TSW, SH	1
24	OU2-4-VEG	8/30/02	1240	G	Plant Tissue	Metals 4	TSW, SH	1
25	OU1-8-SS	8/30/02	1245	G	SSoil	Metals 3	TSW, SH	1
26	OU2-9-SS	8/30/02	1300	G	SSoil	Metals 3	TSW, SH	1
27	OU1-10-SS	8/30/02	1300	G	SSoil	Metals 3	TSW, SH	1
28	OU2-2-SS	8/30/02	0900	G	SSoil	Metals 3	TSW+SH	1
29	OU2-2-INV	8/30/02	0910	G	Tissue	Metals 4	TSW+SH	1
30	OU2-1-VEG	8/30/02	0910	G	Tissue	Metals 4	TSW+SH	1
31	OU2-1-INV	8/30/02	1000	G	Tissue	Metals 4	TSW+SH	1
32	OU2-5-SS	8/30/02	1005	G	SSoil	Metals 3	TSW+SH	1
33	OU2-5-SS	8/30/02	1030	G	SSoil	Metals 3	TSW+SH	1
34	OU2-5-VEG	8/30/02	1030	G	Tissue	Metals 4	TSW+SH	1
35	OU2-3-SS	8/30/02	1140	G	SSoil	Metals 3	TSW+SH	1
36	OU2-4-SS	8/30/02	1200	G	SSoil	Metals 3	TSW+SH	1
37	REF-INV	8/30/02	1240	G	Tissue	Metals 4	TSW+SH	1
38	REF-VEG	8/30/02	1245	G	Tissue	Metals 4	TSW+SH	1
39	REF-SS	8/30/02	1250	G	SSoil	Metals 3	TSW+SH	1

TSW 15

Relinquished by: (signature)	DATE	TIME	Received by: (signature)
	8/30/02	1430	FED EX
Relinquished by: (signature)	DATE	TIME	Received by: (signature)
FED EX	8/31/02	11:00	
Relinquished by: (signature)	DATE	TIME	Received for Laboratory by: (signature)

NOTES TO SAMPLER(S): (1) Limit Sample Identification to 6 characters, if possible; (2) Indicate designated Lab Q.C. sample and type (e.g.; MS/MSD/REP) and provide sufficient sample; (3) Field duplicates are separate sample; (4) e.g.; 40ml/glass/H_2SO_4

Notes to Lab:

3 Metals analysis - Sb, Cd, Cu, Pb, Ni, Se, Zn
4 Metals Analysis - Sb, Cd, Cu, Pb, Ni, Se, Zn

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Sample Receipt Checklist

Client: TRC Environmental	**Receipt Date:** 8/31/02		
Project: Former GE	**Log-in Date:** 9/3/02		
ETR #: 0209002	**Inspection by:** NJL	**Login by:** MR	

ALL SECTIONS BELOW MUST BE COMPLETED

Were samples shipped? (Yes) FedEx / UPS / Other:_____
No, WHG Courier pick-up / Hand delivered

Is bill of lading retained? Yes, Tracking #: ON BACK
No, Unavailable / N/A

Number of coolers received for this project delivery: 2

Indicate cooler temperature upon opening (if multiple coolers, record all temps):

Note: If all coolers are 2-6°C, use one checklist, if NOT, use separate checklists and note all samples received *above* 6°C.

Cooler 1: #1 #2 #1 #2
Temperature(s) taken from: 2, 3 IR Gun, 4, 3 Temp. Blank, / N/A

Were samples received on ice? (Yes) / No

Chain-of-Custody present? (Yes) / No
Complete? Yes / No

Custody seals present on Cooler? Yes / (No)
on Bottles? Yes / (No)
Intact? Yes / No / (N/A)
Note: Affix custody seals to back of this page.

