UPPER COLUMBIA RIVER

FINAL
Soil Study Data Summary Report

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ACRONYMS AND ABBREVIATIONS

ACG	analytical concentration goal
AD	aerial deposition
ADA	aerial deposition area
ALS	ALS Environmental
ARCADIS	ARCADIS U.S., Inc.
BERA	baseline ecological risk assessment
CEC	cation exchange capacity
COC	chain-of-custody
CSM	conceptual site model
DL	detection limit
DQO	data quality objective
DU	decision unit
Eco-SSL	ecological soil screening level
ESI	Environmental Standards, Inc.
EPA	U.S. Environmental Protection Agency
FSP	field sampling plan
GPS	global positioning system
HHRA	human health risk assessment
ICP	inductively coupled plasma
ICS	incremental composite sampling
ID	identification
ITRC	Interstate Technology & Regulatory Council
IVBA	*in vitro* bioaccessibility assay
LCS	laboratory control sample
MDL	method detection limit
MRL	method reporting limit
MS/MSD	matrix spike/matrix spike duplicate
%Ds	percent differences
QA/QC	quality assurance and quality control
QAPP	quality assurance project plan

RBA	relative bioavailability
RBC	risk-based concentration
RF	relict floodplain
RFDA	relict floodplain deposition area
RI/FS	remedial investigation and feasibility study
RL	reporting limit
RM	river mile
RPD	relative percent difference
RSD	relative standard deviation
SOP	standard operating procedure
SRC	Syracuse Research Corporation
TAL	target analyte list
TAI	Teck American Incorporated
TOC	total organic carbon
UCR	Upper Columbia River
USBR	U.S. Bureau of Reclamation
USGS	U.S. Geological Survey
WS	windblown sediment
WSDA	windblown sediment deposition area

UNITS OF MEASURE

ac	acre(s)
cm	centimeter(s)
g	gram(s)
gal.	gallon(s)
in.	inch(es)
m	meter(s)
mg/kg	milligrams per kilogram
mm	millimeter(s)
µm	micrometer(s)
mi^2	square mile(s)

1 INTRODUCTION

This report presents the results for the 2014 Soil Study (herein referred to as "the study") conducted for the Upper Columbia River (UCR) Site, herein referred to as the Site.[1] Analyses were conducted under the U.S. Environmental Protection Agency (EPA)-approved quality assurance project plan (QAPP) for the study (Exponent et al. 2014). The study was conducted as part of the remedial investigation and feasibility study (RI/FS) for the Site to evaluate if there is unacceptable risk to ecological receptors and people from exposure to metals in the upland soils. Data needs addressed by this study are intended to support the conduct of the baseline ecological risk assessment (BERA) (to be completed by Teck American Incorporated [TAI]) and the baseline human health risk assessment (HHRA) (to be completed by EPA).

1.1 BACKGROUND

A review of historical soil data from soil samples collected adjacent to the UCR identified gaps in the data necessary to evaluate ecological and human health risks (Exponent et al. 2014). These data gaps included the need for additional soil data to evaluate upland areas potentially affected by point sources (e.g., aerial deposition of smelter particulates), historical fluvial deposition of sediment onto relict floodplains, and re-deposition of windblown sediment. In addition, historical soil data sets did not include parameters needed to determine the bioavailability of metals to soil organisms (i.e., cation exchange capacity [CEC], total organic carbon [TOC], and pH) or the bioaccessibility of lead in soil to which people may be exposed (i.e., *in vitro* bioaccessibility assay [IVBA]) (USEPA 2007a).

1.2 REPORT ORGANIZATION

This report is organized into the following sections:

- **Section 1 – Introduction.** This section provides background information for the study and outlines the report organization.

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[1] The Site, as defined in the June 2, 2006, Settlement Agreement (USEPA 2006b), is "the areal extent of hazardous substances contamination within the United States in or adjacent to the Upper Columbia River, including the Franklin D. Roosevelt Lake ("Lake Roosevelt"), from the border between the United States and Canada downstream to the Grand Coulee Dam, and all suitable areas in proximity to such contamination necessary for implementation of the response actions.…"

- **Section 2 – Study Design.** This section describes the purpose and objectives of the study and provides an overview of the study design.
- **Section 3 – Methods.** This section provides the methods used for the study, including target sampling locations, collection methods, field analyses, laboratory analyses, and the approach used to summarize the data for the data report. This section also discusses any changes or deviations from the QAPP and field sampling plan (FSP).
- **Section 4 – Validation Assessment.** This section provides an overview of the validation assessment conducted for the analytical results of the study samples.
- **Section 5 – Results.** This section presents a summary of the field and analytical results and provides a comparison of the results with soil screening levels.
- **Section 6 – Summary and Recommendations.** This section presents a summary of the results and provides recommendations.
- **Section 7 – References.** This section presents bibliographic information for the documents cited within this report.

Figures, maps, and data tables are provided following Section 7. Appendices and the raw data are provided in electronic format (see enclosed CD-ROM). Data may also be obtained directly from the project database, accessible at: http://teck-ucr.exponent.com.

2 2014 SOIL STUDY DESIGN

2.1 PURPOSE OF STUDY

The purpose of the study was to collect information on concentrations of analytes in upland soil. This information will be used to evaluate whether there is unacceptable risk to ecological and human receptors from exposure to metals in the upland soil adjacent to the UCR (Exponent et al. 2014).

2.2 DATA QUALITY OBJECTIVES

As described in the QAPP (Exponent et al. 2014), EPA's seven-step data quality objective (DQO) process (USEPA 2006a) was used to guide the study design for the collection of upland soil. The DQO process is used to determine the type, quantity, and quality of data needed to achieve study goals and establishes performance and acceptance criteria for the data. The seven steps of the DQO process are listed below and discussed in the subsections that follow.

1. State the problem
2. Identify the goals of the study
3. Identify information inputs
4. Define the boundaries of the study
5. Develop the analytical approach
6. Specify performance or acceptance criteria
7. Develop the plan for obtaining the data.

2.2.1 Step 1 – State the Problem

The preliminary conceptual site model (CSM) for the UCR RI/FS (Parametrix et al. 2010) identified soil as a potential exposure pathway for ecological receptors (i.e., terrestrial invertebrates, amphibians, reptiles, plants, birds, and mammals) and human receptors. As presented in the QAPP (Exponent et al. 2014), the spatial extent of historical soil data was limited and considered to be insufficient to evaluate potential risks to ecological and human receptors. Therefore, additional soil data were collected during the study to evaluate three types of areas, representing different soil transport mechanisms, where concentrations of analytes in soil might present an unacceptable risk to ecological and human receptors.

These three types of areas are:

- Aerial deposition areas (ADAs)—areas potentially influenced by smelter particulate deposition in the northern portion of the Site
- Relict floodplain deposition areas (RFDAs)—areas that may have been inundated under historical hydraulic conditions in the UCR
- Windblown sediment deposition areas (WSDAs)—areas where sediment from the UCR shoreline may have been transported by the wind during periods of water drawdown.

At the direction of EPA, the analytes evaluated in this study included EPA's target analyte list (TAL) metals[2] and molybdenum (USEPA 2012a). In addition, data that were not available in the historical data sets but were needed to determine the bioavailability of metals to soil organisms (i.e., CEC, TOC, and pH) and the bioaccessibility of lead in soil to which people may be exposed (i.e., IVBA) were also evaluated in the study.[3]

2.2.2 Step 2 – Identify the Goals of the Study

The primary goal of the study was to generate data to be used in characterizing the exposure of ecological and human receptors to upland soil. As presented in the QAPP (Exponent et al. 2014), the primary questions developed to meet this goal were:

- Where have analyte concentrations in soil been influenced by the deposition of particulates in air emissions, sediment onto relict floodplains adjacent to the UCR, or re-deposition of windblown sediment?
- What are the concentrations of analytes in soil that have potentially been influenced by the deposition of particulates in air emissions, sediment onto relict floodplains adjacent to the UCR, or re-deposition of windblown sediment?
- Do analyte concentrations in soil pose an unacceptable risk to ecological or human receptors?

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[2] TAL metals include aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc (USEPA 2015) (see http://www.epa.gov/superfund/programs/clp/ismtarget.htm).

[3] At the direction of EPA, IVBA was expanded to include TAL metals and molybdenum rather than just lead as specified in the QAPP (Exponent et al. 2014). Documentation regarding the rationale for this decision is provided in Appendix B.

The specific risk questions that will be addressed in the BERA and HHRA using the data collected in this study include:

- Is reproduction, growth, or survival of terrestrial invertebrates or plants adversely affected by chemicals of potential concern (COPCs[4]) in UCR soil?
- Are COPCs in UCR soil at concentrations that will adversely affect reproduction, growth, or survival of amphibians or reptiles (herpetofauna) during adult life stages?
- Are COPCs in UCR soil at concentrations that will adversely affect reproduction, growth, or survival of terrestrial birds or mammals?
- Is the health of people working, recreating, or living on the Site adversely affected by COPCs in UCR soil?

2.2.3 Step 3 – Identify Information Inputs

Careful consideration was given to identify the types and sources of information needed to determine whether exposure to soil at the Site poses unacceptable risks to ecological or human receptors. This information included the following:

- Analytical data for TAL metals and molybdenum in the < 2-mm fraction of soil collected from the three area types (i.e., ADAs, RFDAs, and WSDAs) for use in the BERA
- Analytical data for TAL metals and molybdenum in the < 149-µm fraction of soil[5] collected from two area types (i.e., ADAs and RFDAs) for use in the HHRA[6]
- Grain size distribution in bulk soil samples

[4] Screens of chemicals of interest will identify COPCs to be carried forward into the BERA and HHRA.

[5] As specified in the QAPP (Exponent et al. 2014), a No. 100 sieve (mesh size of 149 µm) was used to collect the soil fraction for analysis of data for the HHRA. The laboratory reports and validation reports refer to this fraction as the 150-µm fraction.

[6] WSDAs were focused on evaluating risks to ecological receptors (USEPA 2012a). Prior sampling showed that beaches sampled nearest the WSDAs (i.e., Summer Island and Marcus Flats Island for the Marcus Flats WSDAs and Seven Bays for the Columbia Beach WSDAs) had no lead or arsenic concentrations above human health soil screening levels (USEPA 2012c).

- Soil data for geochemical parameters that could affect the bioavailability of metals to ecological receptors (i.e., pH [bulk soil samples[7]] and TOC and CEC [< 2-mm soil fraction]) from the three area types (i.e., ADAs, RFDAs, and WSDAs)
- IVBA analyses on 20 percent of the soil samples from two area types (i.e., ADAs and RFDAs) that had lead concentrations > 100 mg/kg
- Soil screening levels (i.e., ecological soil screening levels [Eco-SSLs] and human [i.e., residential] soil screening levels).

2.2.4 Step 4 – Define the Boundaries of the Study

The Site encompasses the UCR from the U.S.-Canada border (river mile [RM] 745) to the Grand Coulee Dam (approximately RM 596) and includes Franklin D. Roosevelt Lake. As discussed in Step 1, three types of areas within the Site were selected to represent three different means of soil deposition: aerial deposition from smelter stacks (ADAs), sediment deposition on relict floodplains (RFDAs), and re-deposition of windblown sediment during low water (drawdown) conditions (WSDAs). These areas are shown on Map 2-1 and described in more detail, below.

- **Aerial Deposition Areas.** ADAs are areas located within the northernmost 100 mi^2 of the Site and extend south from the U.S.-Canada border. The eastern border follows the ridge east of the UCR toward Northport, Washington. The western border is bisected by drainages and extends northwesterly along a straight line to the U.S.-Canada border.
- **Relict Floodplain Deposition Areas.** For the purpose of the study, relict floodplains are areas that may have been subjected to flooding under past flow conditions but are not expected to be inundated under current pool level management controls. The relict floodplain is the delineated area between high-pool seasonally inundated lands and the maximum pre-1973 strandline. The five largest UCR relict floodplains are located near Northport, Washington. All five of these floodplains were designated as RFDAs for the study.
- **Windblown Sediment Deposition Areas.** Areas on the west bank of northern Marcus Flats and just north of Seven Bays at Columbia Beach were identified as WSDAs because they represent locations where the windblown re-deposition of

[7] pH was measured in the bulk soil sample rather than in the < 2-mm soil fraction as specified in the QAPP (Exponent et al. 2014) so that the measurement would not be influenced (i.e., altered) by the soil drying and sieving process.

sediment is most likely to occur and represent a possible worst-case scenario. Sampling locations were selected based on site-specific wind dynamics and further refined to avoid areas adjacent to nearby mining activities.

In addition to spatial factors, the timing for sampling was also considered. The only temporal consideration for the soil sampling event was that the soil needed to be accessible (i.e., not snow-covered or frozen). Thus, the targeted time frame for sampling was between June and October.

2.2.5 Step 5 – Develop the Analytical Approach

Except for the soil screening levels, all of the information listed in Step 3 was collected as part of the study. The Eco-SSLs presented in the QAPP (Exponent et al. 2014) are the lowest of the screening levels adopted by EPA for plants, soil invertebrates, birds, and mammals (USEPA 2010a).[8] The human health soil screening levels presented in the QAPP were derived by Syracuse Research Corporation (SRC 2013) and represent residential risk-based screening levels for soil. With the exception of antimony, arsenic, and mercury, all of the SRC (2013) screening levels were calculated using EPA's regional screening level calculator and default values.[9] SRC (2013) adjusted the screening levels for antimony and mercury to reflect changes to the default reference dose values for those metals. SRC (2013) also adjusted the human health screening level for arsenic for natural background.[10] The target method detection limits (MDLs) and method reporting limits (MRLs) (Table 2-1) for analytical methods selected for the study were five-fold lower than the Eco-SSLs and the human health soil screening levels.

The analytical approaches adopted for the study are intended to provide quality data for evaluating whether there are unacceptable risks to ecological or human receptors exposed to soil from the Site. Soil samples were collected using incremental composite sampling

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[8] According to EPA (USEPA 2010a), the metals with Eco-SSLs are those that typically exist as cationic species.

[9] The comparison with screening values provided in this data report are for screening purposes only and are only intended to identify chemicals that should be evaluated in the risk assessments. They do not represent cleanup or action levels (USEPA 2002, 2003).

[10] The human health screening level for arsenic was based on the 2012 default arsenic residential soil screening level for a 1-in-1-million risk level (USEPA 2012b) plus an estimate of the concentration of arsenic in natural background (9 mg/kg). Since SRC's development of this screening level, EPA's 2012 default arsenic screening level (0.39 mg/kg) has been updated to include a default oral relative bioavailability assumption of 0.6 or 60 percent for arsenic in soil. The current default arsenic screening level is 0.67 mg/kg. However, for the purpose of this report, the screening value identified in the QAPP was used.

(ICS) methods (ITRC 2012) within specifically selected decision units (DUs). ICS methods are designed to reduce variability in the data and provide more accurate estimates of the mean soil concentrations to which ecological or human receptors are exposed than those obtained from single, discrete soil samples.

Soil samples collected using the ICS method were sieved into two fractions (< 2-mm and < 149-µm). Analytical data from the < 2-mm and < 149-µm fractions will be used for the evaluation of risk to ecological and human receptors, respectively.

The data were compared with soil screening levels to determine if additional data are needed. The Eco-SSLs and human health soil screening levels used in this screening process are provided in Section 5.6; they are conservative screening levels to be used only for initial screening purposes and are only intended to identify chemicals for further evaluation in the risk assessments. In the risk assessments, the site-specific bioavailability of metals to ecological receptors in the < 2-mm fraction will be determined using the relationships among pH, CEC, and TOC, which affect the ability of organisms to take up metals from soils (e.g., Smolders et al. 2009; Checkai et al. 2014). Site-specific adjustments may be made for copper, nickel, zinc, cobalt, and molybdenum using pH, CEC, and TOC.[11] In addition, IVBA results from the < 149-µm fraction may be used to calculate relative bioavailability (RBA) values for metals in the < 2-mm fraction.[12] The RBA adjustment for the < 2-mm fraction will be conducted in the BERA.

IVBA results for lead in the < 149-µm fraction have been used to calculate site-specific oral RBA values for lead in soil. In addition, arsenic concentrations in the < 149-µm fraction have been adjusted for EPA's default RBA of 60 percent arsenic in soil (USEPA 2012b). Spatial representations of results for metals concentrations in the < 149-µm fraction have been prepared to identify locations where concentrations exceed human health risk-based concentrations (RBCs).[13] The spatial evaluation of data from the < 2-mm fraction will be conducted as part of the BERA, and data may be adjusted for bioavailability. Locations

[11] A simplified Excel-based calculator for conducting the site-specific bioavailability adjustments is available at the following website:
http://www.arche-consulting.be/metals-csa-toolbox/soil-pnec-calculator.

[12] At the direction of EPA, IVBA was expanded to include TAL metals and molybdenum rather than just lead as specified in the QAPP. The usability of the IVBA data to assess RBA for metals in the < 2-mm fraction will be determined in conjunction with EPA.

[13] Maps have only been prepared for metals with concentrations exceeding human health RBCs.

exceeding screening levels will be compared against regional background concentrations.[14]

2.2.6 Step 6 – Specify Performance or Acceptance Criteria

Performance or acceptance criteria are derived to minimize the possibility of either making erroneous conclusions or failing to keep uncertainty regarding the estimates to within acceptable levels.

The sampling goal was to collect 100 percent of the targeted samples. Reserve DUs were established to mitigate sample collection challenges in specific areas (e.g., impassable roads, flooding, rocky outcrops, cultural resource issues, lack of landowner permission, steep terrain, or erosion). For sampling challenges within DUs, procedures were established to shift increment locations if it was not possible to sample a targeted increment location listed in the QAPP.

Soil sampling and analysis were conducted using standard EPA-approved methods. DQOs followed EPA guidelines for precision, accuracy, representativeness, completeness, comparability, and analytical sensitivity. Composite samples were submitted to the analytical laboratory for ICS processing and subsampling according to the Interstate Technology & Regulatory Council (ITRC) guidance (ITRC 2012) and EPA-approved laboratory standard operating procedures (SOPs). Composited samples were homogenized, sieved into fractions (< 2-mm and < 149-μm), and subsampled at the analytical laboratory. Metals analysis was conducted on a 2 g subsample, which is greater than the standard mass of 1 g (dry weight) for EPA Method 3050B but the minimum mass required to obtain a representative sample using ICS methods (Crumbling 2014).

Field quality control included the following:[15]

- Triplicate samples were collected from a total of 22 DUs. A detailed breakdown of triplicate samples by area is described below.
  - Primary ADA (includes reserve DUs in the reserve sampling area)—10 DUs were sampled in triplicate in the primary ADA (8 in the main area and 2 in

[14] An agreement on soil background concentrations for use in the risk assessments has not been reached. Therefore, the comparison with background will be conducted as part of the risk assessments.

[15] According to the QAPP, field quality control includes the use of trip blanks. Trip blanks are used to assess the contamination of volatile compounds during sample transport; however, because volatile compounds were not being assessed in this study, trip blanks were deemed unnecessary and, therefore, not included.

the reserve area). Of the 107 DUs sampled in the primary ADA, slightly less than 10 percent were sampled in triplicate (i.e., 10 of 107 or 9.4 percent), which met the QAPP requirement. This requirement specified that slightly under 10 percent of the DUs from the primary ADA be collected in triplicate because several additional sampling DUs were added at the request of EPA without the stipulation that additional triplicate locations be added to meet the 10 percent minimum criterion.

- High-density ADA—Six DUs were sampled in triplicate in the high-density ADA. Of the 35 DUs sampled in the high-density ADA, 17 percent were sampled in triplicate, which met the QAPP requirement that at least 10 percent of the DUs from the high-density ADA be collected in triplicate.
- RFDA—4 DUs were sampled in triplicate in the RFDA, one from each of the 4 RFDAs sampled (RFA, RFB, RFC, and RFD) as specified in the QAPP. Of the 16 DUs sampled in the RFDA, 25 percent were sampled in triplicate, which is above the minimum QAPP requirement that at least 10 percent of the DUs from the RFDA be collected in triplicate.
- WSDA—2 DUs were sampled in triplicate in the WSDA: one DU in the Columbia Beach North deposition area and one DU in the Marcus Flats East deposition area. Of the 13 DUs sampled in the WSDA, 15 percent were sampled in triplicate, which is above the minimum QAPP requirement that at least 10 percent of the DUs from the WSDA be collected in triplicate.

- Two types of split samples were prepared. These samples were collected in the same manner as standard samples in accordance with the QAPP and as summarized below:
  - Field split samples were pre-selected for certain DUs to assess the homogeneity of samples collected in the field. ALS Environmental (ALS) performed sample homogenization and took two aliquots of sample from the homogenized soil to generate the field split samples. Field split samples were prepared from 10 percent of the collected samples.
  - EPA split samples were pre-selected by EPA representatives for chemical analysis as part of their quality assurance and quality control (QA/QC) program. ALS performed sample homogenization and took two aliquots of sample from the homogenized soil to generate the EPA split sample. EPA split samples were prepared from 15 percent of the collected samples.
  - Equipment rinsate blanks were collected to identify possible contamination from the sampling environment or sampling equipment.

Laboratory quality control included the following:

- Matrix spike/matrix spike duplicate (MS/MSD) quality control was conducted for every 20 samples during analysis.
- Laboratory blanks were used to identify possible contamination from the preparation methods (i.e., sieving).

2.2.7 Step 7 – Develop the Plan for Obtaining the Data

A resource-effective design for collecting and processing the upland soil samples that would achieve the performance criteria for the study was described in the QAPP (Exponent et al. 2014). TAI and its technical team worked with potentially affected parties to assess the effects of the planned work and seek ways to avoid, minimize, or mitigate any adverse effects on properties with historical significance. A study-specific cultural resources coordination plan (Appendix B of the QAPP) provided relevant background information about Site-related cultural resources, defined measures for protecting resources, and defined procedures for consulting with the appropriate state, federal, and tribal parties with interests in the cultural resources of the Site.

2.3 STUDY DESIGN

This section summarizes the study design for the collection of soil samples and the rationale for the design, as presented in detail in the QAPP (Exponent et al. 2014). The sampling approach was developed based on the primary objective of the study, which was to collect information on analytes in upland soils adjacent to the UCR for use in the BERA and HHRA.

2.3.1 Overall Design

Soil samples were collected from predetermined DUs within three area types (i.e., ADAs, RFDAs, and WSDAs) following ICS methods (ITRC 2012). Increment samples (increments) were collected from the top 7.5 cm (3 in.) of soil at 30 increment locations within each DU (or 90 increment locations if the DU was sampled in triplicate). Increments were composited in the field to create one sample representing the entire DU. At the analytical laboratory, composite samples were homogenized and sieved into two soil fractions (i.e., < 2-mm and < 149-µm). Data for analyte concentrations in the two fractions will be used in the BERA and HHRA, respectively and are therefore discussed separately in this report. Data for select conventional soil parameters (e.g., CEC, TOC, and pH will be used to assess the RBA of metals in soil to ecological receptors. IVBA analysis was conducted on a subset (i.e., slightly more than 20 percent) of the < 149-µm fraction samples with lead concentrations > 100 mg/kg. IVBA data for lead provide an estimate of the site-specific oral RBA for lead in soil.[16]

2.3.2 Selection of Sampling Areas

Soil samples were collected from the ADAs, RFDAs, and WSDAs as shown in Maps 2-2 through 2-4. The QAPP (Exponent et al. 2014) includes detailed information regarding how the sampling areas were defined and selected; brief summaries (by area type) are provided in the subsections below.

2.3.2.1 Aerial Deposition Areas

ADAs are lands adjacent to the UCR and within the river valley that most likely received aerial deposition from historical smelter stack emissions. Two ADAs were designated for sampling: the ADA high-density area, which comprises a 23-mi^2 corridor along the section of the UCR immediately downstream of the U.S.-Canada border and the ADA primary area, which comprises approximately 99 mi^2 (Map 2-2). The ADA high-density area was designated for a more extensive sampling due to the perceived likelihood of higher historical deposition rates in that area. In addition to these two subareas, a 16-mi^2 reserve area situated east of the ADA primary area was designated for sampling in the event that the target number of samples could not be collected from the high-density and primary areas (Map 2-2).

2.3.2.2 Relict Floodplain Deposition Areas

For the purpose of this evaluation, the RFDAs were defined as areas of the Site that were flooded under pre-1973 flow conditions but are not expected to flood under current flow and pool level management controls because changes in upstream flow regulations since 1973 have altered the magnitude of flood events. Thus, in the RFDAs, there is a potential for contamination from historical sediment deposition to exist beyond the present-day floodplain limits. The RFDAs are the areas between the maximum pre-1973 and post-1973 high-pool flood levels on the UCR. Five RFDAs that ranged in size from approximately 81 ac (0.13 mi^2) to 268 ac (0.42 mi^2) were designated for sampling (RFA through RFE; Map 2-3).

[16] IVBA data for all metals were obtained at the request of EPA and may be used to estimate the RBA in the < 2-mm-fraction for use in the BERA.

2.3.2.3 Windblown Sediment Deposition Areas

WSDAs were determined by analyzing wind conditions (i.e., speed, direction, and frequency), concentrations of analytes in nearshore sediment, and percent fines in sediment along the UCR. Wind data were gathered from meteorological data collection systems operated by the U.S. Geological Survey (USGS) and U.S. Bureau of Reclamation (USBR) and used to generate plots of wind speed patterns. The areas with the maximum winds, highest percent fines, and highest concentrations of critical analytes were selected to represent soil in areas with the greatest probability of having the highest analyte concentrations from the re-deposition of windblown sediment. The combined analyses indicated that Marcus Flats and Seven Bays on the left bank (east side) of the UCR (Map 2-4) represented the reasonable worst-case scenario for the enrichment of soils by analytes in windblown sediment. Marcus Flats had the highest analyte concentrations in bank sediment, and Seven Bays had the highest percentage of particles of a size most likely to be transported by wind. Thus, two beach areas each at Marcus Flats (East and West) and near Seven Bays (Columbia Beach North and South) were designated as WSDAs (Map 2-4).

2.3.3 Identification of Target DUs and Sampling Locations

The QAPP (Exponent et al. 2014) included detailed information regarding the selection of DUs within the three sampling areas. The process is briefly summarized by area type in the subsections below. Maps 2-2 through 2-4 show the locations of DUs in each area.

2.3.3.1 Aerial Deposition Areas

A total of 142 DUs were targeted for sampling in the ADAs: 39 in the ADA high-density area and 103 in the ADA primary area. In addition, reserve DUs were pre-selected for sampling in the event that the target number of DUs in the ADA high-density and primary areas could not be sampled: 7 in the high-density area, 19 in the primary area, and 16 in the reserve area (Table 2-2). The selection of DUs within the ADAs considered factors such as accessibility for sample collection (e.g., areas with less than 30-degree slope due to safety concerns, areas within 550 m of roads to minimize travel time for field personnel to reach sampling locations). DUs were not located within 50 m of roads and railways or within no-sample buffer zones established for active and abandoned mine sites.[17] DUs

[17] A 500-m no-sample buffer zone was established for mine sites within the ADAs that were sampled as part of the assessment detailed in the START-2 report (START-2 2002). A 100-m no-sample buffer was established around the other known mine sites in the study area, including those identified as "producer," "past producer," "occurrence," "prospect," or "unknown."

were also excluded from areas within relict floodplain depositional areas or areas near the surface of the Columbia River at full pool elevation. Using these criteria, a total of 63.94 square miles (mi^2) were removed from the ADAs (10.62 mi^2 from the ADA high-density area, 44.48 mi^2 from the ADA primary area, and 8.84 mi^2 from the ADA reserve area. Specific details on the area removed from the ADAs due to exclusion features are provided in Table B1-4 of the QAPP (Exponent et al. 2014).

2.3.3.2 Relict Floodplain Deposition Areas

A total of 29 DUs were targeted for sampling in the RFDAs, with 3 to 9 DUs selected per RFDA (Table 2-2). Locations of DUs (Map 2-3) were determined based on the direction and magnitude of flood events and vegetation type.

2.3.3.3 Windblown Sediment Deposition Areas

Two beach areas each at Marcus Flats and Columbia Beach were designated as the WSDAs. The beach areas were identified as being relatively undisturbed because they had no roads, railways, mines, or other sources of dust-producing activity. DUs at each beach area were located within two elongated polygons situated perpendicular to the primary direction of onshore winds. Seven target DUs were selected for each polygon, for a total of 28 DUs (Table 2-2 and Map 2-4). The WSDAs were not evaluated for human health because WSDA sampling was focused on evaluating risks to ecological receptors (USEPA 2012a). Prior sampling showed that the beaches sampled nearest the WSDAs (i.e., Summer Island and Marcus Island for the Marcus Flats WSDAs and Seven Bays for the Columbia Beach WSDAs) had no lead or arsenic concentrations above human health soil screening levels (USEPA 2012c).

Map B1-2 of the QAPP (Exponent et al. 2014) shows the buffer zones established for the mine locations.

3 METHODS

3.1 FIELD METHODS

The sampling program for the study was outlined in the QAPP (Exponent et al. 2014), which included the FSP as Appendix A. The FSP detailed the procedures and methods for sample collection and processing, field quality control, sample documentation, packaging, and transport, field documentation, laboratory analyses, and data management and reporting.

Field sampling was conducted by ARCADIS U.S., Inc. (ARCADIS). Upland soil samples were collected from the three area types within the Site (i.e., ADAs, RFDAs, and WSDAs) between September 8 and October 23, 2014. Sampling activities were conducted under the direct oversight of EPA or their authorized representatives. Cultural resource monitors from the Confederated Tribes of the Colville Reservation, the National Park Service, and/or the Spokane Tribe of Indians and archaeologists[18] from URS Corporation were also present during sampling activities to provide oversight for the protection of cultural artifacts in accordance with the protocols outline in the cultural resources coordination plan (Appendix B of the QAPP [Exponent et al. 2014]). The sampling locations, sample collection methods, and field documentation are documented in the field activity report prepared by ARCADIS, which is included as Appendix A of this report. Field changes and deviations from the QAPP are also detailed in the field activity report (Appendix A) and summarized in Section 3.1.3.

3.1.1 Sampling Locations

As specified in the QAPP (Exponent et al. 2014) and discussed in Section 2.3, upland soil composite samples were targeted for collection from 199 DUs (142 from ADAs, 29 from RFDAs, and 28 from WSDAs). Because of access constraints (e.g., steep terrain, permission not provided by land owner), not all targeted DUs were sampled. Samples were collected from a total of 171 DUs (142 from ADAs, 16 from RFDAs, and 13 from WSDAs) (Maps 2-2 through 2-4 and Table 3-1). Increments were collected from 30 predetermined locations within each DU (or 90 increment locations if the DU was sampled in triplicate).[19] The

[18] Archaeological monitoring was conducted by professional archaeologists meeting the Secretary of Interior's Professional Qualification Standards, as outlined in 36 Code of Federal Regulations Part 61.

[19] Only 15 increments were collected from ADA-101 because the terrain was too steep to collect all 30 increments; see Appendix A.

increment locations were identified using a hand-held global positioning system (GPS) unit. Increments were generally collected within 2 to 10 m of the predetermined location. In some instances (because of steep slopes, access restrictions, or limited accuracy of the GPS units), sample increments were collected more than 10 m from the predetermined location. Table 3 of Appendix A indicates which sample increments were collected, either more than 2 m or more than 10 m, from the predetermined location. The coordinates for the new locations are provided on the Increment Collection Forms in Appendix D of the field activity report (Appendix A).

3.1.2 Methods for Sample Collection

This section summarizes the collection and field processing methods of soil samples, which were carried out in accordance with the methods presented in the QAPP (Exponent et al. 2014) and FSP (Appendix A of the QAPP). Field QC samples included triplicate, field split, EPA split, and equipment rinsate blank samples.

3.1.2.1 Incremental Composite Sampling

Within each DU, increments were collected at predetermined locations using ICS methods in accordance with the QAPP (Exponent et al. 2014). Once the locations had been cleared of any surface debris, increments were collected from the top 0 to 7.5 cm (0 to 3 in.) of soil using a 5-cm-diameter AMS core sampler (soil punch). Each increment was placed in a dedicated plastic zippered storage bag and examined for cultural materials by a cultural resource monitor and/or archaeologist. Once the soil increment passed the cultural inspection, sampling continued. Sample buckets were labeled at the time of sampling. Labels included the alphanumeric sample identification (ID), as detailed in Section 2.6 of Appendix A of the QAPP, sampler's initials, and sample date and time.

Upon the completion of sampling at a DU, all 30 increments for that DU were composited in a laboratory-decontaminated 2-gal. plastic bucket to form a single incremental composite sample representative of the entire DU. Field observations and sampling activities were recorded in the field notebook and on a tablet computer. Sample collection equipment was grossly decontaminated (i.e., brushed off) between increments at the same DU and fully decontaminated between DUs in accordance with the procedures detailed in Appendix A of the QAPP (Exponent et al. 2014). Samples were placed on ice and stored in a secured, refrigerated truck located in the field. At least once a week, samples were transported by ARCADIS personnel to the analytical laboratory, ALS, in Kelso, Washington. At ALS, the contents of each bucket were homogenized and processed as described in Section 3.2 of this report. The sample ID was recorded on the appropriate field sampling form in the tablet and on the chain-of-custody (COC) form. Sample labeling details and completed COC forms are provided in the field activity report (Appendix A).

A total of 215 composite samples were collected (using ICS methods) from 171 DUs and submitted to ALS for analysis (see Section 3.2). This number includes triplicate samples collected (using ICS methods) at 22 of the DUs (Section 3.1.2.2).[20] Table 3-2 identifies the numbers of incremental composite samples collected in each area. Tables 3-3a through 3-3c provide information for each of the composite samples in the three deposition areas, respectively. Details regarding the ICS are provided in the field activity report (Appendix A).

3.1.2.2 Triplicate Samples

A select number of DUs at each of the three sampling areas were sampled in triplicate to assess the precision of the sampling process in accordance with the QAPP (Exponent et al. 2014). Triplicate DUs were assigned based on a select percentage of DUs. Triplicate samples were collected from 22 DUs using ICS methods (Table 3-1) for a total of 66 triplicate samples. Table 3-2 provides the number of triplicate samples collected within each sampling area. Additional information regarding the triplicate samples is provided in the field activity report (Appendix A).

3.1.2.3 Split Samples

As specified in the QAPP (Exponent et al. 2014), two types of split samples were prepared from designated increment composite samples: field split samples and EPA split samples. Split samples were collected from pre-selected DUs to assess the homogeneity of samples collected in the field. A total of 22 (or at least 10 percent) field split samples were prepared and analyzed by ALS, as described in Section 3.2.

EPA split samples were selected by EPA for chemical analysis as part of their QA/QC program. EPA split samples were prepared by ALS from 32 (at least 15 percent) of the collected incremental composite samples and sent to the EPA for analysis, as described in Section 3.2 of this report.

3.1.2.4 Equipment Rinsate Blank Samples

In accordance with Appendix A of the QAPP (Exponent et al. 2014), equipment rinsate blank samples were collected to evaluate equipment decontamination procedures.

[20] The total number of samples collected using ICS methods does not include the field split samples, which were prepared in the laboratory.

Multiple soil punches were used to collect increments at each DU. Soil punches were decontaminated in a manner similar to that used to decontaminate equipment between DUs. To collect a single equipment rinsate blank representative of all soil punches used at a given DU, deionized water was poured over the decontaminated soil punches into a laboratory-supplied sample jar. A total of 22 equipment rinsate blanks were collected from 22 DUs during the field sampling effort. Table 3-1 provides the number of DUs within each sampling area that had equipment rinsate blanks collected. The analysis of equipment rinsate blanks is described in Section 3.2 of this report.

3.1.3 Field Changes and Deviations

Procedures presented in the QAPP (Exponent et al. 2014) were followed to the extent possible during implementation of the study. Modifications to the QAPP were categorized as either "changes" or "deviations." Changes and deviations are summarized in Sections 4.1 and 4.2 of the field activity report (Appendix A).

Changes that were identified prior to the initiation of field work and during implementation of the study were documented on change request forms. Eight change request forms were prepared, submitted, and approved by EPA. The EPA-approved forms are included in the field activity report (Appendix A). The following types of changes were documented in the change request forms:

- Increments in 15 DUs were relocated because they were in areas where access to properties was not granted by the land owner.
- The triplicate selection was adjusted to meet the QAPP requirement to have one triplicate DU per RFDA.
- Increments in DUs were moved because the pre-selected increment locations were in areas that were too steep to sample.
- The boundaries for 13 DUs were adjusted in areas where access to the DUs was not granted by the land owners.
- New DUs were selected to replace two DUs that were in areas that were too steep to sample.
- One DU in the ADAs was not sampled because it was located in an area that was too steep to sample, and no suitable alternative location was identified.

Deviations from the QAPP that were identified during implementation of the study and subsequent corrective actions, if required, were documented on deviation/corrective action report forms included in Appendix A. The following deviations were documented in the deviation/corrective action reports:

- Nine increments were collected just outside of the DU boundary but still on property where TAI had permission to sample, due to limited GPS accuracy, terrain restrictions, and/or potential typographical errors.
- Fifteen of the 30 increments in DU ADA-101 were not collected due to access concerns and steep terrain.
- Forty-three increments were collected more than 2 m from the predetermined increment locations due to physical or access restrictions.
- Actual sampling coordinates were not recorded for 16 increments due to equipment malfunction (12 increments) or typographical errors (4 increments).

In addition to the deviations listed above, increments were identified after the completion of sample collection that had been collected more than 2 m from the predetermined increment location due to discrepancies between the proposed coordinates and the coordinates recorded during sample collection. Information is provided in Table 3 of Appendix A.

The majority of the sampling changes and deviations did not affect the sampling procedure and consisted primarily of the relocation of increments due to GPS malfunction or inaccuracy, safety concerns, lack of access across private property, or sampling obstacles such as the presence of cobbles or a lack of soil.

3.2 LABORATORY METHODS

Following the procedures specified in the QAPP (Exponent et al. 2014), soil samples were processed and analyzed by ALS. Upon receipt at ALS, all incremental composite samples were stored at room temperature, and an aliquot was taken from each sample for the analysis of grain size distribution and pH. The remaining sample underwent ICS processing according to the QAPP and was apportioned for sieving into two fractions: < 2-mm for ecological risk assessments (for ADA, RFDA, and WSDA DUs) and < 149-µm for human health risk assessments (for ADA and RFDA DUs). No < 149-µm fraction was prepared for samples collected from the WSDAs because WSDA sampling was focused on evaluating risks to ecological receptors as discussed in Section 2.3.3.3. Any laboratory deviations from the QAPP are discussed in Section 3.2.2.

Table 3-4 summarizes the analyses conducted on the two fractions of soil from the three sampling areas. The < 2-mm fraction was analyzed for total solids, CEC, TOC, and TAL metals, plus molybdenum. The < 149-µm fraction was analyzed for total solids and TAL metals, plus molybdenum.

Approximately 20 percent of the samples with lead concentrations > 100 mg/kg were selected for IVBA analysis in consultation with EPA (see Appendix B). A subsample of the < 149-µm fraction was apportioned for IVBA analysis and archived until results from the TAL metals and molybdenum analysis were completed. Soil samples for IVBA analysis were originally planned for the analysis of only lead (Exponent et al. 2014). However, at EPA's request, the IVBA analysis was later expanded to include all TAL metals (Appendix B).

Field split samples were prepared by ALS after homogenization and were assigned their own sample IDs. EPA split samples were also prepared by ALS after homogenization using ICS methods for subsampling, and were provided to EPA for separate analysis (Appendix A).

The 22 equipment rinsate blank samples collected in the field, as well as 30 sieve blanks prepared by ALS, were also analyzed for TAL metals and molybdenum.

3.2.1 Methods for Chemical Analysis

ALS prepared and analyzed all soil samples in accordance with the protocols and procedures specified in the QAPP (Exponent et al. 2014), as presented in Table 3-5. Soil samples for metals analyses were prepared with acid digestion following EPA methods 3050B and 7471B. Samples were analyzed for metals according to EPA methods 6010C, 6020A, and 7471B (see Table 3-5). Samples for IVBA were prepared according to EPA 9200.2-86 and analyzed according to EPA 6010B. Analytical concentration goals (ACGs) and MRLs are detailed in the QAPP.

3.2.2 Laboratory Deviations

Laboratory methods included two changes related to procedures specified in the QAPP (Exponent et al. 2014). The QAPP states that pH would be measured in the < 2-mm fraction of each soil sample and grain size would be measured in both the < 2-mm fraction and the < 149-µm fraction; however, prior to sample collection the decision was made to analyze pH and grain size in the bulk soil sample so that the measurement would not be influenced (i.e., altered) by the soil drying and sieving process. In addition, soil samples were stored at room temperature after receipt in the laboratory rather than at 4°C (±2 ºC) as stated in the QAPP, and then air dried and sieved prior to analysis. The storage temperature is not as critical for chemicals that are known to be stable (i.e., total metals) as for chemicals that can be volatilized (e.g., mercury, volatile and semivolatile organic compounds) or degraded (e.g., organic compounds). EPA's national functional guidelines for inorganic Superfund data review (USEPA 2010b) leaves data qualification resulting from not adhering to sample storage requirements of 4 ºC (±2 ºC) up to the discretion of the data reviewer. No laboratory method deviations were noted in the data validation reports (available on the "Downloads" page in the project database [http://teck-ucr.exponent.com]).

3.3 DATA EVALUATION APPROACH

The QAPP (Exponent et al. 2014) included procedures for the documentation of field, laboratory, and data validation. The data management plan detailed information related to the storage and handling of all project data.

3.3.1 Methods

Sampling efforts were documented in field notebooks and forms, COCs, and GPS files. Deviations from the sampling plan were noted in the field and detailed in the field activity report (Appendix A). All documents were scanned and converted to electronic pdf files. Laboratory data were stored at the analytical laboratory and uploaded to the project database. Data were validated by an independent reviewer, Environmental Standards, Inc. (ESI). Data validation reports and the field activity report were submitted to EPA.

Validated data are tabulated and summarized in this report. Section 5 includes summary statistics for soil data (i.e., number of detections, range, and mean) and a field quality control sample assessment. Field split sample relative percent differences (RPDs) and field triplicate relative standard deviations (RSDs) were evaluated based on control limits of 20 and 35 percent, respectively. Results for each of the DUs are provided in figures, maps, and tables in Section 5; field split and triplicate sample replicates are averaged for applicable DUs.

The site-specific bioavailability of metals to ecological receptors in the < 2-mm fraction using select conventional parameters (e.g., pH, CEC, and TOC) has not been determined for this data report. This evaluation will be conducted as part of the BERA.[21] For the HHRA, the IVBA results for lead in the < 149-μm fraction have been used to calculate oral RBA values for lead in soil.[22] The human health screening level for lead includes a default

[21] A simplified Excel-based calculator for conducting the site-specific bioavailability adjustments is available at the following website:
http://www.arche-consulting.be/metals-csa-toolbox/soil-pnec-calculator.
[22] EPA default RBA = 60% (USEPA 2007a); empirical lead soil concentrations are multiplied by this ratio before comparison to the human health soil screening value to account for differences in bioavailability relative to the screening value.

RBA adjustment of 60 percent. To ensure appropriate comparison of upland soil lead concentrations to the lead screening level, soil concentrations are multiplied by the ratio of the site-specific soil lead RBA value to EPA's default RBA. In addition, arsenic concentrations in the < 149-µm fraction have been adjusted for EPA's default RBA of 60 percent arsenic in soil (USEPA 2012b).

3.3.2 Deviations from Planned Data Evaluation Approach

There were no changes to the data evaluation approach addressed in the field activity report (Appendix A) or in the data validation reports (available on the "Downloads" page in the project database [http://teck-ucr.exponent.com]).

4 VALIDATION ASSESSMENT

Data validation were performed by ESI of Valley Forge, Pennsylvania in accordance with the QAPP (Exponent et al. 2014) based on EPA guidance from the following documents:

- *Guidance for Labeling Externally Validated Laboratory Analytical Data for Superfund Use* (EPA 540-R-08-005) (USEPA 2009)
- *USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review* (EPA 540-R-04-004) (USEPA 2004)

Stage 2B validation was conducted for the majority of the soil data. Approximately 15 percent of the data underwent Stage 4 validation, which was in accordance with the QAPP (Exponent et al. 2014). Data were qualified, as needed, based on an evaluation of laboratory and field QC criteria, including holding times, initial and continuing calibration results, blank concentrations, laboratory duplicate and field split RPDs, field triplicate RSDs, serial dilution percent differences (%Ds), and the recoveries of laboratory control samples (LCSs), internal standards, and MS/MSDs. ESI data validation reports are available on the "Downloads" page in the project database (http://teck-ucr.exponent.com). The results of the data validation are summarized in the following subsections.

4.1 OVERALL DATA QUALITY

A summary of the qualifiers assigned to the metals and conventional parameter data (i.e., pH, TOC, CEC, total solids, and grain size) are presented in Tables 4-1a through 4-1c for the ADAs, Tables 4-2a through 4-2c for the RFDAs, and Tables 4-3a and 4-3b for the WSDAs.[23] All data are usable with the qualifiers presented. The IVBA data are usable as qualified, with the exception of four IVBA results for molybdenum that were qualified as unusable (see Section 4.5.3). The data qualifiers were applied by ESI and included the following:

- "J"—The concentration was considered estimated due to one or more of the following: exceedance of project-specific holding time; analytical interference; LCS, MS/MSD, or reporting limit (RL) standard recovery not within acceptable

[23] The numbers of qualified samples presented in the tables (obtained from the project database) do not include laboratory QC samples and are not always consistent with the numbers of qualified samples presented in text (obtained from ESI), which do include laboratory QC samples.

range; high %D, RPD, or RSD for field or laboratory quality control; or the concentration is between the MDL and the MRL.

- "R"—The data point was unusable (i.e., rejected).
- "U"—The analyte was not detected at or above the MDL.
- "UJ"—The analyte was not detected, but the detection limit is likely higher than reported due to low bias.
- "U*"—The analyte was considered “not detected” because a similar concentration was detected in an associated blank sample. ESI considered the sample weight, percent solids, and dilution factor when evaluating blank contamination. For results qualified "U*," the MDL was changed to the concentration of the method blank.

Note that the numbers of qualified samples presented in Tables 4-1 through 4-4 (obtained from the project database) do not include laboratory QC samples, whereas the numbers of qualified samples presented in the text (obtained from the data validator) include laboratory QC samples. Therefore, the numbers in the text and the tables are not always consistent.

4.2 SAMPLE TRANSPORT AND HOLDING TIMES

There were no sample transport issues or exceedances of transport holding times. The QAPP-specified (Exponent et al. 2014) laboratory holding time of 14 days for pH was exceeded for 265 samples. Affected samples were qualified as estimated ("J" flagged).

The CEC data for many samples were originally qualified as estimated ("J" flagged) due to exceedance of the QAPP-specified (Exponent et al. 2014) holding time of 14 days. The qualifiers for holding time were initially applied based on the length of time between sample collection and analysis. However, because the samples were dried within 14 days of collection and the CEC is fixed upon drying, the "J" qualifiers related to hold time were subsequently deemed unnecessary. ESI issued an addendum to the data validation report that is available on the “Downloads” page in the project database (http://teck-ucr.exponent.com). The unnecessary qualifiers were removed from the project database and are not included in this report.

4.3 METALS

The soil metals data are usable as qualified; there are no rejected data for the metals analyses. Samples with reported results between the detection limit (DL) and reporting limit (RL) were qualified as estimated ("J" flagged). Numbers and percentages of qualified samples are presented in Tables 4-1b and 4-1c for the ADAs, Tables 4-2b and 4-2c for the RFDAs, and Table 4-3b for the WSDAs.

In addition, there were no rejected metals data for the 22 equipment rinsate blanks or the 30 laboratory sieve blanks.

4.3.1 Calibration

The nondetected concentrations of selenium in four samples were qualified "UJ" due to a low RL standard recovery.

4.3.2 Blanks

Concentrations of sodium in 29 samples were qualified as nondetected ("U*" flagged) due to the presence of the analyte at similar concentrations in an associated laboratory blank. The nondetected concentrations of magnesium in three samples were qualified "UJ" due to significant negative instrument bias in the associated calibration blanks. Concentrations of magnesium and/or calcium in five samples were qualified as estimated ("J" flagged) due to significant negative instrument bias in the associated calibration blanks.

4.3.3 Matrix Spikes

Concentrations of antimony, barium, cadmium, calcium, chromium, lead, manganese, potassium, and/or zinc in 486 samples were qualified as estimated ("J" flagged) due to MS/MSD recoveries or RPDs that were not within control limits. MS/MSD recoveries and RPDs are provided in the laboratory reports available on the “Downloads” page in the project database (http://teck-ucr.exponent.com).

4.3.4 Laboratory Control Samples

Concentrations of aluminum, antimony, molybdenum, and/or thallium in 122 samples were qualified as estimated ("J" flagged) due to LCS recoveries that were not within control limits.

4.3.5 Laboratory Duplicates, Field Split Samples, and Triplicate Samples

Concentrations of aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, potassium, sodium, and/or vanadium in 134 samples were qualified as estimated ("J" flagged) due to laboratory duplicate or field split RPDs, or triplicate RSDs that were not within control limits.

4.3.6 Interference Check Samples

Concentrations of magnesium, potassium, and/or sodium in 88 samples were qualified as estimated ("J" flagged) due to inductively coupled plasma (ICP) interference.

4.3.7 Serial Dilutions

Concentrations of antimony, beryllium, cadmium, magnesium, molybdenum, sodium, silver and/or thallium in 238 samples were qualified as estimated ("J" flagged) due to high serial dilution percent difference.

4.3.8 Internal Standards

All metals internal standard results were within acceptable limits.

4.4 CONVENTIONAL PARAMETERS

The soil conventional parameters data (i.e., pH, TOC, CEC, total solids, and grain size) are usable as qualified. There are no rejected data for conventional parameters analyses. Samples with reported results between the DL and RL were qualified as estimated ("J" flagged). Numbers and percentages of qualified samples are presented in Tables 4-1a through 4-1c, 4-2a through 4-2c, and 4-3a through 4-3b for the ADAs, RFDAs, and WSDAs, respectively.

4.4.1 Laboratory and Field Duplicates and Triplicates

Concentrations of CEC and/or TOC in 40 out of 274 samples (14.6%) were qualified as estimated ("J" flagged) due to laboratory duplicate or field split RPDs, or triplicate RSDs that were not within control limits.

4.5 IVBA

The IVBA data are usable as qualified with the exception of four samples for molybdenum listed below in Section 4.5.3. Numbers of qualified samples are listed in Table 4-4. Samples with reported positive results between the DL and RL were qualified as estimated ("J" flagged).

IVBA data are reported as percent bioaccessible based on the concentrations of analyte detected in the soil sample and in a liquid extract. Bioaccessibility percentages calculated from qualified data are qualified as estimated ("J" flagged). Results qualified as not detected due to blank contamination ("U*" flagged) were not excluded from the bioaccessibility calculations. However, bioaccessibility percentages were not calculated for "U" or "R" flagged data, as indicated by "NC" in Table 4-4. The qualifiers detailed in Sections 4.5.1 through 4.5.8 apply to the IVBA soil concentrations (as opposed to the reported bioaccessibility percentages).

4.5.1 Calibration

All calibration standard recoveries for IVBA analyses were within control limits.

4.5.2 Blanks

Concentrations of molybdenum or sodium in 19 samples were qualified as nondetected ("U*" flagged) due to the presence of the analyte in an associated laboratory blank.

4.5.3 Matrix Spikes

Concentrations of molybdenum in 12 samples were qualified as unusable ("R" flagged for nondetected results) or estimated ("J" flagged for detected results) due to very low matrix spike recoveries. The IVBA analyses for molybdenum were rejected in the following samples:

- ADA-061-150um
- ADA-061-150umDUP (laboratory duplicate)
- ADA-057-150um
- ADA-057-150umDUP (laboratory duplicate).

The nondetected concentrations of molybdenum or selenium in five samples were qualified "UJ" due to low MS recoveries.

Concentrations of antimony, iron, manganese, and/or molybdenum in 33 samples were qualified as estimated ("J" flagged) due to MS/MSD recoveries that were not within control limits.

4.5.4 Laboratory Control Samples and Standard Reference Material

All LCS and standard reference material results for IVBA analyses were within acceptable limits.

4.5.5 Laboratory Duplicates and Field Split Samples

All laboratory and field split sample results for IVBA analyses were within acceptable limits.

4.5.6 Interference Check Samples

All interference check results for IVBA analyses were within acceptable limits.

4.5.7 Serial Dilutions

Concentrations of lead in 19 samples were qualified as estimated ("J" flagged) due to a high serial dilution percent difference.

4.5.8 Internal Standards

All internal standard results for IVBA analyses were within acceptable limits.

5 RESULTS

The following sections include summary statistics for all usable data, an evaluation of method reporting limits for nondetected samples, and a comparison of detected values with screening levels for ecological and human receptors. Summary statistics for each sampling area and analyte include the number of detected values and the minimum, maximum, and mean values. Summary statistics are presented in Tables 5-1a through 5-1c, 5-2a through 5-2c, and 5-3a and 5-3b for ADA, RFDA, and WSDA areas, respectively. Table 5-4 provides summary statistics for IVBA results (for ADA and RFDA samples). Figures 5-1a through 5-1c, 5-2a through 5-2c, and 5-3 show the results for conventional parameters in the bulk soil, < 2-mm fractions, and < 149-µm fractions, respectively. Figures 5-4a through 5-4x and 5-5a through 5-5x show results for metals in the < 2-mm and < 149-µm fractions, respectively. IVBA results for the TAL metals and molybdenum in the < 149-µm fraction are shown in Figures 5-6a through 5-6x. Rejected IVBA data (i.e., four molybdenum results) are not used in the data summaries; however, all data are included in the project database.

In accordance with the draft data management plan (Exponent 2010), nondetected results are represented in calculations as one-half of the MDL. For field split samples and triplicate samples, the average of the replicate results is used to calculate the minimum, maximum, and mean values. Data for EPA split samples, equipment rinsate blanks, and laboratory QA/QC samples, such as MS/MSDs, are not included in the data summaries.

The QAPP (Exponent et al. 2014) identified the soil screening levels for ecological receptors and humans that would be used to determine ACGs for TAL metals and molybdenum. If no screening level was available, then the laboratory MRL was used as the ACG. Nondetected results for metals were compared with a value that was 10 times the ACG, as summarized in Section 5.4.

As discussed in Section 2.2.4, metals data for ecological receptors (i.e., concentrations in the < 2-mm fraction) were compared with available Eco-SSLs. Metals data for human health (i.e., concentrations in the < 149-µm fraction) were compared with human health screening levels.[24] Screening levels are for comparison purposes only and are only intended to identify chemicals for further evaluation in the risk assessments. They do not represent cleanup or action levels (USEPA 2003, 2002).

[24] Lead data were adjusted for site-specific relative bioavailability (RBA) and arsenic data were adjusted for 60 percent soil arsenic oral RBA prior to comparing the data to screening levels.

5.1 AERIAL DEPOSITION AREAS

For the ADAs, incremental composite samples were collected from 142 DUs as planned (a sampling completion rate of 100 percent [Appendix A]). Samples were collected from 35 DUs in the high-density area (6 of which were reserve locations), 91 DUs in the primary area (11 of which were reserve locations), and 16 DUs in the reserve area (see Table 3-2). Only 15 of the 30 planned increments were collected from one DU (ADA-101) due to access concerns and steep terrain (Deviation Report No. 2 [Appendix A]).

Triplicate samples (48) were collected from 16 of the DUs (6 from the high-density area and 10 from the primary area as shown in Table 3-1) for a total of 174 incremental composite samples collected in the ADA.

5.1.1 Metals and Conventional Parameters

Summary statistics for metals and conventional parameter data for the high-density and primary areas of the ADA are presented in Table 5-1a for bulk soil, Table 5-1b for the < 2-mm fraction, and Table 5-1c for the < 149-μm fraction.

5.1.2 IVBA

The IVBA analysis was conducted on samples (< 149-μm fraction) from 11 DUs in both the high-density area and the primary area. The IVBA analysis also was conducted on one set of triplicate samples from the primary area (ADA-016). Molybdenum results for two samples in the primary area were not usable ("R" qualified). Summary statistics for the IVBA data are presented in Table 5-4. The data are reported as percent bioaccessible. For lead, EPA has a validated method for relating lead IVBA results to lead oral RBA in soil (USEPA 2007a). Lead RBA is an exposure input for assessing lead risks to humans. Table 5-5 summarizes lead RBA values extrapolated from each IVBA result. Based on the lead RBA results for ADA samples with IVBA results, the average lead RBA for the ADA is 71 percent. Table 5-6 provides the RBA-adjusted lead concentrations using the average RBA for the ADA for DUs without IVBA results.

5.2 RELICT FLOODPLAIN DEPOSITION AREAS

For the RFDAs, 24 incremental composite samples were collected from 16 DUs, including triplicate samples collected from four DUs (one DU from each RFDA was sampled in triplicate) (see Table 3-2). The sampling completion rate for the RFDA was 55 percent (Appendix A).

5.2.1 Metals and Conventional Parameters

Summary statistics for metals and conventional parameters in the four RFDAs are presented in Table 5-2a for bulk soil, Table 5-2b for the < 2-mm fraction, and Table 5-2c for the < 149-µm soil fraction.

5.2.2 IVBA

The IVBA analysis was conducted on samples (< 149-µm fraction) from three DUs in the RFDA. One set of triplicate samples from a DU in RFA (RFA-001) underwent IVBA analysis. Summary statistics for the IVBA data are presented in Table 5-4. The data are reported as percent bioaccessible. Table 5-5 summarizes lead RBA values extrapolated from each IVBA result. Table 5-6 provides RBA-adjusted lead concentrations. Empirical lead concentrations were adjusted using the ratio of site-specific RBA to EPA's default RBA (see Table 5-5). The ratio of the DU-specific RBA to EPA's default RBA was used when available. For ADA and RFDA DUs that did not have IVBA measured directly (i.e., those not listed in Table 5-5), the average RBA ratio for the ADA overall (including primary and high density) or the RFDA reported in Table 5-5 was applied.

5.3 WINDBLOWN SEDIMENT DEPOSITION AREAS

For the WSDAs, 17 incremental composite samples were collected from 13 DUs, including triplicate samples collected from two DUs (one DU each from Columbia Beach North and Marcus Flats East was sampled in triplicate) (see Table 3-2). The sampling completion rate for the WSDA was 46 percent (Appendix A).

5.3.1 Metals and Conventional Parameters

Summary statistics for metals and conventional parameters in the WSDAs are presented in Table 5-3a for bulk soil and Table 5-3b for the < 2-mm fraction.

5.3.2 IVBA

There were no IVBA samples planned or analyzed for the WSDAs (Appendix B).

5.4 FIELD QC SUMMARY

Field split RPDs and triplicate RSDs are summarized in Tables 5-7a through 5-9b. A control limit of 20 percent was used to evaluate field split RPDs and a control limit of

35 percent was used to evaluate triplicate RSDs. The sections below discuss field split RPDs and triplicate RSDs by area[25].

5.4.1 Aerial Deposition Areas

Field QC results for the ADA samples are summarized by splits and triplicates in Table 5-7a for bulk soil samples, Table 5-7b for the < 2-mm fraction, and Table 5-7c for the < 149-µm fraction. Total field QC results greater than control limits are as follows (summarized by soil fraction and analyte group):

- Bulk fraction
  - Grain size—38out of 208 data points (18.3percent)
  - Other conventional parameters—0 out of 68 data points
- < 2-mm-fraction
  - Metals—37 out of 816 data points (4.5 percent)
  - Conventional parameters—21 out of 102 data points (20.6 percent)
- < 149-µm fraction
  - Metals—4 out of 816 data points (0.5 percent)
  - Conventional parameters—0 out of 34 data points

5.4.2 Relict Floodplain Deposition Areas

Field quality control results for the RFDA samples are summarized by splits and triplicates in Table 5-8a for bulk soil samples, Table 5-8b for the < 2-mm fraction, and Table 5-8c for the < 149-µm fraction. Total field quality control results greater than control limits are as follows (summarized by sieve fraction and analyte group):

- Bulk fraction
  - Grain size—24 out of 52 data points (46.2 percent)
  - Other conventional parameters—0 out of 12 data points
- < 2-mm fraction
  - Metals—7 out of 145 data points (4.8 percent)
  - Conventional parameters—0 out of 17 data points

[25] The QAPP did not specify a quality objective for grain size RPDs. Therefore, field QC summaries for grain size are based on triplicate sample RSDs only.

- < 149-µm fraction
  - Metals—6 out of 144 data points (4.2 percent)
  - Conventional parameters—0 out of 6 data points

5.4.3 Windblown Sediment Deposition Areas

Field quality control results for the WSDA samples are summarized by splits and triplicates in Table 5-9a for the bulk soil samples and Table 5-9b for the < 2-mm fraction. Total field quality control results greater than control limits are as follows (summarized by sieve fraction and analyte group):

- Bulk fraction
  - Grain size—6 out of 26 data points (23.1 percent)
  - Other conventional parameters—0 out of 8 data points
- < 2-mm fraction
  - Metals—5 out of 96 data points (5.2 percent)
  - Conventional parameters—1 out of 12 data points (8.3 percent)

5.5 EVALUATION OF REPORTING LIMITS FOR NONDETECTED SAMPLES

Target MDLs, MRLs, and ACGs for metals were included in the QAPP (Exponent et al. 2014) (target MDLs and MRLs are presented in Table 2-1). Table 5-10 shows the minimum and maximum MRLs for nondetected metals results (applicable to only a portion of the sodium data in the ADAs and one selenium data point in the WSDAs). The MRLs for all nondetected data points are less than 10 times the ACG.

For conventional parameters, target MDLs and MRLs for total solids and TOC were detailed in the QAPP (Exponent et al. 2014). However, there are no nondetected results for conventional parameters. The QAPP did not include MDLs, MRLs, or ACGs for IVBA.

5.6 COMPARISON WITH SCREENING LEVELS

Data were compared with conservative screening levels protective of ecological receptors and human health. This section summarizes the comparisons with the ecological and human health screening levels by area. This comparison is for screening purposes only and is only intended to identify chemicals that should be evaluated in the risk assessments. They do not represent cleanup or action levels (USEPA 2003, 2002).

5.6.1 Ecological Screening Levels

Results from the < 2-mm fraction were compared with Eco-SSLs using the values presented in the QAPP (Exponent et al. 2014), which were the lowest of the screening levels adopted by EPA for plants, soil invertebrates, birds, and mammals (USEPA 2010a).[26] Eco-SSLs were available for 15 of the 24 metals analyzed in the study.[27] Figures 5-4a through 5-4x provide a comparison of the metals data for DUs from each area with ecological screening levels, when available. Table 5-11a summarizes the number of DUs from the ADAs, RFDAs, and WSDAs that are greater than the available Eco-SSLs. Maps 5-1 through 5-18 provide a spatial representation of DUs with metals concentrations in the < 2-mm fraction that are greater than the Eco-SSLs. Maps are not provided when either no DUs or all DUs had concentrations greater than the screening level. Comparisons with ecological screening levels are discussed by area in the following subsections.

5.6.1.1 Aerial Deposition Areas

Comparisons of available Eco-SSLs with metals data from the ADAs are presented in Table 5-11b. Of the 142 DUs sampled from the ADAs, none had concentrations greater than the Eco-SSL for beryllium (21 mg/kg) or silver (4.2 mg/kg). All DUs had concentrations greater than the Eco-SSL for antimony (0.27 mg/kg), cadmium (0.36 mg/kg), lead (11 mg/kg), vanadium (7.8 mg/kg), and zinc (46 mg/kg). Some of the DUs had concentrations greater than the Eco-SSLs for the remaining eight metals as follows: 41 for arsenic (18 mg/kg), 59 for barium (330 mg/kg), 26 for chromium (26 mg/kg), 5 for cobalt (13 mg/kg), 21 for copper (28 mg/kg), 141 for manganese (220 mg/kg), 10 for nickel (38 mg/kg), and 19 for selenium (0.52 mg/kg).

5.6.1.2 Relict Floodplain Deposition Areas

Comparisons of available Eco-SSLs with metals data from the RFDAs are presented in Table 5-11c. Of the 16 DUs sampled from the RFDAs, none had concentrations greater than the Eco-SSL for beryllium (21 mg/kg), nickel (38 mg/kg), or silver (4.2 mg/kg). All DUs had concentrations greater than the Eco-SSL for antimony (0.27 mg/kg), cadmium (0.36 mg/kg), lead (11 mg/kg), manganese (220 mg/kg), vanadium (7.8 mg/kg), and zinc (46 mg/kg). Thirteen DUs had concentrations greater than the Eco-SSL for copper (28 mg/kg), and nine DUs had concentrations greater than the Eco-SSL for chromium (26

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[26] Eco-SSLs exist for metals that are typically present as cations and can form complexes with inorganic material in soil.
[27] Metals with Eco-SSLs are antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, lead, manganese, nickel, selenium, silver, vanadium, and zinc.

mg/kg) and selenium (0.52 mg/kg). Five DUs had concentrations greater than the Eco-SSLs for the three remaining metals (i.e., arsenic [18 mg/kg], barium [330 mg/kg], and cobalt [13 mg/kg]).

5.6.1.3 Windblown Sediment Deposition Areas

Comparisons of available Eco-SSLs with metals data from the WSDAs are presented in Table 5-11d. Of the 13 DUs sampled from the WSDAs, none had concentrations greater than the Eco-SSL for 9 of the 14 metals (i.e., arsenic [18 mg/kg], barium [330 mg/kg], beryllium [21 mg/kg], chromium [26 mg/kg], cobalt [13 mg/kg], copper [28 mg/kg], nickel [38 mg/kg], selenium [0.52 mg/kg], and silver [4.2 mg/kg]). All DUs had concentrations greater than the Eco-SSL for manganese (220 mg/kg) and vanadium (7.8 mg/kg). For the remaining four metals, 11 DUs had concentrations greater than the Eco-SSL for zinc (46 mg/kg), 8 DUs had concentrations that were greater than the Eco-SSL for antimony (0.27 mg/kg) and lead (11 mg/kg), and 7 DUs had concentrations greater than the Eco-SSL for cadmium (0.36 mg/kg).

5.6.2 Human Health Screening Levels

Results from the < 149-µm fraction were compared with human health screening levels presented in the QAPP (Exponent et al. 2014). Human health screening levels were available for 19 of the 23 TAL metals analyzed.[28] Four of the TAL metals (calcium, magnesium, potassium, and sodium) are essential nutrients and do not have human health screening levels. The QAPP did not include a screening level for molybdenum (which is not a TAL metal); however, for the purposes of evaluation in this report, a screening value of 390 mg/kg was used based on EPA's regional screening level table updated as of January 2015. Figures 5-5a through 5-5x present the metals data compared with human health screening levels, for those metals with human health RBCs. Maps 5-19 through 5-22 provide a spatial representation of concentrations in the < 149-µm fraction for metals that are greater than the human health RBCs (i.e., arsenic and lead). Table 5-12a summarizes the number of DUs from the ADAs and RFDAs that are greater than the available screening levels. For lead, data were adjusted for soil lead RBA prior to comparison.[29] In addition, arsenic concentrations were adjusted for 60 percent soil arsenic

[28] The following metals were used for the comparisons of screening levels with the < 149-µm fraction of soil: aluminum, antimony, arsenic, barium, beryllium, cadmium, chromium, cobalt, copper, iron, lead, manganese, molybdenum, nickel, selenium, silver, thallium, vanadium, and zinc.
[29] The human health screening level for lead includes a default RBA adjustment of 60 percent. To ensure appropriate comparison of upland soil lead concentrations to the lead screening level, soil

oral RBA. Comparisons to human health screening levels are discussed by area in the following subsections.

5.6.2.1 Aerial Deposition Areas

Comparisons of human health soil screening levels with metals data for the 142 DUs in the ADAs are presented in Table 5-12b. Arsenic and lead were the only metals detected at levels that were greater than human health screening levels. For arsenic, the screening level (9.39 mg/kg) was exceeded at 68 of 142 DUs after adjusting for 60 percent soil arsenic oral RBA (Map 5-19). For lead, 21 of 142 DUs had concentrations greater than the human health screening level of 400 mg/kg after adjusting for the ratio of site-specific RBA of lead to EPA's default RBA (Map 5-20).

5.6.2.2 Relict Floodplain Deposition Areas

Comparisons of human health soil screening levels with metals data for the RFDAs are presented in Table 5-12c. Of the 16 DUs in the RFDAs, arsenic and lead were the only metals detected at levels that were greater than the human health screening levels. After adjusting for 60 percent soil arsenic RBA, arsenic concentrations exceeded the screening level of 9.39 mg/kg at 8 of 16 DUs (Map 5-21). For lead, concentrations at 2 of 16 DUs exceeded the screening level of 400 mg/kg after adjusting for the ratio of site-specific RBA of lead to EPA's default RBA (Map 5-22).

concentrations are multiplied by the ratio of the site-specific soil lead RBA value to EPA's default RBA.

6 SUMMARY AND RECOMMENDATIONS

The purpose of this study was to collect additional soil data to evaluate upland areas adjacent to the UCR potentially affected by point sources (e.g., aerial deposition of smelter particulates), historical fluvial deposition of sediment onto relict floodplains, and re-deposition of windblown sediment. These data will be used to assess risk to ecological and human receptors from exposure to metals in the upland soil adjacent to the UCR. The study measured analyte concentrations in soil samples collected from three areas (i.e., ADAs, RFDAs, and WSDAs).

The sampling design, as described in the QAPP (Exponent et al. 2014), used a compositing approach whereby increments were collected from the top 7.5 cm (3 in.) of soil at 30 increment locations within each DU. A total of 215 composite samples were collected between September 8 and October 23, 2014, at 171 DUs (142 from ADAs, 16 from RFDAs, and 13 from WSDAs).

The number of DUs sampled in the ADA included 35 DUs in the high-density area and 107 DUs in the primary area, of which 16 were from the reserve area. Overall, the collected and analyzed samples for the ADA met targets in the QAPP (Exponent et al. 2014). The selected DU locations in the RFDAs were informed largely by the direction and magnitude of different modeled flood events, as discussed in the QAPP (Exponent et al. 2014). The RFDAs were intended to represent five different relict floodplains. Samples from 55 percent of the RFDA DUs could not be collected either because access to the DU was denied or no response was received from the landowner after multiple requests. All five targeted DU samples from RFA were collected and analyzed. A portion of the DUs in each of RFB through RFD could not be collected, and no samples in RFE could be collected (Map 2-3).

The QAPP (Exponent et al. 2014) stated that Marcus Flats and Columbia Beach were predicted to represent a reasonable worst-case scenario for the enrichment of soil by chemicals in windblown sediment and "soil sampling in these areas will provide confirmatory data about whether or not this possibility is realized." For the WDSA, samples were collected and analyzed from Marcus Flats and Columbia Beach (Map 2-4). Samples from 46 percent WSDA DUs could not be collected because access was denied or no response was received from the landowner after multiple requests. All seven targeted Marcus Flats East DU samples were collected and analyzed. Samples could not be obtained from the Marcus Flats West DUs. For both Columbia Beach North and South, some of the more upland DUs (3 of 7 at Columbia Beach North and 2 of 7 at Columbia Beach South) could not be sampled. Previous beach sampling efforts have identified no human health risks from exposed sediment at the Marcus Flats area and the Seven Bays area (which includes Columbia Beach) (USEPA 2012a).

The total number of field-collected samples (i.e., 215) included 66 triplicate samples collected in 22 of the DUs. The increment locations were identified using a hand-held GPS unit. Increments were generally collected within 2 to 10 m of the predetermined location. Because of access constraints (e.g., steep terrain, permission not provided by landowner), the predetermined increment locations within DUs sometimes required adjustment, and, as just discussed, not all 199 targeted DUs could be sampled. Sampling activities were conducted under the direct oversight of EPA or their authorized representatives.

Soil samples were processed and analyzed in accordance with the QAPP (Exponent et al. 2014). Samples were sieved into two fractions: < 2-mm for ecological risk assessments (for ADA, RFDA, and WSDA DUs) and < 149-µm for human health risk assessments (for ADA and RFDA DUs).[30] Prior to sieving, an aliquot was taken from each sample for the analysis of grain size, total solids, and pH to inform contaminant bioavailability. The < 2-mm fraction was analyzed for total solids, CEC, TOC, and EPA's TAL metals, plus molybdenum. The < 149- µm fraction was analyzed for total solids and TAL metals, plus molybdenum. Approximately 20 percent of the samples with lead concentrations > 100 mg/kg were selected for IVBA analysis to assess the RBA of lead in soil to which people might be exposed. Laboratory methods included one change related to procedures specified in the QAPP; pH was analyzed in the unsieved bulk fraction of each sample (rather than analyzing pH after drying and sieving the samples). No other laboratory method deviations were noted in the data validation reports. All chemical analyses specified in the QAPP were performed.[31]

Quality assurance and validation of soil chemistry data were performed in accordance with the QAPP (Exponent et al. 2014). Qualifiers were assigned to the metals and conventional parameter data, as appropriate. The MRLs for all nondetected data points for metals were less than 10 times the ACG. All conventional parameters were detected in all samples. The IVBA data are usable as qualified, with the exception of four IVBA results for molybdenum that were flagged as rejected.

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[30] The WSDAs were not evaluated for human health because WSDA sampling was focused on evaluating risks to ecological receptors (USEPA 2012a). Prior sampling showed that the beaches sampled nearest the WSDAs (i.e., Summer Island and Marcus Island for the Marcus Flats WSDAs and Seven Bays for the Columbia Beach WSDAs) had no lead or arsenic concentrations above human health soil screening levels (USEPA 2012c).

[31] Note that the QAPP specified only IVBA analysis for lead. However, IVBA was performed for all TAL metals and molybdenum at EPA's request (see Appendix B).

DU-specific sampling results representing an estimate of the mean analyte concentration for each sampling area were compared with conservative screening levels that can be used to identify analytes and areas of potential concern for further evaluation in the ecological and human health risk assessments. Results from the < 2-mm fractions were compared with Eco-SSLs, and results from the < 149-µm fraction were compared with residential risk-based screening levels for soils. For the ecological screening, at least one DU from the ADA had concentrations greater than the Eco-SSLs for antimony, arsenic, barium, cadmium, chromium, cobalt, copper, lead, manganese, nickel, selenium, vanadium, and zinc. At least one DU in the RFDA had concentrations greater than Eco-SSLs for all these metals except nickel. In the WSDA, at least one DU had concentrations greater than the Eco-SSLs for antimony, cadmium, lead, manganese, vanadium, and zinc. None of the DUs in any of the areas had concentrations for beryllium or silver greater than the screening levels.

For the human health screening in both the ADAs and RFDAs, only arsenic and lead were at concentrations greater than screening levels. Lead and arsenic concentrations were RBA adjusted prior to comparing to screening levels. Lead was adjusted by the ratio of site-specific RBA to EPA's default RBA and arsenic was adjusted for 60 percent soil arsenic oral RBA. All other metal concentrations in ADA and RFDA DUs were less than the human health screening levels.

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FIGURES

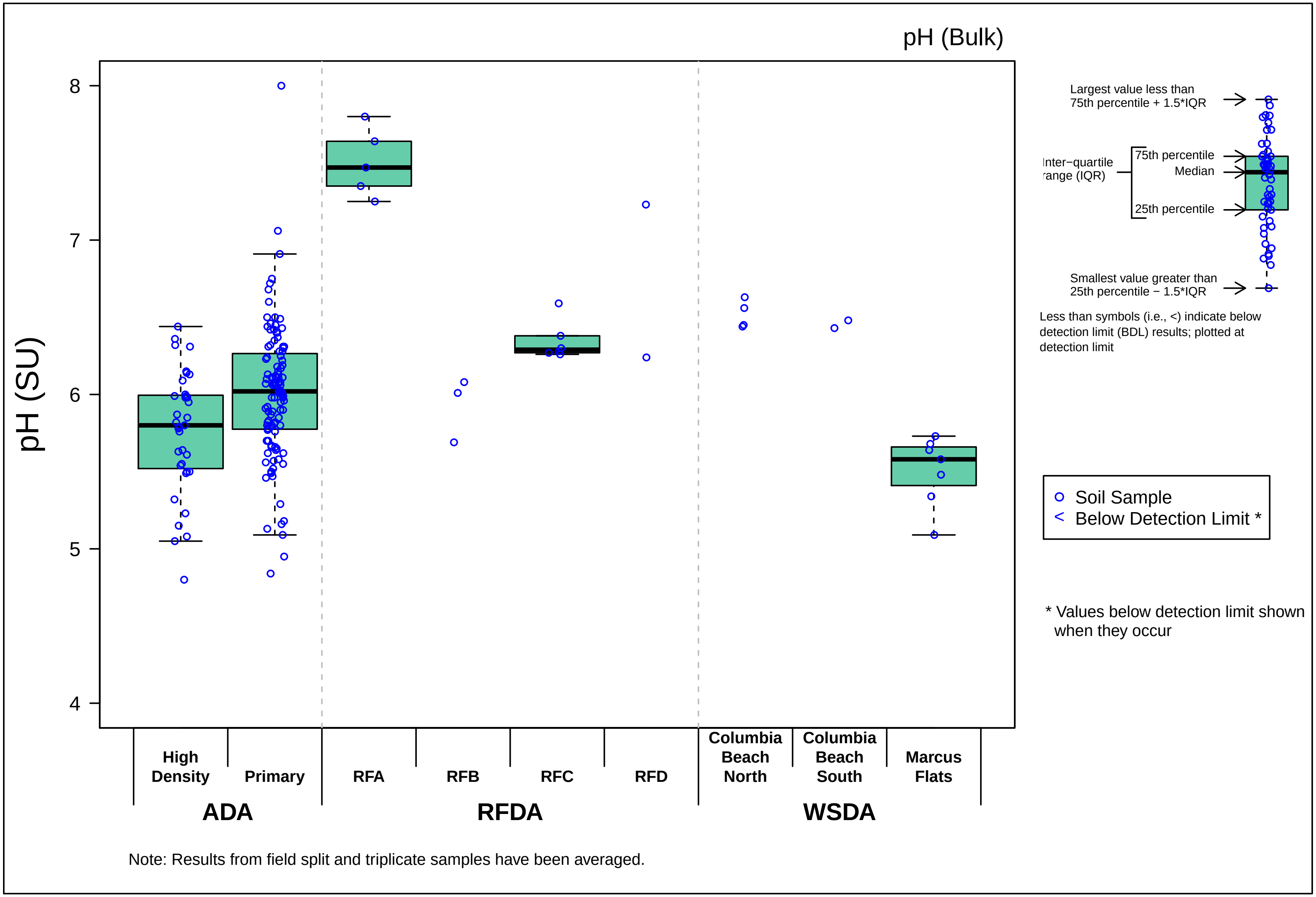


Figure 5−1a. pH in Bulk Soil Samples by Deposition Area

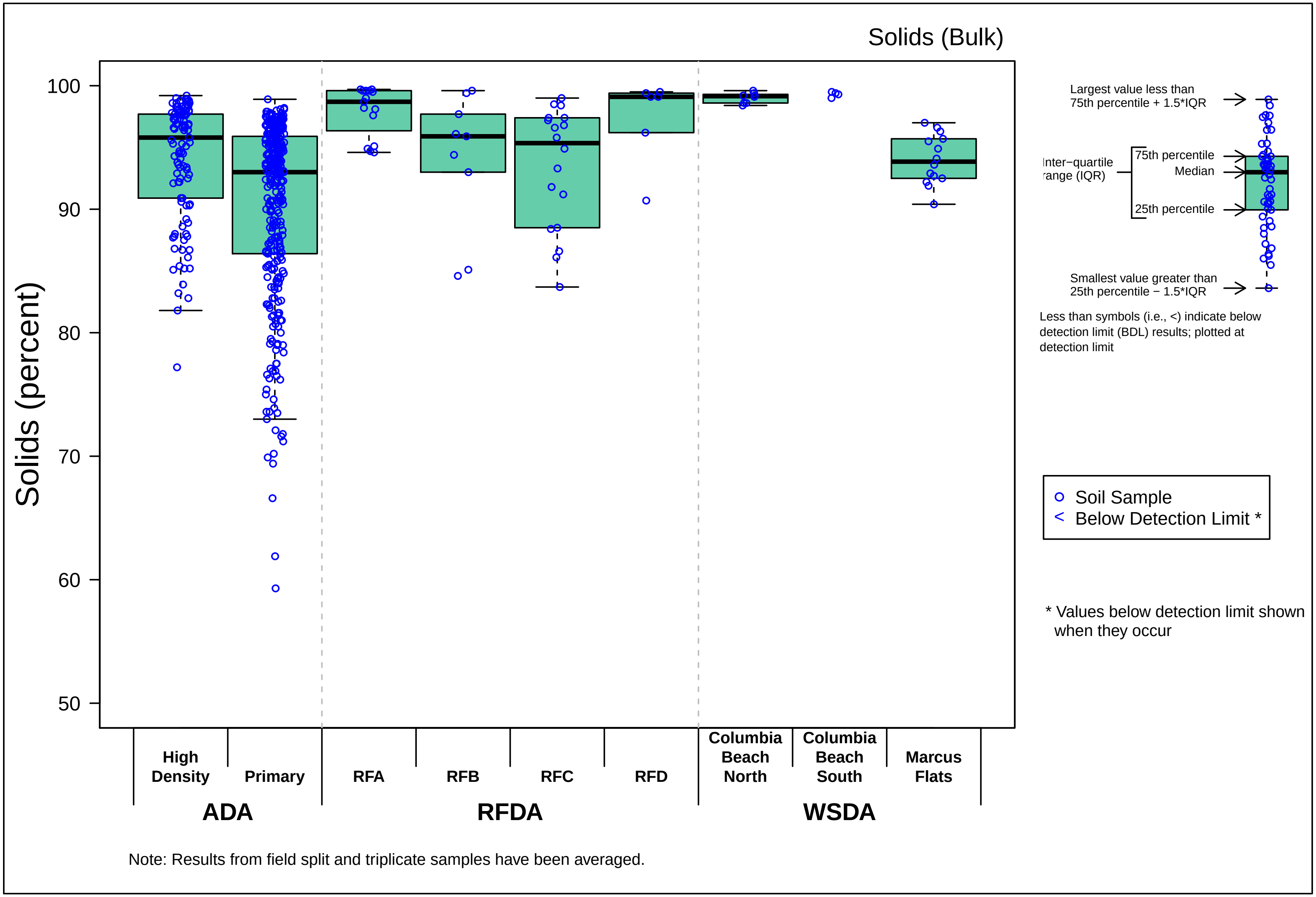
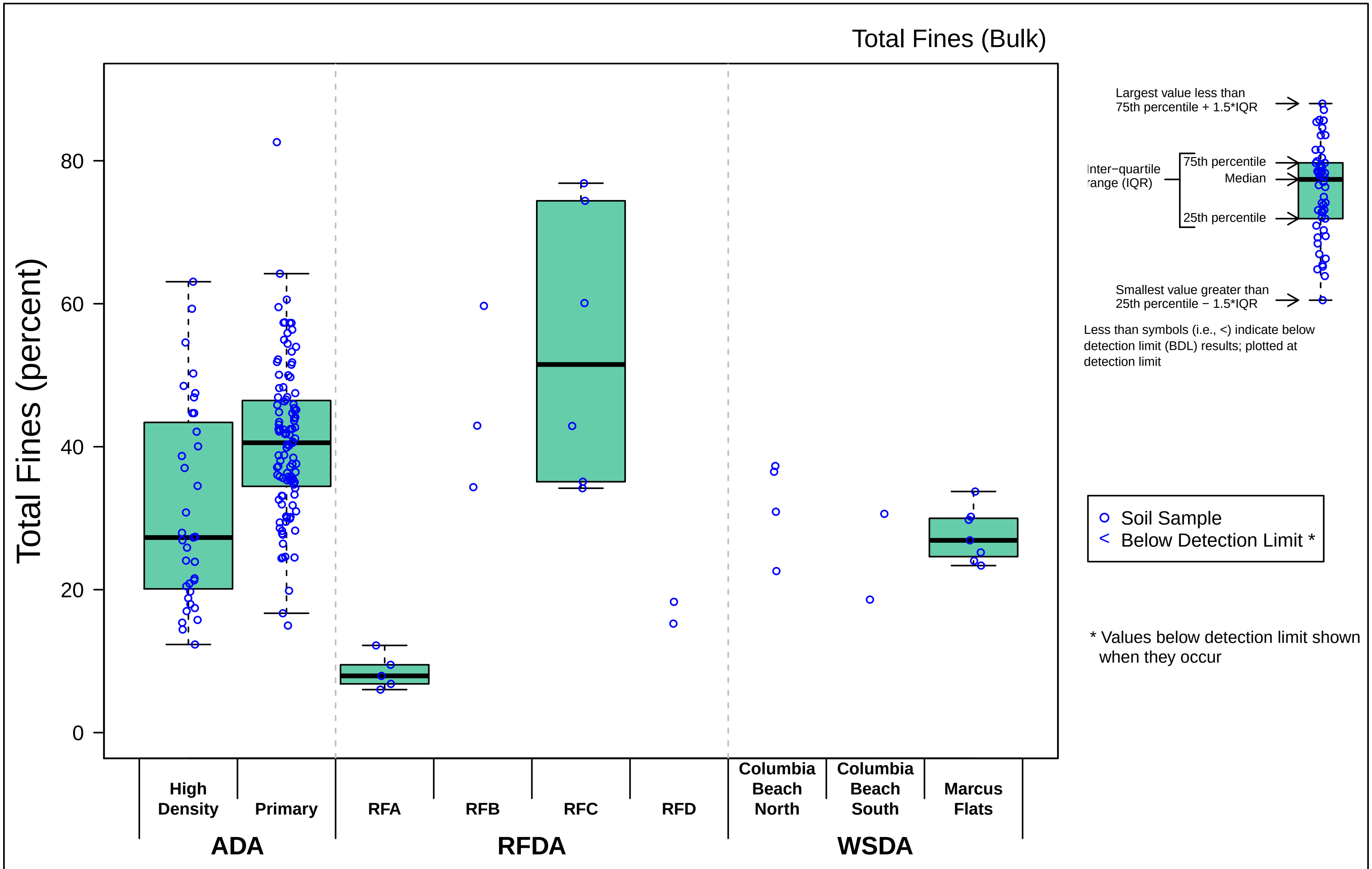


Figure 5−1b. Percent Solids in Bulk Soil Samples by Deposition Area



Note: Results from field split and triplicate samples have been averaged. Total fines is shown in percent and includes the percent of clay and silt.

