30 Dioxin ✓ CO FG MC

East Kapolei Affordable Housing Project

Kapolei, Oahu, Hawaii

FINAL SITE ASSESSMENT REPORT

Prepared for

Office of Hazard Evaluation and Emergency Response
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EXECUTIVE SUMMARY

A site assessment was completed at the former East Kapolei agricultural property according to project plans and data quality objectives. The purpose of the site assessment was to collect sufficient information to determine if areas of the property are currently suitable for a future residential housing development based on the methodologies presented in the sampling and analysis plan (Ecology and Environment, Inc. 2006), and data quality objectives and sampling memoranda (Tetra Tech 2006c, 2006d). The site assessment consisted of collecting and analyzing surface soil samples from decision units at the property. A summary of the field investigation, findings, and recommendations is presented below.

Field Investigation

The field investigation consisted of subdividing the site into 59 decision units. A total of 59 surface soil multi-increment samples, 6 duplicate surface soil multi-increment samples, and 4 equipment rinsate water samples were submitted for laboratory analyses. There were no deviations from the project plans and the data quality assessment indicates that the data is valid and usable.

Field Observations

No previously unidentified areas of potential agricultural chemical mixing and loading were observed during the site reconnaissance or during the site assessment sampling activities.

Investigation Results

Sample results were compared to primary screening levels established in the project plans and this report. With the exception of three dioxin samples analyzed by the XDS-Calux Bioassay method, concentrations of chemicals of potential concern in the soil within all decision units were below the action levels. Duplicate samples evaluated by EPA-approved GC/MS methodology were collected at two of the three decision units with the Calux methodology exceedences; each of the GC/MS results was below the screening values. Comparison of the two analytical methods indicates that the Calux bioassay analysis overestimates the dioxin concentrations and resulted in a consistently higher concentration of dioxin than GC/MS. However, Calux serves as an effective screening tool for dioxin analysis.

A background concentration for dioxin was calculated based on the 25 soil samples analyzed for dioxins by GC/MS. The background concentration was based on the 95th upper confidence of the maximum value detected of the 25 samples. The background level for dioxin was calculated at 93.97 nanograms per kilogram.

Recommendations

There are no elevated concentrations of chemicals of potential concern in the soil that suggest conditions are not suitable for residential reuse, or that any additional sampling or evaluation is necessary.

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Acronyms

ATSDR	Agency for Toxic Substances and Disease Registry
bgs	below ground surface
COPC	Contaminant of potential concern
CRA	Contingency Reserve Area
DHHL	Department of Hawaiian Homelands
DLNR	Department of Land and Natural Resources
DU	decision unit
EAL	Environmental Action Level
EPA	U.S. Environmental Protection Agency
ESA	Environmental Site Assessment
GC/MS	Gas Chromatography Mass Spectometry
GPS	Global Positioning System
HDOH	State of Hawaii, Department of Health
HEER	Hazard Evaluation and Emergency Response
IDW	investigation derived waste
LCS	laboratory control sample
MDH	Minnesota Department of Health
mg/kg	milligrams per kilogram
MS/MSD	Matrix Spike/Matrix Spike Duplicate
ng/kg	nanograms per kilogram
OSC	Oahu Sugar Company
PARCC	precision, accuracy, representativeness, comparability, and completeness parameters
PCDD	polychlorinated dibenzo(p)dioxins
PCDF	polychlorinated dibenzo(p)furans
PCP	pentachlorophenol
PML	Pesticide Mixing and Loading
PPE	personal protective equipment
PRG	Region 9 Preliminary Remediation Goals (2004)
QA/QC	Quality Assessment/Quality Control
QC	quality control
REAC	Response Engineering and Analytical Contract
RPD	relative percent difference
SAP	Sampling and Analysis Plan
START	Superfund Technical Assessment and Response Team
TCDD	2,3,7,8-tetrachlorodibenzo-p-dioxin
TCDF	2,3,7,8-tetrachlorodibenzo-p-furan
TEF	toxicity equivalent factor
TEQ	toxicity equivalent
TMK	Tax Map Key
USDA	United States Department of Agriculture
XDS	Xenobiotic Detection Systems

1.0 INTRODUCTION

Tetra Tech EM Inc. (Tetra Tech) was tasked by the State of Hawaii, Department of Health (HDOH), Hazard Evaluation and Emergency Response Office (HEER) to conduct a site assessment of the East Kapolei property, currently used as agricultural fields and proposed for the development of the East Kapolei Affordable Housing Project, located in Kapolei, Oahu, Hawaii (See Figure 1).

The entire East Kapolei property consists of approximately 404 acres of land currently owned by the State of Hawaii and operated by the State of Hawaii Department of Land and Natural Resources (DLNR). This site assessment focused on approximately 318 acres of land referred to as the East Kapolei Brownfields Agricultural Property. The project site excluded two areas: (1) approximately 3 acres of land, which included an area referred to as the Oahu Sugar Company (OSC) Pesticide Mixing and Loading (PML) Area and (2) approximately 83 acres of land located on the western portion of the property where the Hawaii Department of Transportation was excavating land for use as a drainage basin. Aside from the developmental activities in relation to the drainage basin, various environmental concerns at the East Kapolei property have necessitated the division of the land into two discrete project areas to be evaluated.

The OSC PML Area is a 0.634-acre portion of land located in the northwest portion of the East Kapolei property. Historically, this site was used as a primary mixing and loading area for agricultural chemicals, and previous investigations have documented that soil both inside and outside the fenced area is contaminated with dieldrin, arsenic, atrazine, ametryn, pentachlorophenol (PCP), trifluralin, polychlorinated dibenzo-dioxins (PCDD), and polychlorinated dibenzo-furans (PCDF) at concentrations above current U.S. Environmental Protection Agency (EPA) Region 9 2004 Preliminary Remediation Goals (PRG) for residential soil and December 2003, HDOH *Screening For Environmental Concerns At Sites,* Environmental Action Levels (EAL).

Based on the historical connection of the OSC PML Area with the property being proposed for development, the potential for soil contamination similar to what has been documented in association with the OSC PML Area exists throughout the agricultural property. This report addresses the evaluation of the agricultural property prior to the development of the property for residential use. The strategy used for the property evaluation was adapted from a Sampling and Analysis Plan (SAP) prepared by Ecology and Environment, Inc. titled "*East Kapolei Agricultural Property Phase II Site Assessment, Sampling and Analysis Plan*" dated February 2006. After reviewing the SAP, Tetra Tech prepared a Sampling Memorandum identifying the proposed technical approach to adequately characterize the East Kapolei property. The Sampling Memorandum, dated May 12, 2006, was submitted and approved by the HEER Office and the EPA Region 9 Quality Assurance Officer.

1.1 APPARENT PROBLEMS

The apparent problems at the site, which contributed to the determination that a site assessment was necessary, are as follows:

- Possible surface soil contamination from historical application of herbicides and pesticides. The principal chemicals of potential concern (COPC) are dieldrin, arsenic, atrazine, ametryn, PCP, trifluralin, and dioxins above current EPA PRGs for residential soil and HDOH EALs.

- Finding previously unidentified areas of potential agricultural chemical mixing and loading. The surface soil may be contaminated with COPCs due to operational and waste disposal practices as well as migration of contaminants from the OSC PML Area.

Metals, dioxins, pesticides, and herbicides of concern are environmentally persistent, migrate slowly, and will not greatly vary in concentration in soil over time. Given the location and relative inaccessibility of potential contamination, the threat to groundwater, surface water and present communities is not expected to be immediate or imminent. However, the threat would be increased due to the development activities, since the contamination, if present, would be exposed. Further, a residential development would establish a community in close proximity to contamination.

2.0 PROJECT BACKGROUND

The following sections detail the site background, environmental concerns at the site, and the summary of previous environmental investigations that were conducted at the site.

2.1 SITE DESCRIPTION

The East Kapolei Affordable Housing Project agricultural property consists of two contiguous parcels of land with a total area of approximately 401 acres. The two parcels are Parcel Tax Map Key (TMK) 1-9-1-017-071 and Parcel TMK 1-9-1-017-088 that create a wedge-shaped property situated approximately 1 mile southeast of Highway 1 and northwest of the village of Ewa and the Ewa Village Golf Course (See Figure 2). The OSC PML Area, which is not part of this site assessment, is located on the northwest portion of Parcel TMK 1-9-1-017-088

Approximately two thirds of the agricultural property is characterized by active agricultural fields that were observed to be in various states of cultivation including freshly tilled land, fallow fields, recently harvested areas, and fields where additives such as herbicides and pesticides had recently been applied. The remaining one third of the property, on the western portion of the site, consists of undeveloped land overgrown with field grass and kiawe trees and shrubs. Irrigation ditches were observed across the property; however, the ditches are no longer used to transmit water to the fields. Piping and irrigation lines associated with a pumping station located north of the subject property are currently used to water the crops. A chain link fence enclosed area located on the westernmost portion of the property is designated as a contingency reserve area (CRA). The CRA is a 20-acre environmental preserve that is monitored by the DLNR Division of Forestry and Wildlife due to the presence of endangered plants. Various unnamed dirt access roads cross the entire property. Additionally, North-South Road, Mango Tree Road, and Palehua Road are located on the northern, southern, and central portions of the project area, respectively.

The elevation of the property ranges from approximately 60 feet above sea level at the southern portion to approximately 110 feet above sea level at the northern portion.

2.2 SITE HISTORY AND OPERATIONS

The East Kapolei property, which includes the project area, was part of the Ewa Plantation established in 1890 and operated by Castle & Cooke Incorporated. The land that Castle & Cooke Incorporated utilized was owned by James Campbell and was used for growing sugar cane. In 1970, Oahu Sugar Company assumed ownership of the plantation and continued operation until 1994. During its operational history various herbicides and pesticides were mixed at the PML Area and applied to portions of the agricultural

fields. In the mid 1990s the State of Hawaii obtained the property from the Campbell Estate and the fields are currently leased for commercial fruit and vegetable cultivation.

