Prepared for
Nevada Environmental Response Trust

Project Number
21-37300

Prepared by
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Emeryville, California

Date
July 2015

REFINED SCREENING LEVEL ECOLOGICAL RISK ASSESSMENT WORK PLAN, REVISION 2

Nevada Environmental Response Trust Site
Henderson, Nevada

RAMBOLL ENVIRON

Refined Screening Level Ecological Risk Assessment Work Plan, Revision 2

Nevada Environmental Response Trust (Former Tronox LLC Site) Henderson, Nevada

Nevada Environmental Response Trust (Trust) Representative Certification

I certify that this document and all attachments submitted to the Division were prepared at the request of, or under the direction or supervision of the Trust. Based on my own involvement and/or my inquiry of the person or persons who manage the system(s) or those directly responsible for gathering the information or preparing the document, or the immediate supervisor of such person(s), the information submitted and provided herein is, to the best of my knowledge and belief, true, accurate, and complete in all material respects.

Office of the Nevada Environmental Response Trust

Le Petomane XXVII, Inc., not individually, but solely in its representative capacity as the Nevada Environmental Response Trust Trustee

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Date: 7-6-15

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Responsible Certified Environmental Manager (CEM) for this project

I hereby certify that I am responsible for the services described in this document and for the preparation of this document. The services described in this document have been provided in a manner consistent with the current standards of the profession and, to the best of my knowledge, comply with all applicable federal, state and local statutes, regulations and ordinances.

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ACRONYMS AND ABBREVIATIONS

AF	Assimilation Factor
ATSDR	Agency for Toxic Substances and Disease Registry
ATVs	alternative toxicity values
AUF	Area Use Factor
BAF	bioaccumulation factor
BCL	Basic Comparison Level
BERA	baseline ecological risk assessment
bgs	below ground surface
BHRA	baseline health risk assessment
BMI	Black Mountain Industrial
BRC	Basic Remediation Company
BTAG	Biological Technical Assistance Group
CBR	Critical Body Residue
CEM	certified environmental manager
COPEC	chemical of potential ecological concern
CSM	conceptual site model
ECA	excavation control area
Eco-SSL	Ecological Soil Screening Level
ENVIRON	ENVIRON International Corporation
EPC	exposure point concentration
ERA	ecological risk assessment
ERAGS	Ecological Risk Assessment Guidance for Superfund
ESV	ecological screening value
Facility Area	The Site, excluding Parcels C, D, F, G, and H
FOD	Frequency of Detection
GWETS	Groundwater Extraction and Treatment System
HQ	hazard quotient
kg	kilogram(s)
kg/day	kilogram(s) per day
LANL	Los Alamos National Laboratory
LOAEL	lowest observed adverse effect level

mg/kg	milligram(s) per kilogram
mg/L	milligrams per liter
NDEP	Nevada Division of Environmental Protection
NERT	Nevada Environmental Response Trust
NMED	New Mexico Environment Department
NOAA	National Oceanic and Atmospheric Administration
NOAEL	no observed adverse effect level
Northgate	Northgate Environmental Management, Inc.
ORNL	Oak Ridge National Laboratory
PCOPEC	preliminary chemical of potential ecological concern
Ramboll Environ	Ramboll Environ US Corporation
RI	remedial investigation
RI/FS	remedial investigation/feasibility study
SAP	Sampling and Analysis Plan
SFF	site foraging frequency/factor
Site	Nevada Environmental Response Trust (NERT) Site
SLERA	screening-level ecological risk assessment
SMDP	scientific management decision point
SOP	Standard Operating Procedure
SQuiRT	NOAA Screening Quick Reference Tables
TAC	Texas Administrative Code
TCEQ	Texas Commission of Environmental Quality
TDD	total daily dose
Tronox	Tronox LLC
TRV	Toxicity Reference Value
Trust	Nevada Environmental Response Trust
UCL	upper confidence limit
USEPA	United States Environmental Protection Agency
ww	wet weight

1. INTRODUCTION

This refined screening-level ecological risk assessment work plan (refined SLERA Work Plan) has been prepared by Ramboll Environ US Corporation[1] (Ramboll Environ) on behalf of the Nevada Environmental Response Trust (the Trust or NERT) for the NERT Site (the Site) located in Henderson, Nevada (Figures 1-1, 1-2, and 1-3). The refined SLERA will be conducted as part of the Remedial Investigation/Feasibility Study (RI/FS) for the Site and will be performed to evaluate whether current Site conditions pose a potential risk to ecological receptors at the Site and surrounding areas. This refined SLERA Work Plan defines the approach to be used in the risk assessment including the steps involved in the refined SLERA and elements necessary to move the refined SLERA forward.

1.1 Overview

The Site comprises approximately 346 acres[2] located within the Black Mountain Industrial (BMI) Complex in unincorporated Clark County and is surrounded by the City of Henderson, Nevada (Figure 1-1 and 1-2). The Site has been the location of industrial operations since 1942 when it was developed by the U.S. government as a magnesium plant to support World War II operations. Following the war, the Site continued to be the location of industrial activities, including production of perchlorates, boron, and manganese compounds. Former industrial and waste management activities conducted at the Site, as well as those conducted at adjacent properties, resulted in contamination of environmental media, including soil, groundwater, and surface water. The layout of the facility and Site features is illustrated in Figure 1-3.

The Site has been the subject of numerous regulatory actions and environmental investigations since the early 1970s. For a chronological summary of investigations and remedial activities conducted prior to 2005 the reader is directed to Section 3.1 of the RI/FS Work Plan (ENVIRON 2014a). The RI/FS Work Plan also provides a detailed description of the operational history, physical setting, climate, geology and hydrogeology, and surface water at the Site.

1.2 Refined SLERA Objectives and Approach

The objectives of the refined SLERA are as follows:

- Assess whether chemicals at the Site have the potential to pose risks to ecological resources
- Anticipate where and when such risks are most likely to occur
- Determine the types and magnitudes of effects

The information obtained through the refined SLERA can then be used to help inform and focus mitigation strategies, or to help quantify trade-offs and ecological costs and benefits among alternative response actions.

The refined SLERA will be conducted consistent with the following key United States Environmental Protection Agency (USEPA) ecological risk assessment (ERA) guidance documents:

- Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments (ERAGS) (USEPA 1997)

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[1] On 1 May 2015, ENVIRON officially joined the Ramboll Global Practice Environment & Health and Global Practice Water. Ramboll and ENVIRON have integrated their Environment & Health services into a new Global Practice.
[2] Following the sale of Parcels A and B in December 2013 to TRECO, LLC, the Site comprises approximately 346 acres.

- Guidelines for Ecological Risk Assessment (USEPA 1998)
- Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities (USEPA 1999)
- ECO-Update: Role of Screening-level Risk Assessments and Refining Contaminants of Concern in Baseline Ecological Risk Assessments. USEPA. 2001a[3]. http://www.epa.gov/oswer/riskassessment/ecoup/pdf/slera0601.pdf.
- Region 4 Ecological Risk Assessment Bulletins - Supplement to RAGS. USEPA. 2001b[4]. http://www.epa.gov/region4/waste/ots/ecolbul.htm.
- Nevada Division of Environmental Protection (NDEP) guidance: Screening Level Ecological Risk Assessment Guidelines for the BMI Complex, Henderson, Nevada (NDEP 2006).

A typical SLERA consists of Steps 1 and 2 of USEPA's eight-step ERA process (listed below). The refined SLERA approach described herein includes the addition of Step 3a which is the initial step of the baseline ERA (BERA) (USEPA 1997) (Figures 1-4 and 1-5). Step 3a refines the exposure estimates and risk characterization developed in Step 2, focusing on specific constituents of potential ecological concern (COPECs) that progress beyond the SLERA. Each of these steps is detailed in subsequent sections of this work plan.

Step 1: Screening-Level Problem Formulation and Ecological Effects Evaluation

Step 2: Screening-Level Preliminary Exposure Estimate and Risk Calculation

Step 3a: Refinement of Step 2 – SLERA Exposure Estimates and Risk Calculations

Step 3b: Refinement of Measurement Endpoints for the BERA

Step 4: Study Design and Data Quality Objectives Process

Step 5: Verification of Field Sampling Design

Step 6: Site Investigation and Data Analysis

Step 7: Risk Characterization

Step 8: Risk Management

This refined SLERA Work Plan only addresses Steps 1, 2 and 3a identified above. The screening and refinement steps are detailed in Section 1.2.1. The USEPA process requires scientific management decision points (SMDPs) following certain steps, as shown on Figure 1-4. The SMDPs represent critical steps in the ERA process where multiple stakeholders' input and decision-making can occur. The following types of decisions are typically considered at a SMDP:

- Whether the available information is adequate to conclude that the Site does not pose an unacceptable ecological risk, and, therefore, that there is no need for further action on the basis of ecological risk.
- Whether the available information is not adequate to make a decision, whereupon the ERA process should continue.

[3] USEPA 2001a has been developed based on the Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments, Interim Final (USEPA 1997).

[4] The 2001b Region 4 Ecological Risk Assessment Bulletins - Supplement to RAGS supersedes the November 1995 version.

- Whether the available information indicates a potential for an adverse ecological effect, and a more thorough assessment or remediation is warranted.

1.2.1 Ecological Risk Scenarios

A tiered approach will be used in the refined SLERA that includes “screening” and “refined” scenarios to evaluate the range of potential risks. The screening steps (Steps 1 - 2) are conservative analyses designed to examine potential risks in an overly protective fashion. Conservative risk values and assumptions (for instance, that animals spend 100% of their entire lives in the location with the single highest concentration) will be used in the screening steps. The refined scenario (Step 3a) considers more Site-specific conditions, and is only necessary for those constituents that could not be ruled out in the screening scenario. Therefore, although still conservative and protective, the refined scenario presents a more realistic conservative assessment of potential ecological risks than the screening scenario; as such, it is more useful for the purpose of informing risk management decisions related to ecological risks at the Site.

1.2.1.1 ERA Process for Steps 1 – 3a

This refined SLERA Work Plan has been designed to evaluate potential risk to ecological receptors exposed to chemicals at the Site using highly conservative risk estimates and incorporating uncertainty in a precautionary (i.e., conservative) manner. The purpose of the SLERA (Steps 1 - 2) is to either determine that there is a high probability of no ecologically significant risk, or to identify a need to proceed to Step 3a to conduct further evaluation (USEPA 1997). The remainder of this refined SLERA Work Plan describes in detail the specific elements of Steps 1 through 3a as they will be implemented for the Site. The SMDP following Step 3a will identify the need, if any, to proceed to later steps of the ERA process (e.g., Steps 3b through Step 8) (Figure 1-4). If such steps are necessary, and if directed by NDEP, a separate Work Plan will detail the path forward, including additional sampling that may be required.

The screening scenario (Steps 1 - 2) involves the following assumptions:

- The maximum concentrations in the abiotic media will be used to quantify risk to ecological receptors. Therefore, the receptors of concern will be assumed to be exposed to only the maximum concentrations at the Site, rather than the actual range of concentrations.
- Conservative ecological screening values (ESVs) will be used. The receptors of concern will be assumed to be as sensitive to the constituents as the most sensitive organisms.
- It will be assumed that the ecological receptors spend their entire life within the Site boundaries where the maximum concentration was detected, even if that area contains no habitat for that particular receptor.

The refined scenario (Step 3a) involves the following assumptions:

- The concentrations in the refined scenario will consider the 95 percent upper confidence limit of the mean (95 UCL) and the average concentrations as conservative, yet more realistic measurements of how the receptors are actually exposed to COPECs.
- Exposure concentrations may be generated by looking at different portions of the Site. This allows the ERA to consider how the receptors are actually exposed in a particular area and if habitat for those receptors actually exists in that area.

- A range of screening values for abiotic media, as well as toxicity values will be used. This considers a broader array of potential effects on the receptors.
- The food web model may consider the amount of time that a receptor would realistically be on the Site. This incorporates receptor-specific information about how their home ranges may overlap with the Site and whether or not they may migrate out of the area for part of the year.

Based on a Site reconnaissance by a certified biologist that was conducted on December 10 - 11, 2014, there is little or no habitat on the Site that provides nesting or foraging opportunities for wildlife. Without habitat to attract wildlife there is unlikely to be a significant pathway from the source of chemicals to the wildlife receptors of interest. However, because wildlife has been observed infrequently at the Site, it is considered prudent to conduct a focused evaluation (refined SLERA) using the following proposed approach:

- Evaluate a refined list of chemicals that represent the most toxic and/or bioaccumulative chemicals at the Site.
- Evaluate the most sensitive wildlife receptors first. These would include those animals that directly ingest soil while foraging, such as animals foraging for soil invertebrates.
- Evaluate the data by looking at central tendency estimates for the Site as a whole, and then evaluate specific exposure areas where a receptor might be found

1.2.1.2 ERA Process for Steps 3b - 8

This section identifies the general elements of Steps 3b through Step 8. Should these steps be needed and implemented in later stages of the risk assessment process, Site-specific work plans and other documents would be developed consistent with the USEPA process, as appropriate (Figure 1-4), and budget approvals would be obtained from NDEP to perform the work.

Step 3b (BERA Problem Formulation – Refinement of Measurement Endpoints for the BERA) outlines the assessment endpoints, the exposure pathways, the risk questions, and the conceptual model integrating these components (USEPA 1997). This step sets the scientific framework for hypothesis-testing in the ERA process.

Step 4 of the ERA Process (Study Design and Data Quality Objectives Process) is to design a field study that will answer the appropriate risk questions posed in the baseline problem formulation (Step 3b). The most important component of Step 4 is to identify appropriate assessment and measurement endpoints. The products of Step 4 are the Work Plan and Sampling and Analysis Plan (SAP) for the ecological component of field investigations (USEPA 1997).

Step 5 of the ERA Process (Verification of Field Sampling Design) is designed to verify that the samples specified in the Work Plan and SAP can actually be collected, and that the field SAP is appropriate and implementable at the Site. By verifying the field sampling plan prior to conducting the full Site investigation, alterations can be made to the study design and/or its implementation as necessary. Such changes will ensure that the ERA meets the study objectives (USEPA 1997).

Step 6 of the ERA Process (Site Investigation and Data Analysis) consists of implementation of the study designed in Step 4 and verified in Step 5. In instances where unexpected conditions arise in the field that indicate a need to alter the study design, the ecological risk assessor would reevaluate the feasibility or adequacy of the sampling design in this step.

Site-specific data obtained during Step 6 replace assumptions that were made for the screening-level analysis in Steps 1 and 2. The results of Step 6 are used to characterize ecological risks in Step 7 (USEPA 1997).

Step 7 of the ERA Process (Risk Characterization) integrates exposure data and effects data into a statement about risk to the assessment endpoints established during problem formulation. A weight-of-evidence approach is used to interpret the implications of different studies or tests for the assessment endpoints. Step 7 consists of risk estimation and risk description, which together provide information to help judge the ecological significance of risk estimates in the absence of remedial activities. The risk description also identifies a threshold for effects on the assessment endpoint as a range between contamination levels identified as posing no ecological risk and the lowest contamination levels identified as likely to produce adverse ecological effects (USEPA 1997).

Step 8 of the ERA Process (Risk Management) involves balancing risk reductions associated with cleanup of contaminants with potential impacts of the remedial actions themselves. The risk management decision should be designed to minimize the risk of long-term impacts that could result from the remedy and any residual contamination (USEPA 1997).

1.3 Work Plan Organization

The remainder of this refined SLERA Work Plan is organized as follows:

- Section 2.0 – Step 1: Screening-Level Problem Formulation and Ecological Effects Evaluation.
- Section 3.0 – Step 2: Screening-Level Exposure Estimate and Risk Calculation.
- Section 4.0 – Step 3a: Refinement of SLERA Step 2 – Exposure Estimates and Risk Calculations
- Section 5.0 – References

2. STEP 1: SCREENING-LEVEL PROBLEM FORMULATION AND ECOLOGICAL EFFECTS EVALUATION

The objective of Step 1 is to determine if viable ecological habitat exists for ecological receptors to have direct exposure or food chain exposure to Site-related chemicals. In this step, the environmental surroundings, receptor species/assemblages, habitat/cover types, and relevant environmental and biotic transfer mechanisms at the Site are evaluated and described. This section includes an ecological habitat characterization that is based on a compilation of existing information (e.g., Site history, maps, aerial photographs, natural resource databases) and Site reconnaissance findings to identify wildlife and vegetative communities at the Site. The screening-level problem formulation part of Step 1 is presented in Section 2.1, and the screening-level ecological effects evaluation part of Step 1 is presented in Section 2.2.

2.1 Screening-Level Problem Formulation

The overall purpose of the screening-level problem formulation is to describe the environmental setting at and adjacent to the Site and to provide a preliminary evaluation of ecological exposure pathways and assessment endpoints. The screening-level problem formulation provides the framework for the screening step and the methods for analyzing/characterizing risks (USEPA 1998).

The screening-level problem formulation produces two outputs: 1) assessment endpoints that reflect the management and ecosystem attributes the endpoints are meant to protect; and 2) an ecological conceptual site model (CSM) that describes the relationships between stressors and the assessment endpoints.

2.1.1 Environmental Setting

This section describes the regional and local ecology in and around the Site.

2.1.1.1 Regional Ecology

Figures 2-1 and 2-2 illustrate the regional ecosystem distribution and the predominant ecosystem types in the vicinity of the Site, respectively. Figure 2-3 illustrates the distribution of vegetation in Clark County and the extent of urbanization in the vicinity of the Site. The ecosystem type in this region of southern Nevada is Mojave Desert scrub (Clark County Department of Comprehensive Planning 2000). The Mojave Desert scrub ecosystem includes creosote-bursage and Mojave mixed scrub vegetation communities, invasive, transitional grasslands, as well as large tracts of urban development; and small areas of barren land; and agricultural development.

The USEPA ecological checklist that was completed during the Site reconnaissance conducted on December 10-11, 2014 is provided in Appendix A. A photographic log of the Site and surroundings is provided in Appendix B. The checklist includes the following types of information:

- Site operations relevant to potential ecological risk (i.e. impacted soil, current and former process ponds, retention ponds, etc.)
- Land use / topography / impacted versus unimpacted areas
- Habitats, vegetation types and biological communities
- Surface water features (if any) including lakes, ponds, streams, wetlands, etc. and the potential presence of benthic invertebrates
- The wildlife community (fish, birds, mammals that may be present in the vicinity of the Site)
- Ecologically sensitive areas

The Site is located in a very arid region with few natural surface water bodies. The only surface water present at the Site is located in impoundments receiving process water and extracted groundwater. During the 2011 interim soil removal action, the Facility Area[5] was graded such that storm water would be retained on the Site. Due to existing roads, utility berms, and other Site features, many areas at the Site have inward grades which keep storm water from flowing off Site. Based on the surface areas and soil types, significant ponding is not expected to occur in these areas outside of major storm events. In addition, two main designated retention basins and a drainage channel were constructed within the Facility Area to collect storm water. The retention basins are typically dry, except after storm events (which are infrequent in this region).