Figure 5−1c. Total Fines in Bulk Soil Samples by Deposition Area

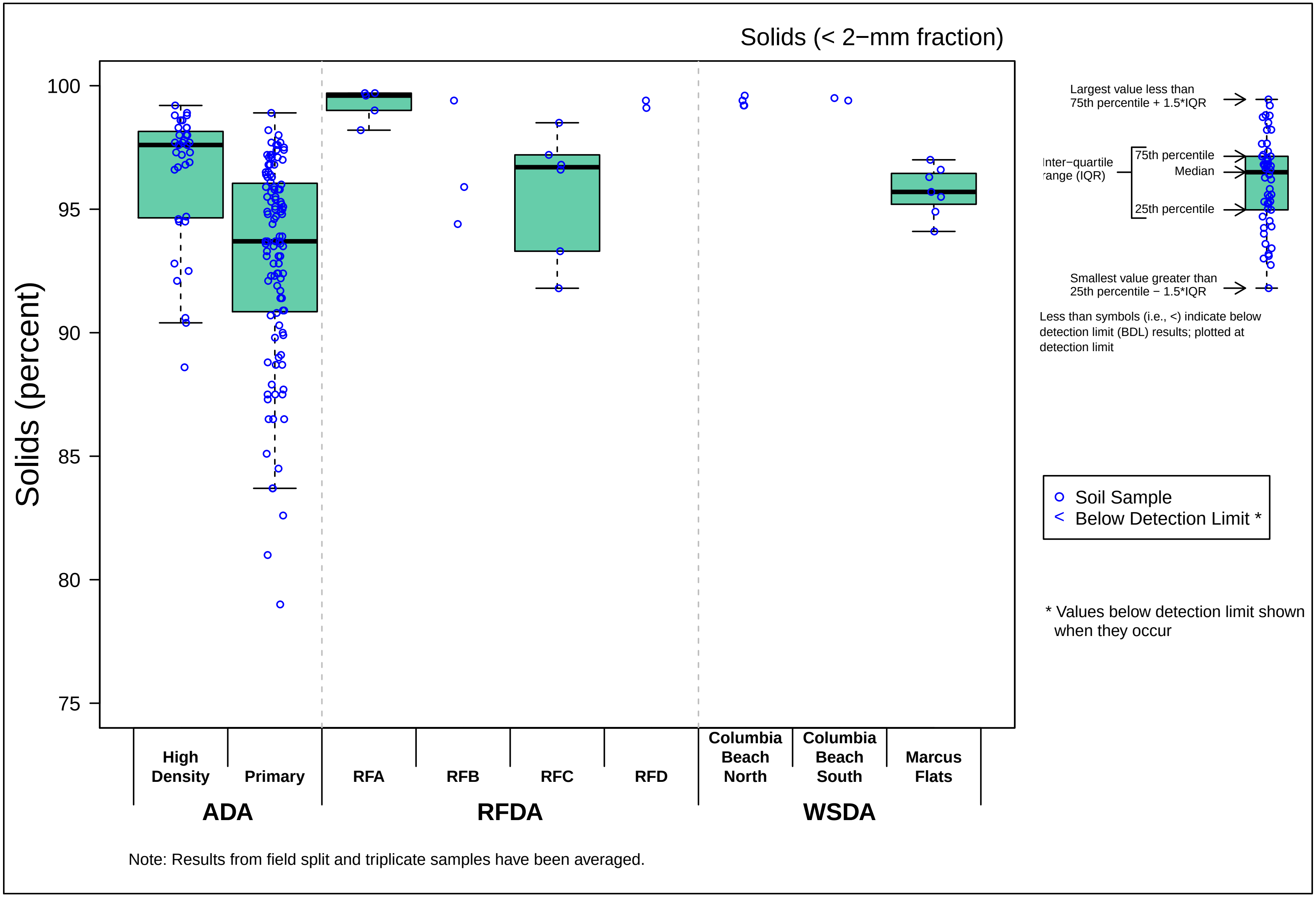


Figure 5−2a. Percent Solids in < 2−mm Soil Fractions by Deposition Area

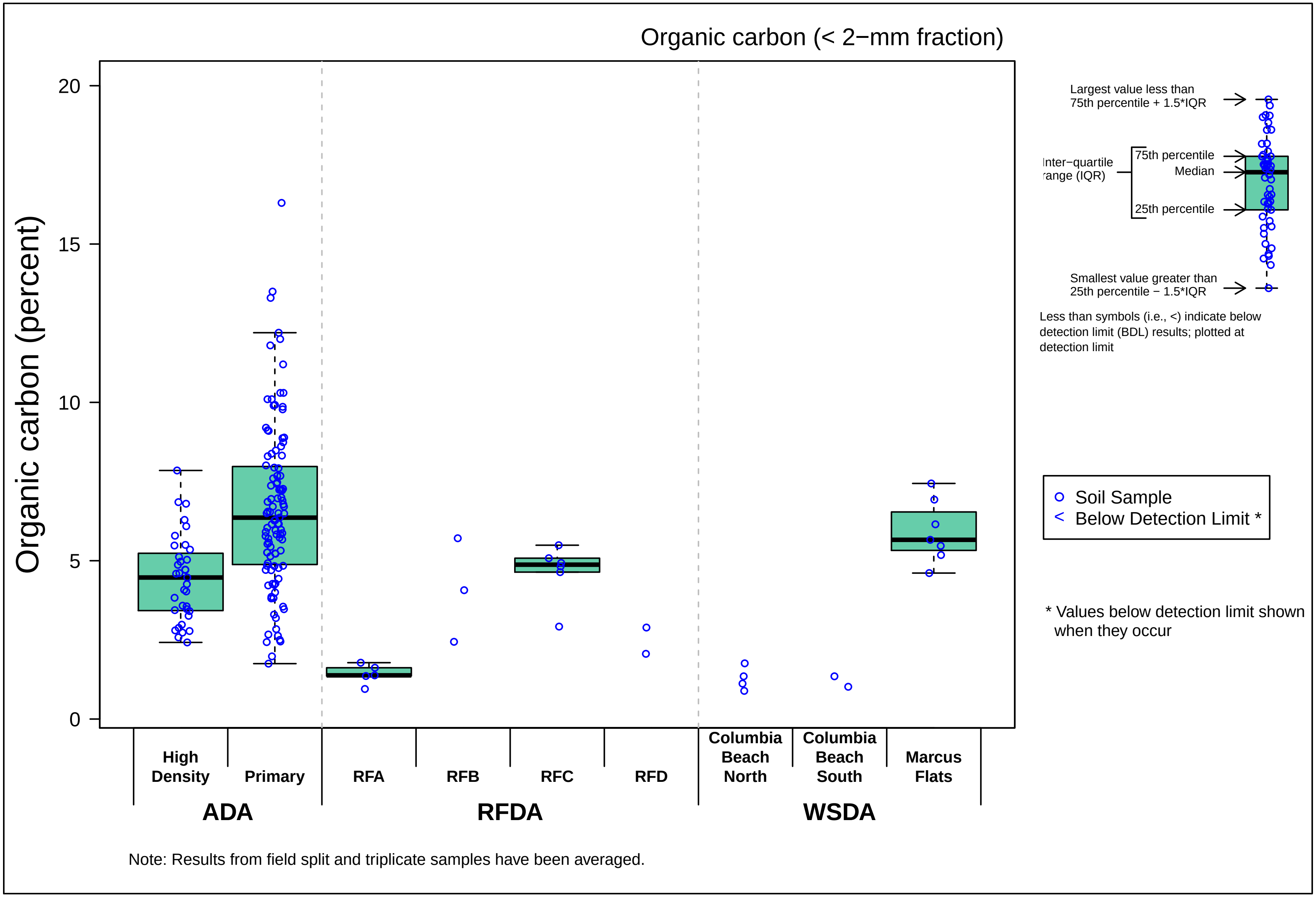


Figure 5−2b. Organic carbon in < 2−mm Soil Fractions by Deposition Area

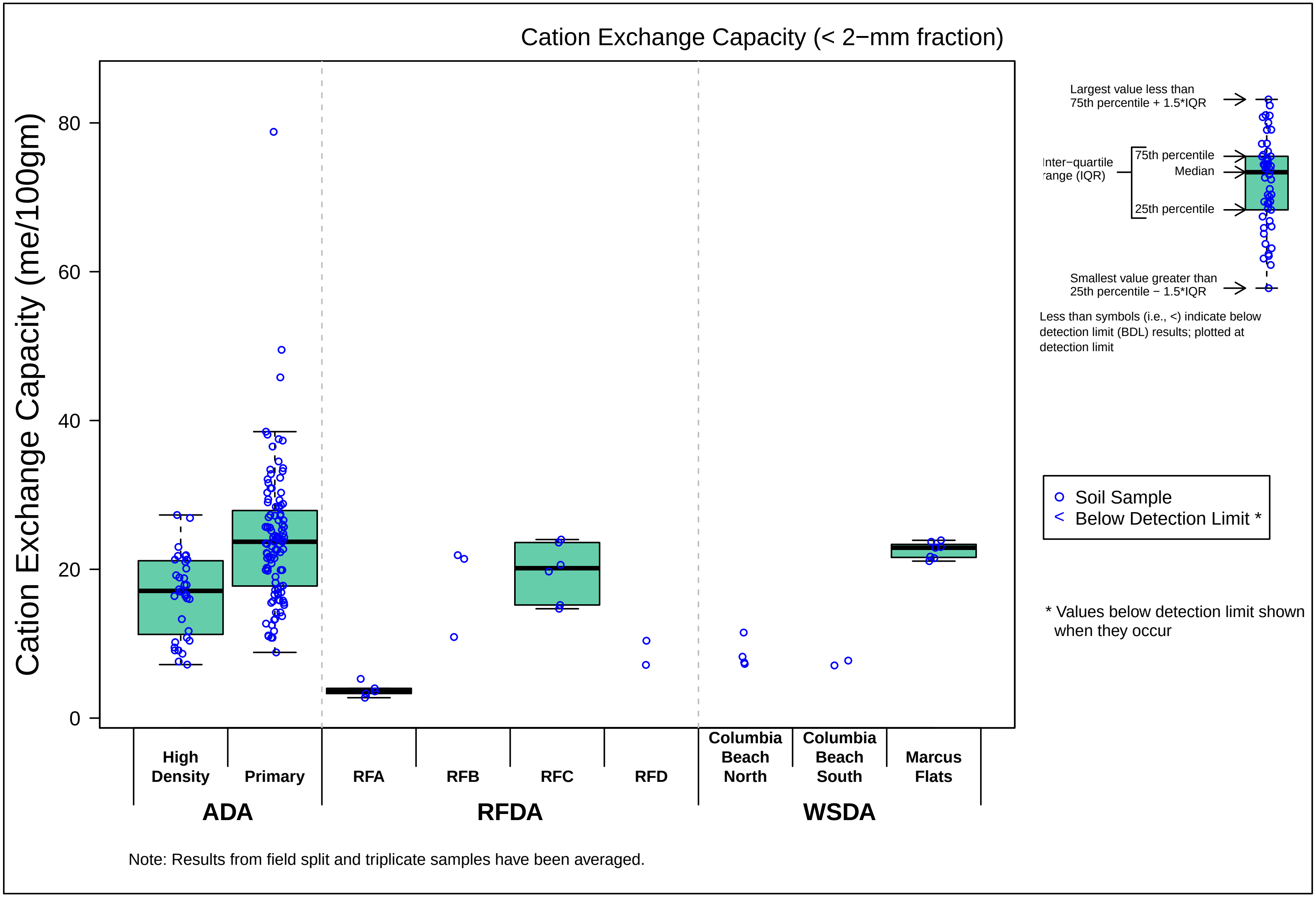


Figure 5−2c. Cation Exchange Capacity in < 2−mm Soil Fractions by Deposition Area

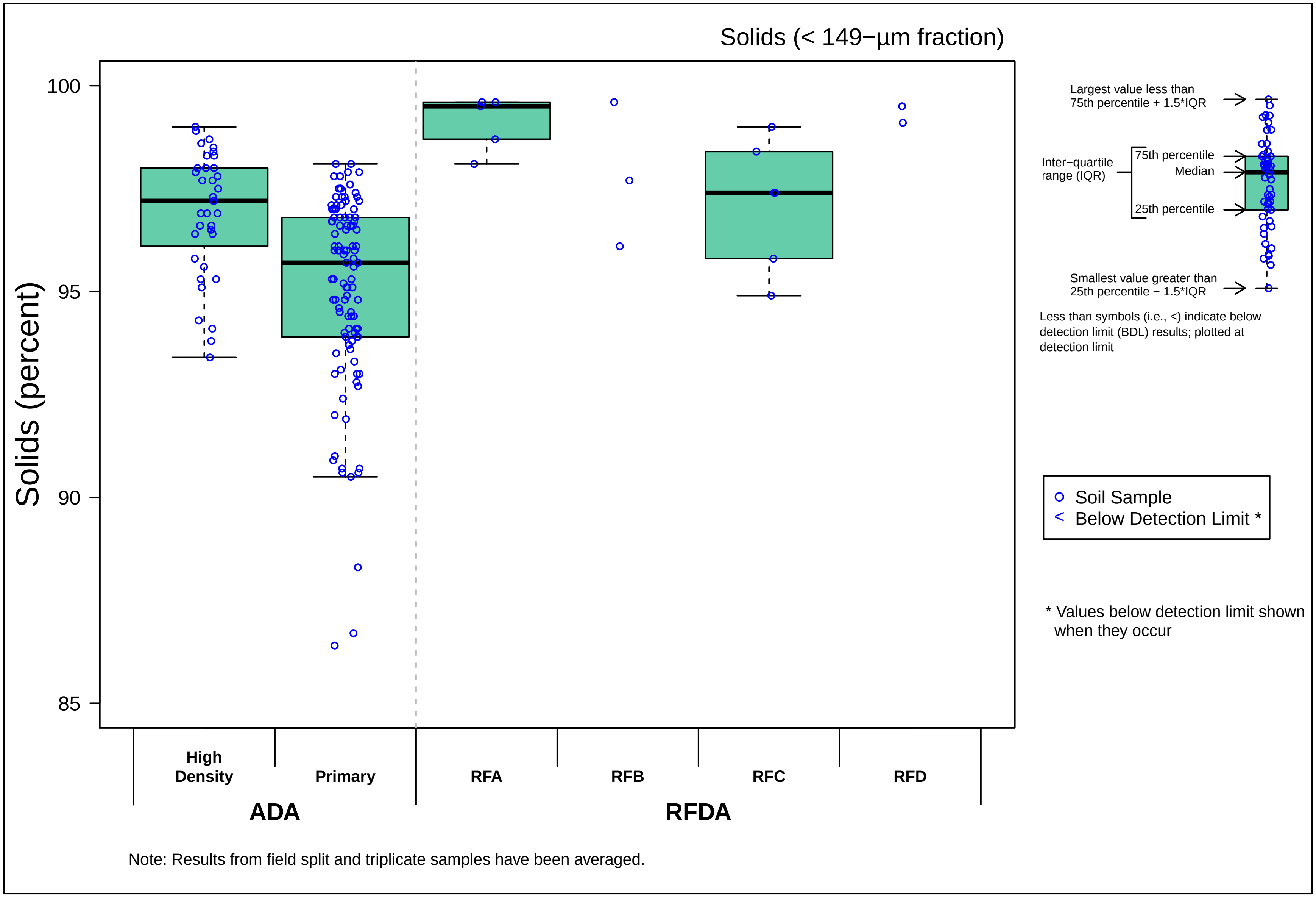


Figure 5−3. Percent Solids in < 149−µm Soil Fractions by Deposition Area

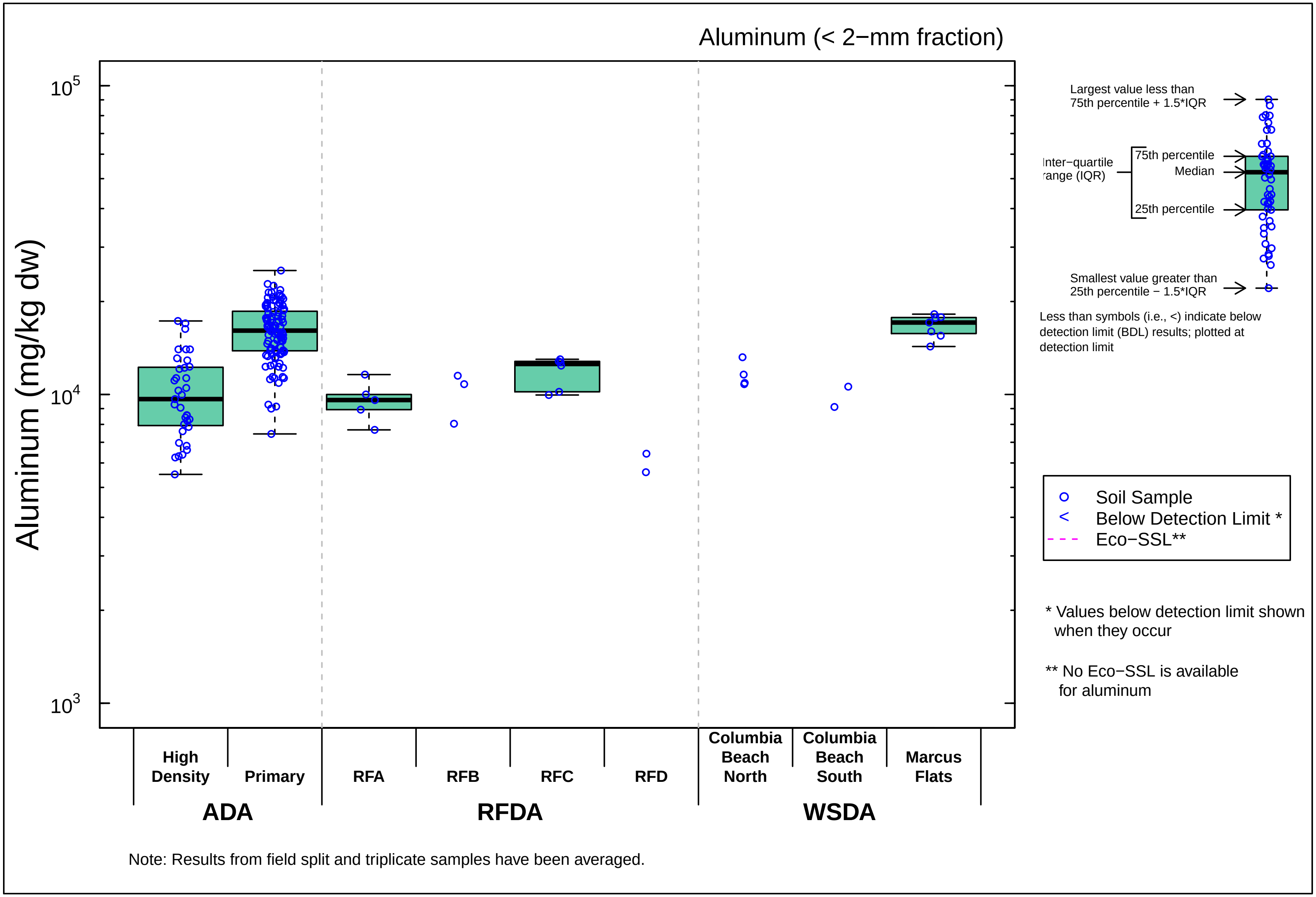


Figure 5−4a. Aluminum Concentrations in < 2−mm Soil Fractions by Deposition Area

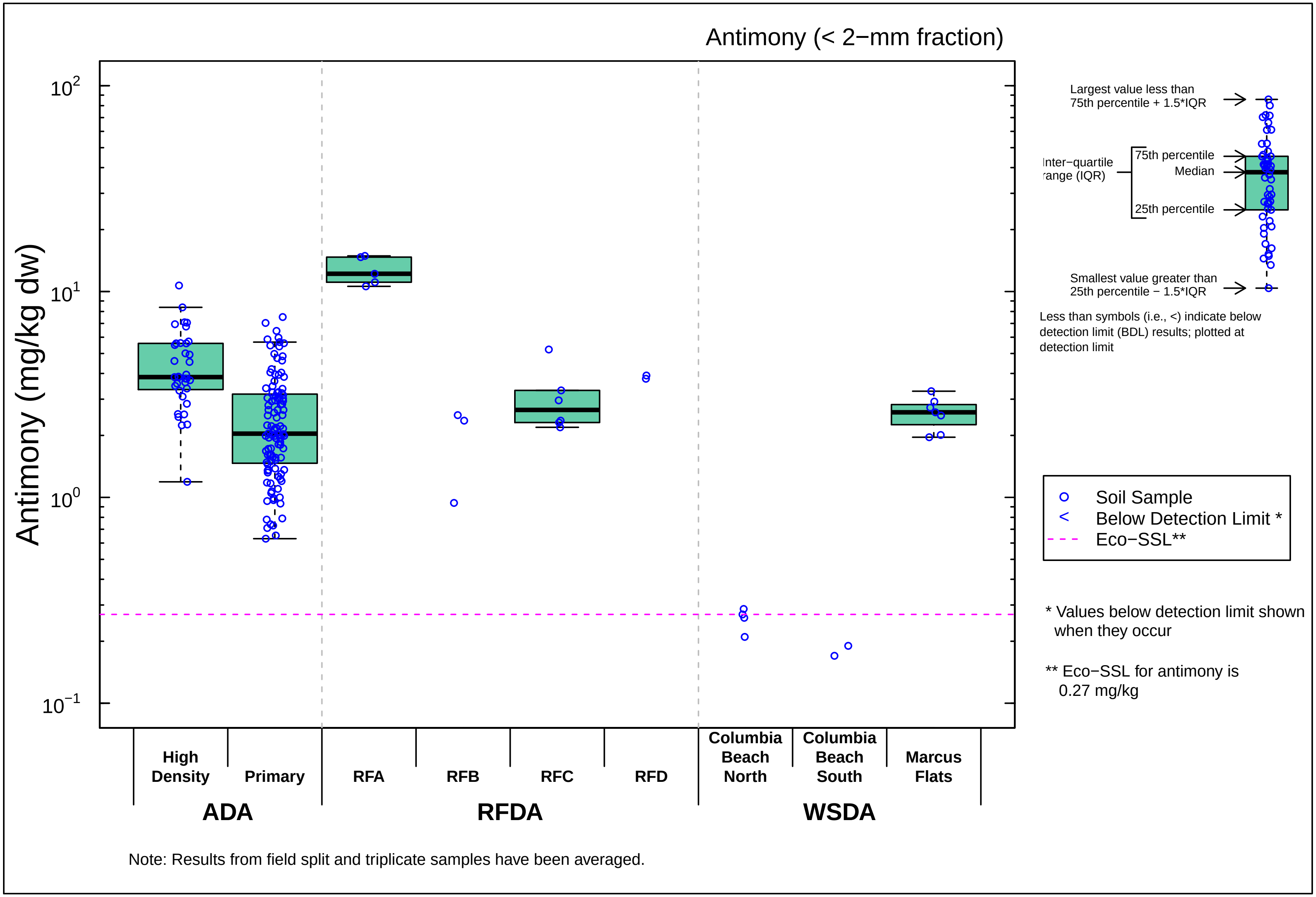


Figure 5−4b. Antimony Concentrations in < 2−mm Soil Fractions by Deposition Area

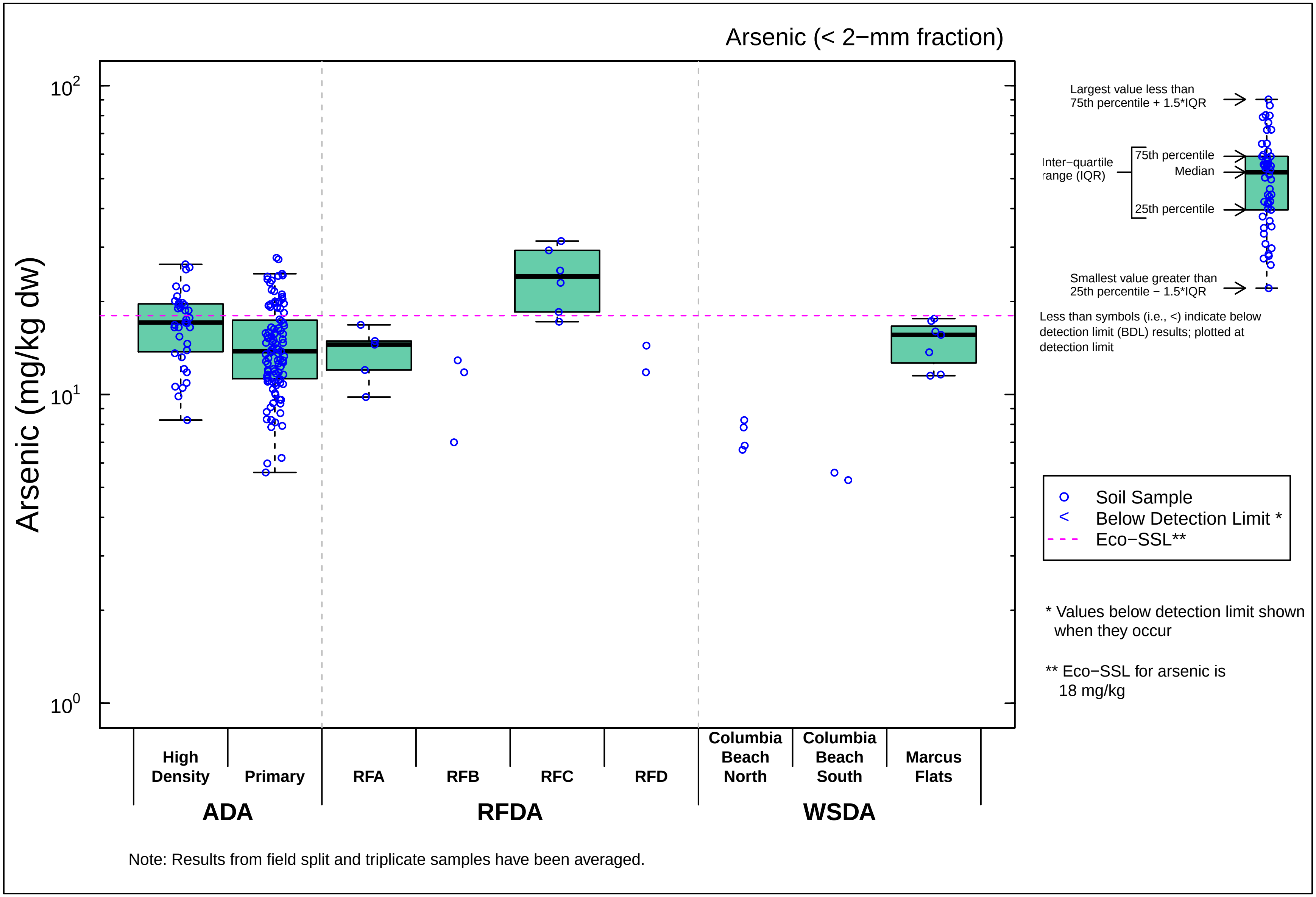


Figure 5−4c. Arsenic Concentrations in < 2−mm Soil Fractions by Deposition Area

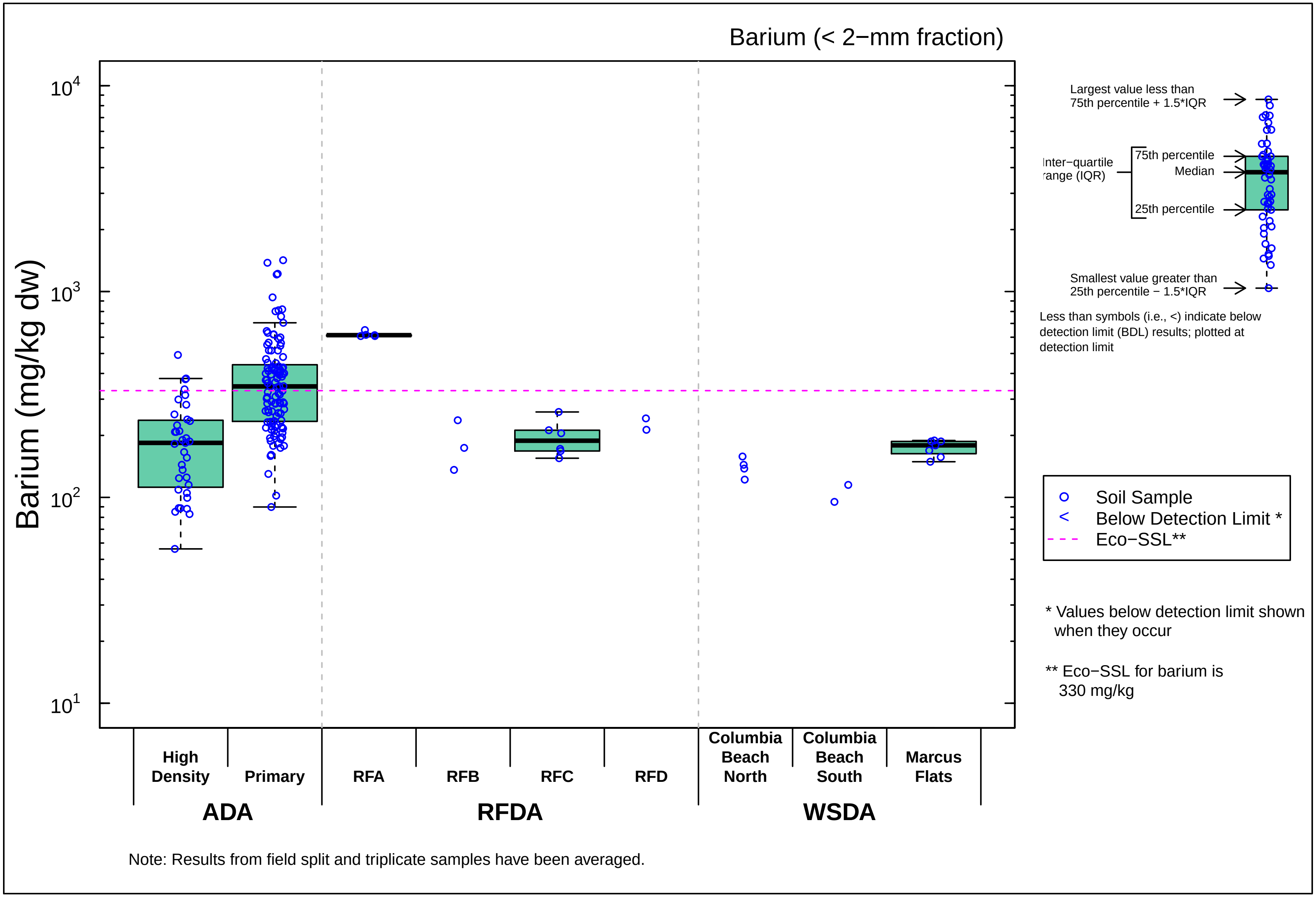


Figure 5−4d. Barium Concentrations in < 2−mm Soil Fractions by Deposition Area

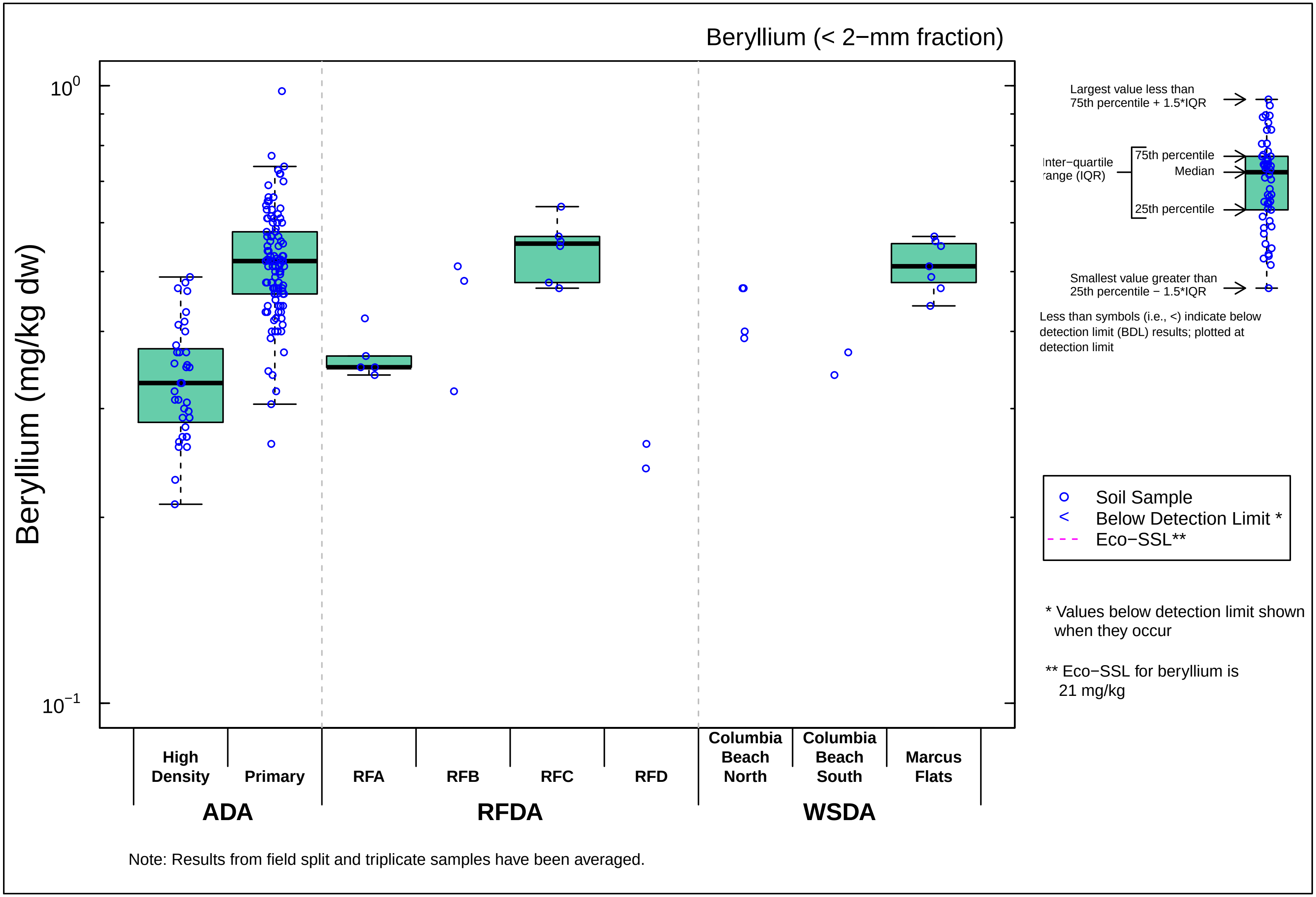


Figure 5−4e. Beryllium Concentrations in < 2−mm Soil Fractions by Deposition Area

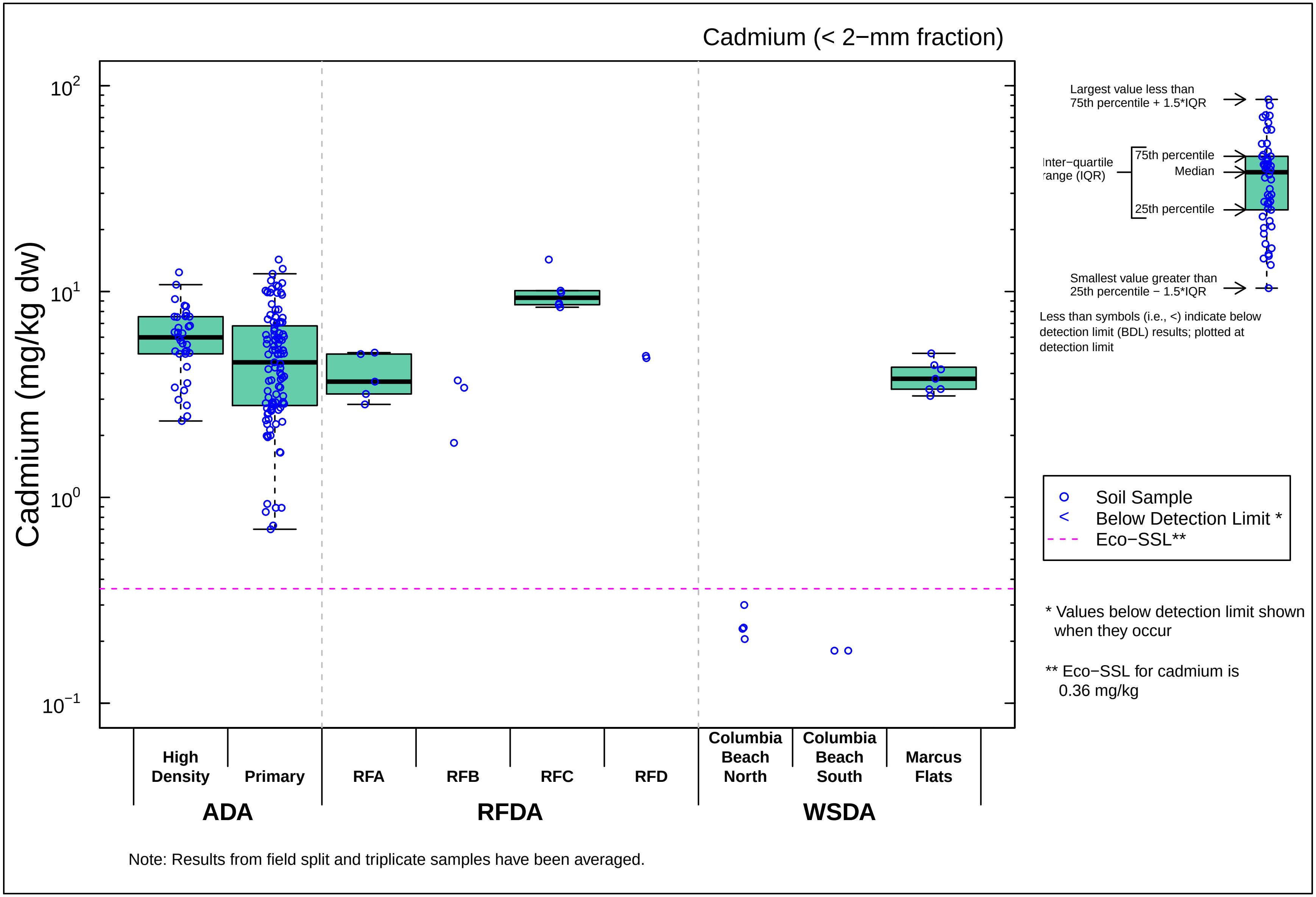


Figure 5−4f. Cadmium Concentrations in < 2−mm Soil Fractions by Deposition Area

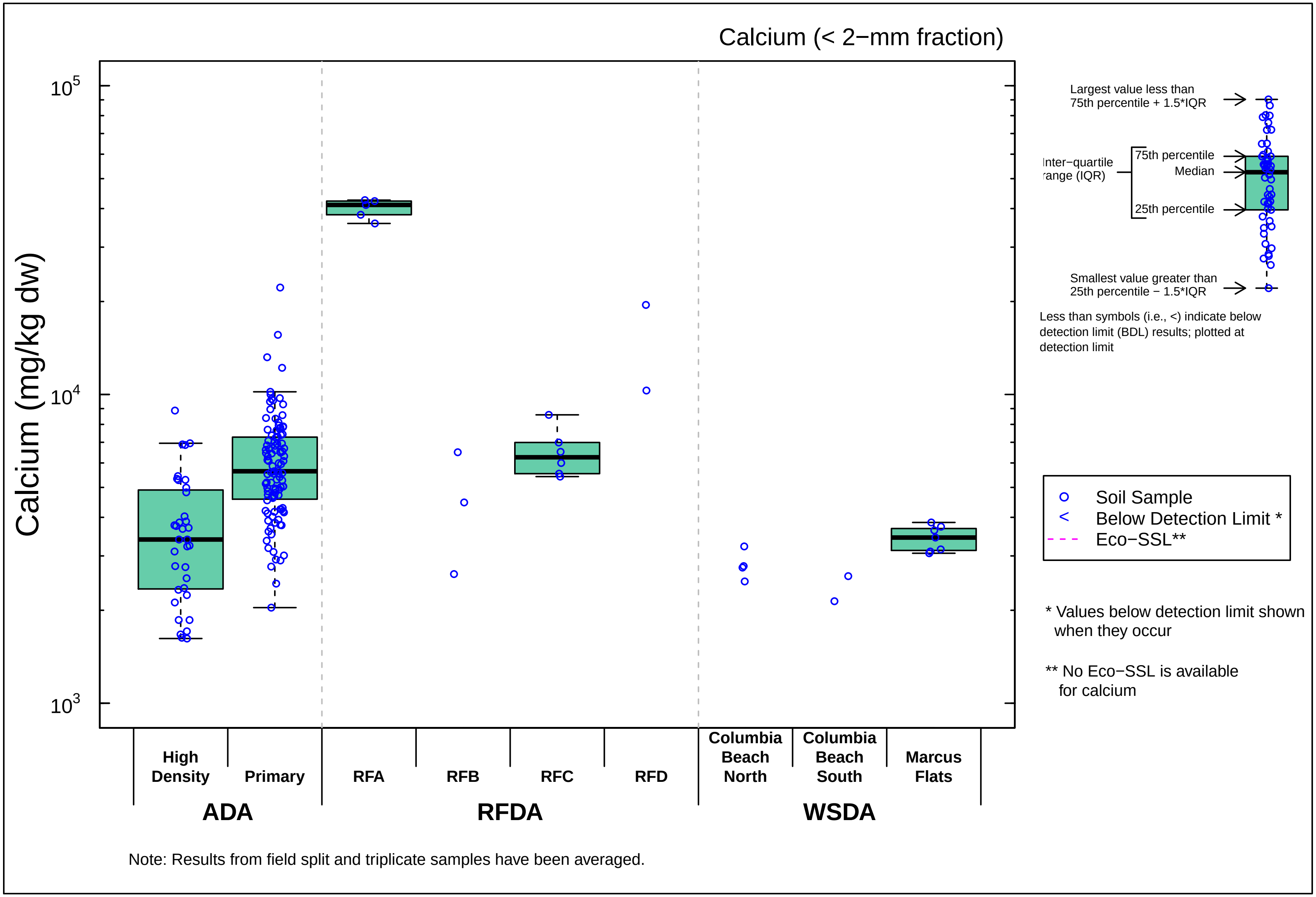


Figure 5−4g. Calcium Concentrations in < 2−mm Soil Fractions by Deposition Area

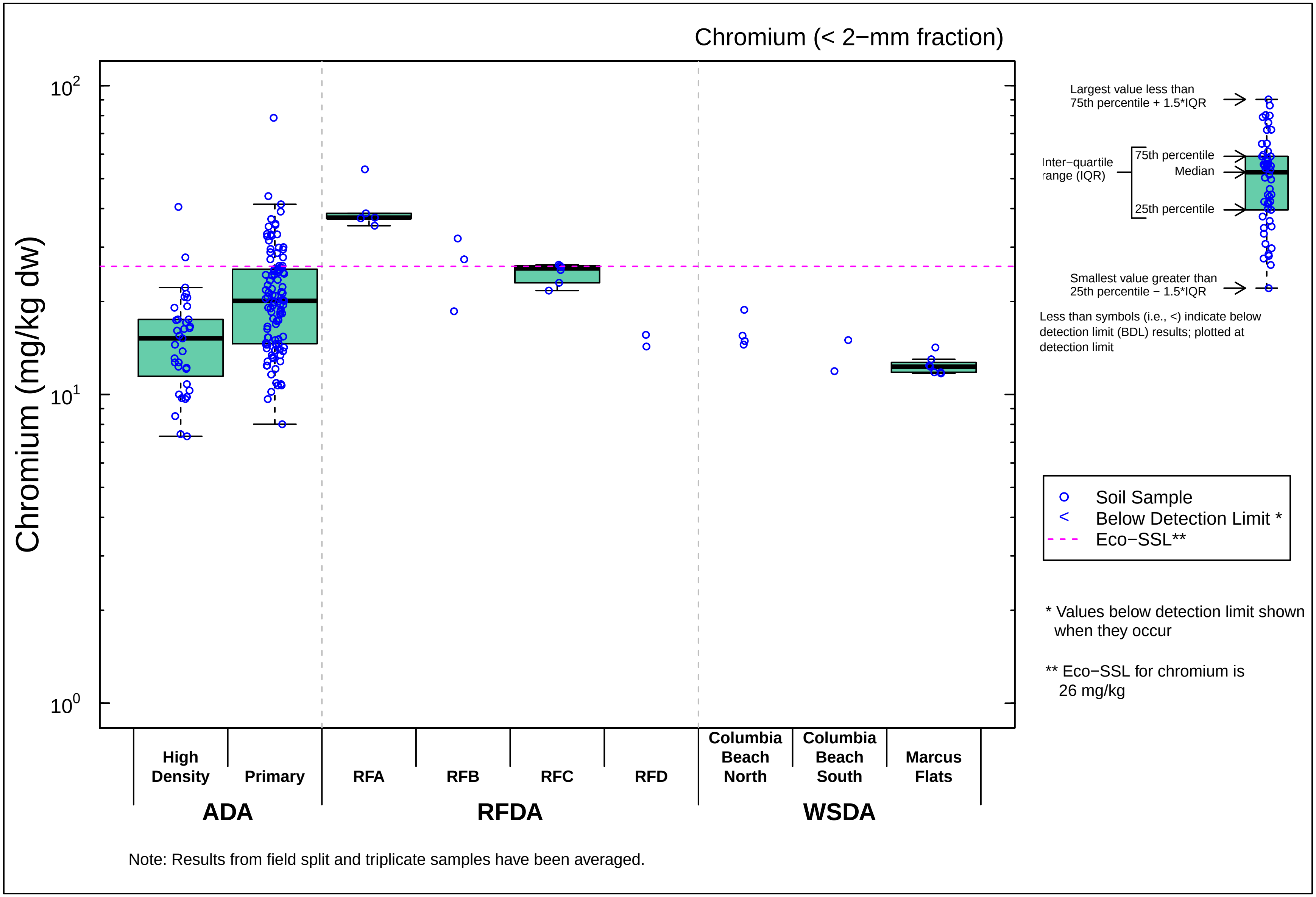


Figure 5−4h. Chromium Concentrations in < 2−mm Soil Fractions by Deposition Area

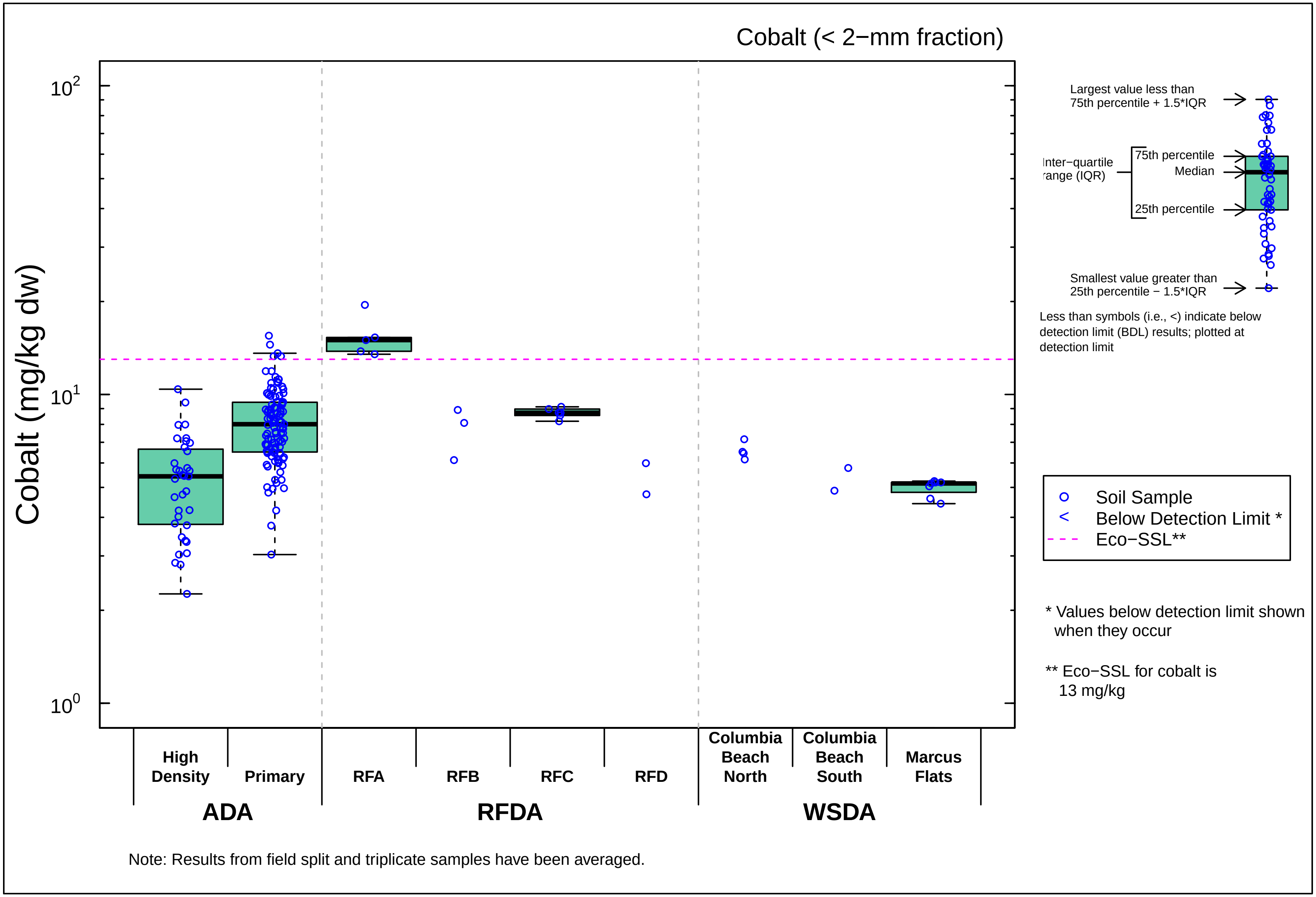


Figure 5−4i. Cobalt Concentrations in < 2−mm Soil Fractions by Deposition Area

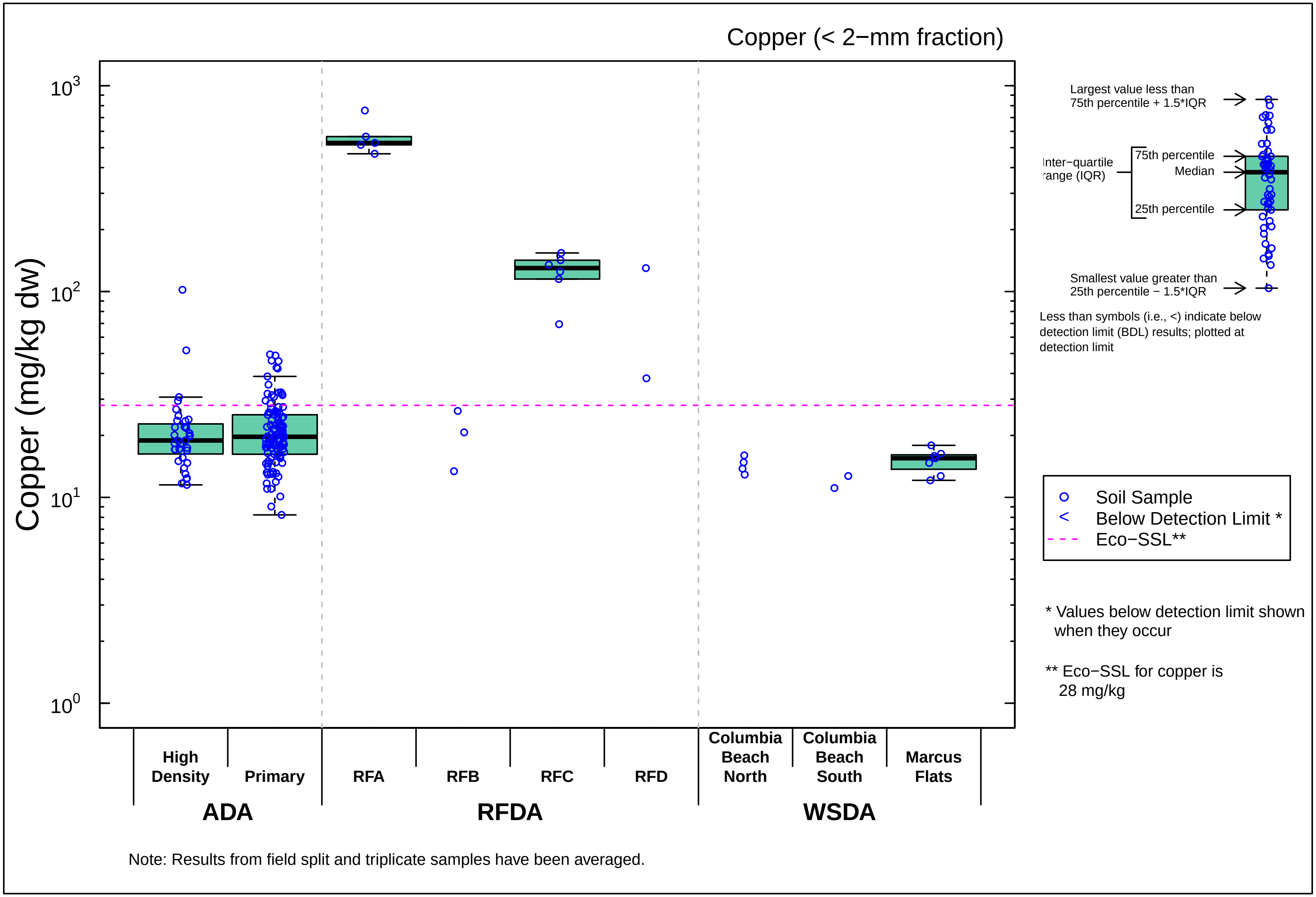


Figure 5−4j. Copper Concentrations in < 2−mm Soil Fractions by Deposition Area

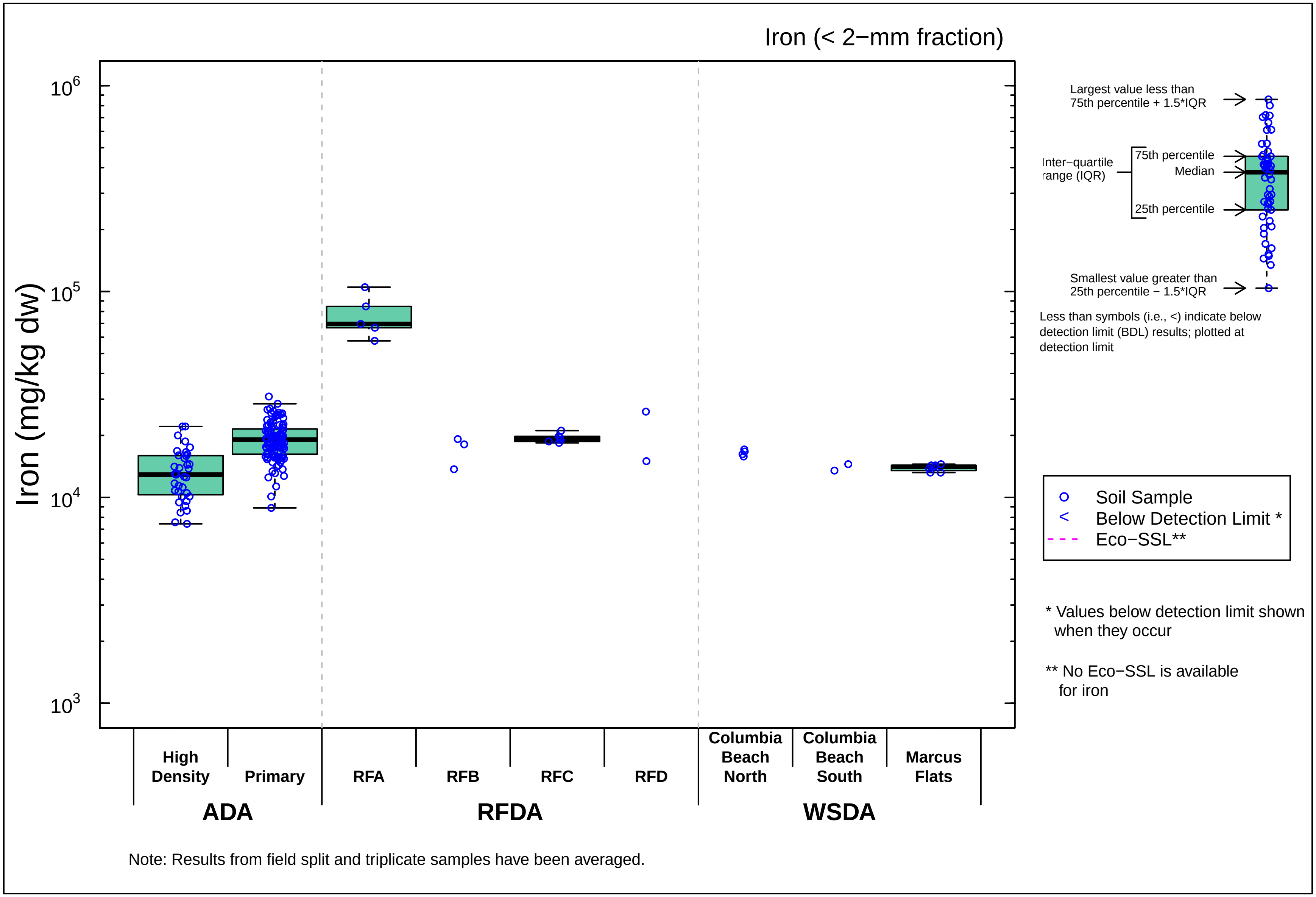


Figure 5−4k. Iron Concentrations in < 2−mm Soil Fractions by Deposition Area

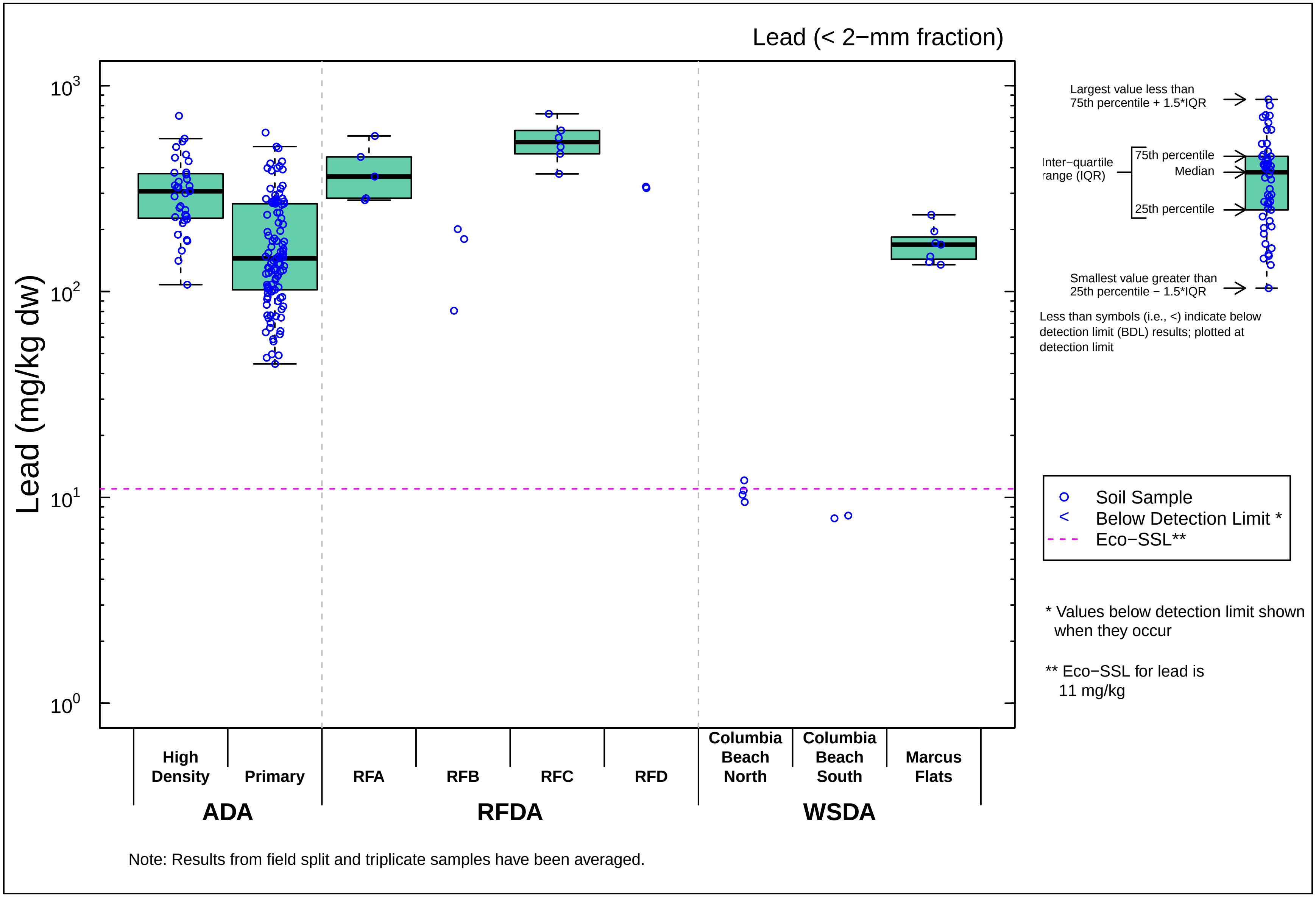


Figure 5−4l. Lead Concentrations in < 2−mm Soil Fractions by Deposition Area

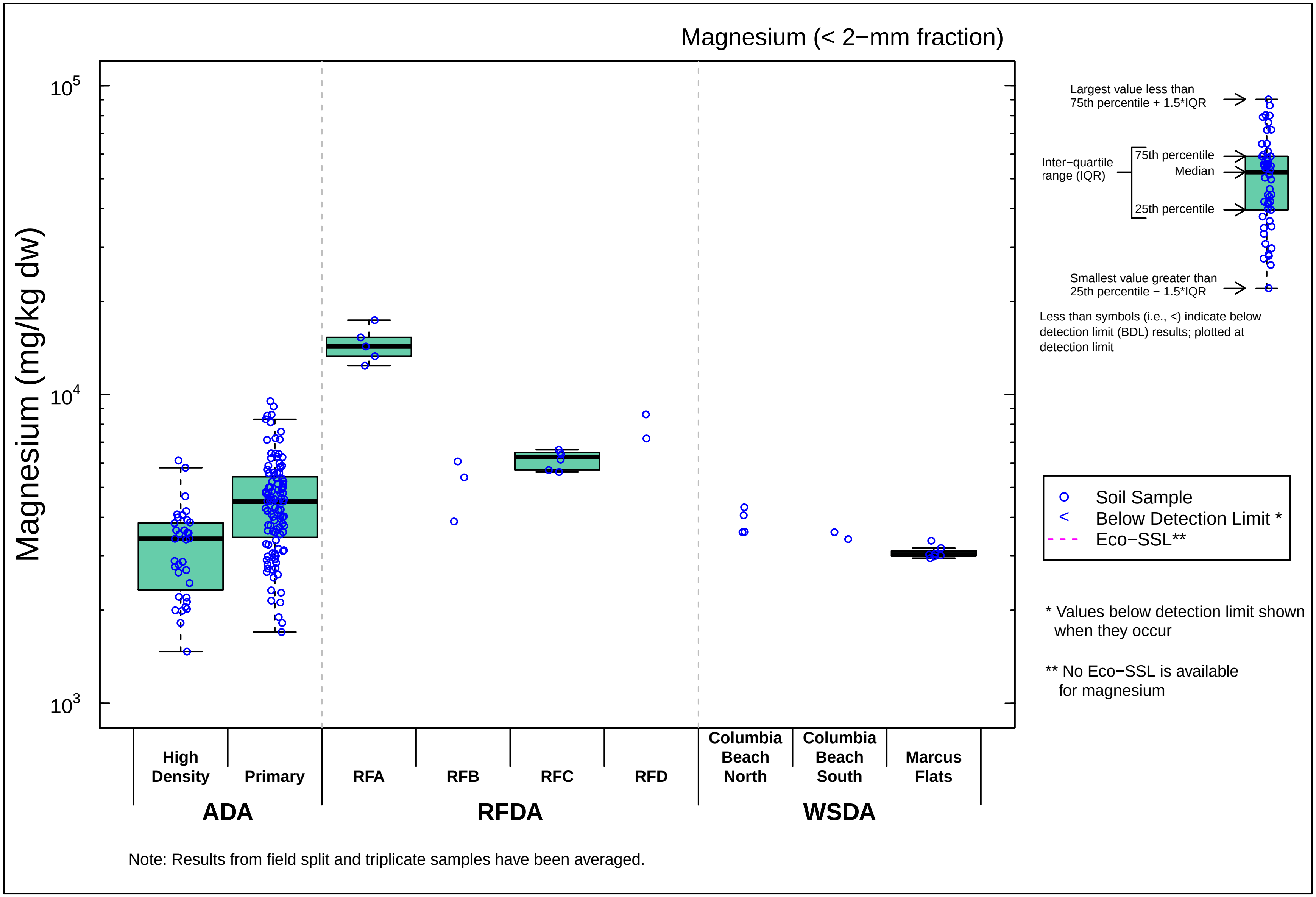


Figure 5−4m. Magnesium Concentrations in < 2−mm Soil Fractions by Deposition Area

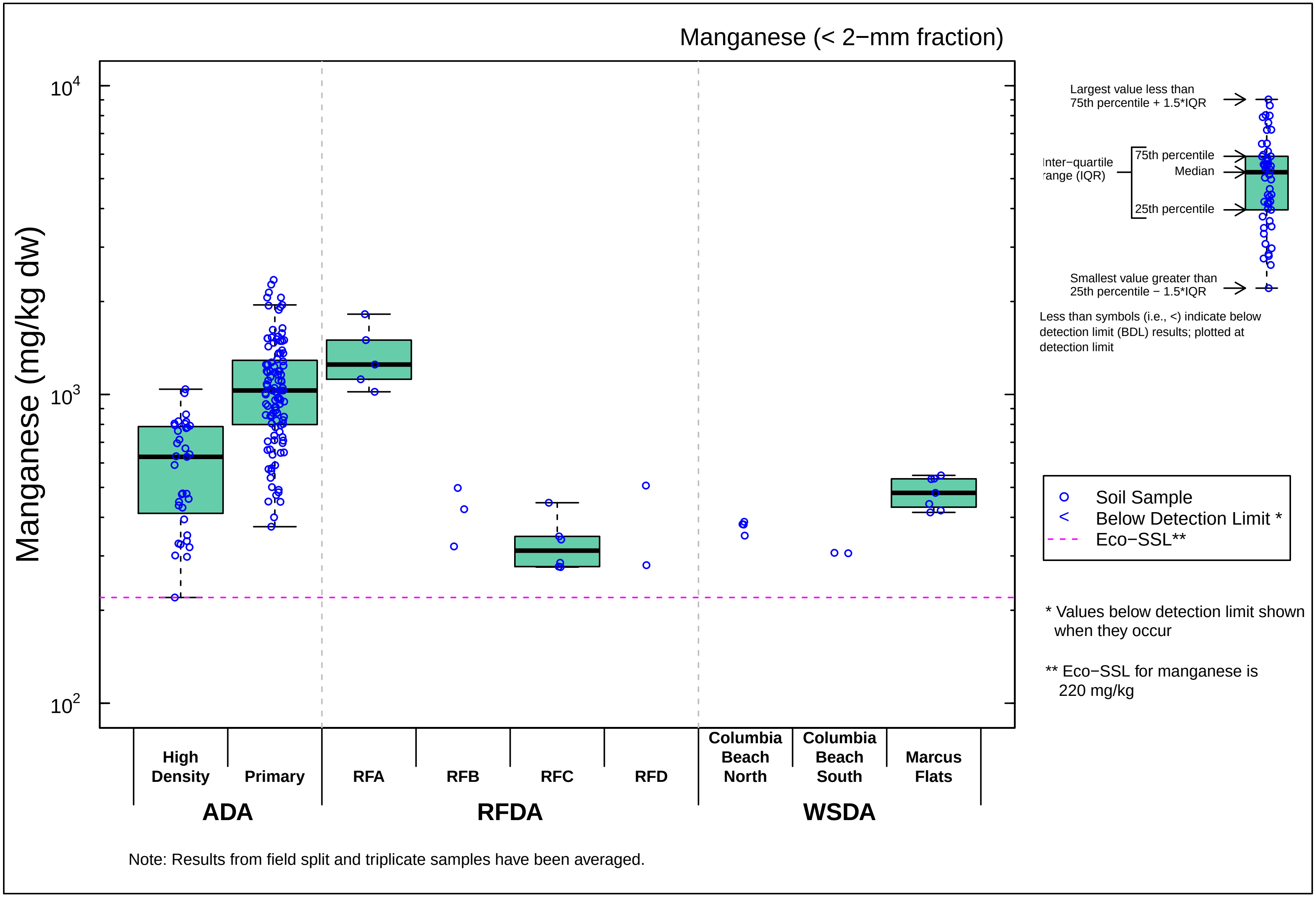


Figure 5−4n. Manganese Concentrations in < 2−mm Soil Fractions by Deposition Area

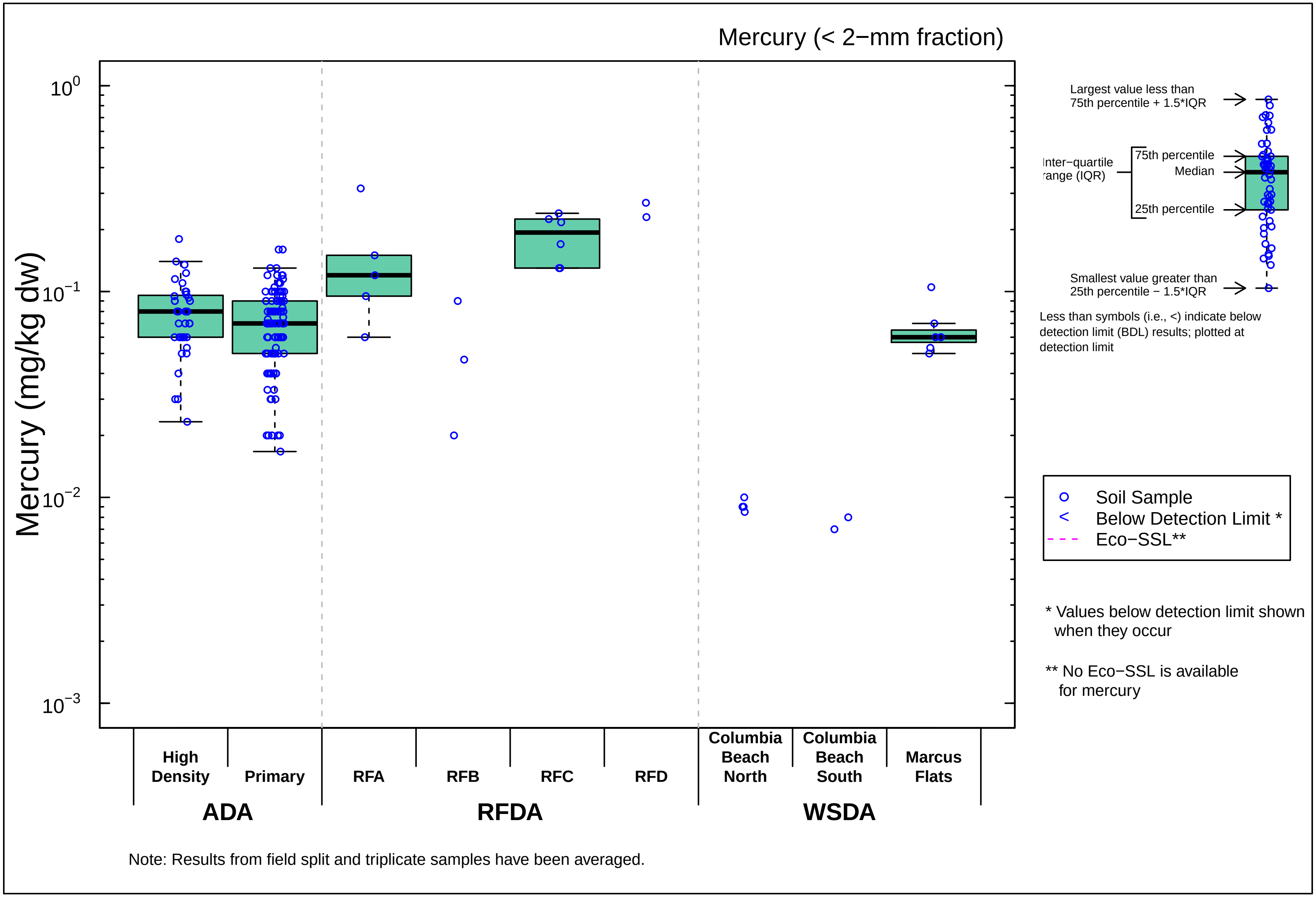


Figure 5−4o. Mercury Concentrations in < 2−mm Soil Fractions by Deposition Area

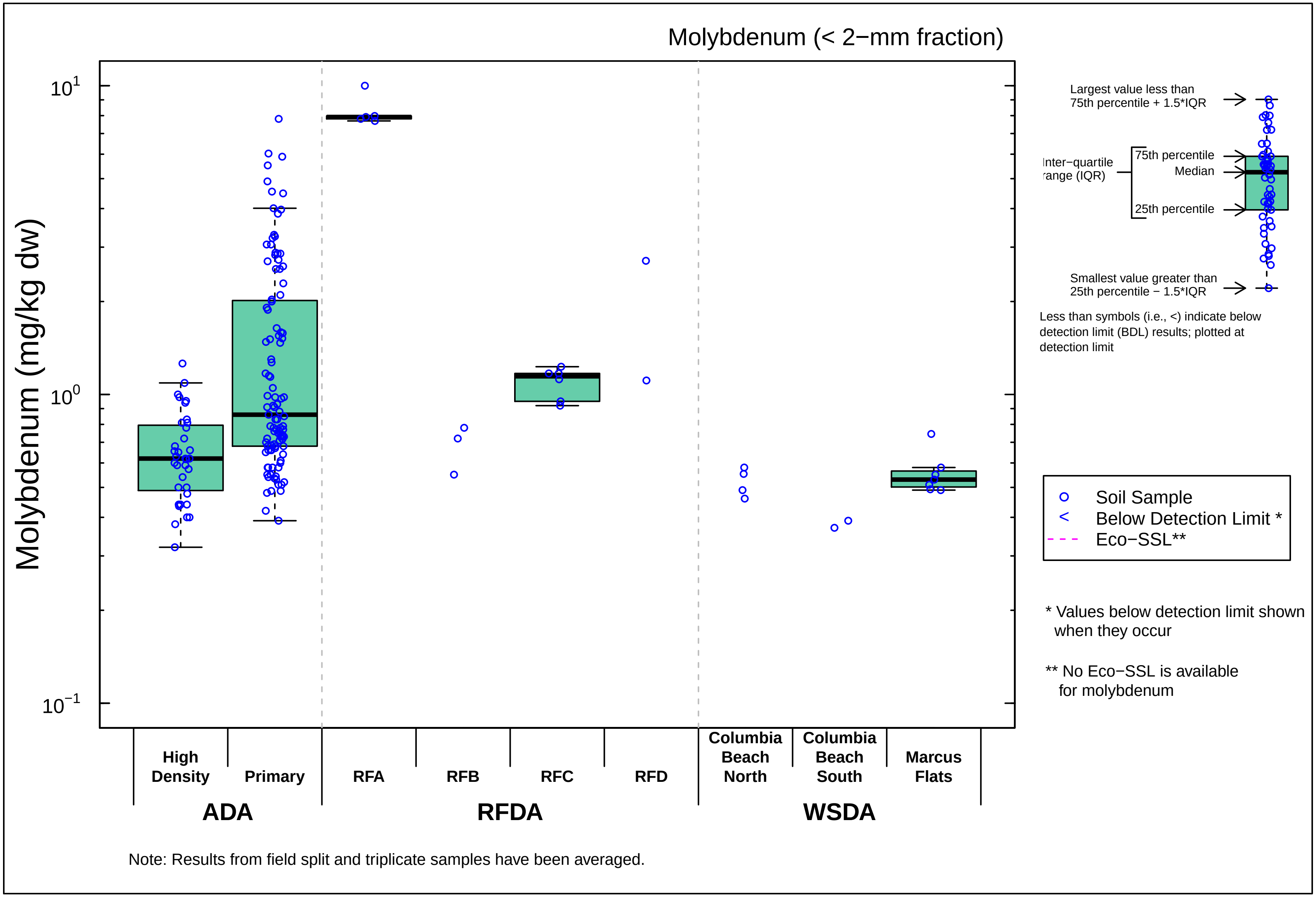


Figure 5−4p. Molybdenum Concentrations in < 2−mm Soil Fractions by Deposition Area

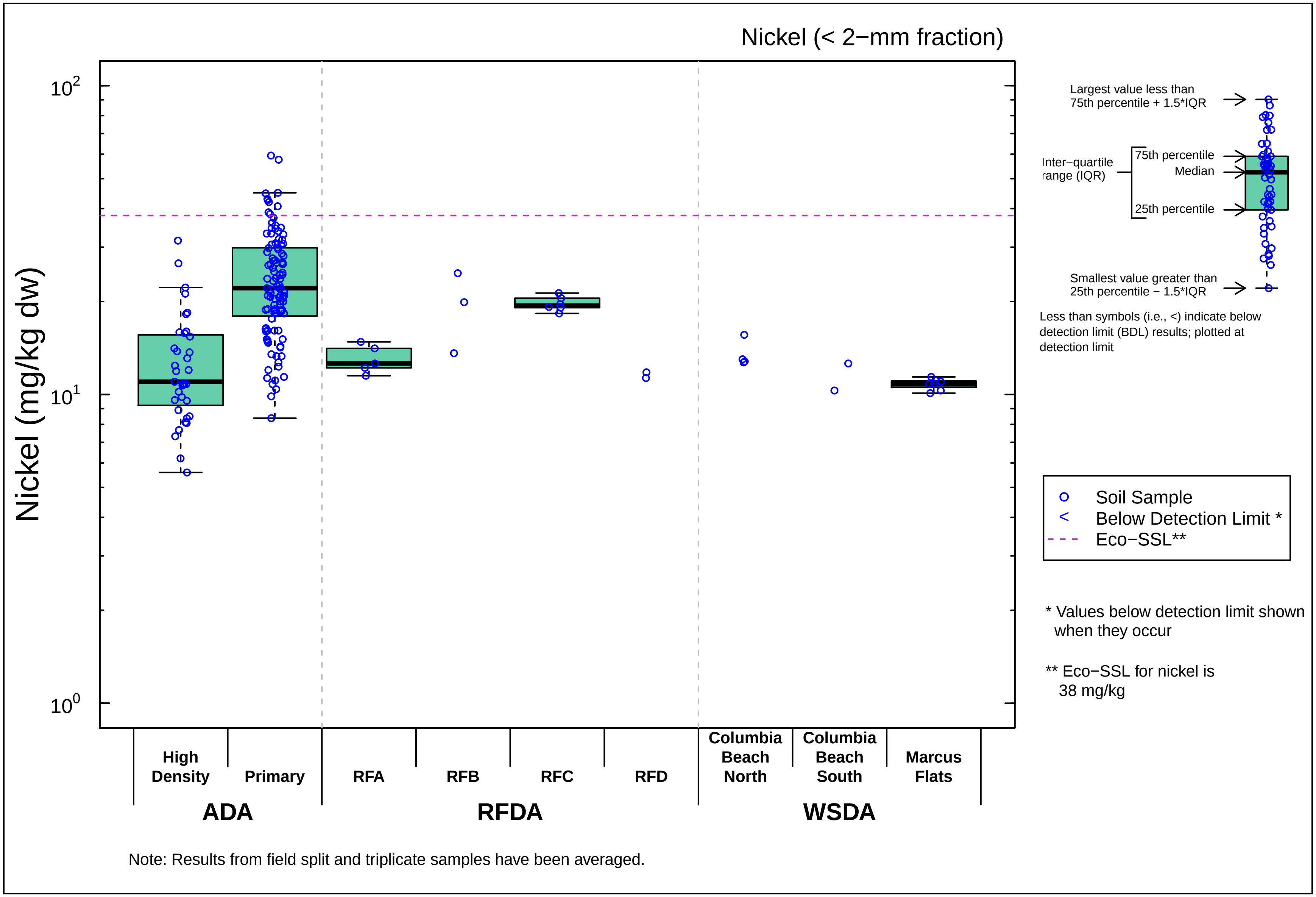


Figure 5−4q. Nickel Concentrations in < 2−mm Soil Fractions by Deposition Area

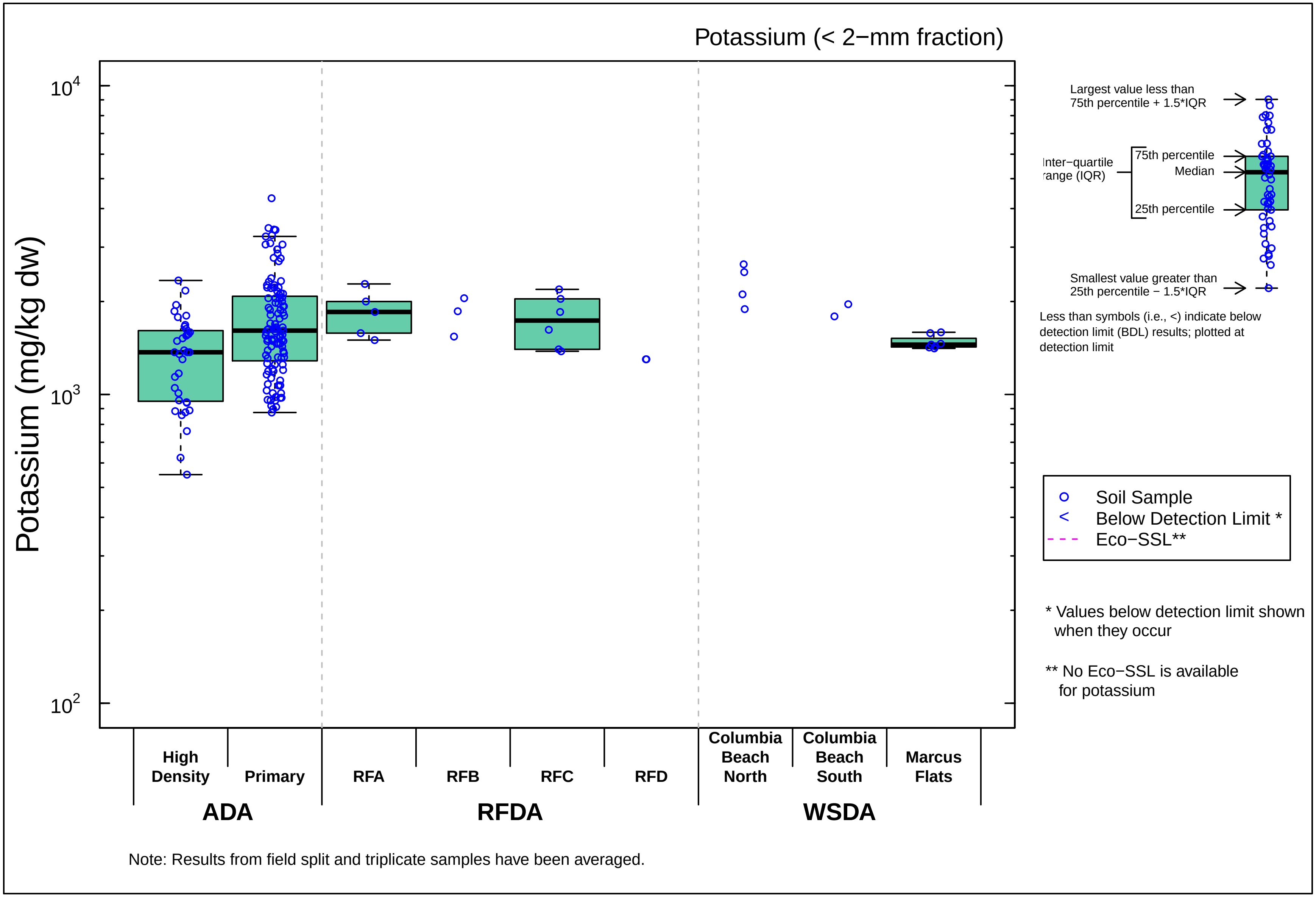


Figure 5−4r. Potassium Concentrations in < 2−mm Soil Fractions by Deposition Area

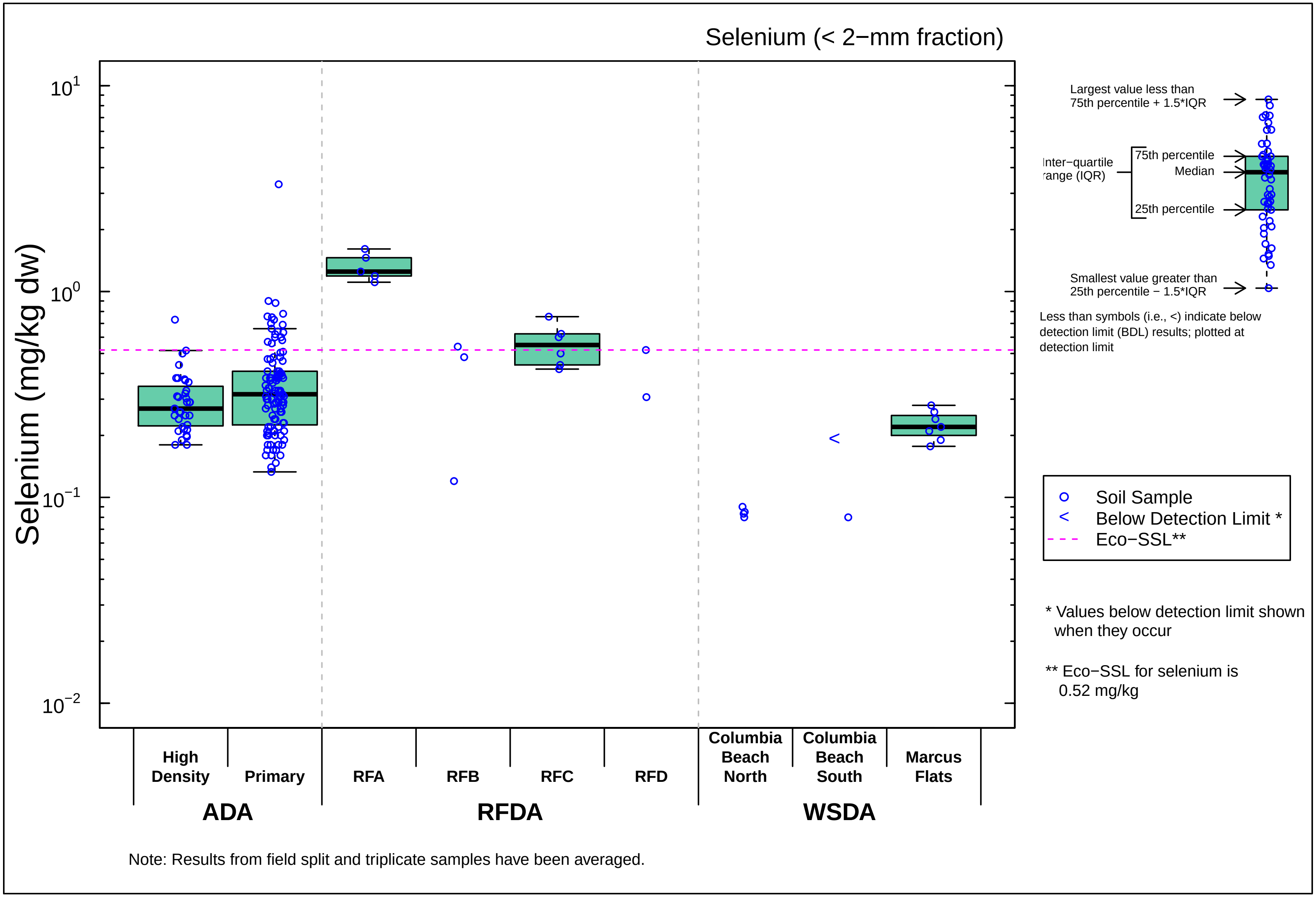


Figure 5−4s. Selenium Concentrations in < 2−mm Soil Fractions by Deposition Area

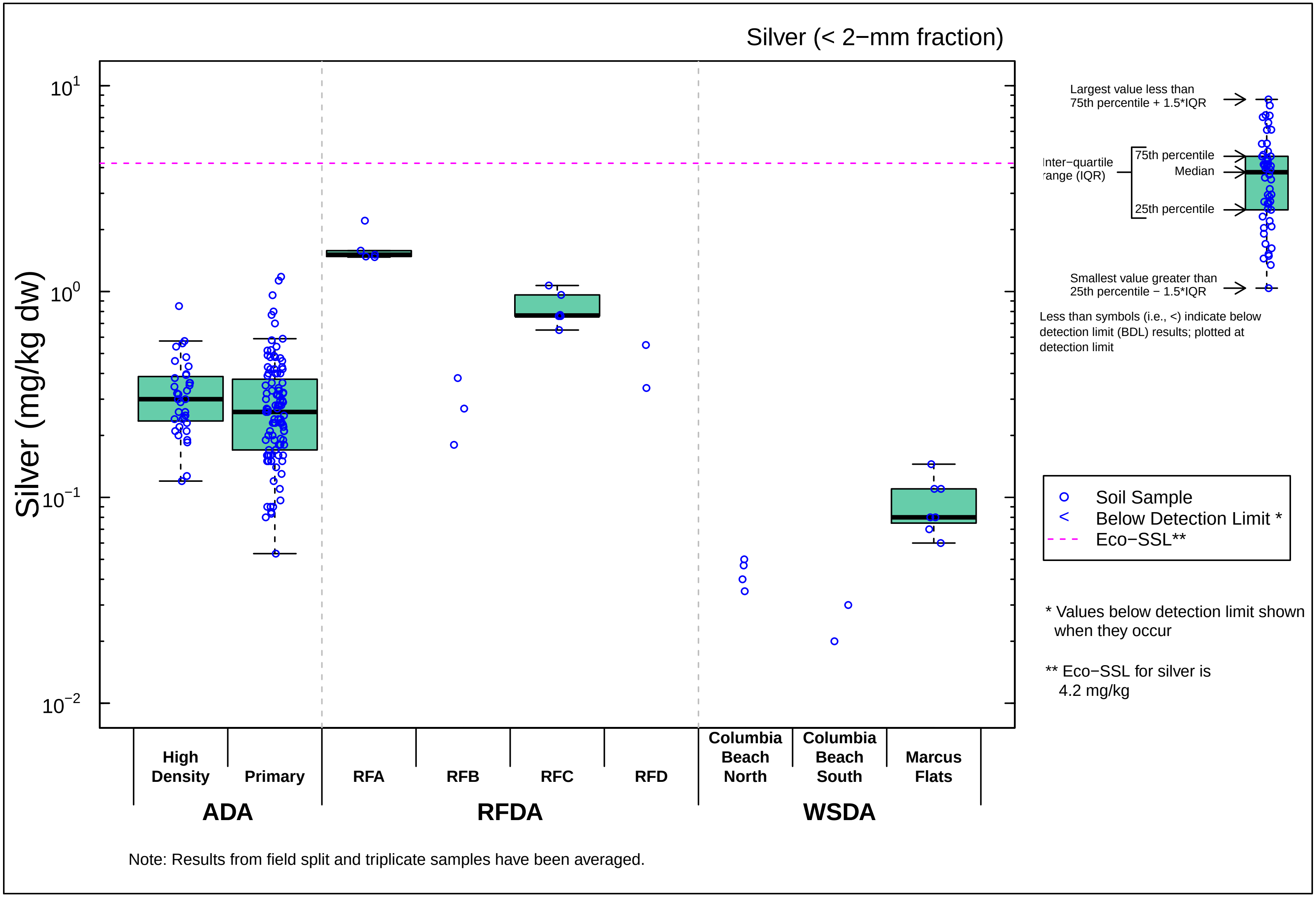


Figure 5−4t. Silver Concentrations in < 2−mm Soil Fractions by Deposition Area

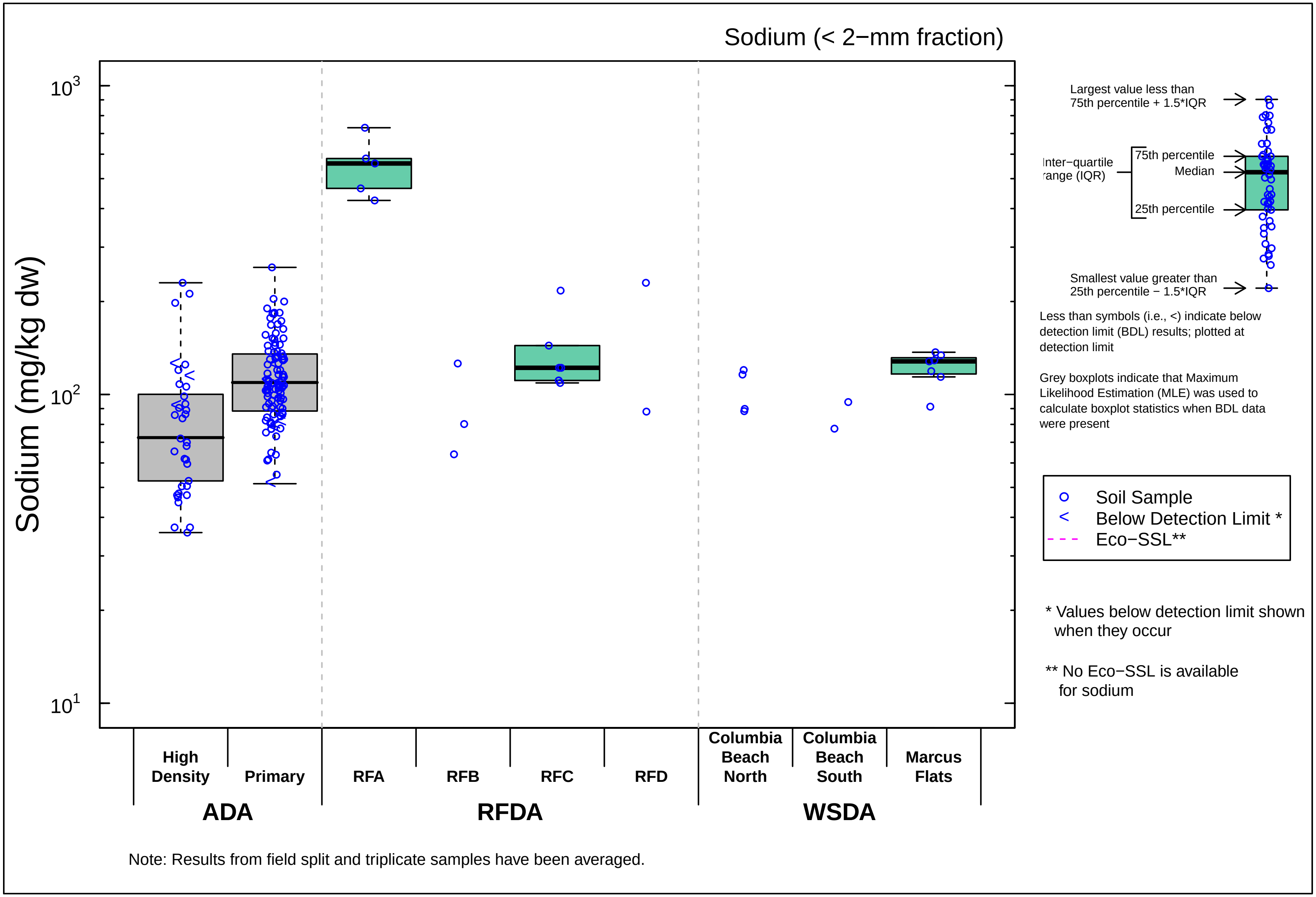


Figure 5−4u. Sodium Concentrations in < 2−mm Soil Fractions by Deposition Area

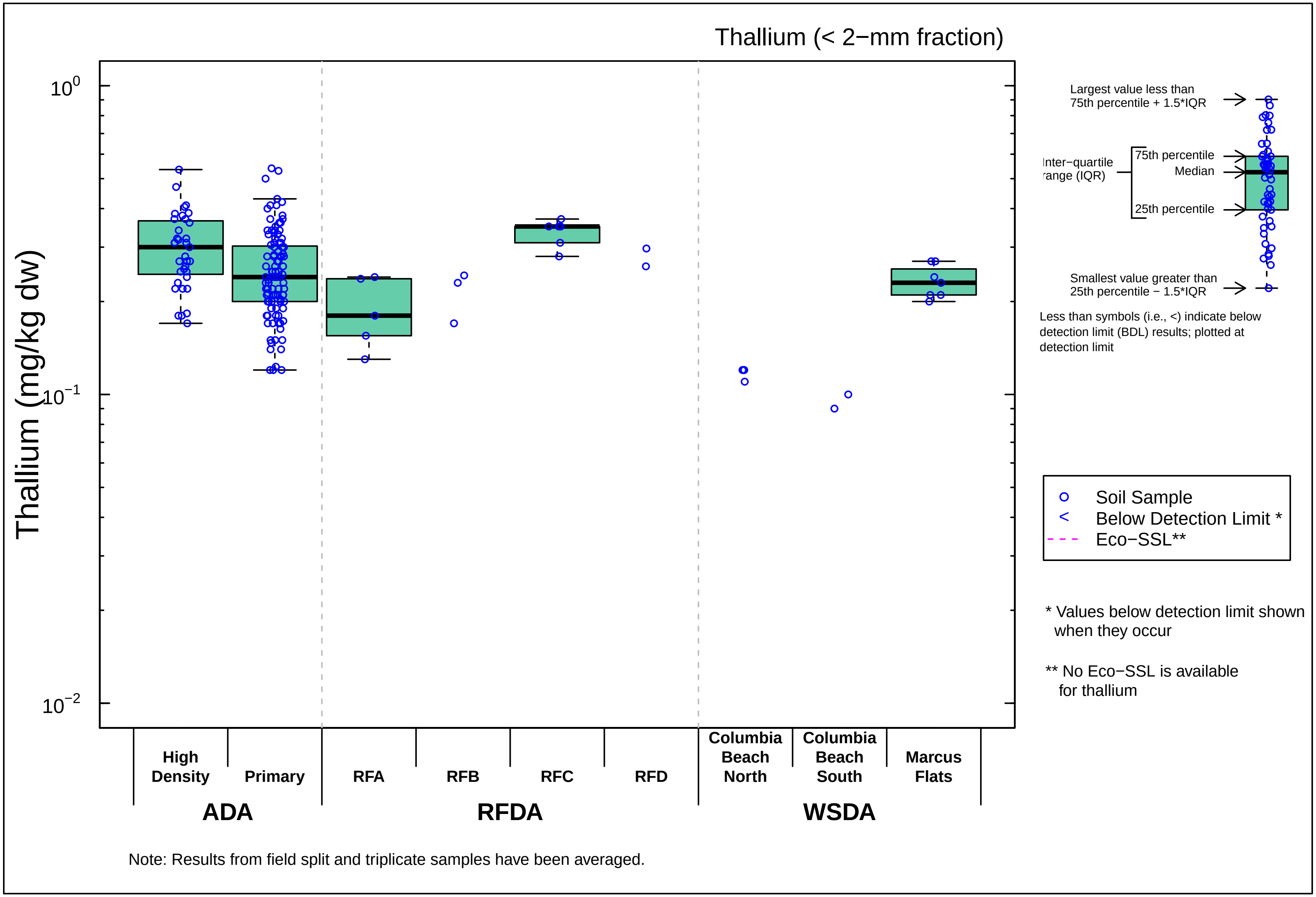


Figure 5−4v. Thallium Concentrations in < 2−mm Soil Fractions by Deposition Area

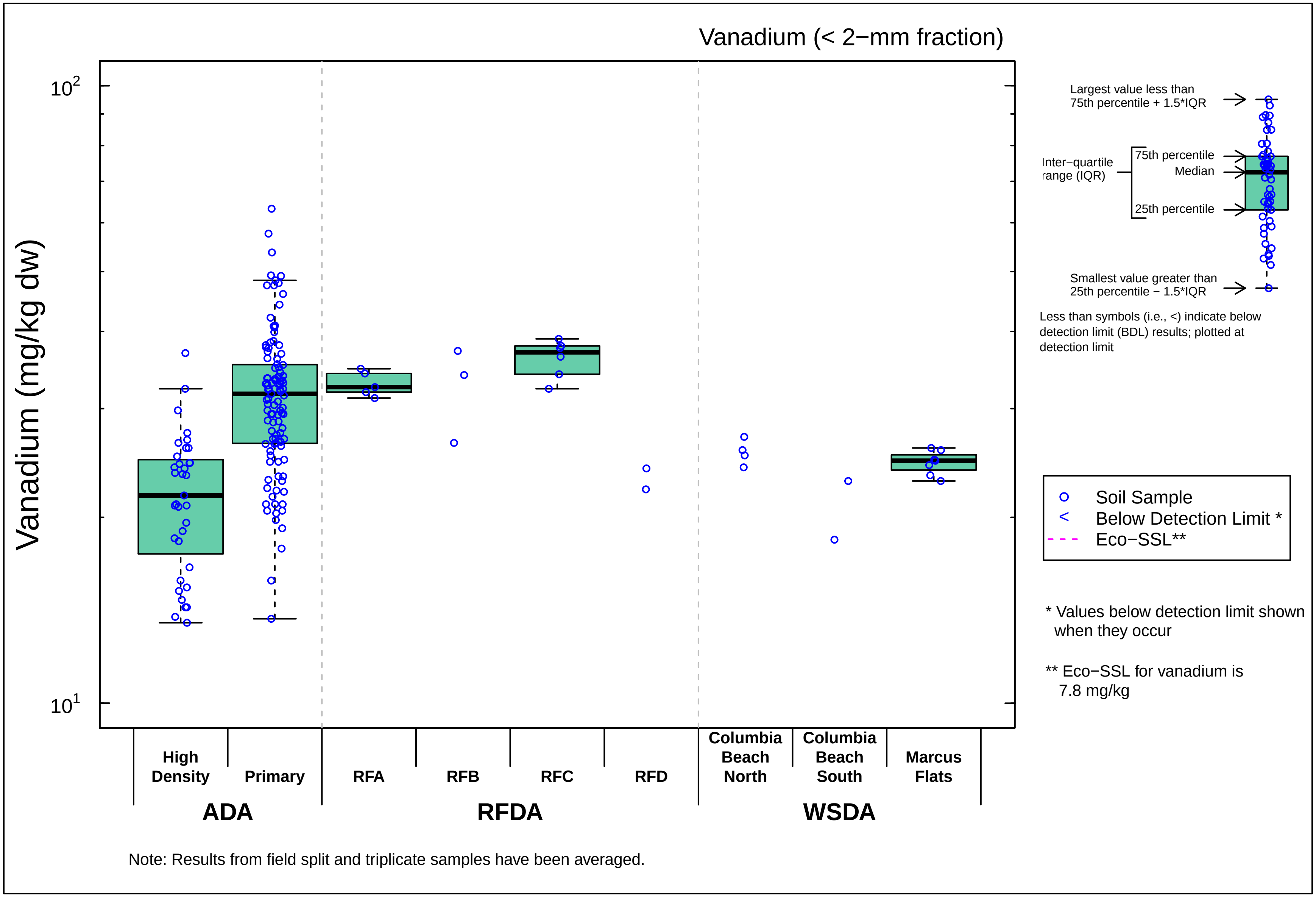


Figure 5−4w. Vanadium Concentrations in < 2−mm Soil Fractions by Deposition Area

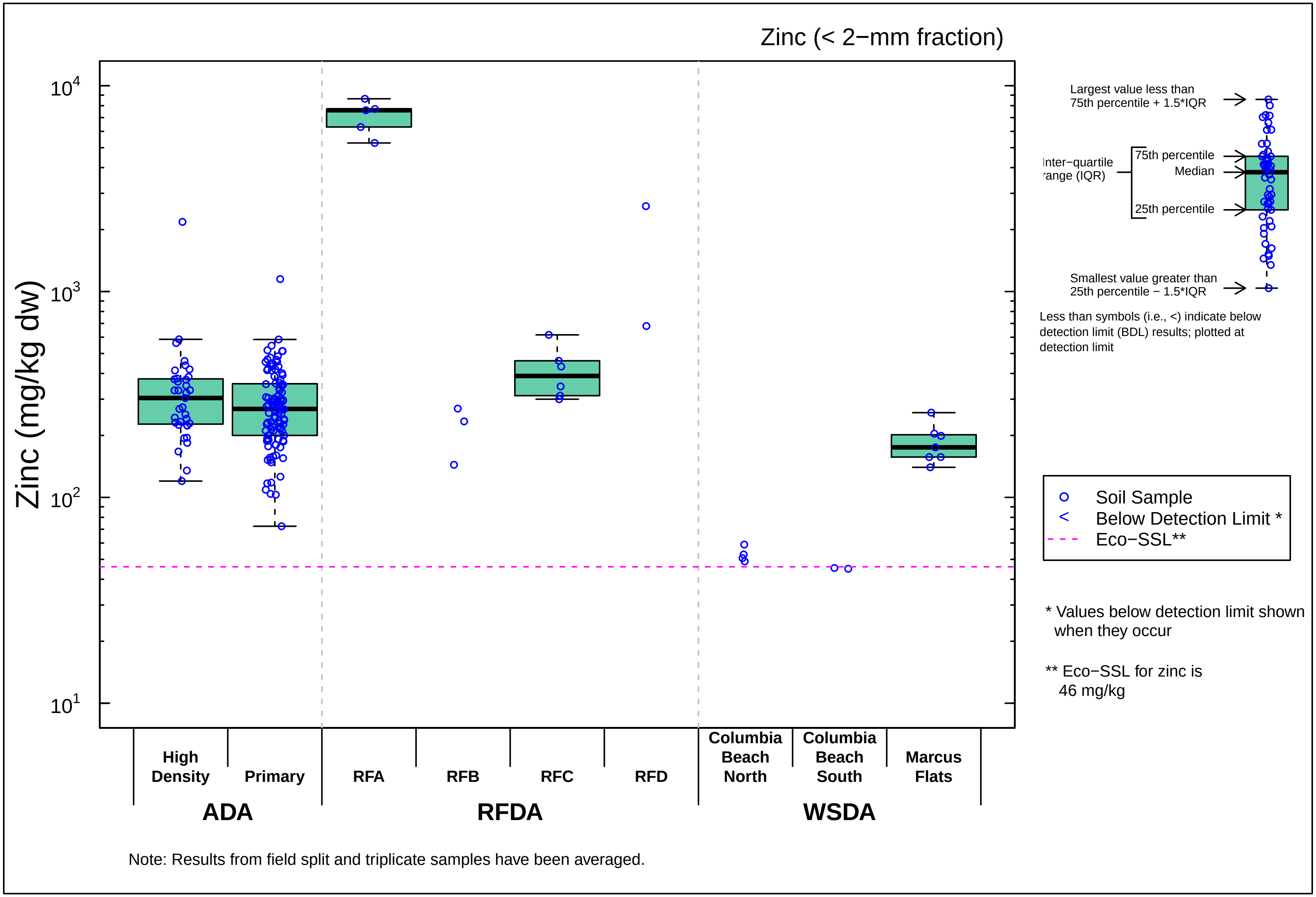


Figure 5−4x. Zinc Concentrations in < 2−mm Soil Fractions by Deposition Area

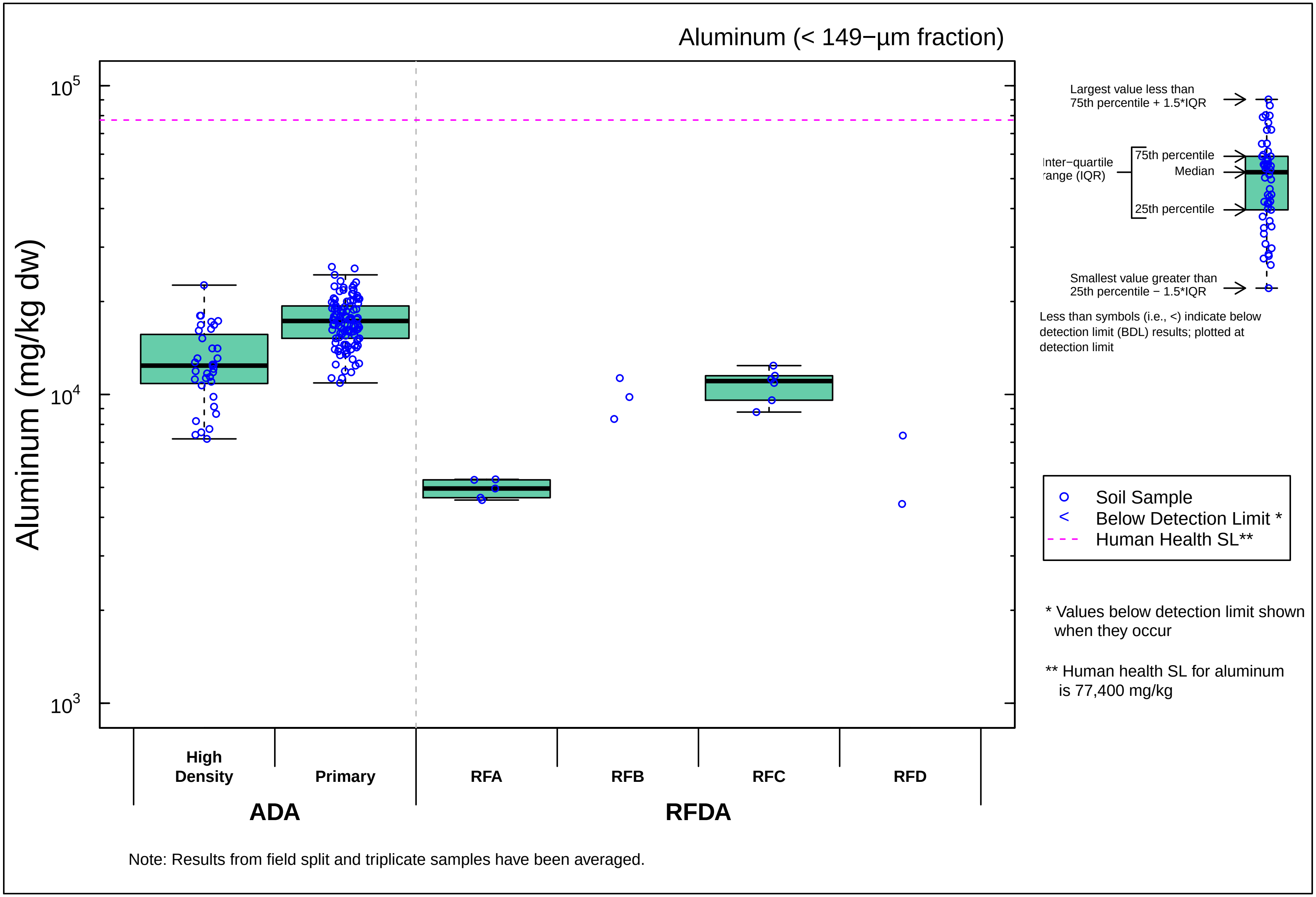


Figure 5−5a. Aluminum Concentrations in < 149−µm Soil Fractions by Deposition Area