2.3 PREVIOUS INVESTIGATIONS

Previous investigations in relation to the East Kapolei Affordable Housing Project focused exclusively on the OSC PML Area and the land in the immediate vicinity of the area. The agricultural fields beyond the PML Area had not been investigated. A report titled "Phase I Environmental Site Assessment at East Kapolei Brownfield, Kapolei, Hawaii" prepared by AMEC Earth and Environmental, Inc., dated September 2004 and a report titled "East Kapolei Agricultural Property Phase II Site Assessment Sampling and Analysis Plan" prepared by Ecology and Environment, Inc. dated February 2006 were reviewed by Tetra Tech and provided information concerning previous investigations. A summary of the PML Area investigations is presented below:

- In 1990 the University of Hawaii and the Hawaii Department of Agriculture identified the OSC PML Area as a source or location of pesticide and herbicide contamination.
- Several studies were performed by HDOH that did not provide conclusive evidence of contamination. In 1992 a non-sampling preliminary site assessment was performed by HDOH that included document reviews, interviews, and a site visit. The conclusion from the site assessment was that pesticides and herbicides had been used historically on the property.
- In 1997 and 1999 results from limited surface soil sampling at the site indicated arsenic, PCP, and dioxin/furan concentrations were above the EPA Region 9 PRGs.
- In 2000, the EPA Response Engineering and Analytical Contract (REAC) conducted additional sampling when surface and subsurface soil was collected. Some analytical results exceeded the PRGs for dioxins, furans, PCP, atrazine, trifluralin, dieldrin, and arsenic.
- No additional intrusive investigations were conducted following the EPA REAC sampling; however, in 2001 the United States EPA Superfund Technical Assessment and Response Team (START) conducted an evaluation of the date from the previous investigations and recommended further sampling to delineate soil contamination and evaluate the groundwater.
- A Phase I Environmental Site Assessment (ESA) was also conducted in 2004 by AMEC to evaluate the property. Based on a review of previous investigations, AMEC concluded that soil from various portions of the pesticide mixing and loading area exceeded the PRGs for PCDD/PCDF as dioxin/dibenzofuran, atrazine, trifluralin, dieldrin, PCP, arsenic, and manganese. Although the manganese concentrations were elevated it was determined that the native soil at the property tends to be rich in this metal naturally and it is therefore unlikely to be a contaminant of concern. In addition to the review of the previous sampling investigations, AMEC also identified an area of potential pesticide mixing and loading used by the current tenants during their site visit. The suspected area "was observed to have a water source, with a 2-inch diameter PVC pipe with 2-inch hose, and the area had approximately eight 5-gallon, recently emptied pesticide containers stockpiled..." The area was located approximately 100 feet east of the OSC PML Area and also contained an area of standing water and stressed vegetation. The presence of the standing water also caused concern since a potential existed for the surface water runoff from the OSC PML Area to drain to and impact the suspected area.

3.0 STUDY AREA INVESTIGATION

This section presents a summary of the activities that were conducted during the site assessment between April and July 2006 in accordance with an adapted sampling memorandum prepared by Tetra Tech and approved by HDOH. These protocols regulate assigning sample numbers, identifying chemicals of concern, handling samples, generating chain-of-custody, adhering to analytical methods, and quality control measures. All sampling was conducted in accordance with the SAP (Ecology and Environment, Inc. 2006) and sampling memorandum (Tetra Tech 2006d).

3.1 PRE-SAMPLING SITE RECONNAISSANCE

A site reconnaissance was conducted on April 28, 2006. Photographs from the site reconnaissance are included in a photolog presented in Appendix A. Mr. Darrell Ing, a land agent for the Department of Hawaiian Home Lands (DHHL) Land Development Division, guided the site visit and provided information concerning the property. The tour of the property consisted of driving around the exterior boundary and observing the land characteristics, topographic features, vegetative cover, and current uses. Observations were made from the dirt and gravel, unimproved North-South Road, Mango Tree Road, and the southern extension of Palehua Road, which are located along the northern, southern, and central portions of the project area, respectively.

The property was characterized by level ground with a combination of active agricultural fields and undeveloped land overgrown with field grass and kiawe trees and shrubs. Dense vegetation was observed within the CRA fence line on the western portion of the property. The OSC PML Area was observed on the northern portion of the project area, adjacent to the corner of Palehua Road and an unnamed dirt access road. Southeast from this site, across the dirt road, is an area designated as a Potential Contaminated Area. These two locations are scheduled to be investigated by Enviroservices and Training Center, LLC under a separate project. Fallow agricultural fields were observed north of the PML Area. No areas of concern (areas of stressed vegetation, hazardous substances, staining, unidentified drums or containers, etc.), where a concentrated sampling effort would be deemed necessary, were observed during the site reconnaissance.

At the conclusion of the site visit, Tetra Tech requested that Mr. Ing identify the current tenant farmers who utilize the project area. The purpose of this information would be used to help with determining the current farming schedules and crop rotations and avoid disturbing the current operations. Mr. Ing provided the phone number for Mr. Mike Sou with Aloun Farms, the company that currently leases the property. Mr. Sou requested that Tetra Tech identify the areas scheduled for sampling on a map and fax

the information to the Aloun Farms office. Following a review of the proposed sampling areas, Mr. Sou stated that farming operations would not be affected by the sample collection and that the farmland in question was not scheduled for pesticide or herbicide application. He requested that sampling personnel attempt to avoid stepping on vines, plants, or vegetables in the agricultural fields.

Based on the site reconnaissance, Tetra Tech concluded that the site conditions were conducive to properly implementing the proposed sampling strategy. The property is predominantly flat and open, which would facilitate access across the agricultural fields. Although an ecologically sensitive area exists on the property, permission was granted to perform sampling if a decision unit falls within the boundaries of the CRA. Additionally, following a discussion with the current tenant farmers, neither the timing for the sample collection nor the placement of the decision units was changed.

3.2 CONTINGENCY RESERVE AREA MEETING AND TRAINING

On May 1, 2006, Tetra Tech contacted Mr. Greg Mansker, a representative with Forestry and Wildlife, to discuss the environmental preserve and to determine if the area would create a conflict with the sampling strategy. The area in question is referred to as the Abutilon CRA and although endangered plants are located on the property, no concerns were identified with entering the area to conduct surficial soil sampling. Due to the ecological sensitivity of the reserve; however, he requested that prior to the scheduling of the sampling events, that a representative from Forestry and Wildlife conduct a brief training session to help the sampling individuals or teams identify the endangered plants and avoid disturbing them. Mr. Mansker also requested that only surficial sampling occur and stated that vehicles would be prohibited from entering the area.

On July 21, 2006, Mr. Mansker conducted an endangered plant species identification training session for Tetra Tech personnel within the CRA. The endangered plant abutilon, also known as Red Ilima, is a small 1 to 2 foot shrub, with silvery heart-shaped leaves, and small, red, down turned, pendant-shaped flowers. Plastic pipes have been placed into the ground next to the plants as identifying markers. Irrigation pipes located across the CRA deliver water to the base of the plants. Other than avoiding the plants, Mr. Mansker also requested that Tetra Tech avoid damaging the irrigation system. Following the training session, Tetra Tech concluded that no change in the sampling strategy would be necessary.

3.3 SAMPLING STRATEGY

As discussed in Section 1.0, the sampling strategy for the East Kapolei agricultural property derived from the February 2006 SAP prepared by Ecology and Environment, Inc. and was adapted into a Sampling Memorandum prepared by Tetra Tech dated May 12, 2006. The sampling strategy was based on

characterizing surface soil concentrations at 59 decision units at the site. The identification of 59 decision units results in a 95th percent upper confidence that concentrations at the site do not exceed the screening levels identified, regardless of site size (DOH 2007, EPA 1989). The 59 decision units were determined as follows:

1. The entire 401-acre site was divided into 59 strata or grids of approximately 7 acres in size.
2. Within each grid, one geographic point was identified by a random number generator.
3. Each point served as the center of a 5,000 square foot decision unit to represent the estimated dimensions of a residential home lot.

The result was 59 decision units located in a stratified random pattern throughout the entire site. Figure 3 presents the distribution of the decision grids, decision units, and center points of the decision units across the project area. Special consideration was made to those decision units which were located within or near the boundaries of the CRA. The latitude and longitude coordinates of the center point of each decision unit was loaded into a global positioning system (GPS) unit for use in the field. The coordinates are presented in Appendix B.

3.4 SAMPLING PROTOCOLS

This section identifies sampling protocols that were followed during the field investigation, including methods and equipment, sample collection, sample preparation, decontamination, waste disposal, and sample containers. All sampling was conducted in accordance with the SAP (Ecology and Environment, Inc. 2006) and sampling memorandum (Tetra Tech 2006d).

3.4.1 Soil Sampling

Surficial soil samples were collected from July 26 to July 31, 2006. The center point of each decision unit was located within the project area using the coordinates that had been loaded into the GPS unit. A wooden stake was placed at the center point and, using a compass and a measuring tape, the corners of the decision unit were established by measuring 35 feet in the northeast, southeast, southwest, and northwest directions from the center point. This process created an approximately 5,000 square foot decision unit where each of the sides was oriented so that incremental soil samples could be collected orthogonally across the sampling area in a north to south manner.

One multi-increment surface soil sample was collected from each of the 59 decision units. The multi-increment soil sample consisted of 40 subsamples collected from 0 to 6 inches below ground surface (bgs) within each decision unit. The multi-increment sampling technique was used to maximize the goal of

obtaining sufficient material over the decision unit to account for both compositional and distributional heterogeneity. Photographs of the sampling procedures are included in a photolog presented in Appendix A. The sampling protocol followed these steps:

1. The field sampler began at a corner of the decision unit and sampled in an orthogonal pattern, moving from north to south to collect subsamples from 40 locations within each decision unit. The location of the subsamples was not critical as long as they were distributed throughout the decision unit. The samples were collected with a stainless steel trowel. A stainless steel hammer was used to break up the surface soil at areas where the soil was too hard or compact to collect with the trowel. The soil was placed into a new, disposable paper bag. A new paper bag was used for each decision unit and disposed after a single use.

2. The 40 subsamples were mixed in the bag to form one composited, multi-increment sample.

3. The composited sample was allowed to air dry and then sieved through a #10 sieve into a disposable aluminum pan. A new aluminum pan was used for each decision unit and disposed after a single use. Any material larger than the #10 sieve size was placed aside for later return to the decision unit of origin.

4. The sieved soil was redistributed into a 1-inch thick uniform layer within the aluminum pan.

5. Forty incremental subsamples of the sieved soil were randomly collected from across the aluminum pan using a stainless steel spoon and placed into sample jars. If more than one sample jar was to be submitted to the laboratory from a single decision unit, then the soil remaining in the container was re-leveled each time a sample jar was filled. Re-leveling consisted of gently redistributing the entire contents of the pan to reestablish a uniform depth and maintain a homogenous grain size distribution.