The Site is traversed (from west to east) by a drainage ditch formerly known as the Beta Ditch that historically conveyed liquid wastes from the Site and from neighboring facilities. At the completion of the 2011 interim soil removal action, the former Beta Ditch was re-graded, channelized, and now includes a retention basin (ENVIRON 2014a). The west end of the former Beta Ditch at the Site may continue to receive storm water drainage from the neighboring property to the west. These Site features are shown in Figure 1-3.

Five lined ponds on the Site (known as WC-West, WC-East, AP-5, Mn-1, and Mn-2) contain process-related sludge and/or water from ongoing Tronox facility operations, and an additional lined pond (GW-11) receives extracted groundwater from remediation activities. The lined holding ponds are permitted through NDEP's Bureau of Water Pollution Control. Because the holding ponds (1) are permitted as part of Site operations and (2) do not discharge to groundwater that resurfaces to a surface water body, they are not included as potential exposure media in the refined SLERA (TAC 2014). Retention basins that capture storm water are inundated only during large storm events and for very brief periods throughout the year. . There are no other surface water features on the Site. Therefore, surface soil is the only potential exposure media at the Site.

A primary focus of the RI/FS[6] is associated with impacted groundwater discharges from the Site to surface water at Las Vegas Wash, which empties into Lake Mead. The NERT Groundwater Extraction and Treatment System (GWETS) includes pumping of impacted groundwater from three extraction well fields to mitigate this exposure pathway. The Las Vegas Water District reports the amount of perchlorate entering Las Vegas Wash has been reduced by approximately 90 percent with the operation of extraction wells by NERT and other neighboring facilities (Las Vegas Water District 2012). Following aquifer restoration (a Remedial Action Objective of the RI/FS), the Trust will conduct an ERA for impacted areas downgradient of the Facility Area (which includes Las Vegas Wash), as requested by NDEP in comments on the 2012 RI/FS Work Plan (NDEP 2013) and as stated in the October 2013 Regional Groundwater Goals and Directives (NDEP 2014). Therefore, the Las Vegas Wash will not be included in the refined SLERA being described here.

2.1.2 Ecological Exposure Media at the Site

In risk assessment, ecologically relevant media typically include surface water, sediment (i.e., the upper six inches), and surface soil (i.e., the upper foot of the soil column) where the vast majority of biological activity occurs (TCEQ 2014). Subsurface soil and groundwater (at depth) are not relevant media for the purposes of an ERA due to the paucity of ecological receptors that have contact with these media.

The maximum concentration of each chemical from the 0 to 1 foot interval, which includes the 0 to 6 inch interval, will be used in the screening. For chemicals that exceed the screening criteria,

[5] The term "Facility Area" represents the portion of the Site excluding Parcels C, D, F, G, and H.

[6] The RI/FS Work Plan, Revision 2 was approved by NDEP on July 2, 2014, NDEP has approved the budget and the RI is being implemented.

attention will be given to the spatial distribution of the chemical at the Site, including the depth interval.

Groundwater becomes relevant in the ERA at the groundwater and surface water transition zone (i.e., the interface; USEPA 2008). As discussed in Section 2.1.1 surface water and solids in holding ponds are not included as part of the refined SLERA because the surface water bodies on Site are operated under the purview of permits issued through NDEP. Therefore, surface soils are the only exposure media that will evaluated in the refined SLERA.

2.1.3 Preliminary Chemicals of Potential Ecological Concern

Preliminary chemicals of potential ecological concern (PCOPECs) are defined as any chemical that was used or manufactured on the Site. PCOPECs are distinguished from COPECs which are the chemicals that will be carried into the screening step and through the refined SLERA. The chemical classes that have been detected in soil that will be evaluated in the SLERA are shown in Table 2-1. Over 500 individual chemicals have been analyzed at the Site.

The current list of PCOPECs at the Site, includes a broad suite of analytes based on Site characterization conducted to date. However, in order to ensure that the risk assessment focuses on those chemicals that contribute the greatest to the overall risk, procedures will be used to identify COPECs for quantitative evaluation in the refined SLERA:

- Identification of chemicals for which Site concentrations are greater than background concentrations (applicable to metals and radionuclides)
- The background data set for the Site is the RZ-A analytical results for soils from 0.5-2 ft and 10-11.5 ft, consistent with the background data set identified in the NDEP-approved BHRA work plan (ENVIRON 2014a). A detailed discussion of this data set is presented in the "*Revised Technical Leaching Memorandum*" (Northgate 2010) and in the "*Preliminary Selection of Facility Area Soil COPCs*" (Ramboll Environ 2015).
- The Q-Q plots presented in the "*Preliminary Selection Facility Area Soil COPCs*" indicate that the background data set represents a single population such that this data set (i.e., including both depth intervals) is appropriate to use for the background evaluation of the 0-1 ft depth interval, thus providing a larger, more robust data set for the analysis[7] (Ramboll Environ 2015). Metals identified as being consistent with background will be excluded as COPECs. Finally, all metals (or other reported elements) for which a background data set is not available will be carried through to the next step of the COPEC selection process.
- Identification of chemicals that exhibit known or potential hot spots
- A "hotspot" represents a discrete area where concentrations of one or more COPECs is statistically significantly greater than the area surrounding it. A comprehensive analysis for "outliers" which may indicate potential hotspots for spatial analysis was conducted for the Site and is provided in the "*Preliminary Selection of Facility Area Soil COPCs"* (Ramboll Environ 2015). Side-by-side box-and-whisker plots were used to provide a visual comparison between various datasets. Data points above and below the whiskers are considered potential outliers from the distribution. These "outliers" may indicate potential hotspots for spatial analysis. This "outlier" analysis will be considered in the refined SLERA consistent with the use of this information in the BHRA.

[7] As noted in the COPC selection report, the RZ-A background data set for some metals appears to include "outliers." The background data set used in the SLERA will be consistent with that used for the human health risk assessment, following further discussion with NDEP.

The Refined SLERA Report will contain documentation for all PCOPECs not carried forward in the evaluation and the justification for elimination of each PCOPEC.

2.1.3.1 Refined SLERA Data Set and Data Evaluation

Similar to the approach for the Baseline Health Risk Assessment (BHRA) for the NERT Site (ENVIRON 2014b), the refined SLERA will use existing data from previous and ongoing Site investigations. While the available data for surface and near-surface soils is more limited for areas excavated during the soil removal action (i.e., many soils with concentrations greater than Basic Comparison Levels (BCLs)[8] were excavated and removed), this issue has been discussed with NDEP and NDEP has agreed that additional samples would not be collected in these areas. The data from the RI data gap field investigation currently being implemented in accordance with the NDEP-approved RI/FS Work Plan, Revision 2 (ENVIRON 2014a), and Sampling and Analysis Plan, Revision 1 (ENVIRON 2014c) will also be used in the refined SLERA. No additional field sampling is planned for the Site.

Soil Data

The data set to be used in the refined SLERA includes soil samples representing the interval of 0 – 0.5 ft below ground surface (bgs) and 0 – 1.0 ft bgs. Table 2-2 summarizes the number of sampling locations for each of these soil horizons. Soil samples from areas inside and outside of the excavation control areas (ECAs) will be included in the ERA as appropriate. ECAs are areas that could not be accessed or which were not completely remediated. Some locations may be excluded if a particular location is inaccessible to wildlife as described in Section 2.1.5

For those PCOPECs that are not detected, one-half of the sample quantitation limits will be used in the screening evaluation. If ESVs are below the detection limit for a particular PCOPEC then the chemical will be retained for further evaluation in the risk assessment process.

Data Usability

The primary objective of the data usability evaluation is to identify appropriate data for use in the SLERA. Ramboll Environ will adopt the methodology described in the BHRA Work Plan (ENVIRON 2014b) for this evaluation. All relevant Site characterization data will be evaluated in accordance with the NDEP *Supplemental Guidance for Assessing Data Usability for Environmental Investigations at the BMI Facility in Henderson, NV* (NDEP 2010), which is based on USEPA's *Guidance for Data Usability in Risk Assessment* (Parts A and B) (USEPA 1992a,b). Following additional statistical review and spatial analysis of the data, the Site may be divided into subareas. The data usability evaluation will be conducted separately for each subarea.

Data Handling

For samples with primary and field duplicate results, both samples will be treated as independent samples and both will be included in all data analyses, regardless of whether one or both are not detected. This is considered appropriate because field duplicate samples represent a discrete and unique measurement of soil chemical conditions proximal to the primary sample (unlike split samples). According to NDEP (2006), this approach is appropriate if the variation between field duplicates and their primary samples does not appear very different than the variation between samples in a given area or exposure unit. The field duplicates will be compared to the primary sample during the course of data validation and a determination will be made regarding whether

[8] NDEP Basic Comparison Levels (BCLs) address common human health exposure pathways. The comparison of site characterization data against these concentrations provides for an initial screening evaluation to assist users in risk assessment components such as the evaluation of data usability, determination of extent of contamination, identification of chemicals of potential concern, and identification of preliminary remediation goals.

it is reasonable to treat field duplicates as independent samples consistent with NDEP guidance (NDEP 2006).

2.1.3.2 Evaluation of Site Concentrations Relative to Background Conditions

Some chemicals (particularly naturally-occurring metals) may be present in environmental media but unrelated to Site releases. Background chemicals fall into two broad categories: those that are naturally occurring and those that are present due to anthropogenic sources (USEPA 2001a). Metals often occur naturally in soil and geological formations. Weathering and dissolution of underlying soil may be a means of transporting these chemicals into media. Background chemicals may come from a variety of anthropogenic sources such as road runoff, atmospheric deposition, washout by rainfall (or precipitation scavenging), and surface flow of chemicals from upstream sources unrelated to activities at the Site.

USEPA (1989, 1992a,b) guidance allows for the elimination of chemicals from further quantitative evaluation if detected levels are not elevated above naturally occurring levels. Typically, for purposes of selecting COPECs for risk assessment, COPECs are defined as chemicals that are elevated above naturally occurring levels based on statistical analyses. Generally, this approach is applicable to metals and radionuclides, although USEPA has identified other classes of chemicals for which background evaluations may be useful (USEPA 1989). For the purpose of selecting COPECs for the Site, appropriate statistical methods will be employed as the basis for elimination decisions (NDEP 2006).

The comparison of Site-related soil concentrations to background levels will be conducted using the existing soils background data sets presented in the *Background Shallow Soil Summary Report,* BMI *Complex and Common Area Vicinity* (BRC and TIMET 2007), which includes the ENVIRON (2003) dataset and the BRC/TIMET dataset collected in 2005, and the *Deep Background Summary Report, BMI Complex and Common Area Vicinity* (BRC, 2009). Comparisons have been performed in the context of the previously defined Remediation Zones (RZs A through D), for which RZ-A has been assumed to represent local background for the NERT Site (Figure 2-4). The RZ-A data set was used for metals background analysis for Parcels C, D, F, G, and H (Northgate 2014). The results of the comparison to background were provided in an interim report submitted to NDEP in May 2015 (Ramboll Environ 2015). Specifically, the RZ-A data set was used for background and the analysis included summary statistics, boxplots, Quantile (Q-Q) plots, and hypothesis testing[9]. . Consistent with NDEP guidance, if the statistical analyses indicate that a particular chemical is within background levels, then the chemical will not be identified as a COPEC.

For radionuclides, if approximate secular equilibrium is exhibited in an isotope decay chain, then background comparisons were performed to confirm if all the radionuclides in a decay chain were similar to background. The radionuclides that are greater than background will be carried forward in the risk assessment. If they are not greater than background, then they will not be identified as COPECs and will not be quantitatively evaluated in the risk assessment. If secular equilibrium is not exhibited, then background comparisons will be performed for each radionuclide separately and individual radionuclides will be selected as COPECs depending on the outcome of the background comparisons.

2.1.4 Description of Potentially Exposed Receptors

The identification of the categories of receptors most likely affected by Site activities helps focus the refined SLERA. The Site reconnaissance provides information on potential wildlife and habitats present on the Site. The Clark County, Nevada Species Account Manual provides information on Clark County's Multiple Species Habitat Conservation Plan and summarizes the

[9] Metals for the refined SLERA have not been screened for background pending NDEP review/approval of the submitted background analysis.

appearance, occurrence, life histories and habitat preferences of a wide variety of species within Clark County, Nevada. Information from these documents, and the Site reconnaissance, was used to identify potentially exposed receptors.

The United States Fish and Wildlife Service and the Nevada Division of Environmental Protection (NDEP) are the federal and state agencies, respectively, responsible for monitoring and managing at-risk and protected species. Species with threatened or endangered listing status in Clark County are provided in Table 2-3. Based on the December 2014 Site reconnaissance, there is no critical habitat on or in the immediate vicinity surrounding the Site[10].

2.1.5 Identification of Potentially Complete Exposure Pathways

A complete exposure pathway is one in which chemicals can be traced or expected to travel from the source to a receptor (USEPA 1997). The CSM is intended to provide a clear description of how ecological receptors may come into contact with Site-related constituents via release mechanisms and exposure to soil and/or associated food items. The CSM identifies the ecological receptors that will be evaluated in the ERA. A preliminary ecological CSM is provided in Figure 2-5.

A complete exposure pathway has five parts:

1. A source of chemical constituents
2. An environmental medium and transport mechanism (such as runoff or groundwater discharge)
3. A point of exposure (lake or stream)
4. A route of exposure (such as a receptor touching, drinking, or eating contaminated sediment)
5. A population of receptors (such as a community of benthic invertebrates).

The exposure pathway is complete and potentially capable of causing unacceptable risks only when all five parts are present.

The CSM for the Site identifies contaminant sources, release mechanisms, exposure media, exposure routes, and receptors and is based on a current understanding of on-Site and off-Site environmental conditions. This information will be used as necessary to understand potential ecological exposure pathways. As described in the BHRA work plan, NDEP previously identified 70 source areas (or areas for further investigation) which included areas that are currently used for chemical production, areas that are no longer active, and/or areas where surface soil contamination has previously been addressed.11 Historical releases from potential source areas have been documented or inferred from field investigations that have identified chemically impacted soils, and other media. Potentially complete exposure pathways from soil for each receptor group is identified in the CSM (Figure 2-5).

The following are possible complete exposure pathways that will be explored in the refined SLERA:

- Direct contact of terrestrial invertebrates to COPECs in surface soil
- Root uptake of surface soil COPECs by terrestrial plants

[10] Critical habitat is a term defined and used in the Endangered Species Act (ESA). It is a specific geographic area that contains features essential to the conservation of an endangered or threatened species and that may require special management and protection (USFWS 2014).

[11] NDEP identified 69 areas in 1994; an additional area, the US Vanadium site was identified later and is referred to as #70.

- Exposure of terrestrial birds and mammals to chemicals through the incidental ingestion of soil and ingestion of food items (i.e. food chain uptake).

Areas of the Site considered to be inaccessible or highly unlikely to attract wildlife will not be considered in the refined SLERA as there would be no complete exposure pathway from source to receptor in these locations. Many of the ECAs represent such areas. Most of the ECAs are in the interior of the Site, and contain no significant attractive features for wildlife (many have operational structures or paved areas) and therefore wildlife would not generally forage or nest there. ECAs in former Remediation Zones B and C (RZ-B and RZ-C, respectively) fall into this category (See Appendix B-3[12]). Those ECAs that are at or near the boundary of the Site and have vegetation or other features that are potentially attractive to wildlife will be considered in the refined SLERA. Figure 2-6 illustrates where the ECAs are located. Because RZ-D is adjacent to Parcels C, D, and E that contain scrub vegetation, ECAs in RZ-D will be considered in the refined SLERA, as appropriate.

2.1.6 Identification of Generic Assessment and Measurement Endpoints

Ecological risk endpoints define ecological attributes that are to be protected (assessment endpoints) and measurable characteristics of those attributes (measurement endpoints). Assessment endpoints most often relate to attributes of biological populations or communities and focus the risk assessment on particular components of the ecosystem that are potentially at risk (USEPA 1997; 2003). Assessment endpoints describe an entity (e.g., fish-eating birds) and an attribute of that entity (e.g., survival rate). A measurement endpoint is a measurable ecological characteristic and/or response to a stressor and provides a method of quantifying potential effects on the receptors potentially at risk (USEPA 1998).

Because of the complexity of natural systems, it is generally not possible to directly assess the potential impacts to all ecological receptors present within an area. Therefore, receptor species (e.g., bald eagle) or species groups (e.g., fish) are often selected as surrogates to evaluate potential risks to larger components of the ecological community, or guilds (e.g., piscivorous birds), represented in the assessment endpoints (e.g., survival and reproduction of piscivorous birds).

Appropriate assessment endpoints for the refined SLERA include those receptors that may be affected by Site-related constituents and for which complete exposure pathways exist. A complete exposure pathway is one in which a contaminant passes through an ecosystem from the source to the receptor. The attributes of a “complete exposure pathway” are described in Section 2.1.6. Ecological receptors are selected for their potential exposure, ecological significance, economic importance, societal relevance, or cultural significance.

The assessment and associated measurement endpoints being considered for the refined SLERA are as follows:

- **Terrestrial assessment endpoint 1**: Survival and reproductive ability of indigenous terrestrial plant communities at the Site.
  - Measure of potential effect—Comparison of soil concentrations against terrestrial plant screening values available in the literature.
- **Terrestrial assessment endpoint 2**: Survival and reproductive ability of terrestrial invertebrate communities at the Site.

[12] The photos in Appendix B-3 focus on areas covered in dirt to illustrate the lack of habitat in these ECAs. There are many ECAs that are also covered in pavement or have structures that are not in the photolog as these are areas that are obviously devoid of wildlife.

  - Measure of potential effect—Comparison of soil concentrations against terrestrial invertebrate screening values available in the literature.

- **Terrestrial assessment endpoint 3**: Survival and reproductive ability of terrestrial bird populations at the Site.
  - Measure of potential effect—Comparison of calculated total daily dose (TDD) for birds from ingestion of terrestrial food items and abiotic media against constituent-specific toxicity reference values (TRVs) in a food web model. Radionuclides will be evaluated based on external exposure to soil and internal exposure from the uptake of radionuclides in food and water, and ingestion of soil

- **Terrestrial assessment endpoint 4**: Survival and reproductive ability of terrestrial mammal populations at the Site.
  - Measure of potential effect—Comparison of calculated TDD for mammals from ingestion of terrestrial food items and abiotic media against constituent-specific TRVs in a food web model. Radionuclides will be evaluated based on external exposure to soil and internal exposure from the uptake of radionuclides in food and water, and ingestion of soil

As described by Barnthouse et al. (2008), "regulations, policies, directives, and guidance documents frequently discuss the need for ecological risk assessments to consider risks to populations, not simply to individual organisms or organism-level attributes. The reason for this [need] is that, from a management perspective, the population-level attributes such as abundance, persistence, age composition, and genetic diversity are usually more relevant than are the health or persistence of individual organisms."