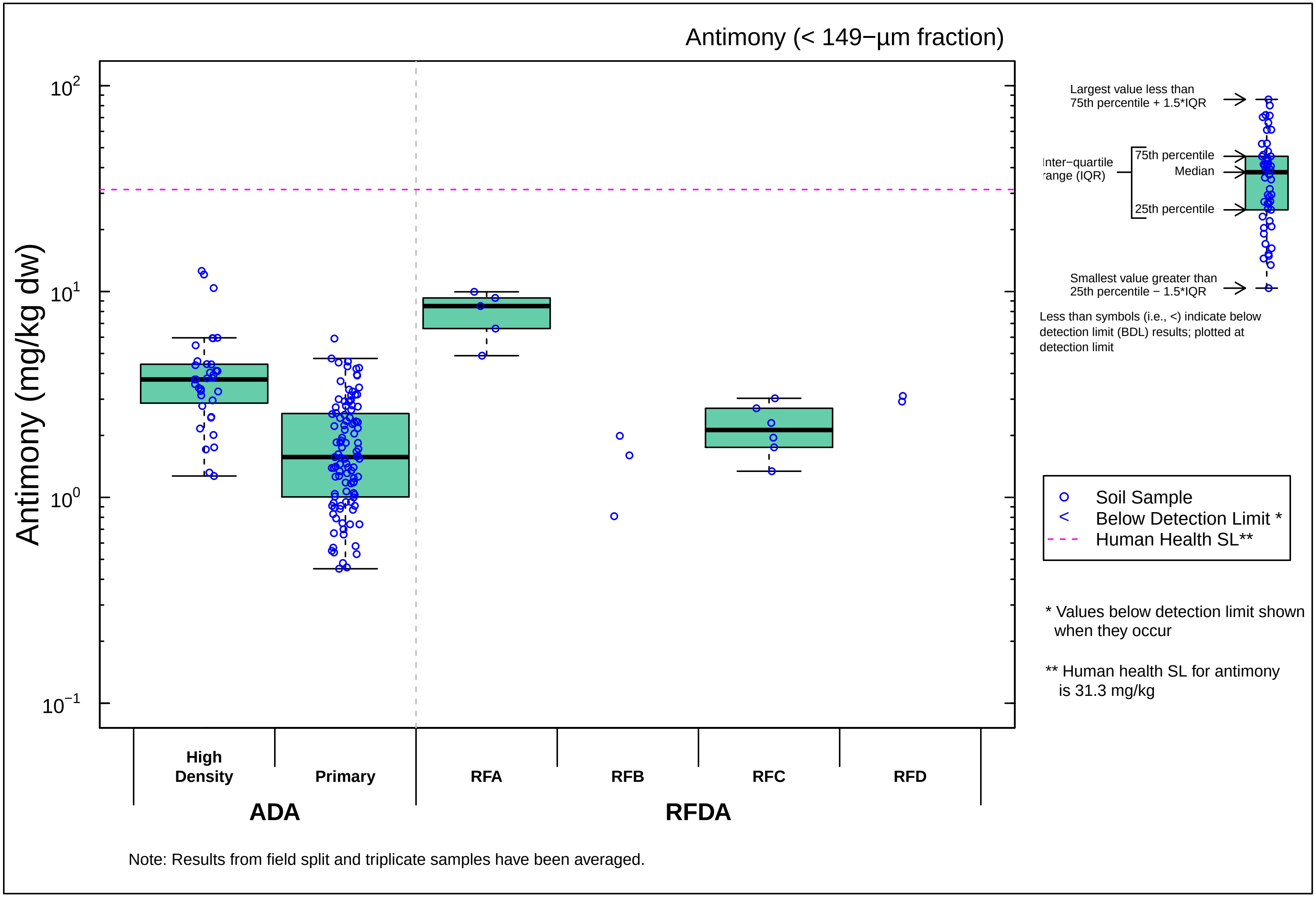
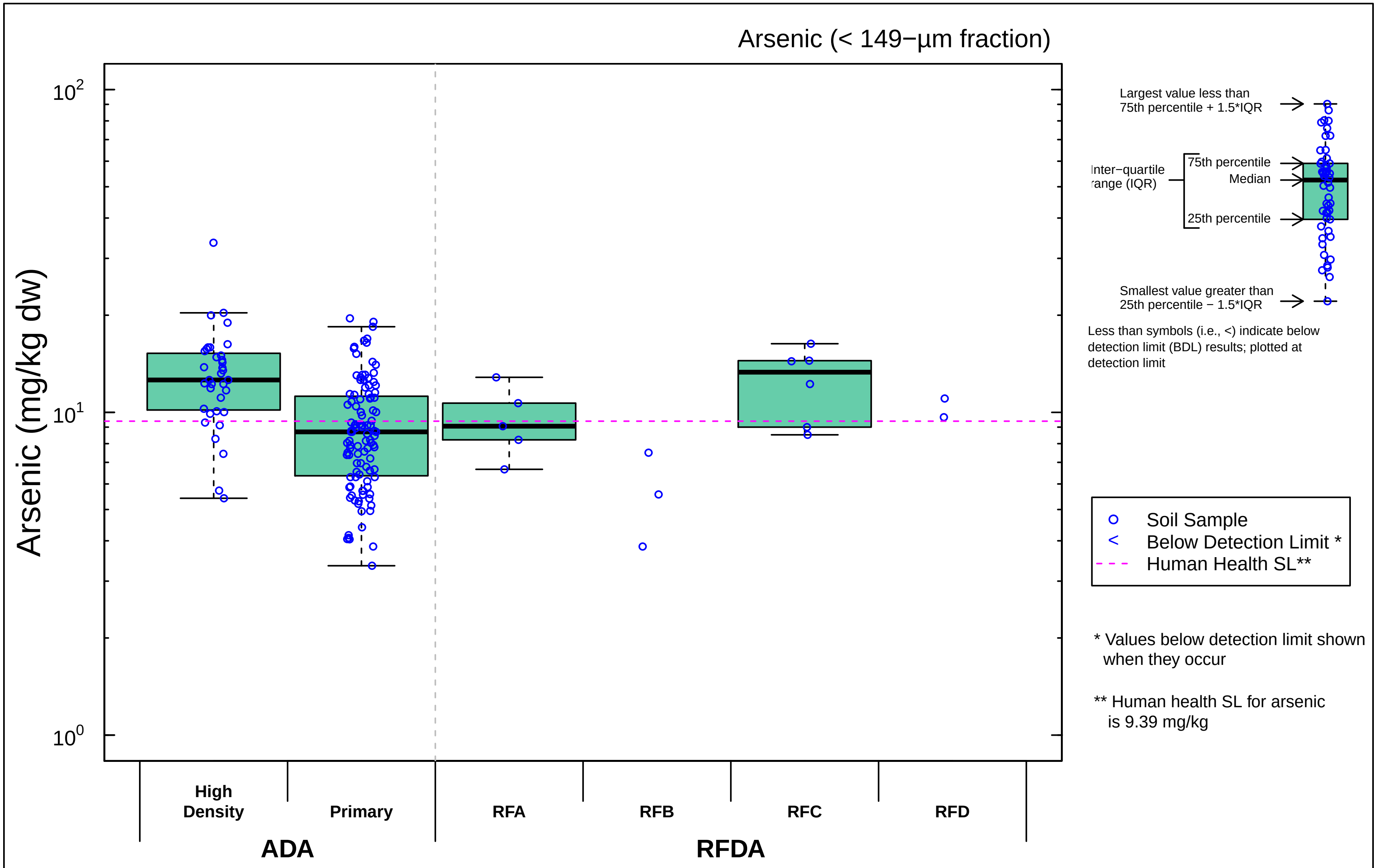


Figure 5−5b. Antimony Concentrations in < 149−µm Soil Fractions by Deposition Area



Notes: (1) Results from field split and triplicate samples have been averaged.
(2) Concentrations have been adjusted by EPA's default relative bioavailability (RBA) of 60 percent for arsenic in soil (EPA 2012b).

Figure 5−5c. Arsenic Concentrations in < 149−µm Soil Fractions by Deposition Area

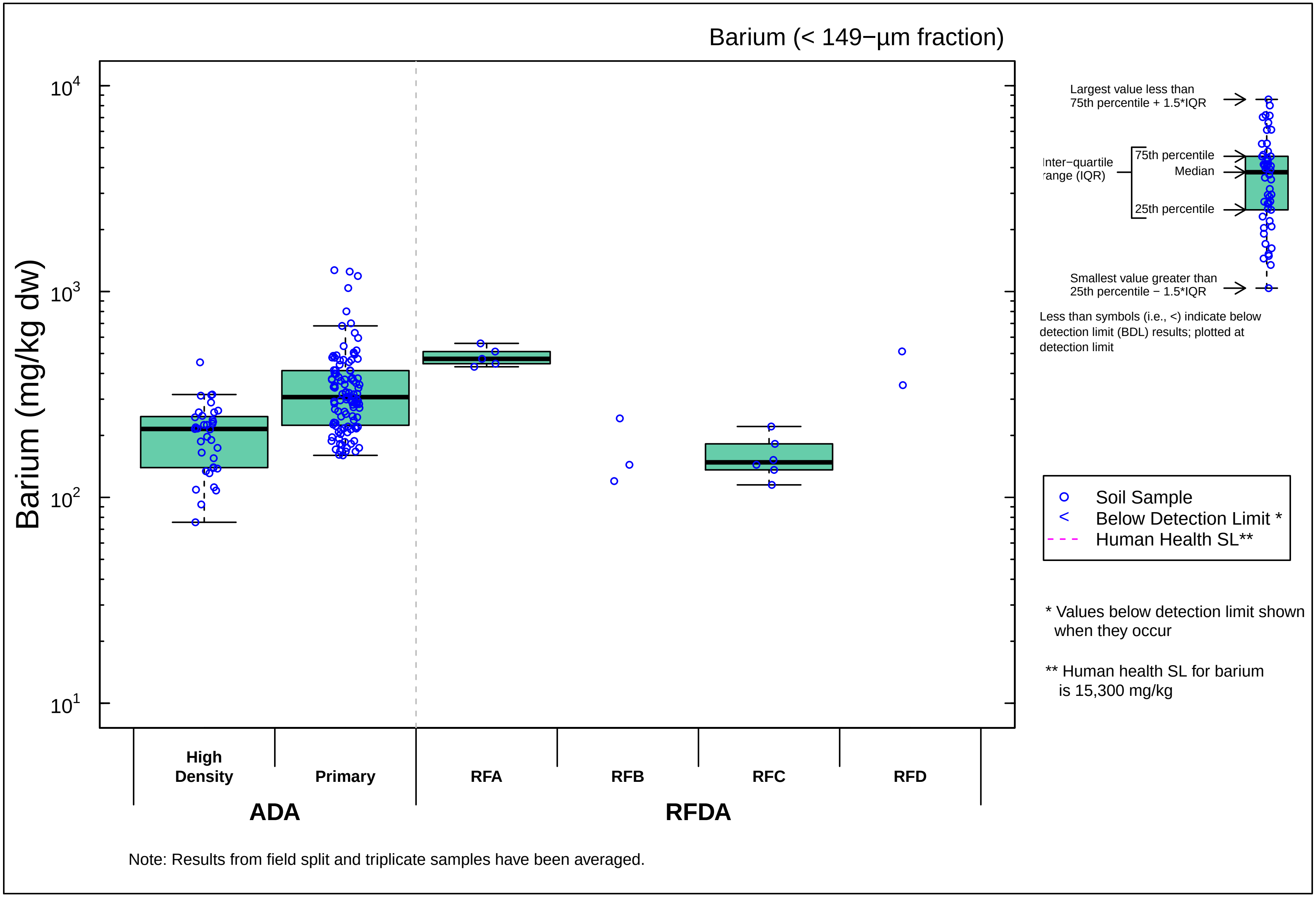


Figure 5−5d. Barium Concentrations in < 149−µm Soil Fractions by Deposition Area

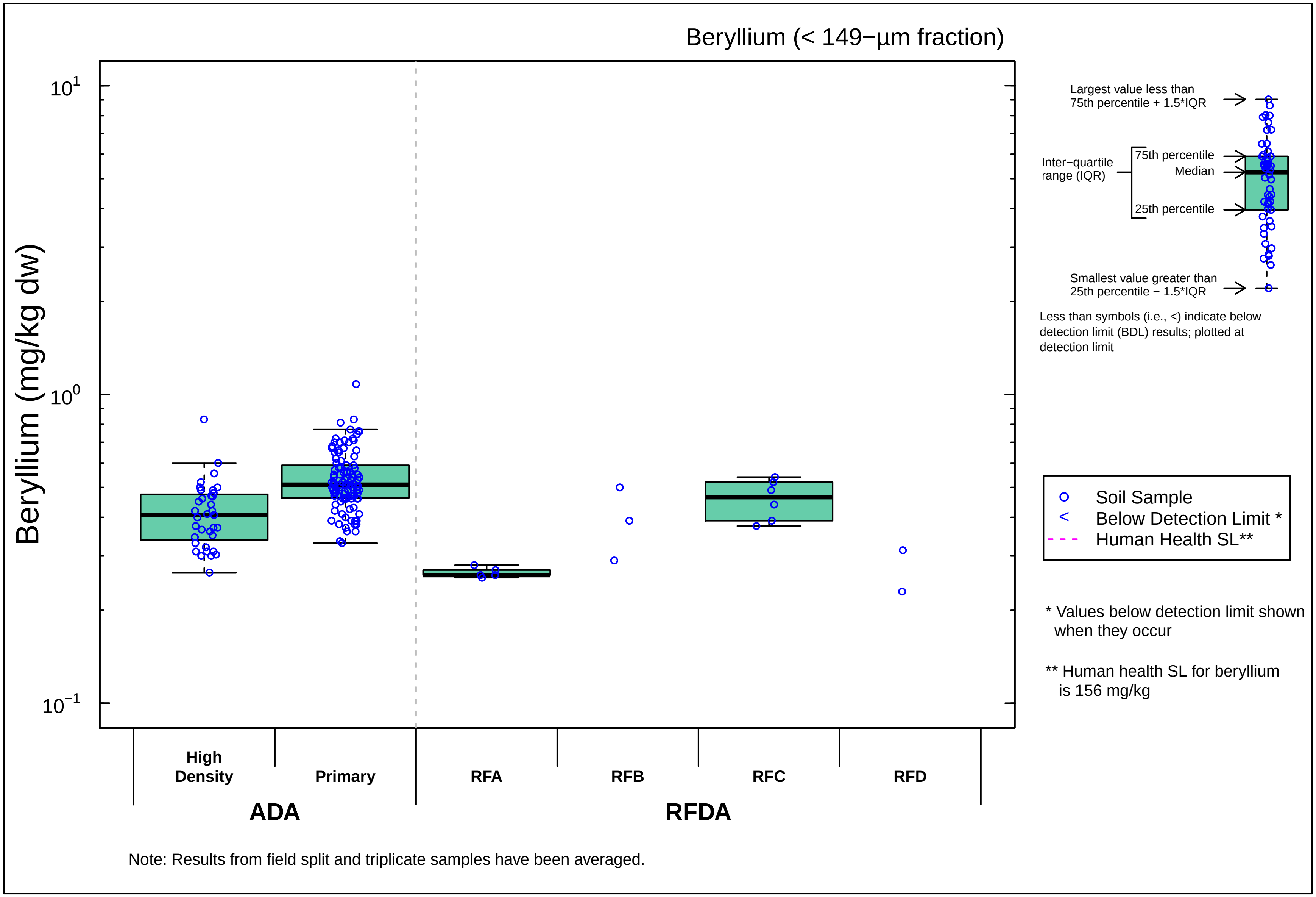


Figure 5−5e. Beryllium Concentrations in < 149−µm Soil Fractions by Deposition Area

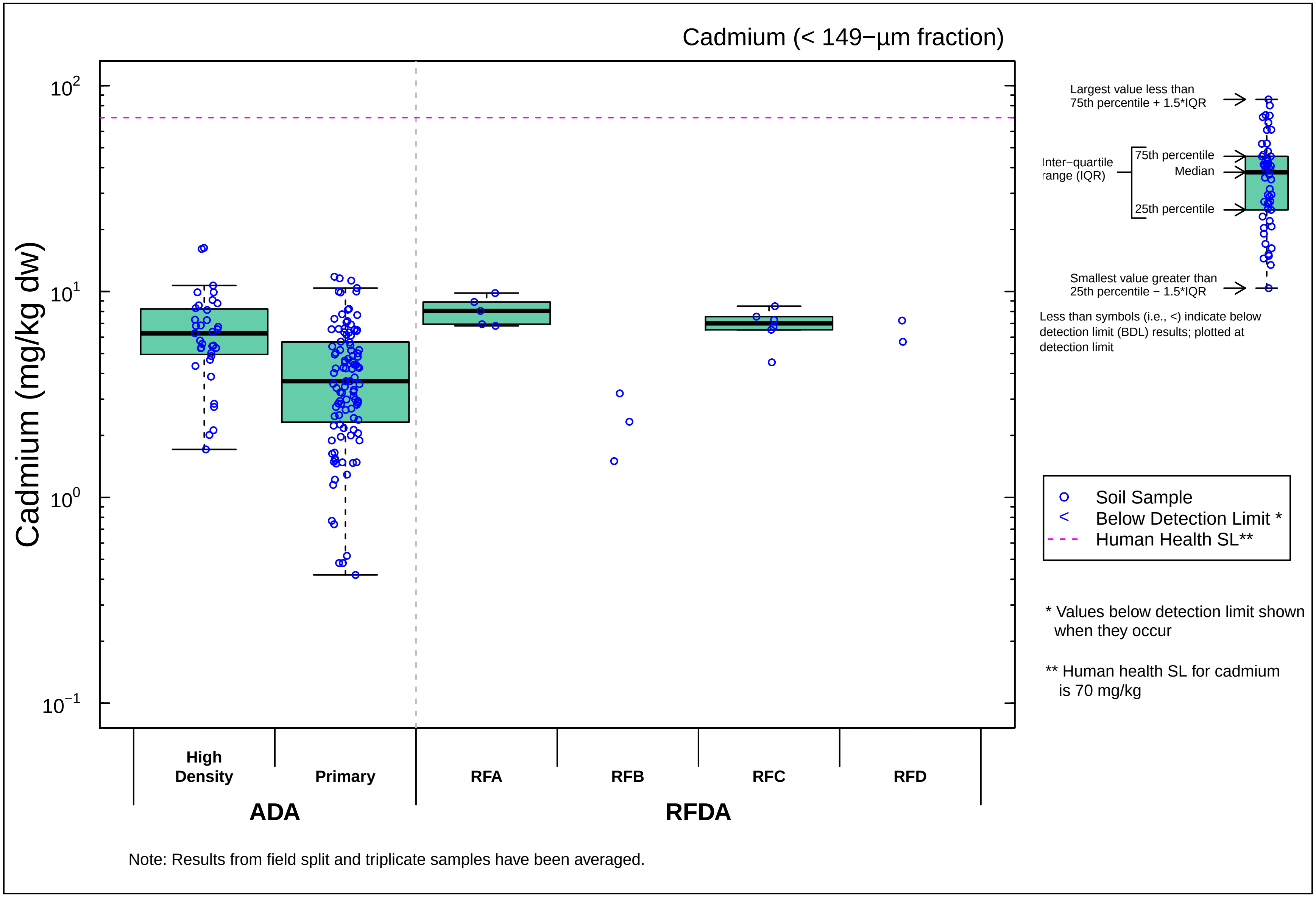


Figure 5−5f. Cadmium Concentrations in < 149−µm Soil Fractions by Deposition Area

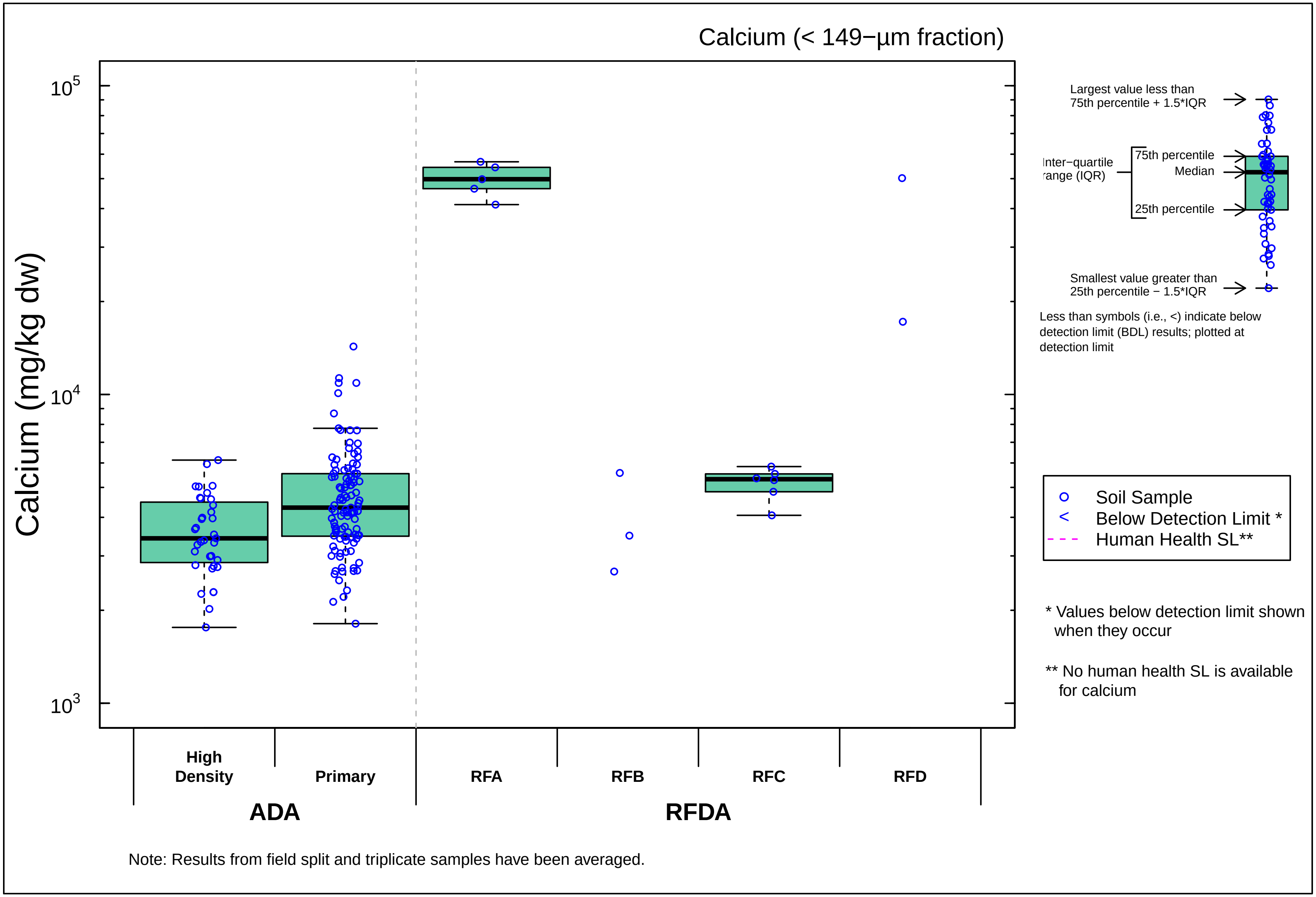


Figure 5−5g. Calcium Concentrations in < 149−µm Soil Fractions by Deposition Area

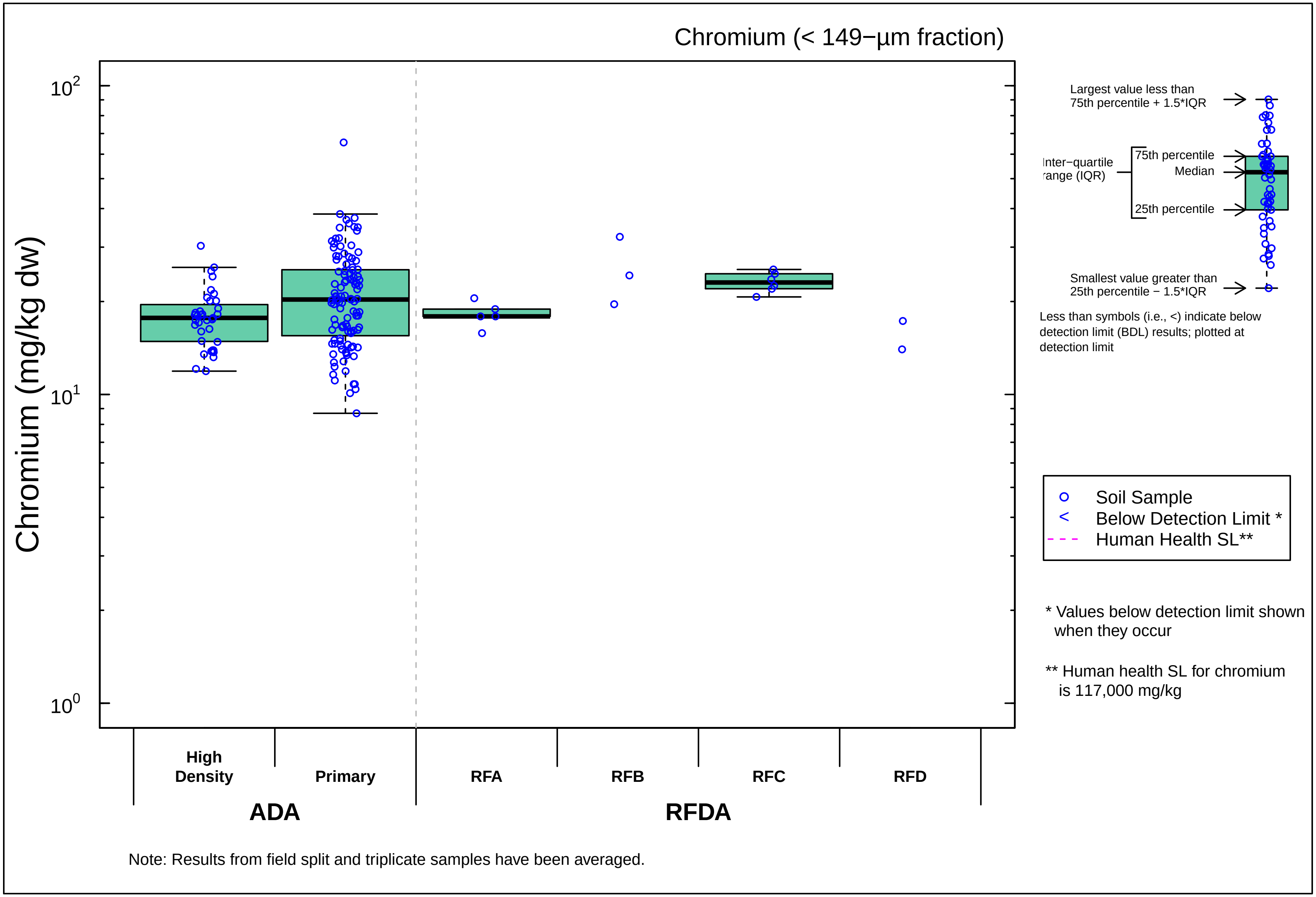


Figure 5−5h. Chromium Concentrations in < 149−µm Soil Fractions by Deposition Area

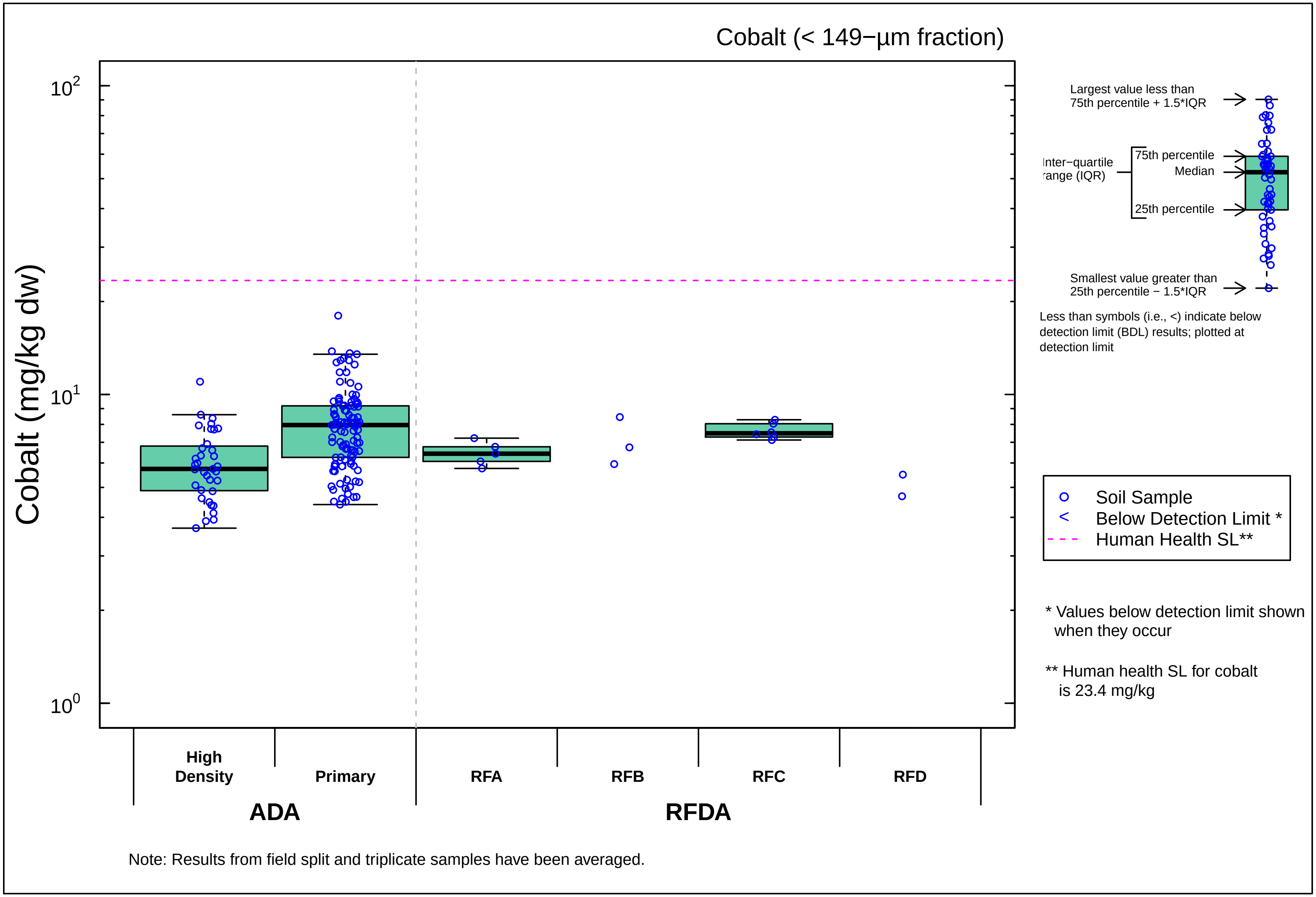


Figure 5−5i. Cobalt Concentrations in < 149−µm Soil Fractions by Deposition Area

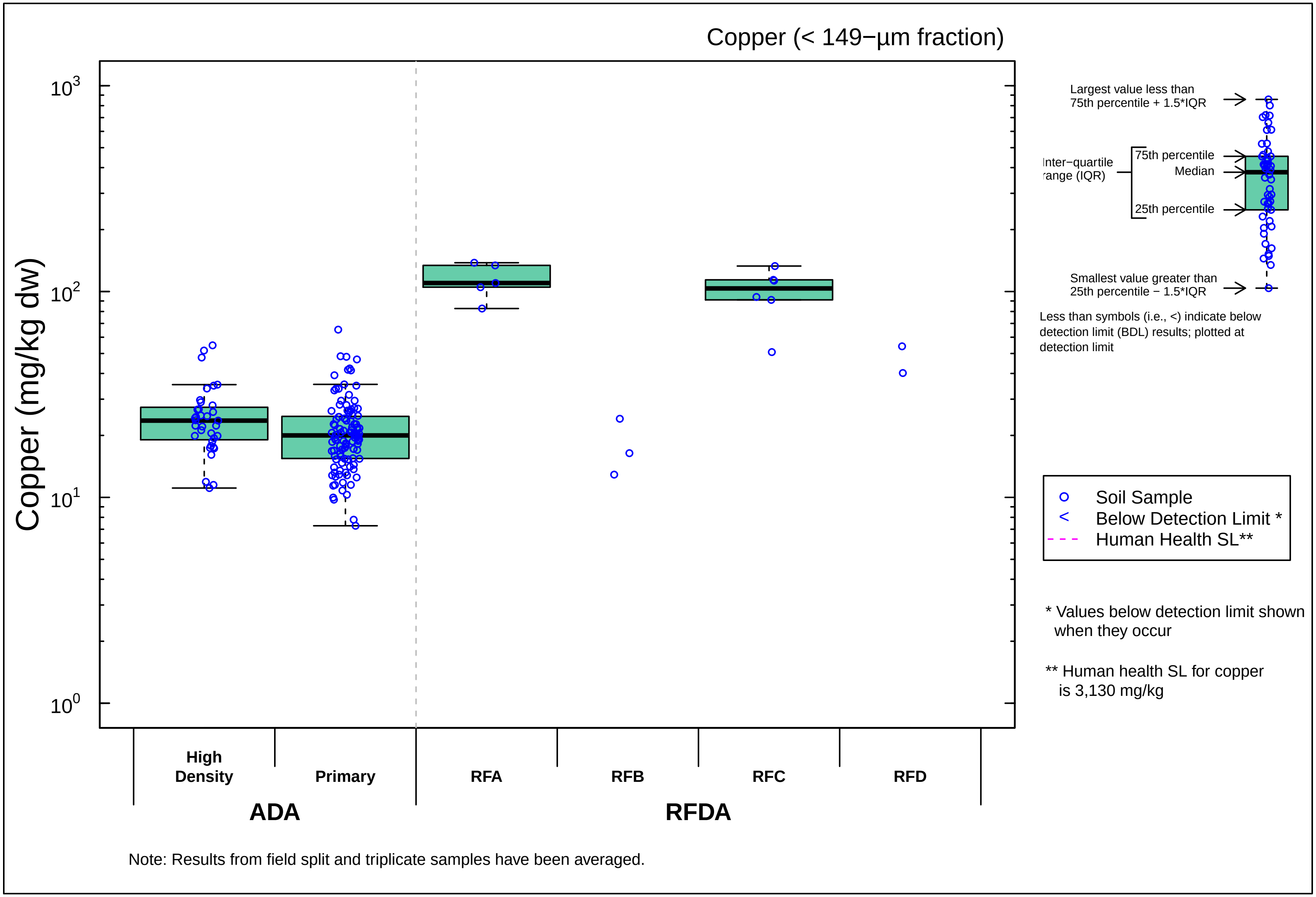


Figure 5−5j. Copper Concentrations in < 149−µm Soil Fractions by Deposition Area

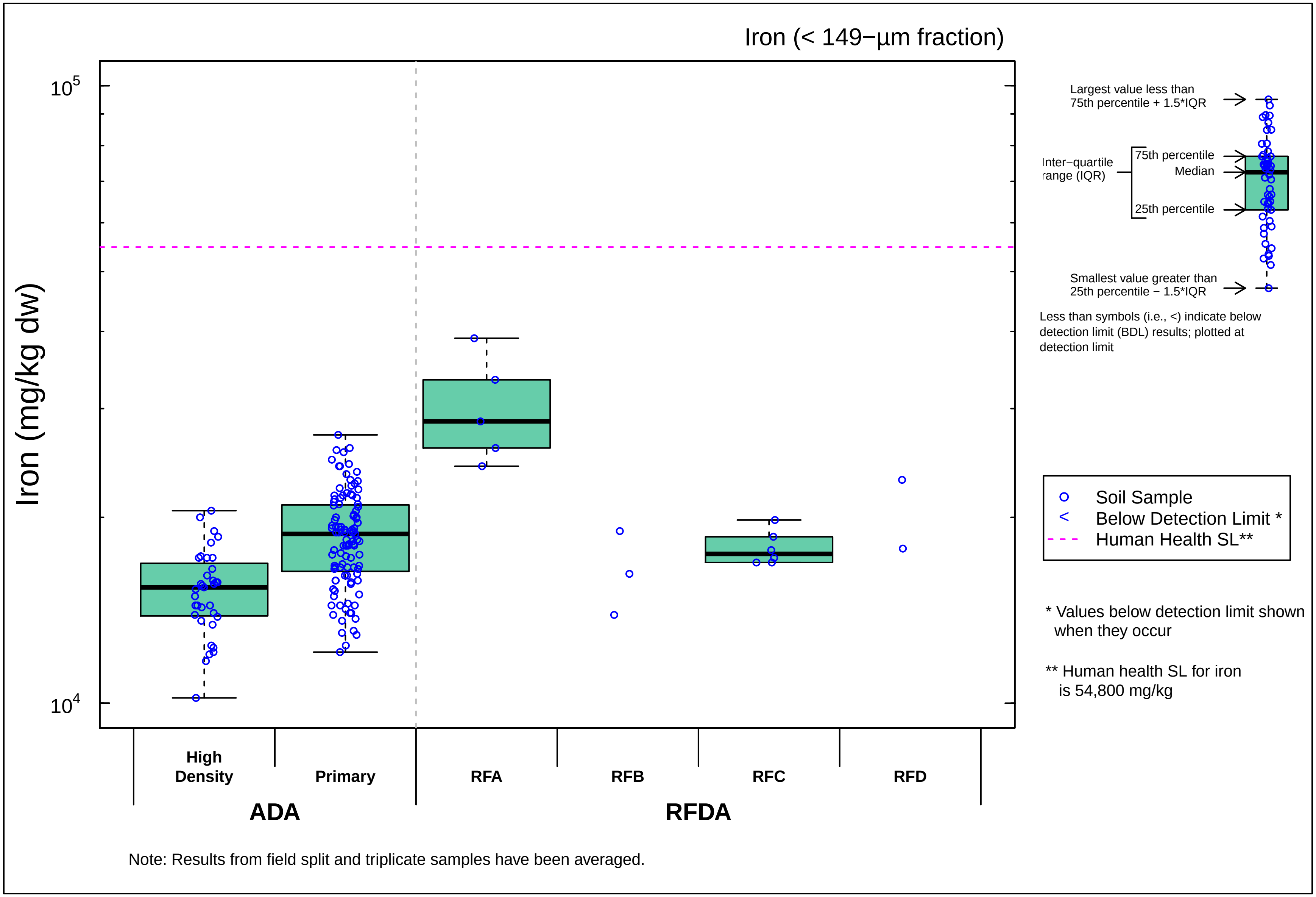


Figure 5−5k. Iron Concentrations in < 149−µm Soil Fractions by Deposition Area

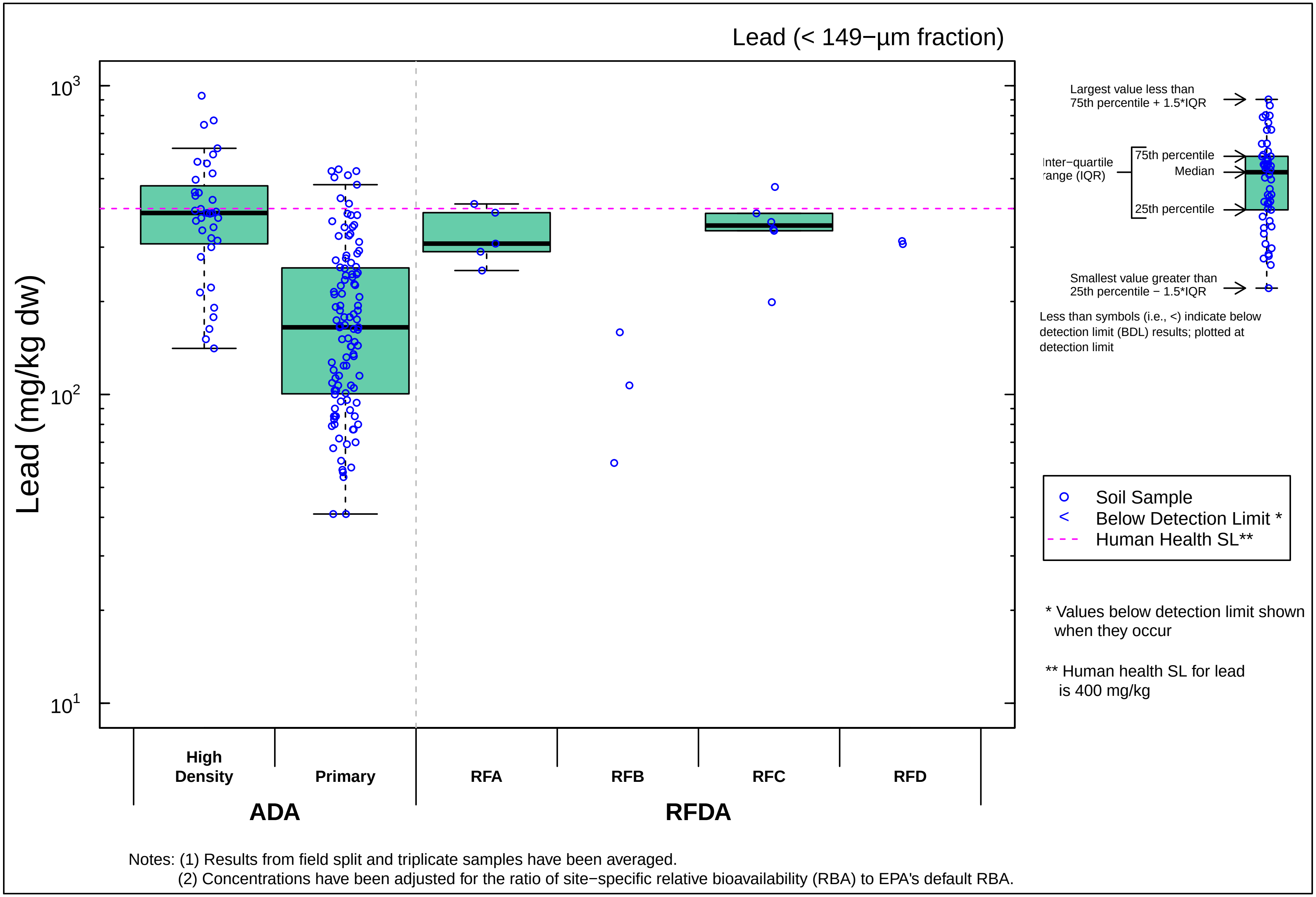


Figure 5−5l. Lead Concentrations in < 149−µm Soil Fractions by Deposition Area

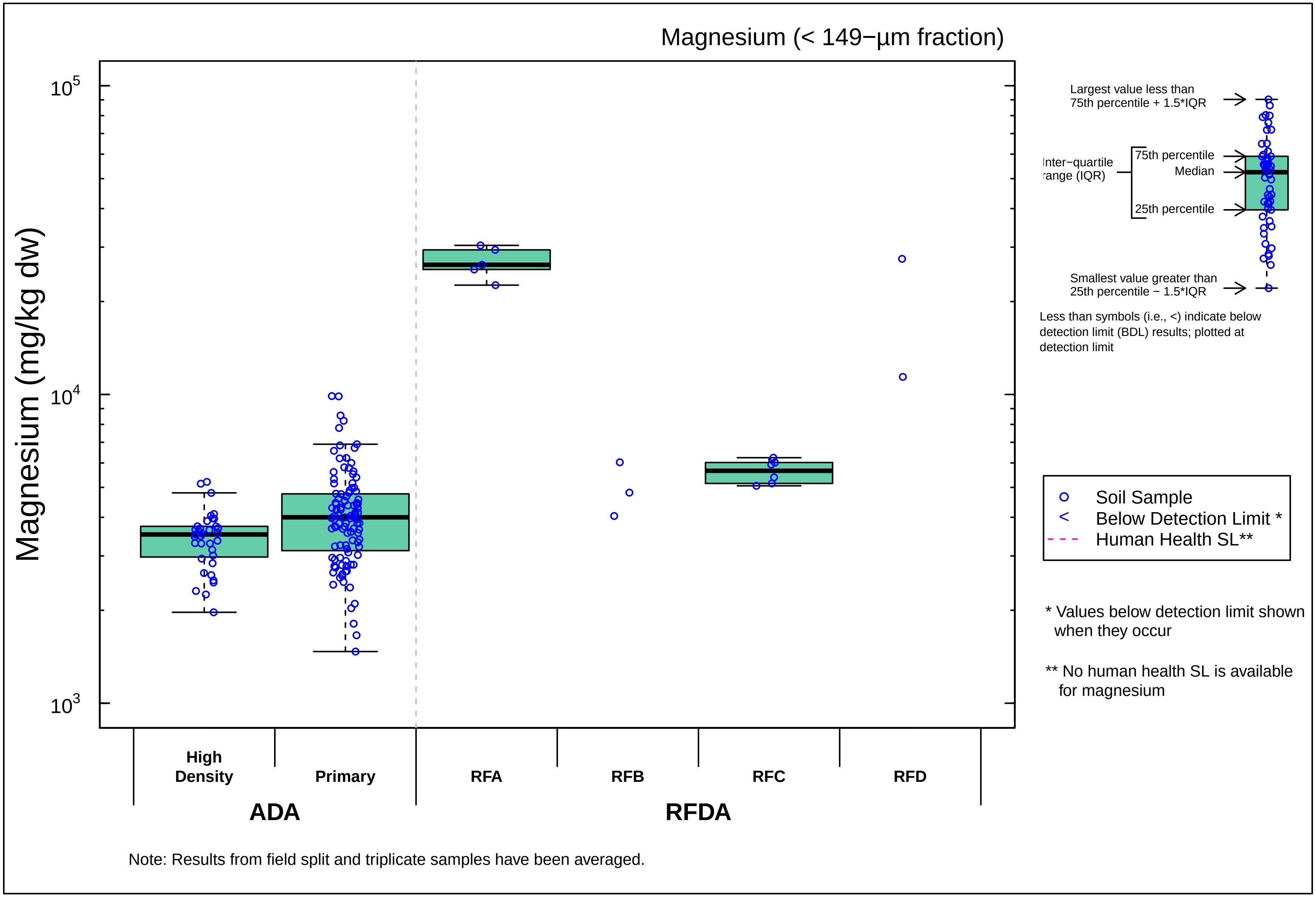


Figure 5−5m. Magnesium Concentrations in < 149−µm Soil Fractions by Deposition Area

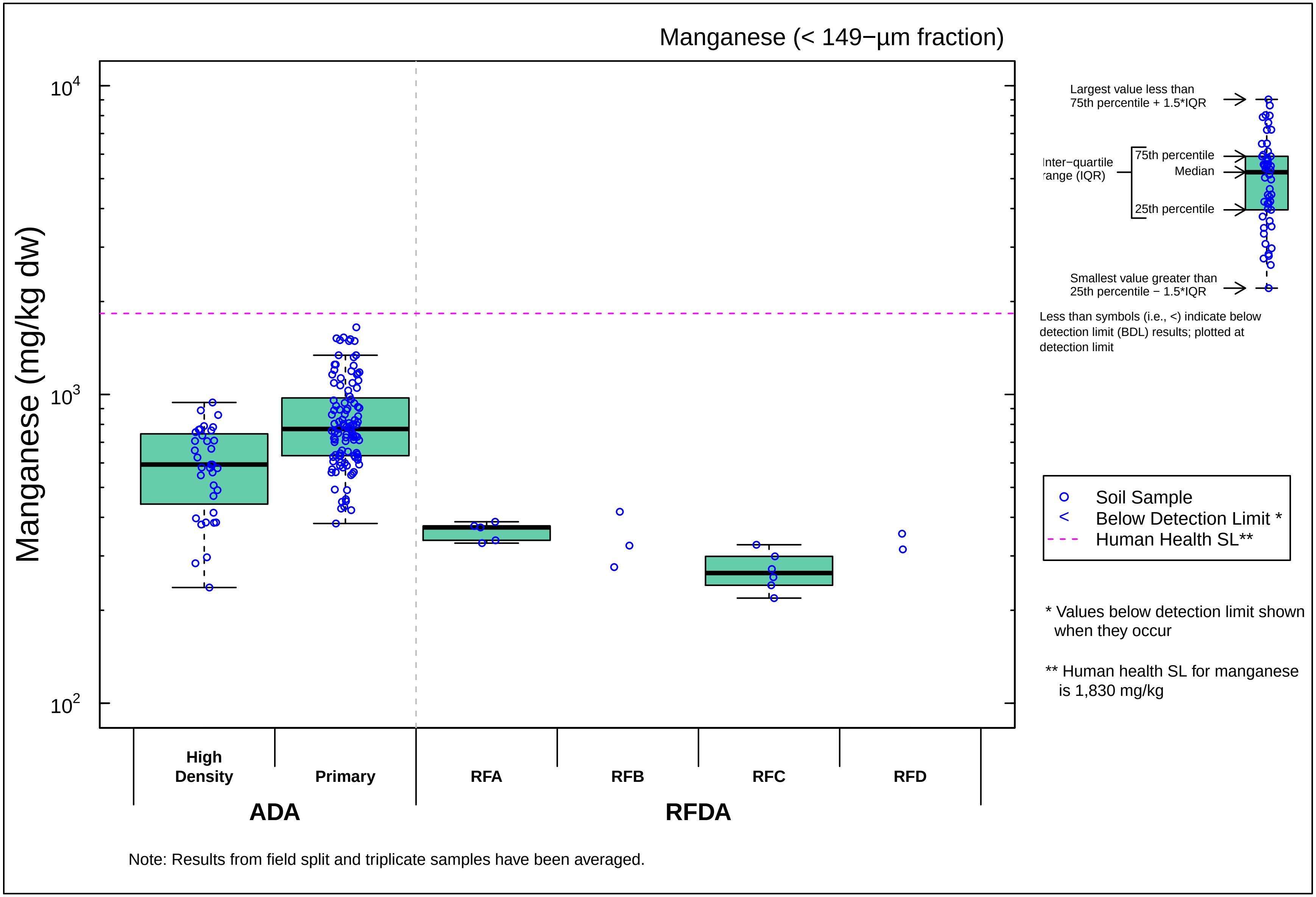


Figure 5−5n. Manganese Concentrations in < 149−µm Soil Fractions by Deposition Area

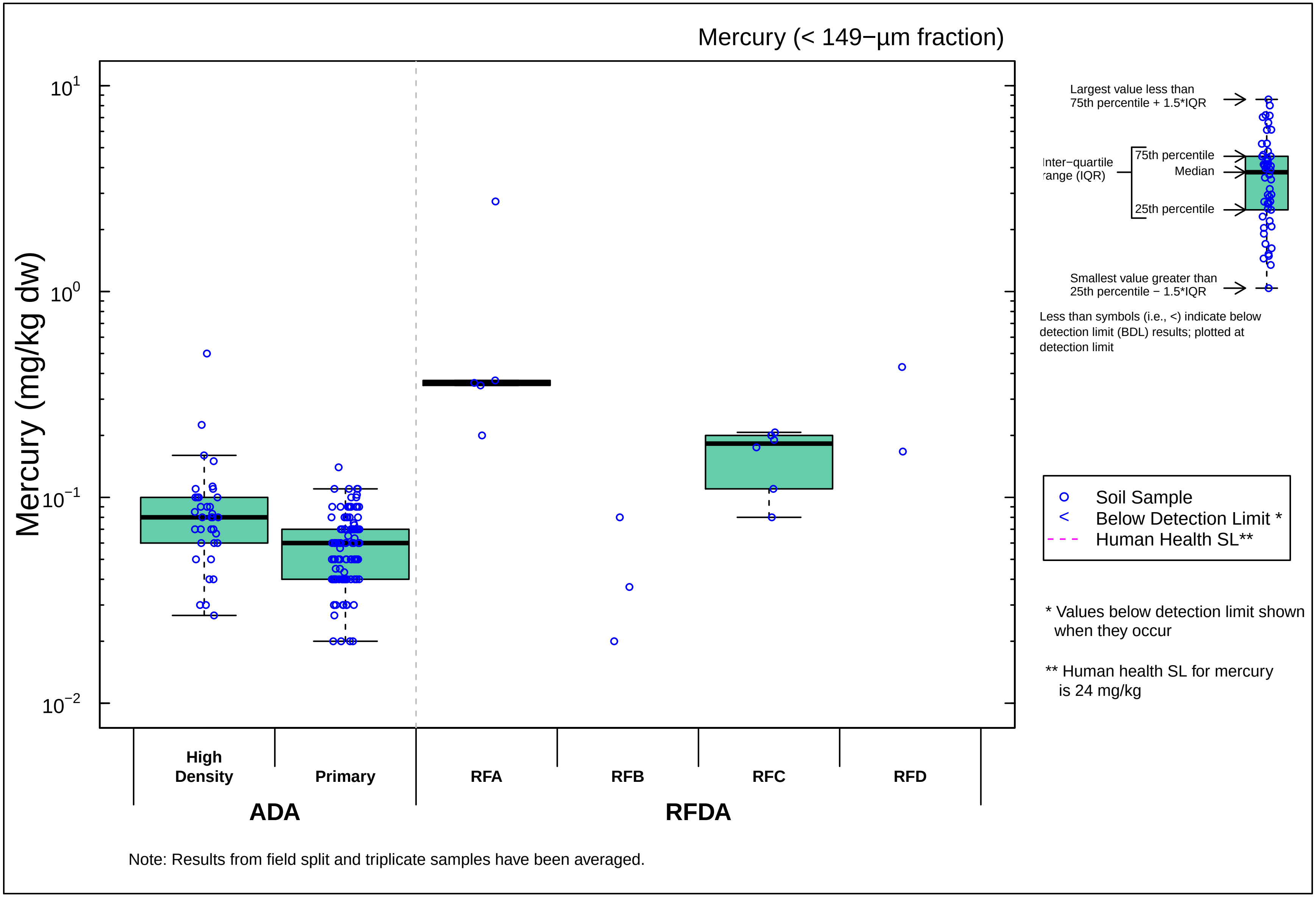


Figure 5−5o. Mercury Concentrations in < 149−µm Soil Fractions by Deposition Area

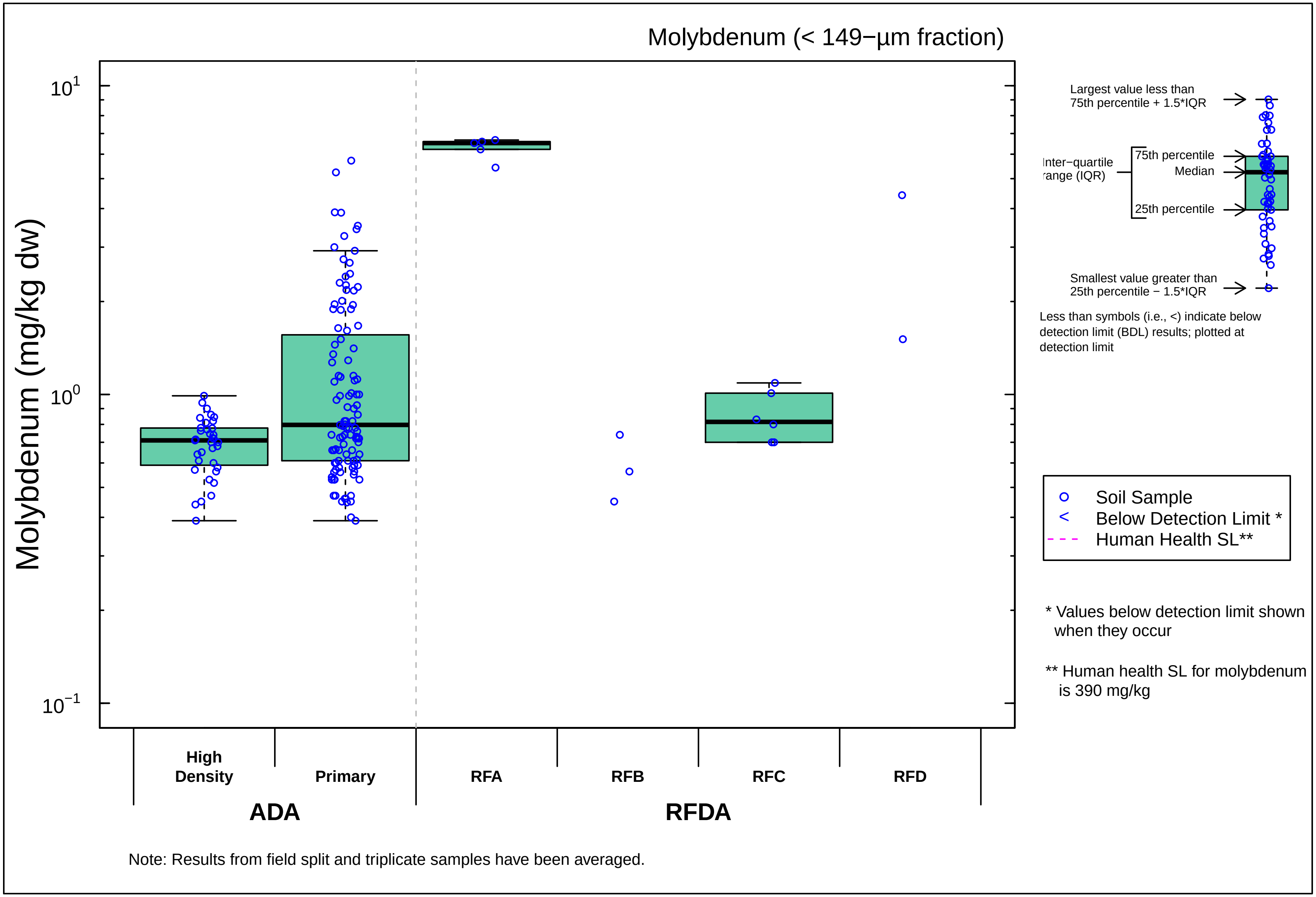


Figure 5−5p. Molybdenum Concentrations in < 149−µm Soil Fractions by Deposition Area

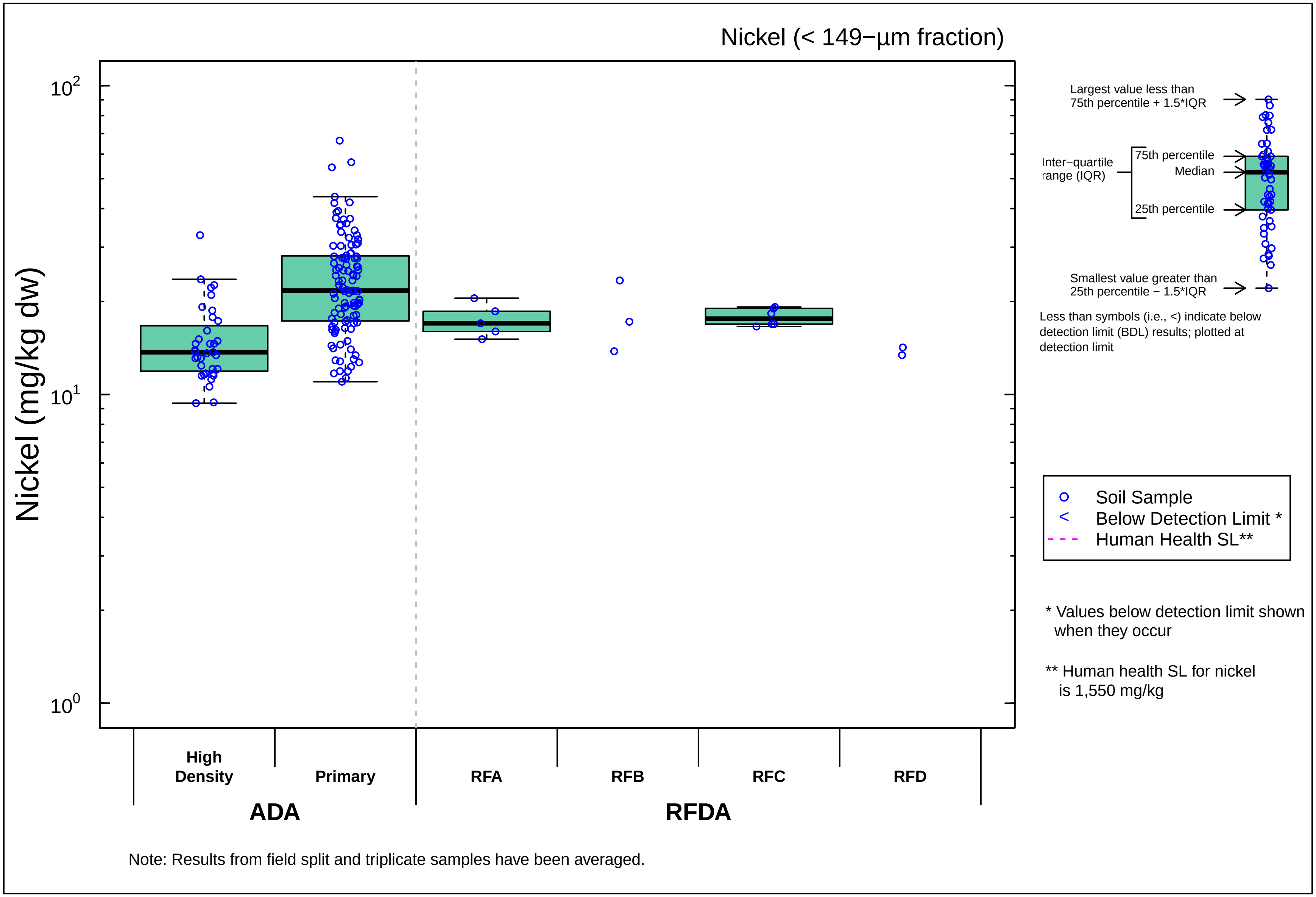


Figure 5−5q. Nickel Concentrations in < 149−µm Soil Fractions by Deposition Area

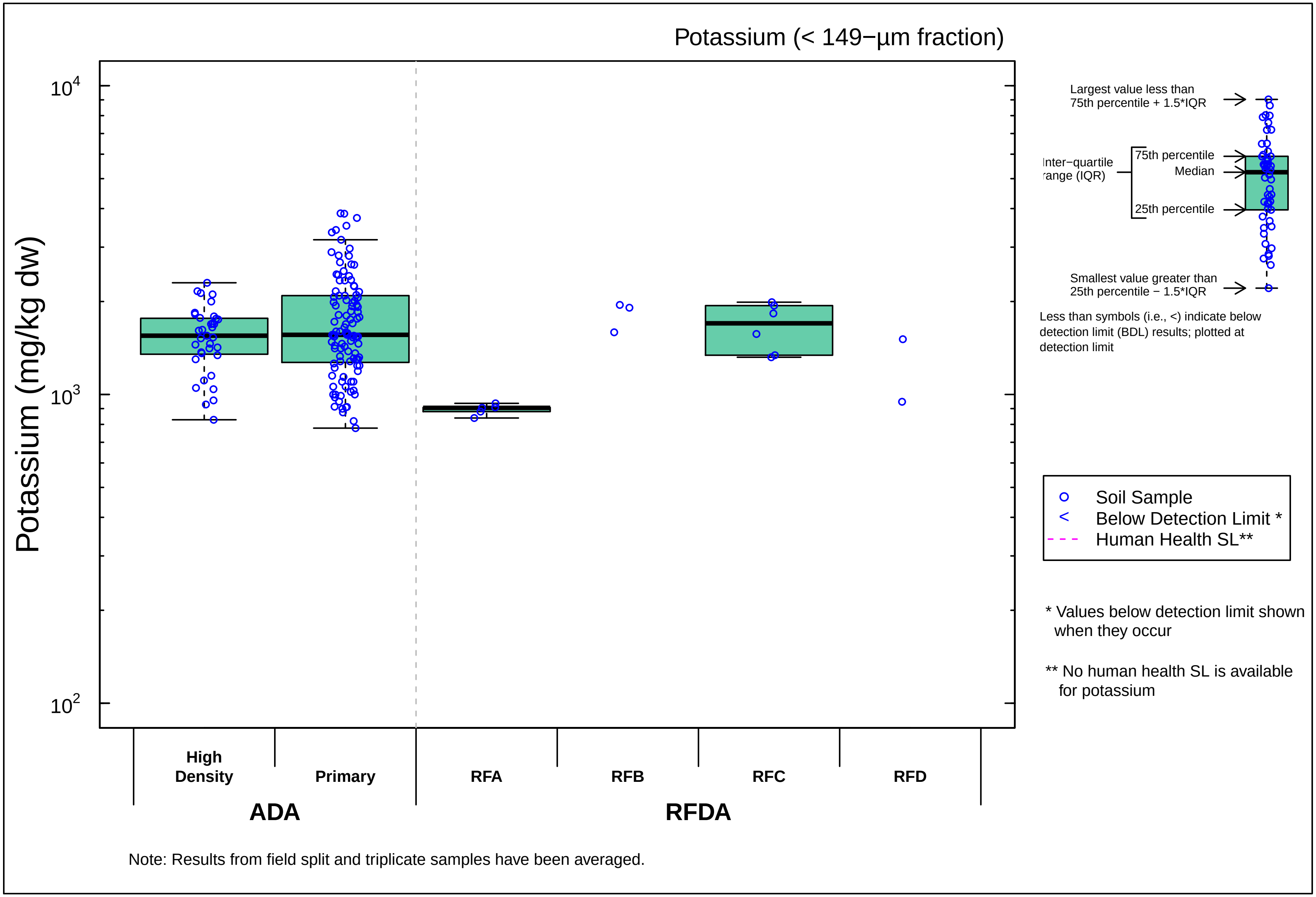


Figure 5−5r. Potassium Concentrations in < 149−µm Soil Fractions by Deposition Area

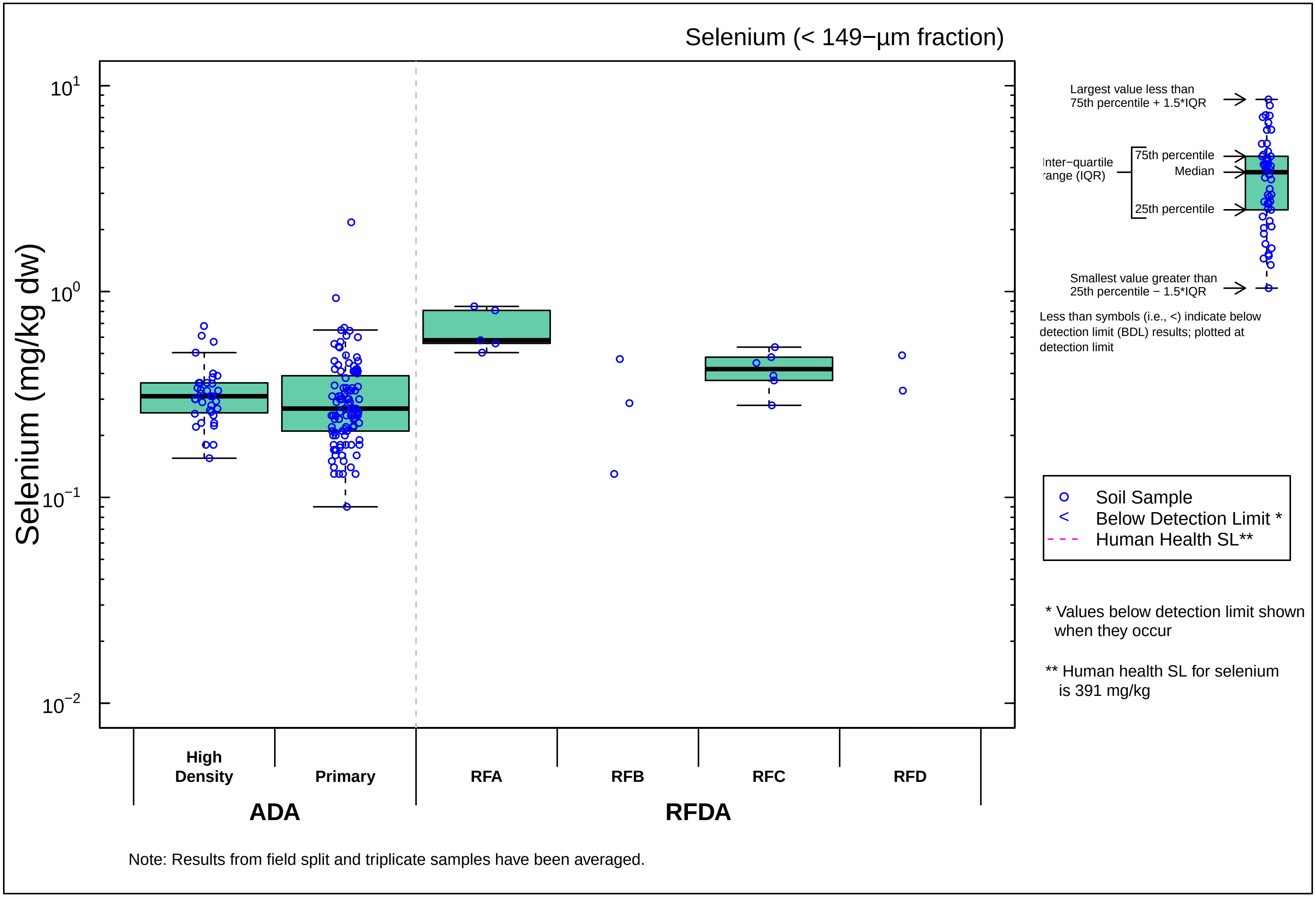


Figure 5−5s. Selenium Concentrations in < 149−µm Soil Fractions by Deposition Area

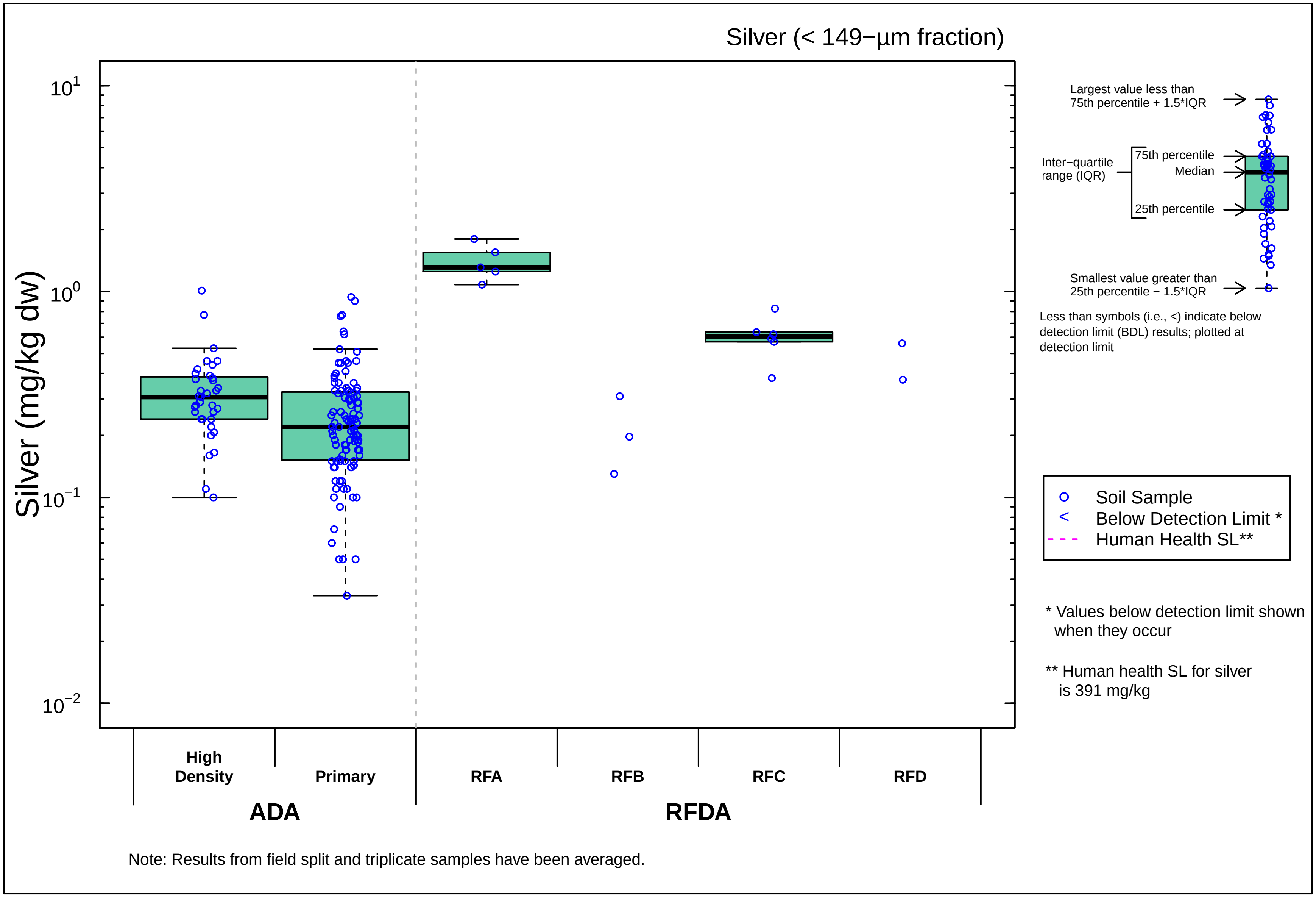


Figure 5−5t. Silver Concentrations in < 149−µm Soil Fractions by Deposition Area

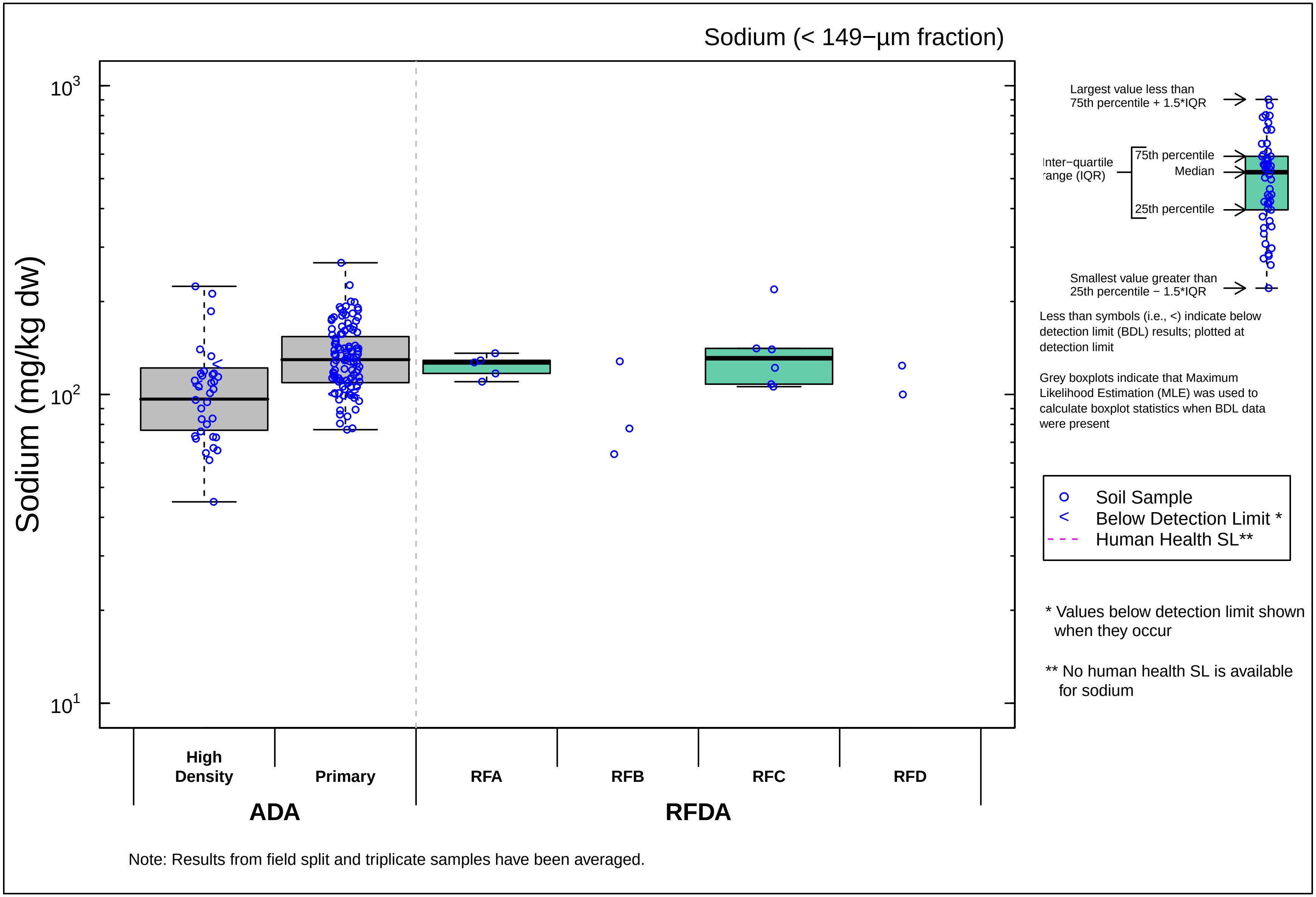


Figure 5−5u. Sodium Concentrations in < 149−µm Soil Fractions by Deposition Area

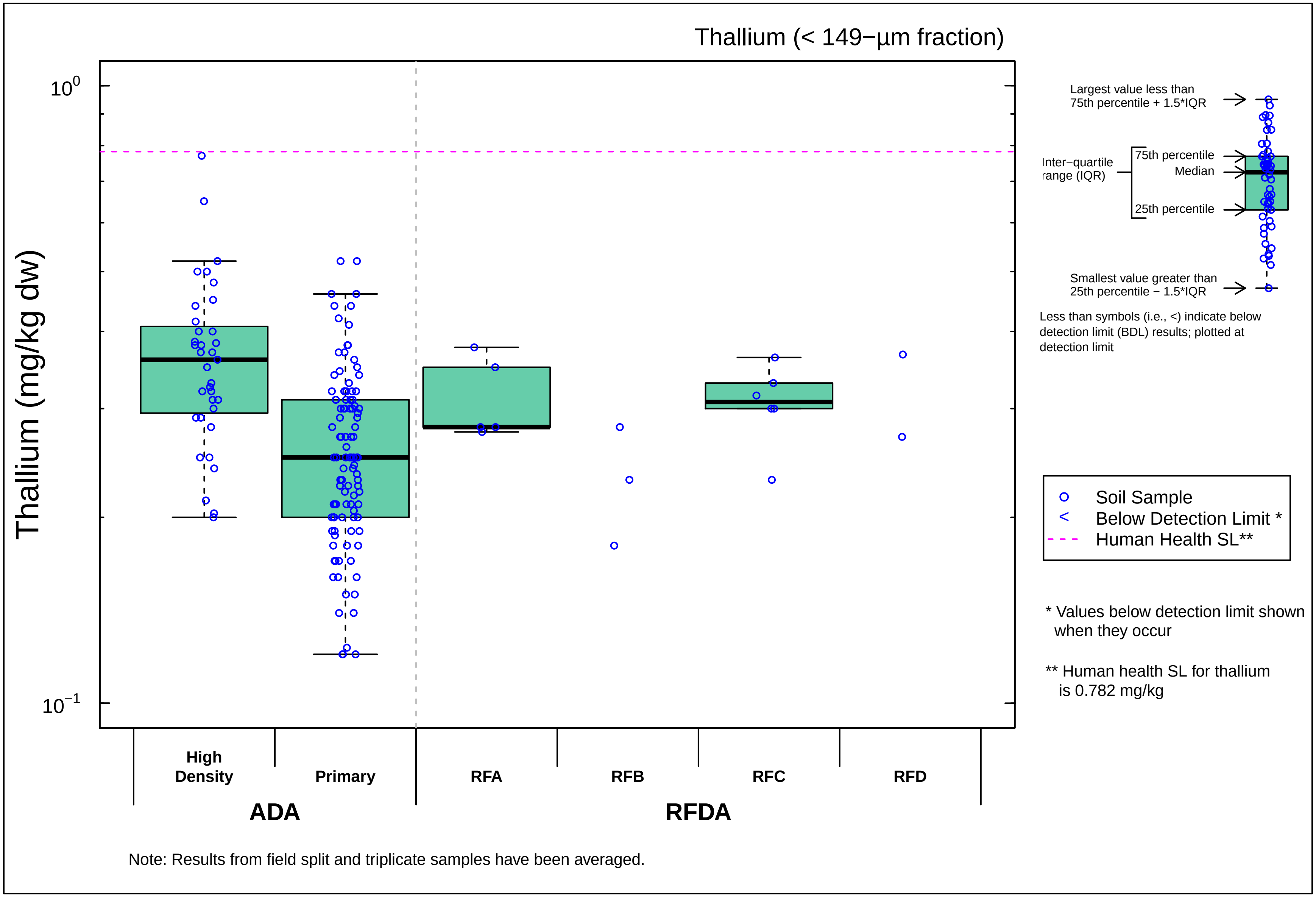


Figure 5−5v. Thallium Concentrations in < 149−µm Soil Fractions by Deposition Area

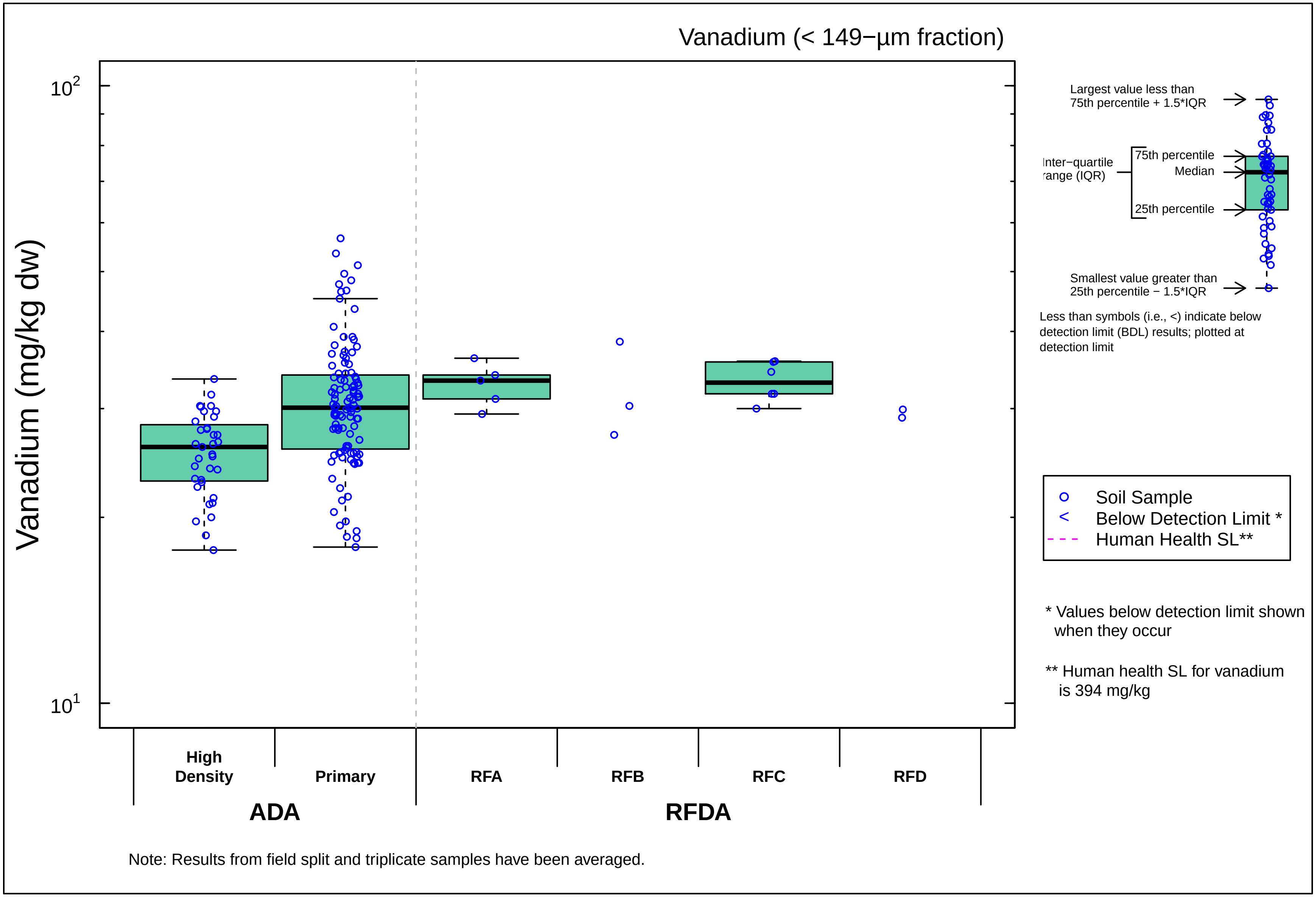


Figure 5−5w. Vanadium Concentrations in < 149−µm Soil Fractions by Deposition Area

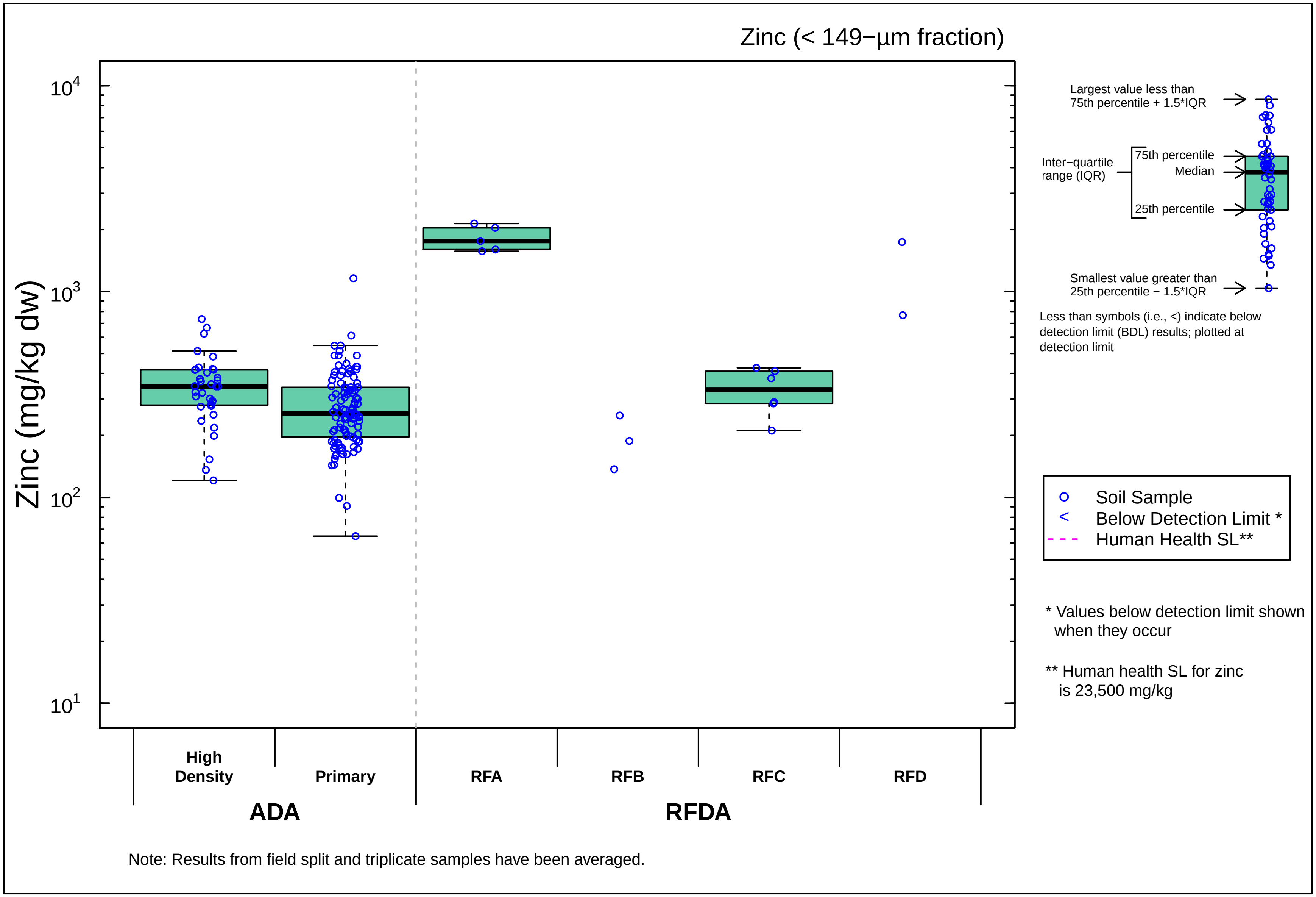


Figure 5−5x. Zinc Concentrations in < 149−µm Soil Fractions by Deposition Area

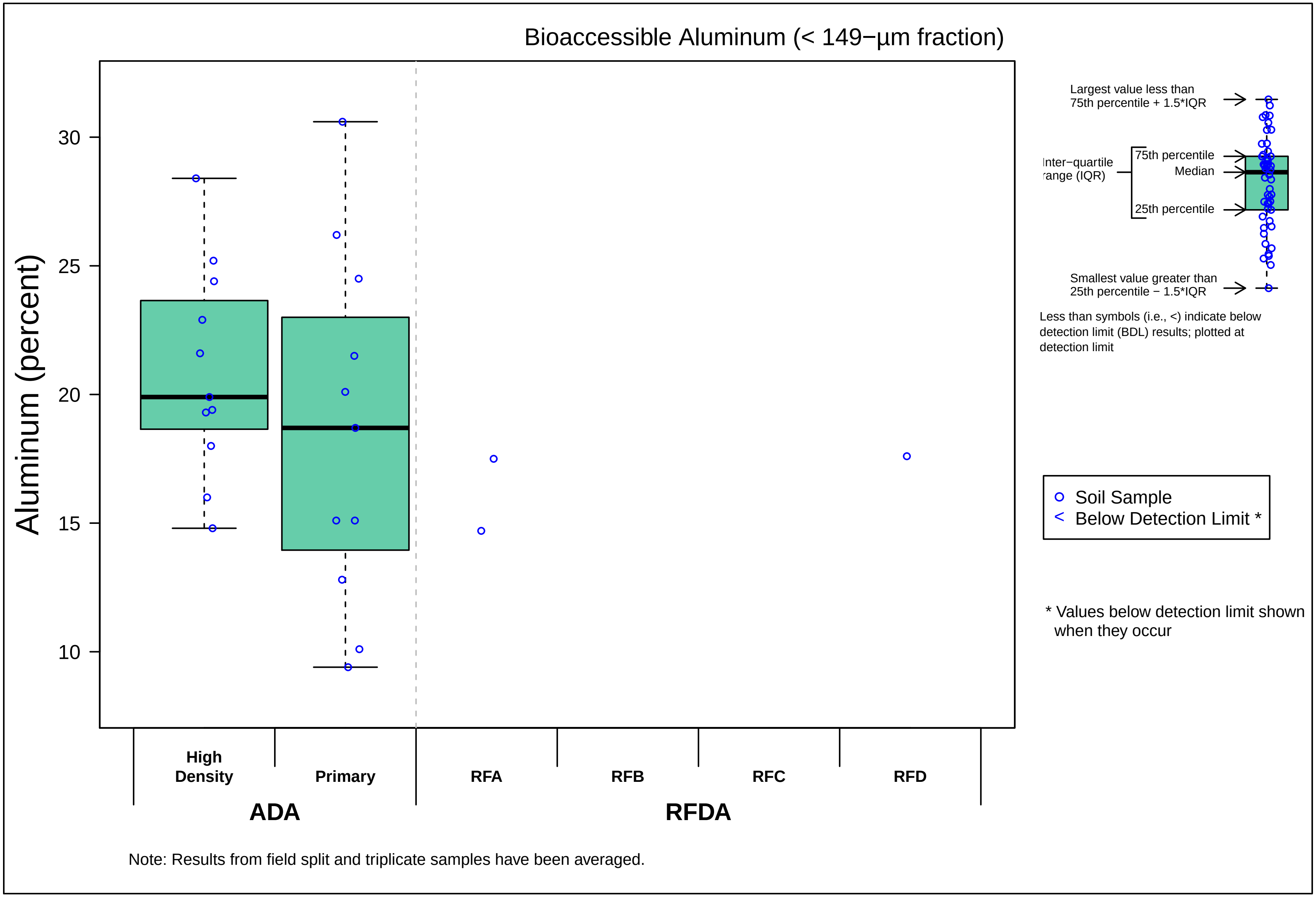


Figure 5−6a. Percent Bioaccessible Aluminum in < 149−µm Soil Fractions by Deposition Area