Twenty five additional split samples were prepared for dioxin/furan analysis by EPA Method 8290A gas chromatography mass spectrometry (GC/MS). Split samples were prepared from the same soil that was collected at the multi-increment soil sample locations.

3.4.2 Decontamination

All non-consumable materials that came into contact with soil during the sampling event were decontaminated. These materials included stainless steel trowels, hammers, sieves, and spoons. The decontamination process included a non-phosphate detergent and tap water wash using a scrub brush to scour the surface of the equipment and remove soil particles, a tap water rinse, a de-ionized water rinse, an isopropyl alcohol rinse, and air drying. All liquids used during the decontamination process were contained in 5-gallon plastic buckets. The volume of decontamination liquids generated daily during the sampling investigation was sufficiently low to allow for disposal on the ground surface of the property. Fresh water and detergent were used at the commencement of each day.

The effectiveness of the decontamination process was confirmed by the collection of daily equipment rinsate blanks. De-ionized water was poured over decontaminated equipment and drained into sample bottles for laboratory analysis. The analysis performed on the rinse water was identical to the analysis of the soil samples, except rinse water was not analyzed by the Xenobiotic Detection System (XDS)-Calux Bioassay method. Results of the blank samples are discussed in Section 4.4.2.

3.4.3 Management of Investigation Derived Waste

Investigation derived waste (IDW) included disposable field sampling equipment and personal protective equipment (PPE). The disposable equipment was intended for one-time use and was packaged in double bagged plastic bags for proper off-property disposal in municipal dumpsters.

3.5 Sample Handling and Custody

Soil samples were placed into one 8-ounce glass jar and one 4-ounce glass jar for laboratory analysis. One additional 8-ounce jar of soil was prepared for each split sample for GC/MS analysis. Two additional 8-ounce jars of soil were prepared for each decision unit where soil was collected for matrix spike/matrix spike duplicate (MS/MSD) analysis. Six 1-liter, glass, unpreserved, amber bottles and one 250-milliliter polyethylene bottle with nitric acid preservative were filled with equipment rinsate water for laboratory analysis.

Following collection, all samples were labeled, wrapped with protective bubble wrap material, placed into sealable plastic bags, and packed into insulated coolers prepared with frozen Blue Ice® to maintain the temperature at or below 4° Celsius. The sample identification information was logged onto a chain-of-custody, which was placed in a sealable plastic bag accompanied by a United States Department of Agriculture (USDA) soil permit provided by the analytical laboratories, and taped to the inside of the coolers. Copies of the chain-of-custody forms are presented in Appendix C. Custody seals were placed across the lids of the coolers and the coolers were then sealed with packing tape. Sample coolers were shipped to Columbia Analytical Services Laboratory located in Kelso, Washington and Xenobiotic Detection Systems, Inc. located in Durham, North Carolina by Federal Express. The specific analyses performed by each laboratory are described in the following section.

3.6 Analytical Methods

The following COPCs were identified from previous investigations in the vicinity of the agricultural fields:

- Dieldrin
- Arsenic

- Atrazine
- Ametryn
- PCP
- Trifluralin
- PCDD/PCDF reported as TCDD Total toxicity equivalent concentration TEQ

Due to the presence of these contaminants at the adjacent PML Area, analyses for these constituents were conducted for the agricultural fields. During the pre-sampling site visit, Tetra Tech identified the current use of pesticides or herbicides within the site boundaries based on posted warning signs that were observed on agricultural fields that had recently been applied with additives. As a result, the complete suite of pesticides was recommended for analysis.

The following laboratory analyses were conducted to determine the extent of contamination of the project area that may have been influenced by historical use:

- Inorganic metals, arsenic only by EPA Method 6020B. Soil samples where arsenic values exceed the screening level will be re-analyzed through physiologically-based extraction tests to measure the bioaccessibility of the arsenic that is present.

- Dioxin/Furans by XDS-Calux Bioassay and EPA Method 8290A GC/MS for 25 split samples. The GC/MS analysis was performed to verify the results of the XDS-Calux Bioassay analysis. For the East Kapolei Affordable Housing Project these methods were used to analyze for the specific chemicals of concern PCDD/PCDF.

- Organophosphorus Pesticides by EPA Method 8141. For the East Kapolei Affordable Housing Project this method was used to analyze for the following specific chemicals of concern: ametryn, atrazine, and trifluralin.

- Organochlorine Pesticides by EPA Method 8081. For the East Kapolei Affordable Housing Project this method was used to analyze for the specific chemicals of concern dieldrin and PCP.

- Chlorinated Herbicides by EPA Method 8151. This method was not used to analyze for a specific chemical of concern specific for the East Kapolei Affordable Housing Project.

Soil and rinsate water samples were shipped to Columbia Analytical Services Laboratory located in Kelso, Washington for all analysis except XDS-Calux Bioassay analysis. Soil samples collected for XDS-Calux Bioassay analysis were shipped to Xenobiotic Detection Systems, Inc. located in Durham, North Carolina.

3.6.1 Special analytical requirements

The subsampling process described in Section 3.4.1 was repeated for soil samples received by the Columbia Analytical Services Laboratory prior to analysis. This included laying soil samples out in a uniform layer and collecting subsamples from across the layer. Subsampling was not performed by Xenobiotic Detection Systems, Inc.

3.6.2 Field Quality Control Samples

Quality control (QC) samples were collected according to the methodology and protocols presented in the existing sampling analysis plan prepared by Ecology and Environment, Inc., with the exception of the field duplicates. Six field duplicate samples (10 percent of the total number of samples) were randomly collected among the decision units during the field investigation. Each field duplicate was collected according to the steps identified in Section 3.4.1; however, in the first step, the field sampler began sampling at a different corner of the decision unit. Results of the field duplicates were used to estimate the representativeness of the multi-increment sampling for the decision units at the site.

Samples collected from arbitrarily selected decision units were identified for use as laboratory QC samples for MS/MSD analysis. Three laboratory QC samples (5 percent of the total number of samples) were prepared for this purpose. Additional volume of soil was collected from these decision units to provide enough material for the analysis by the laboratory.

A discussion of QC sample results is presented in Section 4.4.2.

3.7 DEVIATIONS FROM THE SAMPLING MEMORANDUM

There were no deviations from the sampling memorandum during the site assessment.

3.8 DATA VERIFICATION AND VALIDATION

Validation and verification of the data generated during field and laboratory activities was completed by Ms. Sara Woolley, a project chemist with Tetra Tech, to obtain data of defensible and acceptable quality. Data validation reports are included in Appendix D. All analytical results were evaluated in accordance with precision, accuracy, representativeness, comparability, and completeness (PARCC) parameters. The subsections below detail the results relating to each of the PARCC parameters.

3.8.1 Precision

Generally, the relative percent difference (RPD) of the MS/MSD, and laboratory control samples (LCS) data that were analyzed fell within the limits defined in the SAP. Data that did not fall within the limits were qualified.

3.8.2 Accuracy

Accuracy was evaluated through the MS/MSD, LCS, and field blank samples. Data generated for the site assessment were in accordance with accuracy parameters identified in the SAP.

3.8.3 Representativeness

Surface soil samples were collected for the site assessment. All samples were collected from the decision units in accordance with the procedures presented in the SAP. Due to the incremental sampling collection method used for soils, the concentration of COPCs measured within each decision unit should be representative of the true mean concentration for the decision unit. Based on the samples collected and analyzed, the data generated is assumed to be representative of the media sampled. Additional discussion regarding representativeness and sample duplicates is included in Section 3.6.2.

3.8.4 Comparability

Comparability of data was achieved by consistently following procedures for sampling and field activities and by using the same type of sampling equipment at each area and by using standard measurement units in reporting analytical data. Laboratory data were reported in consistent units for each analytical test. Soil chemical data were corrected for percent moisture and were reported in dry weight.

3.8.5 Completeness

The data validation qualified a few of the data but no data was rejected. Therefore, all of the data collected during the investigation was analyzed. Completeness was 100 percent.

4.0 DATA PRESENTATION AND RESULTS

This section presents the results for the analytical program and compares them to their constituent screening levels. The laboratory analytical results from soil collected within the agricultural fields were compared to EAL and EPA Region 9 PRGs for residential soils as follows:

- Dieldrin results were compared to EAL and PRG concentrations of 0.03 mg/kg.
- Arsenic results were compared to background levels of arsenic in Hawaii soils at 20 mg/kg. Samples with results exceeding 20 mg/kg were proposed to be evaluated for bioaccessibility and compared to State-specific arsenic bioavailability levels; however, no values exceeded 20 mg/kg.
- Atrazine results were compared to a PRG concentration of 2.2 mg/kg and an EAL concentration of 3.1 mg/kg. The EAL value for atrazine was provided by Mr. Roger Brewer with HDOH.
- Ametryn results were compared to a PRG concentration of 550 mg/kg. No EALs exist for ametryn.
- PCP results were compared to a PRG concentration of 3 mg/kg and an EAL concentration of 69 mg/kg. The EAL value for PCP was provided by Mr. Roger Brewer with HDOH.
- Trifluralin results will be compared to a PRG concentration of 63 mg/kg. No EALs exist for trifluralin.

The evaluation of dioxins was provided by Mr. Roger Brewer with the HEER Office in a memorandum dated March 23, 2006. The approach uses a combination of references for dioxin toxicity factors including those used by EPA, the Minnesota Department of Health (MDH), and the Agency for Toxic Substances and Disease Registry (ATSDR).

Dioxins are defined as a family of chlorinated compounds with similar chemical structures and mechanisms of toxicity, referred to as congeners. Human health risks associated with dioxins are evaluated by the examination of seventeen specific congeners and the toxicity of each congener is assigned a value in relation to the most potent congener, 2,3,7,8-TDD. The values are reported as toxicity equivalence factors (TEF). The individual congener concentrations reported by the laboratory are then multiplied by their individual TEF to produce a toxicity equivalence quotient (TEQ). The total 2,3,7,8-TDD TEQ concentration for a soil sample is then calculated by adding together the TEQ concentrations of each individual congener. The EPA and MDH have established residential soil screening levels of 42 ng/kg and 390 ng/kg, respectively, based on cancer slope factors that were calculated based on dioxin TEQs. These screening levels form the basis for the examination of the East Kapolei agricultural fields as

well as the OSC PML Area. Polychlorinated dibenzo-dioxin/furan (PCDD/PCDF) results are reported as TCDD Total TEQ.