The assessment endpoints listed above consider attributes that are tied to population-level abundance and persistence, in that they consider both survival and reproduction. Decreased survival will result in smaller numbers of individuals, decreasing the population of that receptor. Similarly, decreased reproduction can result in smaller numbers of individuals over time, also decreasing the population of that receptor. Decreased growth of individuals, on the other hand, is not directly related to population-level effects. Consequently, ecotoxicological studies on growth endpoints cannot be tied to population-level impacts.

The analysis for special status species (including federally listed threatened and endangered species) is performed on an individual level, as even a single individual comprises a larger percentage of those populations at risk. While there is no critical habitat at the Site and no record of special status species being observed at or in the immediate vicinity of the Site, the assessment of risks to single special status individuals will be qualitatively considered as part of the narrative of the refined SLERA.

2.2 Screening-Level Ecological Effects Evaluation

The screening-level ecological effects evaluation involves the identification of appropriate ESVs for the media being evaluated at a Site. ESVs are available from a broad range of federal and state sources, one or more of which may be relevant to any given site. Further, ESVs for some media and receptors may not be available from each source; thus, consideration of a range of sources provides greater opportunity for identification of ESVs.

The soil ESVs will be assembled once the soil data (including that collected during the RI) has been evaluated. These criteria are intended to ensure protection of terrestrial organisms including plants and soil invertebrates.

An ESV will be identified for any chemical detected in surface soil at the Site from the following sources.

- LANLECORISK Database http://www.lanl.gov/community-environment/environmental-stewardship/protection/eco-risk-assessment.php.
- USEPA Ecological Soil Screening Levels (Eco-SSLs) (2007): The Eco-SSLs are based on a variety of studies that consider effects at multiple levels of the food web.
- USEPA Region 4 (2001b): This source comprises a USEPA compilation of criteria from many sources, similar to USEPA Region 5 (below).
- USEPA Region 5 (2003c): Like the Region 4 ESVs, this source of criteria is a USEPA compilation of criteria from many sources. Region 5 often has criteria where other sources are lacking.
- USEPA Eco-SSL plant-based and soil invertebrate-based values (http://www.epa.gov/ecotox/ecossl/; USEPA 2007a, b, c)
- Oak Ridge National Laboratory (ORNL) terrestrial plant and invertebrate (earthworm) screening values (Efroymson, et al. 1997a, 1997b). Values for soil microorganisms and microbial processes (Efroymson et al. 1997b) will be used in cases when earthworm-based values are not available.
- The primary criteria sources listed above (i.e., LANL, Eco-SSLs, USEPA Region 4, and USEPA Region 5) may not have ESVs for every chemical that will be detected in surface soil at the Site. As such, secondary sources of criteria, such as the following, will be used as necessary:
- USEPA (1999) Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities: Appendix E, Toxicity Reference Values
- The USEPA's ECOTOX database (USEPA 2009)
- Oak Ridge National Laboratory's (ORNL's) Risk Assessment Information System database (ORNL 2009)
- Agency for Toxic Substances and Disease Registry's (ATSDR's) toxicological profiles database (ATSDR 2009)
- National Oceanic and Atmospheric Administration (NOAA) Screening Quick Reference Tables (SQuiRT) (NOAA 2008)

Secondary sources typically are less rigorous and/or less applicable than primary sources. For example, the secondary values could be derived using fewer toxicity studies representing fewer species than are used to derive the primary values (Suter and Tsao 1996). Nevertheless, they do represent available data that are relevant for a refined SLERA and for obscure or rarely detected chemicals; secondary sources present a readily available option for application in the refined SLERA.

Chemicals that lack an ESV from a primary criteria source and for which a secondary source could not be identified will be retained as COPECs and further evaluated in the next step of the ERA process.

The radionuclide contaminants being screened in the Refined SLERA will be evaluated based on a comparison of concentrations of radionuclides in soil compared to ecological screening levels (ESLs) provided by Los Alamos National Laboratory (2012). The pathways of exposure include external exposure from soil and internal exposure from the uptake of radionuclides in food and water, and ingestion of soil. ESLs for radionuclides are derived from models that calculate the internal and external dose (LANL 1999).

3. STEP 2: SCREENING-LEVEL EXPOSURE ESTIMATE AND RISK CALCULATION

The screening-level exposure assessment is comprised of the calculation of exposure and risk estimates, and the evaluation of uncertainties in the exposure and risk estimates (USEPA 1997, 2001a).

3.1 Identification of Screening-Level Exposure Estimates

The maximum concentrations detected in surface soil will be used as the exposure point concentration (EPC) in the screening steps as part of the evaluation of potential direct toxicity. It is important to recognize the overly conservative assumption made by selecting the maximum concentration as the screening-level exposure value. It is very unlikely that organisms would be exposed to the maximum concentration of a chemical for 100 percent of their life/day/life-cycle. Because non-sessile organisms move throughout their home range, they are more likely to experience a wide range of concentrations throughout the life/day/life-cycle. However, in keeping with the conservative nature of a SLERA, maximum detected chemical concentrations will be used in the SLERA (Steps 1 and 2; USEPA 2001a). As necessary, more realistic screening may be conducted during the screening refinement (Step 3a), using more realistic exposure estimates.

3.2 Screening-Level Risk Calculations

Risks will be calculated in the refined SLERA by dividing conservative chemical-specific exposure estimates by conservative chemical-specific ESVs. These unitless chemical-specific ratios are referred to as Hazard Quotients (HQs). HQs have been defined by USEPA as follows:

> *A HQ is typically calculated as the ratio of a chemical's exposure level to its safe* level*, such that values* larger *than 1 are of concern. (USEPA 2004)*

An HQ less than a value of 1 (to one significant figure) indicates that adverse impacts to wildlife are considered unlikely (USEPA 1997). An HQ of one or greater is an indication that further evaluation may be necessary to evaluate the potential for adverse impacts to wildlife. Therefore, chemicals with HQs of one or greater are carried forward into Step 3a where the assumptions responsible for these HQs will be reevaluated. Chemicals that, at this point in the process, lack a reliable and appropriate ESV also are carried forward into Step 3a.

3.3 Evaluation of Uncertainties

An evaluation of uncertainties is a component of risk assessment (USEPA 1997). A risk assessment is designed to provide estimates of the potential risks that may exist for wildlife and incorporates uncertainty in a conservative (i.e., precautionary) manner. Uncertainty in an ERA is "the imperfect knowledge concerning the present or future state of the system under consideration; a component of risk resulting from imperfect knowledge of the degree of hazard or of its spatial and temporal distribution" (USEPA 1997). Uncertainties that may lead to either an overestimation or an underestimation of risk will be considered in association with each stage of risk assessment, as appropriate.

3.4 SLERA Scientific Management Decision Point

The types of decisions typically considered at the SMDPs were identified in Section 1 of this refined SLERA Work Plan. An interim SMDP will occur at the conclusion of the screening step to identify the chemicals and media that do not pose unacceptable risks and those (if any) that require further assessment or action in Step 3a of the BERA. If no chemicals and media require further assessment in Step 3a, the ERA process would conclude at the terminus of the screening (Steps 1 and 2) . If one or more chemicals and media will require further assessment, such assessment will occur in Step 3a and, as noted in Section 1, the primary SMPD will occur at the conclusion of Step 3a.

4. STEP 3A: SCREENING REFINEMENT

The screening refinement is designed to refine the previously identified list of COPECs and to more realistically identify the nature and extent of ecological risks in order to support informed environmental management decision making (USEPA 1997). This is in contrast to the screening step, which is designed to conservatively rule out further evaluation of chemicals and media that clearly do not pose significant ecological risk. The BERA problem formulation method presented in this section is consistent with the following guidance:

- Ecological Risk Assessment Guidance for Superfund (USEPA 1997)
- Guidelines for Ecological Risk Assessment (USEPA 1998)
- ECO-Update: Role of Screening-level Risk Assessments and Refining Contaminants of Concern in Baseline Ecological Risk Assessments (USEPA 2001a)

Step 3a refines the Step 2 exposure estimates and risk characterization, as it is focused toward specific COPECs and media that progress beyond the SLERA. Step 3a assumptions are refined from conservative estimates of exposure and toxicological impacts to site-specific (or receptor-specific) estimates of exposures and more relevant ecotoxicity screening values (USEPA 2001a). Risks are recalculated using the refined assumptions in an iterative process that determines the constituents, media and pathways that are of primary concern at the Site.

4.1 Refinement of COPECs

The refinement of the COPECs identified in the screening is necessary to help further focus the risk assessment. The outcome of this refinement is that chemicals either are retained in the refined assessment or excluded from further evaluation in the risk assessment process. The refinement of COPECs is based on a number of considerations, such as the frequency of occurrence, comparison to background concentrations, and nutrient value (USEPA 2001a).

Chemicals detected even once will be considered in the screening step of the refined SLERA, but the frequency of detection will be an important consideration in Step 3a. Chemicals will be carried into Step 3a if detected in greater than 5 percent of the samples (USEPA 2001a). Frequency of detection (FOD) is a USEPA COPEC selection criterion that may warrant further COPEC reduction for chemicals not addressed by background comparisons. Chemicals exhibiting a low FOD across the Site or within a specific exposure area generally will not contribute significantly to risk and hazard estimates when hot spots are not present. USEPA (1989) suggests that chemicals with a FOD less than or equal to five percent may be considered for elimination. Prior to eliminating a COPEC based on the FOD criteria (1) data distributions across the Site will be considered (e.g., potential hot spots will be assessed) and (2) any elevated detection limits will be addressed. Moreover, the detection limits that will be used will be sample-specific quantitation limits (rather than practical quantitation limits), and radionuclide data will be used “as is”, without censoring as will be described in an upcoming technical memorandum under preparation as part of the BHRA currently in progress.

This criterion will be applied in conjunction with the following considerations (USEPA 2001a):

- Influence of random and/or biased sampling on the frequency and magnitude of detected values within the distribution of data
- Spatial and temporal patterns of contaminants with low detection frequency and/or low magnitude will be considered to ensure that hot spots that may contribute to overall bioaccumulation potential or acute exposures are taken into account

The COPEC selection criteria described in this section will be applied to metals and radionuclide

COPECs that are present above background levels, and all other detected chemicals. Initially, as discussed above, the broad-suite analytes will be considered to be PCOPECs at the Site. From this list, a list of COPECs will be derived for purposes of risk assessment that includes chemicals that are positively identified in at least one sample in a given medium, consistent with the approach used for the BHRA, including:

- Chemicals with no qualifiers attached (excluding non-detect results with unusually high detection limits, if warranted);
- Chemicals with qualifiers attached that indicate known identities but estimated concentrations (e.g., J-qualified data);
- Detected at concentrations significantly elevated above concentrations of the same chemicals detected in associated blank samples. This protocol includes an analyte if it is not a common laboratory contaminant and its concentration is greater than five times the maximum amount detected in any blank; if the chemical is a common laboratory contaminant (as defined by USEPA 1989, 1992b), it is included only if its concentration is greater than 10 times the maximum amount detected in any blank;
- Tentatively identified but presumed to be present because of association with the Site based on historical information; and
- Transformation (e.g., degradation) products of chemicals demonstrated to be present.

The following criteria established by USEPA (1989) for further reducing the number of COPECs may also be considered where relevant to ecological risk assessment:

- Historical Information – Chemicals likely to be associated with Site activities, based on historical information, will not be eliminated, even if the results of other “COPEC reduction” steps indicate that such elimination is warranted.
- Concentration and Toxicity – Aspects of concentration and toxicity will be considered prior to eliminating a chemical as a COPEC. An approach consistent with that used for the BHRA will also be used in the refinement of COPECs for the refined SLERA.
- Availability of Toxicity Criteria – Some chemicals have not been assigned toxicity criteria. Alternative toxicity values (ATV) available in the scientific literature will be considered for these chemicals.
- Mobility, Persistence and Bioaccumulation – Chemicals that are highly mobile, are persistent, or tend to bioaccumulate will generally be retained as COPECs.
- Special Exposure Routes – For some chemicals under special Site-specific scenarios, certain exposure routes need to be considered carefully before eliminating COPECs.
- Treatability – Chemicals that are difficult to treat should remain as COPECs because of their importance during the selection of remedial alternatives if needed.
- Documentation of Rationale – Rationale for the exclusion of any chemicals from the risk assessment will be documented in the risk assessment report.

Some chemicals considered COPECs in the screening step may be vital electrolytes or essential nutrients. Calcium, magnesium, sodium, and potassium may function as vital electrolytes for organisms (USEPA 2001a). These chemicals may not be carried further in the ERA unless concentrations of these chemicals are substantially elevated compared to background concentrations.

Refinement of COPECs will include consideration of refined EPCs (USEPA 2001a). EPCs used in the screening step will be maximum detected concentrations, as discussed in previous sections of this refined SLERA Work Plan. Further assessment and refinement activities will consider conditions that are more reflective of the ecological receptors and exposures that are likely to occur. For example, wildlife receptors such as small mammals with small home ranges may involve consideration of central tendency measures covering data sets for small exposure areas. Larger mammals with exposures over larger areas will require consideration of central tendency estimates for data sets that cover larger areas and/or exposure parameters may be modified based on realistic consideration of area use factors (i.e., Site foraging frequency [SFF]). Depending on the type and size of data groups defined in Step 3a, different EPCs may be chosen to represent exposure within a given data group. A maximum, mean, or upper-confidence limit could be proposed for data groups representing a typical home range for a given receptor, whereas, results from individual sample locations may be appropriate for other data groups, such as for benthic invertebrates.

4.2 Refinement of Risk Calculations: ESVs/Toxicity Values

USEPA's ERA process recognizes that it may be appropriate to use alternative ESVs or toxicity values than those which were identified and used in the screening step (USEPA 2001a, 1997). First, certain chemicals may not have published screening values in the sources of ESVs used in the initial screening. In these cases, alternative ESVs may be developed from toxicity data in the published literature. Alternative values may, for instance, be developed from species sensitivity distributions, to identify the types of receptors that may be most sensitive to chemical exposures and whether such types of receptors are expected at the Site,

Chemicals for which ESVs and alternate benchmarks cannot be derived from the scientific literature will be evaluated quantitatively in Step 3a to the extent possible using surrogate ESVs from similar chemicals. A qualitative evaluation would be based on considerations such as occurrence with and proximity to other chemicals, receptors most likely to be exposed, exposure medium, and physical and chemical properties (e.g., bioavailability, or persistence).

4.3 Refinement of Risk Calculations: Food Web Modeling

A food web model will be used to evaluate potential ecological risk via bioaccumulation pathways to representative mammalian and avian receptors that may forage at the Site and may potentially be exposed to constituents found in food items.

The food-web modeling will be an iterative process which starts from an initial screening using a conservative and simplistic initial food web model. The exposure estimates will be iteratively refined using Site-specific parameters to evaluate realistic exposure scenarios. The simplistic models may have base assumptions that include exposure to maximum contaminant levels all of the time, 100 percent biotic and abiotic media ingestion, and/or area use factors of one. Refined models will realistically alter these parameters to more appropriate Site-specific values. The 95% UCL or maximum (when the 95% UCL exceeds the maximum), will be used as the exposure point concentration.

4.3.1 Wildlife Receptors and Exposure Parameters

The species selected for food web modeling are those commonly found in southern Nevada, are susceptible to food web exposures or are representative prey of organisms that are susceptible to food web exposures (USEPA 1993). They reflect a range of trophic levels (e.g., small carnivorous mammal as compared to a small omnivorous mammal) and thus dietary exposure. While dietary and toxicological information may not be available for the exact species selected; there is data available on closely related species (surrogate species). The toxicological data available for these surrogate species can be applied to the target species selected (e.g., USEPA 1993, Sample et al. 1996). Exposure parameter information that will be developed for the selected species (such as the percentage ranges of invertebrate, plant, and small mammal components in diet) and the types of literature sources that will be considered if food web modeling for these species is needed as part of Step 3a will be included in the refined SLERA.

4.3.1.1 Proposed Mammal and Bird Receptors

Most healthy ecosystems support a large number of individual species representing a variety of feeding guilds. However, it is not scientifically or realistically feasible to complete risk calculations for all potentially exposed species. Moreover, such an effort would be duplicative because of the similarity of exposure patterns among closely related species and among those with similar feeding guilds. For these reasons, representative receptors are selected in this work plan to represent the different feeding guilds.

Three trophic levels were selected to evaluate potential bioaccumulation in the food chain. These trophic levels include Trophic Level 2 - herbivores, Trophic Level 3 - omnivores and insectivores, and Trophic Level 4 - carnivores. Herbivores are primary consumers, ingesting primary producers (vegetation) and chemical constituents from a single trophic level. Omnivores consume both primary producers and consumers, and are thus exposed to chemical constituents from two trophic levels. Insectivores consume primary consumers (invertebrates). Carnivores represent the top of the food chain and are potentially exposed to higher levels of bioaccumulated chemicals.

Table 4-1 provides a list of the target species that will be evaluated in the refined SLERA. The species selected for inclusion in the refined SLERA are species commonly found in the Mojave Desert Scrub Ecosystem of southern Nevada that are known to be susceptible to food web exposures or are representative prey of organisms that are susceptible to food web exposures (USEPA 1993). Dietary and toxicological information may not be available for the target species shown so surrogate species will be selected that are part of the same feeding guilds with similar physical and life history characteristics (e.g., USEPA 1993, Sample et al. 1996). As such, the selected species will be used as surrogate species to represent the types of exposures and potential impacts that could occur to other wildlife species in or around the Site. The food web for the refined SLERA is illustrated in Figure 4-1.

4.3.1.2 Bioaccumulation and Bioconcentration Factors

The processes of bioaccumulation and bioconcentration are important to an ERA because they provide a basis for prediction and discussion regarding the potential chemical uptake into flora and fauna. Chemicals in tissues of organisms of the food web are likely to be ingested by the species that feed on them (i.e., those occupying higher trophic levels) the result of which may be the expression of toxicological effects by the higher trophic level species. Bioaccumulation differs from bioconcentration on the basis of the mechanism of chemical uptake, although distinguishing between the two is sometimes highly artificial (Streit 1992). While chemicals with low bioaccumulation potential can pose a risk to wildlife at high enough soil concentrations via incidental ingestion of soil, the exposure does not occur through the food web. Therefore, only bioaccumulative chemicals will be evaluated in the food web model. Wildlife hazard quotients will be calculated for bioaccumulative chemicals consistent with USEPA guidance (2000; 2007 and 2012).

Bioaccumulation and bioconcentration factors used for the food web modeling will be obtained from literature sources such as Sample et al. (1997), Baes, et al. (1984), Travis and Arms (1988), Belfroid et al. (1994), Belfroid et al. (1995), Beyer (1990), Beyer et al. (1996), and other related literature. Bioaccumulation and exposure potential may be calculated using Site-specific estimates of bioavailability and use of chemical-specific absorption factors and gut uptake factors. Justification will be provided in the refined SLERA report for any case where a bioavailability uptake factor of less than 100% is used.