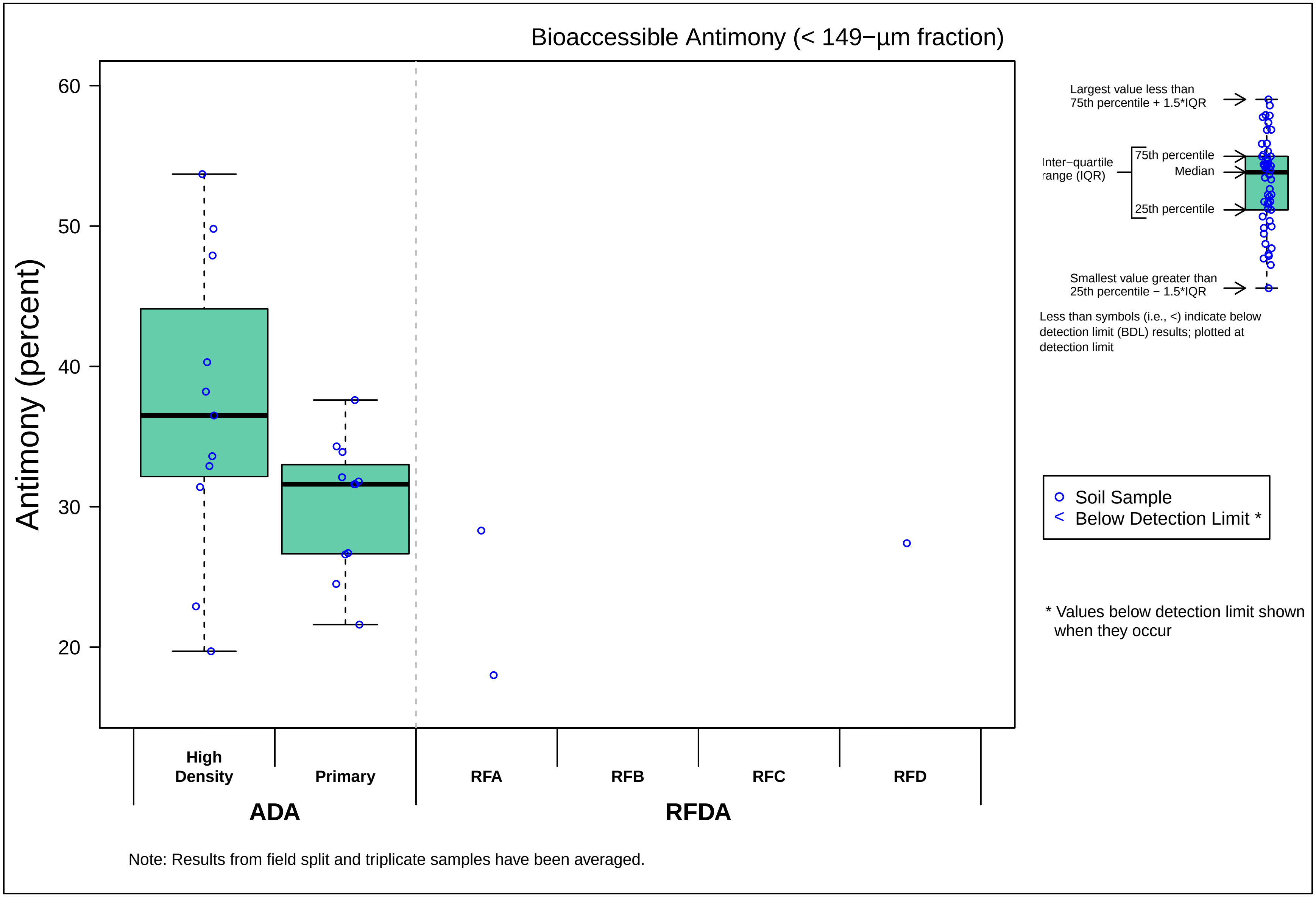


Figure 5−6b. Percent Bioaccessible Antimony in < 149−µm Soil Fractions by Deposition Area

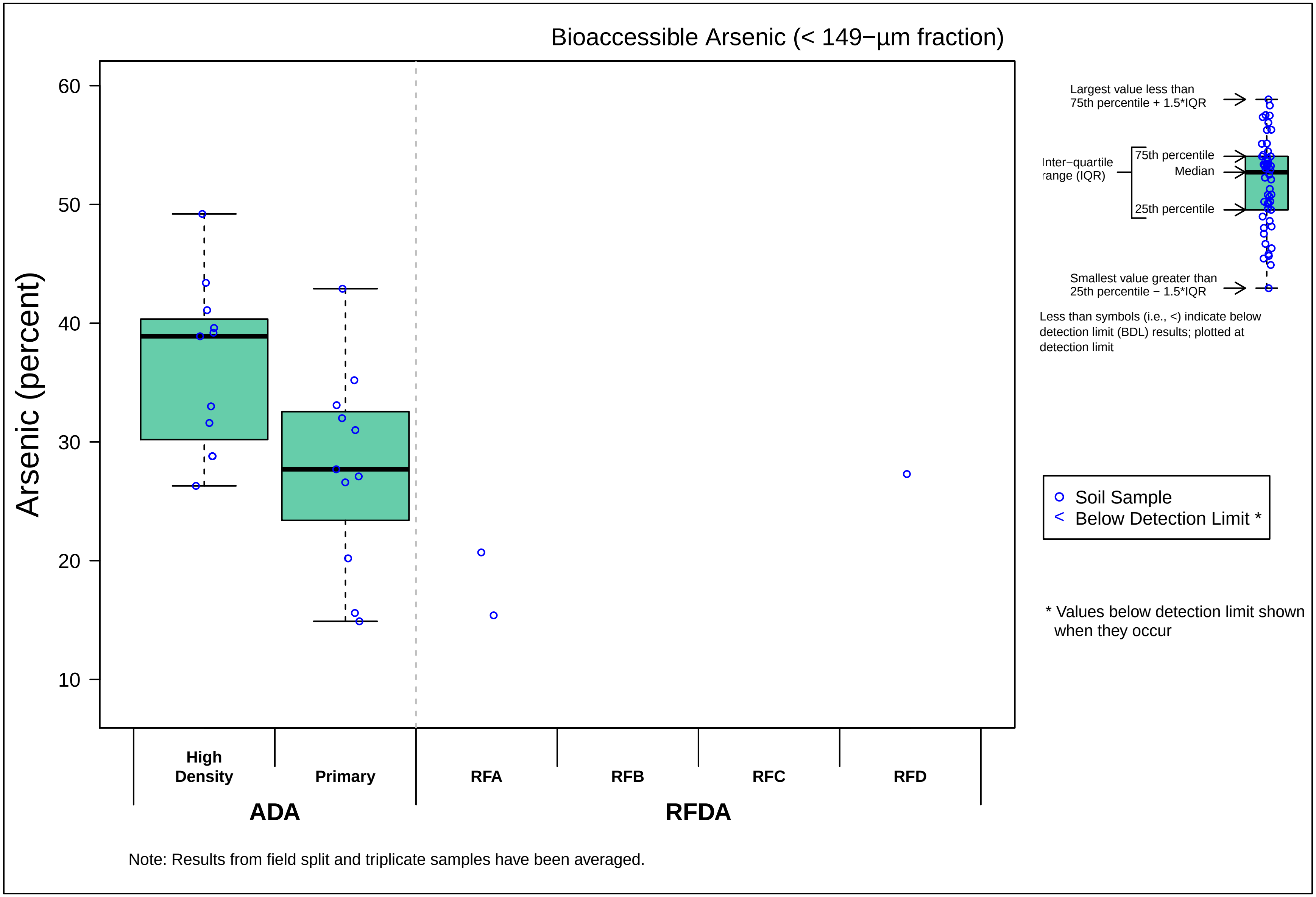


Figure 5−6c. Percent Bioaccessible Arsenic in < 149−µm Soil Fractions by Deposition Area

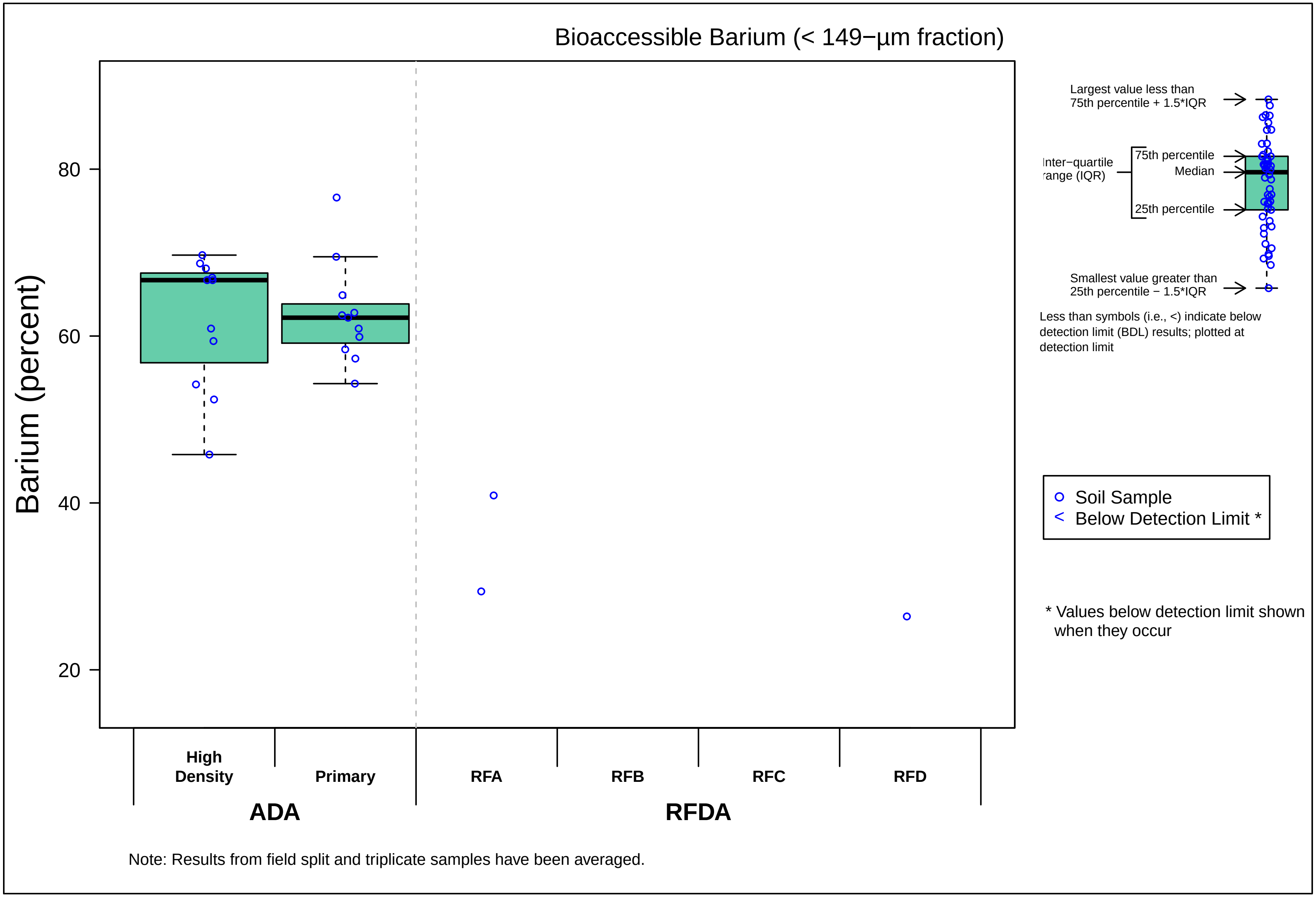


Figure 5−6d. Percent Bioaccessible Barium in < 149−µm Soil Fractions by Deposition Area

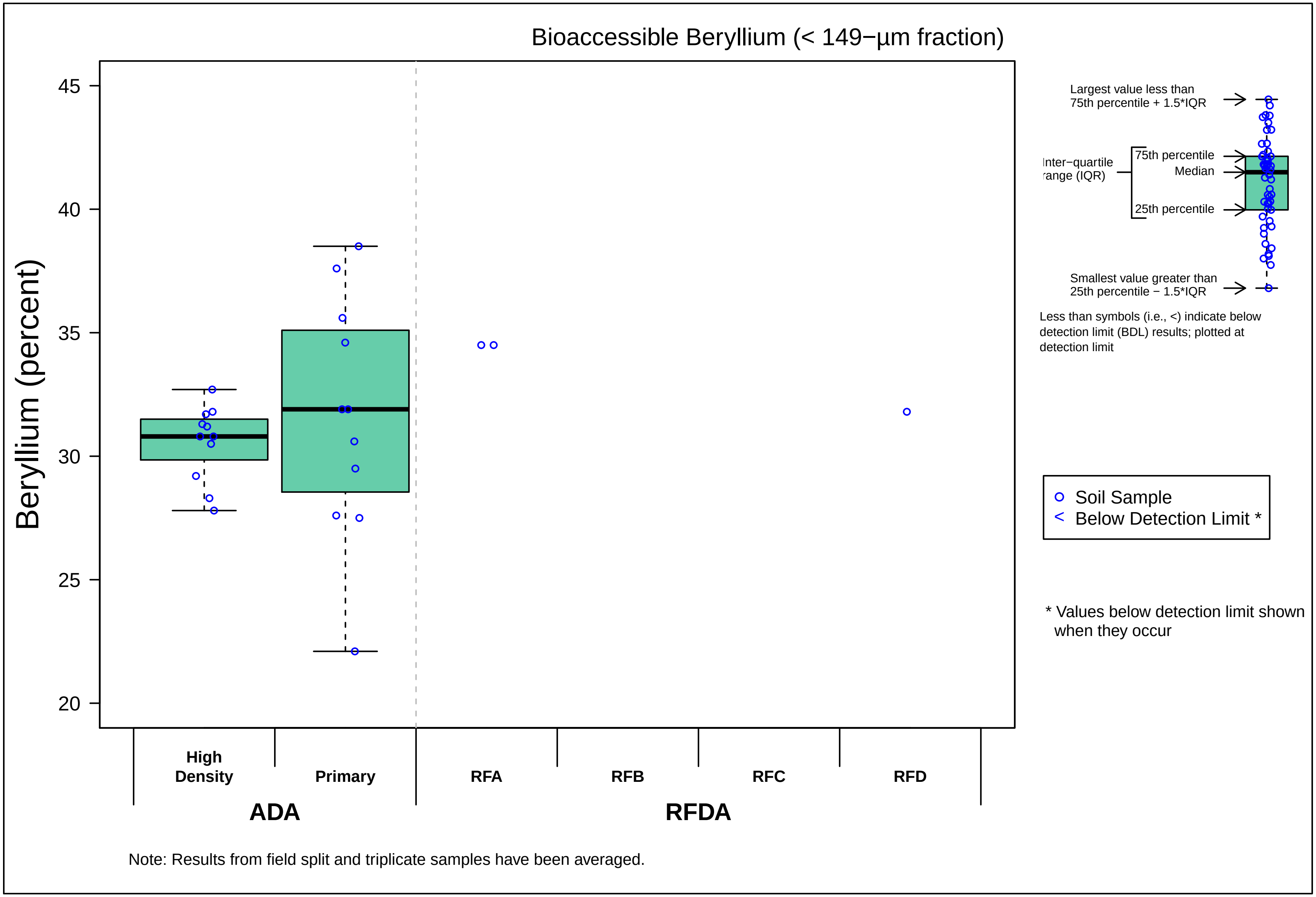


Figure 5−6e. Percent Bioaccessible Beryllium in < 149−µm Soil Fractions by Deposition Area

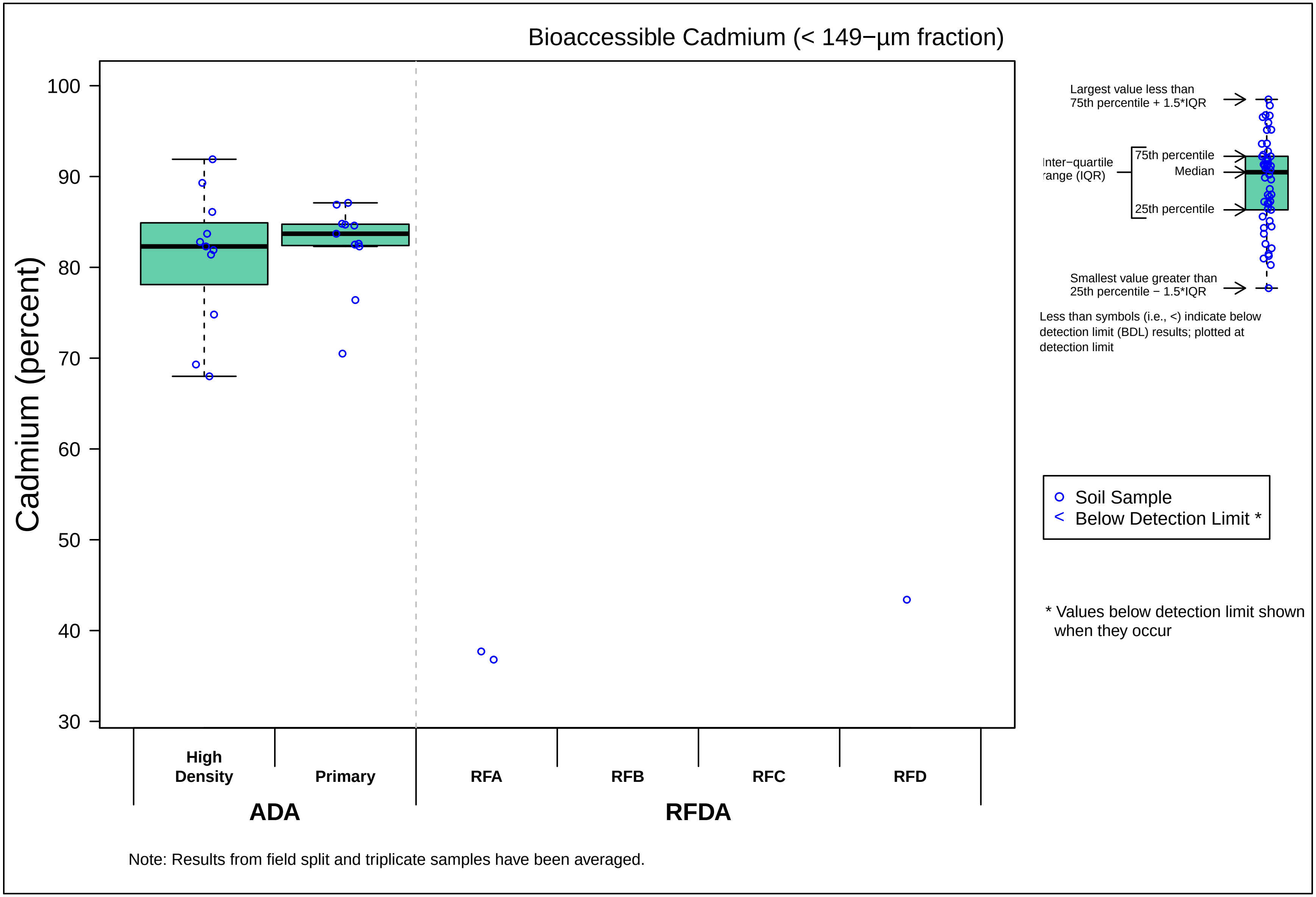


Figure 5−6f. Percent Bioaccessible Cadmium in < 149−µm Soil Fractions by Deposition Area

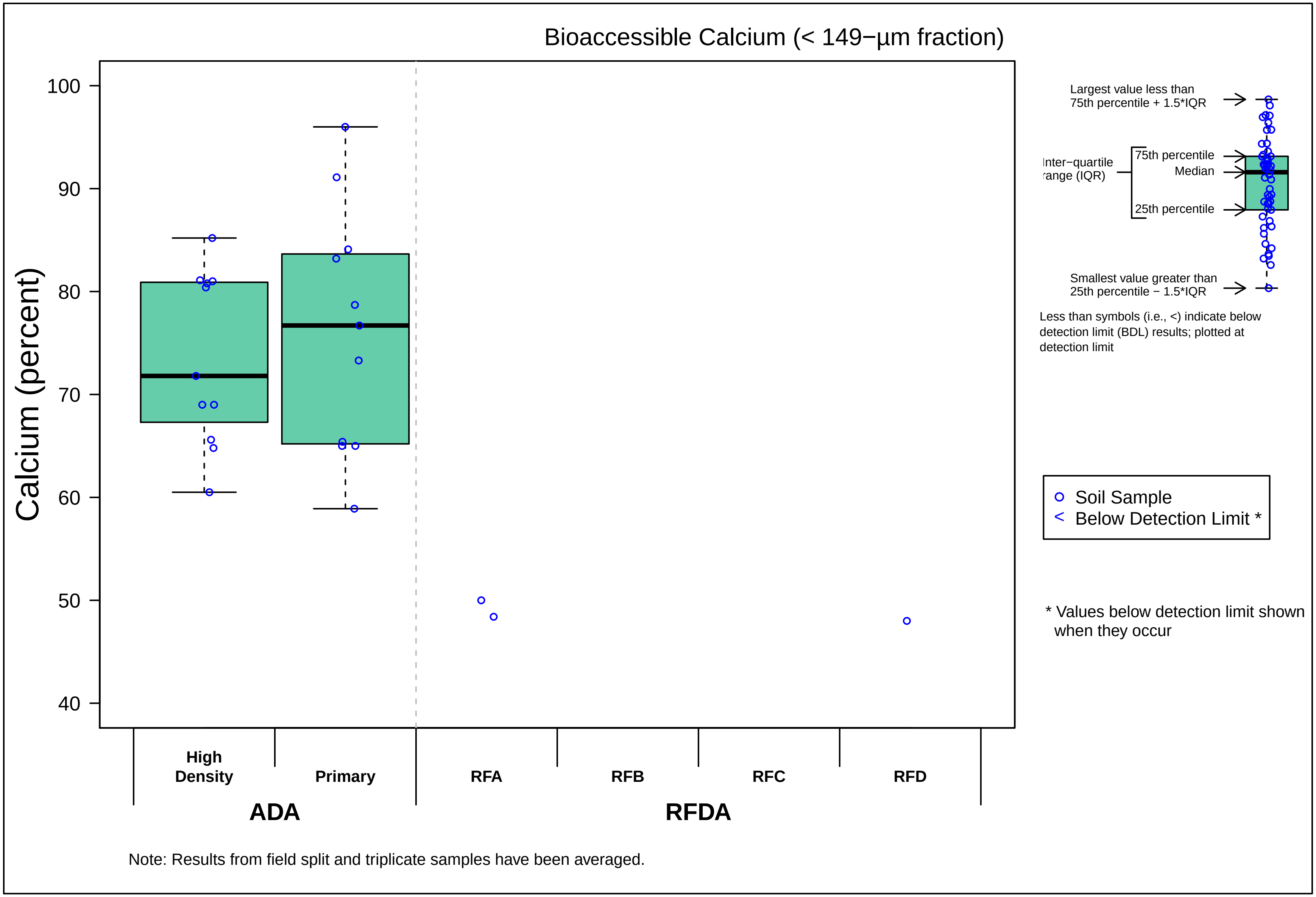


Figure 5−6g. Percent Bioaccessible Calcium in < 149−µm Soil Fractions by Deposition Area

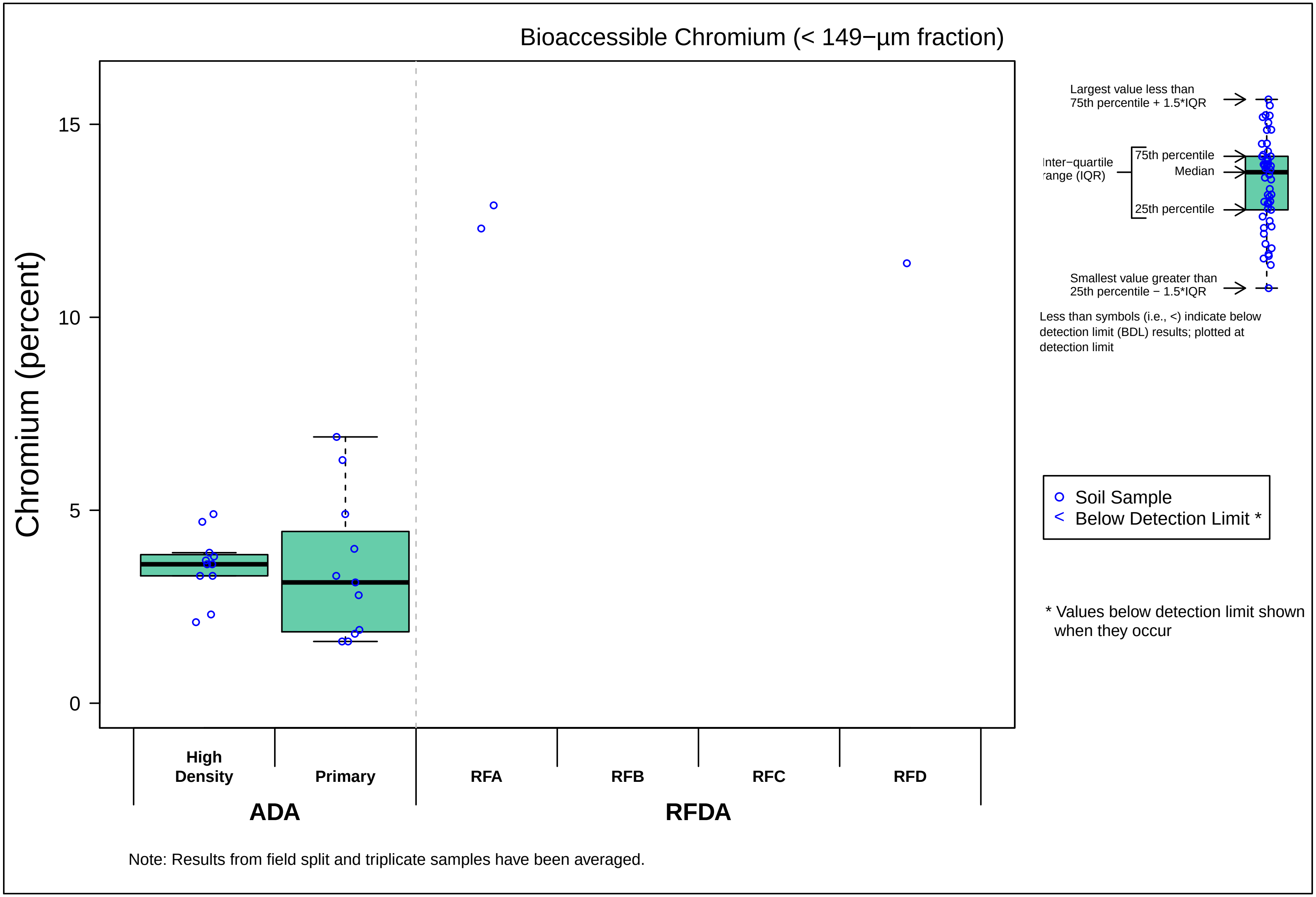


Figure 5−6h. Percent Bioaccessible Chromium in < 149−µm Soil Fractions by Deposition Area

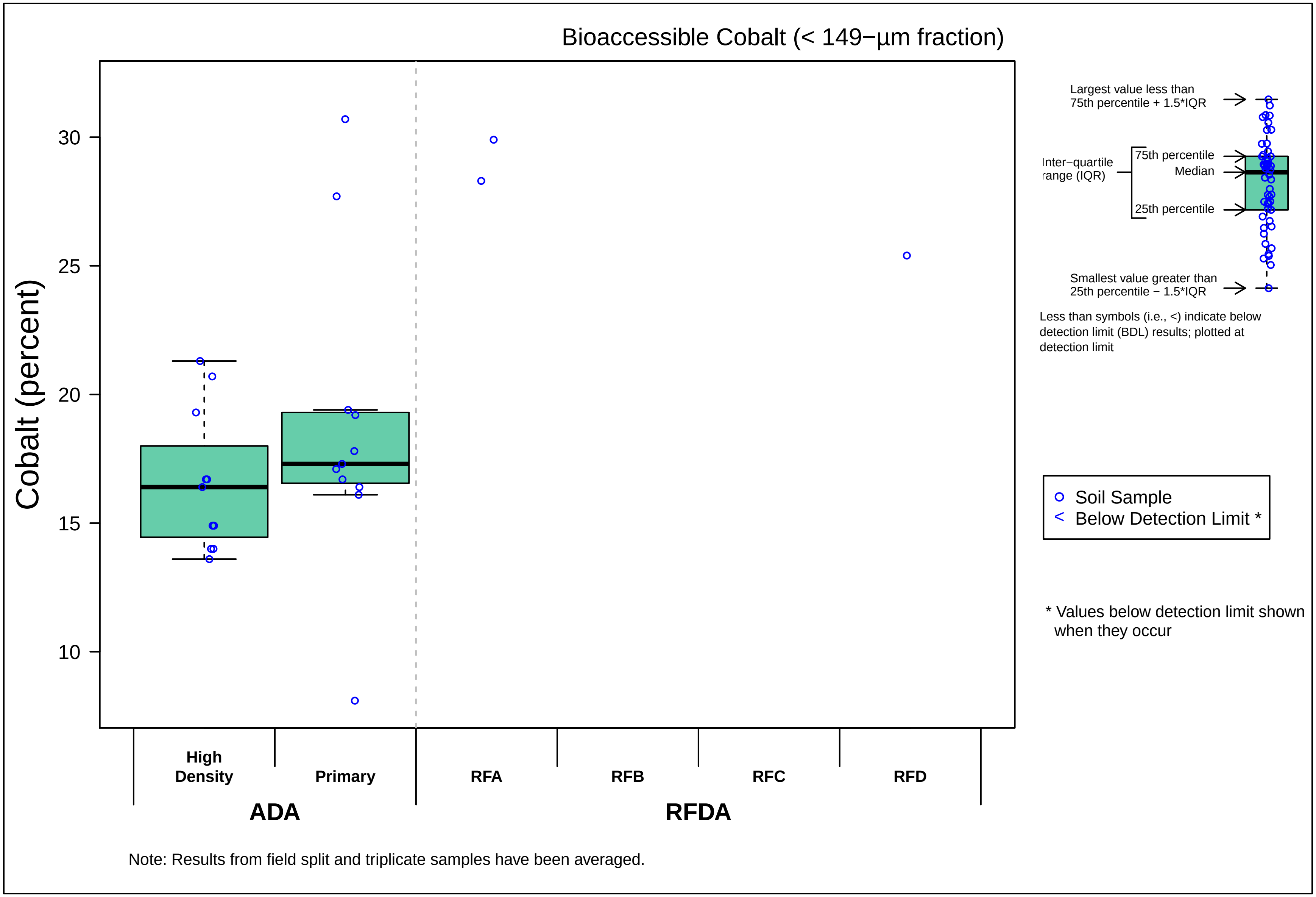


Figure 5−6i. Percent Bioaccessible Cobalt in < 149−µm Soil Fractions by Deposition Area

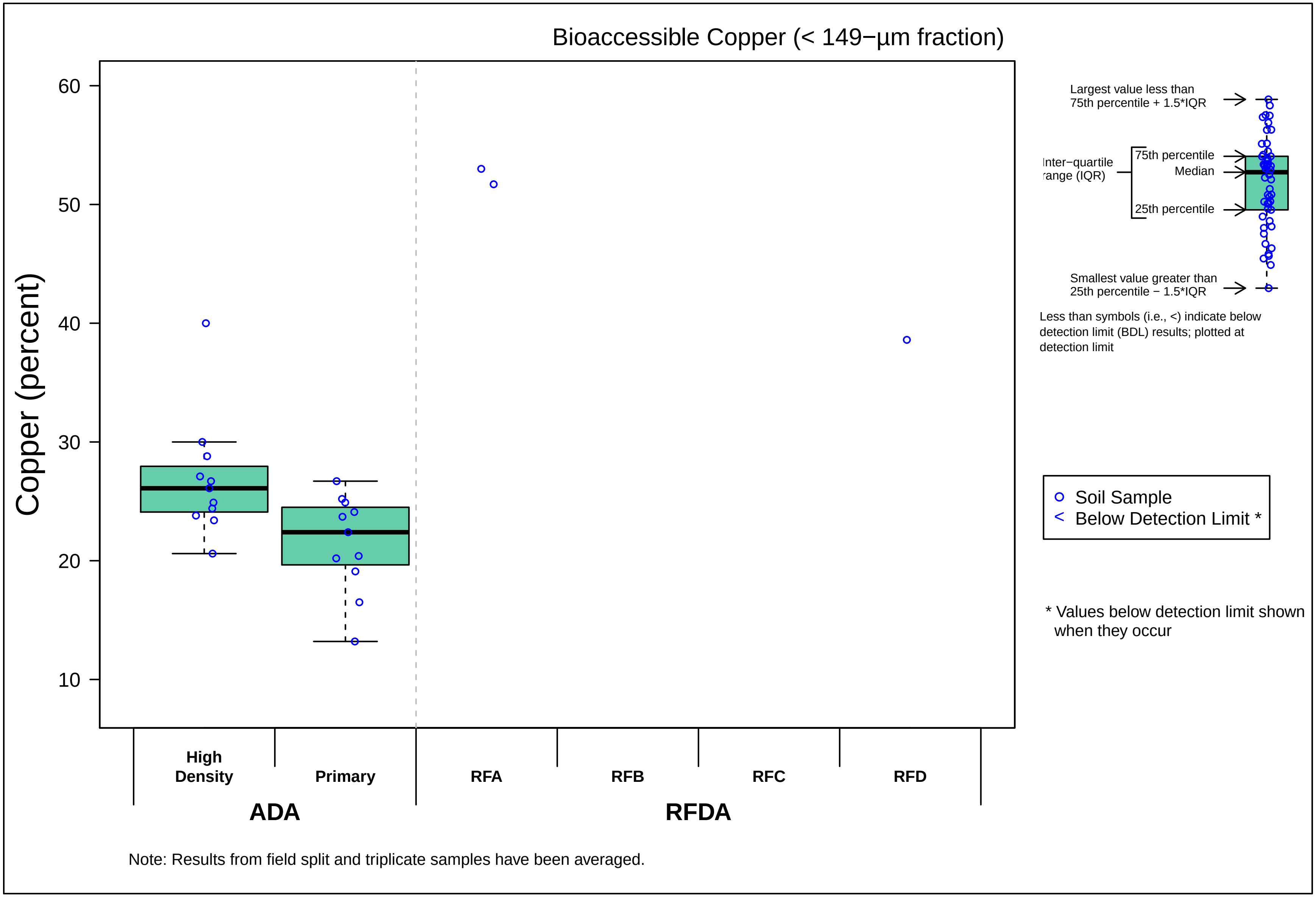


Figure 5−6j. Percent Bioaccessible Copper in < 149−µm Soil Fractions by Deposition Area

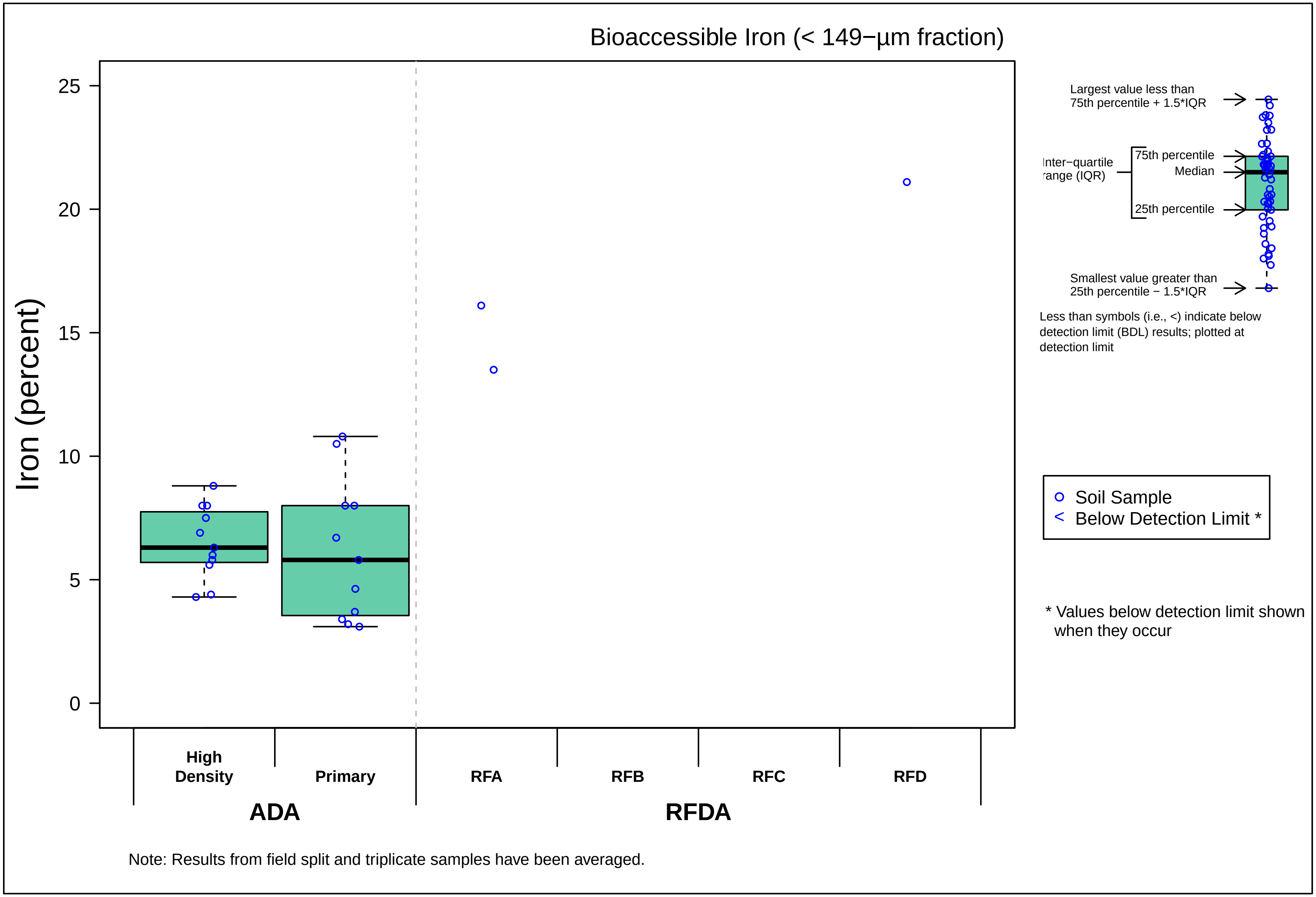


Figure 5−6k. Percent Bioaccessible Iron in < 149−µm Soil Fractions by Deposition Area

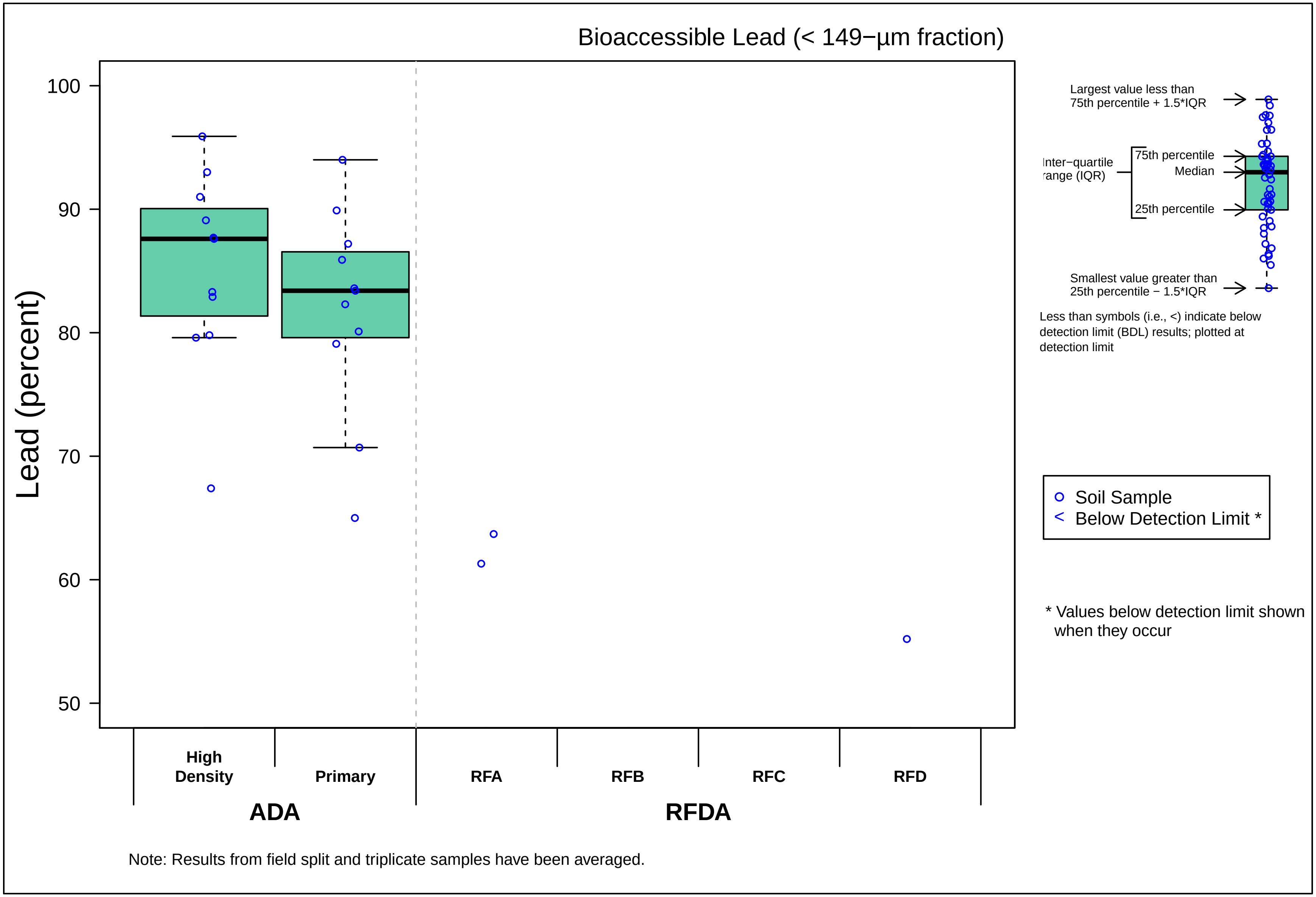


Figure 5−6l. Percent Bioaccessible Lead in < 149−µm Soil Fractions by Deposition Area

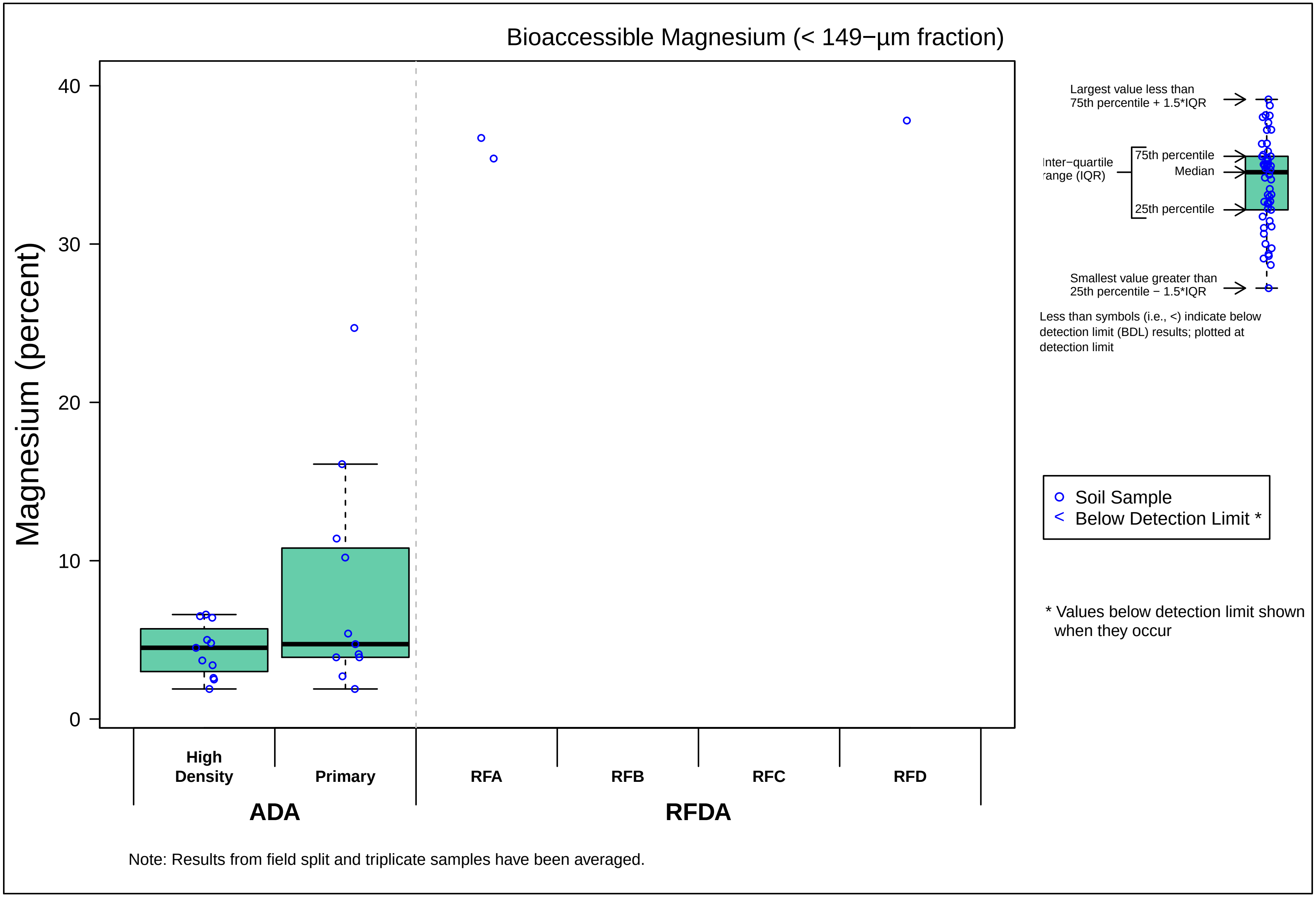


Figure 5−6m. Percent Bioaccessible Magnesium in < 149−µm Soil Fractions by Deposition Area

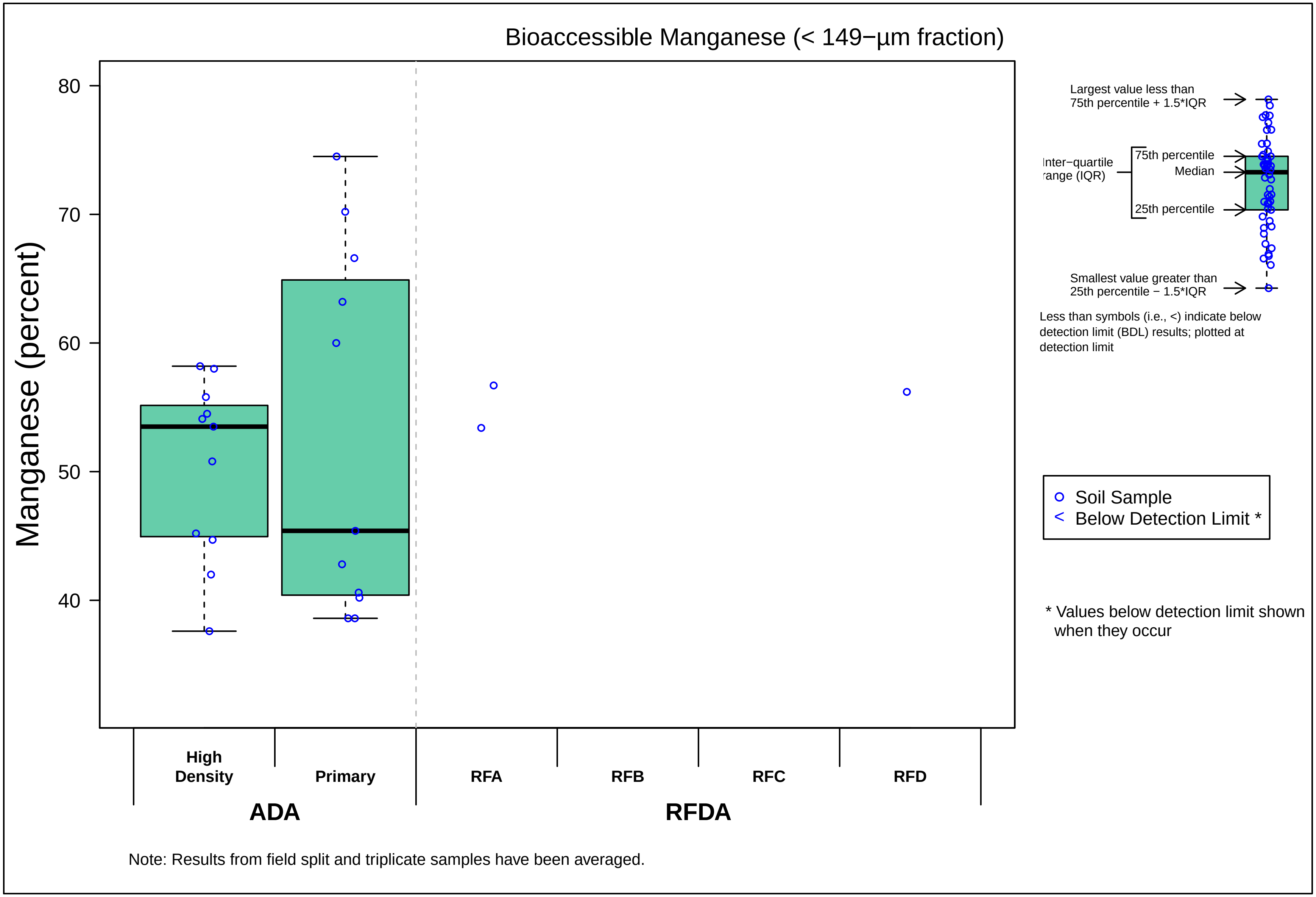


Figure 5−6n. Percent Bioaccessible Manganese in < 149−µm Soil Fractions by Deposition Area

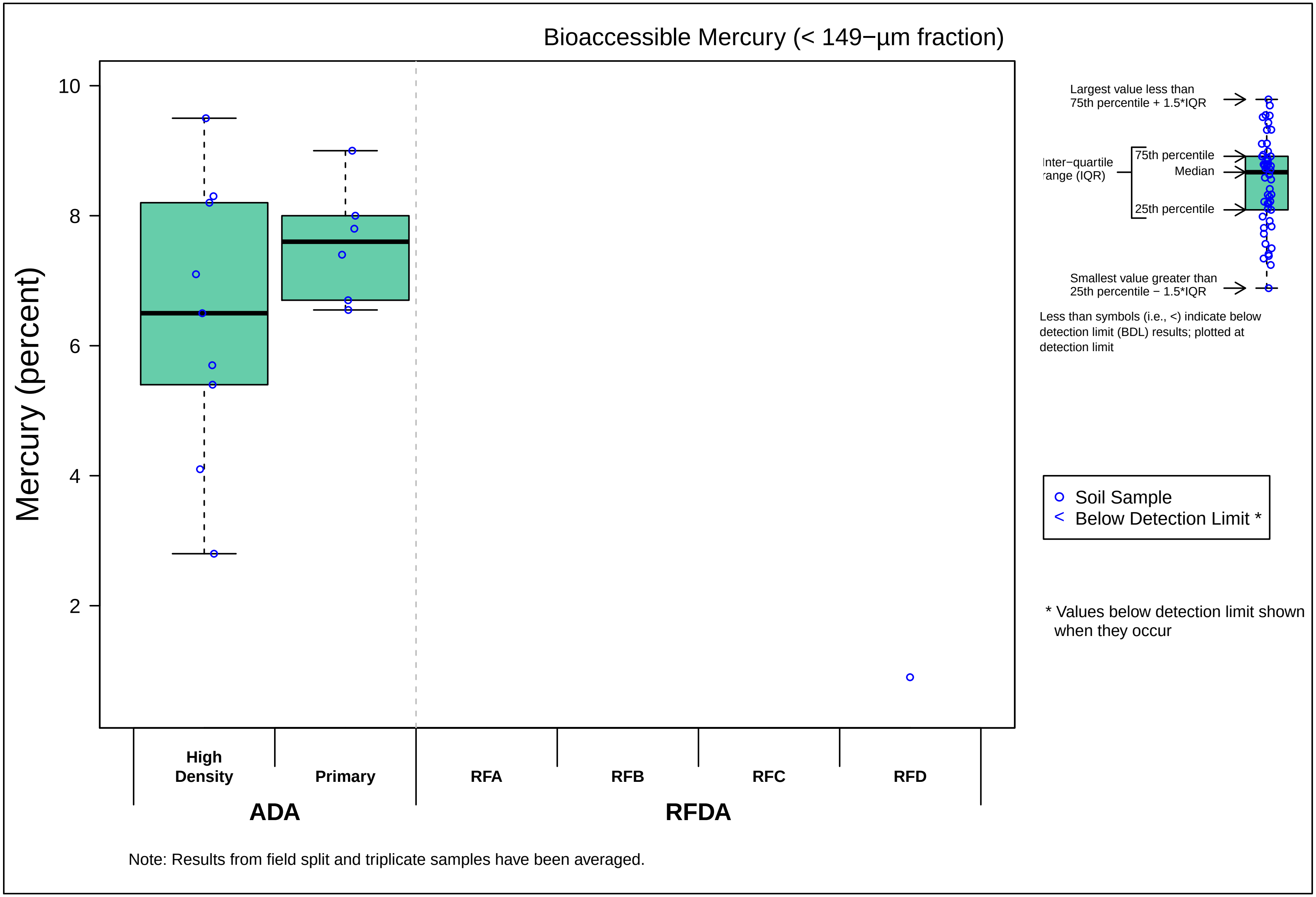


Figure 5−6o. Percent Bioaccessible Mercury in < 149−µm Soil Fractions by Deposition Area

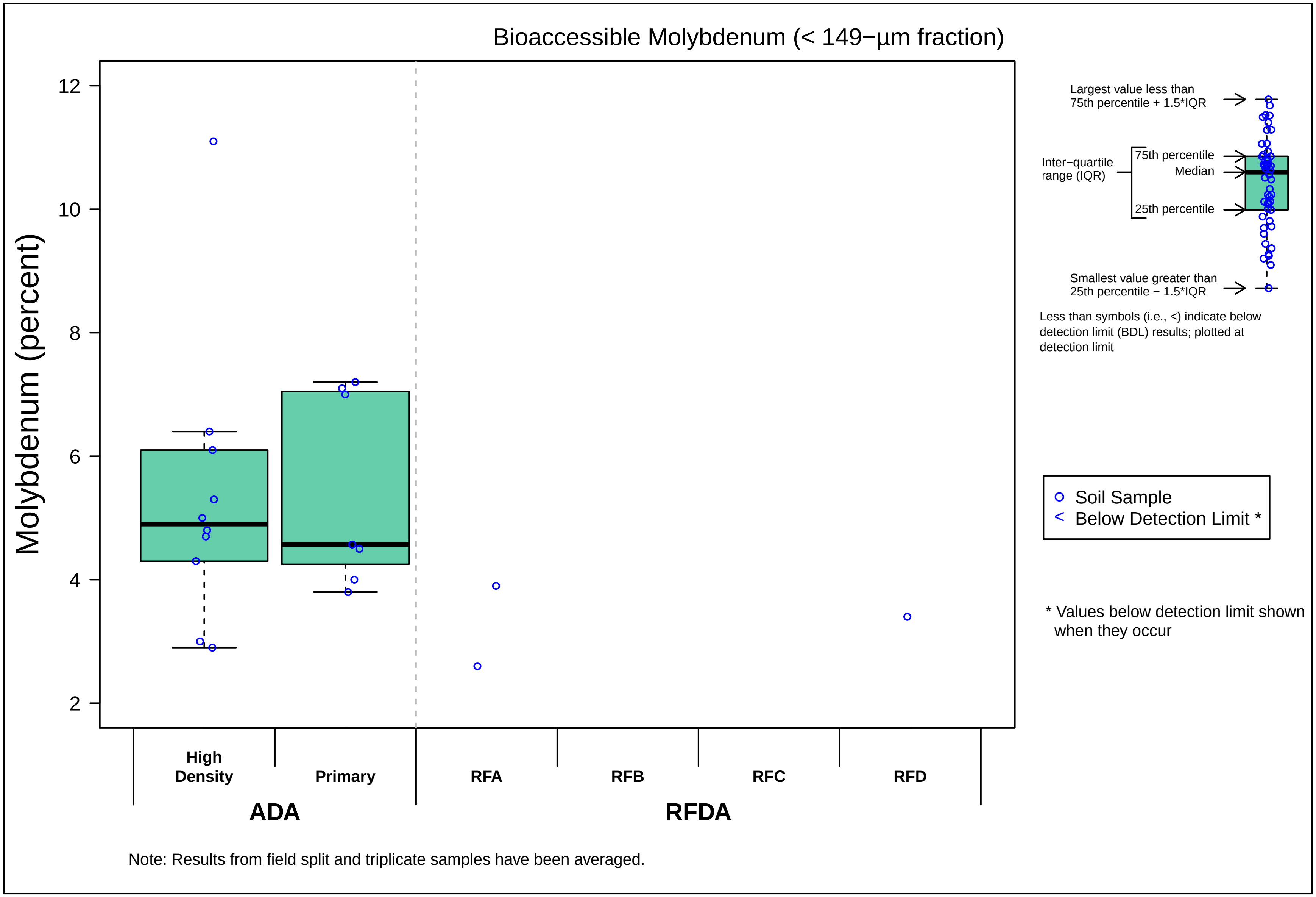


Figure 5−6p. Percent Bioaccessible Molybdenum in < 149−µm Soil Fractions by Deposition Area

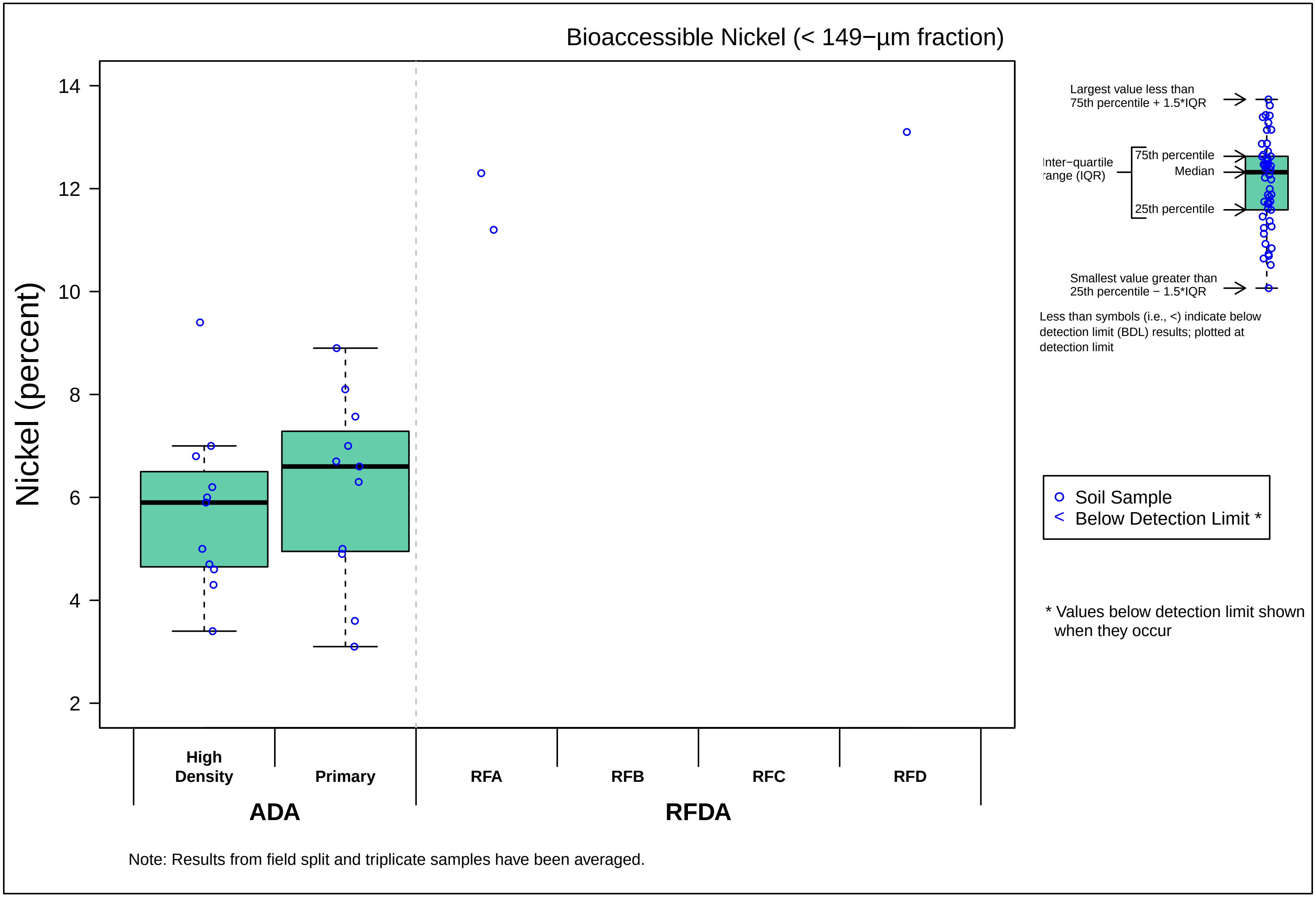


Figure 5−6q. Percent Bioaccessible Nickel in < 149−µm Soil Fractions by Deposition Area

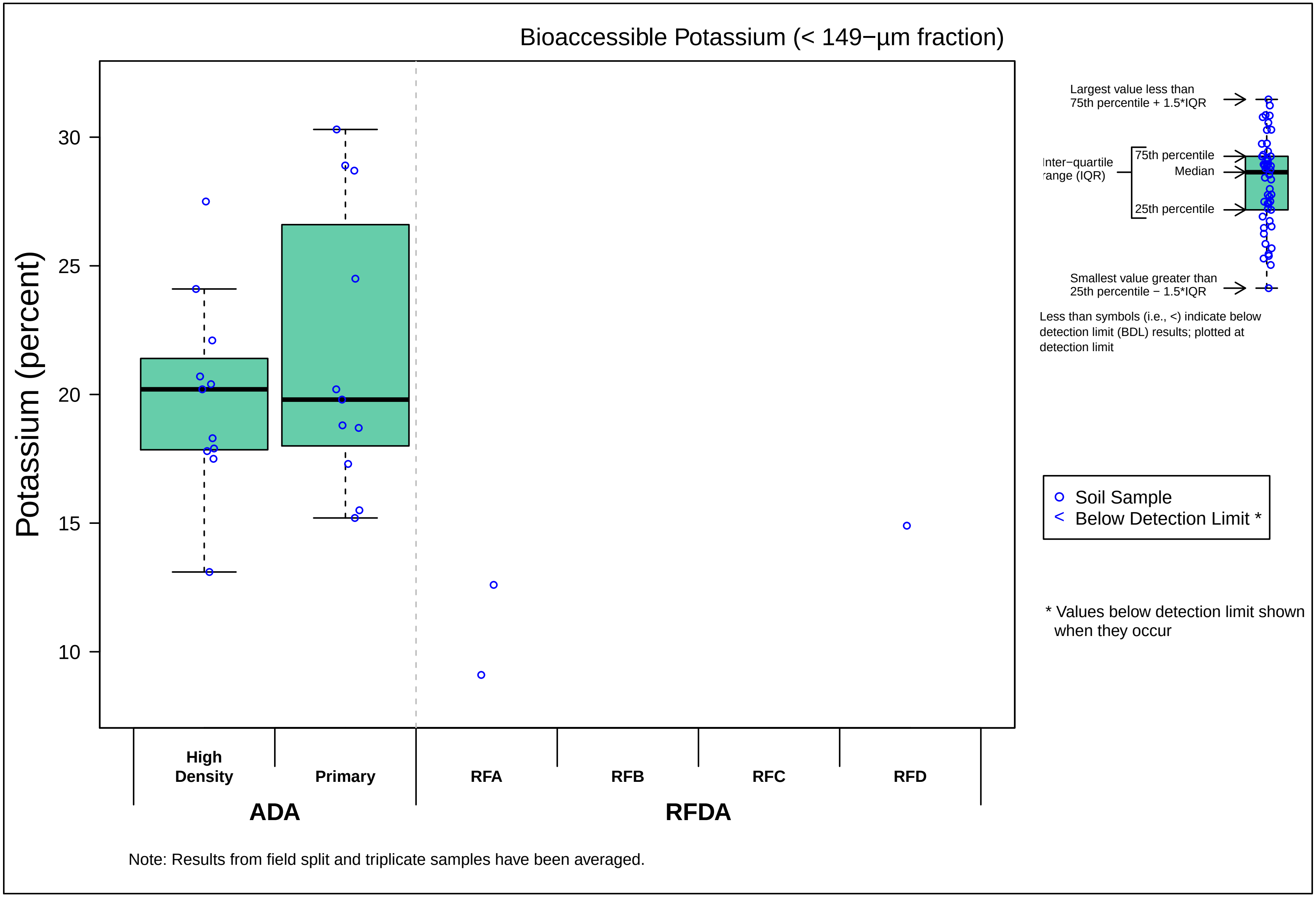


Figure 5−6r. Percent Bioaccessible Potassium in < 149−µm Soil Fractions by Deposition Area

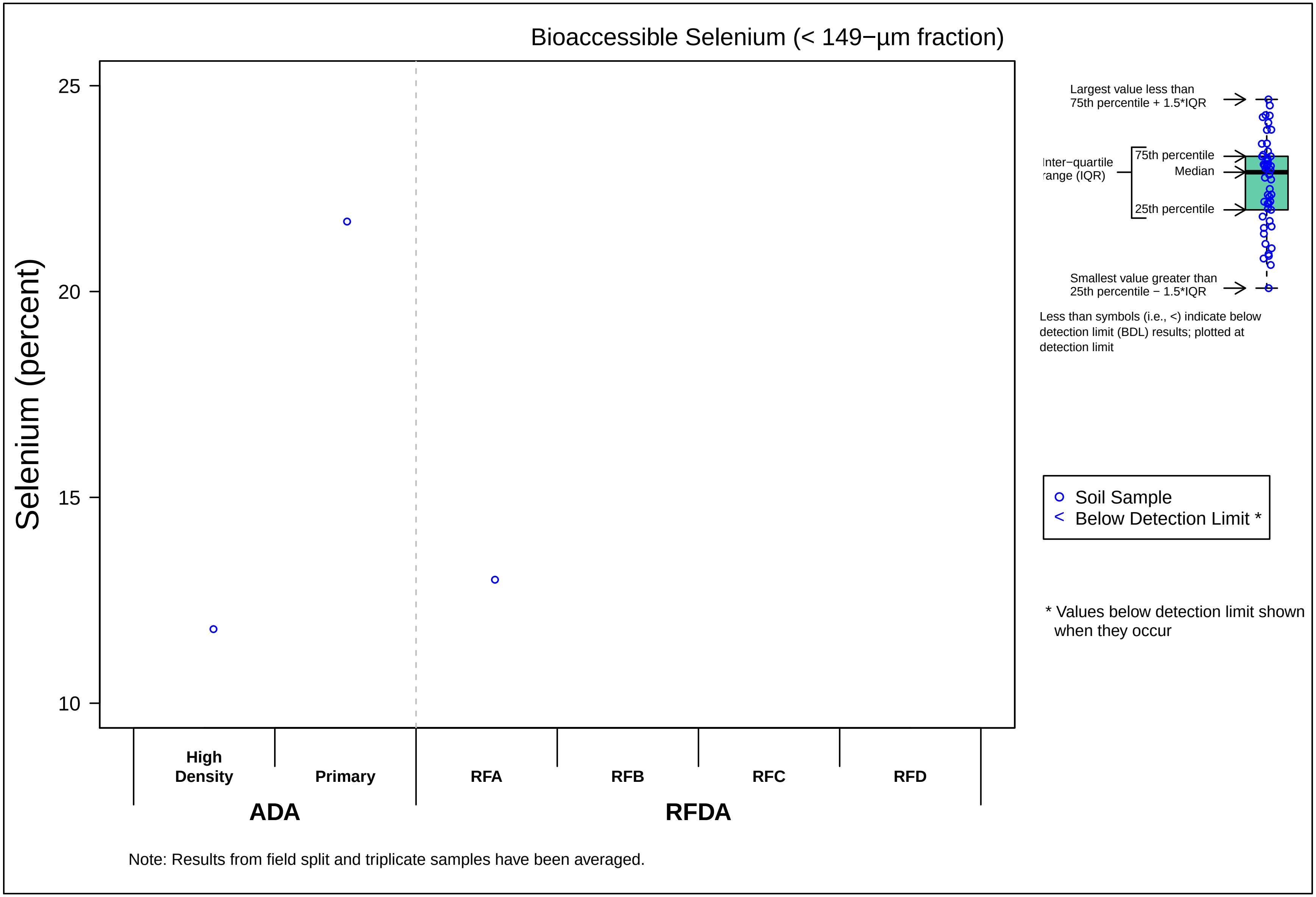


Figure 5−6s. Percent Bioaccessible Selenium in < 149−µm Soil Fractions by Deposition Area

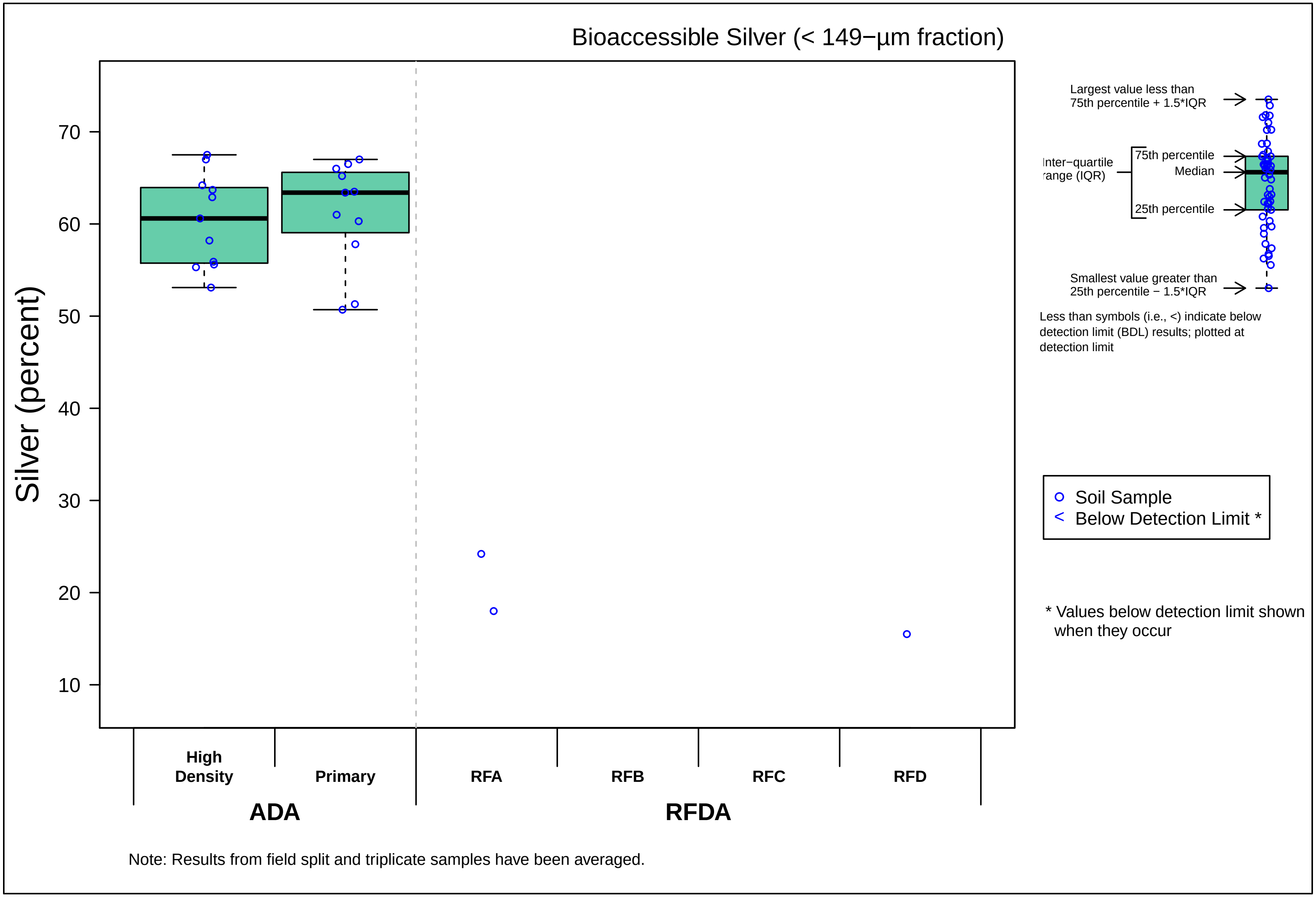


Figure 5−6t. Percent Bioaccessible Silver in < 149−µm Soil Fractions by Deposition Area

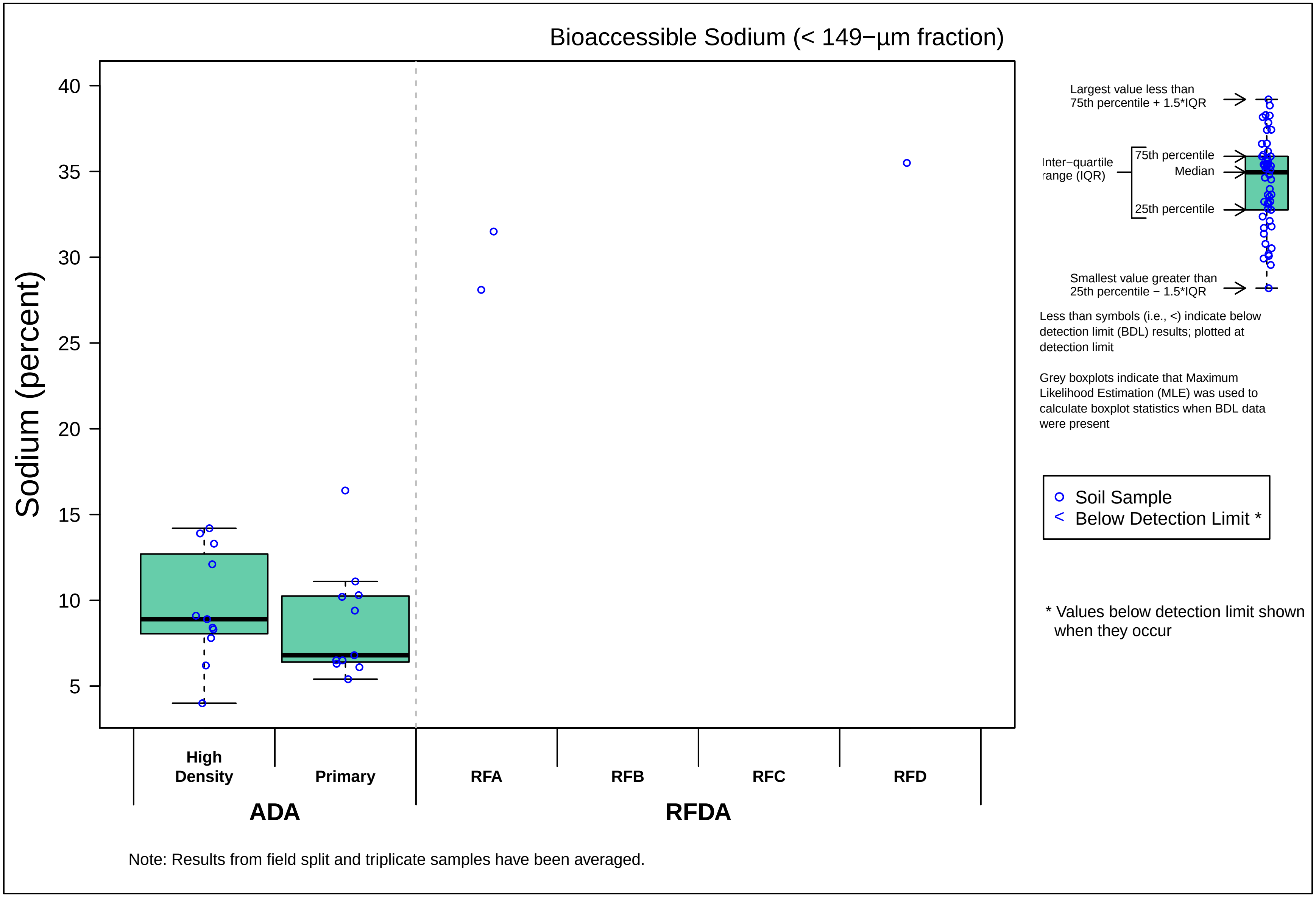


Figure 5−6u. Percent Bioaccessible Sodium in < 149−µm Soil Fractions by Deposition Area

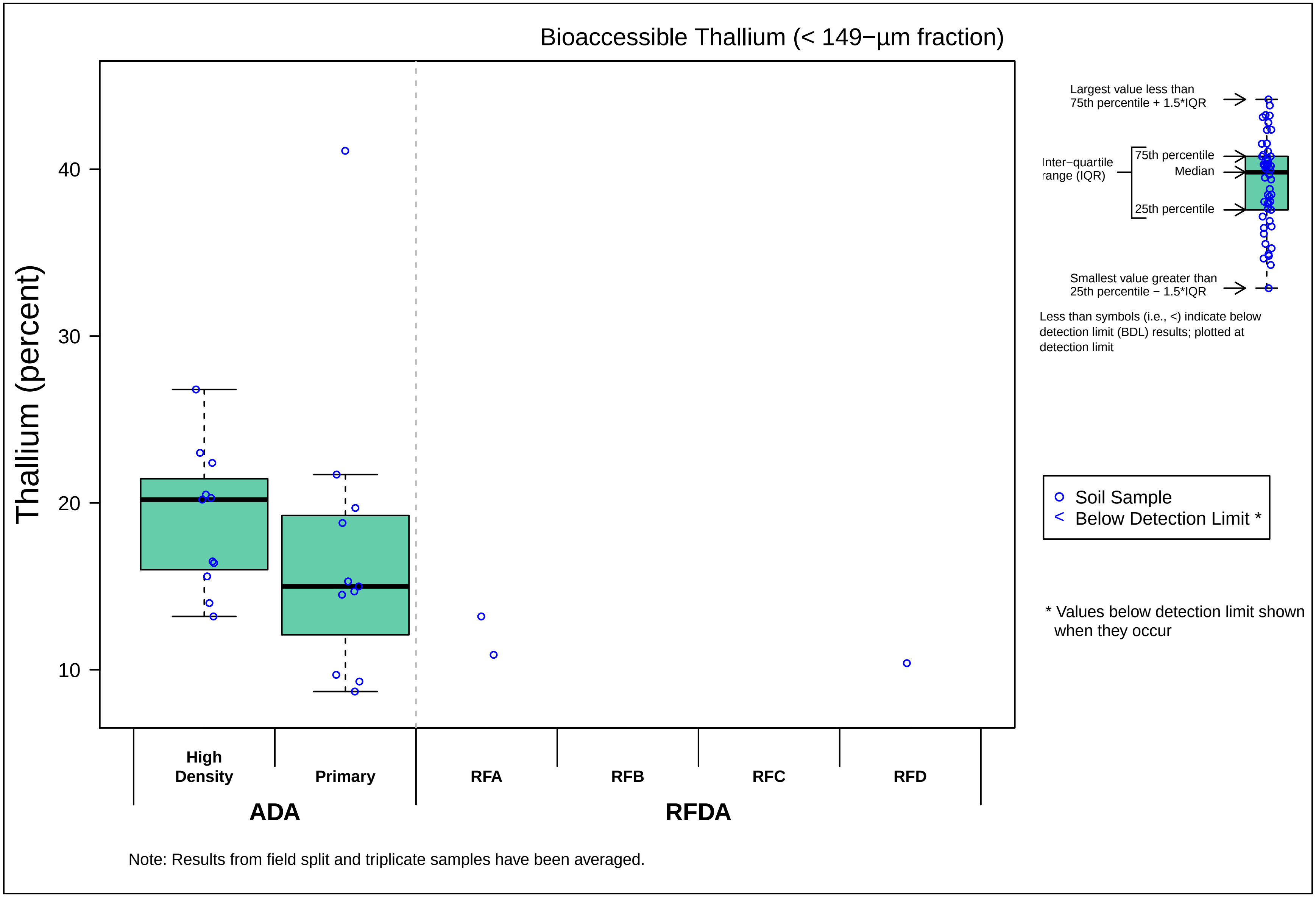


Figure 5−6v. Percent Bioaccessible Thallium in < 149−µm Soil Fractions by Deposition Area

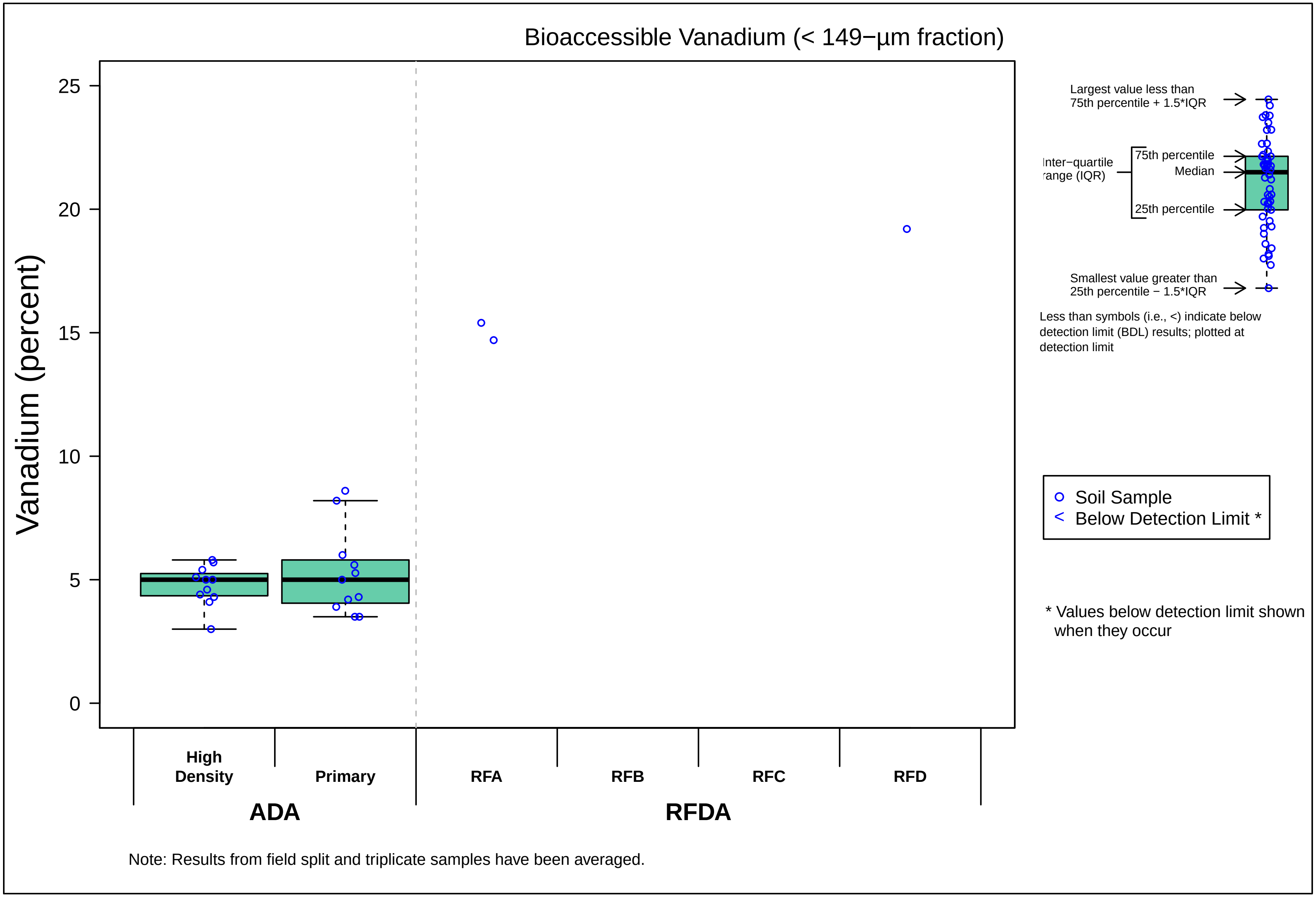


Figure 5−6w. Percent Bioaccessible Vanadium in < 149−µm Soil Fractions by Deposition Area

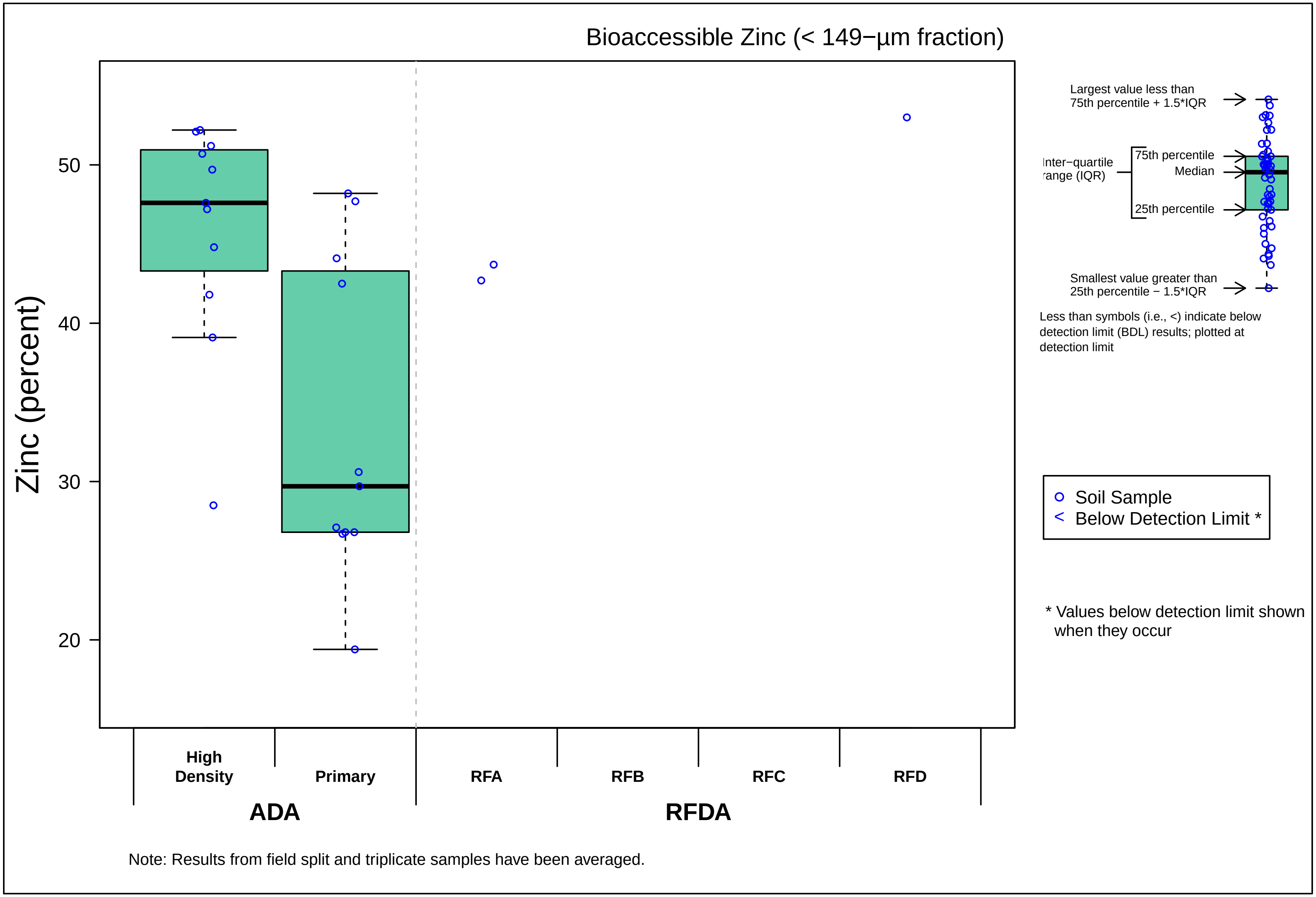
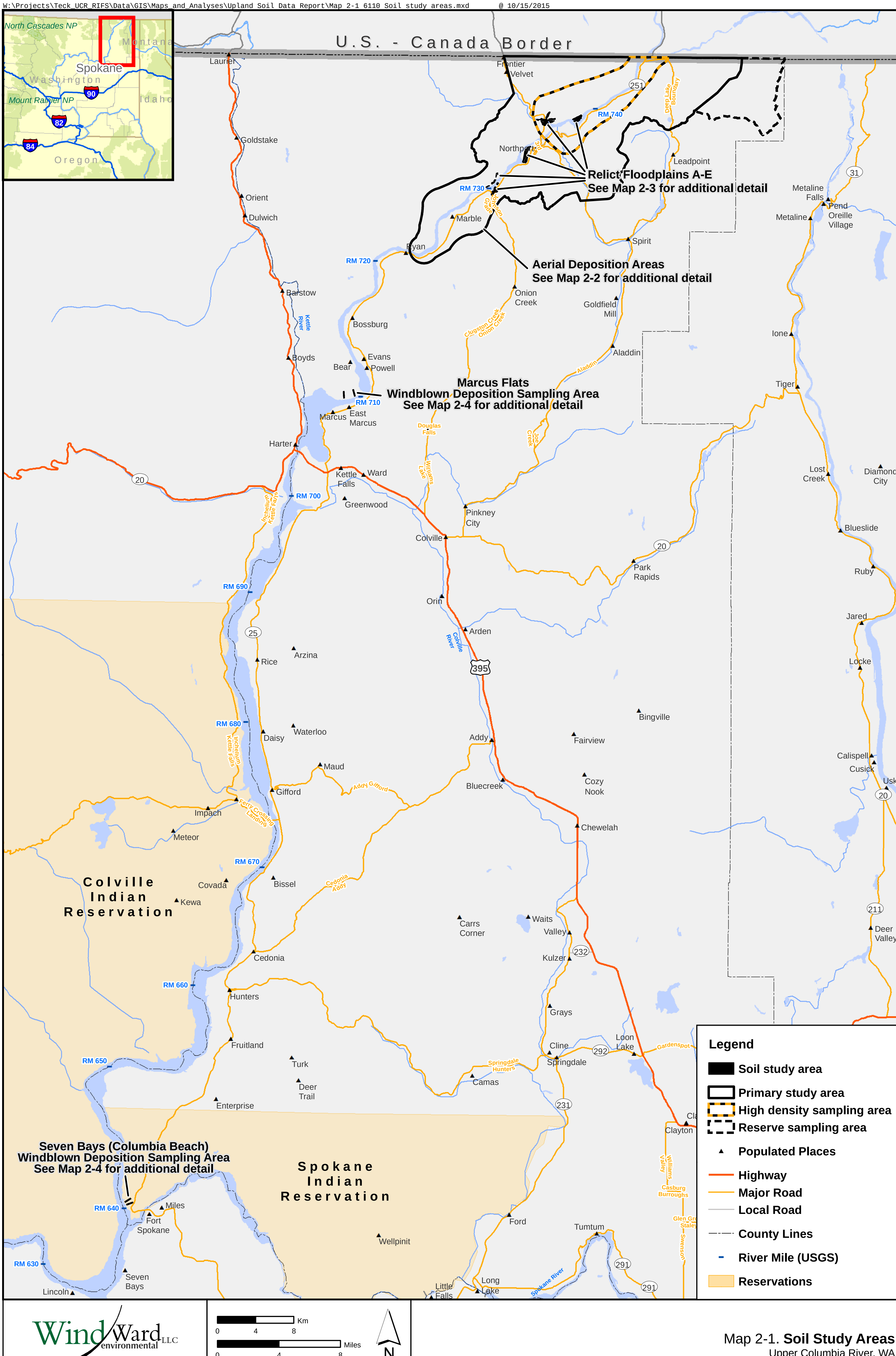