Background dioxin levels established during the agricultural field sampling were compared with samples collected at the former PML area. If background concentrations were below 42 nanograms per kilogram (ng/kg) then the extent of dioxin contamination at the mixing area would be compared with this number. If background dioxin concentrations from the agricultural fields were greater than 42 ng/kg then the extent of contamination at the mixing area would be compared with the new number. Additionally, areas where concentrations were above 390 ng/kg would be evaluated.

4.1 SOIL SAMPLE RESULTS

The complete laboratory analytical results for each soil sample obtained from the site during this investigation are presented in Appendix E. Tables 1 through 7 present a summary of the results for each individual analysis. The following table and discussion is a summary of the specific chemicals of concern for the East Kapolei Affordable Housing Project.

Soil Sample Results of Specific Chemicals of Concern for the East Kapolei Affordable Housing Project

	Arsenic (mg/kg)	Ametryn (mg/kg)	Atrazine (mg/kg)	Dieldrin (mg/kg)	Dioxin TEQ Calux XDS Method (ng/kg)	Dioxin TEQ GC/MS Method (ng/kg)	PCP (mg/kg)	Trifluralin (mg/kg)
EAL	20	NA 1.1	3.1 (1) .11	0.03 .003	NA	390 NA 240	69 (1) .56	NA 14
PRG	NA	550	2.2	0.03	NA	NA	3	63
Detection Limit	0.005	0.055	0.055	0.005	NA	NA	0.005	0.055
DU-1	7.5	ND	ND	ND	83.03 ± 4.65	NA	ND	ND
DU-2	14.9	ND	ND	ND	258.10 ± 23.32	NA	ND	ND
DU-3	4.2	ND	ND	ND	118.12 ± 8.82	NA	ND	ND
DU-4	17.2	ND	ND	ND	137.74 ± 4.73	NA	ND	ND

	Arsenic (mg/kg)	Ametryn (mg/kg)	Atrazine (mg/kg)	Dieldrin (mg/kg)	Dioxin TEQ Calux XDS Method (ng/kg)	Dioxin TEQ GC/MS Method (ng/kg)	PCP (mg/kg)	Trifluralin (mg/kg)
		1.1						
EAL	**20**	**NA**	**3.1 (1)** 1.5	**0.03** .003	**NA** 240	**NA** 240	**69 (1)**	**NA**
PRG	**NA**	**550**	**2.2**	**0.03**	**NA**	**NA**	**3**	**63**
Detection Limit	**0.005**	**0.055**	**0.055**	**0.005**	**NA**	**NA**	**0.005**	**0.055**
DU-4D	11	ND	ND	ND	114.31 ± 10.45	NA	ND	ND
DU-5	10.7	ND	ND	ND	235.92 ± 2.76	NA	ND	ND
DU-6	9.6	ND	ND	ND	224.89 ± 25.26	88.1134	ND	ND
DU-7	6.3	ND	ND	ND	96.28 ± 11.29	38.1903	ND	ND
DU-8	7.4	ND	ND	ND	47.07 ± 2.56	NA	ND	ND
DU-9	10.6	ND	ND	ND	103.86 ± 6.29	NA	ND	ND
DU-10	10.2	ND	ND	ND	169.72 ± 16.12	60.2187	ND	ND
DU-11	8.7	ND	ND	ND	96.74 ± 13.77	NA	ND	ND
DU-12	11.9	ND	ND	ND	98.03 ± 2.55	41.1592	ND	ND
DU-12D	9.6	ND	ND	ND	89.26 ± 4.93	NA	ND	ND
DU-13	9.7	ND	ND	ND	126.74 ± 7.14	49.0156	ND	ND
DU-14	7.3	ND	ND	ND	76.72 ± 5.89	NA	ND	ND
DU-15	6.5	ND	ND	ND	58.01 ± 5.13	NA	ND	ND
DU-16	6.4	ND	ND	ND	79.50 ± 5.15	NA	ND	ND
DU-17	7.4	ND	ND	ND	109.54 ± 17.16	NA	ND	ND
DU-18	6.1	ND	ND	ND	57.27 ± 3.06	NA	ND	ND
DU-18D	8	ND	ND	ND	62.06 ± 4.64	NA	ND	ND

	Arsenic (mg/kg)	Ametryn (mg/kg)	Atrazine (mg/kg)	Dieldrin (mg/kg)	Dioxin TEQ Calux XDS Method (ng/kg)	Dioxin TEQ GC/MS Method (ng/kg)	PCP (mg/kg)	Trifluralin (mg/kg)
EAL	**20**	**NA**	**3.1 (1)**	**0.03**	**NA**	**NA**	**69 (1)**	**NA**
PRG	**NA**	**550**	**2.2**	**0.03**	**NA**	**NA**	**3**	**63**
Detection Limit	**0.005**	**0.055**	**0.055**	**0.005**	**NA**	**NA**	**0.005**	**0.055**
DU-19	12.4	ND	ND	ND	120.94 ± 8.26	NA	ND	ND
DU-20	7.1	ND	ND	ND	116.28 ± 15.71	NA	ND	ND
DU-21	8.2	ND	ND	ND	134.27 ± 4.79	NA	ND	ND
DU-22	4.4	ND	ND	ND	68.99 ± 6.75	NA	ND	ND
DU-23	3.4	ND	ND	ND	59.73 ± 4.80	NA	ND	ND
DU-24	7.4	ND	ND	ND	141.17 ± 14.43	NA	ND	ND
DU-25	7.5	ND	ND	ND	121.78 ± 6.43	NA	ND	ND
DU-26	7	ND	ND	ND	170.86 ± 39.88	NA	ND	ND
DU-27	7.2	ND	ND	ND	137.58 ± 15.51	NA	ND	ND
DU-28	4.9	ND	ND	ND	56.97 ± 3.11	NA	ND	ND
DU-29	3.5	ND	ND	ND	105.70 ± 8.71	NA	ND	ND
DU-30	3.9	ND	ND	ND	56.88 ± 1.48	NA	ND	ND
DU-30D	5	ND	ND	ND	72.28 ± 8.13	NA	ND	ND
DU-31	4.9	ND	ND	ND	58.59 ± 15.40	30.5959	ND	ND
DU-32	9.4	ND	ND	ND	736.16 ± 113.45	100.6597	ND	ND
DU-33	10.8	ND	ND	ND	188.89 ± 14.01	36.5465	ND	ND
DU-34	8.2	ND	ND	ND	267.03 ± 27.14	NA	ND	ND

	Arsenic (mg/kg)	Ametryn (mg/kg)	Atrazine (mg/kg)	Dieldrin (mg/kg)	Dioxin TEQ Calux XDS Method (ng/kg)	Dioxin TEQ GC/MS Method (ng/kg)	PCP (mg/kg)	Trifluralin (mg/kg)
EAL	**20**	**NA**	**3.1 (1)**	**0.03**	**NA**	**NA**	**69 (1)**	**NA**
PRG	**NA**	**550**	**2.2**	**0.03**	**NA**	**NA**	**3**	**63**
Detection Limit	**0.005**	**0.055**	**0.055**	**0.005**	**NA**	**NA**	**0.005**	**0.055**
DU-35	11.5	ND	ND	ND	331.42 ± 56.18	NA	ND	ND
DU-36	9.6	ND	ND	ND	446.32 ± 88.50	NA	ND	ND
DU-37	7.8	ND	ND	ND	180.29 ± 13.10	NA	ND	ND
DU-38	5.7	ND	ND	ND	245.17 ± 23.45	38.8146	ND	ND
DU-39	6.1	ND	ND	ND	424.30 ± 46.10	59.249	ND	ND
DU-40	9.3	ND	ND	ND	221.95 ± 3.63	36.7207	ND	ND
DU-41	11.5	ND	ND	ND	281.46 ± 17.49	39.0139	ND	ND
DU-42	11.1	ND	ND	ND	114.80 ± 13.39	NA	ND	ND
DU-43	7	ND	ND	ND	131.19 ± 13.57	NA	ND	ND
DU-44	9.6	ND	ND	ND	164.78 ± 9.06	NA	ND	ND
DU-45	6.7	ND	ND	ND	133.93 ± 3.43	NA	ND	ND
DU-46	6.7	ND	ND	ND	141.83 ± 5.72	42.7712	ND	ND
DU-47	10.3	ND	ND	ND	137.92 ± 12.66	54.3294	ND	ND
DU-48	12.3	ND	ND	ND	120.83 ± 3.07	43.3179	ND	ND
DU-49	10.1	ND	ND	ND	115.75 ± 2.50	32.554	ND	ND
DU-50	12.2	ND	ND	ND	129.55 ± 8.05	45.799	ND	ND
DU-50D	11.3	ND	ND	ND	130.00 ± 6.38	NA	ND	ND

	Arsenic (mg/kg)	Ametryn (mg/kg)	Atrazine (mg/kg)	Dieldrin (mg/kg)	Dioxin TEQ Calux XDS Method (ng/kg)	Dioxin TEQ GC/MS Method (ng/kg)	PCP (mg/kg)	Trifluralin (mg/kg)
EAL	**20**	**NA**	**3.1 (1)**	**0.03**	**NA**	**NA**	**69 (1)**	**NA**
PRG	**NA**	**550**	**2.2**	**0.03**	**NA**	**NA**	**3**	**63**
Detection Limit	**0.005**	**0.055**	**0.055**	**0.005**	**NA**	**NA**	**0.005**	**0.055**
DU-51	11.7	ND	ND	ND	107.79 ± 3.97	29.9383	ND	ND
DU-52	7.3	ND	ND	ND	91.27 ± 22.47	NA	ND	ND
DU-53	7.1	ND	ND	ND	80.71 ± 6.41	19.2461	ND	ND
DU-54	11.2	ND	ND	ND	212.24 ± 26.72	49.264	ND	ND
DU-55	11	ND	ND	ND	162.74 ± 6.51	41.6955	ND	ND
DU-56	8.6	ND	ND	ND	129.35 ± 8.54	37.4374	ND	ND
DU-56D	11.5	ND	ND	ND	136.95 ± 9.44	NA	ND	ND
DU-57	9.7	ND	ND	ND	159.48 ± 9.32	49.1186	ND	ND
DU-58	9.8	ND	ND	ND	146.52 ± 4.58	37.2494	ND	ND
DU-59	6.9	ND	ND	ND	122.13 ± 2.20	35.6504	ND	ND

Notes:

(1) The EAL was computed by Mr. Roger Brewer with HDOH

DU – Decision Unit

EAL - 2005 Hawaii Department of Health Tier I Environmental Action Levels for soils is greater than 150 to surface water where groundwater is not a current or potential source of drinking water.

mg/kg – milligrams per kilogram

NA – not applicable

ng/kg – nanograms per kilogram

PRG - 2004 Environmental Protection Agency Region 9 Preliminary Remediation Goals for Residential Soils

TEQ – toxicity equivalent

Arsenic. Arsenic was detected in all samples. Results ranged from a minimum of 3.4 mg/kg to a maximum of 17.2 mg/kg at decision units DU-23 and DU-04, respectively. Arsenic results are

presented in Table 1.