4.3.1.3 Exposure Parameters

Exposure assumptions (e.g., body weights, food and water ingestion rates, food preferences, foraging range) for terrestrial wildlife species will generally be obtained from the USEPA's Wildlife Exposure Factors Handbook (USEPA 1993) and Oak Ridge National Laboratory's (ORNL's) Estimating Exposure of Terrestrial Wildlife to Contaminants (ORNL 1994). Alternate sources will be used if the standard sources do not provide sufficient information. The literature will be reviewed for exposure factors specific to local or southwestern species. If exposure factors for local or southwestern species are unavailable then information from standard sources will be used.

Food and water ingestion rates will be based on the receptor's average body weight identified in the literature. Food items that will be evaluated in the food web model include plants, soil invertebrates, and small mammals. The estimated cumulative COPEC concentrations in soil will be used for assessing cumulative (or multi-pathway) exposures in the refined SLERA.

4.3.1.4 Modeled Tissue Concentrations

Generally, the uptake factors (bioconcentration factors [BCFs] and bioaccumulation factors [BAFs]) used to model tissue concentrations will be based on empirical values or regression algorithms obtained from a variety of sources such as Bechtel Jacobs (1998a,b), USEPA (2007a), and LANL Ecorisk Database (2012).

The following literature sources will be reviewed for uptake factors for use in the refined SLERA:

- USEPA 1999. Screening Level Ecological Risk Assessment Protocol for Hazardous Waste Combustion Facilities: Appendix C, Media-to-Receptor Bioconcentration Factors.
- USEPA 2010. Human and Ecological Risk Assessment of Coal Combustion Wastes, Draft. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response.
- USEPA 1998b. Non-groundwater Pathways, Human Health and Ecological Risk Analysis for Fossil Fuel Combustion Phase 2. Draft Final Report. Appendix I: Ecotoxicological Profiles for Constituents of Concern. U.S. Environmental Protection Agency, Office of Solid Waste and Emergency Response. EPA68-W6-0053. June 1998.
- USEPA 2007b. Guidance for Developing Ecological Soil Screening Levels (Eco-SSLs). Attachment 4-1 Exposure Factors and Bioaccumulation Models for Derivation of Wildlife Eco-SSLs. OSWER Directive 9285.7-55. Revised April 2007.
- LANL. 2012. LANL Ecorisk Database (Release 3.1). Available at: http://www.lanl.gov/community-environment/environmental-stewardship/protection/eco-risk-assessment.php
- Bechtel Jacobs. 1998a. Empirical Models for the Uptake of Inorganic Chemicals from Soil by Plants. Prepared for the U.S. Department of Energy. Prepared by Bechtel Jacobs Company LLC. September, 1998.
- Bechtel Jacobs. 1998b. Biota Sediment Accumulation Factors for Invertebrates: Review and Recommendations for the Oak Ridge Reservation. Prepared for the U.S. Department of Energy. BJC/OR-112.
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4.3.1.5 Calculation of Potential Doses

Food web ingestion-based modeling calculations will be performed to characterize potential exposures to contaminants via the food web and to identify potential adverse effects for mammals and birds. A TDD will be calculated for each species in order to estimate dietary exposure. The exposure assessment yields estimates of total daily intake for the wildlife measurement endpoints via diet and incidental ingestion of sediment while the animal is foraging or preening/grooming. Specific exposure estimates, dietary uptake factors, bioaccumulation factors, and TDD estimates will be provided in the refined SLERA. The TDD calculation considers concentrations of COPECs in food items consumed by the animal, the amount of soil, sediment or surface water ingested, the proportion of different food items in the diet, body weight, area use factor (AUF) for each species, exposure duration, food ingestion rates, and assimilation factors (AFs) for each COPEC.

Ingestion modeling is based on species-specific exposure parameters and ingestion intake requirements. Maximum and UCL media concentrations will be used to evaluate the range of potential intake exposures. The following is the type of model that will be used:

$$TDD = \frac{\left(\left[IR_{FOOD} \text{ x } C_{FOOD}\right] + \left[IR_{SOIL/SED} \text{ x } C_{SOIL/SED}\right] + \left[IR_{WATER} \text{ x } C_{WATER}\right]\right) \times AUF \text{ x } AF}{BW}$$

Where:

TDD	=	Total daily dose (mg COPEC/kg ww-d)
IR_{FOOD}	=	Ingestion rate of food (kg/day)
C_{FOOD}	=	Concentration of the COPEC in food (mg/kg)
$IR_{SOIL/SED}$	=	Ingestion rate of sediment or soil (kg/day)
$C_{SOIL/SED}$		Concentration of COPEC in soil or sediment (mg/kg)
IR_{WATER}	=	Ingestion rate of water (L/day)
C_{WATER}		Concentration of COPEC in water (mg/L)
AUF	=	Area use factor (unitless)
AF	=	Assimilation factor (unitless)
BW	=	Body weight (kg ww)

and:

$$C_{FOOD} = \sum\left(\left(C_{FOOD1} + P_{FOOD1}\right) + \left(C_{FOOD2} + P_{FOOD2}\right) + \left(C_{FOOD\,i} + P_{FOOD\,i}\right)\right)$$

C_{FOOD}	=	Concentration of COPEC in food (mg/kg)
C_{FOOD1}	=	C_{MEDIUM} x BAF_{FOOD1} (mg/kg)
P_{FOOD1}	=	Proportion of diet composed of food item 1 (unitless)
C_{FOOD2}	=	C_{MEDIUM} x BAF_{FOOD2} (mg/kg)
P_{FOOD2}	=	Proportion of diet composed of food item 2 (unitless)
$C_{FOOD\,i}$	=	C_{MEDIUM} x $BAF_{FOOD\,i}$ (mg/kg)
$P_{FOOD\,i}$	=	Proportion of diet composed of the i^{th} food item (unitless)
BAF_{FOOD1}	=	Bioaccumulation factor for first food item (unitless)
BAF_{FOOD2}	=	Bioaccumulation factor for second food item (unitless)
$BAF_{FOOD\,i}$	=	Bioaccumulation factor for the i^{th} food item (unitless)

Understanding potential effects to populations requires some consideration of the spatial scale of effects. The AUF is the ratio of the home range of the animal to the size of the site. The portion of the Site where constituent exposures may reasonably occur will be conservatively estimated. Where birds and mammals have large home ranges, their exposure to constituents is lower than AUFs for birds and mammals with smaller home ranges. For example, the home range of the Bewick's wren ranges from 2.5 to 17 acres (1.0 to 6.9 ha) (Cogswell 1962) therefore, the AUF for the wren would be set to one. The AUF for the kit fox, whose home range is 494 hectares (1,220 acres) based on radiotelemetry data, would be set to a number substantially lower than one (O'Farrell and Gilbertson 1986)

Through food web modeling, COPECs will either be retained or eliminated from further steps of the refined SLERA. As stated above, the food-web modeling will start from an initial set of extremely conservative assumptions (maximum EPC, 100% bioavailability, site foraging factor of 1) and will be used to identify chemicals that require further consideration. The food web models will be refined to incorporate more realistic, Site-specific assumptions to better understand both the conservative and realistic scenarios using refined exposure estimates.

4.3.2 Effects Assessment for Bird and Mammal Populations

The effects assessment for wildlife is based on TRVs that relate ingested daily dose to ecotoxicological endpoints. TRVs for wildlife are literature-derived doses, below which adverse effects are unlikely. No observed adverse effect level (NOAEL) TRVs are indicative of doses of constituents that have no deleterious effects on a given wildlife receptor. Lowest observed adverse effect level (LOAEL) TRVs are the minimum doses of constituents where deleterious effects are only just becoming apparent. Both NOAEL and LOAEL TRVs will be used in the ERA because the NOAEL TRVs represent the reasonable worst case measure of effect and the LOAEL TRVs provide a realistic measure of effect. This approach provides a basis for understanding potential effects to individual birds and mammals.

TRVs will be established for each COPEC for both avian and mammalian receptors. For each COPEC identified, the ecotoxicological literature will be reviewed to identify a chronic exposure TRV representing a threshold body weight-normalized dose for effects. As described in the problem formulation step, effects that threaten the protection and maintenance of wildlife in the area will be assessed.

The following literature sources will be reviewed for possible TRVs to be used in the ERA.

- USEPA. 2007c. Guidance for Developing Ecological Soil Screening Levels (Eco-SSLs). Attachment 4-5 Eco-SSL Standard Operating Procedure (SOP) #6: Derivation of Wildlife Toxicity Reference Value. OSWER Directive 9285.7-55. Revised June.
- USEPA. 2002. U.S. EPA Region 9 Biological Technical Assistance Group (BTAG) Recommended Toxicity Reference Values for Mammals. Revision Date 11/21/02.
- USEPA. 2009b. U.S.EPA Region 9 Biological Technical Assistance Group (BTAG) Recommended Toxicity Reference Values for Birds. Revision Date 02/24/09.
- Sample, B. E., D.M. Opresko, G. W. Suter II. 1996. Toxicological Benchmarks for Wildlife: 1996 Revision. Oak Ridge National Laboratory, Oak Ridge, TN. June 1996. ES/ER/TM-86/R3.
- LANL. 2012. LANL Ecorisk Database (Release 3.1). Available at: http://www.lanl.gov/community-environment/environmental-stewardship/protection/eco-risk-assessment.php

If TRVs are not available in these documents, additional literature will be reviewed for relevant data and TRVs will be derived using the methodology of ORNL (Sample et al. 1996).

4.4 Risk Characterization

Predictions of the likelihood for adverse effects, if any, for the food web modeling studies will be based on HQs (USEPA 1997).

$$\text{Hazard Quotient} = \frac{\text{TDD}}{\text{TRV}}$$

The HQs will be calculated by dividing the estimated ingestion intakes by the TRVs for each of the COPECs for each of the species. The HQ value of 1 will be considered the threshold for indicating that adverse effects may occur. An HQ less than a value of 1 (to one significant figure) indicates that adverse impacts to wildlife are considered unlikely (USEPA 1997). An HQ of one or greater is an indication that further evaluation may be necessary to evaluate the potential for adverse impacts to wildlife. HQs equal to one using TRVs that are based on NOAELs should be considered protective. However, HQs equal to one using TRVs that represent LOAELs may indicate a potential for low effects.

During the problem formulation, the risks at the Site will be considered on the basis of weight of evidence and ecological significance of risk estimates. The ecological significance of risk must consider the available information, such as wildlife use of the environment, the spatial extent of the release, the persistence of the release (i.e., the temporal scale), and natural variability within the system (and whether impacts can be measured separate from natural variability). The spatial scale of the risk is considered relative to the extent of the actual wildlife populations, the number of organisms within the population that may be impacted, the correlation between stressor and response as indicated by the TRV, the scientific basis for judging environmental harm, the Site and receptor specificity of available data, and the representativeness of exposure and effects data sets (spatial, temporal, and quantitative) (Barnthouse et al. 2007, USEPA 1997, 1994b, Menzie et al. 1996).

4.4.1 Risk Estimation

Risk estimation is the quantitative and/or qualitative estimate of ecological risks based on the potential exposure of a representative receptor to a constituent present in abiotic media (e.g., soil, surface water, sediment) and in biotic media consumed by the receptor (e.g., plants, invertebrates) relative to defined toxicity data.

Risk estimation involves the following:

- Calculation of HQs for community-based receptors (i.e., terrestrial invertebrates and plants) by comparing the medium-specific EPC to the appropriate ecological benchmark or other applicable toxicity indices (e.g., CBR). The description of the estimated risks will identify the magnitude and nature of potential risks for each receptor group based on the HQ values.
- Calculation of dose-based ecological HQs for higher trophic order (wildlife) species via food web modeling and comparison of the resultant estimated dietary dose(s) of COPECs for each representative receptor to applicable toxicity data.
- While special status species are evaluated on an individual basis, no special status species are expected at the NERT Site. Special regulatory consideration is given to individual organisms of threatened and endangered species populations since these individuals comprise a greater percentage of the small threatened and endangered populations (USEPA 1997, 1998).
- If quantifying risk is not possible for certain instances, a qualitative assessment of risk will be provided.

4.5 Characterization of Uncertainties

The characterization of uncertainty is a component of the ERA process (USEPA 1997). Some of these uncertainties were discussed in Section 3 of this refined SLERA Work Plan, and the general principles apply to the BERA as well. Unlike the SLERA, the refined risk assessment (BERA) seeks to reduce uncertainty (when possible) through the use of Site-specific information. Uncertainties associated with the following food web model attributes will be considered and discussed. Examples include:

- Uncertainties that exist in ecological modeling
- Dietary exposure parameters
- Extrapolation using mammalian toxicity benchmarks
- Biased sample sets
- Conservative toxicological benchmarks
- Home range and SFF
- Risks to reptiles and amphibians
- Risks to the plant ecosystem

4.6 STEP 3a Scientific Management Decision Point

An SMDP will occur at the end of Step 3a to determine whether additional steps in the risk assessment process are warranted. Again, the following three options for a decision are considered at this SMDP (USEPA 1997):

- There is adequate information to conclude that ecological risks are negligible and therefore no need for remediation on the basis of ecological risk
- The information is not adequate to make a decision at this point, and the risk assessment process will continue to Step 3b
- The information indicates a potential for adverse ecological effects, and a more thorough assessment is warranted

These considerations are consistent with USEPA (2001a, pages 5 and 6) guidance for screening of COPECs where it is generally stated that the analogy of screening of COPECs (Step 3a) can be linked to the Step 2 SMDP where:

- refinement of COPECs, which may determine that some or all chemicals do not warrant being retained for further evaluation (i.e., “there is adequate information to conclude that ecological risks are negligible and therefore no need for remediation on the basis of ecological risk”);
- the information is not adequate or indicates a potential for adverse ecological effects, and a more thorough assessment is warranted (proceeding to Step 3b is warranted); and
- decisions can be made to terminate the risk assessment and proceed with remediation for any particular part of the Site and environmental medium. The SMDP at the end of Step 3b, if needed, would consist of agreement on 4 items: contaminants of ecological concern, assessment endpoints, exposure pathways, and risk questions, all of which are integrated into the CSM (USEPA 1997).

5. SCHEDULE

The refined SLERA will be prepared following NDEP approval of this refined SLERA Work Plan and in parallel with the RI and the BHRA currently in progress. Assuming NDEP approval of this work plan is received by July 31, 2015, the refined SLERA report is anticipated to be submitted to NDEP for review in February 2016. Following NDEP review, agency comments will be addressed and the refined SLERA report will be finalized for resubmittal to NDEP.

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TABLES

TABLE 2-1: Chemical Classes Analyzed in Soil at the NERT Site

Nevada Environmental Response Trust Site
Henderson, Nevada

Groups
Asbestos
Dioxins/Furans
Explosives
Herbicides
Metals
Nematocides
Polychlorinated biphenyls (PCBs)
Pesticides
Semi-volatile Organic Compounds (SVOCs)
Volatile Organic Compounds (VOCs)

TABLE 2-2: Surface Soil Sample Counts
Nevada Environmental Response Trust Site
Henderson, Nevada

Sampling Depth	Number of Samples	Area Sampled
0-0.5 feet bgs	73	ECA
	231	On-Site areas surrounding ECAs
0-1.0 feet bgs	7	ECA
	44	On-Site areas surrounding ECAs

Notes:

bgs = Below ground surface

ECA = Excavation Control Area. These areas have not been remedied and no removal action has been undertaken due to access or other mitigating factors (ENVIRON 2012)

ENVIRON (2012 Interim Soil Removal Action Completion Report

TABLE 2-3: Clark County, Nevada Listed Species
Nevada Environmental Response Trust Site
Henderson, Nevada

Organism Group	Listing Category	Species Common Name	Scientific Name
Amphibian			
	C	Relict leopard frog	*Rana onca*
Birds			
	E	Southwestern willow flycatcher ●	*Empidonax traillii extimus*
	PT	Yellow-billed cuckoo (Western U.S. Distinct Population Segment)	*Coccyzus americanus*
	E	Yuma clapper rail	*Rallus longirostris yumanensis*
Invertebrate			
	E	Mt. Charleston blue butterfly	*Icaricia shasta charlestonensis*
Fishes			
	E	Bonytail chub ●	*Gila elegans*
	E	Colorado pikeminnow *	*Ptychocheilus lucius*
	E	Humpback chub *	*Gila cypha*
	T	Lahontan cutthroat trout	*Oncorhynchus clarkii henshawi*
	E	Moapa dace	*Moapa coriacea*
	E	Pahrump poolfish	*Empetrichthys latos*
	E	Razorback sucker ●	*Xyrauchen texanus*
	E	Virgin River chub + ●	*Gila seminuda*
	E	Woundfin ●	*Plagopterus argentissimus*
Plant			
	C	Las Vegas Buckwheat	*Eriogonum corymbosum* var . *nilesil*
Reptile			
	T	Desert tortoise (Mojave population) ●	*Gopherus agassizii*

E = Endangered Δ = Proposed for delisting P = Proposed listing	T = Threatened ● = Designated Critical Habitat in County	C = Candidate * = Believed extirpated from Nevada
+ = Endangered only in the Virgin River, Muddy River population is a sensitive species.		