Figure 5−6x. Percent Bioaccessible Zinc in < 149−µm Soil Fractions by Deposition Area

MAPS

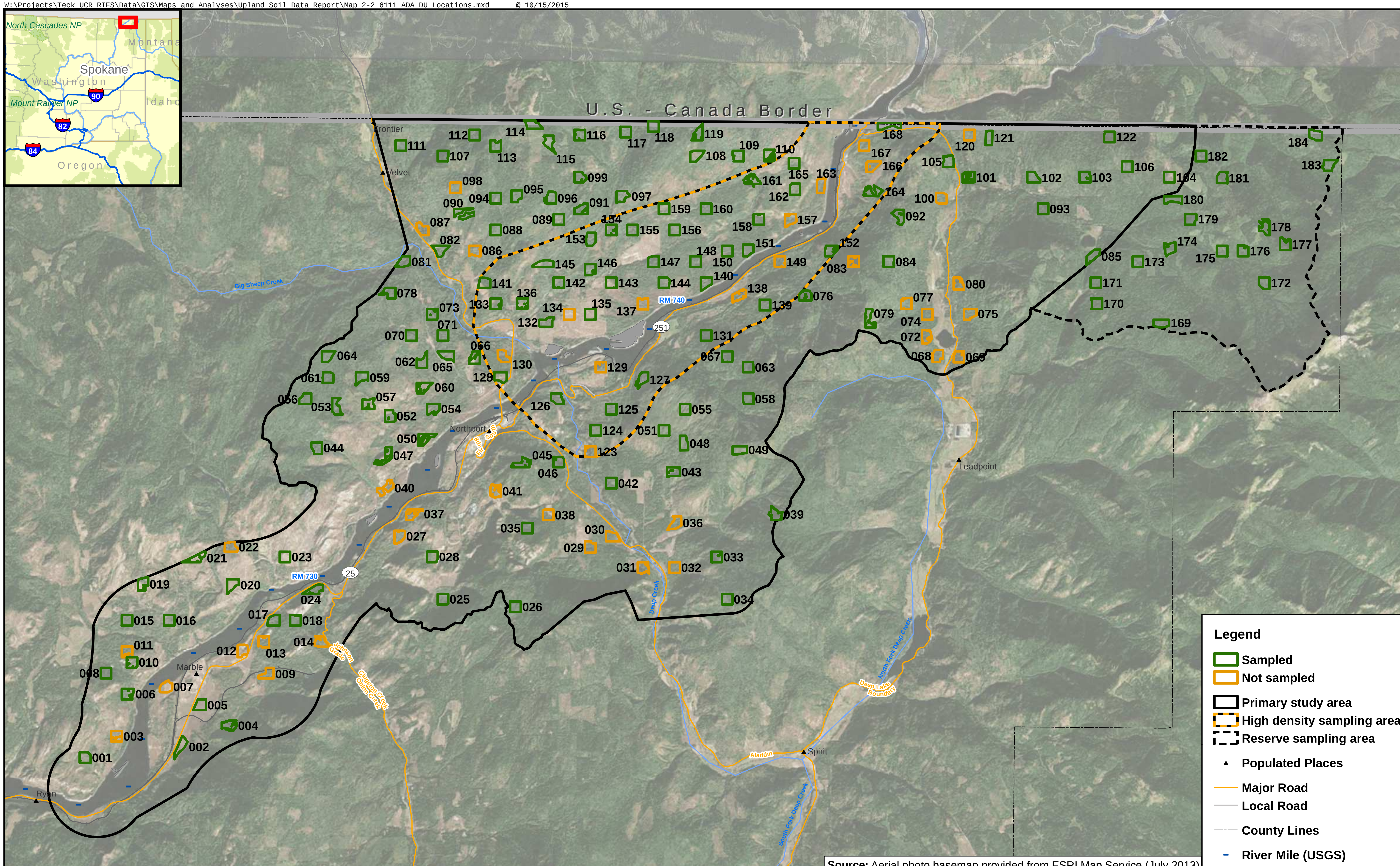
W:\Projects\Teck_UCR_RIFS\Data\GIS\Maps_and_Analyses\Upland Soil Data Report\Map 2-1 6110 Soil study areas.mxd @ 10/15/2015



WindWard environmental LLC

Map 2-1. **Soil Study Areas**
Upper Columbia River, WA

W:\Projects\Teck_UCR_RIFS\Data\GIS\Maps_and_Analyses\Upland_Soil_Data_Report\Map 2-2_6111_ADA_DU_Locations.mxd @ 10/15/2015



Km 0 1 2

Miles 0 1 2

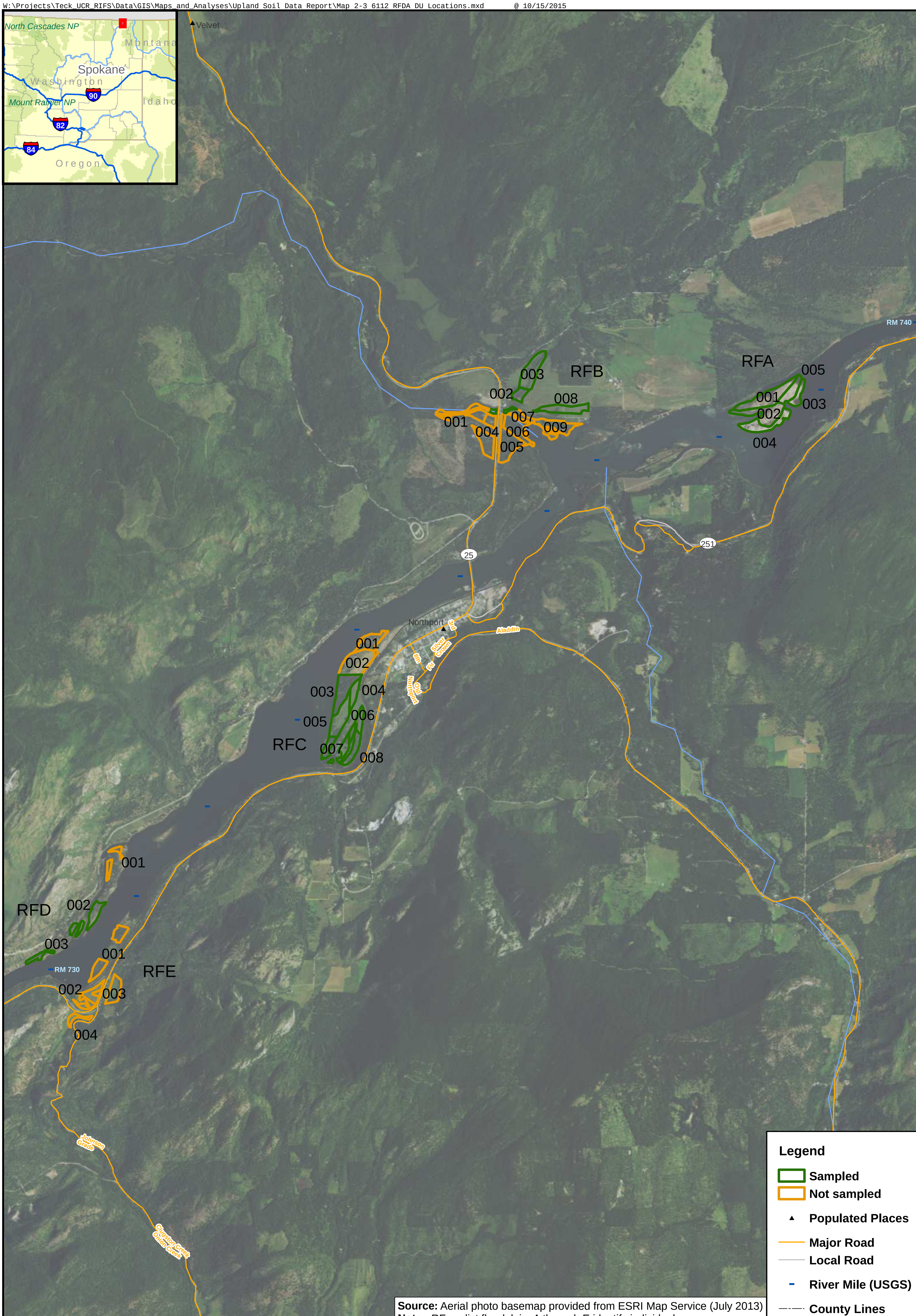
N

Windward environmental LLC

Map 2-2. **Decision Unit Locations in the Aerial Deposition Areas**

Upper Columbia River, WA

W:\Projects\Teck_UCR_RIFS\Data\GIS\Maps_and_Analyses\Upland Soil Data Report\Map 2-3 6112 RFDA DU Locations.mxd @ 10/15/2015



Windward environmental LLC

Km 0 0.5 1

Miles 0 0.5 1

N

Map 2-3. **Decision Unit Locations in the Relict Floodplain Deposition Areas**

Upper Columbia River, WA

W:\Projects\Teck_UCR_RIFS\Data\GIS\Maps_and_Analyses\Upland Soil Data Report\Map 2-4 6113 WSDA DU Locations.mxd @ 10/15/2015

Windward environmental LLC

Km: 0 0.075 0.15

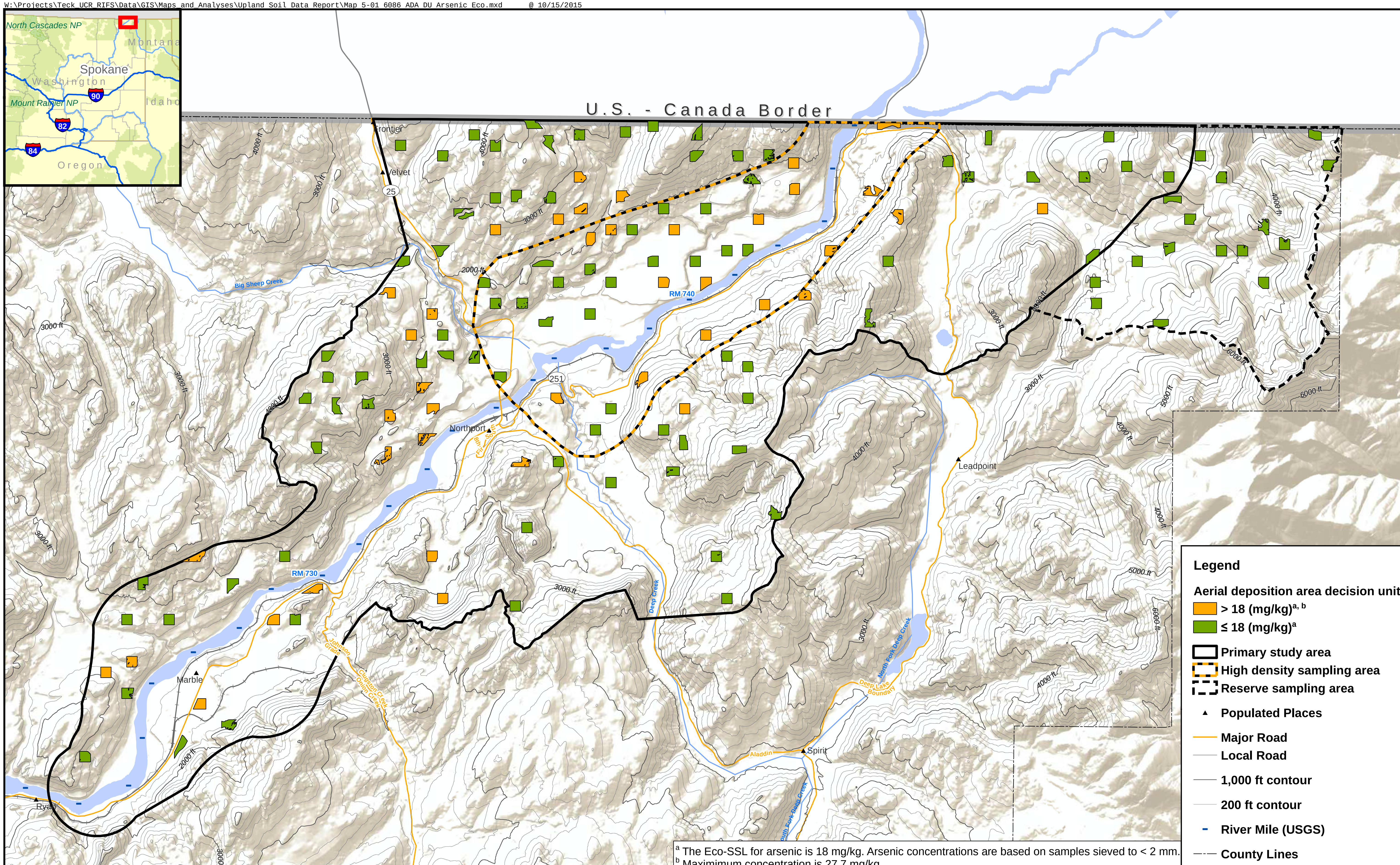
Miles: 0 0.075 0.15

N

Map 2-4. **Decision Unit Locations in the Windblown Sediment Deposition Areas**

Upper Columbia River, WA

W:\Projects\Teck_UCR_RIFS\Data\GIS\Maps_and_Analyses\Upland Soil Data Report\Map 5-01_6086_ADA_DU_Arsenic_Eco.mxd @ 10/15/2015



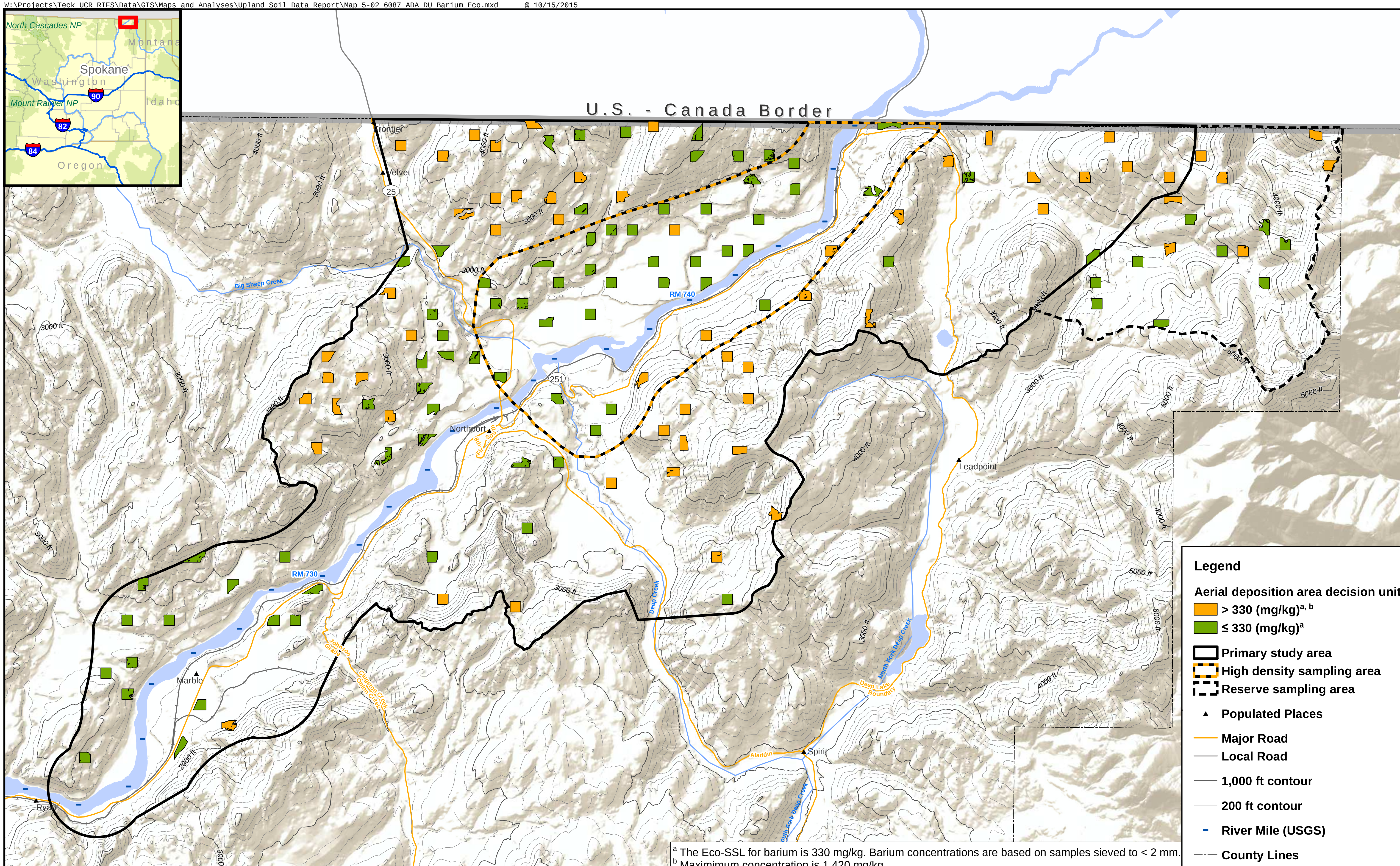
[a] The Eco-SSL for arsenic is 18 mg/kg. Arsenic concentrations are based on samples sieved to < 2 mm.
[b] Maximimum concentration is 27.7 mg/kg.

Windward environmental LLC

Map 5-1. **Spatial Distribution of Arsenic Concentrations in the < 2-mm Fraction of Soil Collected from the Aerial Deposition Areas**

Upper Columbia River, WA

W:\Projects\Teck_UCR_RIFS\Data\GIS\Maps_and_Analyses\Upland_Soil_Data_Report\Map 5-02_6087_ADA_DU_Barium_Eco.mxd @ 10/15/2015



[a] The Eco-SSL for barium is 330 mg/kg. Barium concentrations are based on samples sieved to < 2 mm.
[b] Maximimum concentration is 1,420 mg/kg.

Wind Ward environmental LLC

0 1 2 Km

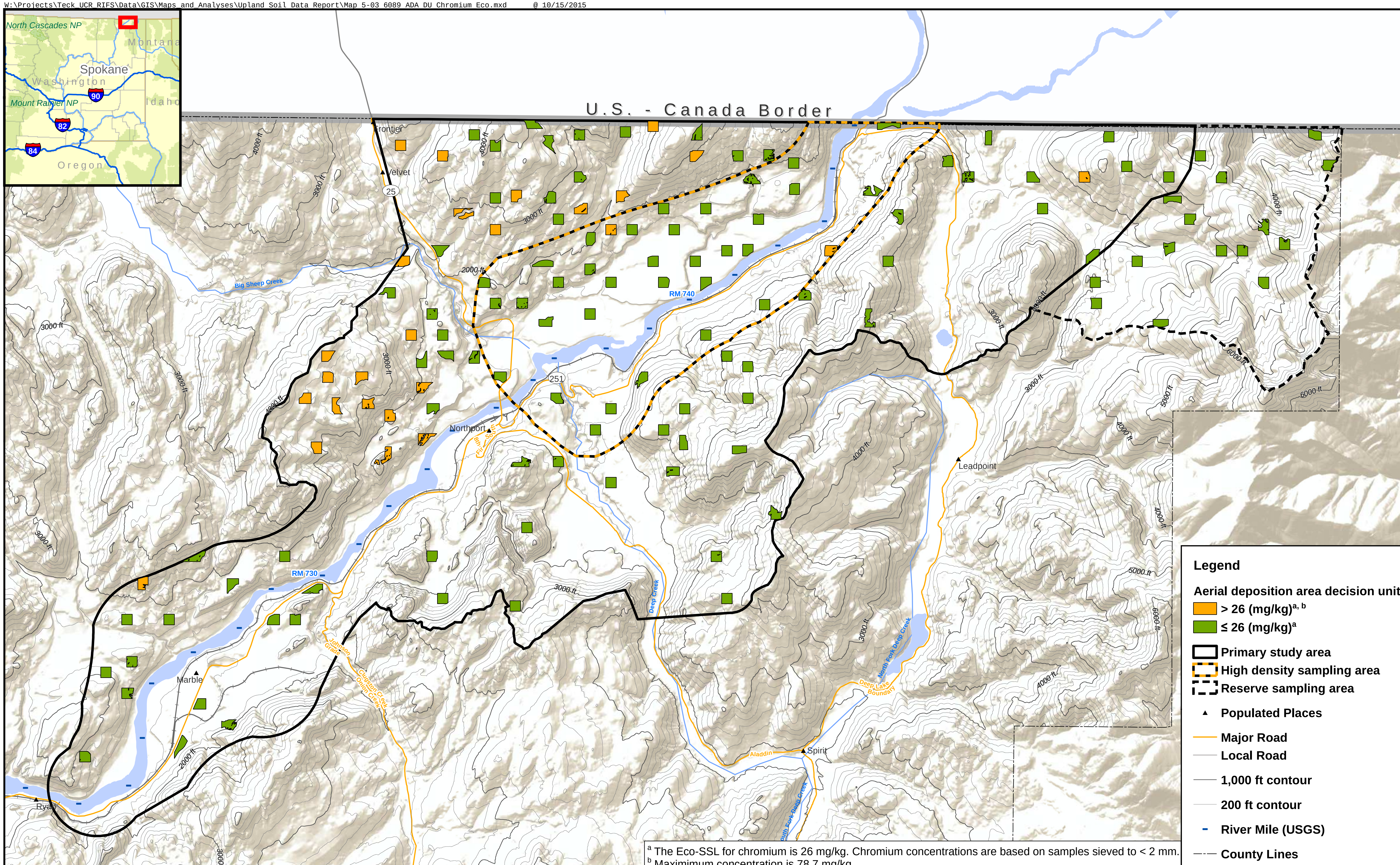
0 1 2 Miles

N

Map 5-2. **Spatial Distribution of Barium Concentrations in the < 2-mm Fraction of Soil Collected from the Aerial Deposition Areas**

Upper Columbia River, WA

W:\Projects\Teck_UCR_RIFS\Data\GIS\Maps_and_Analyses\Upland_Soil_Data_Report\Map 5-03 6089 ADA DU Chromium Eco.mxd @ 10/15/2015

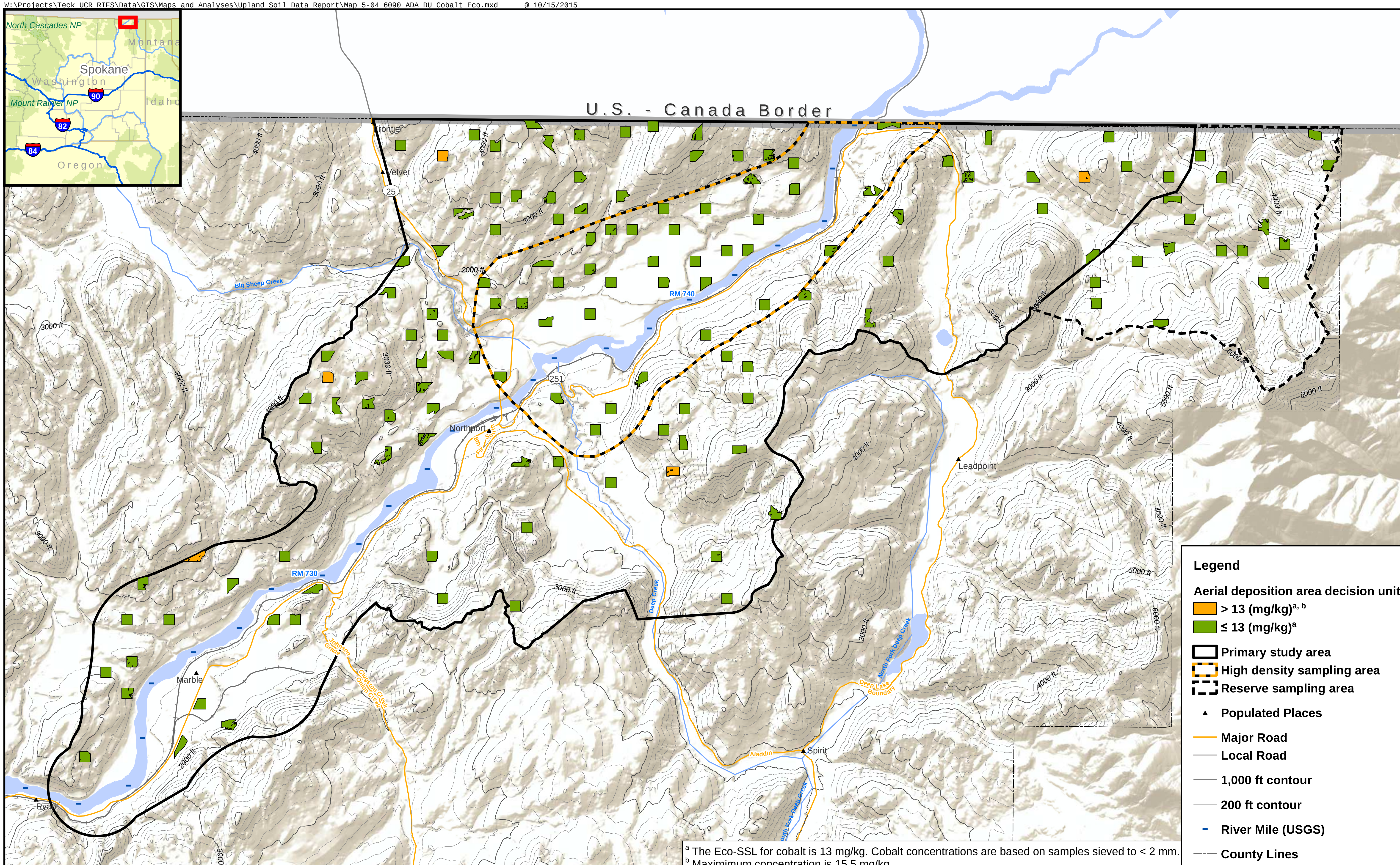


WindWard environmental LLC

Map 5-3. **Spatial Distribution of Chromium Concentrations in the < 2-mm Fraction of Soil Collected from the Aerial Deposition Areas**

Upper Columbia River, WA

W:\Projects\Teck_UCR_RIFS\Data\GIS\Maps_and_Analyses\Upland_Soil_Data_Report\Map 5-04 6090 ADA DU Cobalt Eco.mxd @ 10/15/2015

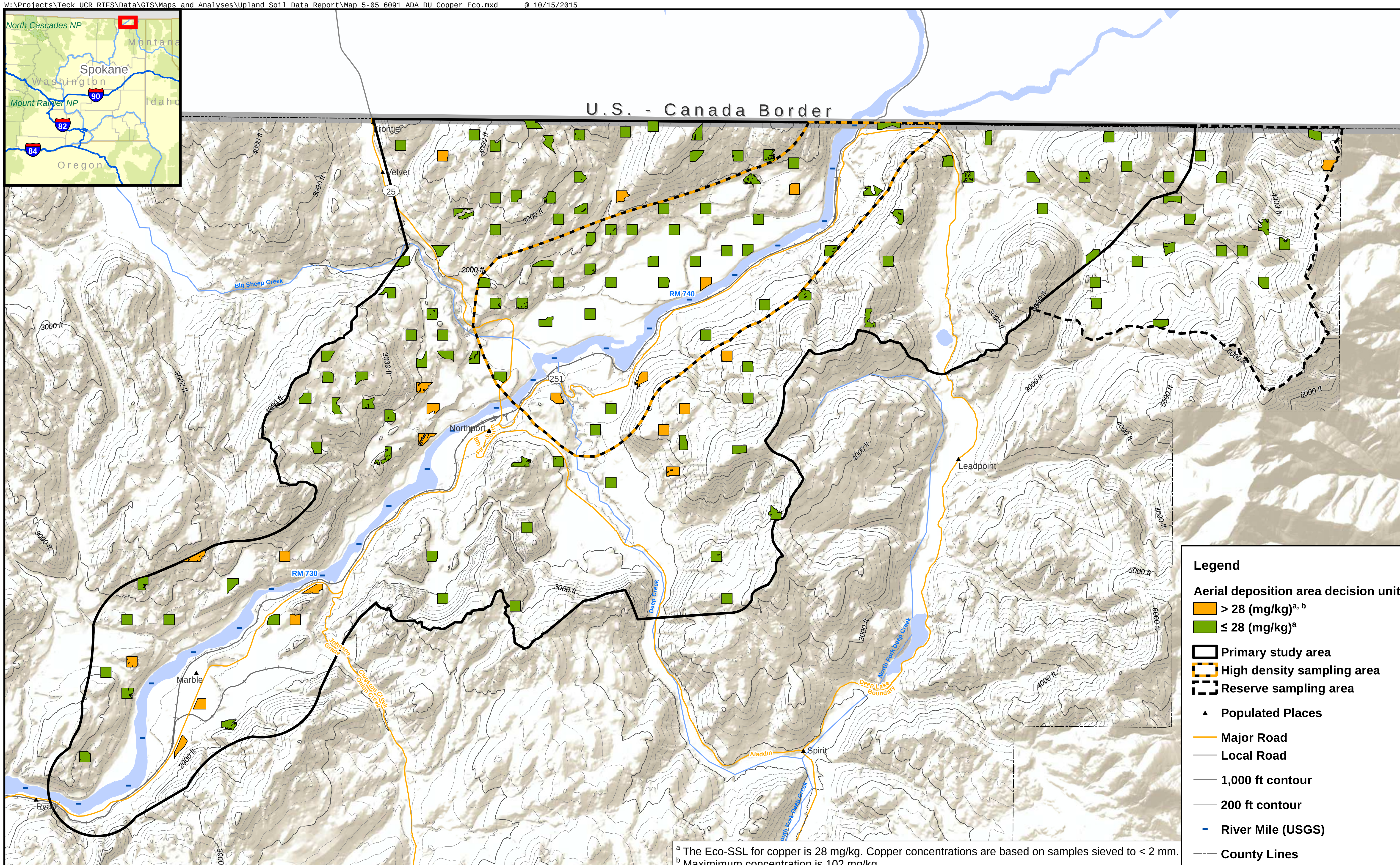


WindWard environmental LLC

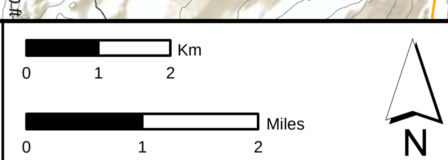
Map 5-4. **Spatial Distribution of Cobalt Concentrations in the < 2-mm Fraction of Soil Collected from the Aerial Deposition Areas**

Upper Columbia River, WA

W:\Projects\Teck_UCR_RIFS\Data\GIS\Maps_and_Analyses\Upland_Soil_Data_Report\Map 5-05 6091 ADA DU Copper Eco.mxd @ 10/15/2015

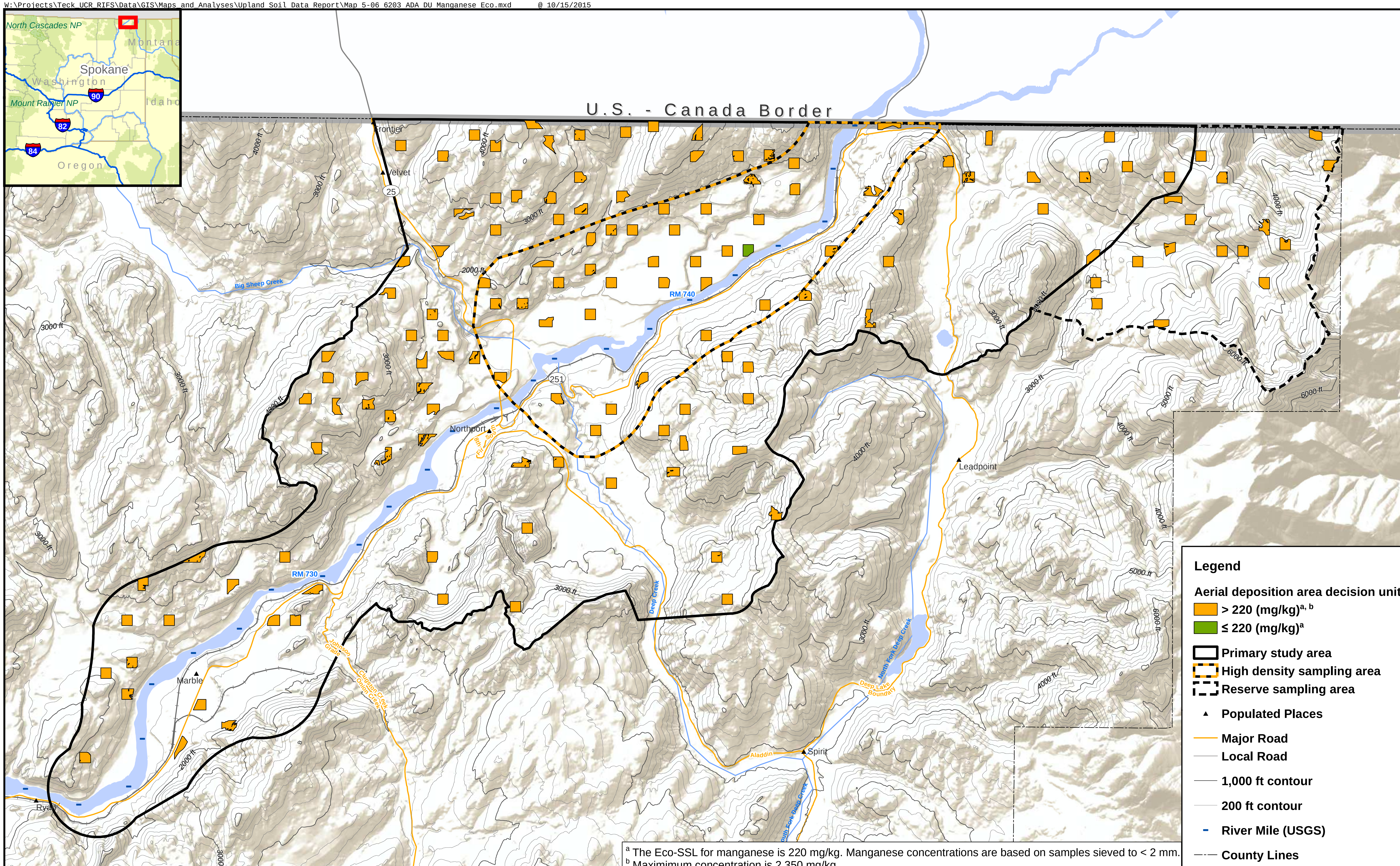


[a] The Eco-SSL for copper is 28 mg/kg. Copper concentrations are based on samples sieved to < 2 mm.
[b] Maximimum concentration is 102 mg/kg.



Map 5-5. **Spatial Distribution of Copper Concentrations in the < 2-mm Fraction of Soil Collected from the Aerial Deposition Areas**
Upper Columbia River, WA

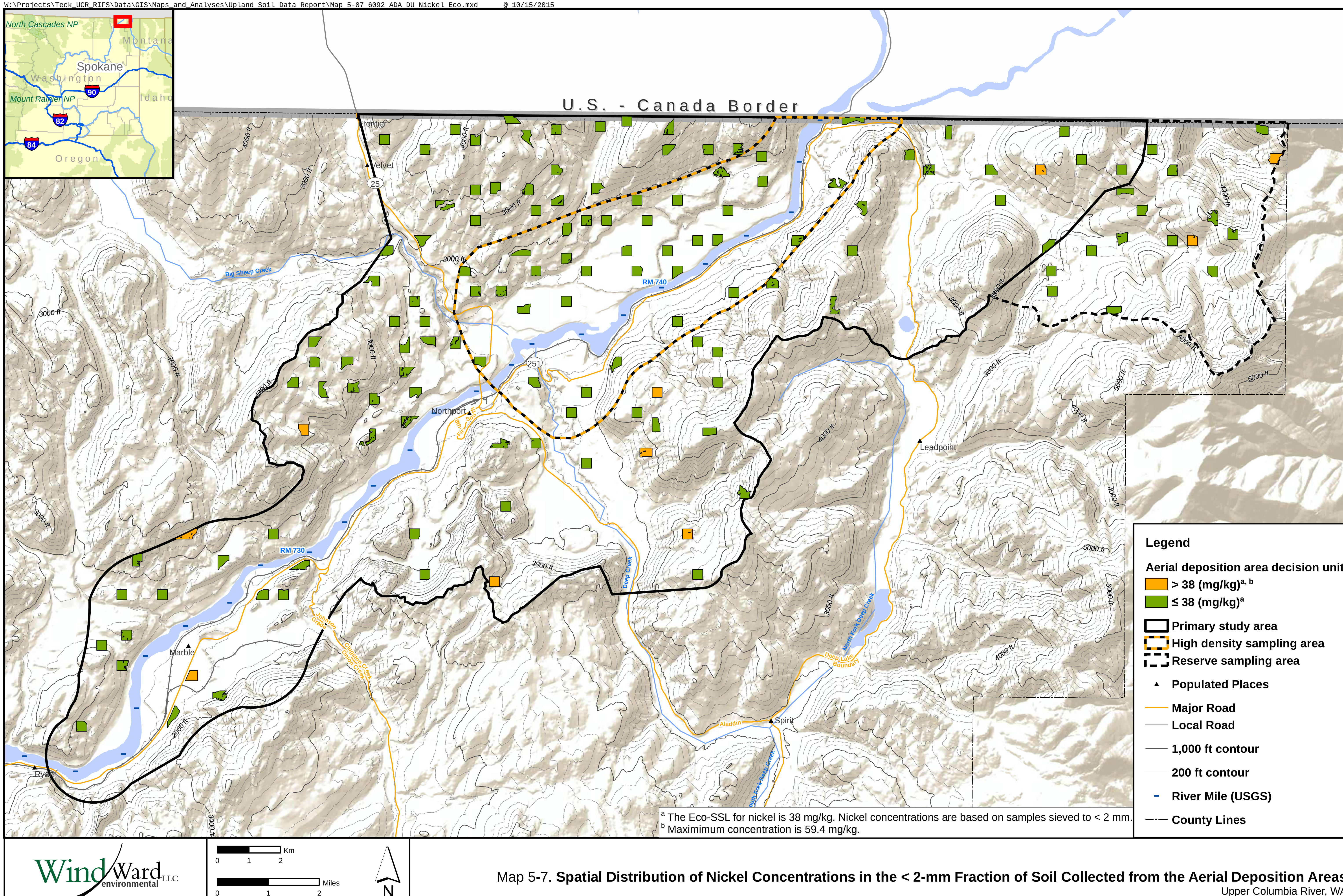
W:\Projects\Teck_UCR_RIFS\Data\GIS\Maps_and_Analyses\Upland_Soil_Data_Report\Map_5-06_6203_ADA_DU_Manganese_Eco.mxd @ 10/15/2015



[a] The Eco-SSL for manganese is 220 mg/kg. Manganese concentrations are based on samples sieved to < 2 mm.
[b] Maximimum concentration is 2,350 mg/kg.

Wind Ward environmental LLC

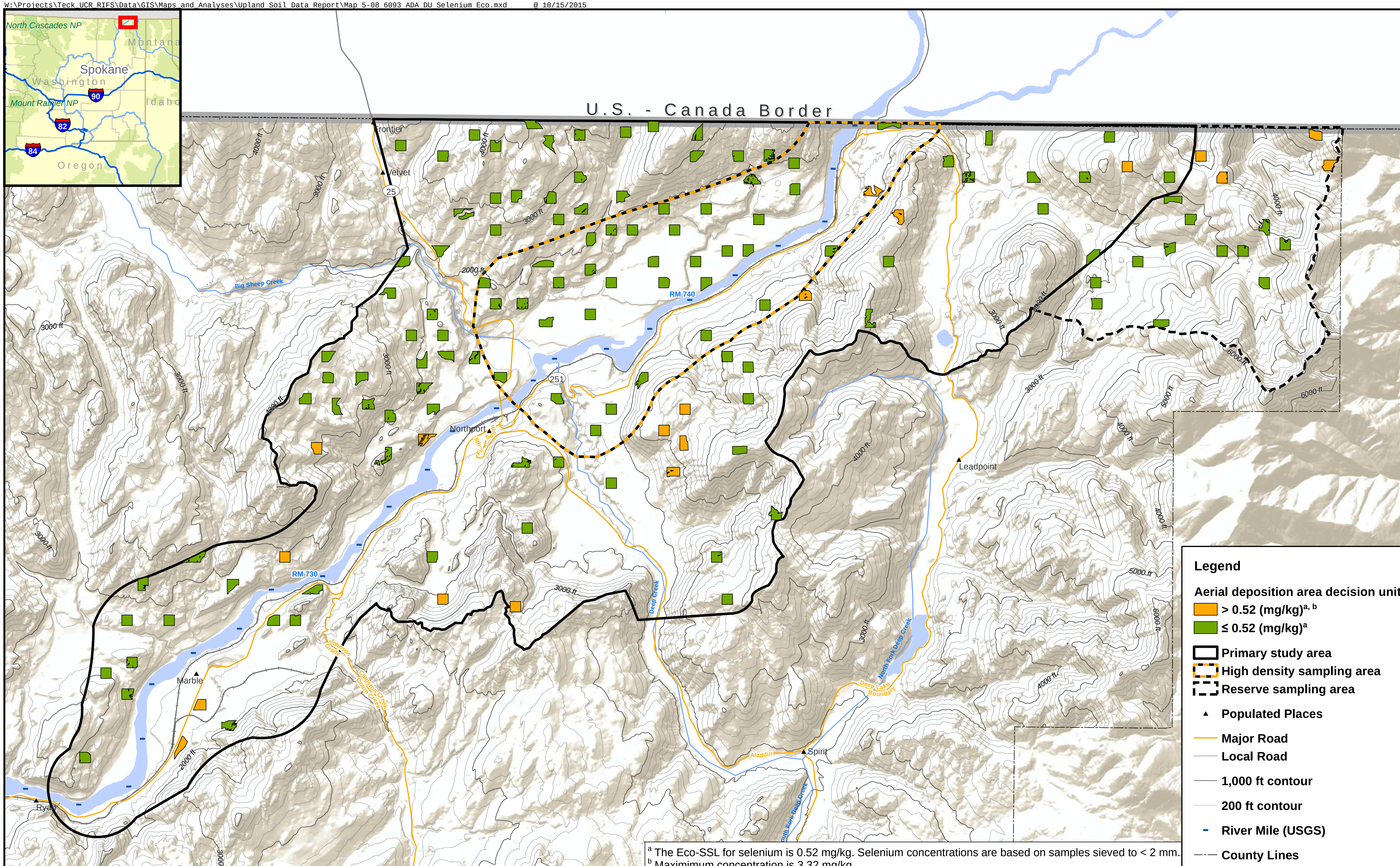
Map 5-6. **Spatial Distribution of Manganese Concentrations in the < 2-mm Fraction of Soil Collected from the Aerial Deposition Areas**
Upper Columbia River, WA



WindWard environmental LLC

Map 5-7. **Spatial Distribution of Nickel Concentrations in the < 2-mm Fraction of Soil Collected from the Aerial Deposition Areas**

Upper Columbia River, WA



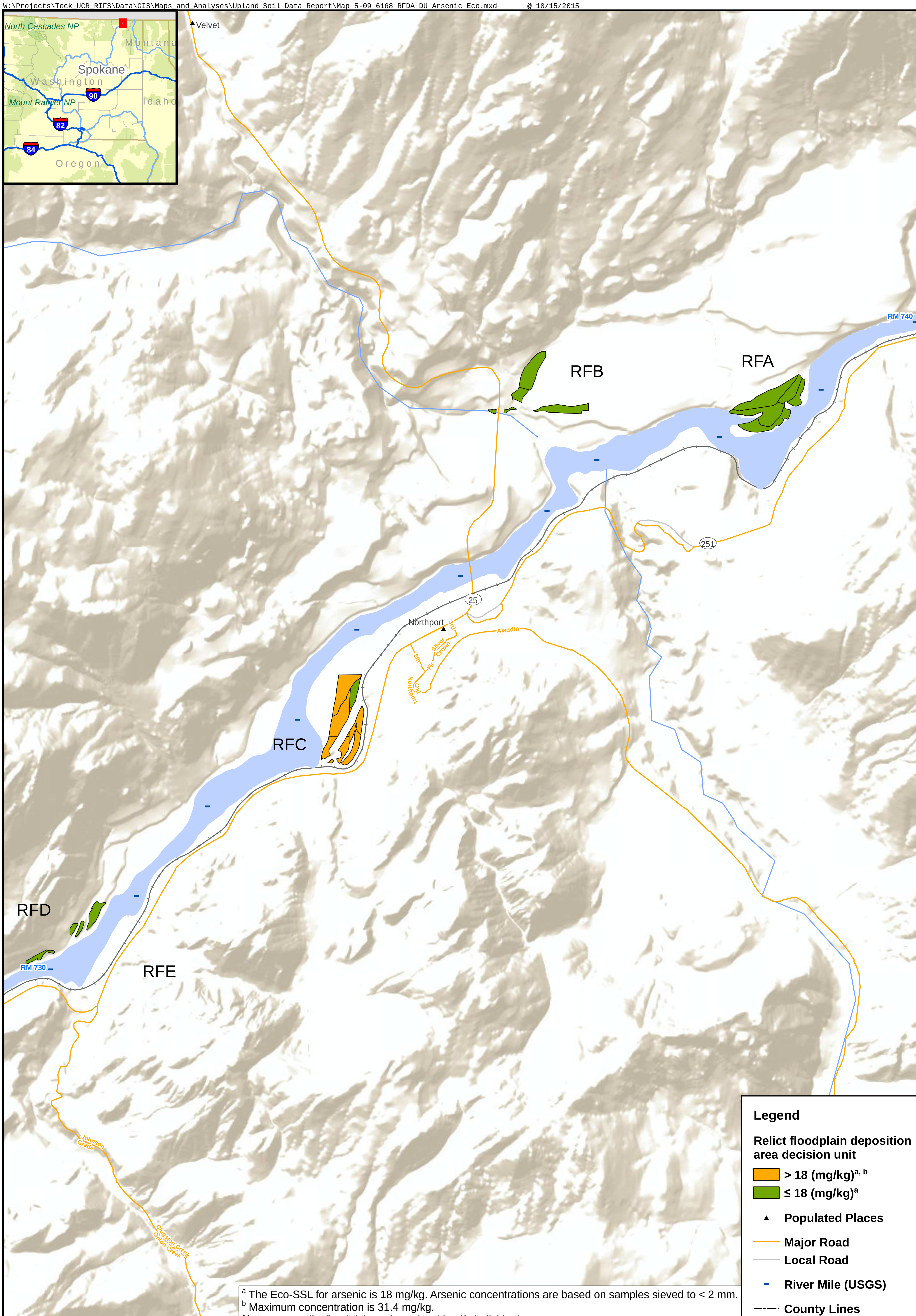
[a] The Eco-SSL for selenium is 0.52 mg/kg. Selenium concentrations are based on samples sieved to < 2 mm.
[b] Maximimum concentration is 3.32 mg/kg.

Windward environmental LLC

Map 5-8. **Spatial Distribution of Selenium Concentrations in the < 2-mm Fraction of Soil Collected from the Aerial Deposition Areas**

Upper Columbia River, WA

W:\Projects\Teck_UCR_RIFS\Data\GIS\Maps_and_Analyses\Upland Soil Data Report\Map 5-09 6168 RFDA DU Arsenic Eco.mxd @ 10/15/2015



[a] The Eco-SSL for arsenic is 18 mg/kg. Arsenic concentrations are based on samples sieved to < 2 mm.
[b] Maximum concentration is 31.4 mg/kg.
Note: RF - relict floodplain; A through E identify individual areas

Wind Ward environmental LLC

0 0.5 1 Km

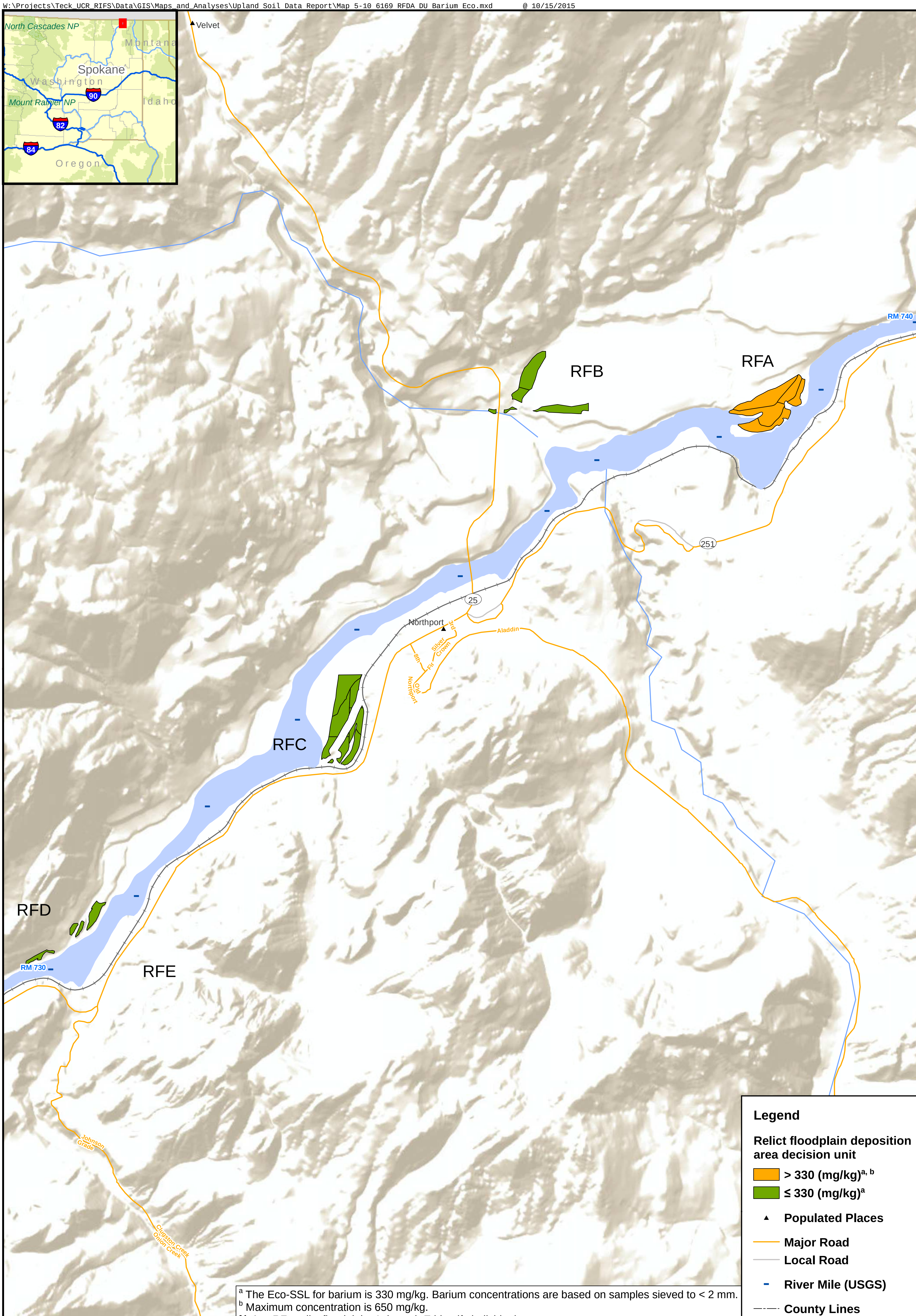
0 0.5 1 Miles

N

Map 5-9. **Spatial Distribution of Arsenic Concentrations in the < 2-mm Fraction of Soil Collected from the Relict Floodplain Deposition Areas**

Upper Columbia River, WA

W:\Projects\Teck_UCR_RIFS\Data\GIS\Maps_and_Analyses\Upland Soil Data Report\Map 5-10 6169 RFDA DU Barium Eco.mxd @ 10/15/2015



[a] The Eco-SSL for barium is 330 mg/kg. Barium concentrations are based on samples sieved to < 2 mm.
[b] Maximum concentration is 650 mg/kg.
Note: RF - relict floodplain; A through E identify individual areas

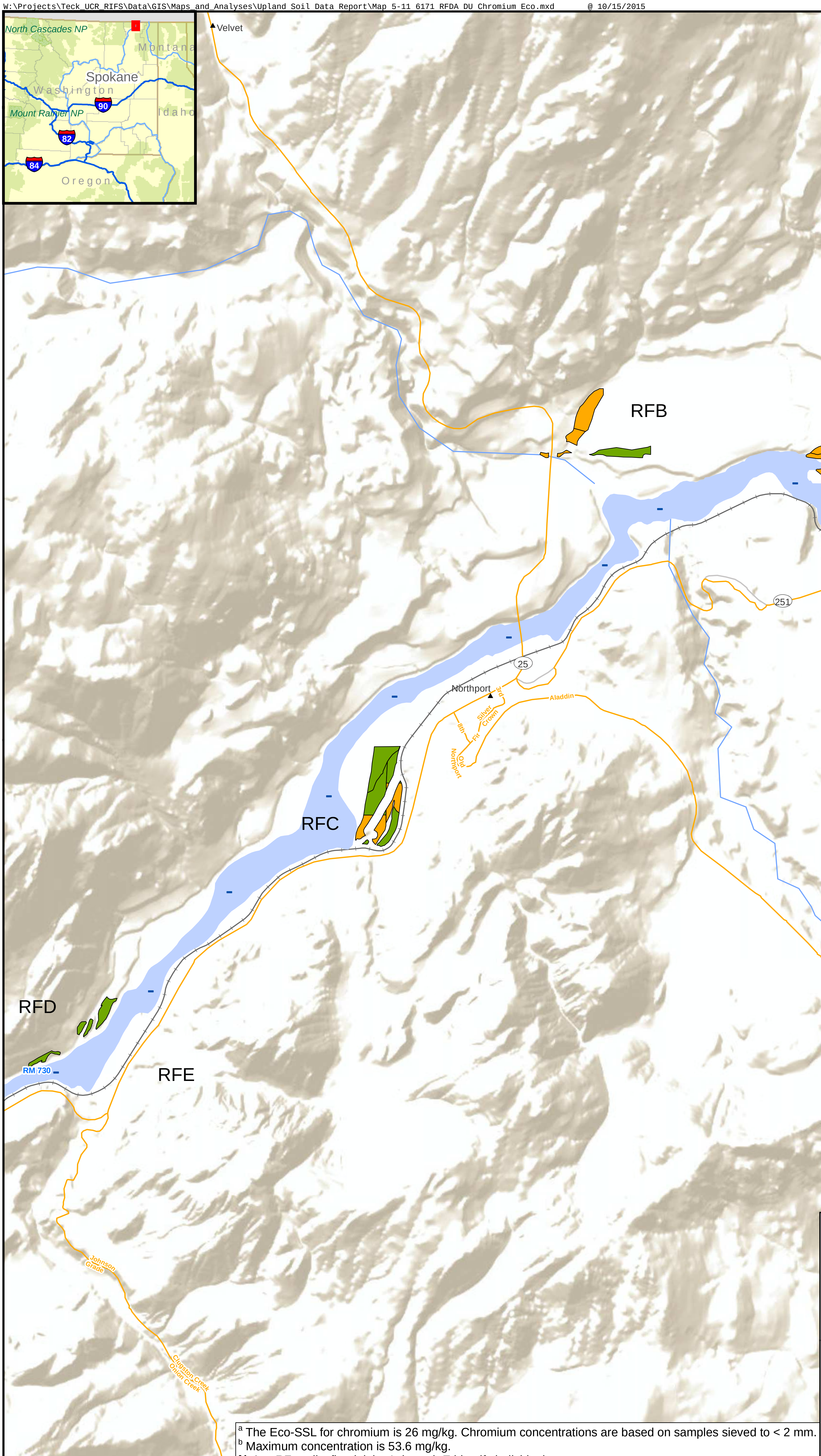
Windward environmental LLC

Km 0 0.5 1
Miles 0 0.5 1

N

Map 5-10. **Spatial Distribution of Barium Concentrations in the < 2-mm Fraction of Soil Collected from the Relict Floodplain Deposition Areas**
Upper Columbia River, WA

W:\Projects\Teck_UCR_RIFS\Data\GIS\Maps_and_Analyses\Upland Soil Data Report\Map 5-11 6171 RFDA DU Chromium Eco.mxd @ 10/15/2015



Legend

Relict floodplain deposition area decision unit

- **> 26 (mg/kg)[a, b]**
- **≤ 26 (mg/kg)[a]**
- **Populated Places**
- **Major Road**
- **Local Road**
- **River Mile (USGS)**
- **County Lines**

[a] The Eco-SSL for chromium is 26 mg/kg. Chromium concentrations are based on samples sieved to < 2 mm.
[b] Maximum concentration is 53.6 mg/kg.
Note: RF - relict floodplain; A through E identify individual areas

Windward environmental LLC

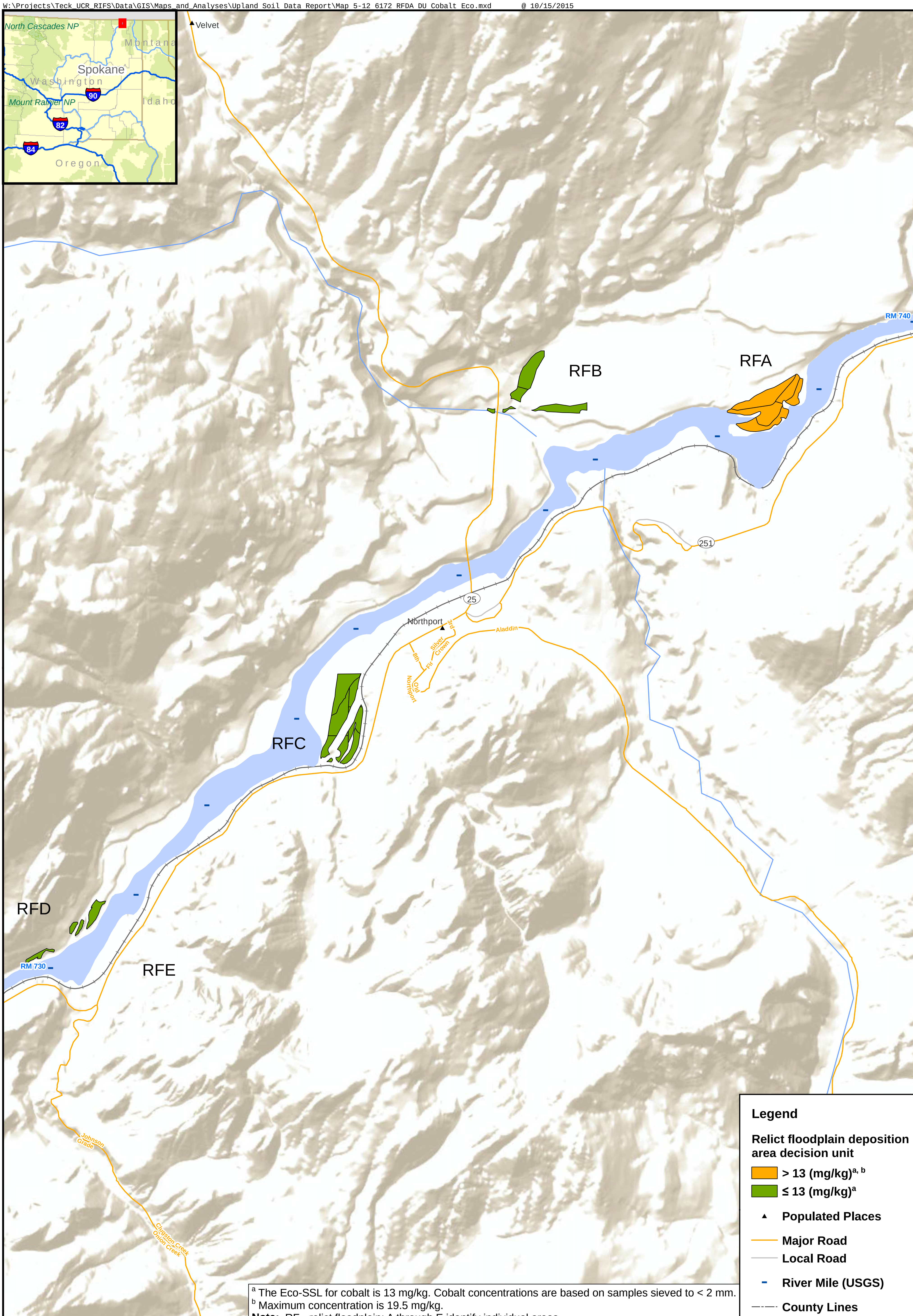
0 0.5 1 Km

0 0.5 1 Miles

N

Map 5-11. **Spatial Distribution of Chromium Concentrations in the < 2-mm Fraction of Soil Collected from the Relict Floodplain Deposition Areas**
Upper Columbia River, WA

W:\Projects\Teck_UCR_RIFS\Data\GIS\Maps_and_Analyses\Upland Soil Data Report\Map 5-12 6172 RFDA DU Cobalt Eco.mxd @ 10/15/2015



Windward environmental LLC

Km 0 0.5 1

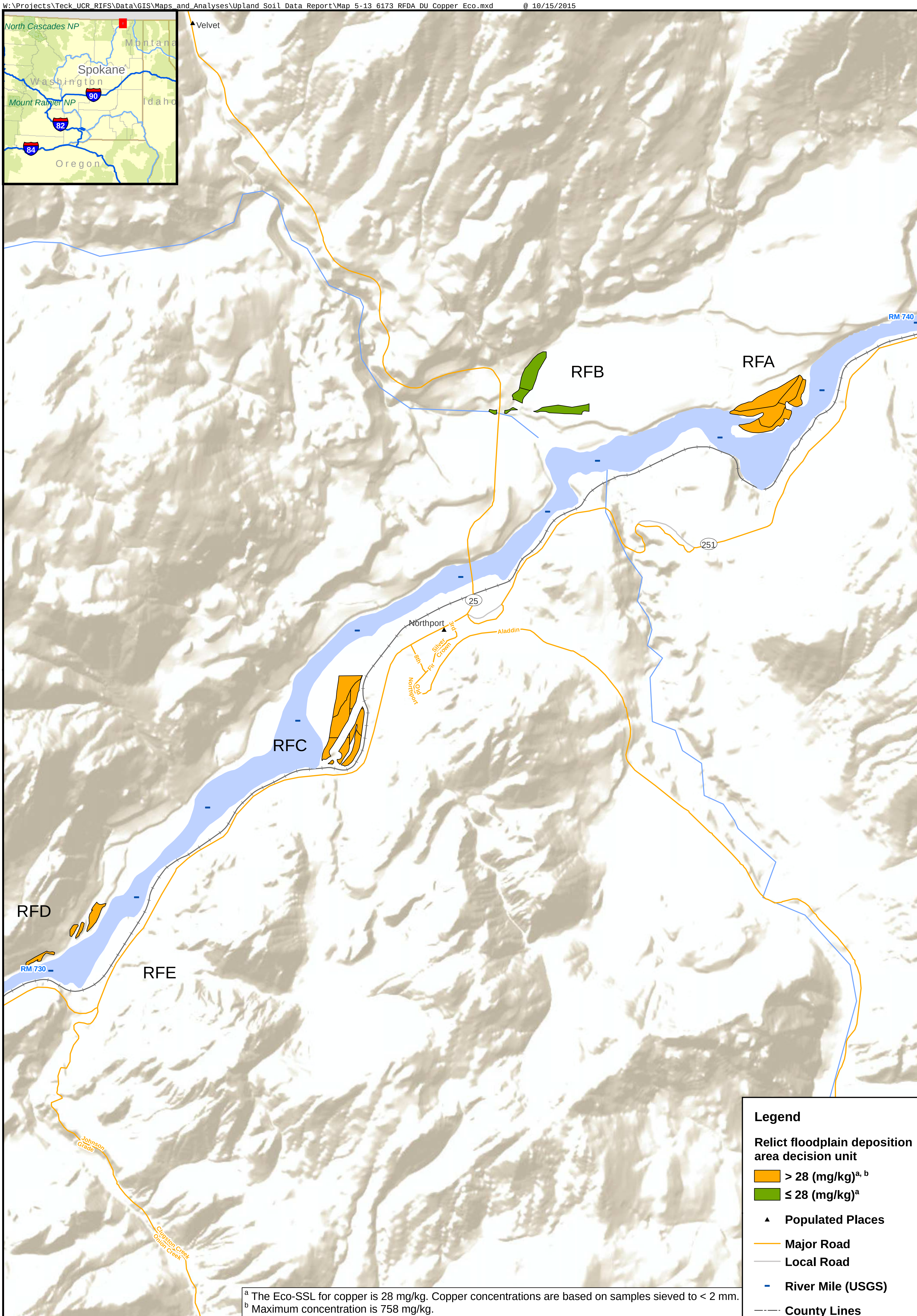
Miles 0 0.5 1

N

Map 5-12. **Spatial Distribution of Cobalt Concentrations in the < 2-mm Fraction of Soil Collected from the Relict Floodplain Deposition Areas**

Upper Columbia River, WA

W:\Projects\Teck_UCR_RIFS\Data\GIS\Maps_and_Analyses\Upland Soil Data Report\Map 5-13 6173 RFDA DU Copper Eco.mxd @ 10/15/2015



[a] The Eco-SSL for copper is 28 mg/kg. Copper concentrations are based on samples sieved to < 2 mm.

[b] Maximum concentration is 758 mg/kg.

Note: RF - relict floodplain; A through E identify individual areas

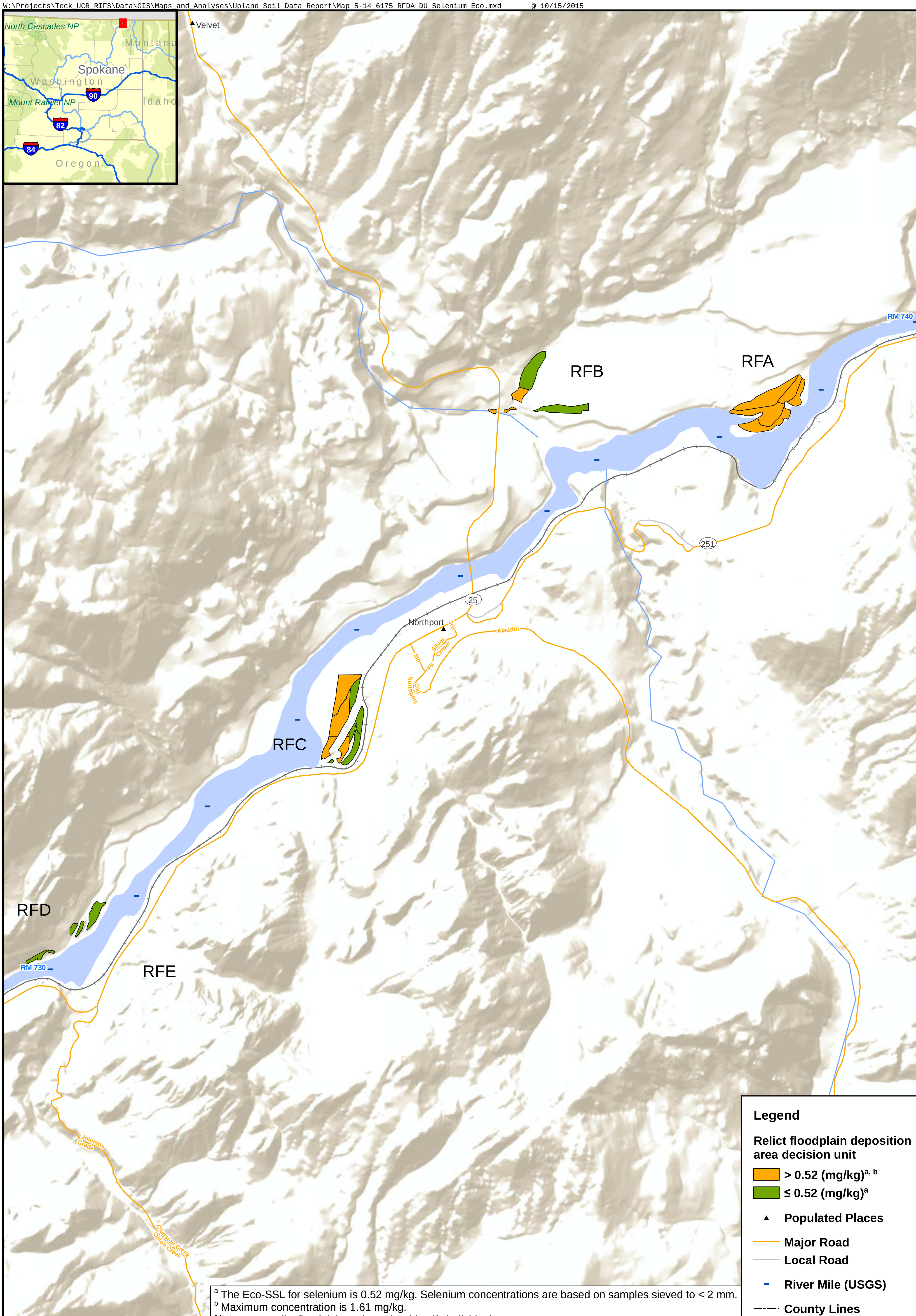
Windward environmental LLC

Km: 0, 0.5, 1
Miles: 0, 0.5, 1
N

Map 5-13. **Spatial Distribution of Copper Concentrations in the < 2-mm Fraction of Soil Collected from the Relict Floodplain Deposition Areas**

Upper Columbia River, WA

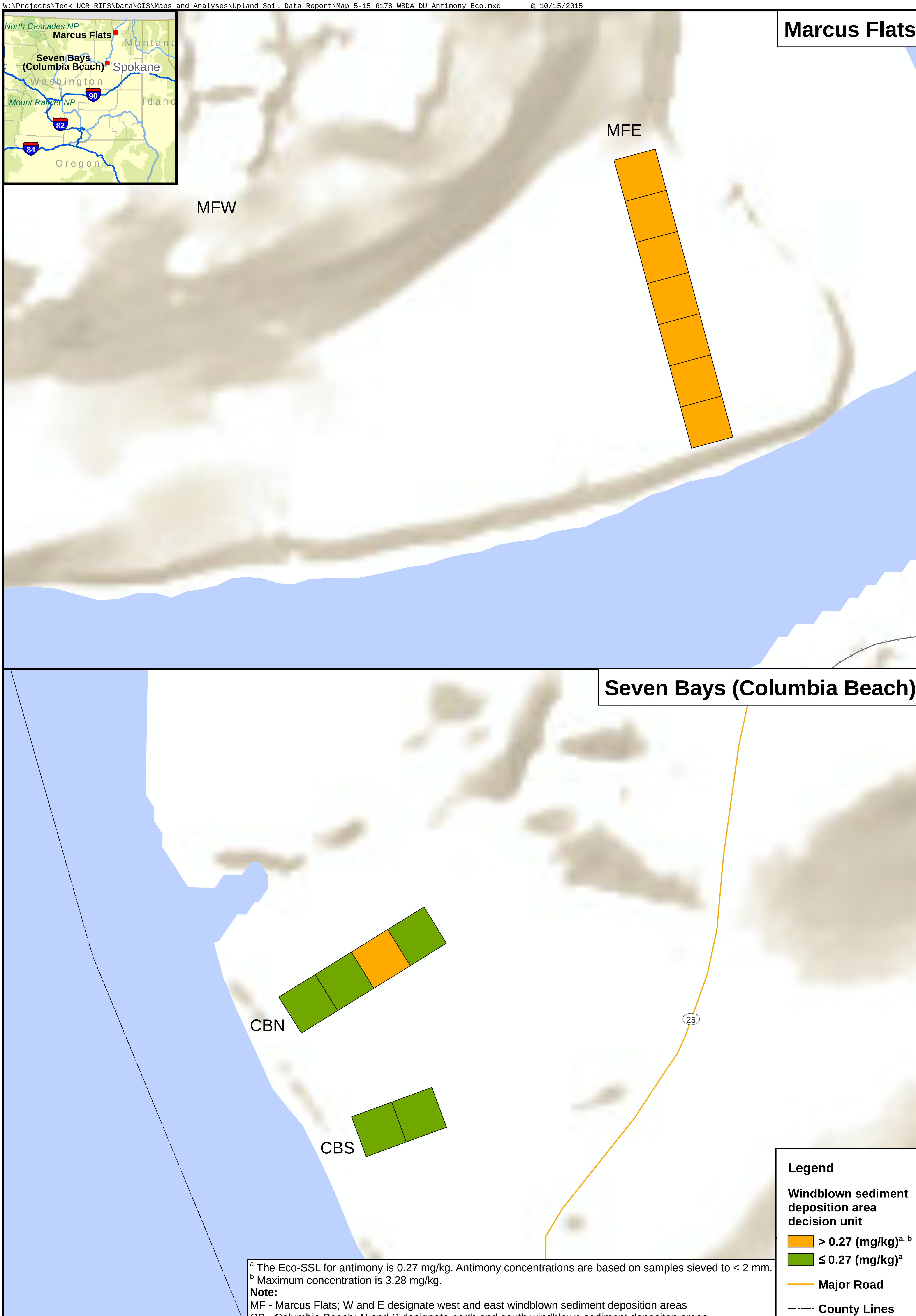
W:\Projects\Teck_UCR_RIFS\Data\GIS\Maps_and_Analyses\Upland Soil Data Report\Map 5-14 6175 RFDA DU Selenium Eco.mxd @ 10/15/2015



Windward environmental LLC

0 0.5 1 Km
0 0.5 1 Miles
N

Map 5-14. **Spatial Distribution of Selenium Concentrations in the < 2-mm Fraction of Soil Collected from the Relict Floodplain Deposition Areas**
Upper Columbia River, WA



[a] The Eco-SSL for antimony is 0.27 mg/kg. Antimony concentrations are based on samples sieved to < 2 mm.
[b] Maximum concentration is 3.28 mg/kg.

Note:
MF - Marcus Flats; W and E designate west and east windblown sediment deposition areas
CB - Columbia Beach; N and S designate north and south windblown sediment depositon areas

Windward environmental LLC

Map 5-15. **Spatial Distribution of Antimony Concentrations in the < 2-mm Fraction of Soil Collected from the Windblown Sediment Deposition Areas**
Upper Columbia River, WA

W:\Projects\Teck_UCR_RIFS\Data\GIS\Maps_and_Analyses\Upland Soil Data Report\Map 5-16 6179 WSDA DU Cadmium Eco.mxd @ 10/15/2015

Legend

Windblown sediment deposition area decision unit

- > 0.36 (mg/kg)[a, b]
- ≤ 0.36 (mg/kg)[a]
- Major Road
- County Lines

[a] The Eco-SSL for cadmium is 0.36 mg/kg. Cadmium concentrations are based on samples sieved to < 2 mm.
[b] Maximum concentration is 5.01 mg/kg.

Note:
MF - Marcus Flats; W and E designate west and east windblown sediment deposition areas
CB - Columbia Beach; N and S designate north and south windblown sediment depositon areas

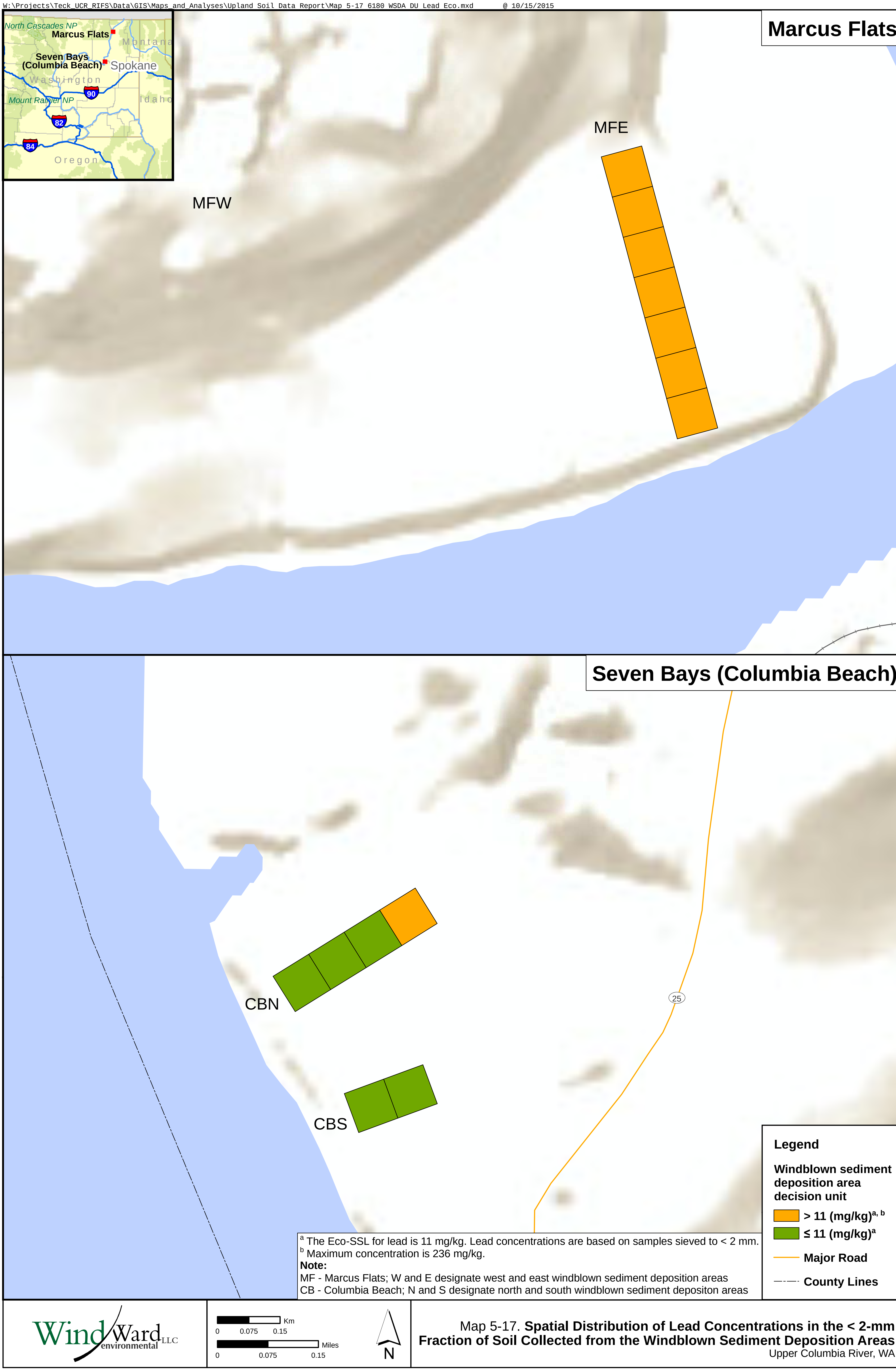
Windward environmental LLC

Km: 0 0.075 0.15
Miles: 0 0.075 0.15

N

Map 5-16. **Spatial Distribution of Cadmium Concentrations in the < 2-mm Fraction of Soil Collected from the Windblown Sediment Deposition Areas**
Upper Columbia River, WA

W:\Projects\Teck_UCR_RIFS\Data\GIS\Maps_and_Analyses\Upland Soil Data Report\Map 5-17 6180 WSDA DU Lead Eco.mxd @ 10/15/2015



[a] The Eco-SSL for lead is 11 mg/kg. Lead concentrations are based on samples sieved to < 2 mm.
[b] Maximum concentration is 236 mg/kg.

Note:

MF - Marcus Flats; W and E designate west and east windblown sediment deposition areas

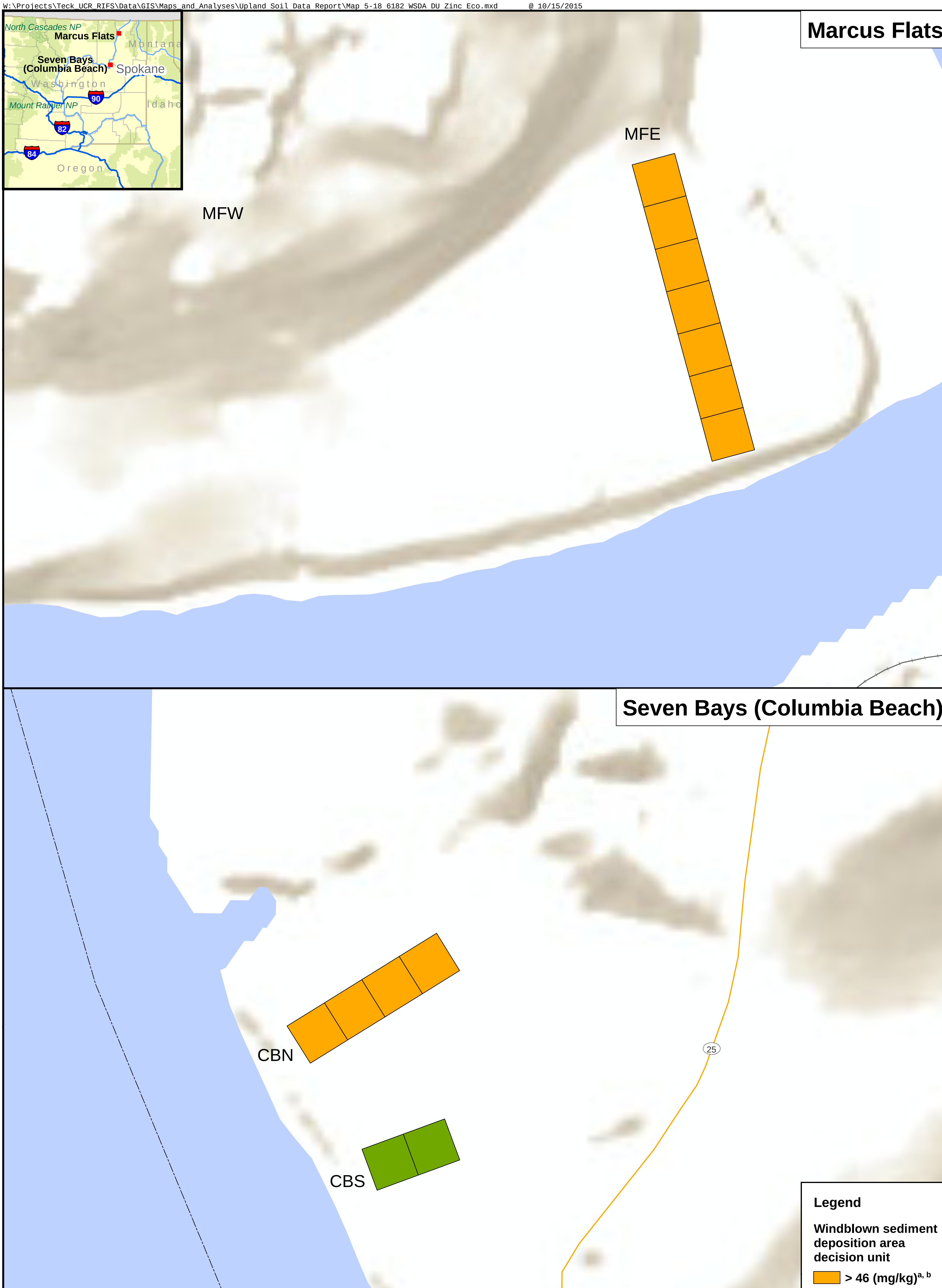
CB - Columbia Beach; N and S designate north and south windblown sediment depositon areas

Windward environmental LLC

Map 5-17. **Spatial Distribution of Lead Concentrations in the < 2-mm Fraction of Soil Collected from the Windblown Sediment Deposition Areas**

Upper Columbia River, WA

W:\Projects\Teck_UCR_RIFS\Data\GIS\Maps_and_Analyses\Upland Soil Data Report\Map 5-18 6182 WSDA DU Zinc Eco.mxd @ 10/15/2015



^a The Eco-SSL for zinc is 46 mg/kg. Zinc concentrations are based on samples sieved to < 2 mm.
^b Maximum concentration is 258 mg/kg.

Note:
MF - Marcus Flats; W and E designate west and east windblown sediment deposition areas
CB - Columbia Beach; N and S designate north and south windblown sediment depositon areas

Legend

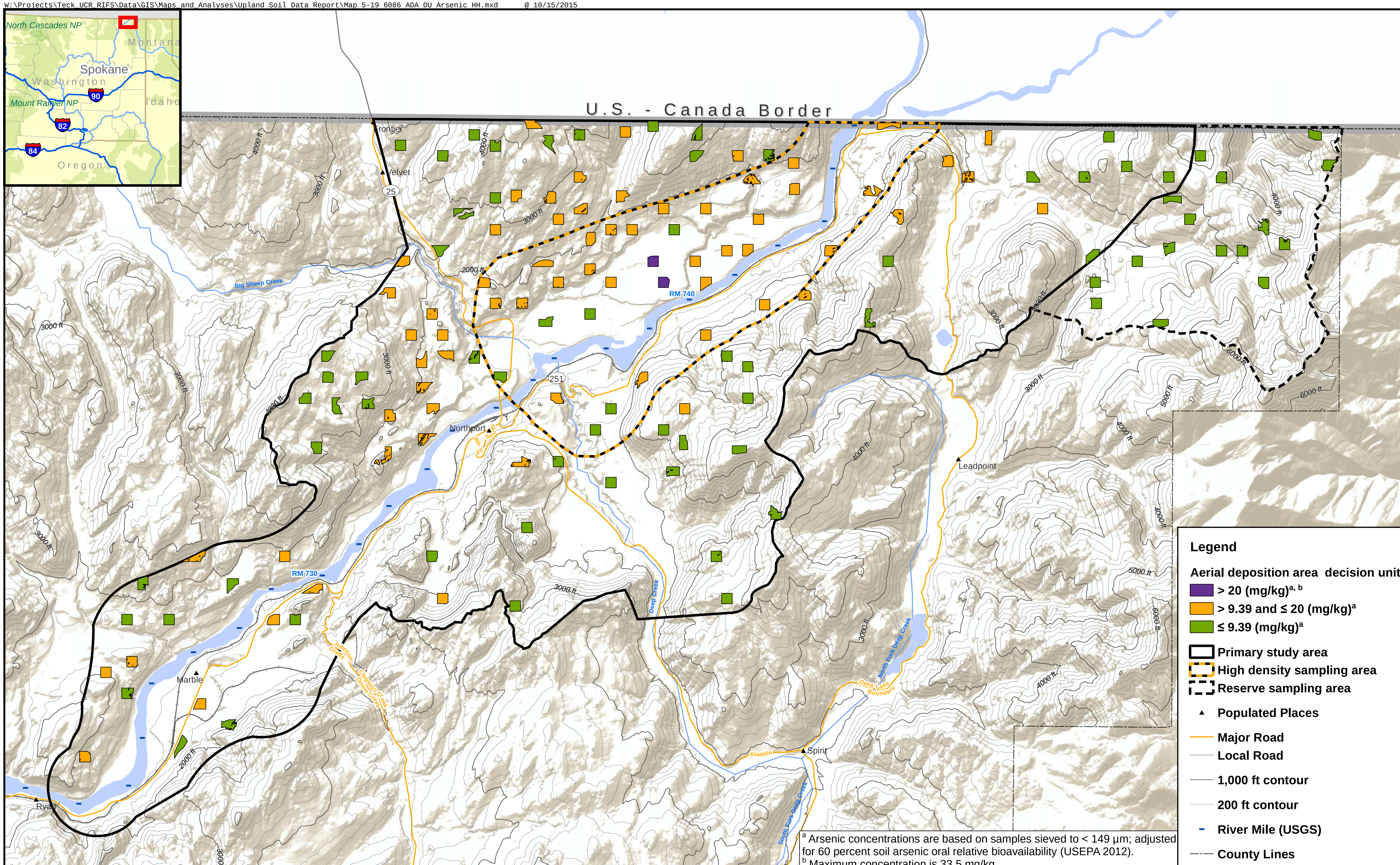
Windblown sediment deposition area decision unit
- **> 46 (mg/kg)[a, b]**
- **≤ 46 (mg/kg)[a]**
- **Major Road**
- **County Lines**

Wind Ward environmental LLC

Km: 0 0.075 0.15
Miles: 0 0.075 0.15
N

Map 5-18. **Spatial Distribution of Zinc Concentrations in the < 2-mm Fraction of Soil Collected from the Windblown Sediment Deposition Areas**
Upper Columbia River, WA

W:\Projects\Teck_UCR_RIFS\Data\GIS\Maps_and_Analyses\Upland_Soil_Data_Report\Map 5-19_6086_ADA_DU_Arsenic_HH.mxd @ 10/15/2015



Windward environmental LLC

Km 0 1 2

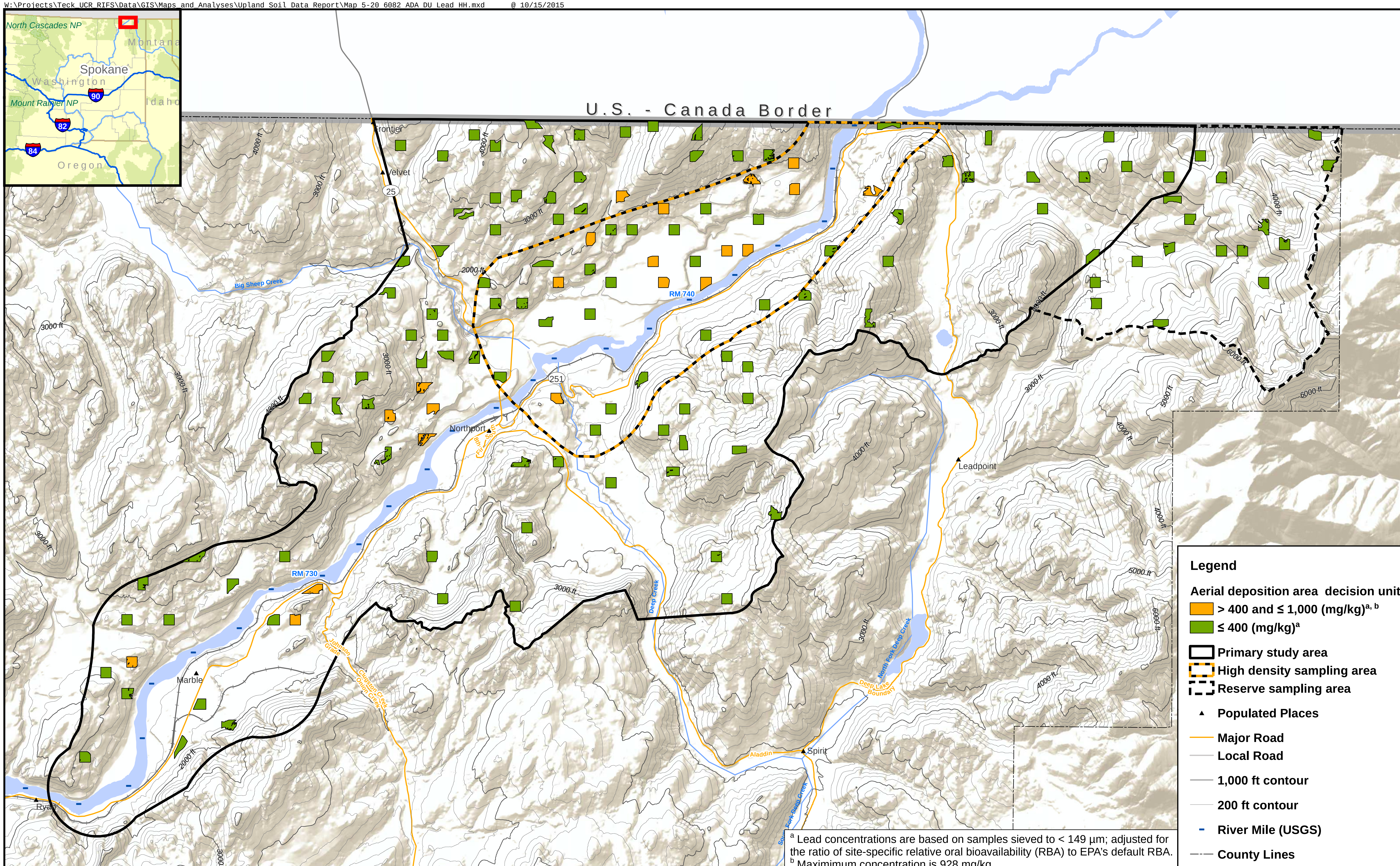
Miles 0 1 2

N

Map 5-19. **Spatial Distribution of Arsenic Concentrations in the < 149-µm Fraction of Soil Collected from the Aerial Deposition Areas**

Upper Columbia River, WA

W:\Projects\Teck_UCR_RIFS\Data\GIS\Maps_and_Analyses\Upland_Soil_Data_Report\Map 5-20_6082_ADA_DU_Lead_HH.mxd @ 10/15/2015



Windward environmental LLC

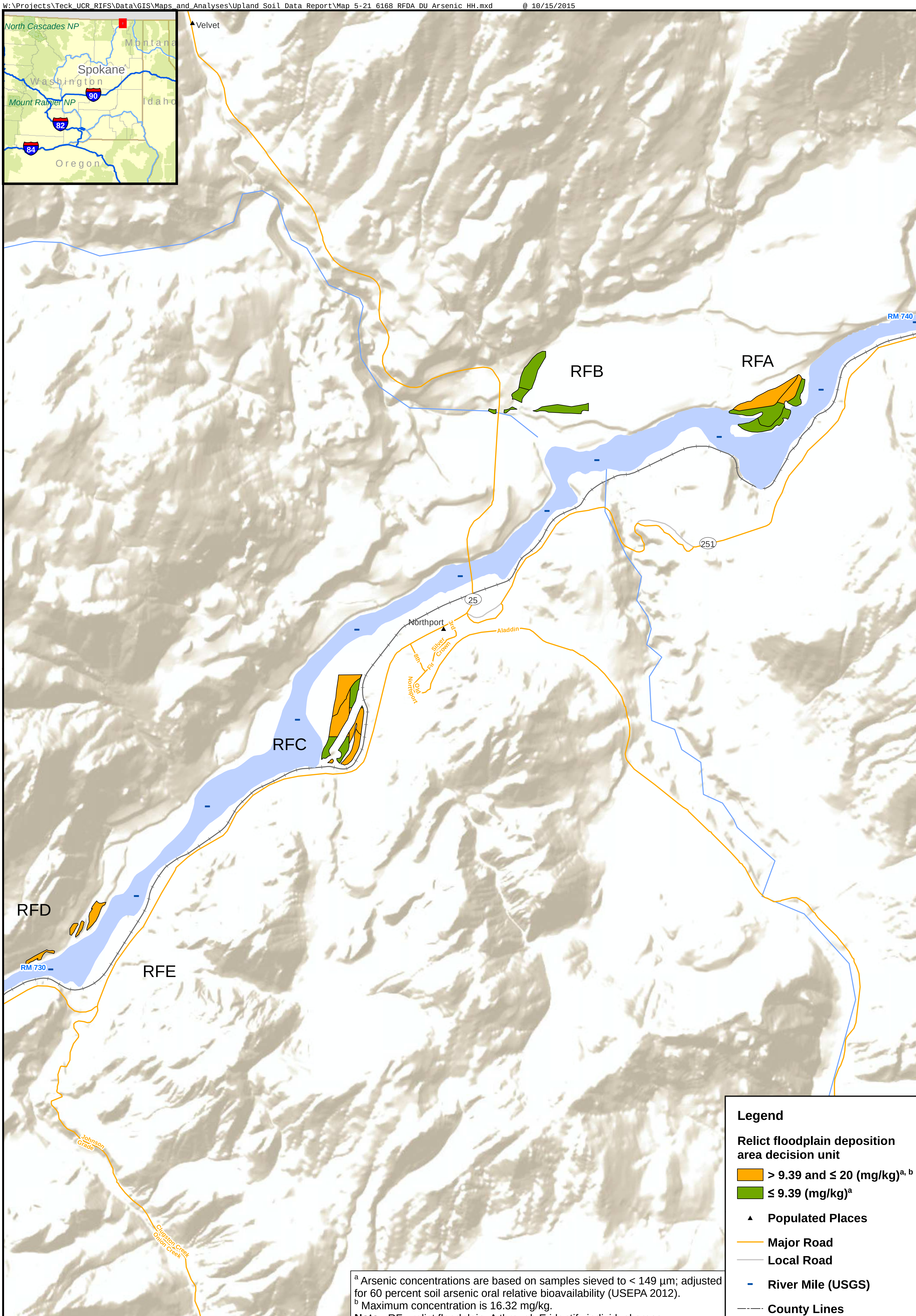
Km 0 1 2

Miles 0 1 2

N

Map 5-20. **Spatial Distribution of Lead Concentrations in the < 149-µm Fraction of Soil Collected from the Aerial Deposition Areas**

Upper Columbia River, WA



[a] Arsenic concentrations are based on samples sieved to < 149 µm; adjusted for 60 percent soil arsenic oral relative bioavailability (USEPA 2012).
[b] Maximum concentration is 16.32 mg/kg.
Note: RF - relict floodplain; A through E identify individual areas

Windward environmental LLC

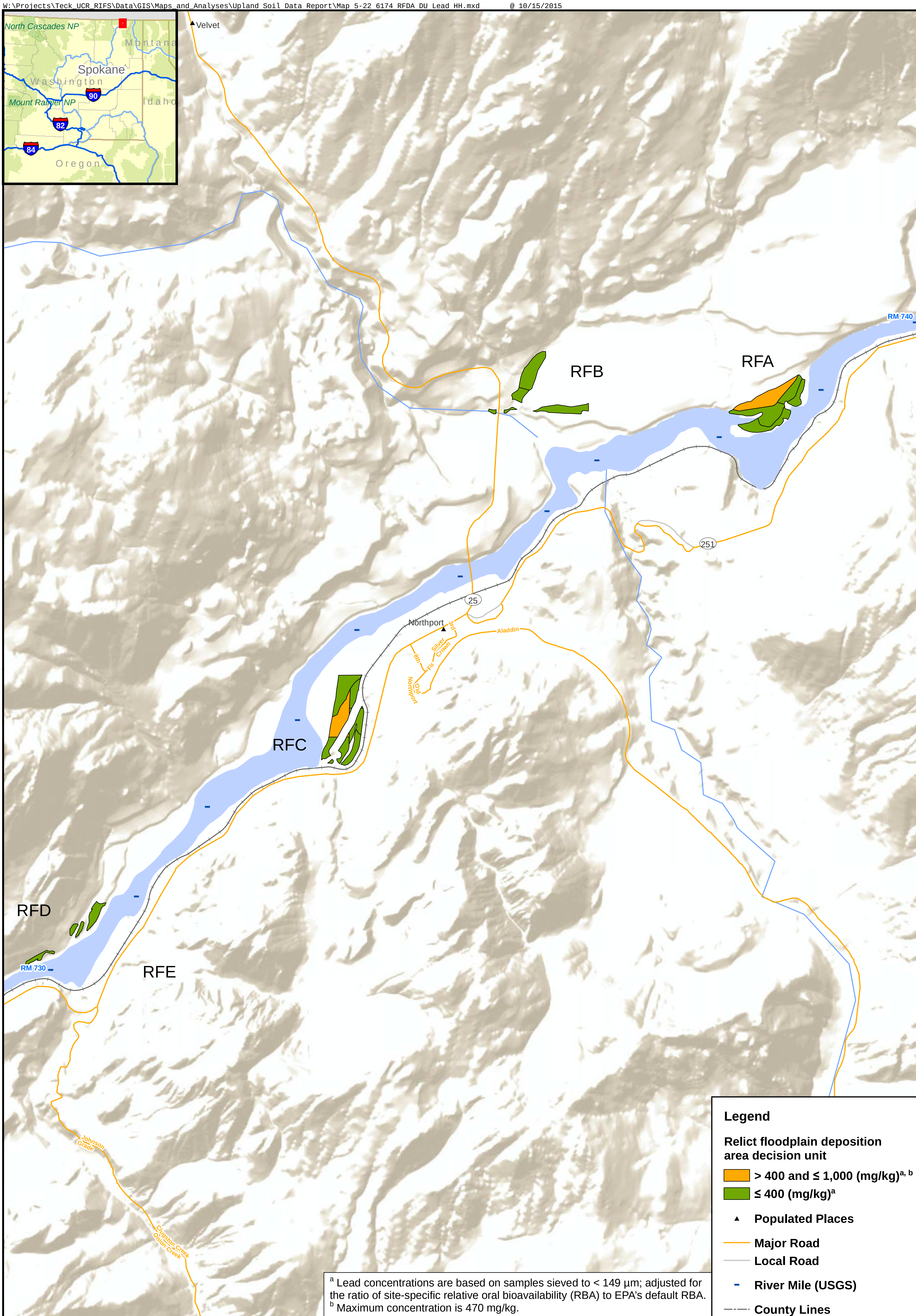
0 0.5 1 Km

0 0.5 1 Miles

N

Map 5-21. **Spatial Distribution of Arsenic Concentrations in the < 149-µm Fraction of Soil Collected from the Relict Floodplain Deposition Areas**
Upper Columbia River, WA

W:\Projects\Teck_UCR_RIFS\Data\GIS\Maps_and_Analyses\Upland Soil Data Report\Map 5-22 6174 RFDA DU Lead HH.mxd @ 10/15/2015



Legend

Relict floodplain deposition area decision unit

- **> 400 and ≤ 1,000 (mg/kg)[a, b]**
- **≤ 400 (mg/kg)[a]**
- **Populated Places**
- **Major Road**
- **Local Road**
- **River Mile (USGS)**
- **County Lines**

[a] Lead concentrations are based on samples sieved to < 149 µm; adjusted for the ratio of site-specific relative oral bioavailability (RBA) to EPA's default RBA.
[b] Maximum concentration is 470 mg/kg.
Note: RF - relict floodplain; A through E identify individual areas

Windward environmental LLC

0 0.5 1 Km
0 0.5 1 Miles
N

Map 5-22. **Spatial Distribution of Lead Concentrations in the < 149-µm Fraction of Soil Collected from the Relict Floodplain Deposition Areas**
Upper Columbia River, WA

TABLES

Table 2-1. Target Method Detection Limits and Method Reporting Limits

Analyte	Analytical Laboratory MDL	Analytical Laboratory MRL
Conventional Parameters		
CEC	NA	NA
Grain size distribution	NA	NA
Moisture content	NA	NA
Total solids (percent of whole weight)	0.01	0.01
TOC (percent)	0.02	0.05
pH	NA	NA
Metals/Metalloids (mg/kg dw)		
Aluminum	0.6	2
Antimony	0.02	0.05
Arsenic	0.2	0.5
Barium	0.02	0.05
Beryllium	0.005	0.02
Cadmium	0.009	0.02
Calcium	1	4
Chromium	0.07	0.2
Cobalt	0.009	0.02
Copper	0.04	0.1
Iron	2	4
Lead	0.02	0.05
Magnesium	0.2	2
Manganese	0.02	0.05
Mercury	0.002	0.02
Molybdenum	0.02	0.05
Nickel	0.09	0.2
Potassium	10	40
Selenium	0.07	0.2
Silver	0.005	0.02
Sodium	5	40
Thallium	0.002	0.02
Vanadium	0.08	0.2
Zinc	0.2	0.5

Notes:

Method detection limits/method reporting limits (MDLs/MRLs) are on a dry weight basis.