Were sample containers intact? (Yes) / No If No, list samples: →

Did VOA waters contain headspace (>5mm)? Yes / No If Yes, list samples: →

Were 5035 VOA soils, or VPH soils, *covered* with MeOH? Yes / No
If No, list samples: →

Was a sufficient amount of sample received for each test indicated on the COC?
Yes / No If No, list samples: →

If chemical preservation is appropriate -
Were samples field preserved? (Yes) / No / N/A
☐C=HCl ☐ M=MeOH ☐ S=H_2SO4
☐H=NaOH ☒ N=HNO_3 ☐ Other:_____ ☐ U= Unknown

Preservation (pH) verified at lab for *EVERY* bottle? (Not: VOA / VPH / Sulfide)
(YES) (<2) or >12 (CN) or NO
If No, why?:

Were samples received within hold time? (Yes) / No If No, list samples: →

Discrepancy between samples rec'd & COC? (Yes) / No If Yes, list samples: →

Was the Project Manager notified of any other problems? Yes / No / N/A

Project Manager Acknowledgement: Date:

Comments / Notes

Sample storage refrigerator #:_____

Sample storage freezer #:_____

Cooler 2:_____ Cooler 3:_____

Cooler 4:_____ Cooler 5:_____

Cooler 6:_____ Cooler 7:_____

More:_____

DID NOT receive
001-3-INV

Chemical preservation OK for ALL samples?
(Yes) / No / N/A

If No, list samples below:

① All Relinquished dates 11/30/02 - Should be 8/30/02

② Samples on page 3 of 3 (COC) All dates 11/29/02 + 11/30/02 - Bottles Labelled 8/29/02 + 8/30/02

Please use back for any additional notes!

Chain-of-Custody Record

Woods Hole Group

375 Paramount Drive
Raynham, MA 02767
TEL: (508) 822-9300
FAX: (508) 822-3288

COMPANY INFORMATION

Name: Scott Heim
Address: IRC Environmental
100 Foot of John St.
Boott Mills South
Lowell, MA 01852
Telephone: 978-970-5600
Facsimile: 978-453-1995
Contact Name: Scott Heim

COMPANY'S PROJECT INFORMATION

Regulatory Protocol:
For the State of: MA
Project Name: Lockheed
Project Number: E9202-5202-0240
P.O. #:
Sampler Name(s): Sandy Weymouth, Scott Heim

SHIPPING INFORMATION

Carrier:
Airbill Number:
Date Shipped:
Quote #:

(TAT IS IN BUSINESS DAYS) (IF OTHER NOTE BELOW)
CIRCLE TAT: 10 Day 5 Day 3 Day 48 Hr 24 Hr Other

SAMPLE CONTAINERS (NOTE 4)

PRESERVATIVE	ice					
CONTAINER TYPE	amber glass jar					
VOLUME	8 oz					

WHG LAB #	SAMPLE ID (NOTE 1)	COLLECTION DATE	COLLECTION TIME	COMPOSITE OR GRAB	MATRIX	ANALYSIS/REMARKS (NOTES 2, 3)	SAMPLER(S) INTIALS	NUMBER OF CONTAINERS
	~~OU1-3 INV~~ OU1-3-INV	8/29/02	1045	G	tissue	Metals (Antimony, Cadmium, Copper, Lead, Nickle, Selenium, Zinc).		1

Relinquished by: (signature)	DATE	TIME	Received by: (signature)
Kristen Marshall	9/5/02	2:07 pm	Ed Butler
Ed Butler	9/05/02	4:30	
Relinquished by: (signature)	DATE	TIME	Received for Laboratory by: (signature)

NOTES TO SAMPLER(S): (1) Limit Sample Identification to 6 characters, if possible; (2) Indicate designated Lab Q.C. sample and type (e.g.; MS/MSD/REP) and provide sufficient sample; (3) Field duplicates are separate sample; (4) e.g.: 40ml/glass/H_2SO_4

Notes to Lab:

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Sample Receipt Checklist

Client: TRC	**Receipt Date:** 9-5-02		
Project: Lockheed	**Log-in Date:** ↓		
ETR #: 0209002	**Inspection by:** EB	**Login by:** DMS	

ALL SECTIONS BELOW MUST BE COMPLETED

Comments / Notes

Were samples shipped? Yes, FedEx / UPS / Other:_____
No, (WHG Courier pick-up) / Hand delivered

Is bill of lading retained? Yes, Tracking #:_____
No, Unavailable / (N/A)

Number of coolers received for this project delivery: 1

Indicate cooler temperature upon opening (if multiple coolers, record all temps):

Note: If all coolers are 2-6°C, use one checklist, if NOT, use separate checklists and note all samples received *above* 6°C.

Cooler 1:
Temperature(s) taken from: 06° IR Gun, _____ Temp. Blank, / N/A

Were samples received on ice? (Yes) / No

Chain-of-Custody present? (Yes) / No

Complete? (Yes) / No

Custody seals present on Cooler? Yes / (No)

on Bottles? Yes / (No)

Intact? Yes / No / N/A

Note: Affix custody seals to back of this page.