Organophosphorus Pesticides. No organophosphorus pesticides, including the COPCs, were detected above the analytical reporting limits. Organophosphorus pesticides results are presented in Table 2.

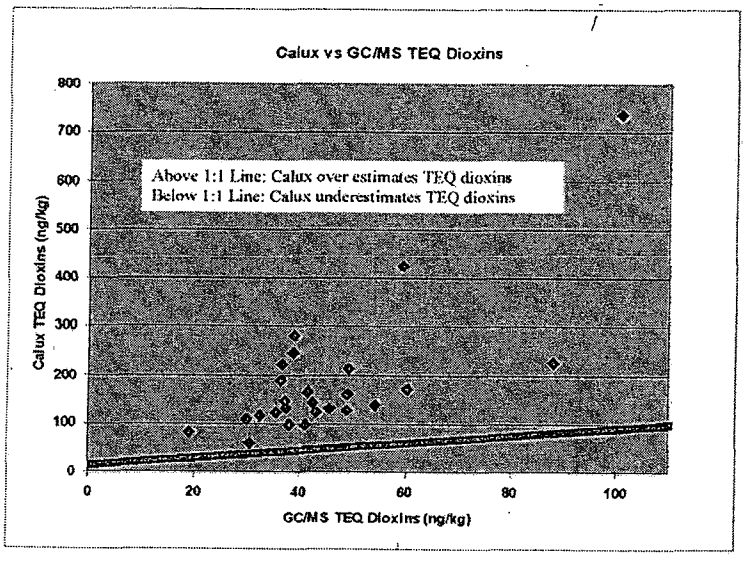
Organochlorine Pesticides. No organochlorine pesticides, including the COPCs, were detected above the analytical reporting limits. Organochlorine pesticides results are presented in Table 3.

Chlorinated Herbicides. No chlorinated herbicides were detected above the analytical reporting limits. Chlorinated herbicides results are presented in Table 4.

Dioxins. Twenty-five soil samples were submitted for analysis by EPA Method 8290A GC/MS. Dioxin/Furan calculated TEQ results from these samples ranged from a minimum of 19.2461 ng/kg to a maximum of 100.6597 ng/kg at decision units DU-53 and DU-32, respectively. The results from 15 of the 25 samples were at or below the low risk action level of 42 ng/kg. The results from the remaining 10 samples were within the intermediate risk action level between 42 ng/kg and less than or equal to 390 ng/kg. A summary of the calculated TEQ for GC/MS analysis are presented in Table 5.

Sixty-five soil samples were submitted for analysis by XDS-Calux Bioassay. The TEQ results ranged from a minimum of 47.07 ng/kg to a maximum of 736.16 ng/kg at decision units DU-08 and DU-32, respectively. The results from 62 samples were within the intermediate risk action level of greater than 42 ng/kg and less than or equal to 390 ng/kg. The results at three decision units were greater than the high risk action level of 390 ng/kg. These samples were DU-39, DU-36, and DU-32 with concentrations of 424.30 ng/kg, 446.32 ng/kg, and 736.16 ng/kg, respectively. Analytical results from XDS-Calux Bioassay are presented in Table 6.

A comparison of the two dioxin analytes indicates that GC/MS results were consistently lower than the XDS-Calux Bioassay results. A summary of the comparison is presented below.



GC/MS analysis was coincidentally performed on two of the XDS-Calux Bioassay analysis samples, which exceeded the high risk level: DU-39 and DU-32. The GC/MS results for these two samples (DU-39 (59 ng/kg) and DU-32 (101 ng/kg)), verified that the TEQ dioxin levels in these two DU's are below the action level of 390 ng/kg. Table 7 presents a breakdown of the individual congeners from the GC/MS analysis and a comparison of the calculated TEQ from GC/MS analysis and the TEQ results from XDS-Calux Bioassay. Figure 5 presents the locations of the decision units where GC/MS TEQ results fell within the intermediate risk action level of 42 ng/kg and less than or equal to 390 ng/kg.

The Calux method presents TCDD Total TEQ results for dioxin/furan without the identification of specific congeners. Method 8290A GC/MS presents results for individual congeners and the TCDD Total TEQ results were calculated by Tetra Tech.

Although the Calux method consistently overestimates TEQ dioxin results in comparison to GC/MS analytical results, it was determined that the Calux method can be used as a preliminary screening technique to evaluate agricultural fields. Updated HDOH guidance concerning pesticides in former agricultural lands and related areas, states that, "bioassay methods [such as Calux] offer a cheaper and faster approach to screen for dioxins in soils (HDOH 2007)." Where soil sample results are below the action levels for dioxins when using the Calux method then HDOH recommends that no further testing is required; however, if the preliminary results are above the action levels then it is recommended that retesting occur through the use of GC/MS. In addition, the updated guidance states that, "for sites where a bioassay method [Calux] is used for dioxin analysis, HDOH recommends that dioxin levels be confirmed on 10 percent of the samples using GC/MS (or two samples, whichever is greater)."

4.2 COMPARISON OF CHEMICALS OF POTENTIAL CONCERN RESULTS TO REGULATORY SCREENING LEVELS

The laboratory analytical results from soil collected within the agricultural fields were compared to HDOH Tier I EAL and EPA Region 9 PRG for residential soils as follows:

Arsenic. Arsenic results were compared to background levels of arsenic in Hawaii soils at 20 mg/kg. No arsenic results exceeded the 20 mg/kg concentration.

Ametryn. Ametryn results will be compared to a PRG concentration of 550 mg/kg. No EALs exist for ametryn. Amytryn was not detected in any of the samples.

Atrazine. Atrazine results were compared to a PRG concentration of 2.2 mg/kg and an EAL concentration of 3.1 mg/kg. Atrazine was not detected in any of the samples.

Dieldrin. Dieldrin results were compared to EAL and PRG concentrations of 0.03 milligrams per kilogram (mg/kg). Dieldrin was not detected in any of the samples.

Dioxin. TCDD Total TEQ values were compared to the intermediate risk action level between 42 ng/kg and less than 390 ng/kg. All but three of the samples analyzed by the XDS-Calux method were below the screening level. Of the three that exceeded the screening level, two duplicate samples were analyzed by GC/MS which did not exceed the screening levels. Results from 15 of the 25 GC/MC samples were at or below the low risk action level of 42 ng/kg. The results from

the remaining 10 GC/MS samples were within the intermediate risk action level between 42 ng/kg and less than 390 ng/kg. All GC/MS samples were below the 390 ng/kg screening level.

PCP. PCP results were compared to a PRG concentration of 3 mg/kg and an EAL concentration of 69 mg/kg. PCP was not detected in any of the samples.

Trifluralin. Trifluralin results will be compared to a PRG concentration of 63 mg/kg. No EALs exist for trifluralin. Trifluralin was not detected in any of the samples.

4.3 BACKGROUND EVALUATION

In addition to evaluating soil conditions suitable for possible residential reuse, soil sample results were evaluated to establish background dioxin levels for the project area and the PML site. The proposed strategy was to evaluate results from XDS-Calux Bioassay method for 65 samples with confirmation of the results through 25 EPA Method 8290A GC/MS samples. A preliminary evaluation of the results indicates that the Calux methodology overestimates the dioxin values; therefore, the data from the GC/MS methodology was evaluated. A summary of the data evaluation is presented below.

Dioxin Background Evaluation

Decision Unit	GC/MS Dioxin Value (TEQ ng/kg)
DU-06	88.1134
DU-07	38.1903
DU-10	60.2187
DU-12	41.1592
DU-13	49.0156
DU-31	30.5959
DU-32	100.6597
DU-33	36.5465
DU-38	38.8146
DU-39	59.249
DU-40	36.7207
DU-41	39.0139
DU-46	42.7712
DU-47	54.3294
DU-48	43.3179
DU-49	32.554
DU-50	45.799
DU-51	29.9383
DU-53	19.2461
DU-54	49.264
DU-55	41.6955
DU-56	37.4374
DU-57	49.1186
DU-58	37.2494

Decision Unit	GC/MS Dioxin Value (TEQ ng/kg)
DU-59	35.6504
	Statistical Summary
n	25
Minimum value	19.25
Maximum Value	100.66
Mean Value	45.47
Standard Deviation Value	17.06
Confidence Value	6.69
95th Confidence of Maximum Value	93.97

The background determination assumes that the dioxin data set represent values not impacted by the PML area, and therefore the 95th confidence level of the maximum value reported is proposed as the background level. The calculated background level for dioxin is 93.97 ng/kg.

4.4 DATA QUALITY ASSESSMENT

The quality of the data presented in this report is based the on the chosen methodology and strategy, adherence to field and laboratory procedures set forth in the sampling memorandum (Tetra Tech 2006d), interpretation of the results, and a continual examination of the data quality objectives.

4.4.1 Chosen Methodology and Strategy

The sampling methodology used in this site assessment was to combine multiple incremental soil samples collected within a decision unit into a single composite soil sample to estimate average concentrations within that decision unit. The assessment included a methodology to minimize the fundamental error in sampling. The methodology included four factors, as follows:

1. Multi-Increment sampling – Using incremental sampling provided an improved approximation of the mean concentration of any chemical across the entire decision unit without focusing on small scale anomalies that might have occurred by traditional biased or judgmental sampling techniques.