The MRL is provided on a dry-weight basis and assumes 50% moisture in the samples. The MRL for project samples will vary with the actual moisture content of the sample.

NA - not applicable, no MDL or MRL available for this method

CEC - cation exchange capacity

TOC - total organic carbon

Table 2-2. Summary of Target Sampling Locations

Sampling Area	Number of Target DUs
ADA	
High-density	39[a]
Primary	103[b]
Reserve	16
Total	142[c]
RFDA	
RFA	5
RFB	9
RFC	8
RFD	3
RFE	4
Total	29
WSDA	
Columbia Beach North	7
Columbia Beach South	7
Marcus Flats East	7
Marcus Flats West	7
Total	28
All Areas	
Total	199

Notes:

[a] In addition to the target DUs in the high-density ADA, an additional 7 DUs were designated as reserve DUs to be used in the event that a target DU was unavailable for sampling.

[b] In addition to the target DUs in the primary ADA, an additional 19 DUs were designated as reserve DUs to be used in the event that a target DU was unavailable for sampling.

[c] The 16 DUs in the reserve area are not included in the total number of target DUs.

ADA - aerial depostion area

DU - decision unit

RFDA - relict flood plain deposition area

RFA, RFB, RFC, RFD, RFE - relict flood plain deposition areas A, B, C, D, and E

WSDA - windblown sediment deposition area

Table 3-1. Summary of Sampling Locations

Sampling Area	Number of DUs Sampled	Number of DUs Sampled for QC by Type			
		EPA Split	Field Split	Triplicate	Field Equipment Rinsate Blanks
ADA					
High-density	35	10	6	6	6
Primary	91	17	10	8	10
Reserve	16	0	2	2	0
RFDA					
RFA	5	2	1	1	1
RFB	3	0	0	1	1
RFC	6	0	1	1	1
RFD	2	0	0	1	1
RFE	0	0	0	0	0
WSDA					
Columbia Beach North	4	2	1	1	1
Columbia Beach South	2	0	0	0	0
Marcus Flats East	7	1	1	1	1
Marcut Flats West	0	0	0	0	0
All Areas					
Total	171	32	22	22	22

Notes:

ADA - areal deposition area

DU - decision unit

EPA - U.S. Environmental Protection Agency

QC - quality control

RFDA - relict flood plain deposition area

RFA, RFB, RFC, RFD - relict flood plain deposition areas A, B, C, and D

WSDA - windblown sediment deposition area

Table 3-2. Summary of Total Samples Collected in the Field

Sampling Area	Number of DUs Sampled	Number of Triplicate Samples Per Sampling Area	Total Number of Samples Per Sampling Area
ADA			
High-density	35	18	47
Primary	91	24	107
Reserve	16	6	20
Total	142	48	174
RFDA			
RFA	5	3	7
RFB	3	3	5
RFC	6	3	8
RFD	2	3	4
RFE	0	0	0
Total	16	12	24
WSDA			
Columbia Beach North	4	3	6
Columbia Beach South	2	0	2
Marcus Flats East	7	3	9
Marcus Flats West	0	0	0
Total	13	6	17
All Areas			
Total	171	66	215

Notes:

ADA - areal deposition area

DU - decision unit

RFDA - relict flood plain deposition area

RFA, RFB, RFC, RFD - relict flood plain depositional areas A, B, C, and D

WSDA - windblown sediment deposition area

Table 3-3a. Aerial Deposition Area Planned and Sampled Decision Units

DU	Sampled?	Reserve DU?	Collection Date	Increments Sampled	QC Samples Collected	Comments	X Coordinate[a]	Y Coordinate[a]
High-density								
ADA-123	No	No	ns	ns		No access	ns	ns
ADA-124	Yes	No	10/4-10/5/2014	90	Soil triplicate, EPA split		445930.85	5418412.10
ADA-125	Yes	No	10/23/2014	30	EPA split		446414.68	5419058.76
ADA-126	Yes	No	9/12/2014	30	EPA split		444790.43	5419389.35
ADA-127	Yes	No	10/15/2014	30			447387.57	5419964.38
ADA-128	Yes	No	10/3/2014	30			443076.44	5420042.99
ADA-129	No	No	ns	ns		No access	ns	ns
ADA-130	No	Yes	ns	ns		No access	ns	ns
ADA-131	Yes	Yes	9/19/2014	90	Soil triplicate, EPA split		449312.85	5421241.76
ADA-132	Yes	No	9/16/2014	30	Field split		444488.36	5421679.27
ADA-133	Yes	No	9/24/2014	30			442921.06	5422266.30
ADA-134	No	No	ns	ns		No access	ns	ns
ADA-135	Yes	Yes	9/18/2014	90	Soil triplicate		445774.68	5421960.23
ADA-136	Yes	No	9/11/2014	30	EPA split		443716.50	5422241.23
ADA-137	No	No	ns	ns		No access	ns	ns
ADA-138	No	No	ns	ns		No access	ns	ns
ADA-139	Yes	No	10/14/2014	30			451060.27	5422224.62
ADA-140	Yes	No	9/16/2014	30			449270.55	5422882.66
ADA-141	Yes	No	9/23/2014	30	Field split		442596.58	5422858.29
ADA-142	Yes	No	9/25/2014	30			444830.00	5422890.11
ADA-143	Yes	No	9/15/2014	30			446410.86	5422879.56
ADA-144	Yes	No	9/30/2014	30	EPA split		448020.85	5422887.43
ADA-145	Yes	No	9/24/2014	30			444382.50	5423458.64
ADA-146	Yes	No	10/3/2014	30			445773.07	5423271.65
ADA-147	Yes	No	9/30/2014	30			447710.68	5423527.46
ADA-148	Yes	No	10/6/2014	30	EPA split		448959.94	5423535.21
ADA-149	No	No	ns	ns		No access	ns	ns
ADA-150	Yes	No	10/7/2014	30			449934.27	5423856.82
ADA-151	Yes	Yes	10/5/2014	30			450555.29	5423841.69
ADA-152	Yes	Yes	10/9/2014	30			453062.12	5423855.41
ADA-153	Yes	No	9/21/2014	30			445801.86	5424216.90
ADA-154	Yes	Yes	9/20-9/21/2014	90	Soil triplicate		446452.64	5424466.44
ADA-155	Yes	No	9/16/2014	30			447068.93	5424510.59
ADA-156	Yes	No	10/8/2014	30	Field split		448330.16	5424459.87
ADA-157	No	No	ns	ns		No access	ns	ns

Table 3-3a. Aerial Deposition Area Planned and Sampled Decision Units

DU	Sampled?	Reserve DU?	Collection Date	Increments Sampled	QC Samples Collected	Comments	X Coordinate[a]	Y Coordinate[a]
High-density (continued)								
ADA-158	Yes	Yes	10/7-10/8/2014	90	Soil triplicate, EPA split		450891.77	5424829.20
ADA-159	Yes	No	10/4-10/5/2014	90	Soil triplicate, EPA split		448001.19	5425158.28
ADA-160	Yes	No	10/4/2014	30			449285.64	5425128.87
ADA-161	Yes	No	10/3/2014	30	Field split		450672.59	5426008.88
ADA-162	Yes	No	10/10/2014	30	Field split		452001.67	5425721.97
ADA-163	No	No	ns	ns		No access	ns	ns
ADA-164	Yes	No	9/30/2014	30	Field split		454291.44	5425621.71
ADA-165	Yes	No	9/17/2014	30			451970.55	5426465.76
ADA-166	No	No	ns	ns		No access	ns	ns
ADA-167	No	No	ns	ns		No access	ns	ns
ADA-168	Yes	No	10/15/2014	30	EPA split		454736.09	5427633.42
Primary								
ADA-001	Yes	No	9/13/2014	30	EPA split		430454.64	5408511.52
ADA-002	Yes	No	10/10/2014	30			433403.18	5408902.29
ADA-003	No	Yes	ns	ns		No access	ns	ns
ADA-004	Yes	No	10/10/2014	30			434841.35	5409509.76
ADA-005	Yes	No	10/9/2014	30			433970.68	5410114.95
ADA-006	Yes	No	10/11/2014	30	Field split		431738.01	5410479.8
ADA-007	No	No	ns	ns		No access	ns	ns
ADA-008	Yes	No	10/12/2014	30	EPA split		431121.98	5411071.92
ADA-009	No	No	ns	ns		No access	ns	ns
ADA-010	Yes	No	10/2/2014	30			431882.23	5411419.95
ADA-011	No	Yes	ns	ns		No access	ns	ns
ADA-012	No	No	ns	ns		No access	ns	ns
ADA-013	No	Yes	ns	ns		No access	ns	ns
ADA-014	No	No	ns	ns		No access	ns	ns
ADA-015	Yes	No	9/14/2014	30	Field split		431758.61	5412692.02
ADA-016	Yes	Yes	9/24-9/25/2014	90	Soil triplicate, EPA split		433047.91	5412676.30
ADA-017	Yes	No	10/1/2014	30			436223.22	5412670.32
ADA-018	Yes	No	10/1/2014	30			436860.07	5412665.23
ADA-019	Yes	No	10/12/2014	30			432246.75	5413794.69
ADA-020	Yes	Yes	9/13-9/14/2014	90	Soil triplicate		434933.00	5413770.79

Table 3-3a. Aerial Deposition Area Planned and Sampled Decision Units

DU	Sampled?	Reserve DU?	Collection Date	Increments Sampled	QC Samples Collected	Comments	X Coordinate[a]	Y Coordinate[a]
Primary (continued)								
ADA-021	Yes	No	10/1/2014	30			433865.15	5414541.12
ADA-022	No	No	ns	ns		No access	ns	ns
ADA-023	Yes	No	9/13/2014	90	Soil triplicate, EPA split		436536.75	5414561.05
ADA-024	Yes	No	10/1/2014	30			437401.59	5413570.48
ADA-025	Yes	No	9/18/2014	30			441302.78	5413328.80
ADA-026	Yes	No	9/17/2014	30			443474.57	5413075.78
ADA-027	No	No	na	na		No access	na	na
ADA-028	Yes	No	10/3/2014	30	EPA split		440972.65	5414580.01
ADA-029	No	No	na	na		No access	na	na
ADA-030	No	No	na	na		No access	na	na
ADA-031	No	No	na	na		No access	na	na
ADA-032	No	Yes	na	na		No access	na	na
ADA-033	Yes	No	9/24/2014	30			449613.36	5414585.04
ADA-034	Yes	No	10/10/2014	30	EPA split		449958.59	5413313.93
ADA-035	Yes	Yes	10/4/2014	30			443883.84	5415485.41
ADA-036	No	Yes	ns	ns		No access	ns	ns
ADA-037	No	No	ns	ns		No access	ns	ns
ADA-038	No	No	ns	ns		No access	ns	ns
ADA-039	Yes	No	10/1/2014	30			451394.89	5415894.16
ADA-040	No	No	ns	ns		No access	ns	ns
ADA-041	No	Yes	ns	ns		No access	ns	ns
ADA-042	Yes	No	10/9/2014	30			446424.57	5416827.09
ADA-043	Yes	No	10/4/2014	30	Field split		448286.60	5417171.67
ADA-044	Yes	No	9/18/2014	30	Field split		437517.69	5417874.07
ADA-045	Yes	No	10/9/2014	30			443775.55	5417445.40
ADA-046	Yes	No	10/2/2014	30			444800.65	5417460.34
ADA-047	Yes	No	10/1/2014	30	EPA split		439605.07	5417642.93
ADA-048	Yes	No	10/23/2014	30			448627.38	5418004.96
ADA-049	Yes	No	9/18/2014	30	EPA split		450330.43	5417827.86
ADA-050	Yes	No	10/5/2014	30			440794.62	5418192.02
ADA-051	Yes	No	10/23/2014	30		1 of the 30 coordinates not collected due to tablet issues	448031.66	5418403.88
ADA-052	Yes	No	10/3/2014	30			439725.88	5418827.27
ADA-053	Yes	Yes	10/8/2014	30			438078.38	5419121.05
ADA-054	Yes	No	10/1/2014	30			441048.01	5419092.79
ADA-055	Yes	No	10/8-10/9/2014	90	Soil triplicate, EPA split		448657.67	5419068.48

Table 3-3a. Aerial Deposition Area Planned and Sampled Decision Units

DU	Sampled?	Reserve DU?	Collection Date	Increments Sampled	QC Samples Collected	Comments	X Coordinate[a]	Y Coordinate[a]
Primary (continued)								
ADA-056	Yes	No	9/16/2014	30			437163.92	5419361.96
ADA-057	Yes	No	10/8/2014	30			439041.12	5419194.04
ADA-058	Yes	No	9/20/2014	30			450578.68	5419381.02
ADA-059	Yes	No	10/7/2014	30			438831.39	5420042.20
ADA-060	Yes	No	10/6-10/7/2014	90	Soil triplicate, EPA split	1 of the 30 coordinates not collected due to tablet issues	440728.23	5419720.32
ADA-061	Yes	No	9/17/2014	30			437829.58	5420006.53
ADA-062	Yes	No	10/7/2014	30			440695.13	5420497.95
ADA-063	Yes	Yes	9/18/2014	30	Field split		450559.98	5420322.58
ADA-064	Yes	No	9/16/2014	30			437775.04	5420643.94
ADA-065	Yes	No	10/8/2014	30			441470.61	5420669.41
ADA-066	Yes	No	10/7/2014	30			442276.59	5420593.92
ADA-067	Yes	No	9/18/2014	30			449938.4	5420651.82
ADA-068	No	No	ns	ns		No access	ns	ns
ADA-069	No	No	ns	ns		No access	ns	ns
ADA-070	Yes	Yes	10/2/2014	30			440339.16	5421308.01
ADA-071	Yes	No	10/8/2014	30	EPA split		441300.44	5421267.67
ADA-072	No	No	ns	ns		No access	ns	ns
ADA-073	Yes	No	10/4/2014	30			440978.67	5421926.71
ADA-074	No	No	ns	ns		No access	ns	ns
ADA-075	No	Yes	ns	ns		No access	ns	ns
ADA-076	Yes	No	10/14/2014	30			452331.28	5422468.07
ADA-077	No	No	ns	ns		No access	ns	ns
ADA-078	Yes	Yes	9/30/2014	30			439741.01	5422599.58
ADA-079	Yes	No	10/14/2014	30	EPA split		454236.08	5421793.21
ADA-080	No	No	ns	ns		No access	ns	ns
ADA-081	Yes	No	10/8/2014	30			440149.13	5423520.90
ADA-082	Yes	No	10/4/2014	30	Field split	1 of the 30 coordinates not collected due to tablet issues	441235.76	5423892.46
ADA-083	No	No	ns	ns		DU not sampled; unsafe to access steep terrain	ns	ns
ADA-084	Yes	No	10/10/2014	30	Field split		454849.78	5423489.49
ADA-085	Yes	No	9/18/2014	30	Field split		461012.08	5423701.15
ADA-086	No	No	ns	ns		No access	ns	ns
ADA-087	No	No	ns	ns		No access	ns	ns
ADA-088	Yes	No	10/3/2014	30			442908.22	5424496.56
ADA-089	Yes	No	10/7/2014	30			444826.92	5424835.38
ADA-090	Yes	No	10/7/2014	30	Field split	1 of the 30 coordinates not collected due to tablet issues	442011.75	5424972.58
ADA-091	Yes	No	10/3/2014	30	EPA split		445538.96	5425089.27

Table 3-3a. Aerial Deposition Area Planned and Sampled Decision Units

DU	Sampled?	Reserve DU?	Collection Date	Increments Sampled	QC Samples Collected	Comments	X Coordinate[a]	Y Coordinate[a]
Primary (continued)								
ADA-092	Yes	No	10/6/2014	30			455156.03	5424892.13
ADA-093	Yes	Yes	9/17/2014	30			459485.85	5425132.23
ADA-094	Yes	Yes	10/17/2014	30	EPA split	1 of the 30 coordinates not collected due to tablet issues	442935.87	5425460.01
ADA-095	Yes	No	10/9/2014	30			443519.63	5425506.74
ADA-096	Yes	No	9/27/2014	30			444567.93	5425426.22
ADA-097	Yes	No	9/25/2014	30		2 of the 30 coordinates not collected due to tablet issues	446756.20	5425504.42
ADA-098	No	No	ns	ns		No access	ns	ns
ADA-099	Yes	Yes	10/11/2014	30			445469.14	5426068.74
ADA-100	No	Yes	na	na		No access	na	na
ADA-101	Yes	No	10/12/2014	15		15 of 30 increments not collected due to safety concerns	457234.81	5425998.13
ADA-102	Yes	No	10/9/2014	30			459162.26	5426045.50
ADA-103	Yes	No	9/26/2014	30			460746.37	5426053.11
ADA-104	Yes	No	9/20/2014	30			463360.88	5426078.09
ADA-105	Yes	No	10/11/2014	30	Field split		456630.28	5426560.54
ADA-106	Yes	No	10/16/2014	90	Soil triplicate		462060.78	5426417.34
ADA-107	Yes	No	10/2/2014	90	Soil triplicate, EPA split		441309.86	5426718.58
ADA-108	Yes	No	10/10-10/11/2014	90	Soil triplicate		448933.42	5426708.53
ADA-109	Yes	No	9/30/2014	30	EPA split		450244.43	5426703.66
ADA-110	Yes	No	9/26/2014	30		1 of the 30 coordinates not collected due to tablet issues	451220.13	5426731.61
ADA-111	Yes	No	10/7/2014	24			440003.76	5427024.60
ADA-112	Yes	No	10/17/2014	30			442278.24	5427342.19
ADA-113	Yes	No	9/20/2014	30			442900.90	5426988.87
ADA-114	Yes	No	10/6/2014	30			444059.46	5427652.87
ADA-115	Yes	No	10/18/2014	30			444533.83	5427152.76
ADA-116	Yes	No	10/9/2014	30			445443.39	5427369.29
ADA-117	Yes	No	9/30/2014	30	EPA split		446897.73	5427439.69
ADA-118	Yes	Yes	9/30/2014	30			447704.37	5427630.14
ADA-119	Yes	No	10/3/2014	30			449078.13	5427385.04
ADA-120	No	No	ns	ns		No access	ns	ns
ADA-121	Yes	No	10/15/2014	30			457851.02	5427244.43
ADA-122	Yes	No	10/11/2014	30			461532.93	5427265.77
ADA-169	Yes	Yes	9/20/2014	90	Soil triplicate		463116.51	5421657.07
ADA-170	Yes	Yes	9/23/2014	30			461139.20	5422256.53
ADA-171	Yes	Yes	9/24/2014	30			461111.06	5422860.89
ADA-172	Yes	Yes	9/30/2014	30			466221.97	5422885.95
ADA-173	Yes	Yes	9/13/2014	90	Soil triplicate		462347.18	5423522.85

Table 3-3a. Aerial Deposition Area Planned and Sampled Decision Units

DU	Sampled?	Reserve DU?	Collection Date	Increments Sampled	QC Samples Collected	Comments	X Coordinate[a]	Y Coordinate[a]
Primary (continued)								
ADA-174	Yes	Yes	9/12/2014	30	Field split		463357.73	5423907.06
ADA-175	Yes	Yes	9/16/2014	30			464902.99	5423841.07
ADA-176	Yes	Yes	9/13/2014	30			465577.16	5423872.26
ADA-177	Yes	Yes	9/17/2014	30			466824.04	5424006.60
ADA-178	Yes	Yes	9/12/2014	30			466252.63	5424581.36
ADA-179	Yes	Yes	9/19/2014	30			463941.11	5424772.17
ADA-180	Yes	Yes	9/19/2014	30	Field split		463390.86	5425403.66
ADA-181	Yes	Yes	9/13/2014	30			464924.51	5426046.15
ADA-182	Yes	Yes	10/14/2014	30			464328.05	5426703.96
ADA-183	Yes	Yes	9/12/2014	30			468128.82	5426440.83
ADA-184	Yes	Yes	9/12/2014	30			467752.89	5427343.69

Notes:

[a] Coordinates were calculated as the mean of the increment coordinates. Coordinates for decision units sampled in triplicate are from triplicate 'A'.

ADA - Aerial deposition area

DU - decision unit

EPA - U.S. Environmental Protection Agency

ns - not sampled

QC - quality control

Table 3-3b. Relict Floodplain Deposition Area Planned and Sampled Decision Units

DU	Sampled?	Reserve DU?	Collection Date	Increments Sampled	QC Samples Collected	Comments	X Coordinate[a]	Y Coordinate[a]
RFA								
RFA-001	Yes	No	9/11/2014	90	Soil triplicate, EPA split		446849.77	5421389.01
RFA-002	Yes	No	9/9/2014	30	Field split		446822.53	5421184.20
RFA-003	Yes	No	9/11/2014	30			447209.18	5421476.67
RFA-004	Yes	No	9/10/2014	30	EPA split		446882.55	5421050.59
RFA-005	Yes	No	9/9/2014	30			447290.32	5421427.34
RFB								
RFB-001	No	No	ns	ns		No access	ns	ns
RFB-002	Yes	No	9/10/2014	30			443651.34	5421384.63
RFB-003	Yes	No	9/8, 9/25/2014	90	Soil triplicate		443847.43	5421706.14
RFB-004	No	No	ns	ns		No access	ns	ns
RFB-005	No	No	ns	ns		No access	ns	ns
RFB-006	No	No	ns	ns		No access	ns	ns
RFB-007	No	No	ns	ns		No access	ns	ns
RFB-008	Yes	No	9/8/2014	30			444317.65	5421245.24
RFB-009	No	No	ns	ns		No access	ns	ns
RFC								
RFC-001	No	No	ns	ns		No access	ns	ns
RFC-002	No	No	ns	ns		No access	ns	ns
RFC-003	Yes	No	9/9/2014	30	Field split		441435.41	5417548.98
RFC-004	Yes	No	9/9/2014	30			441582.87	5417581.77
RFC-005	Yes	No	9/9, 9/25/2014	90	Soil triplicate		441406.34	5417267.81
RFC-006	Yes	No	9/11/2014	30			441613.67	5417207.39
RFC-007	Yes	No	9/10/2014	30			441350.94	5416878.35
RFC-008	Yes	No	9/9/2014	30			441541.13	5416843.18
RFD								
RFD-001	No	No	ns	ns		No access	ns	ns
RFD-002	Yes	No	9/9/2014	30			438218.77	5414719.77
RFD-003	Yes	No	10/21/2014	90	Soil triplicate		437695.27	5414337.20
RFE								
RFE-001	No	No	ns	ns		No access	ns	ns
RFE-002	No	No	ns	ns		No access	ns	ns
RFE-003	No	No	ns	ns		No access	ns	ns
RFE-004	No	No	ns	ns		No access	ns	ns

Notes:

[a] Coordinates were calculated as the mean of the increment coordinates. Coordinates for decision units sampled in triplicate are from triplicate 'A'.

DU - decision unit

ns - not sampled

QC - quality control

RFA, RFB, RFC, RFD - relict flood plain depositional areas A, B, C, and D

Table 3-3c. Windblown Sediment Deposition Area Planned and Sampled Decision Units

DU	Sampled?	Reserve DU?	Collection Date	Increments Sampled	QC Samples Collected	Comments	X Coordinate[a]	Y Coordinate[a]
Columbia Beach North								
CBN-001	Yes	No	9/23/2014	30	Field split		399620.83	5307771.2
CBN-002	Yes	No	9/24/2014	30			399711.62	5307823.61
CBN-003	Yes	No	9/24/2014	90	Soil triplicate, EPA split		399803.78	5307878.29
CBN-004	Yes	No	9/23/2014	30	EPA split		399883.97	5307920.73
CBN-005	No	No	ns	ns		No access	ns	ns
CBN-006	No	No	ns	ns		No access	ns	ns
CBN-007	No	No	ns	ns		No access	ns	ns
Columbia Beach South								
CBS-001	Yes	No	9/23/2014	30			399792.35	5307475.73
CBS-002	Yes	No	9/24/2014	30			399876.47	5307506.9
CBS-003	No	No	ns	ns		No access	ns	ns
CBS-004	No	No	ns	ns		No access	ns	ns
CBS-005	No	No	ns	ns		No access	ns	ns
CBS-006	No	No	ns	ns		No access	ns	ns
CBS-007	No	No	ns	ns		No access	ns	ns
Marcus Flats East								
MFE-001	Yes	No	9/23/2014	30	Field split		423621.35	5392249.49
MFE-002	Yes	No	9/23/2014	30			423595.26	5392357.05
MFE-003	Yes	No	9/22/2014	30	EPA split		423569.15	5392447.14
MFE-004	Yes	No	9/22/2014	30			423537.54	5392544.98
MFE-005	Yes	No	9/23/2014	30			423508.46	5392636.86
MFE-006	Yes	No	9/22/2014	30			423478.16	5392745.63
MFE-007	Yes	No	9/22/2014	90	Soil triplicate		423462.73	5392844.19
Marcus Flats West								
MFW-001	No	No	ns	ns		No access	ns	ns
MFW-002	No	No	ns	ns		No access	ns	ns
MFW-003	No	No	ns	ns		No access	ns	ns
MFW-004	No	No	ns	ns		No access	ns	ns
MFW-005	No	No	ns	ns		No access	ns	ns
MFW-006	No	No	ns	ns		No access	ns	ns
MFW-007	No	No	ns	ns		No access	ns	ns

Notes:

[a] Coordinates were calculated as the mean of the increment coordinates. Coordinates for decision units sampled in triplicate are from triplicate 'A'.

CBN - Columbia Beach North

CBS - Columbia Beach South

DU - decision unit

MFE - Marcus Flats East

MFW - Marcus Flats West

ns - not sampled

QC - quality control

Table 3-4. Soil Sample Analysis Summary

	ICS Composites									
	Bulk Soil			<2 mm Fraction				<149 µm Fraction		
Subarea	Grain Size	pH	Solids	TAL Metals + Mo	TOC	Solids	CEC	TAL Metals + Mo	Solids	IVBA Subset: TAL Metals + Mo[a]
ADA										
High-density	x	x	x	x	x	x	x	x	x	x
Primary	x	x	x	x	x	x	x	x	x	x
RFDA										
RFA	x	x	x	x	x	x	x	x	x	x
RFB	x	x	x	x	x	x	x	x	x	ns[b]
RFC	x	x	x	x	x	x	x	x	x	ns[b]
RFD	x	x	x	x	x	x	x	x	x	x
WSDA										
Columbia Beach North	x	x	x	x	x	x	x	ns[b]	ns[b]	ns[b]
Columbia Beach South	x	x	x	x	x	x	x	ns[b]	ns[b]	ns[b]
Marcus Flats East	x	x	x	x	x	x	x	ns[b]	ns[b]	ns[b]

Notes:

[a] Approximately 20 percent of the samples with lead concentrations >100 mg/kg were selected for *in vitro* bioaccessibility assay (IVBA) analysis in consultation with EPA (Appendix B). A subsample of the <149-µm soil fraction was apportioned for IVBA analysis and archived until results from the target analyte list (TAL) metals and molybdenum (Mo) analysis were completed. Soil samples for IVBA analysis were originally planned only for the analysis of lead. However, per EPA request, IVBA analysis was later expanded to include all TAL metals.

[b] No <149-µm fraction was prepared for samples collected from the wind blown sediment deposition areas (WSDAs).

ADA - Aerial deposition area

CEC - cation exchange capacity

ICS - incremental composite sampling

ns - not sampled

RFDA - relict flood plain deposition area

RFA, RFB, RFC, RFD - relict flood plain depositional areas A, B, C, and D

TOC - total organic carbon

WSDA - windblown sediment deposition area

Table 3-5. Analytical Methods for Soil Samples

Analytes	Sample Preparation		Quantitative Analysis	
	Protocol	Procedure	Protocol	Procedure
Conventional Parameters				
Grain size	NA	NA	PSEP	Sieves and pipette
pH	NA	NA	EPA 9045D	Electrometric
CEC	EPA 9080	Displacement with ammonium acetate	EPA 9080	AAS
TOC	SOP: GEN-ASTM	NA	ASTM D4129-05	Coulometric
Percent moisture	NA	NA	EPA 160.3	Gravimetric
TAL Metals/Metalloids				
Calcium (Ca), iron (Fe), magnesium (Mg), potassium (K), and sodium (Na)	EPA 3050B	Acid digestion	EPA 6010C	ICP-AES
Aluminum (Al), antimony (Sb), arsenic (As), barium (Ba), beryllium (Be), cadmium (Cd), chromium (Cr), cobalt (Co), copper (Cu), lead (Pb), manganese (Mn), nickel (Ni), selenium (Se), silver (Ag), thallium (Tl), vanadium (V), and zinc (Zn)[a]	EPA 3050B	Acid digestion	EPA 6020A	ICP-MS
Mercury (Hg) (total)	EPA 7471B	Acid digestion/oxidation	EPA 7471B	CVAA
Molybdenum (Mo)	EPA 3050B	Acid digestion	EPA 6020A	ICP-MS
Lead (Pb) bioaccessibility	EPA 9200.2-86	Glycine extraction	EPA 6010B	ICP-AES

Notes:

All methods subject to change upon consultation with the selected analytical laboratory

[a] Metals may be reported by EPA Method 6010 rather than EPA Method 6020 if the analyte concentrations are sufficiently high

AAS - atomic absorption spectrometry
AES - atomic emission spectrometry
ALS - ALS Environmental
ASTM - American Society for Testing and Materials
CEC - cation exchange capacity
CVAA - cold vapor atomic absorption spectrometry
ICP - inductively coupled plasma
MS - mass spectrometry
NA - not applicable
PSEP - Puget Sound Estuary Program
SOP: GEN-ASTM - ALS standard operating procedure
TAL - target analyte list
TOC - total organic carbon

Table 4-1a. Aerial Deposition Area Summary of Qualifiers for Bulk Soil Sample Conventional Parameter Results

Analyte	Number of Samples	Reject Results	Accepted Results	Count of Results with No Flags	Count of Accepted Results Laboratory Flags						Count of Accepted Results Validator Flags			Laboratory Flags, % of Accepted Results						Validator Flags, % of Accepted Results		
					*	H	J	N	N*	U	J	U	U*	*	H	J	N	N*	U	J	U	U*
High-density - Conventional Parameters																						
pH	53	0 (0%)	53 (100%)	0	10	43	0	0	0	0	53	0	0	19	81	0	0	0	0	100	0	0
Solids	53	0 (0%)	53 (100%)	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grain Size																						
Clay	53	0 (0%)	53 (100%)	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silt	53	0 (0%)	53 (100%)	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very fine sand	53	0 (0%)	53 (100%)	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fine sand	53	0 (0%)	53 (100%)	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium sand	53	0 (0%)	53 (100%)	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coarse sand	53	0 (0%)	53 (100%)	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very coarse sand	53	0 (0%)	53 (100%)	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very fine gravel	53	0 (0%)	53 (100%)	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fine gravel	53	0 (0%)	53 (100%)	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium gravel	53	0 (0%)	53 (100%)	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coarse gravel	53	0 (0%)	53 (100%)	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very coarse gravel	53	0 (0%)	53 (100%)	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cobbles	53	0 (0%)	53 (100%)	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Primary - Conventional Parameters																						
pH	139	0 (0%)	139 (100%)	0	29	110	0	0	0	0	135	0	0	21	79	0	0	0	0	97	0	0
Solids	139	0 (0%)	139 (100%)	139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grain Size																						
Clay	139	0 (0%)	139 (100%)	139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silt	139	0 (0%)	139 (100%)	139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very fine sand	139	0 (0%)	139 (100%)	139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fine sand	139	0 (0%)	139 (100%)	139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium sand	139	0 (0%)	139 (100%)	139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coarse sand	139	0 (0%)	139 (100%)	139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very coarse sand	139	0 (0%)	139 (100%)	139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very fine gravel	139	0 (0%)	139 (100%)	139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fine gravel	139	0 (0%)	139 (100%)	139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium gravel	139	0 (0%)	139 (100%)	139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coarse gravel	139	0 (0%)	139 (100%)	139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very coarse gravel	139	0 (0%)	139 (100%)	139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cobbles	139	0 (0%)	139 (100%)	139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes:

The numbers of qualified samples (obtained from the project database) do not include laboratory QC samples, whereas the numbers of qualified samples presented in the text (obtained from the data validator) include laboratory QC samples. Therefore, the numbers in the text and the tables are not always consistent.

Laboratory

- * The result is an outlier. See case narrative.
- H The sample was analyzed as soon as possible after collection to minimize holding time.
- J The result is an estimated value that was detected outside the quantitation range.
- N The matrix spike sample recovery is not within control limits. See case narrative.
- U The analyte was analyzed for, but was not detected ("Non-detect") at or above the method reporting limit/method detection limit (MRL/MDL).

Validator

- J Quantitation is approximate due to limitations identified during the QA review (data validation).
- U This analyte was not detected at or above the associated detection limit.
- U* This analyte should be considered "not-detected" because it was detected in an associated blank at a similar level.

Table 4-1b. Aerial Deposition Area Summary of Qualifiers for < 2-mm Fraction Metals and Conventional Parameter Results

Analyte	Number of Samples	Reject Results	Accepted Results	Count of Results with No Flags	Count of Accepted Results Laboratory Flags						Count of Accepted Results Validator Flags			Laboratory Flags, % of Accepted Results						Validator Flags, % of Accepted Results		
					*	H	J	N	N*	U	J	U	U*	*	H	J	N	N*	U	J	U	U*
High-density - Conventional Parameters																						
CEC	53	0 (0%)	53 (100%)	49	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	8	0	0
Organic carbon	53	0 (0%)	53 (100%)	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solids	53	0 (0%)	53 (100%)	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
High-density - Metals/Metalloids																						
Aluminum	53	0 (0%)	53 (100%)	46	3	0	0	0	0	0	7	0	0	6	0	0	0	0	0	13	0	0
Antimony	53	0 (0%)	53 (100%)	0	0	0	0	48	5	0	53	0	0	0	0	0	91	9	0	100	0	0
Arsenic	53	0 (0%)	53 (100%)	51	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	4	0	0
Barium	53	0 (0%)	53 (100%)	49	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	8	0	0
Beryllium	53	0 (0%)	53 (100%)	36	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	32	0	0
Cadmium	53	0 (0%)	53 (100%)	45	0	0	0	8	0	0	8	0	0	0	0	0	15	0	0	15	0	0
Calcium	53	0 (0%)	53 (100%)	49	2	0	0	0	0	0	4	0	0	4	0	0	0	0	0	8	0	0
Chromium	53	0 (0%)	53 (100%)	47	0	0	0	4	0	0	6	0	0	0	0	0	8	0	0	11	0	0
Cobalt	53	0 (0%)	53 (100%)	51	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	4	0	0
Copper	53	0 (0%)	53 (100%)	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron	53	0 (0%)	53 (100%)	48	5	0	0	0	0	0	3	0	0	9	0	0	0	0	0	6	0	0
Lead	53	0 (0%)	53 (100%)	51	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	4	0	0
Magnesium	53	0 (0%)	53 (100%)	49	3	0	0	0	0	0	4	0	0	6	0	0	0	0	0	8	0	0
Manganese	53	0 (0%)	53 (100%)	47	6	0	0	0	0	0	6	0	0	11	0	0	0	0	0	11	0	0
Mercury	53	0 (0%)	53 (100%)	50	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	6	0	0
Molybdenum	53	0 (0%)	53 (100%)	51	1	0	0	0	0	0	2	0	0	2	0	0	0	0	0	4	0	0
Nickel	53	0 (0%)	53 (100%)	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potassium	53	0 (0%)	53 (100%)	48	0	0	0	2	3	0	5	0	0	0	0	0	4	6	0	9	0	0
Selenium	53	0 (0%)	53 (100%)	46	0	0	7	0	0	0	7	0	0	0	0	13	0	0	0	13	0	0
Silver	53	0 (0%)	53 (100%)	52	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0	0
Sodium	53	0 (0%)	53 (100%)	46	0	0	2	0	0	0	4	0	3	0	0	4	0	0	0	8	0	6
Thallium	53	0 (0%)	53 (100%)	46	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	13	0	0
Vanadium	53	0 (0%)	53 (100%)	51	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	4	0	0
Zinc	53	0 (0%)	53 (100%)	49	0	0	0	4	0	0	4	0	0	0	0	0	8	0	0	8	0	0
Primary - Conventional Parameters																						
CEC	139	0 (0%)	139 (100%)	113	0	0	0	0	0	0	26	0	0	0	0	0	0	0	0	19	0	0
Organic carbon	139	0 (0%)	139 (100%)	137	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	1	0	0
Solids	139	0 (0%)	139 (100%)	139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Primary - Metals/Metalloids																						
Aluminum	139	0 (0%)	139 (100%)	133	2	0	0	0	0	0	6	0	0	1	0	0	0	0	0	4	0	0
Antimony	139	0 (0%)	139 (100%)	0	0	0	0	134	5	0	139	0	0	0	0	0	96	4	0	100	0	0
Arsenic	139	0 (0%)	139 (100%)	139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barium	139	0 (0%)	139 (100%)	124	0	0	0	14	0	0	15	0	0	0	0	0	10	0	0	11	0	0
Beryllium	139	0 (0%)	139 (100%)	87	0	0	0	0	0	0	52	0	0	0	0	0	0	0	0	37	0	0
Cadmium	139	0 (0%)	139 (100%)	125	0	0	0	14	0	0	14	0	0	0	0	0	10	0	0	10	0	0
Calcium	139	0 (0%)	139 (100%)	136	3	0	0	0	0	0	3	0	0	2	0	0	0	0	0	2	0	0
Chromium	139	0 (0%)	139 (100%)	131	0	0	0	1	7	0	8	0	0	0	0	0	1	5	0	6	0	0
Cobalt	139	0 (0%)	139 (100%)	139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Copper	139	0 (0%)	139 (100%)	139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron	139	0 (0%)	139 (100%)	134	5	0	0	0	0	0	2	0	0	4	0	0	0	0	0	1	0	0
Lead	139	0 (0%)	139 (100%)	131	0	0	0	8	0	0	8	0	0	0	0	0	6	0	0	6	0	0
Magnesium	139	0 (0%)	139 (100%)	121	2	0	0	0	0	0	18	0	0	1	0	0	0	0	0	13	0	0
Manganese	139	0 (0%)	139 (100%)	131	8	0	0	0	0	0	8	0	0	6	0	0	0	0	0	6	0	0
Mercury	139	0 (0%)	139 (100%)	138	0	0	1	0	0	0	1	0	0	0	0	1	0	0	0	1	0	0
Molybdenum	139	0 (0%)	139 (100%)	118	19	0	0	0	0	0	21	0	0	14	0	0	0	0	0	15	0	0
Nickel	139	0 (0%)	139 (100%)	139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potassium	139	0 (0%)	139 (100%)	134	0	0	0	3	2	0	5	0	0	0	0	0	2	1	0	4	0	0

Table 4-1b. Aerial Deposition Area Summary of Qualifiers for < 2-mm Fraction Metals and Conventional Parameter Results

Analyte	Number of Samples	Reject Results	Accepted Results	Count of Results with No Flags	Count of Accepted Results Laboratory Flags						Count of Accepted Results Validator Flags			Laboratory Flags, % of Accepted Results						Validator Flags, % of Accepted Results		
					*	H	J	N	N*	U	J	U	U*	*	H	J	N	N*	U	J	U	U*
Primary - Metals/Metalloids (continued)																						
Selenium	139	0 (0%)	139 (100%)	114	0	0	25	0	0	0	25	0	0	0	0	18	0	0	0	18	0	0
Silver	139	0 (0%)	139 (100%)	126	0	0	0	0	0	0	13	0	0	0	0	0	0	0	0	9	0	0
Sodium	139	0 (0%)	139 (100%)	105	0	0	0	0	0	0	21	0	13	0	0	0	0	0	0	15	0	9
Thallium	139	0 (0%)	139 (100%)	120	0	0	0	0	0	0	19	0	0	0	0	0	0	0	0	14	0	0
Vanadium	139	0 (0%)	139 (100%)	139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zinc	139	0 (0%)	139 (100%)	135	0	0	0	4	0	0	4	0	0	0	0	0	3	0	0	3	0	0

Notes:

The numbers of qualified samples (obtained from the project database) do not include laboratory QC samples, whereas the numbers of qualified samples presented in the text (obtained from the data validator) include laboratory QC samples. Therefore, the numbers in the text and the tables are not always consistent.

CEC - cation exchange capacity

Laboratory

* The result is an outlier. See case narrative.
H The sample was analyzed as soon as possible after collection to minimize holding time.
J The result is an estimated value that was detected outside the quantitation range.
N The matrix spike sample recovery is not within control limits. See case narrative.
U The analyte was analyzed for, but was not detected ("Non-detect") at or above the method reporting limit/method detection limit (MRL/MDL).

Validator

J Quantitation is approximate due to limitations identified during the QA review (data validation).
U This analyte was not detected at or above the associated detection limit.
U* This analyte should be considered "not-detected" because it was detected in an associated blank at a similar level.

Table 4-1c. Aerial Deposition Area Summary of Qualifiers for < 149-µm Fraction Metals and Conventional Parameter Results

Analyte	Number of Samples	Reject Results	Accepted Results	Count of Results with No Flags	Count of Accepted Results Laboratory Flags						Count of Accepted Results Validator Flags			Laboratory Flags, % of Accepted Results						Validator Flags, % of Accepted Results		
					*	H	J	N	N*	U	J	U	U*	*	H	J	N	N*	U	J	U	U*
High-density - Conventional Parameters																						
Solids	53	0 (0%)	53 (100%)	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
High-density - Metals/Metalloids																						
Aluminum	53	0 (0%)	53 (100%)	46	3	0	0	0	0	0	7	0	0	6	0	0	0	0	0	13	0	0
Antimony	53	0 (0%)	53 (100%)	0	0	0	0	48	5	0	53	0	0	0	0	0	91	9	0	100	0	0
Arsenic	53	0 (0%)	53 (100%)	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barium	53	0 (0%)	53 (100%)	49	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	8	0	0
Beryllium	53	0 (0%)	53 (100%)	36	0	0	0	0	0	0	17	0	0	0	0	0	0	0	0	32	0	0
Cadmium	53	0 (0%)	53 (100%)	45	0	0	0	8	0	0	8	0	0	0	0	0	15	0	0	15	0	0
Calcium	53	0 (0%)	53 (100%)	51	2	0	0	0	0	0	2	0	0	4	0	0	0	0	0	4	0	0
Chromium	53	0 (0%)	53 (100%)	49	0	0	0	4	0	0	4	0	0	0	0	0	8	0	0	8	0	0
Cobalt	53	0 (0%)	53 (100%)	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Copper	53	0 (0%)	53 (100%)	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron	53	0 (0%)	53 (100%)	48	5	0	0	0	0	0	3	0	0	9	0	0	0	0	0	6	0	0
Lead	53	0 (0%)	53 (100%)	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Magnesium	53	0 (0%)	53 (100%)	49	3	0	0	0	0	0	4	0	0	6	0	0	0	0	0	8	0	0
Manganese	53	0 (0%)	53 (100%)	47	6	0	0	0	0	0	6	0	0	11	0	0	0	0	0	11	0	0
Mercury	53	0 (0%)	53 (100%)	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Molybdenum	53	0 (0%)	53 (100%)	51	1	0	0	0	0	0	2	0	0	2	0	0	0	0	0	4	0	0
Nickel	53	0 (0%)	53 (100%)	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potassium	53	0 (0%)	53 (100%)	48	0	0	0	2	3	0	5	0	0	0	0	0	4	6	0	9	0	0
Selenium	53	0 (0%)	53 (100%)	48	0	0	5	0	0	0	5	0	0	0	0	9	0	0	0	9	0	0
Silver	53	0 (0%)	53 (100%)	52	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	2	0	0
Sodium	53	0 (0%)	53 (100%)	49	0	0	0	0	0	0	2	0	2	0	0	0	0	0	0	4	0	4
Thallium	53	0 (0%)	53 (100%)	46	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	13	0	0
Vanadium	53	0 (0%)	53 (100%)	53	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zinc	53	0 (0%)	53 (100%)	49	0	0	0	4	0	0	4	0	0	0	0	0	8	0	0	8	0	0
Primary - Conventional Parameters																						
Solids	139	0 (0%)	139 (100%)	139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Primary - Metals/Metalloids																						
Aluminum	139	0 (0%)	139 (100%)	133	2	0	0	0	0	0	6	0	0	1	0	0	0	0	0	4	0	0
Antimony	139	0 (0%)	139 (100%)	0	0	0	0	134	5	0	139	0	0	0	0	0	96	4	0	100	0	0
Arsenic	139	0 (0%)	139 (100%)	139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barium	139	0 (0%)	139 (100%)	124	0	0	0	14	0	0	15	0	0	0	0	0	10	0	0	11	0	0
Beryllium	139	0 (0%)	139 (100%)	88	0	0	0	0	0	0	51	0	0	0	0	0	0	0	0	37	0	0
Cadmium	139	0 (0%)	139 (100%)	125	0	0	0	14	0	0	14	0	0	0	0	0	10	0	0	10	0	0
Calcium	139	0 (0%)	139 (100%)	136	3	0	0	0	0	0	3	0	0	2	0	0	0	0	0	2	0	0
Chromium	139	0 (0%)	139 (100%)	131	0	0	0	1	7	0	8	0	0	0	0	0	1	5	0	6	0	0
Cobalt	139	0 (0%)	139 (100%)	139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Copper	139	0 (0%)	139 (100%)	139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron	139	0 (0%)	139 (100%)	134	5	0	0	0	0	0	2	0	0	4	0	0	0	0	0	1	0	0
Lead	139	0 (0%)	139 (100%)	131	0	0	0	8	0	0	8	0	0	0	0	0	6	0	0	6	0	0
Magnesium	139	0 (0%)	139 (100%)	123	2	0	0	0	0	0	16	0	0	1	0	0	0	0	0	12	0	0
Manganese	139	0 (0%)	139 (100%)	131	8	0	0	0	0	0	8	0	0	6	0	0	0	0	0	6	0	0
Mercury	139	0 (0%)	139 (100%)	139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Molybdenum	139	0 (0%)	139 (100%)	120	19	0	0	0	0	0	19	0	0	14	0	0	0	0	0	14	0	0
Nickel	139	0 (0%)	139 (100%)	139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potassium	139	0 (0%)	139 (100%)	134	0	0	0	3	2	0	5	0	0	0	0	0	2	1	0	4	0	0
Selenium	139	0 (0%)	139 (100%)	112	0	0	27	0	0	0	27	0	0	0	0	19	0	0	0	19	0	0
Silver	139	0 (0%)	139 (100%)	126	0	0	0	0	0	0	13	0	0	0	0	0	0	0	0	9	0	0
Sodium	139	0 (0%)	139 (100%)	109	0	0	0	0	0	0	21	0	9	0	0	0	0	0	0	15	0	6

Table 4-1c. Aerial Deposition Area Summary of Qualifiers for < 149-µm Fraction Metals and Conventional Parameter Results

Analyte	Number of Samples	Reject Results	Accepted Results	Count of Results with No Flags	Count of Accepted Results Laboratory Flags						Count of Accepted Results Validator Flags			Laboratory Flags, % of Accepted Results						Validator Flags, % of Accepted Results		
					*	H	J	N	N*	U	J	U	U*	*	H	J	N	N*	U	J	U	U*
Primary - Metals/Metalloids (continued)																						
Thallium	139	0 (0%)	139 (100%)	120	0	0	0	0	0	0	19	0	0	0	0	0	0	0	0	14	0	0
Vanadium	139	0 (0%)	139 (100%)	139	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zinc	139	0 (0%)	139 (100%)	135	0	0	0	4	0	0	4	0	0	0	0	0	3	0	0	3	0	0

Notes:

The numbers of qualified samples (obtained from the project database) do not include laboratory QC samples, whereas the numbers of qualified samples presented in the text (obtained from the data validator) include laboratory QC samples. Therefore, the numbers in the text and the tables are not always consistent.

Laboratory

* * The result is an outlier. See case narrative.
* H The sample was analyzed as soon as possible after collection to minimize holding time.
* J The result is an estimated value that was detected outside the quantitation range.
* N The matrix spike sample recovery is not within control limits. See case narrative.
* U The analyte was analyzed for, but was not detected ("Non-detect") at or above the method reporting limit/method detection limit (MRL/MDL).

Validator

* J Quantitation is approximate due to limitations identified during the QA review (data validation).
* U This analyte was not detected at or above the associated detection limit.
* U* This analyte should be considered "not-detected" because it was detected in an associated blank at a similar level.

Table 4-2a. Relict Floodplain Deposition Area Summary of Qualifiers for Bulk Soil Sample Conventional Parameter Results

Analyte	Number of Samples	Reject Results	Accepted Results	Count of Results with No Flags	Count of Accepted Results Laboratory Flags						Count of Accepted Results Validator Flags			Laboratory Flags, % of Accepted Results						Validator Flags, % of Accepted Results		
					*	H	J	N	N*	U	J	U	U*	*	H	J	N	N*	U	J	U	U*
RFA - Conventional Parameters																						
pH	8	0 (0%)	8 (100%)	0	3	5	0	0	0	0	8	0	0	38	63	0	0	0	0	100	0	0
Solids	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grain Size																						
Clay	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silt	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very fine sand	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fine sand	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium sand	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coarse sand	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very coarse sand	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very fine gravel	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fine gravel	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium gravel	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coarse gravel	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very coarse gravel	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cobbles	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RFB - Conventional Parameters																						
pH	5	0 (0%)	5 (100%)	0	2	3	0	0	0	0	5	0	0	40	60	0	0	0	0	100	0	0
Solids	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grain Size																						
Clay	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silt	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very fine sand	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fine sand	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium sand	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coarse sand	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very coarse sand	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very fine gravel	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fine gravel	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium gravel	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coarse gravel	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very coarse gravel	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cobbles	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RFC - Conventional Parameters																						
pH	9	0 (0%)	9 (100%)	0	5	4	0	0	0	0	9	0	0	56	44	0	0	0	0	100	0	0
Solids	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grain Size																						
Clay	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silt	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very fine sand	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fine sand	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium sand	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coarse sand	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very coarse sand	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very fine gravel	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fine gravel	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium gravel	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coarse gravel	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very coarse gravel	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cobbles	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 4-2a. Relict Floodplain Deposition Area Summary of Qualifiers for Bulk Soil Sample Conventional Parameter Results

Analyte	Number of Samples	Reject Results	Accepted Results	Count of Results with No Flags	Count of Accepted Results Laboratory Flags						Count of Accepted Results Validator Flags			Laboratory Flags, % of Accepted Results						Validator Flags, % of Accepted Results		
					*	H	J	N	N*	U	J	U	U*	*	H	J	N	N*	U	J	U	U*
RFD - Conventional Parameters																						
pH	4	0 (0%)	4 (100%)	0	1	3	0	0	0	0	4	0	0	25	75	0	0	0	0	100	0	0
Solids	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grain Size																						
Clay	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silt	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very fine sand	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fine sand	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium sand	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coarse sand	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very coarse sand	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very fine gravel	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fine gravel	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium gravel	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coarse gravel	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very coarse gravel	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cobbles	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes:

The numbers of qualified samples (obtained from the project database) do not include laboratory QC samples, whereas the numbers of qualified samples presented in the text (obtained from the data validator) include laboratory QC samples. Therefore, the numbers in the text and the tables are not always consistent.

RFA, RFB, RFC, RFD - relict flood plain depositional areas A, B, C, and D

Laboratory

- * The result is an outlier. See case narrative.
- H The sample was analyzed as soon as possible after collection to minimize holding time.
- J The result is an estimated value that was detected outside the quantitation range.
- N The matrix spike sample recovery is not within control limits. See case narrative.
- U The analyte was analyzed for, but was not detected ("Non-detect") at or above the method reporting limit/method detection limit (MRL/MDL).

Validator

- J Quantitation is approximate due to limitations identified during the QA review (data validation).
- U This analyte was not detected at or above the associated detection limit.
- U* This analyte should be considered "not-detected" because it was detected in an associated blank at a similar level.

Table 4-2b. Relict Floodplain Deposition Area Summary of Qualifiers for < 2-mm Fraction Metals and Conventional Parameter Results

Analyte	Number of Samples	Reject Results	Accepted Results	Count of Results with No Flags	Count of Accepted Results Laboratory Flags						Count of Accepted Results Validator Flags			Laboratory Flags, % of Accepted Results						Validator Flags, % of Accepted Results		
					*	H	J	N	N*	U	J	U	U*	*	H	J	N	N*	U	J	U	U*
RFA - Conventional Parameters																						
CEC	8	0 (0%)	8 (100%)	5	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	38	0	0
Organic carbon	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solids	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RFA - Metals/Metalloids																						
Aluminum	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Antimony	8	0 (0%)	8 (100%)	0	0	0	0	8	0	0	8	0	0	0	0	0	100	0	0	100	0	0
Arsenic	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barium	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beryllium	8	0 (0%)	8 (100%)	3	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	63	0	0
Cadmium	8	0 (0%)	8 (100%)	5	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	38	0	0
Calcium	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chromium	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cobalt	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Copper	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lead	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Magnesium	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manganese	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mercury	8	0 (0%)	8 (100%)	3	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	63	0	0
Molybdenum	8	0 (0%)	8 (100%)	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	100	0	0
Nickel	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potassium	8	0 (0%)	8 (100%)	5	0	0	0	3	0	0	3	0	0	0	0	0	38	0	0	38	0	0
Selenium	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silver	8	0 (0%)	8 (100%)	5	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	38	0	0
Sodium	8	0 (0%)	8 (100%)	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	100	0	0
Thallium	8	0 (0%)	8 (100%)	3	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	63	0	0
Vanadium	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zinc	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RFB - Conventional Parameters																						
CEC	5	0 (0%)	5 (100%)	3	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	40	0	0
Organic carbon	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solids	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RFB - Metals/Metalloids																						
Aluminum	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Antimony	5	0 (0%)	5 (100%)	0	0	0	0	5	0	0	5	0	0	0	0	0	100	0	0	100	0	0
Arsenic	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barium	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beryllium	5	0 (0%)	5 (100%)	4	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	20	0	0
Cadmium	5	0 (0%)	5 (100%)	1	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	80	0	0
Calcium	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chromium	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cobalt	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Copper	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lead	5	0 (0%)	5 (100%)	2	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	60	0	0
Magnesium	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manganese	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mercury	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Molybdenum	5	0 (0%)	5 (100%)	2	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	60	0	0
Nickel	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potassium	5	0 (0%)	5 (100%)	3	0	0	0	2	0	0	2	0	0	0	0	0	40	0	0	40	0	0

Table 4-2b. Relict Floodplain Deposition Area Summary of Qualifiers for < 2-mm Fraction Metals and Conventional Parameter Results

Analyte	Number of Samples	Reject Results	Accepted Results	Count of Results with No Flags	Count of Accepted Results Laboratory Flags						Count of Accepted Results Validator Flags			Laboratory Flags, % of Accepted Results						Validator Flags, % of Accepted Results		
					*	H	J	N	N*	U	J	U	U*	*	H	J	N	N*	U	J	U	U*
RFB - Metals/Metalloids (continued)																						
Selenium	5	0 (0%)	5 (100%)	4	0	0	1	0	0	0	1	0	0	0	0	20	0	0	0	20	0	0
Silver	5	0 (0%)	5 (100%)	3	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	40	0	0
Sodium	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thallium	5	0 (0%)	5 (100%)	4	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	20	0	0
Vanadium	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zinc	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RFC - Conventional Parameters																						
CEC	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Organic carbon	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solids	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RFC - Metals/Metalloids																						
Aluminum	9	0 (0%)	9 (100%)	4	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	56	0	0
Antimony	9	0 (0%)	9 (100%)	0	0	0	0	9	0	0	9	0	0	0	0	0	100	0	0	100	0	0
Arsenic	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barium	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beryllium	9	0 (0%)	9 (100%)	7	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	22	0	0
Cadmium	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chromium	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cobalt	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Copper	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lead	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Magnesium	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manganese	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mercury	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Molybdenum	9	0 (0%)	9 (100%)	8	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	11	0	0
Nickel	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potassium	9	0 (0%)	9 (100%)	8	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	11	0	0
Selenium	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silver	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sodium	9	0 (0%)	9 (100%)	6	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	33	0	0
Thallium	9	0 (0%)	9 (100%)	8	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	11	0	0
Vanadium	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zinc	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RFD - Conventional Parameters																						
CEC	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Organic carbon	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solids	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RFD - Metals/Metalloids																						
Aluminum	4	0 (0%)	4 (100%)	3	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	25	0	0
Antimony	4	0 (0%)	4 (100%)	0	0	0	0	4	0	0	4	0	0	0	0	0	100	0	0	100	0	0
Arsenic	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barium	4	0 (0%)	4 (100%)	1	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	75	0	0
Beryllium	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cadmium	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium	4	0 (0%)	4 (100%)	1	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	75	0	0
Chromium	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cobalt	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Copper	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 4-2b. Relict Floodplain Deposition Area Summary of Qualifiers for < 2-mm Fraction Metals and Conventional Parameter Results

Analyte	Number of Samples	Reject Results	Accepted Results	Count of Results with No Flags	Count of Accepted Results Laboratory Flags						Count of Accepted Results Validator Flags			Laboratory Flags, % of Accepted Results						Validator Flags, % of Accepted Results		
					*	H	J	N	N*	U	J	U	U*	*	H	J	N	N*	U	J	U	U*
RFD - Metals/Metalloids (continued)																						
Lead	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Magnesium	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manganese	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mercury	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Molybdenum	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nickel	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potassium	4	0 (0%)	4 (100%)	3	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	25	0	0
Selenium	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silver	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sodium	4	0 (0%)	4 (100%)	3	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	25	0	0
Thallium	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vanadium	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zinc	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes:

The numbers of qualified samples (obtained from the project database) do not include laboratory QC samples, whereas the numbers of qualified samples presented in the text (obtained from the data validator) include laboratory QC samples. Therefore, the numbers in the text and the tables are not always consistent.

RFA, RFB, RFC, RFD - relict flood plain depositional areas A, B, C, and D

CEC - cation exchange capacity

Laboratory

- * The result is an outlier. See case narrative.
- H The sample was analyzed as soon as possible after collection to minimize holding time.
- J The result is an estimated value that was detected outside the quantitation range.
- N The matrix spike sample recovery is not within control limits. See case narrative.
- U The analyte was analyzed for, but was not detected ("Non-detect") at or above the method reporting limit/method detection limit (MRL/MDL).

Validator

- J Quantitation is approximate due to limitations identified during the QA review (data validation).
- U This analyte was not detected at or above the associated detection limit.
- U* This analyte should be considered "not-detected" because it was detected in an associated blank at a similar level.

Table 4-2c. Relict Floodplain Deposition Area Summary of Qualifiers for < 149-µm Fraction Metals and Conventional Parameter Results

Analyte	Number of Samples	Reject Results	Accepted Results	Count of Results with No Flags	Count of Accepted Results Laboratory Flags						Count of Accepted Results Validator Flags			Laboratory Flags, % of Accepted Results						Validator Flags, % of Accepted Results		
					*	H	J	N	N*	U	J	U	U*	*	H	J	N	N*	U	J	U	U*
RFA - Conventional Parameters																						
Solids	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RFA - Metals/Metalloids																						
Aluminum	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Antimony	8	0 (0%)	8 (100%)	0	0	0	0	8	0	0	8	0	0	0	0	0	100	0	0	100	0	0
Arsenic	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barium	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beryllium	8	0 (0%)	8 (100%)	3	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	63	0	0
Cadmium	8	0 (0%)	8 (100%)	5	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	38	0	0
Calcium	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chromium	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cobalt	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Copper	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lead	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Magnesium	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manganese	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mercury	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Molybdenum	8	0 (0%)	8 (100%)	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	100	0	0
Nickel	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potassium	8	0 (0%)	8 (100%)	5	0	0	0	3	0	0	3	0	0	0	0	0	38	0	0	38	0	0
Selenium	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silver	8	0 (0%)	8 (100%)	5	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	38	0	0
Sodium	8	0 (0%)	8 (100%)	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	100	0	0
Thallium	8	0 (0%)	8 (100%)	3	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	63	0	0
Vanadium	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zinc	8	0 (0%)	8 (100%)	8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RFB - Conventional Parameters																						
Solids	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RFB - Metals/Metalloids																						
Aluminum	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Antimony	5	0 (0%)	5 (100%)	0	0	0	0	5	0	0	5	0	0	0	0	0	100	0	0	100	0	0
Arsenic	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barium	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beryllium	5	0 (0%)	5 (100%)	4	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	20	0	0
Cadmium	5	0 (0%)	5 (100%)	3	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	40	0	0
Calcium	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chromium	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cobalt	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Copper	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lead	5	0 (0%)	5 (100%)	2	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	60	0	0
Magnesium	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manganese	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mercury	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Molybdenum	5	0 (0%)	5 (100%)	2	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	60	0	0
Nickel	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potassium	5	0 (0%)	5 (100%)	3	0	0	0	2	0	0	2	0	0	0	0	0	40	0	0	40	0	0

Table 4-2c. Relict Floodplain Deposition Area Summary of Qualifiers for < 149-µm Fraction Metals and Conventional Parameter Results

Analyte	Number of Samples	Reject Results	Accepted Results	Count of Results with No Flags	Count of Accepted Results Laboratory Flags						Count of Accepted Results Validator Flags			Laboratory Flags, % of Accepted Results						Validator Flags, % of Accepted Results		
					*	H	J	N	N*	U	J	U	U*	*	H	J	N	N*	U	J	U	U*
RFB - Metals/Metalloids (continued)																						
Selenium	5	0 (0%)	5 (100%)	4	0	0	1	0	0	0	1	0	0	0	0	20	0	0	0	20	0	0
Silver	5	0 (0%)	5 (100%)	3	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	40	0	0
Sodium	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thallium	5	0 (0%)	5 (100%)	4	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	20	0	0
Vanadium	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zinc	5	0 (0%)	5 (100%)	5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RFC - Conventional Parameters																						
Solids	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RFC - Metals/Metalloids																						
Aluminum	9	0 (0%)	9 (100%)	4	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	56	0	0
Antimony	9	0 (0%)	9 (100%)	0	0	0	0	9	0	0	9	0	0	0	0	0	100	0	0	100	0	0
Arsenic	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barium	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beryllium	9	0 (0%)	9 (100%)	7	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	22	0	0
Cadmium	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chromium	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cobalt	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Copper	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lead	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Magnesium	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manganese	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mercury	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Molybdenum	9	0 (0%)	9 (100%)	8	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	11	0	0
Nickel	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potassium	9	0 (0%)	9 (100%)	8	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	11	0	0
Selenium	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silver	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sodium	9	0 (0%)	9 (100%)	6	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	33	0	0
Thallium	9	0 (0%)	9 (100%)	8	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	11	0	0
Vanadium	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zinc	9	0 (0%)	9 (100%)	9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RFD - Conventional Parameters																						
Solids	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
RFD - Metals/Metalloids																						
Aluminum	4	0 (0%)	4 (100%)	3	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	25	0	0
Antimony	4	0 (0%)	4 (100%)	0	0	0	0	4	0	0	4	0	0	0	0	0	100	0	0	100	0	0
Arsenic	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barium	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beryllium	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cadmium	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium	4	0 (0%)	4 (100%)	1	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	75	0	0
Chromium	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cobalt	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Copper	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 4-2c. Relict Floodplain Deposition Area Summary of Qualifiers for < 149-µm Fraction Metals and Conventional Parameter Results

Analyte	Number of Samples	Reject Results	Accepted Results	Count of Results with No Flags	Count of Accepted Results Laboratory Flags						Count of Accepted Results Validator Flags			Laboratory Flags, % of Accepted Results						Validator Flags, % of Accepted Results		
					*	H	J	N	N*	U	J	U	U*	*	H	J	N	N*	U	J	U	U*
RFD - Metals/Metalloids (continued)																						
Lead	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Magnesium	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Manganese	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mercury	4	0 (0%)	4 (100%)	1	0	0	0	0	0	0	3	0	0	0	0	0	0	0	0	75	0	0
Molybdenum	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nickel	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potassium	4	0 (0%)	4 (100%)	3	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	25	0	0
Selenium	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silver	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sodium	4	0 (0%)	4 (100%)	3	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	25	0	0
Thallium	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vanadium	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zinc	4	0 (0%)	4 (100%)	4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes:

The numbers of qualified samples (obtained from the project database) do not include laboratory QC samples, whereas the numbers of qualified samples presented in the text (obtained from the data validator) include laboratory QC samples. Therefore, the numbers in the text and the tables are not always consistent.

RFA, RFB, RFC, RFD - relict flood plain depositional areas A, B, C, and D

Laboratory

* The result is an outlier. See case narrative.
H The sample was analyzed as soon as possible after collection to minimize holding time.
J The result is an estimated value that was detected outside the quantitation range.
N The matrix spike sample recovery is not within control limits. See case narrative.
U The analyte was analyzed for, but was not detected ("Non-detect") at or above the method reporting limit/method detection limit (MRL/MDL).

Validator

J Quantitation is approximate due to limitations identified during the QA review (data validation).
U This analyte was not detected at or above the associated detection limit.
U* This analyte should be considered "not-detected" because it was detected in an associated blank at a similar level.

Table 4-3a. Windblown Sediment Deposition Area Summary of Qualifiers for Bulk Soil Sample Conventional Parameter Results

Analyte	Number of Samples	Reject Results	Accepted Results	Count of Results with No Flags	Count of Accepted Results Laboratory Flags						Count of Accepted Results Validator Flags			Laboratory Flags, % of Accepted Results						Validator Flags, % of Accepted Results		
					*	H	J	N	N*	U	J	U	U*	*	H	J	N	N*	U	J	U	U*
Columbia Beach North - Conventional Parameters																						
pH	7	0 (0%)	7 (100%)	0	0	7	0	0	0	0	7	0	0	0	100	0	0	0	0	100	0	0
Solids	7	0 (0%)	7 (100%)	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grain Size																						
Clay	7	0 (0%)	7 (100%)	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silt	7	0 (0%)	7 (100%)	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very fine sand	7	0 (0%)	7 (100%)	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fine sand	7	0 (0%)	7 (100%)	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium sand	7	0 (0%)	7 (100%)	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coarse sand	7	0 (0%)	7 (100%)	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very coarse sand	7	0 (0%)	7 (100%)	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very fine gravel	7	0 (0%)	7 (100%)	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fine gravel	7	0 (0%)	7 (100%)	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium gravel	7	0 (0%)	7 (100%)	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coarse gravel	7	0 (0%)	7 (100%)	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very coarse gravel	7	0 (0%)	7 (100%)	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cobbles	7	0 (0%)	7 (100%)	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Columbia Beach South - Conventional Parameters																						
pH	2	0 (0%)	2 (100%)	0	0	2	0	0	0	0	2	0	0	0	100	0	0	0	0	100	0	0
Solids	2	0 (0%)	2 (100%)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grain Size																						
Clay	2	0 (0%)	2 (100%)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silt	2	0 (0%)	2 (100%)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very fine sand	2	0 (0%)	2 (100%)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fine sand	2	0 (0%)	2 (100%)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium sand	2	0 (0%)	2 (100%)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coarse sand	2	0 (0%)	2 (100%)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very coarse sand	2	0 (0%)	2 (100%)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very fine gravel	2	0 (0%)	2 (100%)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fine gravel	2	0 (0%)	2 (100%)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium gravel	2	0 (0%)	2 (100%)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coarse gravel	2	0 (0%)	2 (100%)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very coarse gravel	2	0 (0%)	2 (100%)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cobbles	2	0 (0%)	2 (100%)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Marcus Flats East - Conventional Parameters																						
pH	10	0 (0%)	10 (100%)	0	0	10	0	0	0	0	10	0	0	0	100	0	0	0	0	100	0	0
Solids	10	0 (0%)	10 (100%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Grain Size																						
Clay	10	0 (0%)	10 (100%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Silt	10	0 (0%)	10 (100%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very fine sand	10	0 (0%)	10 (100%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fine sand	10	0 (0%)	10 (100%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium sand	10	0 (0%)	10 (100%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coarse sand	10	0 (0%)	10 (100%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very coarse sand	10	0 (0%)	10 (100%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very fine gravel	10	0 (0%)	10 (100%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fine gravel	10	0 (0%)	10 (100%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Medium gravel	10	0 (0%)	10 (100%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Coarse gravel	10	0 (0%)	10 (100%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Very coarse gravel	10	0 (0%)	10 (100%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cobbles	10	0 (0%)	10 (100%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes:

The numbers of qualified samples (obtained from the project database) do not include laboratory QC samples, whereas the numbers of qualified samples presented in the text (obtained from the data validator) include laboratory QC samples. Therefore, the numbers in the text and the tables are not always consistent.

<u>Laboratory</u>

- * The result is an outlier. See case narrative.
- H The sample was analyzed as soon as possible after collection to minimize holding time.
- J The result is an estimated value that was detected outside the quantitation range.
- N The matrix spike sample recovery is not within control limits. See case narrative.
- U The analyte was analyzed for, but was not detected ("Non-detect") at or above the method reporting limit/method detection limit (MRL/MDL).

<u>Validator</u>

- J Quantitation is approximate due to limitations identified during the QA review (data validation).
- U This analyte was not detected at or above the associated detection limit.
- U* This analyte should be considered "not-detected" because it was detected in an associated blank at a similar level.

Table 4-3b. Windblown Sediment Deposition Area Summary of Qualifiers for < 2-mm Fraction Metals and Conventional Parameter Results

					Count of Accepted Results Laboratory Flags						Count of Accepted			Laboratory Flags, % of Accepted Results						Validator Flags, % of		
Analyte	Number of Samples	Reject Results	Accepted Results	Count of Results with No Flags	*	H	J	N	N*	U	J	U	U*	*	H	J	N	N*	U	J	U	U*
Columbia Beach North - Conventional Parameters																						
CEC	7	0 (0%)	7 (100%)	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Organic carbon	7	0 (0%)	7 (100%)	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solids	7	0 (0%)	7 (100%)	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Columbia Beach North - Metals/Metalloids																						
Aluminum	7	0 (0%)	7 (100%)	3	4	0	0	0	0	0	4	0	0	57	0	0	0	0	0	57	0	0
Antimony	7	0 (0%)	7 (100%)	0	0	0	0	3	4	0	7	0	0	0	0	0	43	57	0	100	0	0
Arsenic	7	0 (0%)	7 (100%)	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barium	7	0 (0%)	7 (100%)	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beryllium	7	0 (0%)	7 (100%)	3	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0	57	0	0
Cadmium	7	0 (0%)	7 (100%)	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium	7	0 (0%)	7 (100%)	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chromium	7	0 (0%)	7 (100%)	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cobalt	7	0 (0%)	7 (100%)	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Copper	7	0 (0%)	7 (100%)	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron	7	0 (0%)	7 (100%)	3	4	0	0	0	0	0	4	0	0	57	0	0	0	0	0	57	0	0
Lead	7	0 (0%)	7 (100%)	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Magnesium	7	0 (0%)	7 (100%)	3	4	0	0	0	0	0	4	0	0	57	0	0	0	0	0	57	0	0
Manganese	7	0 (0%)	7 (100%)	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mercury	7	0 (0%)	7 (100%)	0	0	0	7	0	0	0	7	0	0	0	0	100	0	0	0	100	0	0
Molybdenum	7	0 (0%)	7 (100%)	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nickel	7	0 (0%)	7 (100%)	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potassium	7	0 (0%)	7 (100%)	3	0	0	0	0	4	0	4	0	0	0	0	0	0	57	0	57	0	0
Selenium	7	0 (0%)	7 (100%)	0	0	0	7	0	0	0	7	0	0	0	0	100	0	0	0	100	0	0
Silver	7	0 (0%)	7 (100%)	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sodium	7	0 (0%)	7 (100%)	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thallium	7	0 (0%)	7 (100%)	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vanadium	7	0 (0%)	7 (100%)	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zinc	7	0 (0%)	7 (100%)	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Columbia Beach South - Conventional Parameters																						
CEC	2	0 (0%)	2 (100%)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Organic carbon	2	0 (0%)	2 (100%)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solids	2	0 (0%)	2 (100%)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Columbia Beach South - Metals/Metalloids																						
Aluminum	2	0 (0%)	2 (100%)	0	2	0	0	0	0	0	2	0	0	100	0	0	0	0	0	100	0	0
Antimony	2	0 (0%)	2 (100%)	0	0	0	0	0	2	0	2	0	0	0	0	0	0	100	0	100	0	0
Arsenic	2	0 (0%)	2 (100%)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barium	2	0 (0%)	2 (100%)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beryllium	2	0 (0%)	2 (100%)	0	0	0	0	0	0	0	2	0	0	0	0	0	0	0	0	100	0	0
Cadmium	2	0 (0%)	2 (100%)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium	2	0 (0%)	2 (100%)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chromium	2	0 (0%)	2 (100%)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cobalt	2	0 (0%)	2 (100%)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Copper	2	0 (0%)	2 (100%)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron	2	0 (0%)	2 (100%)	0	2	0	0	0	0	0	2	0	0	100	0	0	0	0	0	100	0	0
Lead	2	0 (0%)	2 (100%)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Magnesium	2	0 (0%)	2 (100%)	0	2	0	0	0	0	0	2	0	0	100	0	0	0	0	0	100	0	0
Manganese	2	0 (0%)	2 (100%)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mercury	2	0 (0%)	2 (100%)	0	0	0	2	0	0	0	2	0	0	0	0	100	0	0	0	100	0	0
Molybdenum	2	0 (0%)	2 (100%)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nickel	2	0 (0%)	2 (100%)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Potassium	2	0 (0%)	2 (100%)	0	0	0	0	0	2	0	2	0	0	0	0	0	0	100	0	100	0	0
Selenium	2	0 (0%)	2 (100%)	0	0	0	1	0	0	1	1	1	0	0	0	50	0	0	50	50	50	0

Table 4-3b. Windblown Sediment Deposition Area Summary of Qualifiers for < 2-mm Fraction Metals and Conventional Parameter Results

					Count of Accepted Results Laboratory Flags						Count of Accepted			Laboratory Flags, % of Accepted Results						Validator Flags, % of		
Analyte	Number of Samples	Reject Results	Accepted Results	Count of Results with No Flags	*	H	J	N	N*	U	J	U	U*	*	H	J	N	N*	U	J	U	U*
Columbia Beach South - Metals/Metalloids (continued)																						
Silver	2	0 (0%)	2 (100%)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sodium	2	0 (0%)	2 (100%)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thallium	2	0 (0%)	2 (100%)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vanadium	2	0 (0%)	2 (100%)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zinc	2	0 (0%)	2 (100%)	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Marcus Flats East - Conventional Parameters																						
CEC	10	0 (0%)	10 (100%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Organic carbon	10	0 (0%)	10 (100%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Solids	10	0 (0%)	10 (100%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Marcus Flats East - Metals/Metalloids																						
Aluminum	10	0 (0%)	10 (100%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Antimony	10	0 (0%)	10 (100%)	0	0	0	0	10	0	0	10	0	0	0	0	0	100	0	0	100	0	0
Arsenic	10	0 (0%)	10 (100%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Barium	10	0 (0%)	10 (100%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Beryllium	10	0 (0%)	10 (100%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cadmium	10	0 (0%)	10 (100%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Calcium	10	0 (0%)	10 (100%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Chromium	10	0 (0%)	10 (100%)	0	10	0	0	0	0	0	10	0	0	100	0	0	0	0	0	100	0	0
Cobalt	10	0 (0%)	10 (100%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Copper	10	0 (0%)	10 (100%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Iron	10	0 (0%)	10 (100%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Lead	10	0 (0%)	10 (100%)	0	0	0	0	10	0	0	10	0	0	0	0	0	100	0	0	100	0	0
Magnesium	10	0 (0%)	10 (100%)	0	10	0	0	0	0	0	10	0	0	100	0	0	0	0	0	100	0	0
Manganese	10	0 (0%)	10 (100%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Mercury	10	0 (0%)	10 (100%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Molybdenum	10	0 (0%)	10 (100%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Nickel	10	0 (0%)	10 (100%)	0	10	0	0	0	0	0	10	0	0	100	0	0	0	0	0	100	0	0
Potassium	10	0 (0%)	10 (100%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Selenium	10	0 (0%)	10 (100%)	6	0	0	4	0	0	0	4	0	0	0	0	40	0	0	0	40	0	0
Silver	10	0 (0%)	10 (100%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Sodium	10	0 (0%)	10 (100%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Thallium	10	0 (0%)	10 (100%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Vanadium	10	0 (0%)	10 (100%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Zinc	10	0 (0%)	10 (100%)	10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes:

The numbers of qualified samples (obtained from the project database) do not include laboratory QC samples, whereas the numbers of qualified samples presented in the text (obtained from the data validator) include laboratory QC samples. Therefore, the numbers in the text and the tables are not always consistent.

CEC - cation exchange capacity

Laboratory

- * The result is an outlier. See case narrative.
- H The sample was analyzed as soon as possible after collection to minimize holding time.
- J The result is an estimated value that was detected outside the quantitation range.
- N The matrix spike sample recovery is not within control limits. See case narrative.
- U The analyte was analyzed for, but was not detected ("Non-detect") at or above the method reporting limit/method detection limit (MRL/MDL).

Validator

- J Quantitation is approximate due to limitations identified during the QA review (data validation).
- U This analyte was not detected at or above the associated detection limit.
- U* This analyte should be considered "not-detected" because it was detected in an associated blank at a similar level.

Table 4-4. Summary of Qualifiers for IVBA Results

Analyte	Soil Fraction	Number of Samples	Rejected Results	Accepted Results	Count of Results with No Flags	Count of Accepted Results Validator Flags		Validator Flags, % of Accepted Results	
						J	NC	J	NC
ADA - High-density									
Aluminum, %	< 149-µm	11	0 (0%)	11 (100%)	10	1	0	9	0
Antimony, %	< 149-µm	11	0 (0%)	11 (100%)	0	11	0	100	0
Arsenic, %	< 149-µm	11	0 (0%)	11 (100%)	11	0	0	0	0
Barium, %	< 149-µm	11	0 (0%)	11 (100%)	11	0	0	0	0
Beryllium, %	< 149-µm	11	0 (0%)	11 (100%)	7	4	0	36	0
Cadmium, %	< 149-µm	11	0 (0%)	11 (100%)	10	1	0	9	0
Calcium, %	< 149-µm	11	0 (0%)	11 (100%)	10	1	0	9	0
Chromium, %	< 149-µm	11	0 (0%)	11 (100%)	11	0	0	0	0
Cobalt, %	< 149-µm	11	0 (0%)	11 (100%)	11	0	0	0	0
Copper, %	< 149-µm	11	0 (0%)	11 (100%)	11	0	0	0	0
Iron, %	< 149-µm	11	0 (0%)	11 (100%)	0	11	0	100	0
Lead, %	< 149-µm	11	0 (0%)	11 (100%)	1	10	0	91	0
Magnesium, %	< 149-µm	11	0 (0%)	11 (100%)	10	1	0	9	0
Manganese, %	< 149-µm	11	0 (0%)	11 (100%)	0	11	0	100	0
Mercury, %	< 149-µm	11	0 (0%)	11 (100%)	0	9	2	82	18
Molybdenum, %	< 149-µm	11	0 (0%)	11 (100%)	0	10	1	91	9
Nickel, %	< 149-µm	11	0 (0%)	11 (100%)	11	0	0	0	0
Potassium, %	< 149-µm	11	0 (0%)	11 (100%)	9	2	0	18	0
Selenium, %	< 149-µm	11	0 (0%)	11 (100%)	0	1	10	9	91
Silver, %	< 149-µm	11	0 (0%)	11 (100%)	10	1	0	9	0
Sodium, %	< 149-µm	11	0 (0%)	11 (100%)	0	11	0	100	0
Thallium, %	< 149-µm	11	0 (0%)	11 (100%)	11	0	0	0	0
Vanadium, %	< 149-µm	11	0 (0%)	11 (100%)	11	0	0	0	0
Zinc, %	< 149-µm	11	0 (0%)	11 (100%)	11	0	0	0	0
ADA - Primary									
Aluminum, %	< 149-µm	13	0 (0%)	13 (100%)	12	1	0	8	0
Antimony, %	< 149-µm	13	0 (0%)	13 (100%)	0	13	0	100	0
Arsenic, %	< 149-µm	13	0 (0%)	13 (100%)	13	0	0	0	0
Barium, %	< 149-µm	13	0 (0%)	13 (100%)	13	0	0	0	0
Beryllium, %	< 149-µm	13	0 (0%)	13 (100%)	9	4	0	31	0
Cadmium, %	< 149-µm	13	0 (0%)	13 (100%)	13	0	0	0	0
Calcium, %	< 149-µm	13	0 (0%)	13 (100%)	13	0	0	0	0
Chromium, %	< 149-µm	13	0 (0%)	13 (100%)	13	0	0	0	0
Cobalt, %	< 149-µm	13	0 (0%)	13 (100%)	13	0	0	0	0
Copper, %	< 149-µm	13	0 (0%)	13 (100%)	13	0	0	0	0
Iron, %	< 149-µm	13	0 (0%)	13 (100%)	1	12	0	92	0
Lead, %	< 149-µm	13	0 (0%)	13 (100%)	5	8	0	62	0
Magnesium, %	< 149-µm	13	0 (0%)	13 (100%)	13	0	0	0	0
Manganese, %	< 149-µm	13	0 (0%)	13 (100%)	1	12	0	92	0
Mercury, %	< 149-µm	13	0 (0%)	13 (100%)	0	7	6	54	46
Molybdenum, %	< 149-µm	13	2 (15%)	11 (85%)	0	9	2	69	15
Nickel, %	< 149-µm	13	0 (0%)	13 (100%)	13	0	0	0	0
Potassium, %	< 149-µm	13	0 (0%)	13 (100%)	13	0	0	0	0
Selenium, %	< 149-µm	13	0 (0%)	13 (100%)	0	1	12	8	92
Silver, %	< 149-µm	13	0 (0%)	13 (100%)	6	7	0	54	0
Sodium, %	< 149-µm	13	0 (0%)	13 (100%)	0	13	0	100	0
Thallium, %	< 149-µm	13	0 (0%)	13 (100%)	11	2	0	15	0
Vanadium, %	< 149-µm	13	0 (0%)	13 (100%)	13	0	0	0	0
Zinc, %	< 149-µm	13	0 (0%)	13 (100%)	12	1	0	8	0
RFDA - RFA									
Aluminum, %	< 149-µm	4	0 (0%)	4 (100%)	4	0	0	0	0
Antimony, %	< 149-µm	4	0 (0%)	4 (100%)	0	4	0	100	0
Arsenic, %	< 149-µm	4	0 (0%)	4 (100%)	4	0	0	0	0
Barium, %	< 149-µm	4	0 (0%)	4 (100%)	4	0	0	0	0
Beryllium, %	< 149-µm	4	0 (0%)	4 (100%)	1	3	0	75	0
Cadmium, %	< 149-µm	4	0 (0%)	4 (100%)	3	1	0	25	0
Calcium, %	< 149-µm	4	0 (0%)	4 (100%)	4	0	0	0	0

Table 4-4. Summary of Qualifiers for IVBA Results

Analyte	Soil Fraction	Number of Samples	Rejected Results	Accepted Results	Count of Results with No Flags	Count of Accepted Results Validator Flags		Validator Flags, % of Accepted Results	
						J	NC	J	NC
RFDA - RFA (continued)									
Chromium, %	< 149-µm	4	0 (0%)	4 (100%)	4	0	0	0	0
Cobalt, %	< 149-µm	4	0 (0%)	4 (100%)	4	0	0	0	0
Copper, %	< 149-µm	4	0 (0%)	4 (100%)	4	0	0	0	0
Iron, %	< 149-µm	4	0 (0%)	4 (100%)	0	4	0	100	0
Lead, %	< 149-µm	4	0 (0%)	4 (100%)	4	0	0	0	0
Magnesium, %	< 149-µm	4	0 (0%)	4 (100%)	4	0	0	0	0
Manganese, %	< 149-µm	4	0 (0%)	4 (100%)	0	4	0	100	0
Mercury, %	< 149-µm	4	0 (0%)	4 (100%)	0	0	4	0	100
Molybdenum, %	< 149-µm	4	0 (0%)	4 (100%)	0	4	0	100	0
Nickel, %	< 149-µm	4	0 (0%)	4 (100%)	4	0	0	0	0
Potassium, %	< 149-µm	4	0 (0%)	4 (100%)	3	1	0	25	0
Selenium, %	< 149-µm	4	0 (0%)	4 (100%)	0	1	3	25	75
Silver, %	< 149-µm	4	0 (0%)	4 (100%)	3	1	0	25	0
Sodium, %	< 149-µm	4	0 (0%)	4 (100%)	0	4	0	100	0
Thallium, %	< 149-µm	4	0 (0%)	4 (100%)	1	3	0	75	0
Vanadium, %	< 149-µm	4	0 (0%)	4 (100%)	4	0	0	0	0
Zinc, %	< 149-µm	4	0 (0%)	4 (100%)	4	0	0	0	0
RFDA - RFD									
Aluminum, %	< 149-µm	1	0 (0%)	1 (100%)	0	1	0	100	0
Antimony, %	< 149-µm	1	0 (0%)	1 (100%)	0	1	0	100	0
Arsenic, %	< 149-µm	1	0 (0%)	1 (100%)	1	0	0	0	0
Barium, %	< 149-µm	1	0 (0%)	1 (100%)	1	0	0	0	0
Beryllium, %	< 149-µm	1	0 (0%)	1 (100%)	1	0	0	0	0
Cadmium, %	< 149-µm	1	0 (0%)	1 (100%)	1	0	0	0	0
Calcium, %	< 149-µm	1	0 (0%)	1 (100%)	1	0	0	0	0
Chromium, %	< 149-µm	1	0 (0%)	1 (100%)	1	0	0	0	0
Cobalt, %	< 149-µm	1	0 (0%)	1 (100%)	1	0	0	0	0
Copper, %	< 149-µm	1	0 (0%)	1 (100%)	1	0	0	0	0
Iron, %	< 149-µm	1	0 (0%)	1 (100%)	0	1	0	100	0
Lead, %	< 149-µm	1	0 (0%)	1 (100%)	1	0	0	0	0
Magnesium, %	< 149-µm	1	0 (0%)	1 (100%)	1	0	0	0	0
Manganese, %	< 149-µm	1	0 (0%)	1 (100%)	0	1	0	100	0
Mercury, %	< 149-µm	1	0 (0%)	1 (100%)	0	1	0	100	0
Molybdenum, %	< 149-µm	1	0 (0%)	1 (100%)	0	1	0	100	0
Nickel, %	< 149-µm	1	0 (0%)	1 (100%)	1	0	0	0	0
Potassium, %	< 149-µm	1	0 (0%)	1 (100%)	0	1	0	100	0
Selenium, %	< 149-µm	1	0 (0%)	1 (100%)	0	0	1	0	100
Silver, %	< 149-µm	1	0 (0%)	1 (100%)	0	1	0	100	0
Sodium, %	< 149-µm	1	0 (0%)	1 (100%)	0	1	0	100	0
Thallium, %	< 149-µm	1	0 (0%)	1 (100%)	1	0	0	0	0
Vanadium, %	< 149-µm	1	0 (0%)	1 (100%)	1	0	0	0	0
Zinc, %	< 149-µm	1	0 (0%)	1 (100%)	1	0	0	0	0

Notes:

No lab qualifiers were applied to the calculated bioavailability percentages

ADA - aerial deposition area

IVBA - *in vitro* bioaccessibility assay

J - estimated value

NC - IVBA percentage could not be calculated because the concentration was less than the MRL

RFA, RFB, RFC, RFD - relict flood plain depositional areas A, B, C, and D

Table 5-1a. Aerial Deposition Area Summary Statistics for Bulk Soil Sample Conventional Parameter Results

Analyte	Number of Samples	Number of Detected Values	Minimum Detected Values	Mean Detected Values	Maximum Detected Values	Minimum Nondetected Value[a]	Mean Nondetected Value[a]	Maximum Nondetected Value[a]	Overall Minimum Value[a]	Overall Mean Value[a]	Overall Maximum Value[a]
High-density - Conventional Parameters											
pH (SU)	35	35	4.8	5.76	6.44	--	--	--	4.8	5.76	6.44
Solids (%)	35	35	77.2	88.5	96.8	--	--	--	77.2	88.5	96.8
Grain Size (%)											
Clay	35	35	0.775	2.21	8.74	--	--	--	0.775	2.21	8.74
Silt	35	35	11.44	29.2	59.64	--	--	--	11.44	29.2	59.64
Very fine sand	35	35	5.65	15.6	31.58	--	--	--	5.65	15.6	31.58
Fine sand	35	35	6.36	21.2	44.43	--	--	--	6.36	21.2	44.43
Medium sand	35	35	3.59	13.4	33.01	--	--	--	3.59	13.4	33.01
Coarse sand	35	35	0.94	5.91	11.91	--	--	--	0.94	5.91	11.91
Very coarse sand	35	35	0.58	3.8	8.58	--	--	--	0.58	3.8	8.58
Very fine gravel	35	35	0.13	2.63	8.27	--	--	--	0.13	2.63	8.27
Fine gravel	35	35	0	2.26	9.36	--	--	--	0	2.26	9.36
Medium gravel	35	35	0	1.3	12.3	--	--	--	0	1.3	12.3
Coarse gravel	35	35	0	0.046	1.61	--	--	--	0	0.046	1.61
Very coarse gravel	35	35	0	0	0	--	--	--	0	0	0
Cobbles	35	35	0	0	0	--	--	--	0	0	0
Primary - Conventional Parameters											
pH (SU)	107	107	4.84	6.01	8	--	--	--	4.84	6.01	8
Solids (%)	107	107	59.3	82.5	95.8	--	--	--	59.3	82.5	95.8
Grain Size (%)											
Clay	107	107	0.39	3.71	14.61	--	--	--	0.39	3.71	14.61
Silt	107	107	13.02	37	68	--	--	--	13.02	37	68
Very fine sand	107	107	4.32	9.56	21.49	--	--	--	4.32	9.56	21.49
Fine sand	107	107	2.77	8.92	36.5	--	--	--	2.77	8.92	36.5
Medium sand	107	107	2.54	7.96	33.4	--	--	--	2.54	7.96	33.4
Coarse sand	107	107	2.66	6.93	15.1	--	--	--	2.66	6.93	15.1
Very coarse sand	107	107	0.707	7.08	14.93	--	--	--	0.707	7.08	14.93
Very fine gravel	107	107	0.16	6.11	13.25	--	--	--	0.16	6.11	13.25
Fine gravel	107	107	0	6.63	18.71	--	--	--	0	6.63	18.71
Medium gravel	107	107	0	4.39	34.89	--	--	--	0	4.39	34.89
Coarse gravel	107	107	0	0.203	10.42	--	--	--	0	0.203	10.42
Very coarse gravel	107	107	0	0	0	--	--	--	0	0	0
Cobbles	107	107	0	0	0	--	--	--	0	0	0

Notes:

For decision units (DUs) with field split and triplicate samples, summary statistics are based on the average of results for the DU. Nondetected values (NDs) are included as half the reporting limits (RLs).