Were sample containers intact? (Yes) / No If No, list samples: →

Did VOA waters contain headspace (>5mm)? Yes / No If Yes, list samples: →

Were 5035 VOA soils, or VPH soils, *covered* with MeOH? Yes / No
If No, list samples: →

Was a sufficient amount of sample received for each test indicated on the COC?
Yes / No If No, list samples: →

If chemical preservation is appropriate -
Were samples field preserved? Yes / (No) / N/A

☐C=HCl ☐ M=MeOH ☐ S=H_2SO4

☐H=NaOH ☐ N=HNO_3 ☐ Other:_____ ☐ U= Unknown

Preservation (pH) verified at lab for *EVERY* bottle? (Not: VOA / VPH / Sulfide)
YES: <2 or >12 (CN) or NO
If No, why?:

Were samples received within hold time? (Yes) / No If No, list samples: →

Discrepancy between samples rec'd & COC? Yes / No If Yes, list samples: →

Was the Project Manager notified of any other problems? Yes / No / N/A

Project Manager Acknowledgement: Date:

Sample storage refrigerator #:_____

Sample storage freezer #:_____

Cooler 2:_____ Cooler 3:_____

Cooler 4:_____ Cooler 5:_____

Cooler 6:_____ Cooler 7:_____

More:_____

Chemical preservation OK for ALL samples?
Yes / No / N/A

If No, list samples below:

Please use back for any additional notes!

APPENDIX B

WILDLIFE EXPOSURE DOSES

Table B-1. Mean Exposure Doses of Meadow Vole to Soil and Vegetation Ingestion - Outfall 001 Wetland.

Contaminant of Concern	Mean Soil Concentration (mg/kg)	Mean Vegetation Concentration (mg/kg)	Daily Food Intake (kg/kg/day)	Area Use Factor	Mean Soil Dose (mg/kg/day)	Mean Vegetation Dose (mg/kg/day)	Mean Total Dose (mg/kg/day)
Antimony	0.00E+00	0.00E+00	0.35	1.00	0.00E+00	0.00E+00	0.00E+00
Cadmium	3.65E+00	1.48E-01	0.35	1.00	2.55E-02	5.06E-02	7.61E-02
Copper	1.04E+03	2.93E+00	0.35	1.00	7.26E+00	1.00E+00	8.26E+00
Lead	2.50E+02	1.24E-01	0.35	1.00	1.75E+00	4.24E-02	1.79E+00
Nickel	5.53E+01	8.08E-01	0.35	1.00	3.87E-01	2.77E-01	6.64E-01
Selenium	1.23E+00	2.61E-02	0.35	1.00	8.64E-03	8.96E-03	1.76E-02
Zinc	3.95E+02	1.48E+01	0.35	1.00	2.77E+00	5.06E+00	7.83E+00

Table B-2. Maximum Exposure Doses of Meadow Vole to Soil and Vegetation Ingestion - Outfall 001 Wetland.

Contaminant of Concern	Maximum Soil Concentration (mg/kg)	Maximum Vegetation Concentration (mg/kg)	Daily Food Intake (kg/kg/day)	Area Use Factor	Maximum Soil Dose (mg/kg/day)	Maximum Vegetation Dose (mg/kg/day)	Maximum Total Dose (mg/kg/day)
Antimony	0.00E+00	0.00E+00	0.35	1.00	0.00E+00	0.00E+00	0.00E+00
Cadmium	8.20E+00	2.10E-01	0.35	1.00	5.74E-02	7.20E-02	1.29E-01
Copper	3.90E+03	3.90E+00	0.35	1.00	2.73E+01	1.34E+00	2.86E+01
Lead	4.20E+02	3.20E-01	0.35	1.00	2.94E+00	1.10E-01	3.05E+00
Nickel	1.30E+02	1.10E+00	0.35	1.00	9.10E-01	3.77E-01	1.29E+00
Selenium	2.00E+00	4.80E-02	0.35	1.00	1.40E-02	1.65E-02	3.05E-02
Zinc	1.10E+03	2.10E+01	0.35	1.00	7.70E+00	7.20E+00	1.49E+01

Table B-5. Mean Exposure Doses of Marsh Wren to Soil and Invertebrate Ingestion - Outfall 001 Wetland.