2. Particle size and shape considerations – The samples were sieved to a maximum 2 millimeter diameter. Where possible, clay particles were forced through the sieve openings. This action allows the analytical laboratory to achieve a more representative result due to the larger amount of surface area of the particles.

3. Sub sampling by the laboratory – Sub sampling of the sample jar was conducted at the analytical laboratory; therefore, all portions of the sample were analyzed.

4. Increased sample weight – Larger sample weights reduce the fundamental error of the analysis. The laboratory selected for this project analyzed the samples in 1 gram increments following subsampling procedures.

4.4.2 Quality Control Samples

Data quality control samples included the concentrations for analytical laboratory samples from field duplicates and equipment blanks. All equipment rinsate blanks were free of any detected contamination. The data validation reports for the duplicates and equipment blanks are provided in Appendix D.

Field duplicates were collected at 10 percent of the total sample number; 6 duplicate samples were collected. Field duplicates were evaluated for the relative percent difference for each analyte detected. A summary of the field duplicates is presented below.

Field Duplicate Evaluation

Sample ID	Analyte	Original Sample (mg/kg)	Duplicate Sample (mg/kg)	Relative Percent Difference (%)
DU-04	Dioxin TEQ	137.74	114.31	18.6
DU-12	Dioxin TEQ	98.03	89.26	9.4
DU-18	Dioxin TEQ	57.27	62.06	8.0
DU-30	Dioxin TEQ	56.88	72.28	23.8
DU-50	Dioxin TEQ	129.55	130	0.3
DU-56	Dioxin TEQ	129.35	136.95	5.7
			Average Dioxin TEQ RPD	*11.0%*
DU-04	Arsenic	17.2	11	44.0
DU-12	Arsenic	11.9	9.6	21.4
DU-18	Arsenic	6.1	8	27.0
DU-30	Arsenic	3.9	5	24.7
DU-50	Arsenic	12.2	11.3	7.7
DU-56	Arsenic	8.6	11.5	28.9
			Average Arsenic RPD	*25.6%*

4.4.3 Data Validation

All laboratory data for this project was validated and verified by Tetra Tech. Complete data validation reports for this project are included in Appendix D. The validation reports indicated bias of the data due to internal laboratory quality control and the data were reflagged as necessary. The validation also allowed the minimization of thc tolerable limits in the decision errors.

4.4.4 Examination of the Data Quality Objectives

The data quality objectives prepared during planning activities (Tetra Tech 2006a) are shown in the following table.

STEP 1: State the Problem
Analytical results from previous investigations at the OSC PML Area may not fully represent the agricultural fields being examined for this site assessment. Additional sampling is necessary to characterize the agricultural fields based on known uses and previous investigation results in order to assess the feasibility of residential development of the property.
STEP 2: Identify the Decisions
What are the risks and corrective action recommendations for the agricultural fields? Previous property investigations at the OSC PML Area indicate that the property is associated with pesticide and herbicide application. What is the estimated average concentration of COPCs within the agricultural property?
STEP 3: Identify Inputs to the Decisions
Analytical data from soil samples collected during previous sampling events, historical knowledge of use at the site, analytical data collected during the current sampling event, screening levels, and QA/QC data.
STEP 4: Define Study Boundaries
Sampling will be limited to the agricultural fields within the boundaries of the East Kapolei property.
STEP 5: Develop Decision Rules
Soil will be compared to HDOH EALs and EPA Region 9 PRGs for residential soil as well as EALs computed by HDOH for specific COPCs for which formal action levels have not currently been established.
STEP 6: Specify Tolerable Limits on Decision Errors
Analytical data must meet the project specifications for precision, accuracy, representativeness, completeness, and comparability as prescribed by the quality assurance objectives outlined in this report.
STEP 7: Optimize the Sampling Design
Current sampling design is intended to best represent a potential future human exposure scenario in each decision unit. Increment sampling locations are proposed in a random stratified method designed to collect an amount of soil to adequately represent the multiple sizes of soil grains and adequately characterize the decision unit.

The field activities, data collection, and data evaluation meet the data quality objectives established for the project. Continual examination of these objectives was satisfied during the site assessment.

5.0 SUMMARY AND RECOMMENDATIONS

A site assessment was completed at the former East Kapolei agricultural property according to project plans (Ecology and Environment 2006; Tetra Tech 2006d) and data quality objectives (Tetra Tech 2006a). The purpose of the site assessment was to collect sufficient information to determine if areas of the property are currently suitable for a future residential housing development based on the methodologies presented in the SAP (Ecology and Environment, Inc. 2006) and sampling memorandum (Tetra Tech 2006c). The site assessment consisted of collecting and analyzing surface soil samples from decision units at the property. A summary of the field investigation, findings, and recommendations are presented below.

5.1 FIELD INVESTIGATION

The field investigation consisted of subdividing the site into 59 decision units. A total of 59 surface soil multi-increment samples, 6 duplicate surface soil multi-increment samples, and 4 equipment rinsate water samples were submitted for laboratory analyses. There were no deviations from the project plans and the data quality assessment indicates that the data is valid and usable.

5.2 FIELD OBSERVATIONS

No previously unidentified areas of potential agricultural chemical mixing and loading were observed during the site reconnaissance or during the site assessment sampling activities.

5.3 INVESTIGATION RESULTS

Sample results were compared to primary screening levels established in the project plans and this report. With the exception of three dioxin samples analyzed by the XDS-Calux Bioassay method, concentrations of COPCs in the soil within all decision units were below the action levels. Duplicate samples were collected at two of the three decision units with the Calux methodology exceedences; each of the EPA-approved GC/MS methodology results was below the screening values. Comparison of the two analytes indicates that the Calux methodology overestimates the dioxin concentrations, and as a result, the exceedences are not considered representative. The background level for dioxin was estimated at 93.97 ng/kg.

5.4 RECOMMENDATIONS

There are no elevated concentrations of COPCs in the soil that suggest conditions are not suitable for residential reuse, or that any additional sampling or evaluation is necessary.

6.0 REFERENCES

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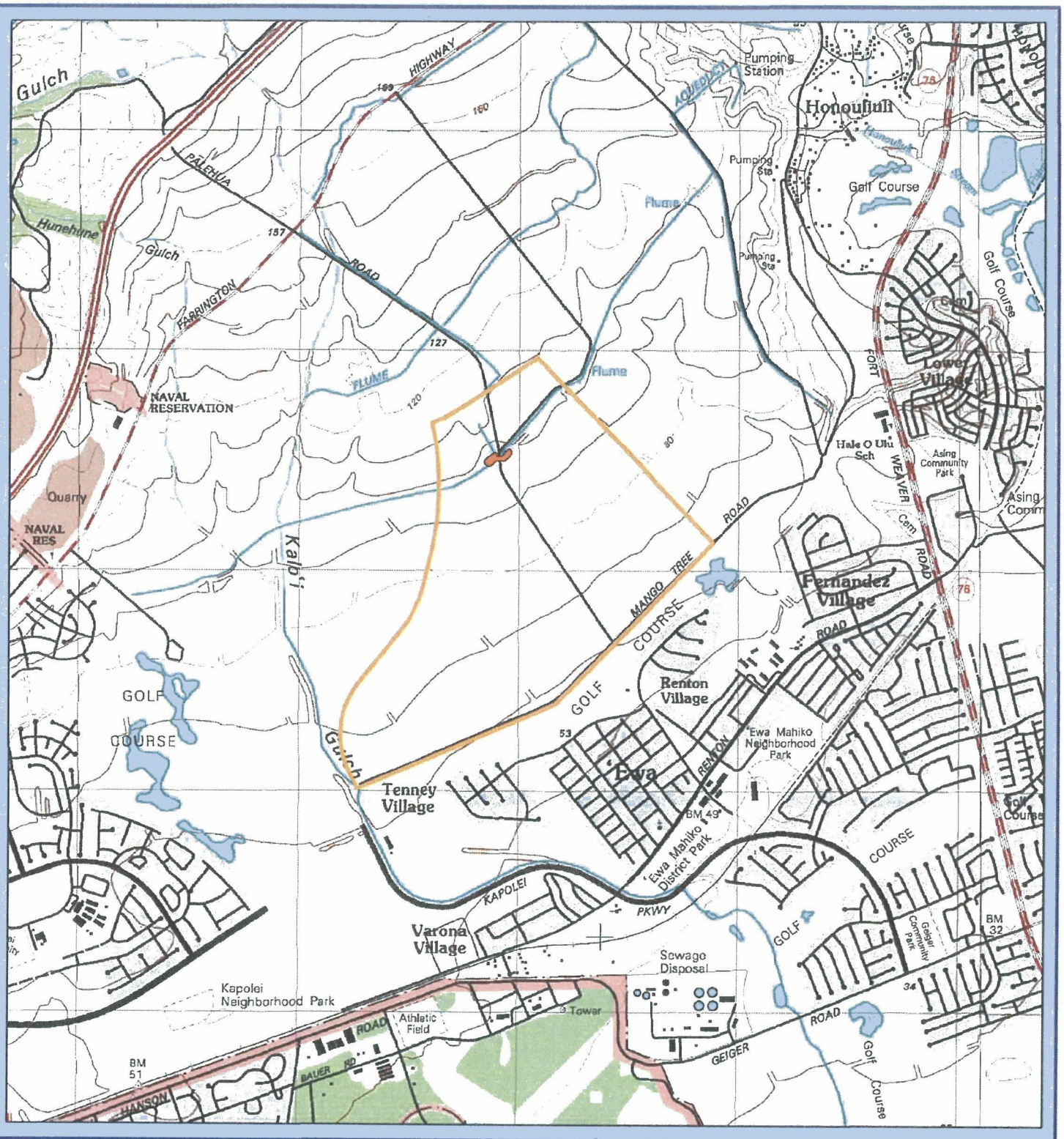
FIGURES