[a] Calculated with nondetected results at one-half of the detection limit.

SU - standard unit

-- - no nondetected values

Table 5-1b. Aerial Deposition Area Summary Statistics for < 2-mm Fraction Metals and Conventional Parameter Results

Analyte	Number of Samples	Number of Detected Values	Minimum Detected Values	Mean Detected Values	Maximum Detected Values	Minimum Nondetected Value[a]	Mean Nondetected Value[a]	Maximum Nondetected Value[a]	Overall Minimum Value[a]	Overall Mean Value[a]	Overall Maximum Value[a]
High-density - Conventional Parameters											
CEC (me/100 gm)	35	35	7.19	16.6	27.3	--	--	--	7.19	16.6	27.3
Organic carbon (%)	35	35	2.42	4.43	7.85	--	--	--	2.42	4.43	7.85
Solids (%)	35	35	88.6	96.3	99.2	--	--	--	88.6	96.3	99.2
High-density - Metals/Metalloids (mg/kg)											
Aluminum	35	35	5510	10200	17300	--	--	--	5510	10200	17300
Antimony	35	35	1.19	4.5	10.7	--	--	--	1.19	4.5	10.7
Arsenic	35	35	8.26	17.1	26.4	--	--	--	8.26	17.1	26.4
Barium	35	35	56.2	193	492	--	--	--	56.2	193	492
Beryllium	35	35	0.21	0.339	0.49	--	--	--	0.21	0.339	0.49
Cadmium	35	35	2.35	6.08	12.4	--	--	--	2.35	6.08	12.4
Calcium	35	35	1620	3750	8870	--	--	--	1620	3750	8870
Chromium	35	35	7.32	15.5	40.5	--	--	--	7.32	15.5	40.5
Cobalt	35	35	2.26	5.33	10.4	--	--	--	2.26	5.33	10.4
Copper	35	35	11.5	22.4	102	--	--	--	11.5	22.4	102
Iron	35	35	7440	13300	22100	--	--	--	7440	13300	22100
Lead	35	35	108	316	714	--	--	--	108	316	714
Magnesium	35	35	1470	3240	6110	--	--	--	1470	3240	6110
Manganese	35	35	220	592	1040	--	--	--	220	592	1040
Mercury	35	35	0.0233	0.0796	0.18	--	--	--	0.0233	0.0796	0.18
Molybdenum	35	35	0.32	0.655	1.26	--	--	--	0.32	0.655	1.26
Nickel	35	35	5.59	13	31.5	--	--	--	5.59	13	31.5
Potassium	35	35	550	1340	2340	--	--	--	550	1340	2340
Selenium	35	35	0.18	0.302	0.73	--	--	--	0.18	0.302	0.73
Silver	35	35	0.12	0.329	0.85	--	--	--	0.12	0.329	0.85
Sodium	35	32	35.7	83.8	230	45.75	55.1	62.5	35.7	81.3	230
Thallium	35	35	0.17	0.301	0.535	--	--	--	0.17	0.301	0.535
Vanadium	35	35	13.5	21.8	36.9	--	--	--	13.5	21.8	36.9
Zinc	35	35	120	358	2180	--	--	--	120	358	2180
Primary - Conventional Parameters											
CEC (me/100 gm)	107	107	8.83	24.1	78.8	--	--	--	8.83	24.1	78.8
Organic carbon (%)	107	107	1.75	6.66	16.3	--	--	--	1.75	6.66	16.3
Solids (%)	107	107	79	93	98.9	--	--	--	79	93	98.9
Primary - Metals/Metalloids (mg/kg)											
Aluminum	107	107	7450	16200	25200	--	--	--	7450	16200	25200
Antimony	107	107	0.63	2.53	7.52	--	--	--	0.63	2.53	7.52
Arsenic	107	107	5.59	14.7	27.7	--	--	--	5.59	14.7	27.7
Barium	107	107	89.8	399	1420	--	--	--	89.8	399	1420
Beryllium	107	107	0.263	0.524	0.98	--	--	--	0.263	0.524	0.98
Cadmium	107	107	0.7	5.11	14.3	--	--	--	0.7	5.11	14.3
Calcium	107	107	2040	6190	22200	--	--	--	2040	6190	22200
Chromium	107	107	8.01	21.6	78.7	--	--	--	8.01	21.6	78.7
Cobalt	107	107	3.03	8.18	15.5	--	--	--	3.03	8.18	15.5
Copper	107	107	8.22	21.6	49.5	--	--	--	8.22	21.6	49.5
Iron	107	107	8890	19200	30900	--	--	--	8890	19200	30900

Table 5-1b. Aerial Deposition Area Summary Statistics for < 2-mm Fraction Metals and Conventional Parameter Results

Analyte	Number of Samples	Number of Detected Values	Minimum Detected Values	Mean Detected Values	Maximum Detected Values	Minimum Nondetected Value[a]	Mean Nondetected Value[a]	Maximum Nondetected Value[a]	Overall Minimum Value[a]	Overall Mean Value[a]	Overall Maximum Value[a]
Primary - Metals/Metalloids (mg/kg) (continued)											
Lead	107	107	44.5	183	592	--	--	--	44.5	183	592
Magnesium	107	107	1700	4570	9510	--	--	--	1700	4570	9510
Manganese	107	107	373	1090	2350	--	--	--	373	1090	2350
Mercury	107	107	0.0167	0.0719	0.16	--	--	--	0.0167	0.0719	0.16
Molybdenum	107	107	0.39	1.56	7.81	--	--	--	0.39	1.56	7.81
Nickel	107	107	8.38	24.2	59.4	--	--	--	8.38	24.2	59.4
Potassium	107	107	874	1770	4320	--	--	--	874	1770	4320
Selenium	107	107	0.133	0.387	3.32	--	--	--	0.133	0.387	3.32
Silver	107	107	0.0533	0.304	1.18	--	--	--	0.0533	0.304	1.18
Sodium	107	99	55	118	258	25.7	45	62	25.7	113	258
Thallium	107	107	0.12	0.256	0.54	--	--	--	0.12	0.256	0.54
Vanadium	107	107	13.7	31.9	63.2	--	--	--	13.7	31.9	63.2
Zinc	107	107	72.4	293	1150	--	--	--	72.4	293	1150

Notes:

For decision units (DUs) with field split and triplicate samples, summary statistics are based on the average of results for the DU. Nondetected values (NDs) are included as half the reporting limits (RLs).

[a] Calculated with nondetected results at one-half of the detection limit.

CEC - cation exchange capacity

me/100 gm - miliequivalents per 100 grams

mg/kg - milligram per kilogram

SU - standard unit

-- - no nondetected values

Table 5-1c. Aerial Deposition Area Summary Statistics for < 149-µm Fraction Metals and Conventional Parameter Results

Analyte	Number of Samples	Number of Detected Values	Minimum Detected Values	Mean Detected Values	Maximum Detected Values	Minimum Nondetected Value[a]	Mean Nondetected Value[a]	Maximum Nondetected Value[a]	Overall Minimum Value[a]	Overall Mean Value[a]	Overall Maximum Value[a]
High-density - Conventional Parameters (%)											
Solids	35	35	93.4	96.9	99	--	--	--	93.4	96.9	99
High-density - Metals/Metalloids (mg/kg)											
Aluminum	35	35	7180	12800	22600	--	--	--	7180	12800	22600
Antimony	35	35	1.27	4.24	12.6	--	--	--	1.27	4.24	12.6
Arsenic	35	35	9.03	22.2	55.9	--	--	--	9.03	22.2	55.9
Barium	35	35	75.7	206	453	--	--	--	75.7	206	453
Beryllium	35	35	0.265	0.417	0.83	--	--	--	0.265	0.417	0.83
Cadmium	35	35	1.71	6.64	16.3	--	--	--	1.71	6.64	16.3
Calcium	35	35	1760	3640	6130	--	--	--	1760	3640	6130
Chromium	35	35	11.9	17.9	30.3	--	--	--	11.9	17.9	30.3
Cobalt	35	35	3.69	6.03	11	--	--	--	3.69	6.03	11
Copper	35	35	11.1	25.1	54.8	--	--	--	11.1	25.1	54.8
Iron	35	35	10200	15300	20500	--	--	--	10200	15300	20500
Lead	35	35	120	348	988	--	--	--	120	348	988
Magnesium	35	35	1970	3440	5210	--	--	--	1970	3440	5210
Manganese	35	35	237	594	942	--	--	--	237	594	942
Mercury	35	35	0.0267	0.0948	0.5	--	--	--	0.0267	0.0948	0.5
Molybdenum	35	35	0.39	0.692	0.99	--	--	--	0.39	0.692	0.99
Nickel	35	35	9.37	15.1	32.8	--	--	--	9.37	15.1	32.8
Potassium	35	35	828	1550	2300	--	--	--	828	1550	2300
Selenium	35	35	0.155	0.327	0.68	--	--	--	0.155	0.327	0.68
Silver	35	35	0.1	0.335	1.01	--	--	--	0.1	0.335	1.01
Sodium	35	33	44.9	104	224	53	57.5	62	44.9	101	224
Thallium	35	35	0.2	0.37	0.77	--	--	--	0.2	0.37	0.77
Vanadium	35	35	17.7	25.6	33.5	--	--	--	17.7	25.6	33.5
Zinc	35	35	121	355	735	--	--	--	121	355	735
Primary - Conventional Parameters (%)											
Solids	107	107	86.4	95	98.1	--	--	--	86.4	95	98.1
Primary - Metals/Metalloids (mg/kg)											
Aluminum	107	107	10900	17300	25900	--	--	--	10900	17300	25900
Antimony	107	107	0.45	1.9	5.91	--	--	--	0.45	1.9	5.91
Arsenic	107	107	5.58	15.2	32.6	--	--	--	5.58	15.2	32.6
Barium	107	107	160	360	1270	--	--	--	160	360	1270
Beryllium	107	107	0.33	0.537	1.08	--	--	--	0.33	0.537	1.08
Cadmium	107	107	0.42	4.24	11.8	--	--	--	0.42	4.24	11.8
Calcium	107	107	1810	4790	14300	--	--	--	1810	4790	14300
Chromium	107	107	8.69	21.4	65.5	--	--	--	8.69	21.4	65.5
Cobalt	107	107	4.4	8	18	--	--	--	4.4	8	18
Copper	107	107	7.28	21.7	65.3	--	--	--	7.28	21.7	65.3
Iron	107	107	12100	18600	27200	--	--	--	12100	18600	27200
Lead	107	107	34.8	166	456	--	--	--	34.8	166	456
Magnesium	107	107	1470	4190	9880	--	--	--	1470	4190	9880
Manganese	107	107	382	843	1650	--	--	--	382	843	1650

Table 5-1c. Aerial Deposition Area Summary Statistics for < 149-µm Fraction Metals and Conventional Parameter Results

Analyte	Number of Samples	Number of Detected Values	Minimum Detected Values	Mean Detected Values	Maximum Detected Values	Minimum Nondetected Value[a]	Mean Nondetected Value[a]	Maximum Nondetected Value[a]	Overall Minimum Value[a]	Overall Mean Value[a]	Overall Maximum Value[a]
Primary - Metals/Metalloids (mg/kg) (continued)											
Mercury	107	107	0.02	0.0599	0.14	--	--	--	0.02	0.0599	0.14
Molybdenum	107	107	0.39	1.25	5.72	--	--	--	0.39	1.25	5.72
Nickel	107	107	11	24.2	66.4	--	--	--	11	24.2	66.4
Potassium	107	107	778	1760	3860	--	--	--	778	1760	3860
Selenium	107	107	0.09	0.322	2.17	--	--	--	0.09	0.322	2.17
Silver	107	107	0.0333	0.261	0.94	--	--	--	0.0333	0.261	0.94
Sodium	107	101	76.9	136	267	48.95	52.9	63.5	48.95	132	267
Thallium	107	107	0.12	0.26	0.52	--	--	--	0.12	0.26	0.52
Vanadium	107	107	17.9	31.2	56.6	--	--	--	17.9	31.2	56.6
Zinc	107	107	64.8	288	1160	--	--	--	64.8	288	1160

Notes:

For decision units (DUs) with field split and triplicate samples, summary statistics are based on the average of results for the DU. Nondetected values (NDs) are included as half the reporting limits (RLs).

[a] Calculated with nondetected results at one-half of the detection limit.

mg/kg - milligram per kilogram

-- - no nondetected values

Table 5-2a. Relict Floodplain Deposition Area Summary Statistics for Bulk Soil Sample Conventional Parameter Results

Analyte	Number of Samples	Number of Detected Values	Minimum Detected Values	Mean Detected Values	Maximum Detected Values	Minimum Nondetected Value[a]	Mean Nondetected Value[a]	Maximum Nondetected Value[a]	Overall Minimum Value[a]	Overall Mean Value[a]	Overall Maximum Value[a]
RFA - Conventional Parameters											
pH (SU)	5	5	7.25	7.5	7.8	--	--	--	7.25	7.5	7.8
Solids (%)	5	5	94.6	95.4	97.6	--	--	--	94.6	95.4	97.6
Grain Size (%)											
Clay	5	5	0.45	0.694	1	--	--	--	0.45	0.694	1
Silt	5	5	5.57	7.8	11.2	--	--	--	5.57	7.8	11.2
Very fine sand	5	5	9.9	14.1	16	--	--	--	9.9	14.1	16
Fine sand	5	5	29.8	33	37.91	--	--	--	29.8	33	37.91
Medium sand	5	5	18.95	24.7	34.82	--	--	--	18.95	24.7	34.82
Coarse sand	5	5	2.95	6.84	11.8	--	--	--	2.95	6.84	11.8
Very coarse sand	5	5	0.62	0.927	1.38	--	--	--	0.62	0.927	1.38
Very fine gravel	5	5	0.31	1.42	2.51	--	--	--	0.31	1.42	2.51
Fine gravel	5	5	0.84	3.28	7.28	--	--	--	0.84	3.28	7.28
Medium gravel	5	5	0	3.34	11.7	--	--	--	0	3.34	11.7
Coarse gravel	5	5	0	2.16	10.76	--	--	--	0	2.16	10.76
Very coarse gravel	5	5	0	0	0	--	--	--	0	0	0
Cobbles	5	5	0	0	0	--	--	--	0	0	0
RFB - Conventional Parameters											
pH (SU)	3	3	5.69	5.93	6.08	--	--	--	5.69	5.93	6.08
Solids (%)	3	3	84.6	87.6	93	--	--	--	84.6	87.6	93
Grain Size (%)											
Clay	3	3	2.94	6.87	9.21	--	--	--	2.94	6.87	9.21
Silt	3	3	31.4	38.8	50.5	--	--	--	31.4	38.8	50.5
Very fine sand	3	3	12.91	20.2	29.36	--	--	--	12.91	20.2	29.36
Fine sand	3	3	7.97	12.9	20.24	--	--	--	7.97	12.9	20.24
Medium sand	3	3	4.15	6.34	8.63	--	--	--	4.15	6.34	8.63
Coarse sand	3	3	2.72	3.56	4.92	--	--	--	2.72	3.56	4.92
Very coarse sand	3	3	1.36	1.8	2.03	--	--	--	1.36	1.8	2.03
Very fine gravel	3	3	0.07	0.826	1.6	--	--	--	0.07	0.826	1.6
Fine gravel	3	3	0.47	0.813	1.09	--	--	--	0.47	0.813	1.09
Medium gravel	3	3	0.11	2.59	7.53	--	--	--	0.11	2.59	7.53
Coarse gravel	3	3	0	0	0	--	--	--	0	0	0
Very coarse gravel	3	3	0	0	0	--	--	--	0	0	0
Cobbles	3	3	0	0	0	--	--	--	0	0	0
RFC - Conventional Parameters											
pH (SU)	6	6	6.26	6.35	6.59	--	--	--	6.26	6.35	6.59
Solids (%)	6	6	83.7	87.4	91.2	--	--	--	83.7	87.4	91.2
Grain Size (%)											
Clay	6	6	2.99	10.1	16.75	--	--	--	2.99	10.1	16.75
Fine sand	6	6	5.11	9.68	14.4	--	--	--	5.11	9.68	14.4
Medium sand	6	6	1.53	4.97	10.52	--	--	--	1.53	4.97	10.52
Coarse sand	6	6	0.47	3.87	7.34	--	--	--	0.47	3.87	7.34
Fine gravel	6	6	0	0.341	1.42	--	--	--	0	0.341	1.42
Medium gravel	6	6	0	0.0439	0.0933	--	--	--	0	0.0439	0.0933
Coarse gravel	6	6	0	0	0	--	--	--	0	0	0
Cobbles	6	6	0	0	0	--	--	--	0	0	0

Table 5-2a. Relict Floodplain Deposition Area Summary Statistics for Bulk Soil Sample Conventional Parameter Results

Analyte	Number of Samples	Number of Detected Values	Minimum Detected Values	Mean Detected Values	Maximum Detected Values	Minimum Nondetected Value[a]	Mean Nondetected Value[a]	Maximum Nondetected Value[a]	Overall Minimum Value[a]	Overall Mean Value[a]	Overall Maximum Value[a]
RFC - Conventional Parameters (continued)											
Silt	6	6	27.46	43.8	63.65	--	--	--	27.46	43.8	63.65
Very fine sand	6	6	14.1	21.3	30.4	--	--	--	14.1	21.3	30.4
Very coarse sand	6	6	0.453	2.11	3.5	--	--	--	0.453	2.11	3.5
Very fine gravel	6	6	0.09	0.719	3.12	--	--	--	0.09	0.719	3.12
Very coarse gravel	6	6	0	0	0	--	--	--	0	0	0
RFD - Conventional Parameters											
pH (SU)	2	2	6.24	6.74	7.23	--	--	--	6.24	6.74	7.23
Solids (%)	2	2	90.7	93.5	96.2	--	--	--	90.7	93.5	96.2
Grain Size (%)											
Clay	2	2	0.77	1.24	1.71	--	--	--	0.77	1.24	1.71
Silt	2	2	14.48	15.5	16.6	--	--	--	14.48	15.5	16.6
Very fine sand	2	2	21.7	26.5	31.2	--	--	--	21.7	26.5	31.2
Fine sand	2	2	26.8	32.5	38.25	--	--	--	26.8	32.5	38.25
Medium sand	2	2	8.26	11.4	14.5	--	--	--	8.26	11.4	14.5
Coarse sand	2	2	1.68	3.88	6.07	--	--	--	1.68	3.88	6.07
Very coarse sand	2	2	1.17	2.28	3.39	--	--	--	1.17	2.28	3.39
Very fine gravel	2	2	0.53	1.57	2.6	--	--	--	0.53	1.57	2.6
Fine gravel	2	2	0.67	0.875	1.08	--	--	--	0.67	0.875	1.08
Medium gravel	2	2	0	1.62	3.23	--	--	--	0	1.62	3.23
Coarse gravel	2	2	0	0	0	--	--	--	0	0	0
Very coarse gravel	2	2	0	0	0	--	--	--	0	0	0
Cobbles	2	2	0	0	0	--	--	--	0	0	0

Notes:

For decision units (DUs) with field split and triplicate samples, summary statistics are based on the average of results for the DU. Nondetected values (NDs) are included as half the reporting limits (RLs).

[a] Calculated with nondetected results at one-half of the detection limit.

RFA, RFB, RFC, RFD - relict flood plain depositional areas A, B, C, and D

SU - standard unit

Table 5-2b. Relict Floodplain Deposition Area Summary Statistics for < 2-mm Fraction Metals and Conventional Parameter Results

Analyte	Number of Samples	Number of Detected Values	Minimum Detected Values	Mean Detected Values	Maximum Detected Values	Minimum Nondetected Value[a]	Mean Nondetected Value[a]	Maximum Nondetected Value[a]	Overall Minimum Value[a]	Overall Mean Value[a]	Overall Maximum Value[a]
RFA - Conventional Parameters											
CEC (me/100 gm)	5	5	2.74	3.78	5.27	--	--	--	2.74	3.78	5.27
Organic carbon (%)	5	5	0.95	1.42	1.78	--	--	--	0.95	1.42	1.78
Solids (%)	5	5	98.2	99.2	99.7	--	--	--	98.2	99.2	99.7
RFA - Metals/Metalloids (mg/kg)											
Aluminum	5	5	7680	9560	11600	--	--	--	7680	9560	11600
Antimony	5	5	10.6	12.7	14.9	--	--	--	10.6	12.7	14.9
Arsenic	5	5	9.81	13.6	16.8	--	--	--	9.81	13.6	16.8
Barium	5	5	608	619	650	--	--	--	608	619	650
Beryllium	5	5	0.34	0.365	0.42	--	--	--	0.34	0.365	0.42
Cadmium	5	5	2.83	3.94	5.05	--	--	--	2.83	3.94	5.05
Calcium	5	5	35800	40000	42600	--	--	--	35800	40000	42600
Chromium	5	5	35.2	40.4	53.6	--	--	--	35.2	40.4	53.6
Cobalt	5	5	13.5	15.4	19.5	--	--	--	13.5	15.4	19.5
Copper	5	5	467	567	758	--	--	--	467	567	758
Iron	5	5	57600	76700	105000	--	--	--	57600	76700	105000
Lead	5	5	278	389	570	--	--	--	278	389	570
Magnesium	5	5	12400	14500	17400	--	--	--	12400	14500	17400
Manganese	5	5	1020	1340	1820	--	--	--	1020	1340	1820
Mercury	5	5	0.06	0.148	0.317	--	--	--	0.06	0.148	0.317
Molybdenum	5	5	7.69	8.28	10	--	--	--	7.69	8.28	10
Nickel	5	5	11.5	13	14.8	--	--	--	11.5	13	14.8
Potassium	5	5	1500	1840	2280	--	--	--	1500	1840	2280
Selenium	5	5	1.11	1.32	1.61	--	--	--	1.11	1.32	1.61
Silver	5	5	1.47	1.65	2.21	--	--	--	1.47	1.65	2.21
Sodium	5	5	425	552	731	--	--	--	425	552	731
Thallium	5	5	0.13	0.188	0.24	--	--	--	0.13	0.188	0.24
Vanadium	5	5	31.2	32.9	34.8	--	--	--	31.2	32.9	34.8
Zinc	5	5	5270	7100	8640	--	--	--	5270	7100	8640
RFB - Conventional Parameters											
CEC (me/100 gm)	3	3	10.9	18.1	21.9	--	--	--	10.9	18.1	21.9
Organic carbon (%)	3	3	2.44	4.07	5.71	--	--	--	2.44	4.07	5.71
Solids (%)	3	3	94.4	96.6	99.4	--	--	--	94.4	96.6	99.4
RFB - Metals/Metalloids (mg/kg)											
Aluminum	3	3	8040	10100	11500	--	--	--	8040	10100	11500
Antimony	3	3	0.94	1.94	2.51	--	--	--	0.94	1.94	2.51
Arsenic	3	3	7	10.6	12.9	--	--	--	7	10.6	12.9
Barium	3	3	136	182	237	--	--	--	136	182	237
Beryllium	3	3	0.32	0.438	0.51	--	--	--	0.32	0.438	0.51
Cadmium	3	3	1.84	2.98	3.7	--	--	--	1.84	2.98	3.7
Calcium	3	3	2620	4530	6500	--	--	--	2620	4530	6500
Chromium	3	3	18.6	26	32	--	--	--	18.6	26	32
Cobalt	3	3	6.13	7.71	8.91	--	--	--	6.13	7.71	8.91
Copper	3	3	13.4	20.1	26.3	--	--	--	13.4	20.1	26.3
Iron	3	3	13700	17000	19200	--	--	--	13700	17000	19200
Lead	3	3	80.7	154	201	--	--	--	80.7	154	201
Magnesium	3	3	3880	5110	6070	--	--	--	3880	5110	6070
Manganese	3	3	322	415	498	--	--	--	322	415	498
Mercury	3	3	0.02	0.0522	0.09	--	--	--	0.02	0.0522	0.09

Table 5-2b. Relict Floodplain Deposition Area Summary Statistics for < 2-mm Fraction Metals and Conventional Parameter Results

Analyte	Number of Samples	Number of Detected Values	Minimum Detected Values	Mean Detected Values	Maximum Detected Values	Minimum Nondetected Value[a]	Mean Nondetected Value[a]	Maximum Nondetected Value[a]	Overall Minimum Value[a]	Overall Mean Value[a]	Overall Maximum Value[a]
RFB - Metals/Metalloids (mg/kg) (continued)											
Molybdenum	3	3	0.55	0.683	0.78	--	--	--	0.55	0.683	0.78
Nickel	3	3	13.6	19.4	24.7	--	--	--	13.6	19.4	24.7
Potassium	3	3	1540	1820	2050	--	--	--	1540	1820	2050
Selenium	3	3	0.12	0.38	0.54	--	--	--	0.12	0.38	0.54
Silver	3	3	0.18	0.277	0.38	--	--	--	0.18	0.277	0.38
Sodium	3	3	64	90.1	126	--	--	--	64	90.1	126
Thallium	3	3	0.17	0.214	0.243	--	--	--	0.17	0.214	0.243
Vanadium	3	3	26.4	32.5	37.2	--	--	--	26.4	32.5	37.2
Zinc	3	3	144	216	270	--	--	--	144	216	270
RFC - Conventional Parameters											
CEC (me/100 gm)	6	6	14.7	19.6	24	--	--	--	14.7	19.6	24
Organic carbon (%)	6	6	2.92	4.65	5.49	--	--	--	2.92	4.65	5.49
Solids (%)	6	6	91.8	95.7	98.5	--	--	--	91.8	95.7	98.5
RFC - Metals/Metalloids (mg/kg)											
Aluminum	6	6	9960	11800	13000	--	--	--	9960	11800	13000
Antimony	6	6	2.19	3.06	5.23	--	--	--	2.19	3.06	5.23
Arsenic	6	6	17.2	24.1	31.4	--	--	--	17.2	24.1	31.4
Barium	6	6	155	195	260	--	--	--	155	195	260
Beryllium	6	6	0.47	0.545	0.637	--	--	--	0.47	0.545	0.637
Cadmium	6	6	8.39	10	14.3	--	--	--	8.39	10	14.3
Calcium	6	6	5420	6510	8590	--	--	--	5420	6510	8590
Chromium	6	6	21.7	24.7	26.3	--	--	--	21.7	24.7	26.3
Cobalt	6	6	8.19	8.71	9.12	--	--	--	8.19	8.71	9.12
Copper	6	6	69.4	123	154	--	--	--	69.4	123	154
Iron	6	6	18400	19400	21100	--	--	--	18400	19400	21100
Lead	6	6	373	540	730	--	--	--	373	540	730
Magnesium	6	6	5610	6160	6620	--	--	--	5610	6160	6620
Manganese	6	6	276	328	446	--	--	--	276	328	446
Mercury	6	6	0.13	0.185	0.24	--	--	--	0.13	0.185	0.24
Molybdenum	6	6	0.92	1.09	1.23	--	--	--	0.92	1.09	1.23
Nickel	6	6	18.3	19.7	21.3	--	--	--	18.3	19.7	21.3
Potassium	6	6	1380	1750	2190	--	--	--	1380	1750	2190
Selenium	6	6	0.42	0.556	0.755	--	--	--	0.42	0.556	0.755
Silver	6	6	0.65	0.829	1.07	--	--	--	0.65	0.829	1.07
Sodium	6	6	109	138	217	--	--	--	109	138	217
Thallium	6	6	0.28	0.335	0.37	--	--	--	0.28	0.335	0.37
Vanadium	6	6	32.3	36.2	38.9	--	--	--	32.3	36.2	38.9
Zinc	6	6	300	411	616	--	--	--	300	411	616
RFD - Conventional Parameters											
CEC (me/100 gm)	2	2	7.15	8.78	10.4	--	--	--	7.15	8.78	10.4
Organic carbon (%)	2	2	2.06	2.48	2.89	--	--	--	2.06	2.48	2.89
Solids (%)	2	2	99.1	99.3	99.4	--	--	--	99.1	99.3	99.4
RFD - Metals/Metalloids (mg/kg)											
Aluminum	2	2	5600	6020	6430	--	--	--	5600	6020	6430
Antimony	2	2	3.77	3.84	3.91	--	--	--	3.77	3.84	3.91
Arsenic	2	2	11.8	13.1	14.4	--	--	--	11.8	13.1	14.4
Barium	2	2	213	228	242	--	--	--	213	228	242
Beryllium	2	2	0.24	0.252	0.263	--	--	--	0.24	0.252	0.263

Table 5-2b. Relict Floodplain Deposition Area Summary Statistics for < 2-mm Fraction Metals and Conventional Parameter Results

Analyte	Number of Samples	Number of Detected Values	Minimum Detected Values	Mean Detected Values	Maximum Detected Values	Minimum Nondetected Value[a]	Mean Nondetected Value[a]	Maximum Nondetected Value[a]	Overall Minimum Value[a]	Overall Mean Value[a]	Overall Maximum Value[a]
RFD - Metals/Metalloids (mg/kg) (continued)											
Cadmium	2	2	4.75	4.81	4.87	--	--	--	4.75	4.81	4.87
Calcium	2	2	10300	14900	19500	--	--	--	10300	14900	19500
Chromium	2	2	14.3	15	15.6	--	--	--	14.3	15	15.6
Cobalt	2	2	4.75	5.37	5.99	--	--	--	4.75	5.37	5.99
Copper	2	2	37.9	84	130	--	--	--	37.9	84	130
Iron	2	2	15000	20600	26100	--	--	--	15000	20600	26100
Lead	2	2	318	321	323	--	--	--	318	321	323
Magnesium	2	2	7200	7910	8620	--	--	--	7200	7910	8620
Manganese	2	2	280	394	507	--	--	--	280	394	507
Mercury	2	2	0.23	0.25	0.27	--	--	--	0.23	0.25	0.27
Molybdenum	2	2	1.11	1.91	2.71	--	--	--	1.11	1.91	2.71
Nickel	2	2	11.3	11.6	11.8	--	--	--	11.3	11.6	11.8
Potassium	2	2	1300	1300	1300	--	--	--	1300	1300	1300
Selenium	2	2	0.307	0.414	0.52	--	--	--	0.307	0.414	0.52
Silver	2	2	0.34	0.445	0.55	--	--	--	0.34	0.445	0.55
Sodium	2	2	88	159	230	--	--	--	88	159	230
Thallium	2	2	0.26	0.279	0.297	--	--	--	0.26	0.279	0.297
Vanadium	2	2	22.2	23.1	24	--	--	--	22.2	23.1	24
Zinc	2	2	680	1640	2600	--	--	--	680	1640	2600

Notes:

For decision units (DUs) with field split and triplicate samples, summary statistics are based on the average of results for the DU. Nondetected values (NDs) are included as half the reporting limits (RLs).

[a] Calculated with nondetected results at one-half of the detection limit.

CEC - cation exchange capacity

me/100 gm - miliequivalents per 100 grams

mg/kg - milligram per kilogram

RFA, RFB, RFC, RFD - relict flood plain depositional areas A, B, C, and D

-- - no nondetected values

Table 5-2c. Relict Floodplain Deposition Area Summary Statistics for < 149-µm Fraction Metals and Conventional Parameter Results

Analyte	Number of Samples	Number of Detected Values	Minimum Detected Values	Mean Detected Values	Maximum Detected Values	Minimum Nondetected Value[a]	Mean Nondetected Value[a]	Maximum Nondetected Value[a]	Overall Minimum Value[a]	Overall Mean Value[a]	Overall Maximum Value[a]
RFA - Conventional Parameters (%)											
Solids	5	5	98.1	99.1	99.6	--	--	--	98.1	99.1	99.6
RFA - Metals/Metalloids (mg/kg)											
Aluminum	5	5	4550	4950	5310	--	--	--	4550	4950	5310
Antimony	5	5	4.88	7.85	9.97	--	--	--	4.88	7.85	9.97
Arsenic	5	5	11.1	15.8	21.4	--	--	--	11.1	15.8	21.4
Barium	5	5	431	484	560	--	--	--	431	484	560
Beryllium	5	5	0.255	0.265	0.28	--	--	--	0.255	0.265	0.28
Cadmium	5	5	6.81	8.11	9.83	--	--	--	6.81	8.11	9.83
Calcium	5	5	41200	49700	56700	--	--	--	41200	49700	56700
Chromium	5	5	15.8	18.2	20.5	--	--	--	15.8	18.2	20.5
Cobalt	5	5	5.76	6.45	7.22	--	--	--	5.76	6.45	7.22
Copper	5	5	82.7	114	138	--	--	--	82.7	114	138
Iron	5	5	24200	30200	39000	--	--	--	24200	30200	39000
Lead	5	5	303	389	468	--	--	--	303	389	468
Magnesium	5	5	22600	26800	30400	--	--	--	22600	26800	30400
Manganese	5	5	330	360	387	--	--	--	330	360	387
Mercury	5	5	0.2	0.804	2.74	--	--	--	0.2	0.804	2.74
Molybdenum	5	5	5.43	6.29	6.67	--	--	--	5.43	6.29	6.67
Nickel	5	5	15.1	17.4	20.5	--	--	--	15.1	17.4	20.5
Potassium	5	5	839	894	936	--	--	--	839	894	936
Selenium	5	5	0.505	0.66	0.847	--	--	--	0.505	0.66	0.847
Silver	5	5	1.08	1.4	1.8	--	--	--	1.08	1.4	1.8
Sodium	5	5	110	124	136	--	--	--	110	124	136
Thallium	5	5	0.275	0.312	0.377	--	--	--	0.275	0.312	0.377
Vanadium	5	5	29.4	32.8	36.2	--	--	--	29.4	32.8	36.2
Zinc	5	5	1570	1820	2140	--	--	--	1570	1820	2140
RFB - Conventional Parameters (%)											
Solids	3	3	96.1	97.8	99.6	--	--	--	96.1	97.8	99.6
RFB - Metals/Metalloids (mg/kg)											
Aluminum	3	3	8330	9810	11300	--	--	--	8330	9810	11300
Antimony	3	3	0.81	1.47	1.99	--	--	--	0.81	1.47	1.99
Arsenic	3	3	6.4	9.39	12.5	--	--	--	6.4	9.39	12.5
Barium	3	3	120	169	242	--	--	--	120	169	242
Beryllium	3	3	0.29	0.393	0.5	--	--	--	0.29	0.393	0.5
Cadmium	3	3	1.5	2.34	3.2	--	--	--	1.5	2.34	3.2
Calcium	3	3	2670	3910	5570	--	--	--	2670	3910	5570
Chromium	3	3	19.6	25.4	32.4	--	--	--	19.6	25.4	32.4
Cobalt	3	3	5.95	7.05	8.45	--	--	--	5.95	7.05	8.45
Copper	3	3	12.9	17.8	24.1	--	--	--	12.9	17.8	24.1
Iron	3	3	13900	16400	19000	--	--	--	13900	16400	19000
Lead	3	3	71.8	130	191	--	--	--	71.8	130	191
Magnesium	3	3	4040	4960	6030	--	--	--	4040	4960	6030
Manganese	3	3	276	339	417	--	--	--	276	339	417
Mercury	3	3	0.02	0.0456	0.08	--	--	--	0.02	0.0456	0.08
Molybdenum	3	3	0.45	0.584	0.74	--	--	--	0.45	0.584	0.74

Table 5-2c. Relict Floodplain Deposition Area Summary Statistics for < 149-µm Fraction Metals and Conventional Parameter Results

Analyte	Number of Samples	Number of Detected Values	Minimum Detected Values	Mean Detected Values	Maximum Detected Values	Minimum Nondetected Value[a]	Mean Nondetected Value[a]	Maximum Nondetected Value[a]	Overall Minimum Value[a]	Overall Mean Value[a]	Overall Maximum Value[a]
RFB - Metals/Metalloids (mg/kg) (continued)											
Nickel	3	3	13.8	18.1	23.4	--	--	--	13.8	18.1	23.4
Potassium	3	3	1590	1820	1950	--	--	--	1590	1820	1950
Selenium	3	3	0.13	0.296	0.47	--	--	--	0.13	0.296	0.47
Silver	3	3	0.13	0.212	0.31	--	--	--	0.13	0.212	0.31
Sodium	3	3	64.1	89.9	128	--	--	--	64.1	89.9	128
Thallium	3	3	0.18	0.23	0.28	--	--	--	0.18	0.23	0.28
Vanadium	3	3	27.2	32	38.5	--	--	--	27.2	32	38.5
Zinc	3	3	137	192	250	--	--	--	137	192	250
RFC - Conventional Parameters (%)											
Solids	6	6	94.9	97.2	99	--	--	--	94.9	97.2	99
RFC - Metals/Metalloids (mg/kg)											
Aluminum	6	6	8770	10700	12400	--	--	--	8770	10700	12400
Antimony	6	6	1.34	2.18	3.03	--	--	--	1.34	2.18	3.03
Arsenic	6	6	14.2	20.8	27.2	--	--	--	14.2	20.8	27.2
Barium	6	6	115	158	221	--	--	--	115	158	221
Beryllium	6	6	0.375	0.459	0.54	--	--	--	0.375	0.459	0.54
Cadmium	6	6	4.53	6.85	8.49	--	--	--	4.53	6.85	8.49
Calcium	6	6	4060	5150	5840	--	--	--	4060	5150	5840
Chromium	6	6	20.7	23.1	25.4	--	--	--	20.7	23.1	25.4
Cobalt	6	6	7.12	7.62	8.28	--	--	--	7.12	7.62	8.28
Copper	6	6	50.8	99.3	133	--	--	--	50.8	99.3	133
Iron	6	6	16900	17900	19800	--	--	--	16900	17900	19800
Lead	6	6	239	420	565	--	--	--	239	420	565
Magnesium	6	6	5060	5630	6240	--	--	--	5060	5630	6240
Manganese	6	6	219	269	326	--	--	--	219	269	326
Mercury	6	6	0.08	0.16	0.207	--	--	--	0.08	0.16	0.207
Molybdenum	6	6	0.7	0.855	1.09	--	--	--	0.7	0.855	1.09
Nickel	6	6	16.6	17.8	19.2	--	--	--	16.6	17.8	19.2
Potassium	6	6	1320	1670	1990	--	--	--	1320	1670	1990
Selenium	6	6	0.28	0.418	0.537	--	--	--	0.28	0.418	0.537
Silver	6	6	0.38	0.604	0.827	--	--	--	0.38	0.604	0.827
Sodium	6	6	106	139	219	--	--	--	106	139	219
Thallium	6	6	0.23	0.306	0.363	--	--	--	0.23	0.306	0.363
Vanadium	6	6	30	33.2	35.8	--	--	--	30	33.2	35.8
Zinc	6	6	211	334	426	--	--	--	211	334	426
RFD - Conventional Parameters (%)											
Solids	2	2	99.1	99.3	99.5	--	--	--	99.1	99.3	99.5
RFD - Metals/Metalloids (mg/kg)											
Aluminum	2	2	4420	5890	7360	--	--	--	4420	5890	7360
Antimony	2	2	2.92	3.02	3.11	--	--	--	2.92	3.02	3.11
Arsenic	2	2	16.1	17.3	18.4	--	--	--	16.1	17.3	18.4
Barium	2	2	351	432	512	--	--	--	351	432	512
Beryllium	2	2	0.23	0.272	0.313	--	--	--	0.23	0.272	0.313
Cadmium	2	2	5.7	6.47	7.23	--	--	--	5.7	6.47	7.23
Calcium	2	2	17200	33700	50200	--	--	--	17200	33700	50200

Table 5-2c. Relict Floodplain Deposition Area Summary Statistics for < 149-µm Fraction Metals and Conventional Parameter Results

Analyte	Number of Samples	Number of Detected Values	Minimum Detected Values	Mean Detected Values	Maximum Detected Values	Minimum Nondetected Value[a]	Mean Nondetected Value[a]	Maximum Nondetected Value[a]	Overall Minimum Value[a]	Overall Mean Value[a]	Overall Maximum Value[a]
RFD - Metals/Metalloids (mg/kg) (continued)											
Chromium	2	2	14	15.7	17.3	--	--	--	14	15.7	17.3
Cobalt	2	2	4.68	5.09	5.5	--	--	--	4.68	5.09	5.5
Copper	2	2	40.2	47.2	54.2	--	--	--	40.2	47.2	54.2
Iron	2	2	17800	20400	23000	--	--	--	17800	20400	23000
Lead	2	2	369	391	413	--	--	--	369	391	413
Magnesium	2	2	11400	19500	27500	--	--	--	11400	19500	27500
Manganese	2	2	315	335	354	--	--	--	315	335	354
Mercury	2	2	0.167	0.299	0.43	--	--	--	0.167	0.299	0.43
Molybdenum	2	2	1.51	2.97	4.42	--	--	--	1.51	2.97	4.42
Nickel	2	2	13.4	13.8	14.2	--	--	--	13.4	13.8	14.2
Potassium	2	2	947	1230	1510	--	--	--	947	1230	1510
Selenium	2	2	0.33	0.41	0.49	--	--	--	0.33	0.41	0.49
Silver	2	2	0.373	0.467	0.56	--	--	--	0.373	0.467	0.56
Sodium	2	2	100	112	124	--	--	--	100	112	124
Thallium	2	2	0.27	0.319	0.367	--	--	--	0.27	0.319	0.367
Vanadium	2	2	29	29.5	29.9	--	--	--	29	29.5	29.9
Zinc	2	2	767	1250	1740	--	--	--	767	1250	1740

Notes:

For decision units (DUs) with field split and triplicate samples, summary statistics are based on the average of results for the DU. Nondetected values (NDs) are included as half the reporting limits (RLs).

[a] Calculated with nondetected results at one-half of the detection limit.

mg/kg - milligram per kilogram

RFA, RFB, RFC, RFD - relict flood plain depositional areas A, B, C, and D

-- - no nondetected values

Table 5-3a. Windblown Sediment Deposition Area Summary Statistics for Bulk Soil Sample Conventional Parameter Results

Analyte	Number of Samples	Number of Detected Values	Minimum Detected Values	Mean Detected Values	Maximum Detected Values	Minimum Nondetected Value[a]	Mean Nondetected Value[a]	Maximum Nondetected Value[a]	Overall Minimum Value[a]	Overall Mean Value[a]	Overall Maximum Value[a]
Columbia Beach North - Conventional Parameters (%)											
Solids	4	4	98.4	98.7	99.1	--	--	--	98.4	98.7	99.1
Grain Size											
Clay	4	4	1.91	2.8	3.67	--	--	--	1.91	2.8	3.67
Silt	4	4	20.3	29	35.4	--	--	--	20.3	29	35.4
Very fine sand	4	4	7.9	11.9	15.97	--	--	--	7.9	11.9	15.97
Fine sand	4	4	8.94	11.1	14.3	--	--	--	8.94	11.1	14.3
Medium sand	4	4	9.66	12.8	16.39	--	--	--	9.66	12.8	16.39
Coarse sand	4	4	5.91	10.3	14.41	--	--	--	5.91	10.3	14.41
Very coarse sand	4	4	4.16	7.09	11	--	--	--	4.16	7.09	11
Very fine gravel	4	4	2.94	6.76	11.9	--	--	--	2.94	6.76	11.9
Fine gravel	4	4	2.43	4.67	8.16	--	--	--	2.43	4.67	8.16
Medium gravel	4	4	0	1.05	4.17	--	--	--	0	1.05	4.17
Coarse gravel	4	4	0	0	0	--	--	--	0	0	0
Very coarse gravel	4	4	0	0	0	--	--	--	0	0	0
Cobbles	4	4	0	0	0	--	--	--	0	0	0
Columbia Beach South - Conventional Parameters											
pH (SU)	2	2	6.43	6.46	6.48	--	--	--	6.43	6.46	6.48
Solids (%)	2	2	99	99.2	99.3	--	--	--	99	99.2	99.3
Grain Size (%)											
Clay	2	2	1.76	2.14	2.51	--	--	--	1.76	2.14	2.51
Silt	2	2	16.85	22.5	28.1	--	--	--	16.85	22.5	28.1
Very fine sand	2	2	10.61	12.5	14.35	--	--	--	10.61	12.5	14.35
Fine sand	2	2	17.28	18.6	19.91	--	--	--	17.28	18.6	19.91
Medium sand	2	2	11.92	12.8	13.62	--	--	--	11.92	12.8	13.62
Coarse sand	2	2	10.51	10.8	11.04	--	--	--	10.51	10.8	11.04
Very coarse sand	2	2	4.09	7.36	10.62	--	--	--	4.09	7.36	10.62
Very fine gravel	2	2	1.82	7.51	13.19	--	--	--	1.82	7.51	13.19
Fine gravel	2	2	1.65	3.52	5.38	--	--	--	1.65	3.52	5.38
Medium gravel	2	2	0.08	0.605	1.13	--	--	--	0.08	0.605	1.13
Coarse gravel	2	2	0	0	0	--	--	--	0	0	0
Very coarse gravel	2	2	0	0	0	--	--	--	0	0	0
Cobbles	2	2	0	0	0	--	--	--	0	0	0
Marcus Flats East - Conventional Parameters											
pH (SU)	7	7	5.09	5.51	5.73	--	--	--	5.09	5.51	5.73
Solids (%)	7	7	90.4	92.3	93.6	--	--	--	90.4	92.3	93.6
Grain Size (%)											
Clay	7	7	1.37	2.52	3.58	--	--	--	1.37	2.52	3.58
Silt	7	7	20.51	25.1	30.15	--	--	--	20.51	25.1	30.15
Fine sand	7	7	8.02	12.3	16.2	--	--	--	8.02	12.3	16.2
Medium sand	7	7	4.51	6.7	9.47	--	--	--	4.51	6.7	9.47
Coarse sand	7	7	2.38	4.15	8.83	--	--	--	2.38	4.15	8.83
Fine gravel	7	7	2.48	8.07	14.74	--	--	--	2.48	8.07	14.74
Medium gravel	7	7	0	16.4	37.81	--	--	--	0	16.4	37.81
Coarse gravel	7	7	0	0	0	--	--	--	0	0	0
Cobbles	7	7	0	0	0	--	--	--	0	0	0

Table 5-3a. Windblown Sediment Deposition Area Summary Statistics for Bulk Soil Sample Conventional Parameter Results

Analyte	Number of Samples	Number of Detected Values	Minimum Detected Values	Mean Detected Values	Maximum Detected Values	Minimum Nondetected Value[a]	Mean Nondetected Value[a]	Maximum Nondetected Value[a]	Overall Minimum Value[a]	Overall Mean Value[a]	Overall Maximum Value[a]
Marcus Flats East - Conventional Parameters (continued)											
Very fine sand	7	7	9.64	15.2	21	--	--	--	9.64	15.2	21
Very coarse sand	7	7	2.56	4.36	7.2	--	--	--	2.56	4.36	7.2
Very fine gravel	7	7	3.36	4.62	6.2	--	--	--	3.36	4.62	6.2
Very coarse gravel	7	7	0	0	0	--	--	--	0	0	0

Notes:

For decision units (DUs) with field split and triplicate samples, summary statistics are based on the average of results for the DU. Nondetected values (NDs) are included as half the reporting limits (RLs).

[a] Calculated with nondetected results at one-half of the detection limit.

SU - standard unit

-- - no nondetected values

Table 5-3b. Windblown Sediment Deposition Area Summary Statistics for < 2-mm Fraction Metals and Conventional Parameter Results

Analyte	Number of Samples	Number of Detected Values	Minimum Detected Values	Mean Detected Values	Maximum Detected Values	Minimum Nondetected Value[a]	Mean Nondetected Value[a]	Maximum Nondetected Value[a]	Overall Minimum Value[a]	Overall Mean Value[a]	Overall Maximum Value[a]
Columbia Beach North - Conventional Parameters											
CEC (me/100 gm)	4	4	7.28	8.63	11.5	--	--	--	7.28	8.63	11.5
Organic carbon (%)	4	4	0.89	1.28	1.76	--	--	--	0.89	1.28	1.76
Solids (%)	4	4	99.2	99.4	99.6	--	--	--	99.2	99.4	99.6
Columbia Beach North - Metals/Metalloids (mg/kg)											
Aluminum	4	4	10800	11600	13200	--	--	--	10800	11600	13200
Antimony	4	4	0.21	0.257	0.287	--	--	--	0.21	0.257	0.287
Arsenic	4	4	6.62	7.38	8.26	--	--	--	6.62	7.38	8.26
Barium	4	4	122	141	158	--	--	--	122	141	158
Beryllium	4	4	0.39	0.433	0.47	--	--	--	0.39	0.433	0.47
Cadmium	4	4	0.205	0.242	0.3	--	--	--	0.205	0.242	0.3
Calcium	4	4	2480	2810	3220	--	--	--	2480	2810	3220
Chromium	4	4	14.5	15.9	18.8	--	--	--	14.5	15.9	18.8
Cobalt	4	4	6.16	6.57	7.16	--	--	--	6.16	6.57	7.16
Copper	4	4	12.9	14.4	16	--	--	--	12.9	14.4	16
Iron	4	4	15800	16500	17100	--	--	--	15800	16500	17100
Lead	4	4	9.49	10.7	12.1	--	--	--	9.49	10.7	12.1
Magnesium	4	4	3580	3890	4310	--	--	--	3580	3890	4310
Manganese	4	4	349	374	387	--	--	--	349	374	387
Mercury	4	4	0.0085	0.00913	0.01	--	--	--	0.0085	0.00913	0.01
Molybdenum	4	4	0.46	0.521	0.58	--	--	--	0.46	0.521	0.58
Nickel	4	4	12.7	13.5	15.6	--	--	--	12.7	13.5	15.6
Potassium	4	4	1890	2280	2640	--	--	--	1890	2280	2640
Selenium	4	4	0.08	0.0846	0.09	--	--	--	0.08	0.0846	0.09
Silver	4	4	0.035	0.0429	0.05	--	--	--	0.035	0.0429	0.05
Sodium	4	4	88.3	104	120	--	--	--	88.3	104	120
Thallium	4	4	0.11	0.118	0.12	--	--	--	0.11	0.118	0.12
Vanadium	4	4	24.1	25.5	27	--	--	--	24.1	25.5	27
Zinc	4	4	48.9	52.9	59	--	--	--	48.9	52.9	59
Columbia Beach South - Conventional Parameters											
CEC (me/100 gm)	2	2	7.08	7.41	7.73	--	--	--	7.08	7.41	7.73
Organic carbon (%)	2	2	1.02	1.19	1.35	--	--	--	1.02	1.19	1.35
Solids (%)	2	2	99.4	99.5	99.5	--	--	--	99.4	99.5	99.5
Columbia Beach South - Metals/Metalloids (mg/kg)											
Aluminum	2	2	9110	9860	10600	--	--	--	9110	9860	10600
Antimony	2	2	0.17	0.18	0.19	--	--	--	0.17	0.18	0.19
Arsenic	2	2	5.28	5.43	5.58	--	--	--	5.28	5.43	5.58
Barium	2	2	95.1	105	115	--	--	--	95.1	105	115
Beryllium	2	2	0.34	0.355	0.37	--	--	--	0.34	0.355	0.37
Cadmium	2	2	0.18	0.18	0.18	--	--	--	0.18	0.18	0.18
Calcium	2	2	2140	2360	2580	--	--	--	2140	2360	2580
Chromium	2	2	11.9	13.5	15	--	--	--	11.9	13.5	15
Cobalt	2	2	4.88	5.33	5.78	--	--	--	4.88	5.33	5.78
Copper	2	2	11.1	11.9	12.7	--	--	--	11.1	11.9	12.7
Iron	2	2	13500	14000	14500	--	--	--	13500	14000	14500
Lead	2	2	7.91	8.04	8.16	--	--	--	7.91	8.04	8.16
Magnesium	2	2	3400	3490	3580	--	--	--	3400	3490	3580
Manganese	2	2	306	307	307	--	--	--	306	307	307
Mercury	2	2	0.007	0.0075	0.008	--	--	--	0.007	0.0075	0.008
Molybdenum	2	2	0.37	0.38	0.39	--	--	--	0.37	0.38	0.39
Nickel	2	2	10.3	11.5	12.6	--	--	--	10.3	11.5	12.6
Potassium	2	2	1790	1880	1960	--	--	--	1790	1880	1960

Table 5-3b. Windblown Sediment Deposition Area Summary Statistics for < 2-mm Fraction Metals and Conventional Parameter Results

Analyte	Number of Samples	Number of Detected Values	Minimum Detected Values	Mean Detected Values	Maximum Detected Values	Minimum Nondetected Value[a]	Mean Nondetected Value[a]	Maximum Nondetected Value[a]	Overall Minimum Value[a]	Overall Mean Value[a]	Overall Maximum Value[a]
Columbia Beach South - Metals/Metalloids (mg/kg) (continued)											
Selenium	2	1	0.08	0.08	0.08	0.095	0.095	0.095	0.08	0.0875	0.095
Silver	2	2	0.02	0.025	0.03	--	--	--	0.02	0.025	0.03
Sodium	2	2	77.5	86	94.5	--	--	--	77.5	86	94.5
Thallium	2	2	0.09	0.095	0.1	--	--	--	0.09	0.095	0.1
Vanadium	2	2	18.4	20.7	22.9	--	--	--	18.4	20.7	22.9
Zinc	2	2	45	45.2	45.4	--	--	--	45	45.2	45.4
Marcus Flats East - Conventional Parameters											
CEC (me/100 gm)	7	7	21.1	22.5	23.9	--	--	--	21.1	22.5	23.9
Organic carbon (%)	7	7	4.61	5.92	7.44	--	--	--	4.61	5.92	7.44
Solids (%)	7	7	94.1	95.7	97	--	--	--	94.1	95.7	97
Marcus Flats East - Metals/Metalloids (mg/kg)											
Aluminum	7	7	14300	16700	18200	--	--	--	14300	16700	18200
Antimony	7	7	1.96	2.57	3.28	--	--	--	1.96	2.57	3.28
Arsenic	7	7	11.5	14.8	17.6	--	--	--	11.5	14.8	17.6
Barium	7	7	149	174	189	--	--	--	149	174	189
Beryllium	7	7	0.44	0.513	0.57	--	--	--	0.44	0.513	0.57
Cadmium	7	7	3.11	3.88	5.01	--	--	--	3.11	3.88	5.01
Calcium	7	7	3060	3420	3850	--	--	--	3060	3420	3850
Chromium	7	7	11.7	12.5	14.2	--	--	--	11.7	12.5	14.2
Cobalt	7	7	4.43	4.98	5.24	--	--	--	4.43	4.98	5.24
Copper	7	7	12.1	15	17.9	--	--	--	12.1	15	17.9
Iron	7	7	13200	13900	14500	--	--	--	13200	13900	14500
Lead	7	7	135	171	236	--	--	--	135	171	236
Magnesium	7	7	2950	3080	3360	--	--	--	2950	3080	3360
Manganese	7	7	415	482	547	--	--	--	415	482	547
Mercury	7	7	0.05	0.0655	0.105	--	--	--	0.05	0.0655	0.105
Molybdenum	7	7	0.49	0.557	0.745	--	--	--	0.49	0.557	0.745
Nickel	7	7	10.1	10.8	11.4	--	--	--	10.1	10.8	11.4
Potassium	7	7	1410	1480	1590	--	--	--	1410	1480	1590
Selenium	7	7	0.177	0.225	0.28	--	--	--	0.177	0.225	0.28
Silver	7	7	0.06	0.0936	0.145	--	--	--	0.06	0.0936	0.145
Sodium	7	7	91.3	122	137	--	--	--	91.3	122	137
Thallium	7	7	0.2	0.233	0.27	--	--	--	0.2	0.233	0.27
Vanadium	7	7	22.9	24.5	25.9	--	--	--	22.9	24.5	25.9
Zinc	7	7	140	184	258	--	--	--	140	184	258

Notes:

For decision units (DUs) with field split and triplicate samples, summary statistics are based on the average of results for the DU. Nondetected values (NDs) are included as half the reporting limits (RLs).

[a] Calculated with nondetected results at one-half of the detection limit.

CEC - cation exchange capacity

mg/kg - milligram per kilogram

me/100 gm - miliequivalents per 100 grams

-- - no nondetected values

Table 5-4. Summary Statistics for IVBA Results

Analyte	Soil Fraction	Number of Samples	Number of Detected Values	Minimum Detected Values	Mean Detected Values	Maximum Detected Values	Minimum Nondetected Value[a]	Mean Nondetected Value[a]	Maximum Nondetected Value[a]	Overall Minimum Value[a]	Overall Mean Value[a]	Overall Maximum Value[a]	Units
ADA - High-density													
Aluminum	< 149-µm	11	11	14.8	20.9	28.4	--	--	--	14.8	20.9	28.4	%
Antimony	< 149-µm	11	11	19.7	37	53.7	--	--	--	19.7	37	53.7	%
Arsenic	< 149-µm	11	11	26.3	36.4	49.2	--	--	--	26.3	36.4	49.2	%
Barium	< 149-µm	11	11	45.8	61.8	69.7	--	--	--	45.8	61.8	69.7	%
Beryllium	< 149-µm	11	11	27.8	30.6	32.7	--	--	--	27.8	30.6	32.7	%
Cadmium	< 149-µm	11	11	68	81	91.9	--	--	--	68	81	91.9	%
Calcium	< 149-µm	11	11	60.5	73.6	85.2	--	--	--	60.5	73.6	85.2	%
Chromium	< 149-µm	11	11	2.1	3.56	4.9	--	--	--	2.1	3.56	4.9	%
Cobalt	< 149-µm	11	11	13.6	16.6	21.3	--	--	--	13.6	16.6	21.3	%
Copper	< 149-µm	11	11	20.6	26.9	40	--	--	--	20.6	26.9	40	%
Iron	< 149-µm	11	11	4.3	6.51	8.8	--	--	--	4.3	6.51	8.8	%
Lead	< 149-µm	11	11	67.4	85.2	95.9	--	--	--	67.4	85.2	95.9	%
Magnesium	< 149-µm	11	11	1.9	4.35	6.6	--	--	--	1.9	4.35	6.6	%
Manganese	< 149-µm	11	11	37.6	50.4	58.2	--	--	--	37.6	50.4	58.2	%
Mercury	< 149-µm	11	9	2.8	6.4	9.5	--	--	--	2.8	6.4	9.5	%
Molybdenum	< 149-µm	11	10	2.9	5.36	11.1	--	--	--	2.9	5.36	11.1	%
Nickel	< 149-µm	11	11	3.4	5.75	9.4	--	--	--	3.4	5.75	9.4	%
Potassium	< 149-µm	11	11	13.1	20	27.5	--	--	--	13.1	20	27.5	%
Selenium	< 149-µm	11	1	11.8	11.8	11.8	--	--	--	11.8	11.8	11.8	%
Silver	< 149-µm	11	11	53.1	60.4	67.5	--	--	--	53.1	60.4	67.5	%
Sodium	< 149-µm	11	11	4	9.65	14.2	--	--	--	4	9.65	14.2	%
Thallium	< 149-µm	11	11	13.2	19	26.8	--	--	--	13.2	19	26.8	%
Vanadium	< 149-µm	11	11	3	4.76	5.8	--	--	--	3	4.76	5.8	%
Zinc	< 149-µm	11	11	28.5	45.9	52.2	--	--	--	28.5	45.9	52.2	%
ADA - Primary													
Aluminum	< 149-µm	11	11	9.4	18.6	30.6	--	--	--	9.4	18.6	30.6	%
Antimony	< 149-µm	11	11	21.6	30.2	37.6	--	--	--	21.6	30.2	37.6	%
Arsenic	< 149-µm	11	11	14.9	27.8	42.9	--	--	--	14.9	27.8	42.9	%
Barium	< 149-µm	11	11	54.3	62.7	76.6	--	--	--	54.3	62.7	76.6	%
Beryllium	< 149-µm	11	11	22.1	31.6	38.5	--	--	--	22.1	31.6	38.5	%
Cadmium	< 149-µm	11	11	70.5	82.4	87.1	--	--	--	70.5	82.4	87.1	%
Calcium	< 149-µm	11	11	58.9	76.1	96	--	--	--	58.9	76.1	96	%
Chromium	< 149-µm	11	11	1.6	3.48	6.9	--	--	--	1.6	3.48	6.9	%
Cobalt	< 149-µm	11	11	8.1	18.8	30.7	--	--	--	8.1	18.8	30.7	%
Copper	< 149-µm	11	11	13.2	21.5	26.7	--	--	--	13.2	21.5	26.7	%
Iron	< 149-µm	11	11	3.1	6.17	10.8	--	--	--	3.1	6.17	10.8	%
Lead	< 149-µm	11	11	65	81.9	94	--	--	--	65	81.9	94	%
Magnesium	< 149-µm	11	11	1.9	8.09	24.7	--	--	--	1.9	8.09	24.7	%
Manganese	< 149-µm	11	11	38.6	52.8	74.5	--	--	--	38.6	52.8	74.5	%
Mercury	< 149-µm	11	6	6.55	7.58	9	--	--	--	6.55	7.58	9	%
Molybdenum	< 149-µm	9	7	3.8	5.45	7.2	--	--	--	3.8	5.45	7.2	%
Nickel	< 149-µm	11	11	3.1	6.16	8.9	--	--	--	3.1	6.16	8.9	%
Potassium	< 149-µm	11	11	15.2	21.6	30.3	--	--	--	15.2	21.6	30.3	%
Selenium	< 149-µm	11	1	21.7	21.7	21.7	--	--	--	21.7	21.7	21.7	%
Silver	< 149-µm	11	11	50.7	61.2	67	--	--	--	50.7	61.2	67	%
Sodium	< 149-µm	11	11	5.4	8.64	16.4	--	--	--	5.4	8.64	16.4	%
Thallium	< 149-µm	11	11	8.7	17.1	41.1	--	--	--	8.7	17.1	41.1	%
Vanadium	< 149-µm	11	11	3.5	5.28	8.6	--	--	--	3.5	5.28	8.6	%
Zinc	< 149-µm	11	11	19.4	33.6	48.2	--	--	--	19.4	33.6	48.2	%

Table 5-4. Summary Statistics for IVBA Results

Analyte	Soil Fraction	Number of Samples	Number of Detected Values	Minimum Detected Values	Mean Detected Values	Maximum Detected Values	Minimum Nondetected Value[a]	Mean Nondetected Value[a]	Maximum Nondetected Value[a]	Overall Minimum Value[a]	Overall Mean Value[a]	Overall Maximum Value[a]	Units
RFDA - RFA													
Aluminum	< 149-µm	2	2	14.7	16.1	17.5	--	--	--	14.7	16.1	17.5	%
Antimony	< 149-µm	2	2	18	23.2	28.3	--	--	--	18	23.2	28.3	%
Arsenic	< 149-µm	2	2	15.4	18.1	20.7	--	--	--	15.4	18.1	20.7	%
Barium	< 149-µm	2	2	29.4	35.2	40.9	--	--	--	29.4	35.2	40.9	%
Beryllium	< 149-µm	2	2	34.5	34.5	34.5	--	--	--	34.5	34.5	34.5	%
Cadmium	< 149-µm	2	2	36.8	37.3	37.7	--	--	--	36.8	37.3	37.7	%
Calcium	< 149-µm	2	2	48.4	49.2	50	--	--	--	48.4	49.2	50	%
Chromium	< 149-µm	2	2	12.3	12.6	12.9	--	--	--	12.3	12.6	12.9	%
Cobalt	< 149-µm	2	2	28.3	29.1	29.9	--	--	--	28.3	29.1	29.9	%
Copper	< 149-µm	2	2	51.7	52.4	53	--	--	--	51.7	52.4	53	%
Iron	< 149-µm	2	2	13.5	14.8	16.1	--	--	--	13.5	14.8	16.1	%
Lead	< 149-µm	2	2	61.3	62.5	63.7	--	--	--	61.3	62.5	63.7	%
Magnesium	< 149-µm	2	2	35.4	36.1	36.7	--	--	--	35.4	36.1	36.7	%
Manganese	< 149-µm	2	2	53.4	55.1	56.7	--	--	--	53.4	55.1	56.7	%
Mercury	< 149-µm	2	0	na	na	na	--	--	--	na	na	na	%
Molybdenum	< 149-µm	2	2	2.6	3.25	3.9	--	--	--	2.6	3.25	3.9	%
Nickel	< 149-µm	2	2	11.2	11.8	12.3	--	--	--	11.2	11.8	12.3	%
Potassium	< 149-µm	2	2	9.1	10.9	12.6	--	--	--	9.1	10.9	12.6	%
Selenium	< 149-µm	2	1	13	13	13	--	--	--	13	13	13	%
Silver	< 149-µm	2	2	18	21.1	24.2	--	--	--	18	21.1	24.2	%
Sodium	< 149-µm	2	2	28.1	29.8	31.5	--	--	--	28.1	29.8	31.5	%
Thallium	< 149-µm	2	2	10.9	12.1	13.2	--	--	--	10.9	12.1	13.2	%
Vanadium	< 149-µm	2	2	14.7	15.1	15.4	--	--	--	14.7	15.1	15.4	%
Zinc	< 149-µm	2	2	42.7	43.2	43.7	--	--	--	42.7	43.2	43.7	%
RFDA - RFD													
Aluminum	< 149-µm	1	1	17.6	17.6	17.6	--	--	--	17.6	17.6	17.6	%
Antimony	< 149-µm	1	1	27.4	27.4	27.4	--	--	--	27.4	27.4	27.4	%
Arsenic	< 149-µm	1	1	27.3	27.3	27.3	--	--	--	27.3	27.3	27.3	%
Barium	< 149-µm	1	1	26.4	26.4	26.4	--	--	--	26.4	26.4	26.4	%
Beryllium	< 149-µm	1	1	31.8	31.8	31.8	--	--	--	31.8	31.8	31.8	%
Cadmium	< 149-µm	1	1	43.4	43.4	43.4	--	--	--	43.4	43.4	43.4	%
Calcium	< 149-µm	1	1	48	48	48	--	--	--	48	48	48	%
Chromium	< 149-µm	1	1	11.4	11.4	11.4	--	--	--	11.4	11.4	11.4	%
Cobalt	< 149-µm	1	1	25.4	25.4	25.4	--	--	--	25.4	25.4	25.4	%
Copper	< 149-µm	1	1	38.6	38.6	38.6	--	--	--	38.6	38.6	38.6	%
Iron	< 149-µm	1	1	21.1	21.1	21.1	--	--	--	21.1	21.1	21.1	%
Lead	< 149-µm	1	1	55.2	55.2	55.2	--	--	--	55.2	55.2	55.2	%
Magnesium	< 149-µm	1	1	37.8	37.8	37.8	--	--	--	37.8	37.8	37.8	%
Manganese	< 149-µm	1	1	56.2	56.2	56.2	--	--	--	56.2	56.2	56.2	%
Mercury	< 149-µm	1	1	0.9	0.9	0.9	--	--	--	0.9	0.9	0.9	%
Molybdenum	< 149-µm	1	1	3.4	3.4	3.4	--	--	--	3.4	3.4	3.4	%
Nickel	< 149-µm	1	1	13.1	13.1	13.1	--	--	--	13.1	13.1	13.1	%
Potassium	< 149-µm	1	1	14.9	14.9	14.9	--	--	--	14.9	14.9	14.9	%
Selenium	< 149-µm	1	0	na	na	na	--	--	--	na	na	na	%
Silver	< 149-µm	1	1	15.5	15.5	15.5	--	--	--	15.5	15.5	15.5	%
Sodium	< 149-µm	1	1	35.5	35.5	35.5	--	--	--	35.5	35.5	35.5	%
Thallium	< 149-µm	1	1	10.4	10.4	10.4	--	--	--	10.4	10.4	10.4	%
Vanadium	< 149-µm	1	1	19.2	19.2	19.2	--	--	--	19.2	19.2	19.2	%
Zinc	< 149-µm	1	1	53	53	53	--	--	--	53	53	53	%

Notes:

For decision units (DUs) with field split and triplicate samples, summary statistics are based on the average of results for the DU. Nondetected values (NDs) are included as half the reporting limits (RLs).

[a] Calculated with nondetected results at one-half of the detection limit.

ADA- Aerial deposition area

IVBA - *in vitro* bioaccessibility

RFA, RFB, RFC, RFD - relict flood plain depositional areas A, B, C, and D

RFDA - relict flood plain deposition area

-- - no nondetected values

Table 5-5. Relative Bioavailability (RBA) Data for Lead from the < 149-µm Fraction

Decision Unit	Bioavailable Percentage Overall (IVBA)	Qualifier	Decision Unit RBA[a,b]	Ratio of Site-specific RBA to EPA Default RBA[c]
ADA - High-density				
ADA-125	87.7	J	74.2	1.2
ADA-126	89.1	J	75.4	1.3
ADA-141[d]	82.9	J	70.0	1.2
ADA-142	91.0	J	77.1	1.3
ADA-144	79.6	J	67.1	1.1
ADA-145	83.3	J	70.3	1.2
ADA-150	79.8	J	67.3	1.1
ADA-152	95.9	J	81.4	1.4
ADA-160	87.6	J	74.1	1.2
ADA-161[d]	93.0	J	78.9	1.3
ADA-162	67.4		56.4	0.94
Average for ADA High-density			**72.0**	**1.2**
ADA - Primary				
ADA-001	87.2	J	73.8	1.2
ADA-016-A	88.6		70.4	1.2
ADA-016-B	83.8		70.4	1.2
ADA-016-C	77.8		70.4	1.2
ADA-016[e]	77.8		70.4	1.2
ADA-035	83.6	J	70.6	1.2
ADA-047	85.9	J	72.6	1.2
ADA-048	82.3	J	69.5	1.2
ADA-057	70.7		59.3	1.0
ADA-059	79.1	J	66.6	1.1
ADA-061	65.0		54.3	0.90
ADA-076	94.0	J	79.7	1.3
ADA-081	80.1	J	67.5	1.1
ADA-096	89.9	J	76.1	1.3
Average for ADA Primary[f]			**69.1**	**1.2**
Average for ADA Overall[f]			**70.6**	**1.2**
RFDA				
RFA-001-A	67.0		53.1	0.89
RFA-001-B	65.8		53.1	0.89
RFA-001-C	58.3		53.1	0.89
RFA-001[e]	58.3		53.1	0.89
RFA-005	61.3		51.0	0.85
RFD-002	55.2		45.7	0.76
Average for RFDA[f]			**49.9**	**0.8**

Notes:

[a] RBA equation from EPA (2007-lead estimation guidance) RBA= 0.878*IVBA-0.028

[b] For decision units (DUs) with triplicate samples (ADA-016 and RFA-001), triplicate sample results were RBA adjusted and then averaged.

[c] EPA default RBA= 60% (EPA 2007a), empirical lead soil concentrations are multiplied by this ratio before comparison to the human health soil screening value to account for differences in bioavailability relative to the the screening value.

[d] Analysis of bioaccessibility percentage was performed on the split sample rather than the primary sample from ADA-141 (i.e., DIRT-011 149µm) and from ADA-161 (i.e., DIRT-015 149µm).

[e] Values are averages of the preceeding triplicate samples for that DU.

[f] The average value for the area is calculated using the average of the triplicate values and not the individual values.

ADA - aerial deposition area

IVBA - *in vitro* bioaccessibility

RFDA - relict floodplain deposition area

Table 5-6. Lead Data from < 149-µm Fraction Adjusted for Bioavailability

Decision Unit	Bioavailability Adjusted Lead Concentration[a] (mg/kg)	Qualifier[b]
ADA - High Density		
ADA-124	178	
ADA-125	151	
ADA-126	427	
ADA-127	214	
ADA-128	365	
ADA-131	387	
ADA-132	163	
ADA-133	340	
ADA-135	141	
ADA-136	387	
ADA-139	222	
ADA-140	560	
ADA-141	191	
ADA-142	599	
ADA-143	279	
ADA-144	747	
ADA-145	373	
ADA-146	394	
ADA-147	772	
ADA-148	373	
ADA-150	627	
ADA-151	440	
ADA-152	300	
ADA-153	450	
ADA-154	399	
ADA-155	321	
ADA-156	385	
ADA-158	391	
ADA-159	520	
ADA-160	348	
ADA-161	452	
ADA-162	928	
ADA-164	496	
ADA-165	567	
ADA-168	315	
ADA - Primary		
ADA-001	354	
ADA-002	61	
ADA-004	162	
ADA-005	85	J
ADA-006	272	
ADA-008	349	
ADA-010	529	
ADA-015	187	
ADA-016	258	
ADA-017	292	
ADA-018	529	
ADA-019	115	
ADA-020	105	
ADA-021	107	
ADA-023	178	
ADA-024	513	

Table 5-6. Lead Data from < 149-µm Fraction Adjusted for Bioavailability

Decision Unit	Bioavailability Adjusted Lead Concentration[a] (mg/kg)	Qualifier[b]
ADA - Primary (continued)		
ADA-025	245	
ADA-026	85	
ADA-028	243	
ADA-033	89	
ADA-034	77	
ADA-035	215	
ADA-039	41	
ADA-042	96	
ADA-043	178	
ADA-044	165	
ADA-045	381	
ADA-046	212	
ADA-047	326	
ADA-048	144	
ADA-049	54	
ADA-050	432	
ADA-051	124	
ADA-052	415	
ADA-053	103	
ADA-054	505	
ADA-055	211	J
ADA-056	85	
ADA-057	132	
ADA-058	94	
ADA-059	143	
ADA-060	478	
ADA-061	124	
ADA-062	348	
ADA-063	152	
ADA-064	167	
ADA-065	385	
ADA-066	168	
ADA-067	107	
ADA-070	245	
ADA-071	276	
ADA-073	312	
ADA-076	286	
ADA-078	256	
ADA-079	151	
ADA-081	187	J
ADA-082	194	
ADA-084	175	
ADA-085	135	
ADA-088	327	
ADA-089	331	
ADA-090	248	
ADA-091	282	
ADA-092	225	
ADA-093	182	
ADA-094	100	
ADA-095	165	J
ADA-096	364	

Table 5-6. Lead Data from < 149-µm Fraction Adjusted for Bioavailability

Decision Unit	Bioavailability Adjusted Lead Concentration[a] (mg/kg)	Qualifier[b]
ADA - Primary (continued)		
ADA-097	536	
ADA-099	259	
ADA-101	226	
ADA-102	127	J
ADA-103	174	
ADA-104	80	
ADA-105	235	
ADA-106	80	
ADA-107	148	
ADA-108	228	
ADA-109	381	
ADA-110	267	
ADA-111	120	
ADA-112	103	
ADA-113	163	
ADA-114	115	
ADA-115	143	
ADA-116	113	J
ADA-117	194	
ADA-118	192	
ADA-119	207	
ADA-121	240	
ADA-122	57	
ADA-169	69	
ADA-170	109	
ADA-171	95	
ADA-172	70	
ADA-173	90	
ADA-174	77	
ADA-175	83	
ADA-176	79	
ADA-177	72	
ADA-178	56	
ADA-179	67	
ADA-180	133	
ADA-181	101	
ADA-182	41	
ADA-183	58	
ADA-184	85	
RFDA - RFA		
RFA-001	414	
RFA-002	252	
RFA-003	388	
RFA-004	290	
RFA-005	308	
RFDA - RFB		
RFB-002	159	
RFB-003	107	J
RFB-008	60	

Table 5-6. Lead Data from < 149-µm Fraction Adjusted for Bioavailability

Decision Unit	Bioavailability Adjusted Lead Concentration[a] (mg/kg)	Qualifier[b]
RFDA - RFC		
RFC-003	386	
RFC-004	199	
RFC-005	470	
RFC-006	343	
RFC-007	362	
RFC-008	339	
RFDA - RFD		
RFD-002	314	
RFD-003	307	

Notes:

[a] Lead concentrations adjusted for the ratio of site-specific relative bioavailability (RBA) to EPA's default RBA, see Table 5-5. The ratio of the DU-specific RBA to EPA's default RBA was used when available. For ADA and RFDA DUs that did not have IVBA measured directly (i.e. those DUs not listed in Table 5-5), the average RBA ratio for the ADA overall (including primary and high density) or RFDA reported in Table 5-5 was applied.

[b] Qualifiers are from lead data before the adjustment for bioavailability.

ADA - aerial deposition area

J - estimated value

mg/kg - milligram per kilogram

RFDA - relict floodplain deposition area

RFA, RFB, RFC, and RFD- relict flood plain depositional areas A, B, C, and D

Table 5-7a. Aerial Deposition Area Summary of Field Split and Triplicate Sample Results for Bulk Soil Samples

	Field Split Sample RPDs			Triplicate Sample RSDs		
Analyte	Number of Samples	No. RPDs >20%	Max RPD (%)	Number of Samples	No. RSDs >35%	Max RSD (%)
High-density - Conventional Parameters						
pH	6	0	18.8	6	0	5.07
Solids	6	0	6.95	6	0	4.93
Grain Size						
Clay	6	na	64	6	2	51.3
Silt	6	na	16.6	6	0	18.7
Very fine sand	6	na	34.4	6	0	34.4
Fine sand	6	na	30.8	6	1	43.5
Medium sand	6	na	24.5	6	1	46.3
Coarse sand	6	na	14.9	6	1	35.7
Very coarse sand	6	na	34.5	6	1	38.3
Very fine gravel	6	na	56.3	6	2	77
Fine gravel	6	na	139	6	6	111
Medium gravel	6	na	200	6	4	173
Coarse gravel	6	na	200	6	0	0
Very coarse gravel	6	na	0	6	0	0
Cobbles	6	na	0	6	0	0
Primary - Conventional Parameters						
pH	12	0	3.05	10	0	5.63
Solids	12	0	5.61	10	0	5.97
Grain Size						
Clay	12	na	64.9	10	1	94.2
Silt	12	na	28.3	10	0	32.1
Very fine sand	12	na	106	10	0	24.9
Fine sand	12	na	45	10	0	27.7
Medium sand	12	na	49.4	10	0	20.1
Coarse sand	12	na	35.8	10	0	34.4
Very coarse sand	12	na	32.4	10	0	27.5
Very fine gravel	12	na	63.8	10	2	88.6
Fine gravel	12	na	156	10	8	122
Medium gravel	12	na	200	10	9	173
Coarse gravel	12	na	200	10	0	0
Very coarse gravel	12	na	0	10	0	0
Cobbles	12	na	0	10	0	0

Notes:

Highlighted cells identify where relative percent differences (RPDs) and relative standard deviations (RSDs) are greater than the control limit.

Control limits specified in the quality assurance project plan (QAPP) (Exponent et al. 2014) are 20% for analytical RPDs (i.e., metals, mercury, total organic carbon [TOC], cation exchange capacity [CEC], and pH) and 35% for field triplicate RSDs. The QAPP did not specify a quality objective for grain size RPDs.

na - not applicable

Table 5-7b. Aerial Deposition Area Summary of Field Split and Triplicate Sample Results for the < 2-mm Soil Fraction

	Field Split Sample RPDs			Triplicate Sample RSDs		
Analyte	Number of Samples	No. RPDs >20%	Max RPD (%)	Number of Samples	No. RSDs >35%	Max RSD (%)
High-density - Conventional Parameters						
CEC	6	3	32.5	6	0	28.2
Organic carbon	6	2	23.5	6	0	26.6
Solids	6	0	3.16	6	0	2.89
High-density - Metals/Metalloids						
Aluminum	6	1	41.2	6	0	14.2
Antimony	6	1	27.4	6	1	35.2
Arsenic	6	1	35.1	6	0	26
Barium	6	1	29.8	6	0	10.8
Beryllium	6	1	36.6	6	0	12.4
Cadmium	6	1	30.4	6	0	24.9
Calcium	6	1	36.3	6	0	14.2
Chromium	6	1	37.9	6	0	23.5
Cobalt	6	1	35.6	6	0	20.9
Copper	6	1	32.7	6	0	19.5
Iron	6	1	34.6	6	0	13.9
Lead	6	1	40.5	6	0	34.9
Magnesium	6	1	35.6	6	0	17.9
Manganese	6	2	33.4	6	0	14.5
Mercury	6	1	33.3	6	0	28.6
Molybdenum	6	1	32.1	6	0	14.2
Nickel	6	1	34.8	6	0	18
Potassium	6	1	38.8	6	0	21.9
Selenium	6	1	31.1	6	0	24
Silver	6	1	27	6	0	26.9
Sodium	6	1	43.9	6	0	27.8
Thallium	6	1	27.3	6	0	23.5
Vanadium	6	1	39.1	6	0	14.2
Zinc	6	1	26.9	6	0	24.1
Primary - Conventional Parameters						
CEC	12	8	62.8	10	2	43.1
Organic carbon	12	6	52.9	10	0	22.6
Solids	12	0	2.42	10	0	4.7
Primary - Metals/Metalloids						
Aluminum	12	1	20.1	10	0	7.58
Antimony	12	1	22.2	10	0	12.9
Arsenic	12	0	12.5	10	0	15.3
Barium	12	2	26.4	10	0	22.3
Beryllium	12	0	17.9	10	0	9.56
Cadmium	12	0	19.5	10	0	14.4
Calcium	12	0	17.9	10	1	35.1
Chromium	12	1	28.8	10	0	26.6
Cobalt	12	0	16.1	10	0	12.3
Copper	12	0	8.6	10	0	14.4
Iron	12	0	9.69	10	0	8.94
Lead	12	1	22.7	10	0	14.8
Magnesium	12	1	25.6	10	0	16.8
Manganese	12	1	20.5	10	0	16.6
Mercury	12	0	13.3	10	0	34.6
Molybdenum	12	0	20	10	1	35.9
Nickel	12	0	18	10	0	23
Potassium	12	0	17.2	10	0	14.1
Selenium	12	0	14.3	10	0	21
Silver	12	0	15.9	10	0	15.1
Sodium	12	0	15.4	10	0	30.2
Thallium	12	1	23	10	0	10.2
Vanadium	12	0	10.5	10	0	11.7
Zinc	12	0	19.4	10	0	11.5

Notes:

Highlighted cells identify where relative percent differences (RPDs) and relative standard deviations (RSDs) are greater than the control limit.

Control limits specified in the quality assurance project plan (QAPP) (Exponent et al. 2014) are 20% for analytical RPDs (i.e., metals, mercury, total organic carbon [TOC], cation exchange capacity [CEC], and pH) and 35% for field triplicate RSDs. The QAPP did not specify a quality objective for grain size RPDs.

Table 5-7c. Aerial Deposition Area Summary of Field Split and Triplicate Sample Results for the < 149-µm Soil Fraction

Analyte	Field Split Sample RPDs			Triplicate Sample RSDs		
	Number of Samples	No. RPDs >20%	Max RPD (%)	Number of Samples	No. RSDs >35%	Max RSD (%)
High-density - Conventional Parameters						
Solids	6	0	1.82	6	0	1.64
High-density - Metals/Metalloids						
Aluminum	6	0	2.69	6	0	11.3
Antimony	6	0	8.56	6	0	29.7
Arsenic	6	0	5.11	6	0	22.4
Barium	6	0	5.95	6	0	11.6
Beryllium	6	0	3.77	6	0	13.9
Cadmium	6	0	8.93	6	0	23.6
Calcium	6	0	9.92	6	0	15.3
Chromium	6	0	2.88	6	0	28.8
Cobalt	6	0	1.75	6	0	20.1
Copper	6	0	6.91	6	0	16.2
Iron	6	0	4.17	6	0	9.89
Lead	6	0	10.1	6	0	31.1
Magnesium	6	0	2.13	6	0	15.6
Manganese	6	0	6.76	6	0	12.9
Mercury	6	0	13.3	6	0	25
Molybdenum	6	0	7.55	6	0	8.2
Nickel	6	0	3.64	6	0	14.3
Potassium	6	0	3.69	6	0	21.2
Selenium	6	0	19.4	6	0	20
Silver	6	0	8.96	6	0	18.9
Sodium	6	0	8	6	0	33.7
Thallium	6	0	8	6	0	19.5
Vanadium	6	0	4.13	6	0	10.7
Zinc	6	0	7.28	6	0	17.6
Primary - Conventional Parameters						
Solids	12	0	1.27	10	0	3.46
Primary - Metals/Metalloids						
Aluminum	12	0	8.84	10	0	8.13
Antimony	12	0	15.3	10	0	12.8
Arsenic	12	0	16.8	10	0	19
Barium	12	1	24.7	10	0	26.1
Beryllium	12	0	4.17	10	0	11.3
Cadmium	12	0	16.7	10	0	16.1
Calcium	12	0	8.55	10	0	31.8
Chromium	12	0	9.4	10	0	21.9
Cobalt	12	0	6.08	10	0	10.5
Copper	12	0	12.9	10	0	13.2
Iron	12	0	6.06	10	0	6.57
Lead	12	0	18.3	10	0	13.9
Magnesium	12	0	7.2	10	0	15.5
Manganese	12	0	11.1	10	0	14
Mercury	12	2	22.2	10	0	33.3
Molybdenum	12	0	9.66	10	0	27
Nickel	12	0	6.15	10	0	20.2
Potassium	12	0	8.22	10	0	15.9
Selenium	12	0	16	10	0	27.2
Silver	12	1	22.2	10	0	21.7
Sodium	12	0	12.1	10	0	22.3
Thallium	12	0	13.3	10	0	10.2
Vanadium	12	0	10.7	10	0	9.36
Zinc	12	0	13.9	10	0	12.2

Notes:

Highlighted cells identify where relative percent differences (RPDs) and relative standard deviations (RSDs) are greater than the control limit.

Control limits specified in the quality assurance project plan (QAPP) (Exponent et al. 2014) are 20% for analytical RPDs (i.e., metals, mercury, total organic carbon [TOC], cation exchange capacity [CEC], and pH) and 35% for field triplicate RSDs. The QAPP did not specify a quality objective for grain size RPDs.

Table 5-8a. Relict Floodplain Deposition Area Summary of Field Split and Triplicate Sample Results for Bulk Soil Samples

	Field Split Sample RPDs			Triplicate Sample RSDs		
Analyte	Number of Samples	No. RPDs >20%	Max RPD (%)	Number of Samples	No. RSDs >35%	Max RSD (%)
RFA - Conventional Parameters						
pH	1	0	1.47	1	0	2.12
Solids	1	0	0.841	1	0	2.43
Grain Size						
Clay	1	na	19.7	1	1	53.4
Silt	1	na	4.51	1	0	10
Very fine sand	1	na	16.2	1	0	9.32
Fine sand	1	na	5.71	1	0	14.6
Medium sand	1	na	9.56	1	0	7.17
Coarse sand	1	na	5.67	1	1	36.9
Very coarse sand	1	na	1.57	1	0	29.2
Very fine gravel	1	na	21.9	1	0	19.8
Fine gravel	1	na	198	1	1	57.7
Medium gravel	1	na	200	1	1	98.4
Coarse gravel	1	na	0	1	1	173
Very coarse gravel	1	na	0	1	0	0
Cobbles	1	na	0	1	0	0
RFB - Conventional Parameters						
pH	ns	ns	ns	1	0	0.285
Solids	ns	ns	ns	1	0	4.49
Grain Size						
Clay	ns	ns	ns	1	0	24.7
Silt	ns	ns	ns	1	0	18
Very fine sand	ns	ns	ns	1	0	5.48
Fine sand	ns	ns	ns	1	1	44
Medium sand	ns	ns	ns	1	1	71.9
Coarse sand	ns	ns	ns	1	1	91.5
Very coarse sand	ns	ns	ns	1	1	74.2
Very fine gravel	ns	ns	ns	1	0	22.9
Fine gravel	ns	ns	ns	1	1	63.7
Medium gravel	ns	ns	ns	1	1	125
Coarse gravel	ns	ns	ns	1	0	0
Very coarse gravel	ns	ns	ns	1	0	0
Cobbles	ns	ns	ns	1	0	0
RFC - Conventional Parameters						
pH	1	0	0.638	1	0	1.44
Solids	1	0	0.339	1	0	4.85
Grain Size						
Clay	1	na	10.1	1	0	15.8
Silt	1	na	5.71	1	0	13.4
Very fine sand	1	na	10.9	1	0	12.9
Fine sand	1	na	8.34	1	0	28.3
Medium sand	1	na	2.53	1	1	102
Coarse sand	1	na	1.1	1	1	93.5
Very coarse sand	1	na	10.7	1	1	83.5
Very fine gravel	1	na	85.7	1	1	75.2
Fine gravel	1	na	96.3	1	1	163
Medium gravel	1	na	0	1	1	173
Coarse gravel	1	na	0	1	0	0
Very coarse gravel	1	na	0	1	0	0
Cobbles	1	na	0	1	0	0
RFD - Conventional Parameters						
pH	ns	ns	ns	1	0	8.29
Solids	ns	ns	ns	1	0	3.17
Grain Size						
Clay	ns	ns	ns	1	0	22.8
Silt	ns	ns	ns	1	1	35.8
Very fine sand	ns	ns	ns	1	0	34.4
Fine sand	ns	ns	ns	1	0	9.82
Medium sand	ns	ns	ns	1	1	48.7
Coarse sand	ns	ns	ns	1	1	50
Very coarse sand	ns	ns	ns	1	1	42.3
Very fine gravel	ns	ns	ns	1	1	68.9
Fine gravel	ns	ns	ns	1	1	37
Medium gravel	ns	ns	ns	1	1	173
Coarse gravel	ns	ns	ns	1	0	0
Very coarse gravel	ns	ns	ns	1	0	0
Cobbles	ns	ns	ns	1	0	0

Notes:

Highlighted cells identify where relative percent differences (RPDs) and relative standard deviations (RSDs) are greater than the control limit.