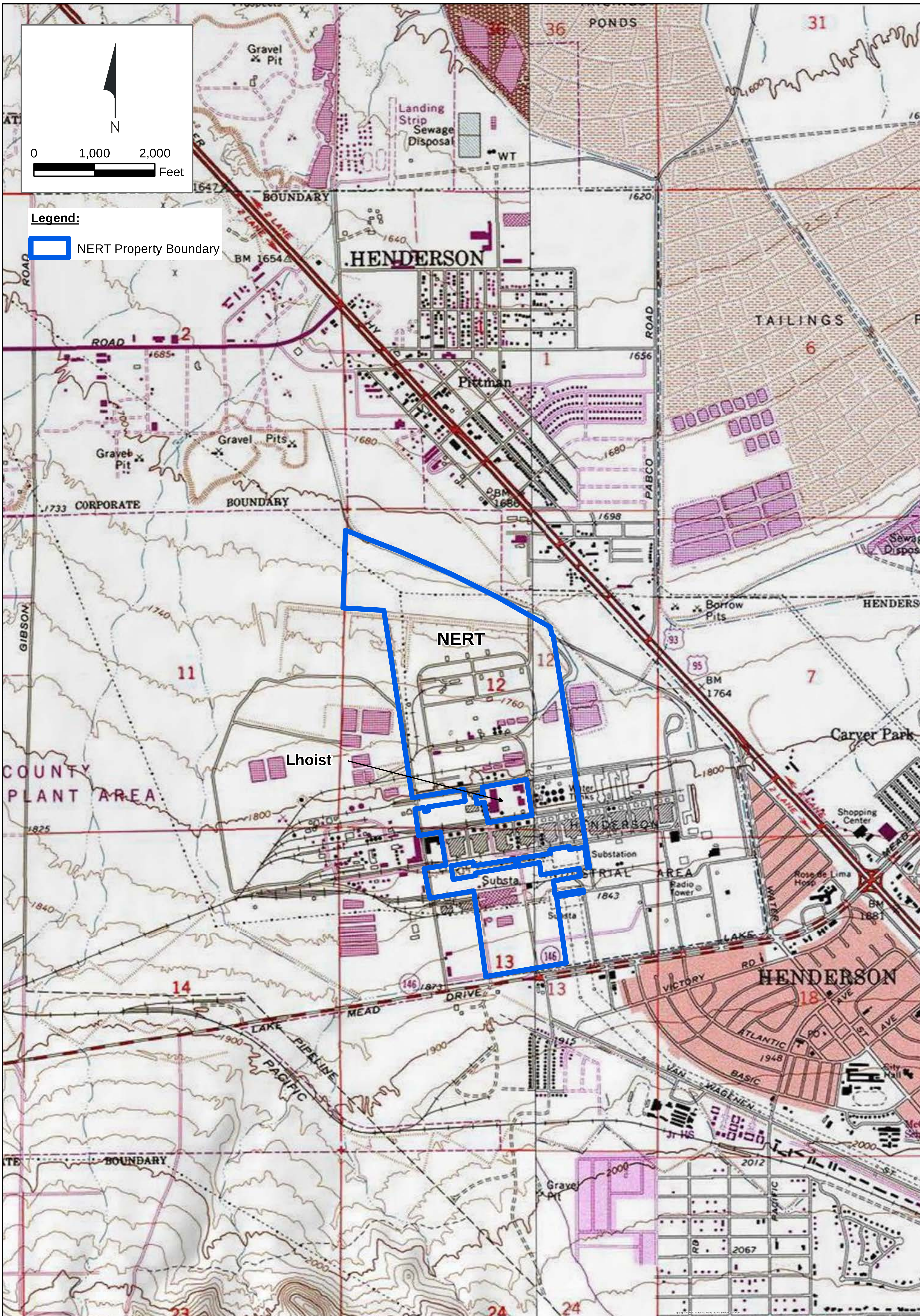
Notes:
C = Candidate
E = Endangered
P = Proposed listing
T = Threatened
● = Designated Critical Habitat in County
* = Believed extirpated from Nevada
+ = Endangered only in the Virgin River, Muddy River population is a sensitive species.

Source:
Nevada Fish & Wildlife Office. 2014. Nevada's Protected Species by County. Last updated April 16, 2014.
Available at http://www.fws.gov/nevada/protected_species/species_by_county.html

TABLE 4-1: Target Species to be evaluated in the Refined SLERA
Nevada Environmental Response Trust Site
Henderson, Nevada

Guild	Species
Carnivores	
	Coopers Hawk *(Accipiter cooperii)*
	Kit Fox *(Vulpes macrotis)*
	Western Burrowing Owl (*Athene cunicuiaria hypogea)*
Insectivores	
	Bewick's wren *(Thryomanes bewickii*)
	Fringed Myotis (*Myotis thysanodes)*
	Inyo Shrew (*Sorex tenellus*)
Omnivores	
	Raccoon *(Procyon lotor)*
Herbivores	
	Mourning Dove *(Zenaida macroura*)
	desert pocket mouse *(Chaetodipus penicillatus sobrinus)*

FIGURES



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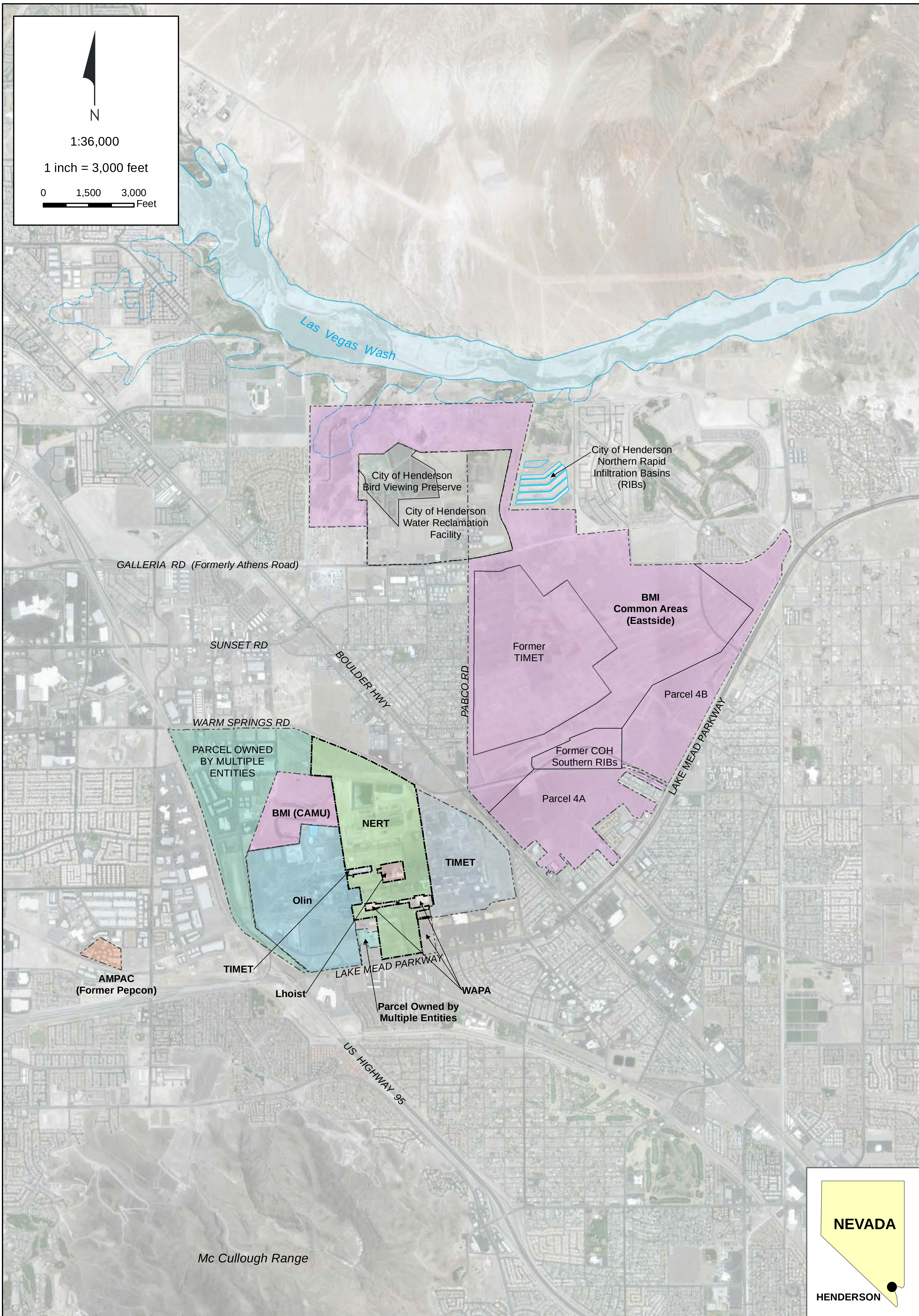
Site Location Map

Nevada Environmental Response Trust Site, Henderson, Nevada

Figure 1-1

Drafter: RS | Date: 6/26/2014 | Contract Number: 21-34800I | Approved by: | Revised:



Path: H:\LePetomane\NERT\RI.FS_Workplan\SLERA_Work Plan\Figures\GIS\Fig1-2_FacilitySurroundings.mxd

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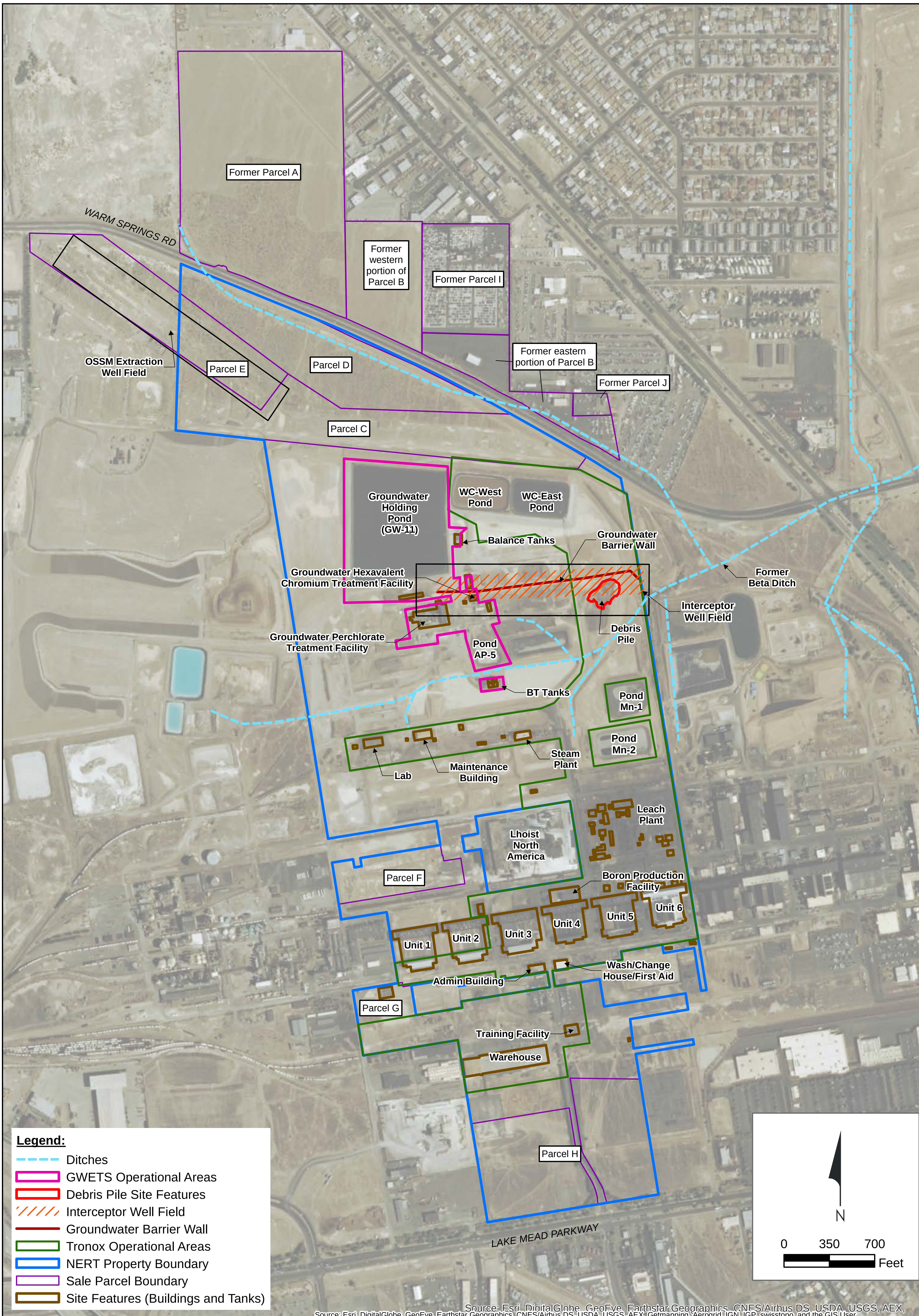
Facility and Urbanized Surroundings

Nevada Environmental Response Trust Site, Henderson, Nevada

Figure **1-2**

Drafter: RS | Date: 6/26/2014 | Contract Number: 21-34800I | Approved by: | Revised:



Path: H:\LePetomane\NERT\RI_FS_Workplan\SLERA_Work Plan\Figures\GIS\Fig1-3_SiteFeatures.mxd

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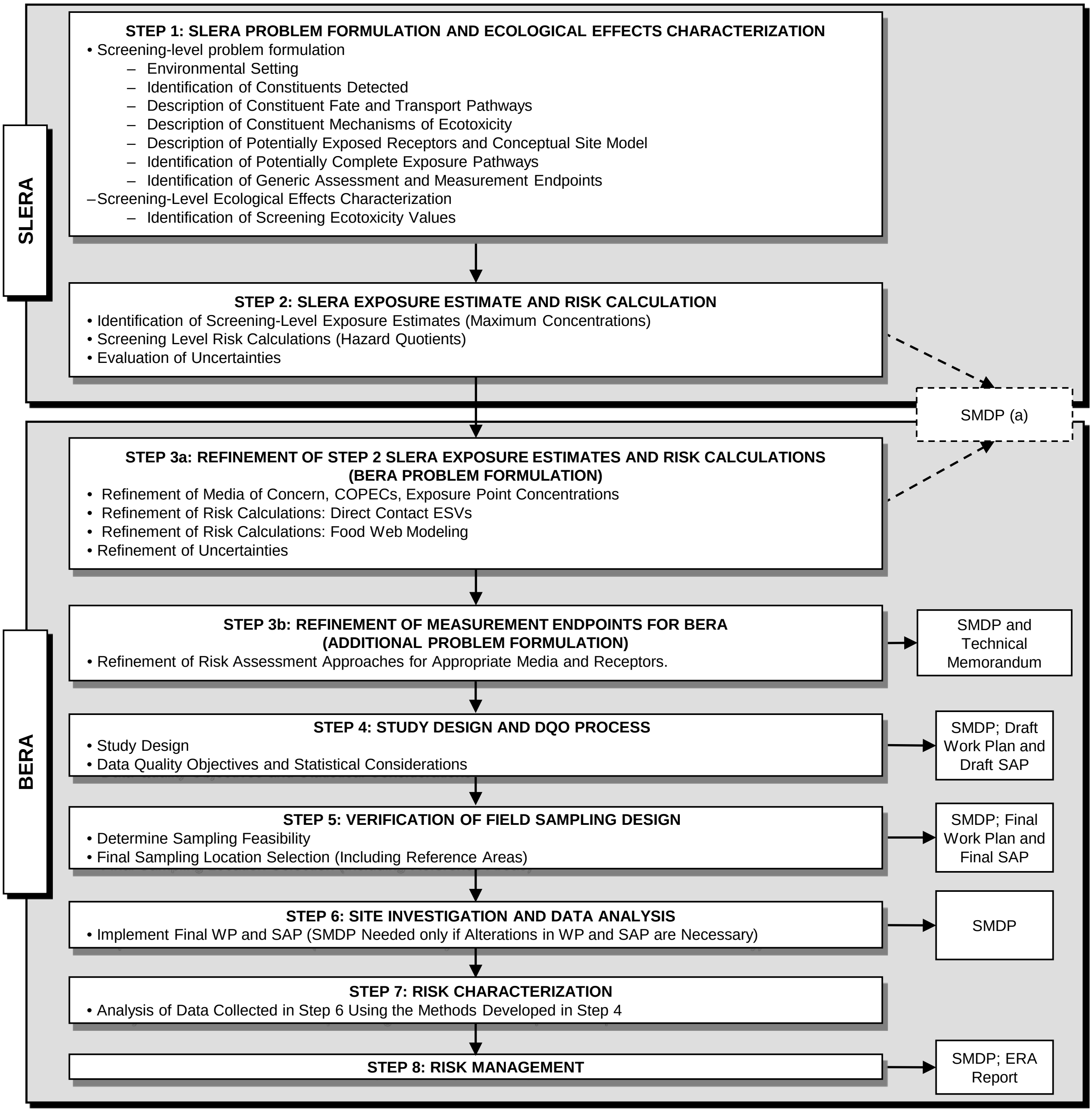
Facility Layout and Site Features

Nevada Environmental Response Trust Site, Henderson, Nevada

Figure **1-3**

Drafter: EA/RS | Date: 6/19/2015 | Contract Number: 21-34800I | Approved by: | Revised:



Notes:

COPEC	Chemical of Potential Ecological Concern.
DQO	Data Quality Objectives.
ERA	Ecological Risk Assessment.
ESV	Ecological Screening Value.
SAP	Sampling and Analysis Plan.
SMDP	Scientific Management Decision Point.
WP	Work Plan.
BERA	Baseline ERA.
SLERA	Screening-level ERA.
USEPA	United State Environmental Protection Agency.

(a) SMDP occurs EITHER after Step 2 or after Step 3a.

Source: Adapted from Figure 1-2 of USEPA 1997 (modification to reflect the Step 1-3a elements specific to the Chemtronics ERA).