Contaminant of Concern	Mean Soil Concentration (mg/kg)	Mean Invertebrate Concentration (mg/kg)	Daily Food Intake (kg/kg/day)	Area Use Factor	Mean Soil Dose (mg/kg/day)	Mean Invertebrate Dose (mg/kg/day)	Mean Total Dose (mg/kg/day)
Antimony	0.00E+00	0.00E+00	0.67	1.00	0.00E+00	0.00E+00	0.00E+00
Cadmium	3.65E+00	2.01E+00	0.67	1.00	4.89E-02	1.32E+00	1.37E+00
Copper	1.04E+03	7.98E+01	0.67	1.00	1.39E+01	5.24E+01	6.63E+01
Lead	2.50E+02	2.48E+01	0.67	1.00	3.35E+00	1.63E+01	1.96E+01
Nickel	5.53E+01	3.13E+00	0.67	1.00	7.41E-01	2.05E+00	2.79E+00
Selenium	1.23E+00	5.78E-01	0.67	1.00	1.65E-02	3.79E-01	3.96E-01
Zinc	3.95E+02	6.35E+01	0.67	1.00	5.30E+00	4.17E+01	4.70E+01

Table B-6. Maximum Exposure Doses of Marsh Wren to Soil and Invertebrate Ingestion - Outfall 001 Wetland.

Contaminant of Concern	Maximum Soil Concentration (mg/kg)	Maximum Invertebrate Concentration (mg/kg)	Daily Food Intake (kg/kg/day)	Area Use Factor	Maximum Soil Dose (mg/kg/day)	Maximum Invertebrate Dose (mg/kg/day)	Maximum Total Dose (mg/kg/day)
Antimony	0.00E+00	0.00E+00	0.67	1.00	0.00E+00	0.00E+00	0.00E+00
Cadmium	8.20E+00	4.30E+00	0.67	1.00	1.10E-01	2.82E+00	2.93E+00
Copper	3.90E+03	1.50E+02	0.67	1.00	5.23E+01	9.85E+01	1.51E+02
Lead	4.20E+02	8.10E+01	0.67	1.00	5.63E+00	5.32E+01	5.88E+01
Nickel	1.30E+02	4.40E+00	0.67	1.00	1.74E+00	2.89E+00	4.63E+00
Selenium	2.00E+00	9.30E-01	0.67	1.00	2.68E-02	6.11E-01	6.37E-01
Zinc	1.10E+03	9.10E+01	0.67	1.00	1.47E+01	5.98E+01	7.45E+01

Table B-7. Mean Exposure Doses of Marsh Wren to Soil and Invertebrate Ingestion - Outfall 002 Wetland.

Contaminant of Concern	Mean Soil Concentration (mg/kg)	Mean Invertebrate Concentration (mg/kg)	Daily Food Intake (kg/kg/day)	Area Use Factor	Mean Soil Dose (mg/kg/day)	Mean Invertebrate Dose (mg/kg/day)	Mean Total Dose (mg/kg/day)
Antimony	0.00E+00	0.00E+00	0.67	1.00	0.00E+00	0.00E+00	0.00E+00
Cadmium	4.52E+00	1.25E+00	0.67	1.00	6.06E-02	8.21E-01	8.81E-01
Copper	3.78E+03	1.03E+02	0.67	1.00	5.07E+01	6.76E+01	1.18E+02
Lead	4.54E+02	2.70E+00	0.67	1.00	6.08E+00	1.77E+00	7.86E+00
Nickel	4.76E+01	9.10E-01	0.67	1.00	6.38E-01	5.98E-01	1.24E+00
Selenium	1.76E+00	3.25E-01	0.67	1.00	2.36E-02	2.13E-01	2.37E-01
Zinc	6.86E+02	7.15E+01	0.67	1.00	9.19E+00	4.69E+01	5.61E+01

Table B-8. Maximum Exposure Doses of Marsh Wren to Soil and Invertebrate Ingestion - Outfall 002 Wetland.