Control limits specified in the quality assurance project plan (QAPP) (Exponent et al. 2014) are 20% for analytical RPDs (i.e., metals, mercury, total organic carbon [TOC], cation exchange capacity [CEC], and pH) and 35% for field triplicate RSDs. The QAPP did not specify a quality objective for grain size RPDs.
na - not applicable

ns - not sampled (field duplicates were not prepared)

RFA, RFB, RFC, and RFD - relict flood plain depositional areas A, B, C, and D

Table 5-8b. Relict Floodplain Deposition Area Summary of Field Split and Triplicate Sample Results for the < 2-mm Soil Fraction

	Field Split Sample RPDs			Triplicate Sample RSDs		
Analyte	Number of Samples	No. RPDs >20%	Max RPD (%)	Number of Samples	No. RSDs >35%	Max RSD (%)
RFA - Conventional Parameters						
CEC	1	0	13.9	1	0	14
Organic carbon	1	0	5.88	1	0	14.6
Solids	1	0	0	1	0	0.823
RFA - Metals/Metalloids						
Aluminum	1	0	11.3	1	0	8.1
Antimony	1	0	0	1	0	5.21
Arsenic	1	0	2.75	1	0	6.57
Barium	1	0	4.39	1	0	1.37
Beryllium	1	0	13.7	1	0	7.56
Cadmium	1	0	7.55	1	0	7.73
Calcium	1	0	3.17	1	0	5.41
Chromium	1	0	12.4	1	0	4.78
Cobalt	1	0	8.7	1	0	10.3
Copper	1	0	16.4	1	0	12.8
Iron	1	0	14.8	1	0	15
Lead	1	0	0.704	1	0	8.47
Magnesium	1	0	8.39	1	0	8.49
Manganese	1	0	13.3	1	0	13.3
Mercury	1	1	52.6	1	1	46.9
Molybdenum	1	0	8.97	1	0	6.13
Nickel	1	0	1.74	1	0	5.85
Potassium	1	0	10.5	1	0	9.71
Selenium	1	0	15.8	1	0	4.61
Silver	1	0	16.2	1	0	11.6
Sodium	1	0	15.7	1	0	18.7
Thallium	1	0	19.4	1	0	10.6
Vanadium	1	0	6.9	1	0	3.16
Zinc	1	0	15.5	1	0	15.7
RFB - Conventional Parameters						
CEC	ns	ns	ns	1	0	26.3
Organic carbon	ns	ns	ns	1	0	4.67
Solids	ns	ns	ns	1	0	1.57
RFB - Metals/Metalloids						
Aluminum	ns	ns	ns	1	0	6.01
Antimony	ns	ns	ns	1	1	45.5
Arsenic	ns	ns	ns	1	0	19.2
Barium	ns	ns	ns	1	0	10.7
Beryllium	ns	ns	ns	1	0	15.3
Cadmium	ns	ns	ns	1	1	39.5
Calcium	ns	ns	ns	1	0	8.65
Chromium	ns	ns	ns	1	0	7.19
Cobalt	ns	ns	ns	1	0	5
Copper	ns	ns	ns	1	0	13.9
Iron	ns	ns	ns	1	0	5.84
Lead	ns	ns	ns	1	1	45.9
Magnesium	ns	ns	ns	1	0	3.72
Manganese	ns	ns	ns	1	0	22.5
Mercury	ns	ns	ns	1	0	24.7
Molybdenum	ns	ns	ns	1	0	8.97
Nickel	ns	ns	ns	1	0	7.85
Potassium	ns	ns	ns	1	0	4.21
Selenium	ns	ns	ns	1	0	24.6
Silver	ns	ns	ns	1	0	25.9
Sodium	ns	ns	ns	1	0	4.26
Thallium	ns	ns	ns	1	0	20.3
Vanadium	ns	ns	ns	1	0	4.93
Zinc	ns	ns	ns	1	0	21.2
RFC - Conventional Parameters						
CEC	1	0	0.509	1	0	14.5
Organic carbon	1	0	2.76	1	0	2.14
Solids	1	0	0	1	0	0.588
RFC - Metals/Metalloids						
Aluminum	1	0	0.502	1	0	7.51
Antimony	1	0	0.574	1	0	10.4
Arsenic	1	0	0	1	0	2.65
Barium	1	0	2.36	1	0	5.91
Beryllium	1	0	0	1	0	9.6
Cadmium	1	0	0.702	1	0	2.79

Table 5-8b. Relict Floodplain Deposition Area Summary of Field Split and Triplicate Sample Results for the < 2-mm Soil Fraction

	Field Split Sample RPDs			Triplicate Sample RSDs		
Analyte	Number of Samples	No. RPDs >20%	Max RPD (%)	Number of Samples	No. RSDs >35%	Max RSD (%)
RFC - Metals/Metalloids (continued)						
Calcium	1	0	5.82	1	0	1.5
Chromium	1	0	1.84	1	0	4.18
Cobalt	1	0	2.45	1	0	2.2
Copper	1	0	4.44	1	0	4.95
Iron	1	0	1.07	1	0	4.09
Lead	1	0	4.8	1	0	4.8
Magnesium	1	0	1.05	1	0	4.11
Manganese	1	0	0.448	1	0	5.46
Mercury	1	0	13.3	1	0	5.33
Molybdenum	1	0	1.71	1	0	0.813
Nickel	1	0	2.61	1	0	3.17
Potassium	1	0	1.86	1	0	7.35
Selenium	1	0	3.97	1	0	3.7
Silver	1	0	1.87	1	0	4.91
Sodium	1	0	16.7	1	0	31.1
Thallium	1	0	5.71	1	0	9.74
Vanadium	1	0	0.93	1	0	3.37
Zinc	1	0	0.487	1	0	1.29
RFD - Conventional Parameters						
CEC	ns	ns	ns	1	0	2.88
Organic carbon	ns	ns	ns	1	0	21.5
RFD - Metals/Metalloids						
Solids	ns	ns	ns	1	0	0.354
Aluminum	ns	ns	ns	1	0	6.05
Antimony	ns	ns	ns	1	0	7.11
Arsenic	ns	ns	ns	1	0	13.2
Barium	ns	ns	ns	1	1	37.6
Beryllium	ns	ns	ns	1	0	5.8
Cadmium	ns	ns	ns	1	0	6.69
Calcium	ns	ns	ns	1	1	37.6
Chromium	ns	ns	ns	1	0	3.05
Cobalt	ns	ns	ns	1	0	4.79
Copper	ns	ns	ns	1	0	8.62
Iron	ns	ns	ns	1	0	5.36
Lead	ns	ns	ns	1	0	1.79
Magnesium	ns	ns	ns	1	0	28.1
Manganese	ns	ns	ns	1	0	6.08
Mercury	ns	ns	ns	1	0	31.4
Molybdenum	ns	ns	ns	1	0	30.7
Nickel	ns	ns	ns	1	0	6
Potassium	ns	ns	ns	1	0	5.11
Selenium	ns	ns	ns	1	0	12.3
Silver	ns	ns	ns	1	0	20.4
Sodium	ns	ns	ns	1	0	3.82
Thallium	ns	ns	ns	1	0	5.15
Vanadium	ns	ns	ns	1	0	4.01
Zinc	ns	ns	ns	1	0	19.8

Notes:

Highlighted cells identify where relative percent differences (RPDs) and relative standard deviations (RSDs) are greater than the control limit.

Control limits specified in the quality assurance project plan (QAPP) (Exponent et al. 2014) are 20% for analytical RPDs (i.e., metals, mercury, total organic carbon [TOC], cation exchange capacity [CEC], and pH) and 35% for field triplicate RSDs. The QAPP did not specify a quality objective for grain size RPDs.

ns - not sampled (field duplicates were not prepared)

RFA, RFB, RFC, and RFD - relict flood plain depositional areas A, B, C, and D

Table 5-8c. Relict Floodplain Deposition Area Summary of Field Split and Triplicate Sample Results for the < 149-µm Soil Fraction

Analyte	Field Split Sample RPDs			Triplicate Sample RSDs		
	Number of Samples	No. RPDs >20%	Max RPD (%)	Number of Samples	No. RSDs >35%	Max RSD (%)
RFA - Conventional Parameters						
Solids	1	0	0.502	1	0	0.637
RFA - Metals/Metalliods						
Aluminum	1	0	5.27	1	0	6.63
Antimony	1	0	3.9	1	0	16.1
Arsenic	1	0	2.71	1	0	3.45
Barium	1	0	11	1	0	6.93
Beryllium	1	0	3.92	1	0	7.14
Cadmium	1	0	4.76	1	0	2.29
Calcium	1	0	0.603	1	0	6.2
Chromium	1	0	7.59	1	0	5.43
Cobalt	1	0	2.43	1	0	3.73
Copper	1	0	4.23	1	0	7.56
Iron	1	0	3.31	1	0	1.21
Lead	1	0	4.96	1	0	4.41
Magnesium	1	0	0.76	1	0	4.7
Manganese	1	0	3.34	1	0	1.96
Mercury	1	0	20	1	0	31.5
Molybdenum	1	0	8.35	1	0	12.7
Nickel	1	0	5.3	1	0	1.85
Potassium	1	0	4.2	1	0	6.3
Selenium	1	0	1.98	1	0	7.86
Silver	1	1	21.4	1	0	11.6
Sodium	1	0	2.74	1	0	4.09
Thallium	1	0	10.9	1	0	8.11
Vanadium	1	0	7.16	1	0	1.84
Zinc	1	0	6.37	1	0	1.18
RFB - Conventional Parameters						
Solids	ns	ns	ns	1	0	0.446
RFB - Metals/Metalliods						
Aluminum	ns	ns	ns	1	0	3.65
Antimony	ns	ns	ns	1	1	41.1
Arsenic	ns	ns	ns	1	0	17.7
Barium	ns	ns	ns	1	0	4.61
Beryllium	ns	ns	ns	1	0	4.44
Cadmium	ns	ns	ns	1	0	33.1
Calcium	ns	ns	ns	1	0	2.6
Chromium	ns	ns	ns	1	0	3.11
Cobalt	ns	ns	ns	1	0	4.03
Copper	ns	ns	ns	1	0	8.44
Iron	ns	ns	ns	1	0	2.5
Lead	ns	ns	ns	1	1	40.6
Magnesium	ns	ns	ns	1	0	5.43
Manganese	ns	ns	ns	1	0	12.8
Mercury	ns	ns	ns	1	0	31.5
Molybdenum	ns	ns	ns	1	0	6.72
Nickel	ns	ns	ns	1	0	2.66
Potassium	ns	ns	ns	1	0	7.24
Selenium	ns	ns	ns	1	0	7.26
Silver	ns	ns	ns	1	0	20.5
Sodium	ns	ns	ns	1	0	11.5
Thallium	ns	ns	ns	1	0	15.1
Vanadium	ns	ns	ns	1	0	4
Zinc	ns	ns	ns	1	0	14.2
RFC - Conventional Parameters						
Solids	1	0	0.305	1	0	0.389

Table 5-8c. Relict Floodplain Deposition Area Summary of Field Split and Triplicate Sample Results for the < 149-µm Soil Fraction

	Field Split Sample RPDs			Triplicate Sample RSDs		
Analyte	Number of Samples	No. RPDs >20%	Max RPD (%)	Number of Samples	No. RSDs >35%	Max RSD (%)
RFC - Metals/Metalliods						
Aluminum	1	0	0.456	1	0	3.3
Antimony	1	0	1.85	1	0	12.6
Arsenic	1	0	1.67	1	0	5.84
Barium	1	0	2.09	1	0	5.24
Beryllium	1	0	2.67	1	0	12.1
Cadmium	1	0	3.18	1	0	4.58
Calcium	1	0	1.68	1	0	1.4
Chromium	1	0	1.93	1	0	1.86
Cobalt	1	0	3.1	1	0	1.19
Copper	1	0	1.28	1	0	9.5
Iron	1	0	1.78	1	0	2.1
Lead	1	0	4.31	1	0	6.44
Magnesium	1	0	2.37	1	0	2.33
Manganese	1	0	2.15	1	0	3.87
Mercury	1	0	5.71	1	0	7.39
Molybdenum	1	0	4.82	1	0	5.04
Nickel	1	0	1.81	1	0	1.59
Potassium	1	0	3.19	1	0	10.2
Selenium	1	0	8.89	1	0	4.69
Silver	1	0	4.72	1	0	10.1
Sodium	1	0	5.67	1	1	37.2
Thallium	1	0	3.17	1	0	12.4
Vanadium	1	0	3.33	1	0	2.11
Zinc	1	0	0.469	1	0	0.422
RFD - Conventional Parameters						
Solids	ns	ns	ns	1	0	0.101
RFD - Metals/Metalliods						
Aluminum	ns	ns	ns	1	0	9.87
Antimony	ns	ns	ns	1	0	17.4
Arsenic	ns	ns	ns	1	0	16.8
Barium	ns	ns	ns	1	0	31.7
Beryllium	ns	ns	ns	1	0	4.88
Cadmium	ns	ns	ns	1	0	3.98
Calcium	ns	ns	ns	1	1	40
Chromium	ns	ns	ns	1	0	4.59
Cobalt	ns	ns	ns	1	0	5.22
Copper	ns	ns	ns	1	0	7.62
Iron	ns	ns	ns	1	0	4.22
Lead	ns	ns	ns	1	0	9.44
Magnesium	ns	ns	ns	1	0	32.3
Manganese	ns	ns	ns	1	0	6.44
Mercury	ns	ns	ns	1	1	36.2
Molybdenum	ns	ns	ns	1	0	24.6
Nickel	ns	ns	ns	1	0	2.94
Potassium	ns	ns	ns	1	0	13
Selenium	ns	ns	ns	1	0	10.9
Silver	ns	ns	ns	1	0	13.2
Sodium	ns	ns	ns	1	0	6.17
Thallium	ns	ns	ns	1	0	4.17
Vanadium	ns	ns	ns	1	0	1.07
Zinc	ns	ns	ns	1	0	19.5

Notes:

Highlighted cells identify where relative percent differences (RPDs) and relative standard deviations (RSDs) are greater than the control limit.

Control limits specified in the quality assurance project plan (QAPP) (Exponent et al. 2014) are 20% for analytical RPDs (i.e., metals, mercury, total organic carbon [TOC], cation exchange capacity [CEC], and pH) and 35% for field triplicate RSDs. The QAPP did not specify a quality objective for grain size RPDs.

ns - not sampled (field duplicates were not prepared)
RFA, RFB, RFC, and RFD - relict flood plain depositional areas A, B, C, and D

Table 5-9a. Windblown Sediment Deposition Area Summary of Field Split and Triplicate Sample Results for Bulk Soil Samples

	Field Split Sample RPDs			Triplicate Sample RSDs		
Analyte	Number of Samples	No. RPDs >20%	Max RPD (%)	Number of Samples	No. RSDs >35%	Max RSD (%)
Columbia Beach North - Conventional Parameters						
pH	1	0	3.62	1	0	1.07
Solids	1	0	0.101	1	0	0.0587
Grain Size						
Clay	1	na	0.425	1	0	3.87
Silt	1	na	11.5	1	0	12.3
Very fine sand	1	na	4.27	1	0	3.59
Fine sand	1	na	6.22	1	0	6.28
Medium sand	1	na	8.1	1	0	10.4
Coarse sand	1	na	2.73	1	0	8.19
Very coarse sand	1	na	9.64	1	0	14.8
Very fine gravel	1	na	9.32	1	0	24.6
Fine gravel	1	na	60.1	1	1	83
Medium gravel	1	na	0	1	1	173
Coarse gravel	1	na	0	1	0	0
Very coarse gravel	1	na	0	1	0	0
Cobbles	1	na	0	1	0	0
Marcus Flats East - Conventional Parameters						
pH	1	0	2.44	1	0	2.66
Solids	1	0	1.41	1	0	1.15
Grain Size						
Clay	1	na	8.22	1	1	40.3
Silt	1	na	6.35	1	0	8.48
Very fine sand	1	na	0.477	1	0	4.9
Fine sand	1	na	1.06	1	0	10.4
Medium sand	1	na	8.59	1	0	9.03
Coarse sand	1	na	23.1	1	0	34
Very coarse sand	1	na	25.6	1	0	11.6
Very fine gravel	1	na	102	1	1	54.1
Fine gravel	1	na	28.9	1	1	51.3
Medium gravel	1	na	200	1	1	173
Coarse gravel	1	na	0	1	0	0
Very coarse gravel	1	na	0	1	0	0
Cobbles	1	na	0	1	0	0

Notes:

Highlighted cells identify where relative percent differences (RPDs) and relative standard deviations (RSDs) are greater than the control limit.

Control limits specified in the quality assurance project plan (QAPP) (Exponent et al. 2014) are 20% for analytical RPDs (i.e., metals, mercury, total organic carbon [TOC], cation exchange capacity [CEC], and pH) and 35% for field triplicate RSDs. The QAPP did not specify a quality objective for grain size RPDs.

na - not applicable

Table 5-9b. Windblown Sediment Deposition Area Summary of Field Split and Triplicate Sample Results for the < 2-mm Soil Fraction

	Field Split Sample RPDs			Triplicate Sample RSDs		
Analyte	Number of Samples	No. RPDs >20%	Max RPD (%)	Number of Samples	No. RSDs >35%	Max RSD (%)
Columbia Beach North - Conventional Parameters						
CEC	1	0	18.8	1	0	14
Organic carbon	1	0	1.71	1	0	13.8
Solids	1	0	0.1	1	0	0.0582
Columbia Beach North - Metals/Metalloids						
Aluminum	1	0	2.76	1	0	1.79
Antimony	1	0	9.52	1	0	5.33
Arsenic	1	1	24.2	1	0	8.02
Barium	1	0	1.64	1	0	1.84
Beryllium	1	0	0	1	0	4.26
Cadmium	1	0	4.88	1	0	2.47
Calcium	1	0	11.3	1	0	2.8
Chromium	1	0	1.34	1	0	4.5
Cobalt	1	0	4.87	1	0	1.83
Copper	1	0	0.778	1	0	2.34
Iron	1	0	9.58	1	0	2.19
Lead	1	0	0.211	1	0	2.32
Magnesium	1	0	5.01	1	0	2.8
Manganese	1	0	4.01	1	0	2.7
Mercury	1	0	11.8	1	0	11.1
Molybdenum	1	0	4.35	1	0	6.35
Nickel	1	0	4.69	1	0	3.95
Potassium	1	0	4.23	1	0	4.38
Selenium	1	0	11.8	1	0	6.93
Silver	1	1	28.6	1	0	12.4
Sodium	1	1	27.2	1	0	22.5
Thallium	1	0	0	1	0	0
Vanadium	1	0	1.59	1	0	1.1
Zinc	1	0	5.32	1	0	1.33
Marcus Flats East - Conventional Parameters						
CEC	1	1	30.4	1	0	33.9
Organic carbon	1	0	10.8	1	0	28
Solids	1	0	0.105	1	0	0.26
Marcus Flats East - Metals/Metalloids						
Aluminum	1	0	0.627	1	0	2.25
Antimony	1	0	7.63	1	0	13
Arsenic	1	0	5.78	1	0	12.1
Barium	1	0	2.68	1	0	4.11
Beryllium	1	0	0	1	0	3.94
Cadmium	1	0	5.99	1	0	20.2
Calcium	1	0	2.6	1	0	1.95
Chromium	1	0	7.69	1	0	3.38
Cobalt	1	0	4.47	1	0	1.11
Copper	1	0	6.16	1	0	4.09
Iron	1	0	0.702	1	0	3.05
Lead	1	0	7.22	1	0	23.4
Magnesium	1	0	1.79	1	0	3.62
Manganese	1	0	2.26	1	0	3.46
Mercury	1	0	9.52	1	0	10.8
Molybdenum	1	1	25.5	1	0	4.68
Nickel	1	0	1.75	1	0	1.14
Potassium	1	0	0	1	0	3.86
Selenium	1	1	21.4	1	0	6.54
Silver	1	0	6.9	1	0	0.00000134
Sodium	1	0	15.1	1	0	6.57
Thallium	1	0	0	1	0	9.52
Vanadium	1	0	1.16	1	0	5.59
Zinc	1	0	1.94	1	0	12.8

Notes:

Highlighted cells identify where relative percent differences (RPDs) and relative standard deviations (RSDs) are greater than the control limit.

Control limits specified in the quality assurance project plan (QAPP) (Exponent et al. 2014) are 20% for analytical RPDs (i.e., metals, mercury, total organic carbon [TOC], cation exchange capacity [CEC], and pH) and 35% for field triplicate RSDs. The QAPP did not specify a quality objective for grain size RPDs.

Table 5-10. Comparison of Actual Method Reporting Limits with Analytical Concentration Goals for Nondetected Samples

Analyte	Soil Fraction	ACG	MRL	Minimum MRL	Maximum MRL	Units	Number of 1X ACG Exceedances / Total Nondetected Results	Number of 10X ACG Exceedances / Total Nondetected Results
ADA - High-density								
Sodium	< 149-µm	40	40	106	124	mg/kg	2 / 2	0 / 2
Sodium	< 2-mm	40	40	91.5	125	mg/kg	3 / 3	0 / 3
ADA - Primary								
Sodium	< 149-µm	40	40	97.9	127	mg/kg	9 / 9	0 / 9
Sodium	< 2-mm	40	40	51.4	125	mg/kg	13 / 13	0 / 13
WSDA - Columbia Beach South								
Selenium	< 2-mm	0.3	0.2	0.19	0.19	mg/kg	0 / 1	0 / 1

Notes:

ACG - analytical concentration goal

ADA - Aerial deposition area

MRL - method reporting limit

WSDA - windblown sediment deposition area

Table 5-11a. Summary of Metals Data Compared with Available Eco-SSLs

Analyte	Soil Fraction	Eco-SSL (mg/kg)[a]	ADA Number of DUs	ADA Number of DUs > Eco-SSL	RFDA Number of DUs	RFDA Number of DUs > Eco-SSL	WSDA Number of DUs	WSDA Number of DUs > Eco-SSL
Antimony	< 2-mm	0.27	142	142	16	16	13	8
Arsenic	< 2-mm	18	142	41	16	5	13	0
Barium	< 2-mm	330	142	59	16	5	13	0
Beryllium	< 2-mm	21	142	0	16	0	13	0
Cadmium	< 2-mm	0.36	142	142	16	16	13	7
Chromium	< 2-mm	26	142	26	16	9	13	0
Cobalt	< 2-mm	13	142	5	16	5	13	0
Copper	< 2-mm	28	142	21	16	13	13	0
Lead	< 2-mm	11	142	142	16	16	13	8
Manganese[b]	< 2-mm	220	142	141	16	16	13	13
Nickel	< 2-mm	38	142	10	16	0	13	0
Selenium	< 2-mm	0.52	142	19	16	9	13	0
Silver	< 2-mm	4.2	142	0	16	0	13	0
Vanadium	< 2-mm	7.8	142	142	16	16	13	13
Zinc	< 2-mm	46	142	142	16	16	13	11

Notes:

For decision units (DUs) with field split and triplicate samples, summary statistics are based on the average of results for the DU. Nondetected values (NDs) are included as half the reporting limits (RLs).

[a] Ecolgocial soil screening level (Eco-SSL) values are presented in the quality assurance project plan (QAPP) (Exponent et al. 2014), except as noted, and are the lowest of the screening levels adopted by EPA for plants, soil invertebrates, birds, and mammals (USEPA 2010a).

[b] The Eco-SSL for manganese was not presented in Table A7-2 of the QAPP but is referenced in USEPA (2007b).

ADA - aerial deposition area

mg/kg - milligram per kilogram

RFDA - relict flood plain deposition area

WSDA - wind blown sediment deposition area

Table 5-11b. Comparison of Aerial Deposition Area Metals Data from < 2-mm Fraction with Available Eco-SSLs

Decision Unit	Soil Concentration by Analyte (mg/kg dw)[a]														
	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Selenium	Silver	Vanadium	Zinc
Eco-SSL (mg/kg)[b]	*0.27*	*18*	*330*	*21*	*0.36*	*26*	*13*	*28*	*11*	*220*	*38*	*0.52*	*4.2*	*7.8*	*46*
ADA - High-density															
ADA-124	**2.85** J	11.8	156	0.307	**2.8**	10.8	3.77	11.5	**178**	**628**	9.54	0.197 J	0.127	**15.4**	**135**
ADA-125	**2.24** J	13.2	144	0.33	**2.35**	9.73	3.45	11.7	**158**	**475**	9.81	0.19 J	0.12	**14.7**	**120**
ADA-126	**3.95** J	**22.1**	282	0.35 J	**7.9**	12.1	4.86	**51.8**	**379**	**778**	10.8	0.33	0.48	**19.6**	**322**
ADA-127	**2.54** J	**19**	**492**	0.47 J	**6.32**	17.5	10.4	**29.4**	**189**	**762**	31.5	0.38	0.3	**29.8**	**365**
ADA-128	**3.48** J	10.6	85.1	0.23 J	**5.13**	8.51	2.85	17.1	**230**	**301** J	7.32	0.18 J	0.21	**13.8**	**231**
ADA-131	**6.76** J	**25.4**	**378**	0.43	**8.48** J	17.1	7.06	22	**463**	**862**	18.2	0.517	0.393	**25.9**	**373**
ADA-132	**2.53** J	12.1	166	0.3	**3.31**	16.3	5.45	13.9	**222**	**394**	10.8	0.215	0.245	**21.7**	**194** J
ADA-133	**3.3** J	15.4	210	0.37 J	**4.98**	15.5	5.66	17.2	**255**	**714**	15.9	0.26	0.22	**24.4**	**269**
ADA-135	**1.19** J	8.26	99.5	0.353	**2.48** J	19.3	5.78	17.4	**108**	**350**	13.1	0.213 J	0.19	**26.7**	**184**
ADA-136	**3.09** J	10.5	136	0.29 J	**5.59**	13.8	4.74	15.6	**215**	**478**	10.8	0.22	0.24	**19**	**274**
ADA-139	**3.62** J	**18.7**	314	0.4 J	**5.1**	22.2	7.99	18.9	**236**	**804**	21.2	0.37	0.26	**32.3**	**304**
ADA-140	**8.38** J	**19.8**	190	0.27	**6.27**	15.2	5.49	**102**	**536**	**430**	10.7	0.5	0.56	**23.5**	**2180** J
ADA-141	**2.26** J	14.6 J	239	0.465 J	**3.59**	20.6 J	6.55 J	14.7	**176** J	**782**	18.4	0.225 J	0.185	**27.4** J	**223**
ADA-142	**3.77** J	10.9	125	0.27	**5.16**	12.2	3.33	12.3	**232**	**477**	8.08	0.2	0.21	**20.9**	**241**
ADA-143	**2.46** J	9.86	109	0.31 J	**2.98**	12.3	4.02	15	**141**	**329**	8.9	0.21	0.2	**20.8**	**167**
ADA-144	**5.62** J	**19.1**	88.6	0.33	**5.78** J	7.44	2.81	18.2	**260**	**327** J	6.21	0.26	0.29	**15.8**	**233**
ADA-145	**3.71** J	16.5	235	0.49	**6.83**	16.6	6.97	20	**309**	**792**	15.4	0.29	0.36	**24.5**	**332**
ADA-146	**3.84** J	16.8	182	0.32 J	**6.35**	13.1	4.65	18.3	**290**	**591**	11	0.25	0.24 J	**18.5**	**331**
ADA-147	**7.06** J	17	88	0.26	**5.52** J	7.32	2.26	16.9	**352**	**298** J	5.59	0.29	0.33	**13.5**	**224**
ADA-148	**3.84** J	16.5	88.7	0.26	**5.99**	12.7	4.21	18.8	**342**	**437**	10.2	0.24	0.26	**18.3**	**225**
ADA-150	**4.55** J	17.7	83	0.29	**5.03**	10.3	4.22	19.8	**326**	**320**	8.5	0.25	0.35	**16.6**	**229**
ADA-151	**5.5** J	13.6	56.2	0.21	**3.42**	12.7	3.82	17.1	**328**	220	9.59	0.27	0.38	**20.9**	**244**
ADA-152	**3.78** J	**26.4**	**375**	0.48	**7.58**	**27.8**	9.42	23.5	**300**	**1040**	22.2	0.32	0.3	**36.9**	**438**
ADA-153	**3.57** J	**20.8**	224 J	0.37	**7.52**	16.1 J	7.21	23.6	**321**	**695**	13.8	0.31	0.32	**25.1**	**378**
ADA-154	**3.86** J	**19.5**	299 J	0.41	**6.67**	**40.5** J	7.97	24.9	**321**	**819**	26.6	0.307	0.317	**26.4**	**331**
ADA-155	**5.01** J	17.1	184	0.28 J	**4.98**	9.67	3.36	13	**249**	**669**	8.13	0.25	0.25	**14.3**	**253**
ADA-156	**7.09** J	**19.5**	**335**	0.415	**8.55**	20.7	6.75	22	**553**	**1010**	15.8	0.375	0.575	**24**	**460**
ADA-158	**5.72** J	**18.7**	115	0.297 J	**6.76**	17.5	5.43	23.9	**430**	**459**	12	0.363	0.433	**25.9**	**385**
ADA-159	**5.6** J	17.5	194	0.37	**7.63**	21.2	7.22	21.7	**370**	**816**	16	0.303	0.397	**23.4**	**349**
ADA-160	**3.38** J	13.9	105	0.27 J	**4.31**	9.82	3.06	12.4	**224**	**335** J	8.37	0.18 J	0.23	**14.3**	**195**
ADA-161	**4.6** J	16.5	253	0.355 J	**7.55**	19.1	5.99	20.1	**378**	**805** J	14.1	0.27	0.345	**24.1**	**375**
ADA-162	**10.7** J	**19.8**	124	0.265	**12.4**	10	3.03	**30.7**	**714**	**449**	7.67	0.44	0.85	**15.2**	**586**
ADA-164	**6.94** J	**20.1**	208	0.31	**9.19**	14.5	5.33	21.9	**447**	**795**	12.4	**0.73**	0.46	**23.6**	**414**
ADA-165	**5.6** J	**22.4**	208	0.38	**10.8**	17.4	5.71	26.8	**504**	**631**	11.9	0.38	0.54	**21**	**562** J
ADA-168	**4.94** J	**25.8**	187	0.35 J	**7.55**	16.4	5.66	20.5	**307**	**640**	13.7	0.29	0.36	**24.5**	**419**
ADA - Primary															
ADA-001	**2.82** J	16.1	192	0.44	**7.13**	18.8	8.63	22.3	**316**	**647**	18.7	0.27	0.24	**26.5**	**301**
ADA-002	**2.01** J	14	262	0.63	**2.85**	22	9.28	**31.4**	**49.6**	**501**	36	**0.75**	0.33	**53.7**	**292**
ADA-004	**2.94** J	15.7	**428**	0.52	**6.2**	13.8	6.19	22.2	**152**	**826**	26.5	0.51	0.32	**32.3**	**353**
ADA-005	**2.66** J	**19.4**	259	0.66 J	**3.06**	21.4	9.98	**35.3**	**74.2** J	**573**	**38.9**	**0.9**	0.4	**57.6**	**283**
ADA-006	**2.8** J	11.9	130	0.345	**4.2**	15.3	4.81	15	**187**	**450**	12	0.205	0.15	**23**	**200**
ADA-008	**5.68** J	**20**	289	0.5	**7.06**	25.2	6.47	20.5	**407**	**757**	22	0.4	0.31	**32.9**	**330**
ADA-010	**4.62** J	**24.6**	196	0.6 J	**9.64**	18.3	9.27	**31.8**	**429**	**1390**	18.8	0.39	0.43 J	**22.9**	**401**
ADA-015	**1.5** J	8.27	161	0.305	**2.67**	11.6	3.76	11	**137**	**565**	9.86	0.14 J	0.085	**15.8**	**148**
ADA-016	**1.61** J	7.84	89.8	0.263	**2.63**	10.2	3.03	9.03	**108**	**373**	8.38	0.133 J	0.0833	**13.7**	**118**
ADA-017	**3.85** J	**18.4**	178 J	0.37 J	**6.04**	14.2	4.97	19.6	**267**	**649**	11.4	0.23	0.21	**22**	**268**
ADA-018	**7.04** J	15.8	263 J	0.43 J	**10.1**	20.4	6.91	**29.5**	**592**	**1010**	16.3	0.35	0.35	**26.3**	**455**
ADA-019	**1.17** J	13.8	159	0.52	**2**	**29.6**	8.95	22.5	**76.6**	**537**	26.4	0.22	0.16	**42.1**	**152**
ADA-020	**0.933** J	9.34	174	0.633	**1.65**	19.6	7.11	16	**64.3**	**449**	14.3	0.16 J	0.0967	**33.2**	**126**
ADA-021	**1.61** J	**23**	194	0.52	**2.13**	23.4	**14.5**	**49.5**	**66.7**	**664**	**38.4**	0.38	0.21	**24.6**	**156**
ADA-023	**2.13** J	16.3	198	0.417	**5.43**	25.1	8.29	**30.8**	**129**	**400**	25	**0.73**	0.487	**47.5**	**279**
ADA-024	**6.44** J	**27.7**	248	0.47	**10.7**	14.4	5.17	**42.8**	**506**	**824**	13.3	0.37	0.54	**22.1**	**466**
ADA-025	**2.84** J	**20.7**	**820**	0.52	**11** J	8.01	7.02	24.3	**283**	**1490**	31.7	**0.58**	0.46	**19.2**	**514**
ADA-026	**2.5** J	11.3	**630**	0.44	**7.34** J	9.66	5.84	25.2	**104**	**705**	**42.6**	**0.57**	0.43	**28.7**	**420**
ADA-028	**2.96** J	**20**	221	0.4 J	**5.8**	13.9	5.29	21.5	**280**	**905** J	11.1	0.2	0.23	**21**	**246**
ADA-033	**1.1** J	13.6	**517**	0.62	**5**	10.7	6.13	16.2	**89.7**	**1160**	**45**	0.38	0.28	**30.8**	**485**
ADA-034	**1** J	9.62	316	0.72	**1.66**	14 J	6.76	15.8	**62**	**931**	24.4	0.31	0.11 J	**32.9**	**229**
ADA-035	**2.24** J	15.5	307	0.57 J	**5.85**	12.4	5.01	11	**236**	**1250** J	11.3	0.2	0.15	**20.5**	**415**

Table 5-11b. Comparison of Aerial Deposition Area Metals Data from < 2-mm Fraction with Available Eco-SSLs

Decision Unit	Soil Concentration by Analyte (mg/kg dw)[a]																													
	Antimony		Arsenic		Barium		Beryllium		Cadmium		Chromium		Cobalt		Copper		Lead		Manganese		Nickel		Selenium		Silver		Vanadium		Zinc	
Eco-SSL (mg/kg)[b]	*0.27*		*18*		*330*		*21*		*0.36*		*26*		*13*		*28*		*11*		*220*		*38*		*0.52*		*4.2*		*7.8*		*46*	
ADA - Primary (continued)																														
ADA-039	**0.78**	J	8.31		**643**	J	0.63	J	**5.57**		14.1		6.56		13.2		**47.7**		**1080**		33.2		0.33		0.32		**33**		**277**	
ADA-042	**1.94**	J	11.7		**449**		0.42		**2.27**		16.9		7.48		14.8		**116**		**908**		18.3		0.29		0.17		**26.4**		**180**	
ADA-043	**2.66**	J	12.9		**1220**		0.4	J	**4.95**		23.5		**13.6**		**42.3**		**119**		**972**	J	**40.7**		**0.64**		0.315		**32.9**		**296**	
ADA-044	**1.73**	J	13.7		**395**		0.615		**11.3**	J	**33**		10.5		27.1		**137**		**856**		**59.4**		**0.7**		0.52		**49.3**		**443**	
ADA-045	**5.97**	J	**27.4**		257		0.47		**10.6**		15.1		7.02		27.5		**497**		**1110**		16.1		0.39		0.33		**23.3**		**432**	
ADA-046	**3.24**	J	14		230	J	0.34	J	**5.19**		13.2		4.95		18.1		**269**		**638**		10.8		0.25		0.2		**21.6**		**221**	
ADA-047	**4.05**	J	**19.2**		233		0.56		**7.7**		**27.4**		8.71		25.8		**316**		**851**		20.7		0.37		0.42		**38.4**		**478**	
ADA-048	**2.16**	J	10.8		**1420**		0.46		**5.16**		15.4		9.45		27.5		**127**		**1030**		30.8		**0.78**		0.29		**23.3**		**297**	
ADA-049	**0.97**	J	12.1		**618**		0.66		**7.11**	J	13.1		8.2		21.4		**57.2**		**1470**		27.1		0.48		0.8		**38.6**		**290**	
ADA-050	**4.2**	J	**21.8**		213		0.77		**10.3**		**32.6**		11.9		**46.2**		**387**		**577**		34.6		**0.66**		0.77		**63.2**		**546**	
ADA-051	**1.52**	J	9.98		**802**		0.45		**8.16**		12.1		7.57		**48.9**		**114**		**783**		35.3		**0.88**		0.4		**26.8**		**418**	
ADA-052	**4.75**	J	**19.1**		**343**		0.46	J	**9.85**		**28.7**		8.67		26		**398**		**872**		22.4		0.39		0.4	J	**36.1**		**456**	
ADA-053	**1.36**	J	11.1		**565**		0.54	J	**2.4**		**35**		10		18.4		**123**		**1940**		29.8		0.34		0.16		**37.6**		**190**	
ADA-054	**5.86**	J	**24.1**		232		0.55		**9.98**		16.6		6.46		**31.9**		**398**		**661**		15		0.41		0.39		**29.8**		**468**	
ADA-055	**3.04**	J	**23.6**		**1380**		0.523	J	**9.91**		14.5		8.78		**38.7**		**195**	J	**1520**		**43**		**0.757**		0.517		**36.2**		**519**	
ADA-056	**0.96**	J	11.5		**551**		0.61	J	**2.27**		**32.5**		10.1		17.5		**92**		**2060**		28.9		0.21		0.16		**33.6**		**193**	
ADA-057	**1.56**	J	14.6		285		0.51		**2.9**		**35.4**		11.4		26.3		**127**		**913**		30.9		0.24		0.17		**48.4**		**180**	
ADA-058	**0.79**	J	7.91		**424**		0.47	J	**2.33**		20.2		10.6		14.7		**94.1**		**1950**		26.8		0.18	J	0.15		**20.5**		**210**	
ADA-059	**2.01**	J	11.8		**588**		0.48	J	**3.46**		**29.9**		11.2		23.2		**137**		**1880**		31.9		0.29		0.18		**35**		**236**	
ADA-060	**3.37**	J	**20.4**		206		0.53		**7.09**		**26.1**		9.42		**31.4**		**283**		**728**		24.8		0.317		0.36		**33.3**		**350**	
ADA-061	**0.99**	J	15		**620**		0.61		**2.83**		**78.7**		**13.3**		19.4		**141**		**2350**		37.3		0.21		0.12		**40.8**		**211**	J
ADA-062	**2.58**	J	15.7		235		0.53		**6.45**		19.9		6.98		19.7		**277**		**736**		18.7		0.24		0.23		**30.4**		**303**	
ADA-063	**2.44**	J	14.1		**1210**		0.525		**6.99**	J	17.3		9.45		18		**176**		**1510**		26.7		0.385		0.315		**27.2**		**282**	
ADA-064	**1.05**	J	16.5		**517**		0.57		**2.68**		**37**		10.9		20.2		**126**		**2270**		33.2		0.38		0.15		**29.4**		**233**	J
ADA-065	**2.18**	J	10.7		102		0.32	J	**3.17**		10.9		4.21		13.1		**145**		**472**		10.4		0.17	J	0.14		**20.3**		**160**	
ADA-066	**2.15**	J	11.9		211		0.47		**4.53**		19.9		6.46		18.5		**181**		**711**		16.1		0.21		0.19		**26.3**		**243**	
ADA-067	**1.26**	J	11.1		**811**		0.55		**8.18**	J	24.9		11.2		**45.9**		**105**		**1360**		33.8		0.38		0.34		**33.8**		**279**	
ADA-070	**5.41**	J	**20**		**347**	J	0.51	J	**6.28**		**26.1**		8.54		22.6		**300**		**972**		20.6		0.41		0.33		**38**		**338**	
ADA-071	**3.96**	J	15.8		287		0.49	J	**5.85**		20.9		6.62		18		**294**		**959**		18.9		0.27		0.23		**33.5**		**266**	
ADA-073	**5.61**	J	**19.7**		286		0.46	J	**5**		20.1		6.26		18.1		**274**		**847**	J	18.3		0.31		0.25		**31.5**		**240**	
ADA-076	**7.52**	J	**24.3**		**397**		0.52	J	**12.9**		20.3		7.82		21		**392**		**1050**		26.4		**0.69**		0.59		**30.1**		**514**	
ADA-078	**4.98**	J	**21.6**		**420**		0.52		**6.13**	J	24.5		7.82		16.2		**272**		**1230**	J	19.5		0.32		0.24		**39.9**		**281**	
ADA-079	**3.47**	J	14.8		**937**		0.51	J	**12.2**		21		6.52		19		**176**		**1030**		27.6		0.45		0.96		**29.4**		**448**	
ADA-081	**3.14**	J	14.7		216		0.44	J	**2.91**		**29.5**		7.5		17.2		**157**	J	**803**		20.8		0.23		0.16		**46**		**155**	
ADA-082	**2.03**	J	12.7		290		0.475		**3.11**		24.8		7.74		24.6		**147**		**709**		20		0.38		0.19		**33.9**		**189**	
ADA-084	**2.51**	J	12.7		329		0.465		**3.81**		22.3		9.4		20.9		**169**		**1640**		24.4		0.315		0.295		**27.9**		**269**	
ADA-085	**1.86**	J	11.2		287		0.495		**4.02**	J	18.2		7.85		17.5		**136**		**1030**		23.7		0.48		0.295		**32.2**		**1150**	
ADA-088	**3.22**	J	**19.2**		**379**		0.6	J	**5.98**		**33**		11		25.5		**242**		**1300**		29.9		0.41		0.27	J	**35.4**		**290**	
ADA-089	**3.04**	J	**24.2**		**402**		0.73	J	**5.59**		25.2		10.9		24.6		**274**		**1540**		29.5		0.33		0.24		**29.3**		**312**	
ADA-090	**3.02**	J	12.9		**481**		0.555	J	**5.19**		**27.8**		8.8		18.6		**212**		**1280**		20.5		0.28		0.225		**35.3**		**294**	
ADA-091	**3.11**	J	**19.8**		309		0.58	J	**7.52**		**35.7**		9.82		22.4		**267**		**1020**		34.5		0.33		0.28	J	**33.3**		**358**	
ADA-092	**2.93**	J	**23.4**		**423**		0.57		**8.69**		24.3		8.52		23.7		**273**		**1530**		30.6		**0.56**		0.36		**27.6**		**413**	
ADA-093	**2.22**	J	**19**		**416**		0.61		**4.46**		18.5		8.13		15.5		**197**		**1920**		19.6		0.33		0.23		**29.8**		**265**	J
ADA-094	**1.32**	J	12.6		**359**		0.61		**1.96**		22.6		7.97		16.4		**98.4**		**918**		20.9		0.18	J	0.15		**30.5**		**152**	
ADA-095	**2.66**	J	17		**347**		0.7	J	**2.86**		**30**		10.1		18.4		**161**	J	**1240**		28.1		0.29		0.22		**29.4**		**187**	
ADA-096	**3.39**	J	14.7		**470**		0.64		**6.16**		14.5		6.85		18.2		**282**		**1250**		16		0.38		0.26		**21**		**307**	
ADA-097	**5.47**	J	**19.6**		**346**		0.53		**9.89**		**28.9**		8.37		**28.6**		**419**		**1190**		21.9		0.47		0.48		**25.6**		**446**	
ADA-099	**3.21**	J	**21.1**		**386**		0.98		**5.81**		25.7	J	9.34		22.4		**264**		**1580**		28.6		0.29		0.23	J	**29.5**		**324**	
ADA-101	**4.04**	J	17.3		237		0.4	J	**3.93**		21.5		8.15		20.8		**227**		**1110**		18.6		0.4		0.28		**36.8**		**254**	
ADA-102	**1.99**	J	13.5		**400**		0.52	J	**2.87**		21.8		8.94		19.2		**148**	J	**1000**		18.8		0.27		0.19		**38**		**211**	
ADA-103	**1.95**	J	15.9		**518**		0.65		**3.68**		**31.5**		**15.5**		25.9		**130**		**2140**		**42**		0.34		0.17		**32.3**		**257**	
ADA-104	**1.45**	J	11		**423**		0.54	J	**2.54**		12.8		6.86		14.2		**94.2**		**1180**		18.9		0.47		0.49		**32.7**		**231**	
ADA-105	**3.67**	J	15.7		**413**		0.46		**6.63**		25.5	J	9.09		25.2		**270**		**1050**		18.3		0.285		0.42	J	**40.6**		**387**	
ADA-106	**1.73**	J	11.6		**705**		0.53		**2.85**		19.5		10.4		20.1		**84.7**		**1360**		33		**0.633**		0.323		**33**		**226**	
ADA-107	**1.56**	J	13.8		**562**	J	0.56	J	**4.97**		**41.3**		**13.3**		**32.4**		**147**		**2060**		34.7		0.31		0.23	J	**49.2**		**294**	
ADA-108	**1.95**	J	12.3		256		0.523		**3.75**		**39.1**	J	8.8		21.9		**156**		**795**		22.1		0.2	J	0.193	J	**32**		**219**	
ADA-109	**4.85**	J	15.1		217		0.41		**7.46**		21.3		5.89		20.4		**327**		**696**		15.1		0.46		0.42		**21**		**393**	
ADA-110	**3.25**	J	12.6		183		0.43		**5.22**		20		6.03		18.8		**216**		**482**		12.3		0.22		0.28		**28.6**		**257**	

Table 5-11b. Comparison of Aerial Deposition Area Metals Data from < 2-mm Fraction with Available Eco-SSLs

	Soil Concentration by Analyte (mg/kg dw)[a]														
Decision Unit	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Selenium	Silver	Vanadium	Zinc
Eco-SSL (mg/kg)[b]	*0.27*	*18*	*330*	*21*	*0.36*	*26*	*13*	*28*	*11*	*220*	*38*	*0.52*	*4.2*	*7.8*	*46*
ADA - Primary (continued)															
ADA-111	**1.18** J	11.3	**373**	0.48 J	**2.71**	**33.1**	10.1	22	**108**	**1070**	22.1	0.2 J	0.16	**47.5**	**188**
ADA-112	**1.35** J	11.6	**451**	0.65	**3.29**	20.7	8.35	19.8	**103**	**1520**	14.8	0.3	0.26	**37.1**	**193**
ADA-113	**1.23** J	13	**545** J	0.72	**2.73**	25.8 J	8.64	17.9	**145**	**1490**	20.9	0.26	0.18	**34.3**	**175**
ADA-114	**1.36** J	16.7	**401**	0.74	**2.85**	20.1	7.21	16.6	**133**	**1500**	20.9	0.21 J	0.21	**26.8**	**200**
ADA-115	**1.81** J	14	320	0.57	**2.66**	17.4	5.99	12.6	**148**	**1190**	12.7	0.18 J	0.16	**24.6**	**192**
ADA-116	**2.04** J	15.2	266	0.51 J	**2.57**	19.1	7.2	14.6	**131** J	**1110**	14.7	0.2 J	0.15	**32.2**	**177**
ADA-117	**2.22** J	15.4	292	0.48	**3.71** J	18.5	7.15	15.7	**165**	**1270** J	13.5	0.16 J	0.15	**31.7**	**214**
ADA-118	**1.72** J	13.1	**411**	0.69	**4.95**	**43.9**	8.89	17.9	**154**	**1430**	26.2	0.22	0.2	**31.1**	**304**
ADA-119	**1.99** J	13.3	268	0.51 J	**3.87**	24.6	8.01	19.7	**175**	**948**	21.4	0.19 J	0.18 J	**24.8**	**237**
ADA-121	**2.99** J	17.5	**393**	0.5 J	**5.84**	25.4	9.91	25.6	**242**	**1190**	22.6	0.31	0.28	**44.2**	**360**
ADA-122	**1.57** J	10.4	**431**	0.6	**2.9**	19.4 J	8.09	13	**102**	**1620**	25.7	0.36	0.23 J	**26.8**	**220**
ADA-169	**0.653** J	10.9	204	0.587 J	**0.89**	14.6	9.07	11.9	**75.9**	**889**	23.8	0.147 J	0.0533	**19.8**	**103**
ADA-170	**1.68** J	12.8	218	0.48 J	**2.37**	14.7	7.36	14.6	**122**	**931**	16.4	0.31	0.3	**37.7**	**355**
ADA-171	**1.07** J	11	221	0.4 J	**2.76**	13.4	6.3	17.4	**100**	**805**	17.6	0.3	0.58	**33**	**433**
ADA-172	**1.2** J	6.23	220	0.42	**0.89** J	10.7	5.29	8.22	**82**	**1100** J	13.3	0.26	0.13	**17.8**	**72.4**
ADA-173	**1.61** J	12	325 J	0.523	**1.99**	15.3	6.5	12.9	**106**	**1250**	16.1	0.28	0.267	**33.6**	**191**
ADA-174	**1.95** J	10.9	**407** J	0.515	**3.42**	12.8	5.6	10.1	**93.1**	**1360**	14.2	0.325	0.475	**27.4**	**216**
ADA-175	**0.71** J	5.98	286	0.43 J	**0.93**	16.3	7.47	13.2	**76.6**	**1070**	23.7	0.17 J	0.09	**22.3**	**117**
ADA-176	**0.63** J	5.59	**371** J	0.52	**0.85**	24.4	11.9	17.5	**63.4**	**858**	**44.8**	0.16 J	0.08	**32.9**	**109**
ADA-177	**0.74** J	9.09	188	0.39	**0.7**	19	9.89	13	**70.4**	**1140**	21.3	0.18 J	0.09	**25.2**	**104** J
ADA-178	**0.73** J	9.37	178	0.47 J	**0.73**	17.6	10.4	13.3	**58.7**	**871**	23.3	0.17 J	0.09	**28.5**	**158**
ADA-179	**1.48** J	8.78	302	0.58	**1.99** J	12.4	5.92	11.7	**86.2**	**1190**	15.1	0.3	0.27	**31**	**227**
ADA-180	**1.8** J	8.7	**599**	0.5 J	**4.25**	13.4	6.42	16	**125**	**962**	20	0.505	0.4	**32**	**371**
ADA-181	**1.99** J	10.1	**420** J	0.46	**4.27**	13.9	6.08	17.8	**102**	**1180**	20.4	**0.6**	0.7	**40.9**	**298**
ADA-182	**1.38** J	8.12	**362**	0.5	**5.2**	15	6.74	19.7	**44.5**	**590**	27.2	**0.62**	0.48	**34.9**	**244**
ADA-183	**3.94** J	16.4	**433**	0.44 J	**14.3**	14.6	6.13	**32.3**	**49**	**491**	**57.6**	**3.32**	1.13	**47.9**	**585**
ADA-184	**1.3** J	9.61	**757**	0.43 J	**9.86**	10.8	7.5	22	**74.7**	**1160**	30.5	**0.6**	1.18	**26.1**	**352**

Notes:

Bold and shaded cells indicate concentrations greater than the ecolgocial soil screening level (Eco-SSL).

Averaged results have three significant figures applied.

[a] For decision units (DUs) with field split and triplicate samples, summary statistics are based on the average of results for the DU. Nondetected values (NDs) are included as half the reporting limits (RLs).

[b] Eco-SSL values are presented in the quality assurance project plan (QAPP) (Exponent et al. 2014) and are the lowest of the screening levels adopted by EPA for plants, soil invertebrates, birds, and mammals (USEPA 2010a).

ADA - aerial deposition area

dw - dry weight

J - estimated value

mg/kg - milligram per kilogram

Table 5-11c. Comparison of Relict Floodplain Deposition Area Metals Data from < 2-mm Fraction with Available Eco-SSLs

	Soil Concentration by Analyte (mg/kg dw)[a]																													
Decision Unit	Antimony		Arsenic		Barium		Beryllium		Cadmium		Chromium		Cobalt		Copper		Lead		Manganese		Nickel		Selenium		Silver		Vanadium		Zinc	
Eco-SSL (mg/kg)[b]	*0.27*		*18*		*330*		*21*		*0.36*		*26*		*13*		*28*		*11*		*220*		*38*		*0.52*		*4.2*		*7.8*		*46*	
RFA																														
RFA-001	**14.7**	J	16.8		**608**		0.35	J	**4.97**		**37.2**		**13.8**		**516**		**451**		**1120**		14.8		**1.25**		1.58		**34.8**		**6300**	
RFA-002	**10.6**	J	9.81		**616**		0.365		**3.18**	J	**38.6**		**15**		**566**		**284**		**1500**		11.5		**1.46**		1.48	J	**31.9**		**7600**	
RFA-003	**12.2**	J	14.5		**614**		0.34	J	**5.05**		**35.2**		**13.5**		**467**		**362**		**1020**		14.1		**1.11**		1.47		**31.2**		**5270**	
RFA-004	**14.9**	J	12		**650**		0.42	J	**2.83**		**53.6**		**19.5**		**758**		**278**		**1820**		12.2		**1.61**		2.21		**34.2**		**8640**	
RFA-005	**11.1**	J	14.9		**608**		0.35		**3.65**	J	**37.4**		**15.3**		**527**		**570**		**1250**		12.6		**1.19**		1.51	J	**32.5**		**7710**	
RFB																														
RFB-002	**2.51**	J	12.9		237		0.51	J	**3.7**		**32**		8.91		26.3		**201**		**498**		24.7		**0.54**		0.38		**37.2**		**270**	
RFB-003	**2.36**	J	11.8		174		0.483		**3.41**	J	**27.4**		8.09		20.7		**180**	J	**425**		19.9		0.48		0.27	J	**34**		**234**	
RFB-008	**0.94**	J	7		136		0.32		**1.84**	J	18.6		6.13		13.4		**80.7**		**322**		13.6		0.12	J	0.18	J	**26.4**		**144**	
RFC																														
RFC-003	**5.23**	J	**29.3**		212		0.48		**14.3**		21.7		8.97		**135**		**730**		**446**		19.2		**0.755**		1.07		**32.3**		**616**	
RFC-004	**2.31**	J	17.2		155		0.47		**8.76**		23		8.19		**69.4**		**373**		**347**		18.3		0.42		0.65		**34.1**		**300**	
RFC-005	**3.31**	J	**31.4**		205		0.637		**9.89**		25.9		9.12		**154**		**606**		**339**		20.5		**0.623**		0.963		**37.9**		**432**	
RFC-006	**2.19**	J	**25.2**		172		0.55	J	**8.39**		**26.1**		8.55		**125**		**467**		**285**		19.6		0.44		0.77		**37.6**		**312**	
RFC-007	**2.96**	J	**18.5**		260		0.57	J	**8.63**		**26.3**		8.73		**115**		**559**		**277**		21.3		**0.6**		0.76		**38.9**		**461**	
RFC-008	**2.36**	J	**23**		168		0.56		**10.1**		25.3		8.72		**142**		**505**		**276**		19.1		0.5		0.76		**36.4**		**346**	
RFD																														
RFD-002	**3.77**	J	11.8		242		0.24		**4.87**		15.6		5.99		**130**		**323**		**507**		11.3		0.52		0.55		**22.2**		**2600**	
RFD-003	**3.91**	J	14.4		213	J	0.263		**4.75**		14.3		4.75		**37.9**		**318**		**280**		11.8		0.307		0.34		**24**		**680**	

Notes:

Bold and shaded cells indicate concentrations greater than the ecolgocial soil screening level (Eco-SSL).

Averaged results have three significant figures applied.

[a] For decision units (DUs) with field split and triplicate samples, summary statistics are based on the average of results for the DU. Nondetected values (NDs) are included as half the reporting limits (RLs).

[b] Eco-SSL values are presented in the quality assurance project plan (QAPP) (Exponent et al. 2014) and are the lowest of the screening levels adopted by EPA for plants, soil invertebrates, birds, and mammals (USEPA 2010a).

dw - dry weight

J - estimated value

mg/kg - milligram per kilogram

RFA, RFB, RFC, RFD - relict flood plain depositional areas A, B, C,and D

Table 5-11d. Comparison of Windblown Sediment Deposition Area Metals Data from < 2-mm Fraction with Available Eco-SSLs

Decision Unit	Soil Concentration by Analyte (mg/kg dw)[a]													
	Antimony	Arsenic	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Selenium	Silver	Vanadium	Zinc
Eco-SSL (mg/kg)[b]	*0.27*	*18*	*330*	*21*	*0.36*	*26*	*13*	*28*	*11*	*220*	*38*	*0.52*	*4.2*	*7.8*	*46*
Columbia Beach North															
CBN-001	0.21 J	6.83	122	0.4 J	0.205	14.9	6.16	12.9	9.49	**349**	12.8	0.085 J	0.035	**25.2**	**48.9**
CBN-002	0.27 J	6.62	158	0.47 J	0.23	15.5	6.52	13.8	10.3	**380**	13	0.09 J	0.04	**25.7**	**50.7**
CBN-003	**0.287** J	7.82	144	0.47	0.233	14.5	6.45	14.8	10.8	**379**	12.7	0.0833 J	0.0467	**24.1**	**52.8**
CBN-004	0.26 J	8.26	138	0.39 J	0.3	18.8	7.16	16	**12.1**	**387**	15.6	0.08 J	0.05	**27**	**59**
Columbia Beach South															
CBS-001	0.19 J	5.28	115	0.37 J	0.18	15	5.78	12.7	8.16	**306**	12.6	0.08 J	0.03	**22.9**	45
CBS-002	0.17 J	5.58	95.1	0.34 J	0.18	11.9	4.88	11.1	7.91	**307**	10.3	0.19 U	0.02	**18.4**	45.4
Marcus Flats East															
MFE-001	**3.28** J	17.3	187	0.49	**5.01**	13 J	5.15	17.9	**236** J	**532**	11.4 J	0.28	0.145	**25.9**	**258**
MFE-002	**2.5** J	15.6	187	0.55	**4.19**	11.7 J	5.19	16.3	**169** J	**547**	11 J	0.22	0.11	**25.7**	**199**
MFE-003	**2.92** J	17.6	189	0.57	**4.39**	11.8 J	5.24	15.9	**196** J	**534**	10.8 J	0.26	0.11	**24.8**	**204**
MFE-004	**2.59** J	16	179	0.56	**3.77**	14.2 J	5.19	15.5	**172** J	**480**	11.1 J	0.24	0.08	**24.7**	**175**
MFE-005	**1.96** J	13.7	169	0.51	**3.35**	12.4 J	5.04	14.7	**139** J	**442**	10.8 J	0.21	0.07	**24.3**	**157**
MFE-006	**2.01** J	11.6	157	0.47	**3.36**	11.8 J	4.43	12.7	**135** J	**421**	10.3 J	0.19 J	0.06	**22.9**	**157**
MFE-007	**2.73** J	11.5	149	0.44	**3.11**	12.3 J	4.6	12.1	**148** J	**415**	10.1 J	0.177 J	0.08	**23.4**	**140**

Notes:

Bold and shaded cells indicate concentrations greater than the ecolgocial soil screening level (Eco-SSL).

Averaged results have three significant figures applied.

[a] For decision units (DUs) with field split and triplicate samples, summary statistics are based on the average of results for the DU. Nondetected values (NDs) are included as half the reporting limits (RLs).

[b] Eco-SSL values are presented in the quality assurance project plan (QAPP) (Exponent et al. 2014) and are the lowest of the screening levels adopted by EPA for plants, soil invertebrates, birds, and mammals (USEPA 2010a).

dw - dry weight

J - estimated value

mg/kg - milligram per kilogram

Table 5-12a. Summary of Metals Data from < 149-µm Fraction Compared with Available Human Health Screening Levels

Analyte	Human Health Soil Screening Level[a] (mg/kg)[a]	ADA		RFDA	
		Total Number of DUs	Number of DUs > Screening Level	Total Number of DUs	Number of DUs > Screening Level
Aluminum	77,400	142	0	16	0
Antimony	31.3[b]	142	0	16	0
Arsenic[c]	9.39[b,d]	142	68	16	8
Barium	15,300	142	0	16	0
Beryllium	156	142	0	16	0
Cadmium	70.3	142	0	16	0
Chromium	117,000	142	0	16	0
Cobalt	23.4	142	0	16	0
Copper	3,130	142	0	16	0
Iron	54,800	142	0	16	0
Lead[e]	400	142	21	16	2
Manganese	1,830	142	0	16	0
Mercury	24[b]	142	0	16	0
Molybdenum	390	142	0	16	0
Nickel	1,550	142	0	16	0
Selenium	391	142	0	16	0
Silver	391	142	0	16	0
Thallium	0.782	142	0	16	0
Vanadium	394	142	0	16	0
Zinc	23,500	142	0	16	0

Notes:

For decision units (DUs) with field split and triplicate samples, summary statistics are based on the average of results for the DU. Nondetected values (NDs) are included as half the reporting limits (RLs).

[a] Screening level values are from Syracuse Research Corporation (SRC) (2013) and presented in the quality assurance project plan (QAPP) (Exponent et al. 2014).

[b] The screening levels for antimony, arsenic, and mercury were adjusted to reflect changes to the default values for those metals as discussed by SRC when developing screening levels for use in EPA's subsurface sediment screen (SRC 2013).

[c] Arsenic concentrations adjusted for EPA's default relative bioavailability (RBA) of 60 percent arsenic in soil (USEPA 2012b).

[d] The human health screening level for arsenic is based on the 2012 default residential soil screening level for a 1 in 1 million risk level (USEPA 2012b) plus an estimate of the concentration of arsenic in natural background (9 mg/kg).

[e] Lead concentrations adjusted for the ratio of site-specific RBA to EPA's default RBA, see Table 5-5.

ADA - aerial deposition area
mg/kg - milligram per kilogram
RFDA - relict flood plain deposition area

Table 5-12b. Comparison of Aerial Deposition Area Metals Data from < 149-µm Fraction with Available Human Health Screening Levels

	Soil Concentration by Analyte (mg/kg dw)[a]																			
Decision Unit	Aluminum	Antimony[c]	Arsenic[c,d,e]	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead[f]	Manganese	Mercury[c]	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Human Health Screening Level (mg/kg)[b]	77,400	31.3	9.39	15,300	156	70.3	117,000	23.4	3,130	54,800	400	1,830	24	390	1,550	391	391	0.782	394	23,500
ADA - High-density																				
ADA-124	9,830	2.01 J	7.44	140	0.31	2.12	13.2	4.13	11.5	12,300	178	469	0.04	0.74	11.5	0.18 J	0.1	0.2	18.7	136
ADA-125	11,300	1.71 J	8.28	134	0.32	1.71	11.9	3.89	11.9	11,700	151	385	0.03	0.81	11.7	0.18 J	0.11	0.213	17.7	121
ADA-126	12,500	2.96 J	**13.74**	238	0.35 J	6.38	13.9	4.86	54.8	13,400	**427**	559	0.08	0.67	12.1	0.31	0.38	0.31	21.1	294
ADA-127	18,000	2.16 J	**12.6**	453	0.5 J	5.78	18.6	11	29.7	20,000	214	772	0.03	0.84	32.8	0.36	0.29	0.25	30.3	376
ADA-128	8,200	3.74 J	9.3	109	0.31 J	6.81	12.1	3.69	24.6	10,200	365	397 J	0.05	0.39	9.37	0.22	0.28	0.29	19.7	309
ADA-131	14,100	3.81 J	**14.52**	316	0.42	5.43 J	17.5	6.6	18.7	16,500	387	593	0.0833	0.777	18.7	0.357	0.28	0.37	25.3	291
ADA-132	7,730 J	1.32 J	5.724	131	0.265	2.01	16.3	4.48	11.1	12,000	163	237	0.04	0.53	10.6	0.155 J	0.16	0.25 J	21	153 J
ADA-133	15,200 J	2.78 J	**12.24**	249	0.46 J	5.57	18.2	6.7	22.1	15,500 J	340	736	0.08	0.94	19.2	0.29	0.24	0.32	26	322
ADA-135	9,130	1.27 J	5.418	112	0.407	2.75 J	21.2	6.31	19.4	15,600	141	384	0.0267	0.517	14.6	0.223	0.207	0.203	29.1	199
ADA-136	11,700	3.79 J	**10.08**	197	0.41 J	8.14	20.6	6.91	24.8	16,100	387	706	0.09	0.77 J	16.1	0.33	0.32	0.35 J	27.9	404
ADA-139	16,300	2.44 J	**11.1**	289	0.44 J	3.86	21.8	7.73	17.8	18,200	222	593	0.05	0.86	22.2	0.31	0.2	0.28	30.3	283
ADA-140	7,180 J	4.44 J	**14.82**	225	0.31	7.26	17.4	5.46	33.8	17,200	**560**	297	0.5	0.9	13.6	0.36	0.46	0.5 J	27.8	667 J
ADA-141	16,800 J	1.75 J	**10.02**	259	0.555 J	2.85	25.8	7.7	17.3	19,000 J	191	709	0.06	0.845	22.6	0.23	0.165	0.24	33.5	218
ADA-142	11,800	5.93 J	**13.5**	233	0.49	10.7	17.7	5.74	26	15,800	**599**	784	0.11	0.82	13.7	0.4	0.37	0.45	26.3	483
ADA-143	18,000	3.29 J	**9.9**	187	0.52 J	5.3	18.1	6.34	25	15,600	279	547	0.07	0.78	13.1	0.32	0.33	0.29	30.2	276
ADA-144	22,600	12.1 J	**33.54**	225	0.83	16.3 J	13.5	5.6	51.7	15,400	**747**	790 J	0.16	0.99	11.6	0.68	0.77	0.65	29.7	624
ADA-145	17,300	3.27 J	**12.6**	264	0.6	6.74	19	7.76	23.6	18,600	373	858	0.08	0.7	17.3	0.33	0.34	0.31	26.5	346
ADA-146	12,700	3.55 J	**13.8**	245	0.42 J	7.3	16.8	5.92	24.3	14,900	394	707	0.07	0.71 J	13.9	0.3	0.26 J	0.38	23.1	416
ADA-147	12,500	10.4 J	**20.34**	155	0.48	9.92 J	13.7	3.93	34.9	14,000	**772**	508 J	0.15	0.72	9.43	0.57	0.53	0.48	27.2	417
ADA-148	7,540	3.13 J	**11.88**	92.4	0.3	5.33	16	4.9	21.2	13,600	373	379	0.06	0.45	12.4	0.23	0.24	0.38	23	235
ADA-150	14,100	5.96 J	**18.96**	138	0.5	8.77	14.8	5.26	35.3	13,800	**627**	490	0.1	0.68	12.1	0.39	0.46	0.52	23.9	371
ADA-151	7,400	4.39 J	**12.3**	75.7	0.33	4.35	18.4	5.08	22.3	14,400	**440**	284	0.1	0.44	13.1	0.3	0.4	0.44	28.6	325
ADA-152	17,200	2.46 J	**15**	314	0.47	5.03	25.1	8.04	20.5	20,500	300	765	0.07	0.47	21	0.26	0.22	0.32	31.6	355
ADA-153	16,100	3.4 J	**15.9**	259 J	0.45	8.57	17.1 J	7.94	26.8	17,200	**450**	769	0.1	0.61	15.1	0.36	0.31	0.4	24.9	428
ADA-154	16,800	3.36 J	**15.9**	312 J	0.49	6.85	30.3 J	8.6	29	17,300	399	888	0.09	0.763	23.6	0.333	0.307	0.37	27.7	366
ADA-155	11,000	4.43 J	**13.2**	190	0.3 J	4.86	13.8	4.38	16.1	12,400	321	667	0.08	0.7	11.2	0.28	0.24	0.33	20	278
ADA-156	11,400	4.04 J	9.12	214	0.36	4.66	20.1	5.29	17.4	14,400	385	578	0.09	0.745	14.6	0.265	0.39	0.325	24	302
ADA-158	8,650	4.12 J	**11.7**	108	0.303 J	5.32	20.1	5.63	22.3	15,700	391	385	0.0667	0.563	13.4	0.293	0.33	0.383 J	29.7	346
ADA-159	12,400	5.94 J	**14.28**	228	0.467	9.1	24.1	8.37	28	17,200	**520**	942	0.113	0.723	17.8	0.383	0.44	0.4	25.1	421
ADA-160	12,100	3.94 J	**12.24**	139	0.37 J	5.47	13.9	4.36	17.5	12,100	348	414 J	0.07	0.6	11.7	0.25	0.26	0.3	21.5	252
ADA-161	11,200	3.74 J	**10.26**	215	0.345 J	6.27	18.1	5.72	19.9	13,900	**452**	659 J	0.085	0.57	13.8	0.255	0.275	0.385	24.2	347
ADA-162	10,700	12.6 J	**19.98**	165	0.365	16.1	14.9	4.61	47.8	14,300	**928**	580	0.225	0.65	11.5	0.61	1.01	0.77	22.8	735
ADA-164	11,900	5.48 J	**15.48**	219	0.375	8.31	17.4	6.2	23.7	15,300	**496**	755	0.11	0.715	14.6	0.505	0.375	0.415	26.3	417
ADA-165	13,100 J	4.59 J	**15.72**	216	0.4	9.92	18	5.99	26.7	14,400	**567**	625	0.1	0.64	13.2	0.34	0.42	0.5 J	22.4	514 J
ADA-168	13,100	4.11 J	**16.26**	174	0.37 J	6.56	18.2	5.85	19.9	15,700	315	577	0.06	0.58	14.9	0.27	0.27	0.36	27.2	381
ADA - Primary																				
ADA-001	15,600	2.3 J	**11.1**	188	0.47	6.52	20	9.12	22.7	18,000	354	634	0.05	0.59	19.4	0.25	0.21	0.36	28.1	282
ADA-002	16,400	1.89 J	6.96	247	0.61	2.85	20.8	7.6	29.5	19,300	61	427	0.02	3.88	33.6	0.65	0.33	0.27	46.4	295
ADA-004	14,400	2.17 J	8.76	379	0.48	5.01	14.2	5.68	21.3	15,800	162	614	0.05	3.52	25.9	0.41	0.29	0.25	31.3	343
ADA-005	15,200	2.57 J	**10.8**	222	0.62 J	2.75	20.7	8.09	33.7	20,000	85 J	382	0.03	5.24	37.2	0.93	0.4	0.31	53.5	273
ADA-006	12,500	2.74 J	9.3	171	0.48	5.03	20.8	6.25	20.1	15,800	272	560	0.045	0.665	16.2	0.25	0.18	0.31	29.2	245
ADA-008	13,000	3.27 J	**12.12**	248	0.5	4.87	25.3	6.27	18.7	18,900	349	554	0.07	0.58	21.6	0.27	0.22	0.31	32.5	268
ADA-010	18,900	4.22 J	**18.42**	216	0.66 J	10	18	9.3	34.9	19,900	**529**	1,650	0.1	0.73 J	18.1	0.41	0.46 J	0.46	25.5	432
ADA-015	10,900	1.45 J	6.3	182	0.335	2.94	14.9	4.4	13.5	12,100	187	588	0.045	0.725	11.9	0.175 J	0.09	0.225	19.4	174
ADA-016	13,400	2.43 J	9.18	168	0.5	5.2	15.2	5.14	17.8	14,400	258	645	0.0567	0.797	12.8	0.26	0.153	0.27	22.3	218
ADA-017	12,600	3.42 J	**12.12**	174 J	0.41 J	5.2	16.5	5.2	20.4	15,000	292	593	0.04	0.72	12.7	0.23	0.17	0.34	24.5	247
ADA-018	11,300	4.73 J	7.38	188 J	0.39 J	6.56	19.8	5.04	26.3	14,400	**529**	559	0.08	0.74	14.4	0.25	0.25	0.46	24.6	347
ADA-019	14,100	1.27 J	9.12	193	0.65	2.51	32.1	9.48	24.6	24,200	115	633	0.04	0.66	25.7	0.24	0.22	0.17	47.7	179
ADA-020	22,600	1.24 J	7.2	237	0.83	2.43	23.3	8.39	20.3	20,200	105	561	0.03	0.9	17	0.223	0.143	0.217	38.8	166
ADA-021	13,800	1.62 J	**15.78**	262	0.65	2.86	20.3	18	65.3	27,200	107	749	0.05	1.64	39.3	0.44	0.32	0.16	27.7	184
ADA-023	14,500	2.24 J	**10.98**	217	0.477	6.34	28.6	9.21	35.4	19,100	178	433	0.0433	3.26	27.7	0.667	0.62	0.32	49.6	321
ADA-024	14,300	4.57 J	**16.68**	221	0.49	8.16	14.5	4.76	41.7	14,500	**513**	653	0.09	0.61	11.9	0.3	0.45	0.38	21.6	400
ADA-025	14,200	1.67 J	**10.14**	518	0.38	6.43 J	8.69	4.66	20.2	12,900	245	647	0.05	3.43	28	0.42	0.33	0.25	18.5	419
ADA-026	14,000	1.57 J	5.892	477	0.42	4.94 J	11.1	5.64	22.4	15,200	85	492	0.04	3.89	43.7	0.42	0.33	0.21	30.1	407
ADA-028	13,500	1.84 J	9	167	0.37 J	3.66	13.7	4.49	18.3	12,400	243	458 J	0.04	0.46	11.3	0.18 J	0.17	0.25	19.7	207
ADA-033	19,300	0.74 J	6.78	414	0.56	3.67	10.1	5.02	14.1	14,000	89	772	0.02	2.46	37.1	0.29	0.19	0.3	27.3	410
ADA-034	21,200	0.87 J	5.406	282	0.72	1.47	14.3 J	6.6	15.5	18,300	77	735	0.02	1.95	24.5	0.22	0.1 J	0.24	31	241
ADA-035	17,900	1.39 J	8.16	231	0.54 J	4.02	12.7	4.5	9.75	14,900	215	722 J	0.04	0.53	11.7	0.14 J	0.1	0.25	20.4	392
ADA-039	17,500	0.57 J	4.086	487 J	0.51 J	3.56	13.5	5.65	11.4	13,900	41	607	0.02	1.89	30.3	0.25	0.26	0.18	30.5	261
ADA-042	13,600	1.31 J	5.712	309	0.36	1.29	16.6	5.29	12.8	16,100	96	490	0.04	1.61	17.4	0.21	0.11	0.18	25.9	162
ADA-043	16,200	2.44 J	8.16	1250	0.425 J	5.66	24.6	13.6	42.3	25,900	178	985 J	0.08	2.67	41.9	0.645	0.295	0.25	31.2	333
ADA-044	21,600	1.34 J	9.18	441	0.7	11.6 J	34.7	11.8	28.2	22,300	165	893	0.06	2.3	66.4	0.535	0.525	0.345	45.2	516
ADA-045	15,900	2.97 J	**16.92**	214	0.47	6.92	15.8	6.61	23.4	17,200	381	772	0.07	0.47	16.3	0.27	0.21	0.44	25.4	343
ADA-046	11,300	1.75 J	7.86	180 J	0.33 J	3.22	14	4.6	14.7	13,000	212	449	0.04	0.45	11	0.16 J	0.12	0.23	21.3	174
ADA-047	16,700	3 J	**11.34**	208	0.58	6.58	25	7.97	24.6	18,900	326	773	0.06	0.61	19	0.31	0.36	0.37	34.2	438
ADA-048	16,800	1.59 J	6.66	1190	0.46	4.3	16.2	9.35	27	21,000	144	912	0.07	2.23	30.9	0.6	0.27	0.2	24.5	285

Table 5-12b. Comparison of Aerial Deposition Area Metals Data from < 149-µm Fraction with Available Human Health Screening Levels

Decision Unit	Aluminum	Antimony[c]	Arsenic[c,d,e]	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead[f]	Manganese	Mercury[c]	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
	Soil Concentration by Analyte (mg/kg dw)[a]																			
Human Health Screening Level (mg/kg)[b]	77,400	31.3	9.39	15,300	156	70.3	117,000	23.4	3,130	54,800	400	1,830	24	390	1,550	391	391	0.782	394	23,500
ADA - Primary (continued)																				
ADA-049	21,800	0.7 J	6.42	466	0.56	4.26 J	12.8	6.86	18.8	18,000	54	803	0.03	2.74	25.2	0.34	0.64	0.24	36.6	268
ADA-050	23,300	3.67 J	**15.18**	203	0.81	9.9	30.2	12.9	48.5	21,500	**432**	634	0.09	1.14	35.5	0.57	0.76	0.52	56.6	547
ADA-051	13,900	1.07 J	5.712	801	0.46	7.09	13.6	8	48.2	18,000	124	742	0.03	2.18	35.8	0.61	0.34	0.21	26.1	447
ADA-052	16,100	3.34 J	**11.94**	322	0.51 J	8.24	27.9	8.58	25.8	18,100	**415**	808	0.09	0.78 J	21.3	0.3	0.33 J	0.41	30.1	422
ADA-053	19,100	0.79 J	5.526	398	0.49 J	1.46	28.1	8.03	15.3	18,900	103	919	0.04	0.6	25.3	0.17 J	0.11	0.21 J	30.3	161
ADA-054	22,400	5.91 J	**19.56**	286	0.7	11.8	17.5	7.73	39.2	16,500	**505**	804	0.11	1.1	17.1	0.46	0.38	0.44	29.3	546
ADA-055	16,900	2.22 J	**11.4**	1270	0.47 J	7.37	15	7.98	33.1	21,700	211 J	1,200	0.0267	3	41.7	0.557	0.39	0.34	32.4	489
ADA-056	19,700	0.67 J	5.856	415	0.55 J	1.49	30.8	8.92	16.9	21,200	85	1,090	0.03	0.66	26.6	0.17 J	0.14	0.2	33.7	173
ADA-057	18,600	1.46 J	9.12	307	0.56	2.99	36.8	11.8	28.1	23,500	132	786	0.05	0.78	28.2	0.25	0.17	0.26	46.6	199
ADA-058	16,200	0.53 J	3.84	283	0.39 J	1.48	18.4	8	12.5	20,000	94	799	0.04	1	24.2	0.16 J	0.1	0.16 J	19	190
ADA-059	17,400	1.35 J	5.868	465	0.46 J	2.7	30.4	9.47	21.2	22,500	143	1,190	0.05	1.01	30.5	0.18 J	0.14	0.25 J	34.3	229
ADA-060	20,600	3.94 J	**19.08**	287	0.743	10.4	33.9	13.5	46.8	23,700	**478**	1,050	0.103	0.923	32.8	0.48	0.51	0.52	37.8	489
ADA-061	22,200 J	0.66 J	9.18	543	0.67	2.17	65.5	13.1	21.1	25,500	124	1,530	0.04	0.69	36.9	0.15 J	0.11	0.3 J	39.2	214 J
ADA-062	19,200	2.52 J	**12.6**	261	0.71	6.61	24.4	8.13	24.2	19,100	348	794	0.08	0.82	21.6	0.32	0.25	0.37	33.3	342
ADA-063	16,000	1.4 J	7.56	1040	0.465	4.71 J	16	8.12	15.3	18,000	152	1,030	0.065	1.29	25.1	0.285	0.235	0.225	26.1	253
ADA-064	17,900 J	0.88 J	8.94	463	0.55	2.26	38.4	11	21.5	24,200	167	1,500	0.05	0.99	35.3	0.3	0.12	0.29 J	32.2	256 J
ADA-065	16,800	4.33 J	**12.6**	207	0.56 J	7.19	17.7	6.68	26.4	16,600	385	901	0.08	0.91	14.9	0.33	0.33	0.38 J	30.8	317
ADA-066	11,900	1.54 J	6.96	186	0.46	3.45	20.9	6.15	17.4	16,100	168	600	0.04	0.8	16.4	0.2	0.15	0.22	25.7	213
ADA-067	17,700	0.95 J	6.12	701	0.51	6.11 J	20.4	9.2	41.4	21,800	107	964	0.04	1.89	28.7	0.33	0.3	0.21	30	252
ADA-070	21,200	2.8 J	**12.78**	290 J	0.55 J	4.21	27.6	8.41	21.9	19,100	245	751	0.07	0.66	21.7	0.34	0.24	0.32	37	270
ADA-071	14,500	2.78 J	**9.78**	254	0.51 J	4.23	23.4	6.66	17.7	18,000	276	726	0.06	0.82	19.3	0.22	0.18	0.31 J	32.5	245
ADA-073	16,500	4.26 J	**14.04**	284	0.49 J	4.26	22.5	6.56	19.1	16,700	312	711 J	0.09	1	19.8	0.3	0.25	0.3	31.4	245
ADA-076	20,900	3.16 J	**13.26**	319	0.46 J	7.69	21.9	7.26	17	18,400	286	639	0.09	1.12	27.6	0.4	0.34	0.29	30	431
ADA-078	16,000	2.93 J	**12.84**	354	0.53	4.53 J	25.1	7.55	15.4	18,900	256	939 J	0.07	0.74	19.8	0.27	0.18	0.32	37.1	244
ADA-079	15,700	1.95 J	7.44	681	0.41 J	7.76	19.8	5.85	17.1	13,600	151	659	0.07	2.01	27.7	0.3	0.77	0.2	29.1	410
ADA-081	15,100	2.76 J	**11.1**	220	0.53 J	2.88	34.8	8.06	19	22,900	187 J	815	0.07	0.86	21.6	0.25	0.17	0.23	51.2	172
ADA-082	16,300	1.84 J	8.46	294	0.505	2.94	24.1	7.68	24.9	16,500	194	627	0.08	0.725	19.8	0.345	0.185	0.225	28.9	203
ADA-084	17,500	1.58 J	7.92	299	0.49	2.82	22.9	9.46	20	21,500	175	1,160	0.07	0.615	26	0.26	0.23	0.235	28.9	253
ADA-085	16,700	1.18 J	6.6	274	0.515	3.26 J	18.6	7.63	17.2	20,100	135	801	0.07	1.15	24.3	0.41	0.255	0.27	31.9	1,160
ADA-088	17,500	2.91 J	**13.08**	454	0.7 J	6.32	35.8	12.9	31.5	24,400	327	1,490	0.11	0.99 J	32.2	0.45	0.3 J	0.33	35.4	327
ADA-089	20,100	2.96 J	**16.44**	412	0.77 J	5.48	23.6	10.9	26.3	23,000	331	1,510	0.09	0.74	28.6	0.33	0.24	0.31 J	29.1	334
ADA-090	17,700	2.32 J	7.8	471	0.55 J	4.82	25.4	8.44	18.2	19,600	248	1,170	0.11	0.59	19.6	0.255	0.2	0.295 J	33	301
ADA-091	17,900	2.35 J	**13.08**	299	0.59 J	6.16	26.4	8.84	23.6	18,400	282	889	0.08	0.64 J	26.3	0.34	0.24 J	0.32	29.9	339
ADA-092	18,500	1.56 J	**13.02**	368	0.58	5.71	22.2	8.14	20.6	19,100	225	1,130	0.06	1.51	30.3	0.41	0.26	0.3	25.5	359
ADA-093	21,800 J	1.4 J	**11.04**	368	0.59	3.1	16.1	7.09	13.7	18,100	182	1,240	0.07	0.61	18	0.27	0.2	0.25 J	25.4	243 J
ADA-094	17,800	1.04 J	7.92	341	0.57	1.55	22.8	7.73	15.9	19,800	100	756	0.04	0.6 J	20.5	0.17 J	0.14	0.17	31.6	154
ADA-095	20,400	1.72 J	**11.52**	340	0.76 J	2.38	28.9	10.6	19.8	22,200	165 J	1,110	0.06	0.7	25.3	0.26	0.19	0.21	32.7	186
ADA-096	16,200	2.54 J	**10.56**	478	0.68	5.41	16.2	7.26	18.6	17,400	364	1,160	0.09	0.66	16.6	0.31	0.21	0.28	23.1	306
ADA-097	17,300	4.52 J	**15.96**	384	0.66	10	28	9.63	33.7	19,300	**536**	1,340	0.14	1.15	23.3	0.54	0.45	0.42	27.9	489
ADA-099	23,100	2.34 J	**14.34**	359	1.08	4.4	27.1 J	9.96	22.7	20,500	259	1,340	0.09	0.72	30.6	0.27	0.2 J	0.32	33.5	305
ADA-101	16,600	3.15 J	**9.42**	218	0.39 J	2.99	22.7	7.87	20.2	18,800	226	626	0.07	0.78	19.3	0.33	0.24	0.28	33.8	250
ADA-102	19,900	1.39 J	8.04	376	0.52 J	1.89	20.2	7.96	16.8	19,200	127 J	762	0.04	0.54	17.6	0.22	0.15	0.2	31.9	187
ADA-103	18,100	1.85 J	8.7	490	0.6	3.4	27.3	12.7	24	25,700	174	1,520	0.06	0.96	38.9	0.29	0.15	0.25	29.4	273
ADA-104	18,900	0.89 J	5.436	349	0.47 J	1.65	12.3	5.85	13.2	16,700	80	701	0.06	1.96	18.4	0.35	0.36	0.17 J	29.5	213
ADA-105	16,900	2.13 J	**10.02**	374	0.485	4.62	23.1 J	8.88	24.1	19,100	235	862	0.07	0.46	19.1	0.215	0.305 J	0.3	35.6	306
ADA-106	19,700	1.26 J	6.3	595	0.503	2.05	18	9.13	18.8	20,800	80	850	0.05	1.67 J	31.8	0.46	0.287	0.18	31.7	220
ADA-107	25,600	1.03 J	8.04	494 J	0.577 J	3.83	37.3	12.5	29.5	22,700	148	1,490	0.0633	1.11 J	34	0.243	0.187 J	0.303	43.5	289
ADA-108	15,600	2.04 J	9.12	305	0.63	4.42	34.9 J	9.68	27.2	19,200	228	937	0.0733	0.563	21.7	0.243	0.213 J	0.243	32.7	257
ADA-109	14,900	3.91 J	**12.42**	245	0.5	6.5	20.4	6.96	21.9	16,200	381	729	0.11	0.76	17.1	0.42	0.31	0.35	25.1	359
ADA-110	14,000	3.13 J	9.12	182	0.47	5.18	20.3	6.34	20.7	15,700	267	548	0.09	0.4	12.3	0.25	0.28	0.27	29.6	256
ADA-111	20,500	0.94 J	7.38	344	0.52 J	2.23	29.9	9.5	22.7	20,900	120	957	0.05	0.47	21.2	0.18 J	0.14	0.21 J	40.7	184
ADA-112	24,400	0.89 J	7.74	400	0.65	2.48	21.3	8.61	19.4	21,400	103	1,250	0.06	0.53 J	15.8	0.24	0.23	0.19	38	190
ADA-113	20,200	1 J	8.22	506 J	0.71	2.43	24 J	8.11	17.2	19,000	163	1,320	0.07	0.55	19.4	0.22	0.15	0.2	32.1	176
ADA-114	20,400	0.74 J	**10.02**	353	0.76	1.89	18.5	6.98	15.4	18,300	115	1,180	0.07	0.64	20.2	0.18 J	0.17	0.19	26.7	187
ADA-115	17,500	1.17 J	8.58	296	0.53	2	16	5.96	11.5	15,600	143	792	0.05	0.45	14	0.14 J	0.14	0.17	24.8	198
ADA-116	14,700	1.26 J	8.7	230	0.44 J	1.52	16.8	5.95	12.6	15,800	113 J	637	0.04	0.47	12.9	0.16 J	0.12	0.17	27.9	159
ADA-117	15,800	1.85 J	**10.44**	296	0.51	3.24 J	19	7.02	16.3	16,600	194	1,070 J	0.06	0.56	14.5	0.18 J	0.15	0.23	29.3	228
ADA-118	19,400	1.41 J	8.76	415	0.72	4.23	32	8.47	19	19,300	192	1,250	0.06	0.57	24.3	0.2	0.18	0.21	28.3	318
ADA-119	15,200	1.54 J	8.7	272	0.54 J	3.55	23.5	8.14	21.7	17,400	207	904	0.06	0.53 J	20.3	0.19 J	0.16 J	0.22	25.3	235
ADA-121	22,200	2.27 J	**11.4**	380	0.54 J	4.58	25.8	10	25.1	21,700	240	1,090	0.06	0.82	23.4	0.27	0.24	0.3	39.2	322
ADA-122	18,800	0.75 J	5.208	318	0.52	1.48	16.5 J	6.79	10.8	16,800	57	829	0.04	0.73	23.4	0.21 J	0.16 J	0.12	25	169
ADA-169	20,000	0.457 J	5.556	174	0.54 J	0.52	13.4	8.09	10.3	21,900	69	588	0.03	0.447	21.8	0.09 J	0.0333	0.123 J	18.6	90.8
ADA-170	19,000 J	0.91 J	7.5	196	0.5	1.63	14.6	7.01	12.8	19,400 J	109	572	0.06	1.27	16.2	0.21	0.22	0.19	35.2	371
ADA-171	17,400 J	0.91 J	6.54	213	0.45 J	1.97	14.4	6.26	15.8	17,500 J	95	602	0.07	1.88	18.2	0.31	0.45	0.23	33.4	391
ADA-172	12,400	0.58 J	3.348	167	0.36	0.42 J	10.4	5.23	7.28	13,700	70	733 J	0.05	0.39	13.4	0.13 J	0.05	0.12	17.9	64.8
ADA-173	20,300	1.01 J	6.3	268 J	0.483	1.22	14.6	5.94	11.5	16,600	90	714	0.05	1.45 J	16	0.207	0.19	0.187	31.1	178

Table 5-12b. Comparison of Aerial Deposition Area Metals Data from < 149-µm Fraction with Available Human Health Screening Levels

	Soil Concentration by Analyte (mg/kg dw)[a]																			
Decision Unit	Aluminum	Antimony[c]	Arsenic[c,d,e]	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead[f]	Manganese	Mercury[c]	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Human Health Screening Level (mg/kg)[b]	77,400	31.3	9.39	15,300	156	70.3	117,000	23.4	3,130	54,800	400	1,830	24	390	1,550	391	391	0.782	394	23,500
ADA - Primary (continued)																				
ADA-174	18,800	1.05 J	5.58	317 J	0.43	2.13	10.8	4.65	7.79	13,100	77	728	0.075	1.41 J	13	0.24	0.36	0.14	24.5	195
ADA-175	17,400	0.54 J	4.044	292	0.48 J	0.74	19.6	8.64	14	17,700	83	889	0.03	0.56	28	0.13 J	0.07	0.2	25.2	144
ADA-176	25,900	0.55 J	4.05	373 J	0.67	0.77	31.4	13.8	20.6	24,800	79	860	0.05	0.53 J	54.4	0.15 J	0.06	0.32	36.8	143
ADA-177	15,300 J	0.45 J	5.334	161	0.38	0.48	19.9	9.75	12.9	21,000	72	817	0.05	0.58	22.6	0.13 J	0.05	0.14 J	25.4	99.4 J
ADA-178	18,400	0.48 J	5.304	160	0.46 J	0.48	16.7	9.17	11.8	21,700	56	580	0.03	0.79	22.2	0.13 J	0.05	0.12	27.9	162
ADA-179	16,800	0.83 J	4.164	226	0.49	1.15 J	11.6	4.91	9.98	15,300	67	627	0.04	1.35	14.1	0.2 J	0.2	0.16	27.8	209
ADA-180	16,000	1.19 J	4.95	502	0.47 J	3.33	13.3	5.87	14.4	16,600	133	713	0.06	2.17	19.8	0.435	0.305	0.205 J	30.4	384
ADA-181	15,500	1.18 J	4.938	323 J	0.4	2.66	11.9	4.96	13.2	14,200	101	706	0.06	2.41 J	17.2	0.38	0.41	0.27	34.2	266
ADA-182	17,800	0.95 J	4.404	325	0.46	3.67	16.9	6.9	18.1	17,300	41	451	0.05	2.26 J	27.5	0.49	0.46	0.15	36.2	240
ADA-183	11,800	2.66 J	7.74	376	0.39 J	11.3	14.2	6.07	26.8	14,000	58	422	0.1	5.72	56.5	2.17	0.94	0.19	48.4	611
ADA-184	14,400	0.91 J	5.148	630	0.38 J	6.54	10.8	6.52	19.5	14,400	85	827	0.04	2.92	27.6	0.41	0.9	0.15	24.4	330

Notes:

Bold and shaded cells indicate concentrations greater than the human health soil screening level.

Averaged results have three significant figures applied.

[a] For decision units (DUs) with field split and triplicate samples, summary statistics are based on the average of results for the DU. Nondetected values (NDs) are included as half the reporting limits (RLs).

[b] Screening level values are from Syracuse Research Corporation (SRC) (2013) and presented in the quality assurance project plan (QAPP) (Exponent et al. 2014).

[c] The screening levels for antimony, arsenic, and mercury were adjusted to reflect changes to the default values for those metals as discussed by SRC when developing screening levels for use in EPA's subsurface sediment screen (SRC 2013).

[d] Arsenic concentrations adjusted for EPA's default relative bioavailability (RBA) of 60 percent arsenic in soil (USEPA 2012b).

[d] The human health screening level for arsenic is based on the 2012 default residential soil screening level for a 1 in 1 million risk level (USEPA 2012b) plus an estimate of the concentration of arsenic in natural background (9 mg/kg).

[e] Lead concentrations adjusted for the ratio of site-specific RBA to EPA's default RBA, see Table 5-5.

ADA - aerial deposition area

dw - dry weight

J - estimated value

Table 5-12c. Comparison of Relict Floodplain Deposition Area Metals Data from < 149-µm Fraction with Available Human Health Screening Levels

	Soil Concentration by Analyte (mg/kg dw)[a]																			
Decision Unit	Aluminum	Antimony[c]	Arsenic[c,d,e]	Barium	Beryllium	Cadmium	Chromium	Cobalt	Copper	Iron	Lead[f]	Manganese	Mercury[c]	Molybdenum	Nickel	Selenium	Silver	Thallium	Vanadium	Zinc
Human Health Screening Level (mg/kg)[b]	77,400	31.3	9.39	15,300	156	70.3	117,000	23.4	3,130	54,800	400	1,830	24	390	1,550	391	391	0.782	394	23,500
RFA																				
RFA-001	5,290	9.97 J	**12.84**	431	0.28 J	8.9	20.5	7.22	138	39,000	**414**	375	0.36	6.52 J	20.5	0.847	1.8	0.377 J	36.2	2,140
RFA-002	4,550	4.88 J	6.66	471	0.255	6.94 J	15.8	5.76	82.7	24,200	252	330	0.2	6.59 J	15.1	0.505	1.08 J	0.275	29.4	1,570
RFA-003	4,960	9.31 J	**10.68**	511	0.26 J	9.83	18.9	6.77	134	33,400	388	387	0.37	6.67 J	18.6	0.81	1.55	0.35 J	34	2,040
RFA-004	4,630	8.5 J	9.06	560	0.26 J	8.05	17.9	6.07	105	28,600	290	371	0.35	6.22 J	17	0.58	1.31	0.28 J	33.3	1,760
RFA-005	5,310	6.61 J	8.22	446	0.27	6.81 J	17.9	6.43	110	25,900	308	337	2.74	5.43 J	16	0.56	1.25 J	0.28	31.1	1,600
RFB																				
RFB-002	11,300	1.99 J	7.5	242	0.5 J	3.2	32.4	8.45	24.1	19,000	159	417	0.08	0.74 J	23.4	0.47	0.31	0.28 J	38.5	250
RFB-003	9,810	1.6 J	5.568	144	0.39	2.33 J	24.3	6.74	16.4	16,200	107 J	324	0.0367	0.563 J	17.2	0.287	0.197 J	0.23	30.3	188
RFB-008	8,330	0.81 J	3.84	120	0.29	1.5 J	19.6	5.95	12.9	13,900	60	276	0.02	0.45 J	13.8	0.13 J	0.13 J	0.18	27.2	137
RFC																				
RFC-003	8,770 J	2.71 J	**14.4**	144	0.375	7.55	20.7	7.43	94.1	16,900	386	326	0.175	0.83	16.6	0.45	0.635	0.315	30	426
RFC-004	9,580 J	1.34 J	8.52	115	0.39	4.53	22	7.12	50.8	16,900	199	272	0.08	0.70	16.9	0.28	0.38	0.23	31.7	211
RFC-005	11,500 J	3.03 J	**16.32**	182	0.54	8.49	24.6	8.28	133	19,800	**470**	299	0.207	1.09	19.2	0.537	0.827	0.363	35.8	410
RFC-006	12,400	1.95 J	**14.46**	152	0.52 J	6.74	25.4	8.04	114	18,600	343	256	0.11	0.8	19	0.39	0.62	0.33	35.7	286
RFC-007	11,200	2.3 J	9	221	0.49 J	6.52	23.6	7.54	91.1	17,700	362	241	0.2	1.01 J	18.3	0.48	0.59	0.3 J	34.4	379
RFC-008	10,900 J	1.75 J	**12.24**	136	0.44	7.28	22.5	7.28	113	17,200	339	219	0.19	0.7	16.9	0.37	0.57	0.3	31.7	290
RFD																				
RFD-002	4,420 J	2.92 J	**9.66**	512	0.23	7.23	14	4.68	54.2	23,000	314	354	0.43	4.42	13.4	0.49	0.56	0.27	29	1,740
RFD-003	7,360	3.11 J	**11.04**	351	0.313	5.7	17.3	5.5	40.2	17,800	307	315	0.167 J	1.51	14.2	0.33	0.373	0.367	29.9	767

Notes:

Bold and shaded cells indicate concentrations greater than the human health soil screening level.

Averaged results have three significant figures applied.

[a] For decision units (DUs) with field split and triplicate samples, summary statistics are based on the average of results for the DU. Nondetected values (NDs) are included as half the reporting limits (RLs).

[b] Screening level values are from Syracuse Research Corporation (SRC) (2013) and presented in the quality assurance project plan (QAPP) (Exponent et al. 2014).

[c] The screening levels for antimony, arsenic, and mercury were adjusted to reflect changes to the default values for those metals as discussed by SRC when developing screening levels for use in EPA's subsurface sediment screen (SRC 2013).

[d] Arsenic concentrations adjusted for EPA's default relative bioavailability (RBA) of 60 percent arsenic in soil (USEPA 2012b).

[d] The human health screening level for arsenic is based on the 2012 default residential soil screening level for a 1 in 1 million risk level (USEPA 2012b) plus an estimate of the concentration of arsenic in natural background (9 mg/kg).

[e] Lead concentrations adjusted for the ratio of site-specific RBA to EPA's default RBA, see Table 5-5.

dw - dry weight

mg/kg - milligram per kilogram

RFA, RFB, RFC, RFD - relict flood plain depositional areas A, B, C,and D