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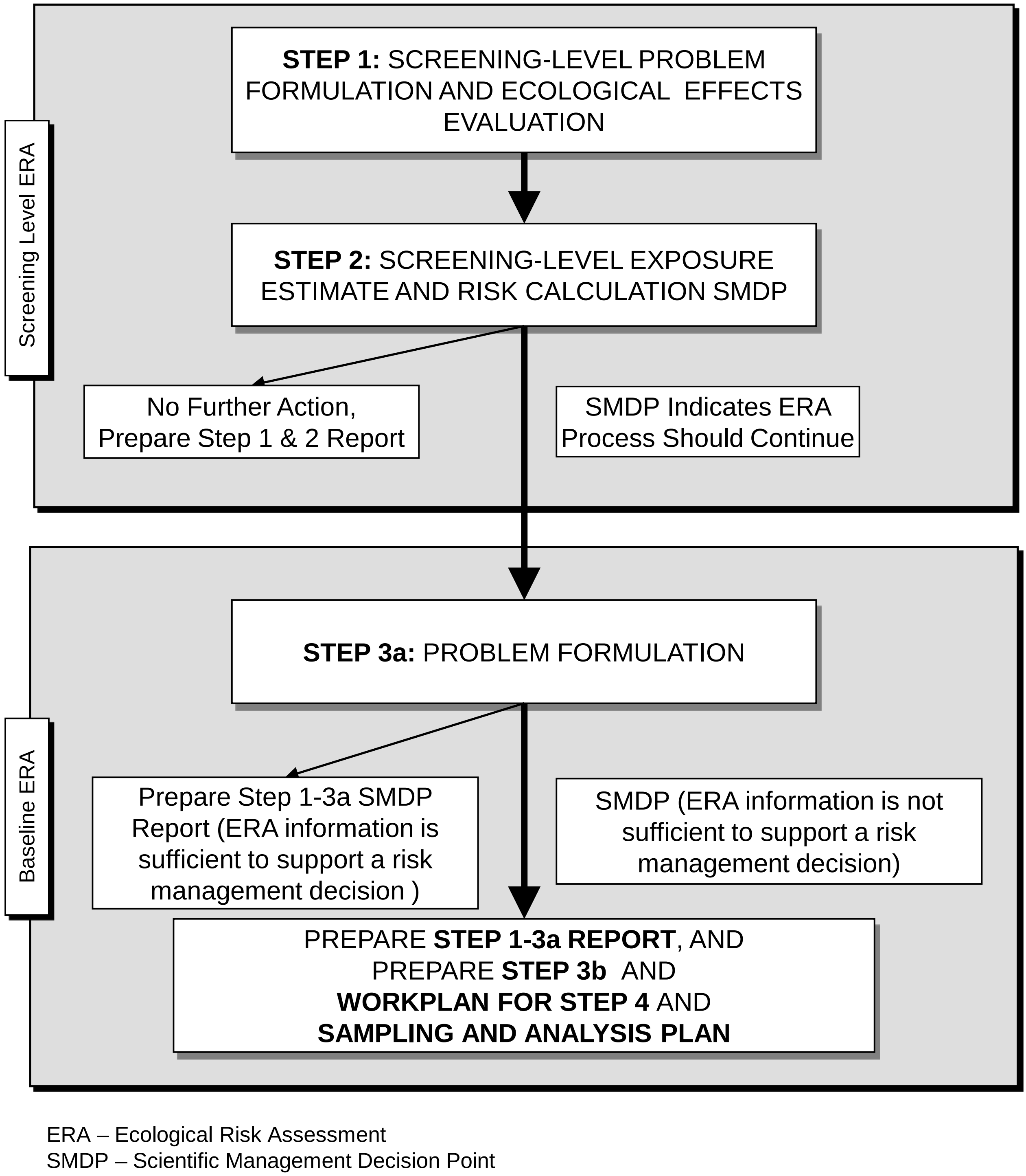
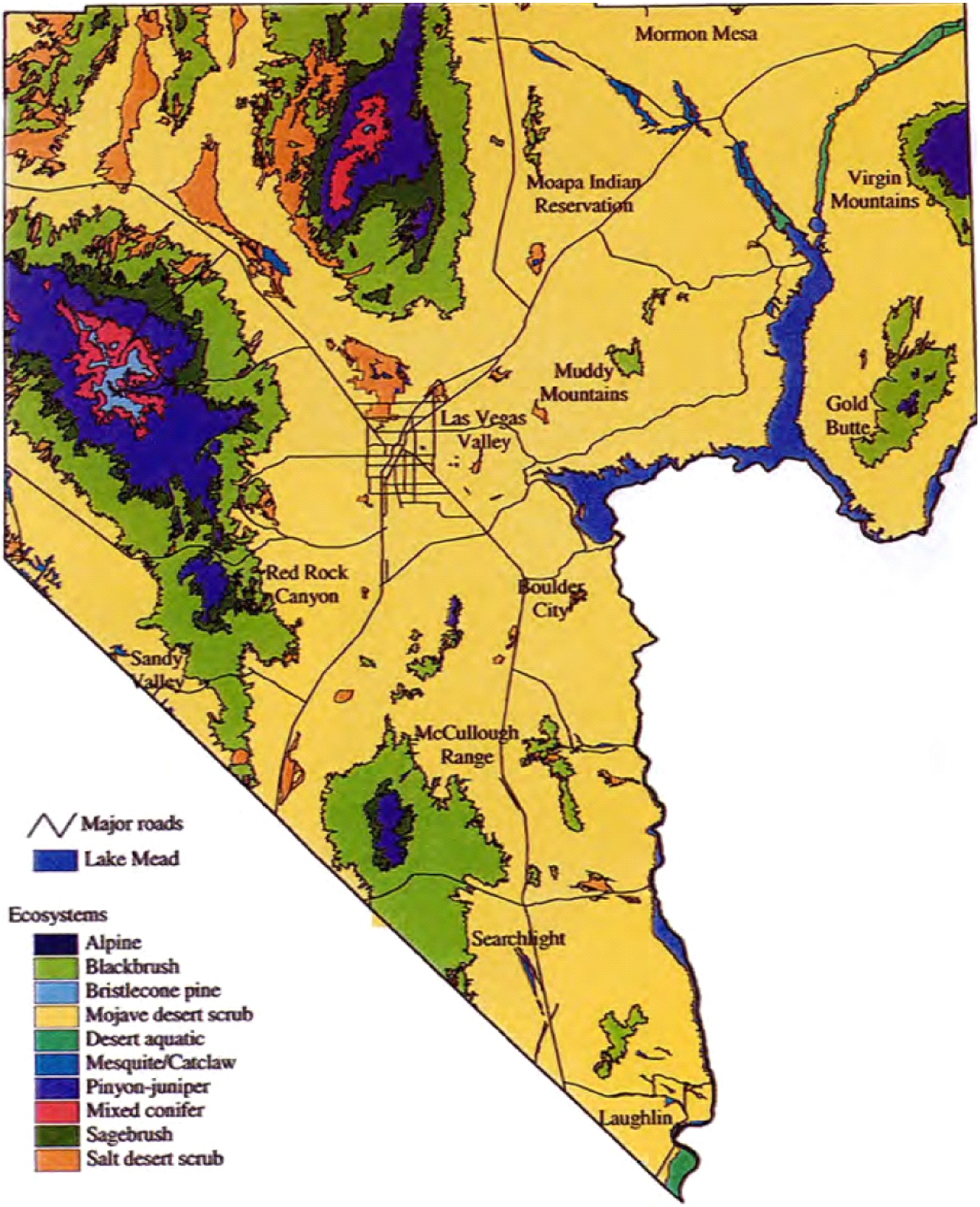
USEPA Expanded Eight-Step Ecological Risk Assessment Process
NERT
Henderson, Nevada

Figure 1-4



RAMBOLL ENVIRON	Flowchart of Step 1, 2, and 3 Process and Reporting NERT Henderson, Nevada	Figure 1-5



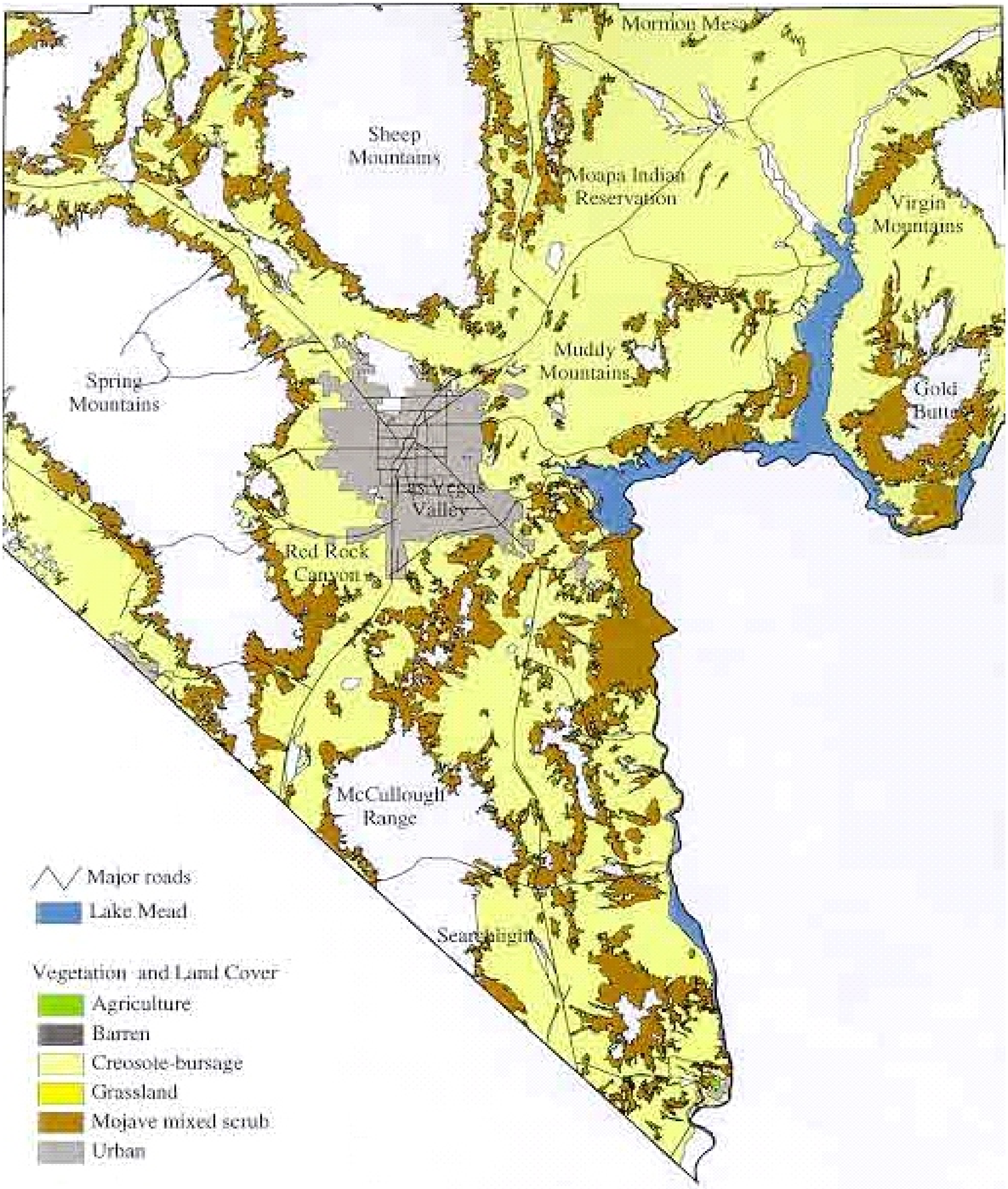
RAMBOLL ENVIRON

Clark County Ecosystem Distribution Map

Figure 2-1

Drafter: RS | Date: 6/26/14 | Contract Number: 21-34800I | Approved: | Revised:

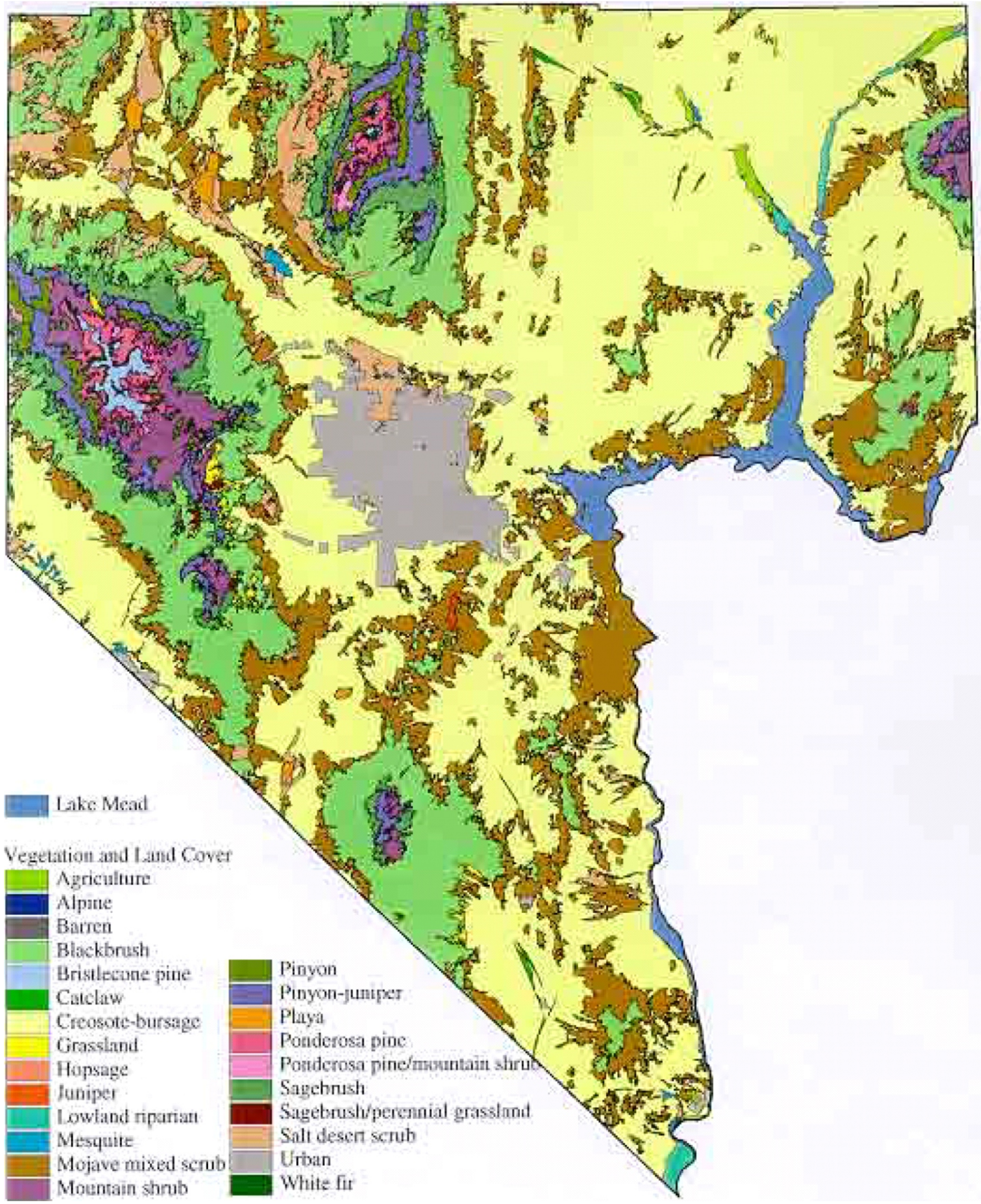
H:\LePetomane\NERT\RI.FS_Workplan\SLERA_Work Plan\Figures\Fig 2-1.CDR



RAMBOLL ENVIRON	Clark County Mojave Desert Scrub Ecosystem	Figure 2-2

Drafter: RS Date: 6/26/14 Contract Number: 21-34800I Approved: Revised:

H:\LePetomane\NERT\RI.FS_Workplan\SLERA_Work Plan\Figures\Fig 2-2.CDR



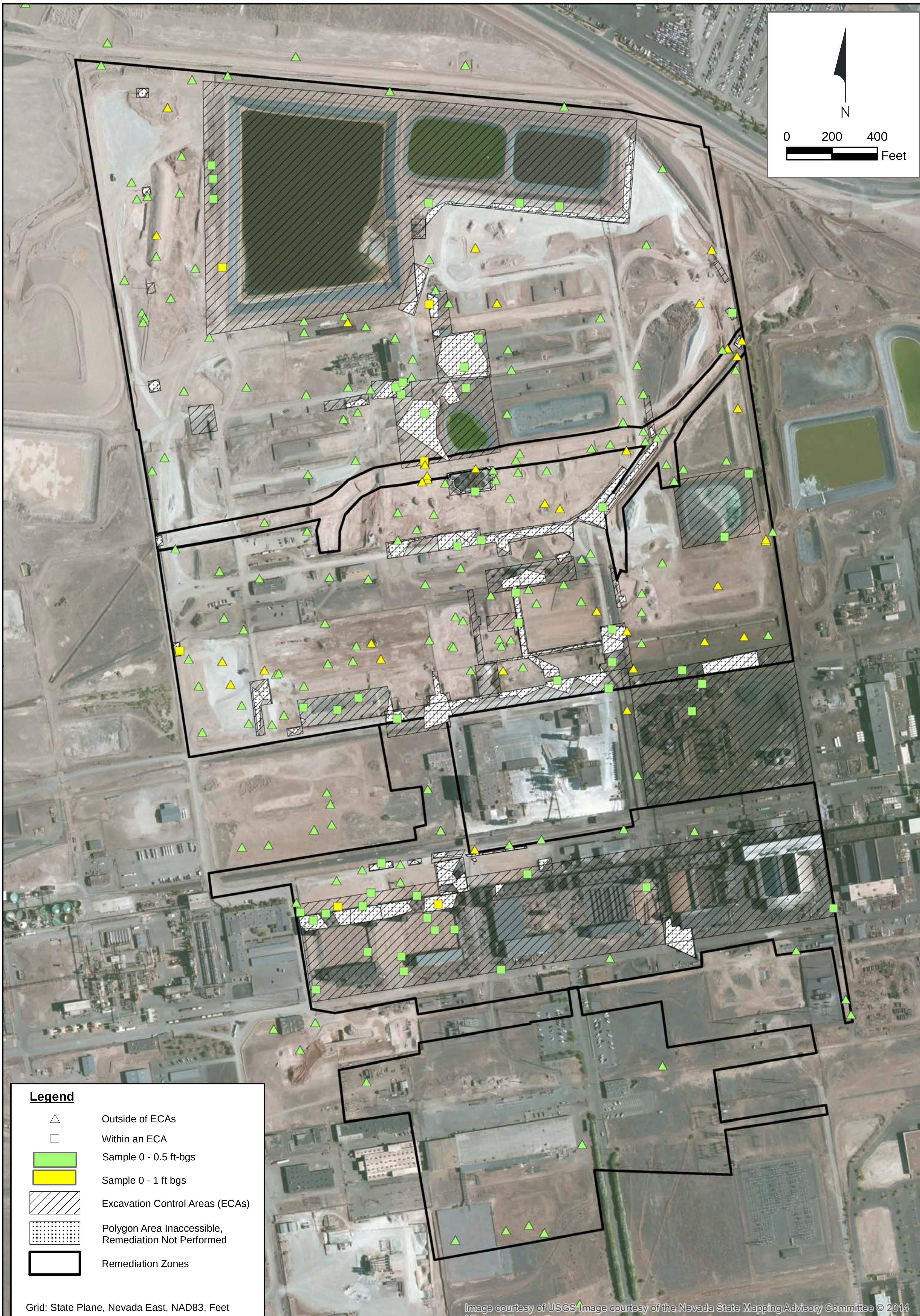
RAMBOLL ENVIRON

Clark County Distribution of Vegetation and Extent of Urbanization in and around Henderson, NV

Figure **2-3**

Drafter: RS	Date: 6/26/14	Contract Number: 21-34800I	Approved:	Revised:

H:\LePetomane\NERT\RI.FS_Workplan\SLERA_Work Plan\Figures\Fig 2-3.CDR



Path: H:\cjk\Projects\NERT\ECO WP\Figures\Surface Soil Locations.mxd

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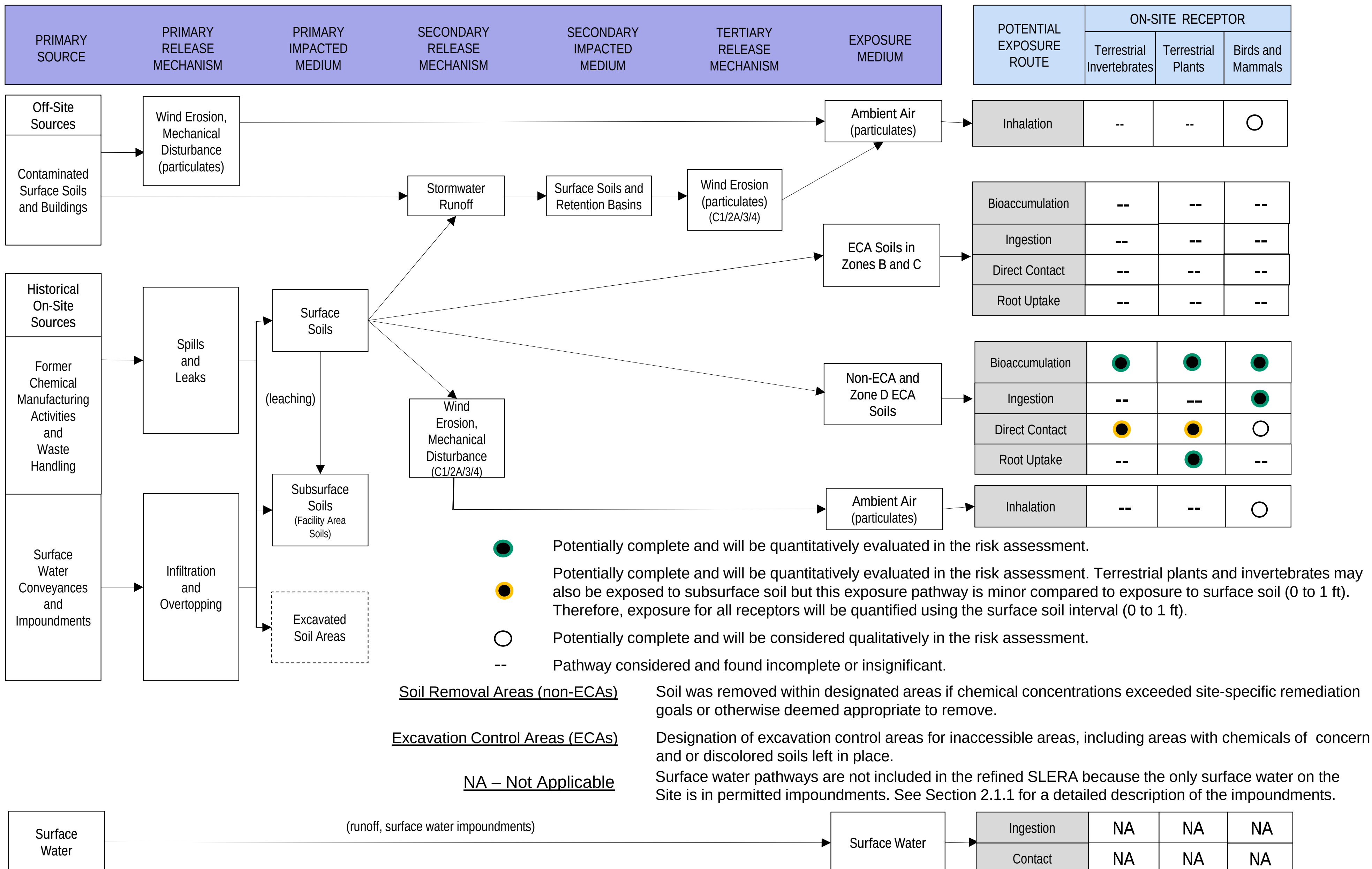
SURFACE SOIL SAMPLE LOCATIONS ALL REMEDIATION ZONES

Nevada Environmental Response Trust (NERT)
Henderson, Nevada

Figure **2-4**

Drafter: RS | Date: 6/27/2014 | Contract Number: | Approved by: | Revised:



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Ecological Conceptual Site Model for the NERT Site
Nevada Environmental Response Trust Site, Henderson, Nevada

Figure **2-5**

Drafter: EL Date: 6/18/2014 Contract Number: 21-34800I Approved by: Revised:

H:\LePetomane\NERT\BHRA\Report\Figures

RAMBØLL ENVIRON

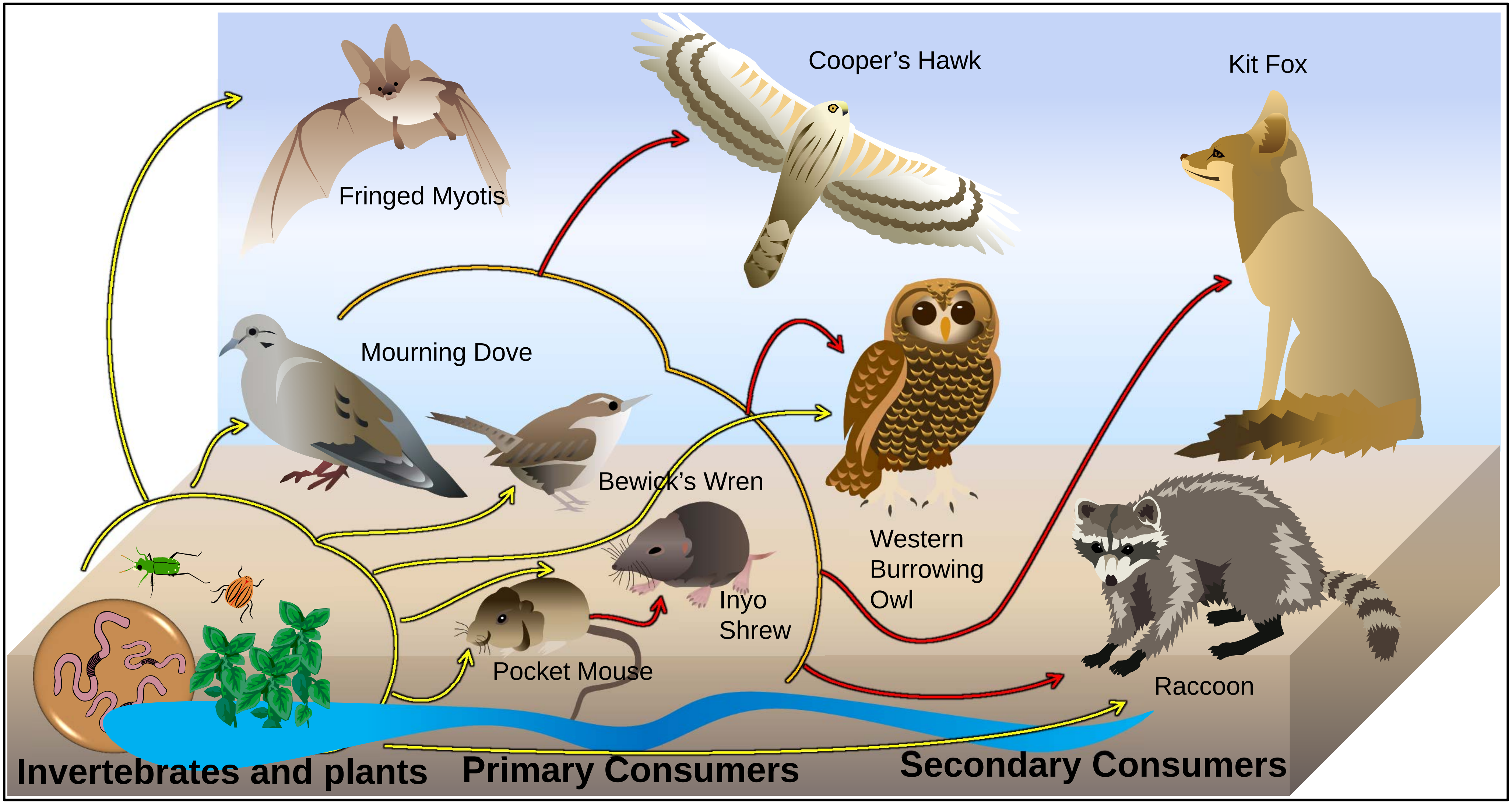
Excavation Control Areas - All Remediation Zones (without Remediation Polygons)

Nevada Environmental Response Trust Site, Henderson, Nevada

Figure **2-6**

Drafter: RS | Date: 6/19/2015 | Contract Number: 21-32100FA | Approved by: | Revised:

Path: H:\LePetomane\NERT\Soil Excavation\GIS\Maps\ExcavationControlAreas_2013\Fig2-6_ExcavationControlAreas_RZ.mxd



RAMBOLL ENVIRON

NERT Refined SLERA Food Web

Nevada Environmental Response Trust Site, Henderson, Nevada

FIGURE

4-1

APPENDIX A
USEPA COMPLETED ECOLOGICAL SITE VISIT CHECKLIST

CHECKLIST FOR ECOLOGICAL ASSESSMENT/SAMPLING

Introduction

The checklist that follows provides guidance in making observations for an ecological assessment. It is not intended for limited or emergency response actions (e.g., removal of a few drums) or for purely industrial settings with no discharges. The checklist is a screening tool for preliminary site evaluation and may also be useful in planning more extensive site investigations. It must be completed as thoroughly as time allows. The results of the checklist will serve as a staring point for the collection of appropriate biological data to be used in developing a response action. It is recognized that certain questions in this checklist are not universally applicable and that site-specific conditions will influence interpretation. Therefore, a site synopsis is requested to facilitate final review of the checklist by a trained ecologist.

Checklist

The checklist has been divided into sections that correspond to data collection methods and ecosystem types. These sections are:

I Site Description

- IA. Summary of Observations and Site Setting

II Terrestrial Habitat Checklist

- IIA. Wooded
- IIB. Shrub/Scrub
- IIC. Open Field
- IID. Miscellaneous

III Aquatic Habitat Checklist – Non-Flowing Systems

IV Aquatic Habitat Checklist – Flowing Systems

V Wetlands Habitat Checklist

Checklist for Ecological Assessment/Sampling

I. SITE DESCRIPTION

1. Site Name: Nevada Environmental Trust Site

   Location: Henderson, Nevada

   County: Clark City: Henderson State: Nevada

2. Latitude: 36° 02' 35.4" N Longitude: 114° 59' 58.7" W

3. What is the approximate area of the site: 350 Acres

4. Is this the first site visit? Yes No. If no, attach trip report of previous site visit(s), if available.

   Date(s) of previous site visit(s): __________

5. Please attach to the checklist USGS topographic map(s) of the site, if available.

6. Are aerial or other site photographs available? Yes No. If yes, please attach any available photo(s) to the site map at the conclusion of this section.

   Photo log provided as Appendix B of the Refined SLERA Work Plan

   maps have been provided in the Refined SLERA Work Plan.

7. The land use of the site is:

_____ % Urban

_____ % Rural

_____ % Residential

99 % Industrial (___ light ✓ heavy)

_____ % Agricultural

(Crops: ____________________________)

_____ % Recreational

(Describe: note if it is a park etc.)

_____ % Undisturbed

_____ % Other

The area surrounding the site is:
____________________ mile radius

30 % Urban

_____ % Rural

_____ % Residential

70 % Industrial (✓ light ✓ heavy)

_____ % Agricultural

(Crops: ____________________________)

_____ % Recreational

(Describe: note if it is a park, etc.)

_____ % Undisturbed

_____ % Other

8. Has any movement of soil taken place at the site? ✓ Yes ___ No. If yes, please identify the most likely cause of this disturbance:

Agricultural Use	Heavy Equipment	Mining
Natural Events	Erosion	Other

Please describe:

Contaminated soil has been removed. Details of the soil removal can be found in the "Interim Soil Removal Action Completion Report" (ENVIRON 2012).

9. Do any potential sensitive environmental areas exist adjacent to or in proximity to the site, e.g., Federal and State parks, National and State monuments, wetlands, prairie potholes? *Remember, flood plains and wetlands are not always obvious; do not answer "no" without confirming information.*

Las Vegas Wash (2.5 miles) / Clark Co Wetlands Park (7.1 miles from Site)
Henderson Bird Viewing Preserve (5.8 miles from Site)

Please provide the source(s) of the information used to identify these sensitive areas, and indicate their general location on the site map.

Google Earth, USGS topo maps, area maps, Site Maps

10. What type of facility is located at the site?

Chemical | Manufacturing | Mixing | Waste disposal

Other (specify)______________________________

11. What are the suspected contaminants of concern at the site? If know, what are the maximum concentration levels?

Perchlorate, metals, dioxins, PAHs

12. Check any potential routes of off-site migration of contaminants observed at the site:

Swales | Depressions | Drainage ditches Beta Ditch * see below

Runoff | Windblown particulates | Vehicular traffic

Other (specify)______________________________

13. If known, what is the approximate depth to the water table? 35 to 40 feet below ground surface

14. Is the direction of surface runoff apparent from site observations? yes no If yes, to which of the following does the surface runoff discharge? Indicate all that apply.

Surface water | Groundwater | Sewer | Collection impoundment

15. Is there a navigable waterbody or tributary to a navigable waterbody? yes no

* The facility area was graded so that stormwater would be retained on-site. Also, two main designated retention basins and a drainage channel to collect storm water. The retention basins are typically dry.

16. Is there a waterbody anywhere on or in the vicinity of the site? If yes, also complete Section III: Aquatic Habitat Checklist – Non-Flowing Systems and/or Section IV: Aquatic Habitat Checklist – Flowing Systems.

yes (approx. distance ____________________) no

17. Is there evidence of flooding? yes no *Wetlands and flood plains are not always obvious; do not answer "no" without confirming information.* If yes, complete Section V: Wetland Habitat Checklist.

18. If a field guide was used to aid any of the identifications, please provide a reference. Also, estimate the time spent identifying fauna. [Use a blank sheet if additional space is needed for text.]

The Site reconnaissance was conducted by a certified biologist.
The Peterson field Guides were used during the Site Recon.

19. Are any threatened and/or endangered species (plant or animal) known to inhabit the area of the site? yes no *If yes, you are required to verify this information with the U.S. Fish and Wildlife Service.* If species' identities are known, please list them next.

There are currently three species federally-listed as threatened or endangered under ESA. These include desert tortoise (Gopherus agassizii), Southwestern willow flycatcher (Empidonax traillii extimus), and the Yuma Clapper rail (Rallus longirostris yumanensis). These species may be found at Clark Co. Wetlands, LV Wash or Bird Preserve but are not found in or around the immediate vicinity of the Site.

20. Record weather conditions at the time this checklist was prepared:

Date: Dec. 10 - 11

60-63 Temperature (C/F)

4-5 mph Wind (direction/speed)

30% Cloud cover

56°F Normal daily high temperature

0 inch Precipitation (rain, snow)

IA. SUMMARY OF OBSERVATIONS AND SITE SETTING

The ecology at the NERT Site is barren and dry with little or no vegetation. The few plants on the property are sparsely distributed and are less than 2 feet high (see photo log - Appendix B of the Refined SLERA Work Plan). Outside of the fenceline shrubs reach heights of approximately 5-6 feet. No mammals were observed on the Site during the two day site reconnaissance. However, coyote have been observed outside of the fenceline and on the property on the debris pile (see figure 1-3 of the Refined SLERA Work Plan).

A red-tailed hawk was observed on a telephone wire off Boulder Highway on Parcel D to the north of the Site. A burrowing owl was observed outside of the eastern fence line.

Completed by Linda Martello Affiliation ENVIRON

Additional Preparers

Site Manager John Pekala (ENVIRON)

Date Dec 11, 2014

II TERRESTRIAL HABITAT CHECKLIST

IIA. WOODED

1. Are there any wooded areas at the site? yes no If no, go to Section IIB: Shrub/Scrub.

2. What percentage or area of the site is wooded? (________ % _________ acres). Indicate the wooded area on the site map which is attached to a copy of this checklist. Please identify what information was used to determine the wooded area of the site.

   N/A

3. What is the dominant type of vegetation in the wooded area? (Circle one: Evergreen/Deciduous/Mixed) Provide a photograph, if available. N/A

   Dominant plant, if known: ______________________________

4. What is the predominant size of the trees at the site? Use diameter at breast height. N/A

   0 - 6 in. 6 - 12 in. >12 in.

5. Specify type of understory present, if known. Provide a photograph, if available.

   Photos of vegetation are provided in Appendix B of the Refined SLERA Work Plan.

IIB. SCHRUB/SCRUB

1. Is shrub/scrub vegetation present at the site? yes no If no, go to Section IIC: Open Field.

2. What percentage of the site is covered by scrub/shrub vegetation? (1 % _____ acres). Indicate the areas of shrub/scrub on the site map. Please identify what information was used to determine this area.

   Shrubs occur intermittently along the fence line and in small (5 x 5 ft) patches near drainage areas (Beta ditch)

3. What is the dominant type of scrub/shrub vegetation, if known? Provide a photograph, if available.

   Dominant shrub type is creosote bush, sagebrush

4. What is the approximate average height of the scrub/shrub vegetation?

   0 - 2 ft. 2 - 5 ft. > 5 ft.

5. Based on site observations, how dense is the scrub/shrub vegetation?

Dense Patchy Sparse very sparse

IIC. OPEN FIELD

1. Are there open (bare, barren) field areas present at the site? yes no If yes, please indicate the type below:

Prairie/plains Savannah Old field Other (specify) ________________

2. What percentage of the site is open field? (__________ % _______ acres). Indicate the open fields on the site map.

3. What is/are the dominant plant(s)? Provide a photograph, if available.

4. What is the approximate average height of the dominant plant? ________________________

5. Describe the vegetation cover: Dense Sparse Patchy

IID. MISCELLANEOUS

1. Are other types of terrestrial habitats present at the site, other than woods, scrub/shrub, and open field? yes no If yes, identify and describe them below.

2. Describe the terrestrial miscellaneous habitat(s) and identify these area(s) on the site map.

A photo log is provided in Appendix B of the refined SLERA Work Plan.

3. What observations, if any, were made at the site regarding the presence and/or absence of insects, fish, birds, mammals, etc.?

Small song birds were observed intermittently at the site.

A burrowing owl was observed off-site at the fence lin

4. Review the questions in Section I to determine if any additional habitat checklists should be completed for this site.

The photo log shows whre the burrowing owl was observed.

III AQUATIC HABITAT CHECKLIST

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type of open-water, non-flowing system is present at the site?

   Natural (pond, lake)
   Artificially created (lagoon, reservoir, canal, impoundment) - permitted pond - not habitat

2. If known, what is the name(s) of the waterbody(ies) on or adjacent to the site?

   WC-West, WC-East, Mn-1, GW-11

3. If a waterbody is present, what are its known uses (e.g., recreation, navigation, etc.)?

   Process water, extracted groundwater from Remediation activities

4. What is the approximate size of the waterbody(ies)? ____________ acre(s).

   GW11 = 9.5 acres, WC-West + WC-East = 2.6 acres each

5. Is any aquatic vegetation present? yes no If yes, please identify the type of vegetation present if known.

   Emergent Submergent Floating

6. If known, what is the depth of the water? approximately 9-10 feet

7. What is the general composition of the substrate? Check all that apply.

Bedrock	Sand (coarse)	Muck (find/black)
Boulder (>10 in.)	Silt (fine)	Debris
Cobble (2.5 - 10 in.)	Marl (shells)	Detritus
Gravel (0.1 - 2.5 in.)	Clay (slick)	Concrete

   Other (specify) Concrete lined

8. What is the source of water in the waterbody?

River/Stream/Creek	Groundwater	Industrial discharge
Surface runoff	Other (specify) ____________	

9. Is there a discharge from the site to the waterbody? yes no If yes, please describe this discharge and its path.

The ponds contain process-related water and groundwater from remediation activities.

10. Is there a discharge from the waterbody? yes no. If yes, and the information is available, identify from the list below the environment into which the waterbody discharges.