Contaminant of Concern	Maximum Soil Concentration (mg/kg)	Maximum Invertebrate Concentration (mg/kg)	Daily Food Intake (kg/kg/day)	Area Use Factor	Maximum Soil Dose (mg/kg/day)	Maximum Invertebrate Dose (mg/kg/day)	Maximum Total Dose (mg/kg/day)
Antimony	0.00E+00	0.00E+00	0.67	1.00	0.00E+00	0.00E+00	0.00E+00
Cadmium	6.80E+00	1.30E+00	0.67	1.00	9.11E-02	8.54E-01	9.45E-01
Copper	6.70E+03	1.20E+02	0.67	1.00	8.98E+01	7.88E+01	1.69E+02
Lead	8.30E+02	4.00E+00	0.67	1.00	1.11E+01	2.63E+00	1.37E+01
Nickel	5.90E+01	1.00E+00	0.67	1.00	7.91E-01	6.57E-01	1.45E+00
Selenium	2.20E+00	3.90E-01	0.67	1.00	2.95E-02	2.56E-01	2.86E-01
Zinc	9.10E+02	8.60E+01	0.67	1.00	1.22E+01	5.65E+01	6.87E+01

Table B-9. Mean Exposure Doses of Short-tailed Shrew to Soil, Vegetation and Invertebrate Ingestion - Outfall 001 Wetland.

Contaminant of Concern	Mean Soil Concentration (mg/kg)	Mean Vegetation Concentration (mg/kg)	Mean Invertebrate Concentration (mg/kg)	Daily Food Intake (kg/kg/day)	Area Use Factor	Mean Soil Dose (mg/kg/day)	Mean Vegetation Dose (mg/kg/day)	Mean Invertebrate Dose (mg/kg/day)	Mean Total Dose (mg/kg/day)
Antimony	0.00E+00	0.00E+00	0.00E+00	0.62	1.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium	3.65E+00	1.48E-01	2.01E+00	0.62	1.00	4.52E-02	1.10E-02	1.07E+00	1.13E+00
Copper	1.04E+03	2.93E+00	7.98E+01	0.62	1.00	1.29E+01	2.18E-01	4.25E+01	5.56E+01
Lead	2.50E+02	1.24E-01	2.48E+01	0.62	1.00	3.10E+00	9.19E-03	1.32E+01	1.63E+01
Nickel	5.53E+01	8.08E-01	3.13E+00	0.62	1.00	6.85E-01	6.01E-02	1.67E+00	2.41E+00
Selenium	1.23E+00	2.61E-02	5.78E-01	0.62	1.00	1.53E-02	1.94E-03	3.08E-01	3.25E-01
Zinc	3.95E+02	1.48E+01	6.35E+01	0.62	1.00	4.90E+00	1.10E+00	3.39E+01	3.99E+01

Table B-10. Maximum Exposure Doses of Short-tailed Shrew to Soil, Vegetation and Invertebrate Ingestion - Outfall 001 Wetland.

Contaminant of Concern	Maximum Soil Concentration (mg/kg)	Maximum Vegetation Concentration (mg/kg)	Maximum Invertebrate Concentration (mg/kg)	Daily Food Intake (kg/kg/day)	Area Use Factor	Maximum Soil Dose (mg/kg/day)	Maximum Vegetation Dose (mg/kg/day)	Maximum Invertebrate Dose (mg/kg/day)	Maximum Total Dose (mg/kg/day)
Antimony	0.00E+00	0.00E+00	0.00E+00	0.62	1.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium	8.20E+00	2.10E-01	4.30E+00	0.62	1.00	1.02E-01	1.56E-02	2.29E+00	2.41E+00
Copper	3.90E+03	3.90E+00	1.50E+02	0.62	1.00	4.84E+01	2.90E-01	8.00E+01	1.29E+02
Lead	4.20E+02	3.20E-01	8.10E+01	0.62	1.00	5.21E+00	2.38E-02	4.32E+01	4.84E+01
Nickel	1.30E+02	1.10E+00	4.40E+00	0.62	1.00	1.61E+00	8.18E-02	2.35E+00	4.04E+00
Selenium	2.00E+00	4.80E-02	9.30E-01	0.62	1.00	2.48E-02	3.57E-03	4.96E-01	5.24E-01
Zinc	1.10E+03	2.10E+01	9.10E+01	0.62	1.00	1.36E+01	1.56E+00	4.85E+01	6.37E+01

Table B-11. Mean Exposure Doses of Short-tailed Shrew to Soil, Vegetation and Invertebrate Ingestion - Outfall 002 Wetland.