0 1,200 2,400 3,600 4,800 Feet

Legend

Pesticide Mixing and Loading Area and Potential Contamination Area

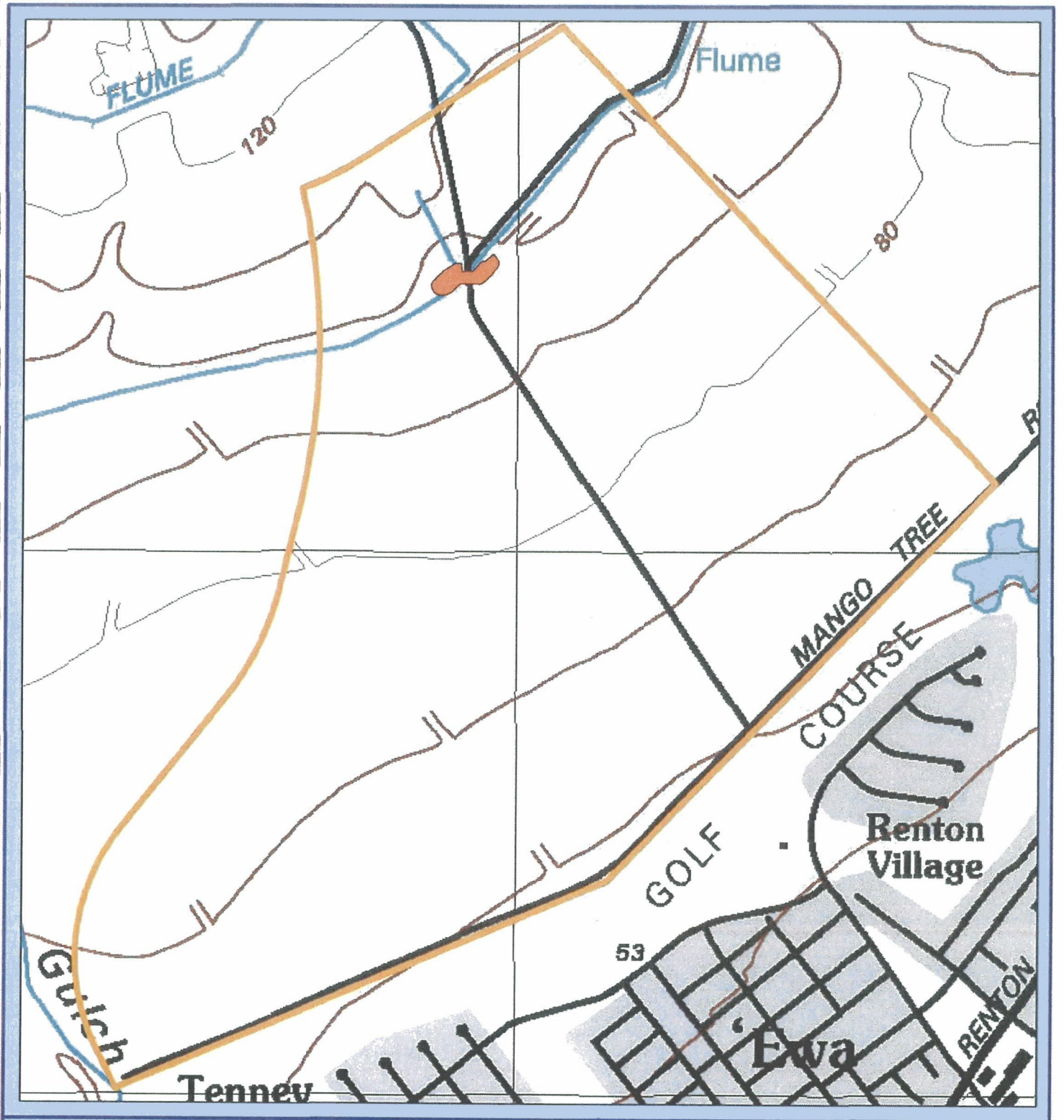
Site Boundary

N W E S

REGIONAL SITE LOCATION MAP

Tetra Tech EM Inc

FIGURE 1



0 500 1,000 1,500 2,000 Feet

Legend

Pesticide Mixing and Loading Area and Potential Contamination Area

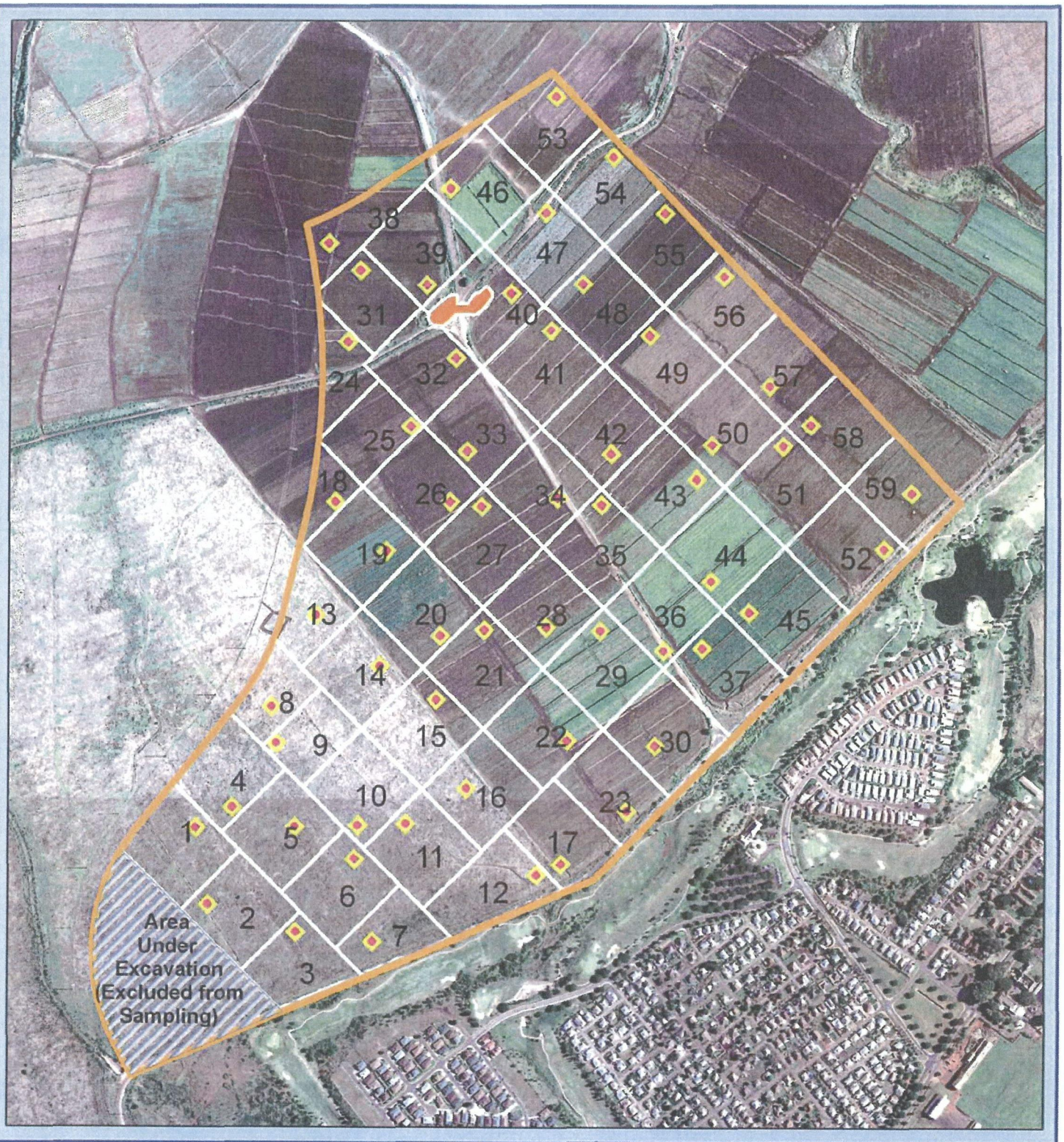
Site Boundary

N W E S

SITE MAP

Tetra Tech EM Inc

FIGURE 2



0 500 1,000 1,500 2,000 Feet

Legend

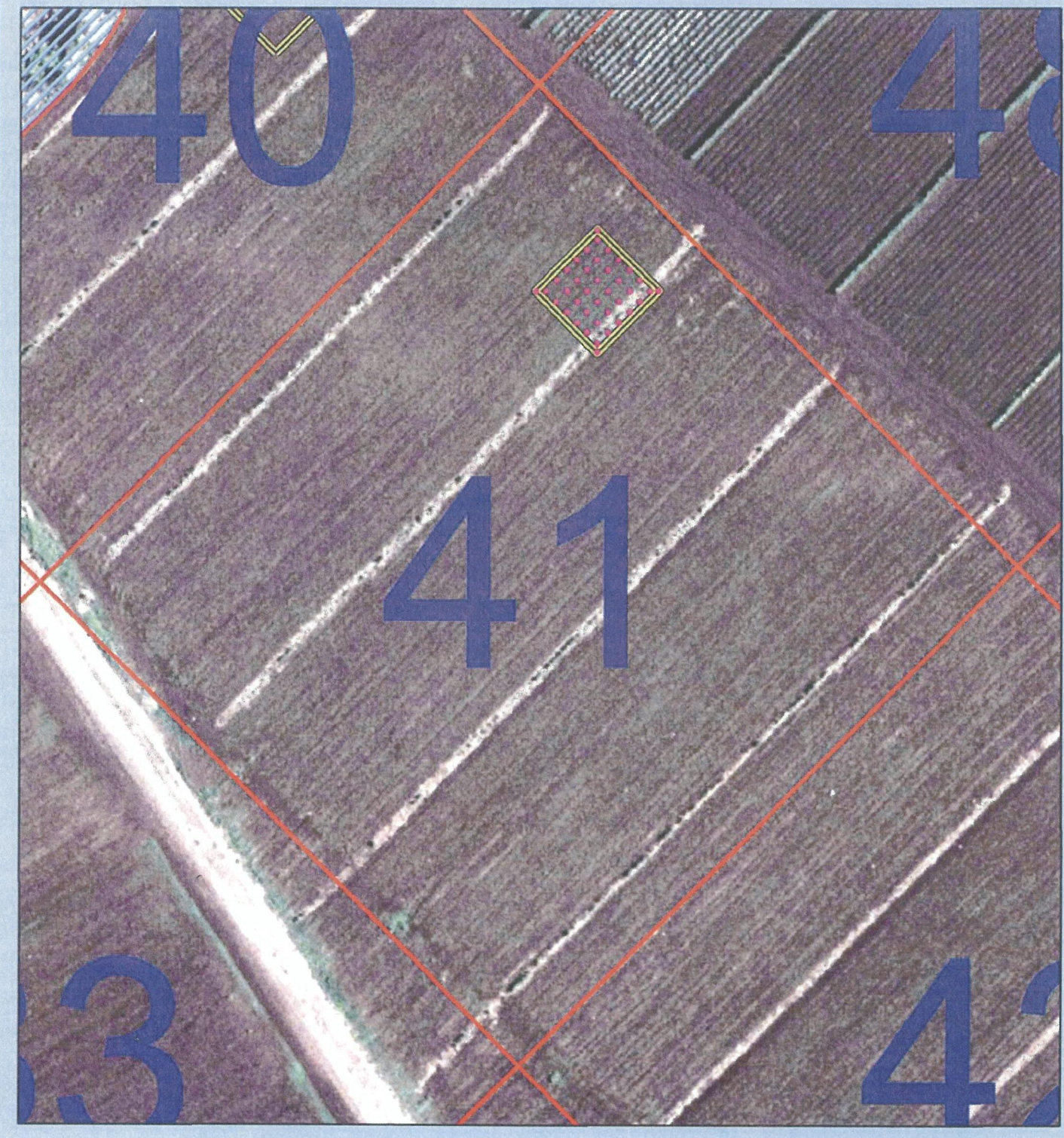
- Center of Decision Units
- Decision Units
- Decision Grids
- Pesticide Mixing and Loading Area and Potential Contamination Area
- Site Boundary