River/Stream/Creek	onsite	offsite	Distance ________________
Groundwater	onsite	offsite	
Wetland	onsite	offsite	Distance __________________
Impoundment	onsite	offsite	

11. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected provide the measurement and the units of measure below:

No measurements were made During the Site Recon.

~414,000 Sq. Ft. Area

20ft ~~to top~~ of Berm Depth (average)

NA Temperature (depth of the water at which the reading was taken) __________

NA pH

NA Dissolved oxygen

NA Salinity

NA Turbidity (clear, slightly turbid, turbid, opaque) (Seecchi disk depth _________)

— Other (specify)

NA = Not available

12. Describe observed color and area of coloration.

Dark consistent with the black liner.

13. Mark the open-water, non-flowing system on the site map attached to this checklist.

14. What observations, if any, were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?

Several mallards and coots were observed. However, no dabbling was observed during the observation period (1/2 hour)

IV AQUATIC HABITAT CHECKLIST – FLOWING SYSTEMS

Not Applicable

Note: Aquatic systems are often associated with wetland habitats. Please refer to Section V, Wetland Habitat Checklist.

1. What type(s) of flowing water system(s) is (are) present at the site? None

River	Stream	Creek
Dry wash	Arroyo	Brook
Artificially created (ditch, etc.)	Intermittent Stream	Channeling

Other (specify) ____________________

2. If known, what is the name of the waterbody? ____________________

3. For natural systems, are there any indicators of physical alteration (e.g. channeling, debris, etc.)? yes no If yes, please describe indicators that were observed.

4. What is the general composition of the substrate? Check all that apply.

Bedrock	Sand (coarse)	Muck (find/black)
Boulder (>10 in.)	Silt (fine)	Debris
Cobble (2.5 - 10 in.)	Marl (shells)	Detritus
Gravel (0.1 - 2.5 in.)	Clay (slick)	Concrete

Other (specify) ____________________

5. What is the condition of the bank (e.g., height, slope, extent of vegetative cover)?

6. Is the system influenced by tides? yes no What information was used to make this determination?

7. Is the flow intermittent? yes no If yes, please note the information that was used in making this determination.

8. Is there a discharge from the site to the waterbody? yes no If yes, please describe the discharge and its path.

9. Is there a discharge from the waterbody? yes no If yes, and the information is available, please identify what the waterbody discharges to and whether the discharge is on site or off site.

10. Identify any field measurements and observations of water quality that were made. For those parameters for which data were collected, provide the measurement and the units of measure in the appropriate space below:

________ Area

________ Depth (average)

________ Temperature (depth of the water at which the reading was taken) __________

________ pH

________ Dissolved oxygen

________ Salinity

________ Turbidity (clear, slightly turbid, turbid, opaque) (Seecchi disk depth _________)

________ Other (specify)

11. Describe observed color and area of coloration.

12. Is any aquatic vegetation present? yes no If yes, please identify the type of vegetation present, if know.

Emergent Submergent Floating

13. Mark the flowing water system on the attached site map.

14. What observations were made at the waterbody regarding the presence and/or absence of benthic macroinvertebrates, fish, birds, mammals, etc.?

V. WETLAND HABITAT CHECKLIST

1. Based on observation and/or available information, are designated or known wetland definitely present at the site? yes no

   No wetland is present at the Site

   Please note the sources of observations and information used (e.g., USGS Topographic Maps, National Wetland Inventory, Federal or State Agency, etc.) To make this determination.

   Site reconnaissance, Google Earth maps

2. Based on the location of the site (e.g., along a waterbody, in a floodplain) and site conditions (e.g. standing water, dark, wet soils; mud cracks; debris line; water marks), are wetland habitats suspected? yes no If yes, proceed with the remainder of the wetland habitat identification checklist.

3. What type(s) of vegetation are present in the wetland? N/A

   Submergent Emergent Scrub/Shrub Wooded
   Other (specify) ______________________________

4. Provide a general description of the vegetation present in and around the wetland (height, color, etc.). Provide a photograph of the known or suspected wetlands, if available.

5. Is standing water present? yes no If yes, is water: Fresh Brackish
   What is the approximate area of the water (sq. ft.) ______________________
   Please complete questions 4, 11, 12 in Checklist III - Aquatic Habitat – Non-Flowing Systems.

6. Is there evidence of flooding at the site? What observations were noted?

   Buttressing Water marks Mud cracks

   Debris line Other (describe below)

7. If known, what is the source of the water in the wetland? N/A

Stream/River/Creek/Lake/Pond Groundwater

Flooding Surface Runoff

8. Is there a discharge from the site to a known or suspected wetland? yes no If yes, please describe.

Potential impacted groundwater discharge from the site to surface water at Las Vegas Wash (2 miles). Mitigation measures in the form of an extraction and treatment system is in place. Discharges into the Las Vegas Wash have been significantly reduced. Following aquifer restoration, the Trust will conduct an ERA for downgradient areas including the wash.

9. Is there a discharge from the wetland? yes no If yes, to what waterbody is discharge released?

Surface Stream/River Groundwater Lake/Pond Marine

Las Vegas Wash empties into Lake Mead

10. If a soil sample was collected, describe the appearance of the soil in the wetland area. Circle or write in the best response.

Color (blue/grey, brown, black, mottled) ______________________

Water content (dry, wet, saturated/unsaturated) ______________________

11. Mark the observed area(s) on the attached site map.

See Figure 1-2 of the Refined SLERA Work Plan

APPENDIX B
DECEMBER 10-11, 2014 SITE RECONNAISSANCE PHOTO LOG

B-1: On-Site Photos

B-2: Area to the North of the Site

B-3: Excavation Control Areas

APPENDIX B-1
ON-SITE PHOTOS

Photo 1: Former Impoundment Soil Removal Area Directly West of GW-11

Photo 2: Former Beta Ditch Facing East

Photo 3: Former Beta Ditch Facing East

Photo 4: Site Property Boundary Looking Northwest Towards the BMI Corrective Action Management Unit

RAMBOLL ENVIRON

Site Photographs

On-Site Photos

December 2014

Photo 5: Pond AP-5 facing west

Photo 6: Property Fence Line looking westward Along Decommissioned Drainage Ditch

Photo 7: Site Property Looking East Towards Tronox Facility

Photo 8: MN-1 Pond Facing Southeast

Photo 9: Groundwater Holding Pond GW-11 Facing Northwest

Photo 10: WC-East Pond Facing East

Photo 11: WC-West Pond Facing East

APPENDIX B-2
AREA TO THE NORTH OF THE SITE

Photo 1: View from Boulder Highway looking south across Parcels D and C to the North of the NERT Site

Photo 2: View from Boulder Highway looking east. Parcel D is to the right under the telephone wires.

Photo 3: View from Boulder Highway looking west across Parcels D and E. These Parcels are north of the NERT Site.

Photo 4: Parcels D and E looking West from Boulder Highway.

APPENDIX B-3
EXCAVATION CONTROL AREAS

Photo 1: Excavation Control Area (ECA) from Unit 1 in Zone B facing Northeast

Photo 2: ECA C18 facing Northeast

Photo 3: ECA C18 facing Southeast

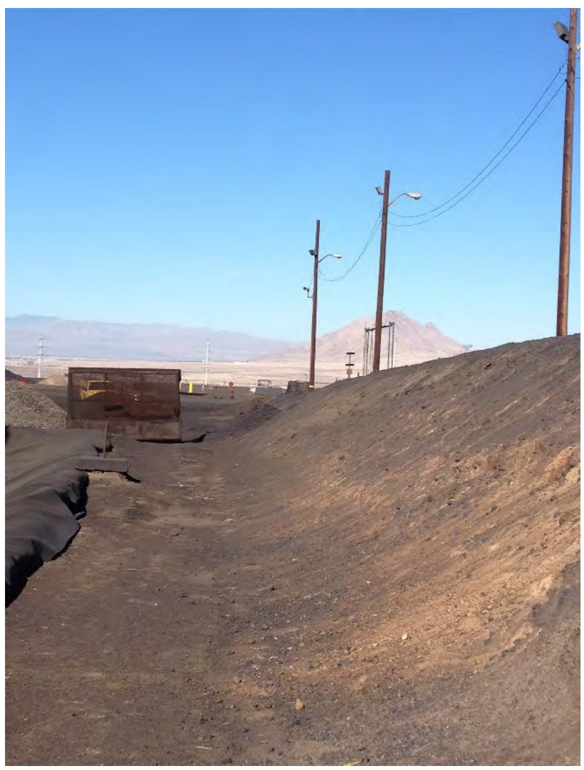


Photo 4: ECA C18 facing Northwest

Photo 5: ECA C6 facing Southwest

Photo 6: ECA C12 facing Northwest

Photo 7: ECA C15 facing Southwest

Photo 8: ECA C17 facing Northwest

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Site Photographs

Excavation Control Areas

December 2014

Photo 9: ECA C16 facing Southwest

Photo 10: ECA D8 facing Northwest

Photo 11: ECA D1 facing Northwest

Photo 12: ECA D1 facing East

Photo 13: ECA E3 facing Northwest

ATTACHMENT A
RESPONSE TO NDEP COMMENTS, DATED APRIL 30, 2015, ON THE REFINED SCREENING-LEVEL ECOLOGICAL RISK ASSESSMENT WORK PLAN, REVISION 0, DATED FEBRUARY 13, 2015

NDEP Comment	Response
Specific Comment #1: Section 2.1.2, Ecological Exposure Media at the Site, Page 9. Surface soil is defined in this section as the top 1 foot of soil for characterizing chemical concentrations. The section further states that subsurface soil is not a relevant media for the ERA "due to the paucity of ecological receptors" that have contact with subsurface soil. Plant roots, soil invertebrates (particularly harvester ants), and burrowing mammals generally have contact with soils below the 1-foot depth horizon. These receptors can also serve as transport mechanisms to bring subsurface contaminants back to the surface. Text should be added to this section to justify why the top foot of soil is 1) a worst-case scenario; or, 2) representative of deeper soils (particularly in the 1 to 3 foot depth range). The root zone in Las Vegas is generally about 3 feet and can be up to 10 feet, so the NDEP suggests that the NERT considers ecological exposure media for top 10 feet of soil if the data is available. In addition, it appears as though both 0-6 in. and 0-1 ft bgs data are available for use. It is not clear how these data will be used together. Some exploratory data analysis might be necessary to justify merging these data. Also, note that the background data represent 0-6 inches which could create a lack of comparability. Please describe how these data will be used to support background comparisons and the ERA.	NDEP has elected to drop Specific Comment #1 as stated in the email sent from Weiquan Dong (NDEP) to Steve Clough (NERT Trust) dated June 19, 2015.
Specific Comment #2: Figure 2-5, Ecological Conceptual Site Model. Based on Specific Comment # 1, the figure should be revised to show potentially complete exposure pathways to subsurface soil for Terrestrial Plants and Terrestrial Invertebrates. Also, correct the typographical error in the Excavation Control Areas (ECAs) explanation change "wit" to "with").	This modification was made as requested as insects and plant roots may be found deeper than 1 foot. However, there is no evidence that (1) there are burrowing wildlife at the Site, or (2) the plants are a viable source of food for wildlife. Therefore exposure to subsurface soil is not a complete exposure pathway for mammals and birds at the Site. The typographical error in the Excavation Control Areas (ECAs) explanation was corrected as requested from "wit" to "with".

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Specific Comment #3: Section 2.1.3, Preliminary Chemicals of Potential Ecological Concern, Page 9. This section outlines the process for narrowing the list of PCOPECs to the list of COPECs for quantitative evaluation in the SLERA. The NDEP suggests that the SLERA include documentation for all PCOPECs not carried forward for evaluation in the screening, and the justification for elimination of each PCOPEC in the SLERA report.	The Refined SLERA Report will contain documentation for all PCOPECs not carried forward in the evaluation and the justification for elimination of each PCOPEC. Text has been added to the revised SLERA Section 2.1.3 stating this.
Specific Comment #4: Section 2.1.3, Preliminary Chemicals of Potential Ecological Concern, Page 9. The third bullet states that identification of chemicals that exhibit known or suspected hotspots will be used as modifying criteria when evaluating whether a PCOPEC can be eliminated based on frequency of detection. Please clarify how a hotspot will be defined. Suggest changing the term "hotspot" to "evidence of release".	A “hotspot” represents a discrete area where concentrations of one or more COPECs is statistically significantly greater than the area surrounding it. A comprehensive analysis for “outliers” which may indicate potential hotspots for spatial analysis was conducted for the Site and is provided in the “*Preliminary Selection of Facility Area Soil COPCs”* (ENVIRON 2015). Side-by-side box-and-whisker plots were used to provide a visual comparison between various datasets. Data points above and below the whiskers are considered potential outliers from the distribution. These “outliers” may indicate potential hotspots for spatial analysis. This “outlier” analysis will be considered in the refined SLERA consistent with the use of this information in the BHRA. A definition of the term hotspot has been added to Section 2.1.3. ENVIRON does not recommend changing the term "hotspot" to "evidence of release". A hotspot is not necessarily evidence of a release as hotspots can occur from, for instance, pooling of storm water that causes an accumulation of chemicals in a specific location. “Evidence of release” suggests that there is some record of an active release at a particular location on the Site.

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Specific Comment #5: Section 2.1.3.2, Evaluation of Site Conditions Relative to Background Conditions, Page 12. Though the work plan does not specify which analytes will be included in the analysis, the last paragraph of this section discusses the evaluation of radionuclides. Please clarify whether the radionuclide contaminants are being screened in the SLERA for just direct toxicity to ecological receptors or if radiation dose is also included in the screening. Also, the last sentence of this section states that the approach for assessing radionuclides in the refined SLERA will be consistent with that defined by LANL (2012). It is assumed that this sentence refers to the entire screening approach, not just the background comparison approach, since LANL 2012 does not appear to address background comparisons. Therefore, this sentence would fit better in Section 2.2.	NDEP has elected to drop Specific Comment #5 as stated in the email sent from Weiquan Dong (NDEP) to Steve Clough (NERT Trust) dated June 19, 2015. Nonetheless, the ESLs for radionuclides provided by LANL consider both external exposure from soil and internal exposure from the uptake of radionuclides in food and water, and ingestion of soil. ESLs are available for terrestrial invertebrates and plants as well as avian and mammalian wildlife. Therefore, it is not necessary to develop a food web model for radionuclides in the ERA. This information has been added to the revised SLERA in Section 2.2.
Specific Comment #6: Section 2.1.5, Identification of Potentially Complete Exposure Pathways, Page 13. In the bulleted list of potentially complete exposure pathways, please modify the third bullet to read (changes in bold): "Exposure of terrestrial birds and mammals to chemicals through incidental ingestion of soil and ingestion of food items (i.e. food chain uptake).	The text was revised as requested.

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Specific Comment #7: Section 2.1.6, Identification of Generic Assessment and Measurement Endpoints, Page 14. If radiation dose is being considered (See Specific Comment #5), assessment endpoints for terrestrial mammals and birds should be modified, or additional endpoints added to better reflect radiation exposure pathways. Currently the assessment endpoints for birds and mammals state that daily dose is based solely on food chain ingestion, which is the standard approach for assessing toxicity of contaminants to wildlife. Radiation dose is the sum of internal dose (based on food chain ingestion and inhalation) and external dose (based on direct exposure to soil/water/sediment).	NDEP has elected to drop Specific Comment #7 as stated in the email sent from Weiquan Dong (NDEP) to Steve Clough (NERT Trust) dated June 19, 2015.
Specific Comment #8: Section 3.1, Identification of Screening-Level Exposure Estimates, Page 17. In the first paragraph of this section, change "non-sentient organisms" to "non-sessile organisms".	The text was revised as suggested.
Specific Comment #9: Section 4.1, Refinement of COPECs, Page 19. This section states that frequency of detection (FOD) will be used in Step 3A to refine the list of COPECs, with a threshold of 5% detects as the criteria for retaining a chemical as a COPEC. However, the 5% FOD is also proposed in Section 2.1.3 as a criterion for deriving the initial list of COPECs from the list of PCOPECs. If the FOD threshold is applied in the initial narrowing of the list of PCOPECs, there is no reason to use it in the Step 3A refinement because all chemicals with less than a 5% detection frequency will already have been eliminated. That said, for the sake of screening conservatism, the preference would be to apply the FOD criteria in Step 3A, not in the initial winnowing of the list of PCOPECs.	The 5% FOD approach will be used only in Step 3A as suggested. The 5% FOD text has been removed from Section 2.1.3 and additional text has been added to Section 4.1.

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Specific Comment #10: Section 4.3.1.2, Bioaccumulation and Bioconcentration Factors, Page 23. The last sentence of the first paragraph states that food web modeling will be limited to relevant important bioaccumulating compounds as prescribed in USEPA (2000). The reference provided is for sediment. Bioaccumulation into aquatic organisms is generally greater than in terrestrial organisms. Doses to wildlife should be calculated for each COPEC that is carried into the SLERA, and should not be limited based on the USEPA (2000) reference. Even chemicals with low bioaccumulation potential could pose risk to wildlife at high enough soil concentrations.	Wildlife hazard quotients will be calculated for bioaccumulative chemicals consistent with USEPA (2000, 2007, and 2012). Chemicals with low bioaccumulation potential could pose risk to wildlife at high enough soil concentrations via incidental ingestion of soil but not through the food web. Therefore, only bioaccumulative chemicals will be evaluated in the food web model. Text relevant to this approach is provided in Section 4.3.1.2 of the revised SLERA Work Plan.
Specific Comment #11: Section 4.4.1, Risk Estimation, Page 27. In the first bullet in this section remove reference to aquatic invertebrates and fish, as these are not relevant receptors for the NERT areas being evaluated. Revise the third bullet to note that no special status species are expected at the NERT Site.	The text was revised as suggested.

REFERENCES

Los Alamos National Laboratory (LANL). 1999. Screening Level Ecological Risk Assessment Methods. Environmental Restoration Project. LA-UR-99-1405, April.

U.S. Environmental Protection Agency (USEPA) 2000. Bioaccumulation Testing and Interpretation For The Purpose Of Sediment Quality Assessment Status and Needs. EPA-823-R-00-001. February 2000. Table 4-2. Important Bioaccumulative Compounds. http://water.epa.gov/polwaste/sediments/cs/biotesting_index.cfm

USEPA 2007. Constituents which the USEPA has provided guidance to describe uptake to higher trophic levels. Attachment 4-1, Guidance for Developing Ecological Soil Screening Levels (Eco-SSLs). Exposure Factors and Bioaccumulation Models for Derivation of Wildlife Eco-SSLs. OSWER Directive 9285.7-55. Revised April http://www.epa.gov/ecotox/ecossl/pdf/ecossl_attachment_4-1.pdf

USEPA Region 3 2012. List of bioaccumulative compounds in freshwater and freshwater sediment. http://www.epa.gov/reg3hwmd/risk/eco/index.htm