Contaminant of Concern	Mean Soil Concentration (mg/kg)	Mean Vegetation Concentration (mg/kg)	Mean Invertebrate Concentration (mg/kg)	Daily Food Intake (kg/kg/day)	Area Use Factor	Mean Soil Dose (mg/kg/day)	Mean Vegetation Dose (mg/kg/day)	Mean Invertebrate Dose (mg/kg/day)	Mean Total Dose (mg/kg/day)
Antimony	0.00E+00	0.00E+00	0.00E+00	0.62	0.70	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium	4.52E+00	1.85E-02	1.25E+00	0.62	0.70	3.92E-02	9.63E-04	4.67E-01	5.07E-01
Copper	3.78E+03	3.65E+00	1.03E+02	0.62	0.70	3.28E+01	1.90E-01	3.84E+01	7.14E+01
Lead	4.54E+02	1.25E-01	2.70E+00	0.62	0.70	3.94E+00	6.51E-03	1.01E+00	4.95E+00
Nickel	4.76E+01	1.33E+00	9.10E-01	0.62	0.70	4.13E-01	6.93E-02	3.40E-01	8.22E-01
Selenium	1.76E+00	7.68E-02	3.25E-01	0.62	0.70	1.53E-02	4.00E-03	1.21E-01	1.41E-01
Zinc	6.86E+02	8.80E+01	7.15E+01	0.62	0.70	5.95E+00	4.58E+00	2.67E+01	3.72E+01

Table B-12. Maximum Exposure Doses of Short-tailed Shrew to Soil, Vegetation and Invertebrate Ingestion - Outfall 002 Wetland.

Contaminant of Concern	Maximum Soil Concentration (mg/kg)	Maximum Vegetation Concentration (mg/kg)	Maximum Invertebrate Concentration (mg/kg)	Daily Food Intake (kg/kg/day)	Area Use Factor	Maximum Soil Dose (mg/kg/day)	Maximum Vegetation Dose (mg/kg/day)	Maximum Invertebrate Dose (mg/kg/day)	Maximum Total Dose (mg/kg/day)
Antimony	0.00E+00	0.00E+00	0.00E+00	0.62	0.70	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Cadmium	6.80E+00	2.90E-02	1.30E+00	0.62	0.70	5.90E-02	1.51E-03	4.85E-01	5.46E-01
Copper	6.70E+03	4.60E+00	1.20E+02	0.62	0.70	5.82E+01	2.40E-01	4.48E+01	1.03E+02
Lead	8.30E+02	1.30E-01	4.00E+00	0.62	0.70	7.20E+00	6.77E-03	1.49E+00	8.70E+00
Nickel	5.90E+01	1.70E+00	1.00E+00	0.62	0.70	5.12E-01	8.85E-02	3.73E-01	9.74E-01
Selenium	2.20E+00	1.40E-01	3.90E-01	0.62	0.70	1.91E-02	7.29E-03	1.46E-01	1.72E-01
Zinc	9.10E+02	1.10E+02	8.60E+01	0.62	0.70	7.90E+00	5.73E+00	3.21E+01	4.57E+01

Table B-13. Exposure Doses of Marsh Wren to Soil and Invertebrate Ingestion - Outer Outfall 001 Wetland.

Contaminant of Concern	Maximum Soil Concentration (mg/kg)	Outfall 001 Invertebrate Concentration (mg/kg)	Daily Food Intake (kg/kg/day)	Area Use Factor	Maximum Soil Dose (mg/kg/day)	Outfall 001 Invertebrate Dose (mg/kg/day)	Outfall 001 Total Dose (mg/kg/day)
Antimony	2.40E+00	0.00E+00	0.67	1.00	3.22E-02	0.00E+00	3.22E-02
Cadmium	4.80E+00	6.50E-01	0.67	1.00	6.43E-02	4.27E-01	4.91E-01
Copper	4.90E+02	2.60E+01	0.67	1.00	6.57E+00	1.71E+01	2.36E+01
Lead	2.60E+02	1.10E+00	0.67	1.00	3.48E+00	7.22E-01	4.21E+00
Nickel	5.00E+01	1.30E+00	0.67	1.00	6.70E-01	8.54E-01	1.52E+00
Selenium	2.00E+00	3.60E-01	0.67	1.00	2.68E-02	2.36E-01	2.63E-01
Zinc	5.30E+02	4.10E+01	0.67	1.00	7.10E+00	2.69E+01	3.40E+01

Table B-14. Exposure Doses of Marsh Wren to Soil and Invertebrate Ingestion - Reference Wetland Area.

Contaminant of Concern	Reference Soil Concentration (mg/kg)	Reference Invertebrate Concentration (mg/kg)	Daily Food Intake (kg/kg/day)	Area Use Factor	Reference Soil Dose (mg/kg/day)	Reference Invertebrate Dose (mg/kg/day)	Reference Total Dose (mg/kg/day)
Antimony	2.00E+00	0.00E+00	0.67	1.00	2.68E-02	0.00E+00	2.68E-02
Cadmium	7.90E-01	4.30E-01	0.67	1.00	1.06E-02	2.82E-01	2.93E-01
Copper	4.20E+01	4.30E+00	0.67	1.00	5.63E-01	2.82E+00	3.39E+00
Lead	2.40E+02	5.10E+00	0.67	1.00	3.22E+00	3.35E+00	6.56E+00
Nickel	8.70E+00	2.90E-01	0.67	1.00	1.17E-01	1.90E-01	3.07E-01
Selenium	1.10E+00	4.40E-01	0.67	1.00	1.47E-02	2.89E-01	3.04E-01
Zinc	4.70E+01	5.10E+01	0.67	1.00	6.30E-01	3.35E+01	3.41E+01

Table B-15. Exposure Doses of Short-tailed Shrew to Soil, Vegetation and Invertebrate Ingestion - Outer Outfall 001 Wetland.

Contaminant of Concern	Maximum Soil Concentration (mg/kg)	Outfall 001 Vegetation Concentration (mg/kg)	Outfall 001 Invertebrate Concentration (mg/kg)	Daily Food Intake (kg/kg/day)	Area Use Factor	Maximum Soil Dose (mg/kg/day)	Outfall 001 Vegetation Dose (mg/kg/day)	Outfall 001 Invertebrate Dose (mg/kg/day)	Outfall 001 Maximum Total Dose (mg/kg/day)
Antimony	2.40E+00	0.00E+00	0.00E+00	0.62	1.00	2.98E-02	0.00E+00	0.00E+00	2.98E-02
Cadmium	4.80E+00	1.40E-01	6.50E-01	0.62	1.00	5.95E-02	1.04E-02	3.47E-01	4.17E-01
Copper	4.90E+02	2.90E+00	2.60E+01	0.62	1.00	6.08E+00	2.16E-01	1.39E+01	2.02E+01
Lead	2.60E+02	5.90E-02	1.10E+00	0.62	1.00	3.22E+00	4.39E-03	5.87E-01	3.81E+00
Nickel	5.00E+01	3.10E-01	1.30E+00	0.62	1.00	6.20E-01	2.31E-02	6.93E-01	1.34E+00
Selenium	2.00E+00	4.10E-02	3.60E-01	0.62	1.00	2.48E-02	3.05E-03	1.92E-01	2.20E-01
Zinc	5.30E+02	1.00E+01	4.10E+01	0.62	1.00	6.57E+00	7.44E-01	2.19E+01	2.92E+01

Table B-16. Exposure Doses of Short-tailed Shrew to Soil, Vegetation and Invertebrate Ingestion - Reference Wetland Area.

Contaminant of Concern	Reference Soil Concentration (mg/kg)	Reference Vegetation Concentration (mg/kg)	Reference Invertebrate Concentration (mg/kg)	Daily Food Intake (kg/kg/day)	Area Use Factor	Reference Soil Dose (mg/kg/day)	Reference Vegetation Dose (mg/kg/day)	Reference Invertebrate Dose (mg/kg/day)	Reference Total Dose (mg/kg/day)
Antimony	2.00E+00	0.00E+00	0.00E+00	0.62	1.00	2.48E-02	0.00E+00	0.00E+00	2.48E-02
Cadmium	7.90E-01	1.40E-02	4.30E-01	0.62	1.00	9.80E-03	1.04E-03	2.29E-01	2.40E-01
Copper	4.20E+01	1.50E+00	4.30E+00	0.62	1.00	5.21E-01	1.12E-01	2.29E+00	2.93E+00
Lead	2.40E+02	7.90E-02	5.10E+00	0.62	1.00	2.98E+00	5.88E-03	2.72E+00	5.70E+00
Nickel	8.70E+00	1.80E-01	2.90E-01	0.62	1.00	1.08E-01	1.34E-02	1.55E-01	2.76E-01
Selenium	1.10E+00	6.90E-02	4.40E-01	0.62	1.00	1.36E-02	5.13E-03	2.35E-01	2.53E-01
Zinc	4.70E+01	7.20E+00	5.10E+01	0.62	1.00	5.83E-01	5.36E-01	2.72E+01	2.83E+01