N W E S

DECISION GRIDS AND DECISION UNITS LOCATION MAP

Tetra Tech EM Inc

FIGURE 3



0 25 50 100 150 200
Feet

Legend

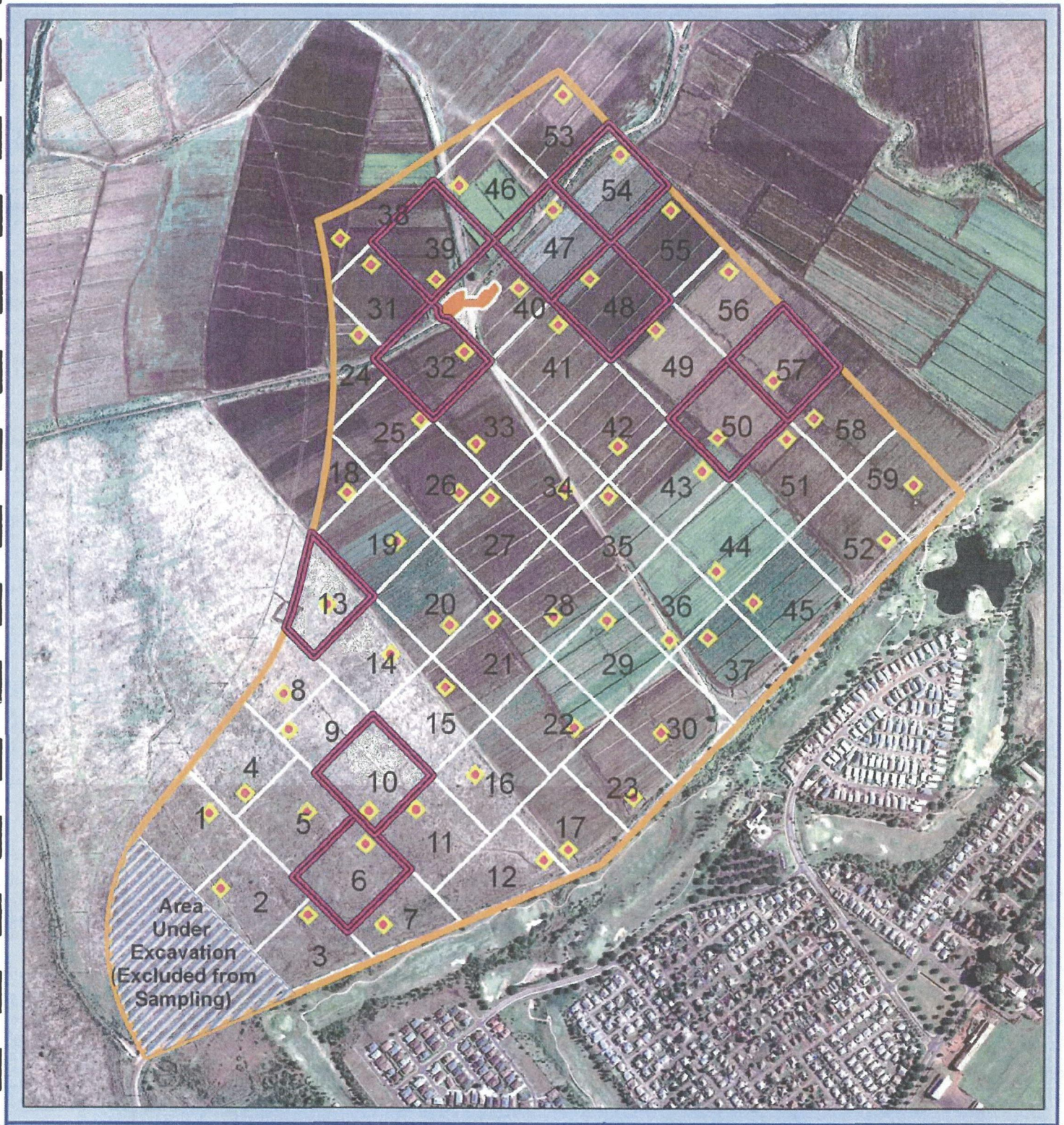
- Subsample Locations
- Decision Unit
  5,000 square foot area
- Decision Grids

N
W E
S

EXAMPLE OF MULTI-INCREMENT SAMPLE LOCATION DISTRIBUTION WITHIN A DECISION UNIT

Tetra Tech EM Inc

FIGURE 4



Legend

0 500 1,000 1,500 2,000 Feet

- Center of Decision Units
- Decision Units
- Decision Grids
- Pesticide Mixing and Loading Area and Potential Contamination Area
- Decision Units with calculated TCDD TEQ results > 42 ng/kg <= 390 ng/kg
- Site Boundary

N W E S

DECISION UNIT RESULTS SUMMARY

Tetra Tech EM Inc

FIGURE 5

TABLES

Table 1
Summary of Arsenic Analytical Results

Sample ID	DU-01	DU-02	DU-03	DU-04	DU-04D	DU-05	DU-06	DU-07	DU-08	DU-09	DU-10	DU-11	DU-12	DU-12D	DU-13	DU-14	DU-15
Result (mg/kg)	7.5	14.9	4.2	17.2	11	10.7	9.6	6.3	7.4	10.6	10.2	8.7	11.9	9.6	9.7	7.3	6.5

Sample ID	DU-16	DU-17	DU-18	DU-18D	DU-19	DU-20	DU-21	DU-22	DU-23	DU-24	DU-25	DU-26	DU-27	DU-28	DU-29	DU-30	DU-30D
Result (mg/kg)	6.4	7.4	6.1	8	12.4	7.1	8.2	4.4	3.4	7.4	7.5	7	7.2	4.9	3.5	3.9	5

Sample ID	DU-31	DU-32	DU-33	DU-34	DU-35	DU-36	DU-37	DU-38	DU-39	DU-40	DU-41	DU-42	DU-43	DU-44	DU-45	DU-46	DU-47
Result (mg/kg)	4.9	9.4	10.8	8.2	11.5	9.6	7.8	5.7	6.1	9.3	11.5	11.1	7	9.6	6.7	6.7	10.3

Sample ID	DU-48	DU-49	DU-50	DU-50D	DU-51	DU-52	DU-53	DU-54	DU-55	DU-56	DU-56D	DU-57	DU-58	DU-59
Result (mg/kg)	12.3	10.1	12.2	11.3	11.7	7.3	7.1	11.2	11	8.6	11.5	9.7	9.8	6.9

Sample ID	ER-01	ER-02	ER-03	ER-04
Result (mg/l)	0.5	0.5	0.5	0.5

Notes:
DU = decision unit
mg/kg = miligrams per kilogram
mg/l = miligrams per liter
Screening ciriteria is the 2006 Environmental Action Level (EAL) of 22 mg/kg assigned by DOH based on background concentrations

Table 2
Summary of Organophosporus Pesticides Analytical Results

	AMETRYN	ATRAZINE	AZINPHOSMETHYL	BOLSTAR	CHLORPYRIFOS	COUMAPHOS	DEF	DEMETON	DIAZINON	DICHLORVOS	DIMETHOATE	DISULFOTON	EPN	ETHION	ETHOPROP	ETHYLPARATHION	FENSULFOTHION	FENTHION	MALATHION	MERPHOS	METHYL PARATHION	MEVINPHOS	NALED	PHORATE	PROWL	RONNEL	STIROPHOS	SULFOTEP	TOKUTHION	TRICHLORONATE	TRIFLURALIN
EALs	NA	3.1 (1)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	NA
PRGs	550	2.2	N/A	N/A	180	N/A	N/A	2.4	55	1.7	12	2.4	N/A	31	N/A	N/A	N/A	N/A	1200	1.8	16	N/A	120	12	N/A	3100	20	N/A	N/A	N/A	83
Soil Sample Results (mg/kg)																															
DU-01	0.055	0.055	0.11	0.055	0.055	0.11	0.055	0.11	0.055	0.11	0.11	0.055	0.055	0.055	0.055	0.055	0.28	0.055	0.055	0.055	0.055	0.39	0.28	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
DU-02	0.054	0.054	0.11	0.054	0.054	0.11	0.054	0.11	0.054	0.11	0.11	0.054	0.054	0.054	0.054	0.054	0.27	0.054	0.054	0.054	0.054	0.38	0.27	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054
DU-03	0.055	0.055	0.11	0.055	0.055	0.11	0.055	0.11	0.055	0.11	0.11	0.055	0.055	0.055	0.055	0.055	0.27	0.055	0.055	0.055	0.055	0.38	0.27	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
DU-04	0.055	0.055	0.11	0.055	0.055	0.11	0.055	0.11	0.055	0.11	0.11	0.055	0.055	0.055	0.055	0.055	0.27	0.055	0.055	0.055	0.055	0.38	0.27	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
DU-04D	0.054	0.054	0.11	0.054	0.054	0.11	0.054	0.11	0.054	0.11	0.11	0.054	0.054	0.054	0.054	0.054	0.27	0.054	0.054	0.054	0.054	0.38	0.27	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054
DU-05	0.055	0.055	0.11	0.055	0.055	0.11	0.055	0.11	0.055	0.11	0.11	0.055	0.055	0.055	0.055	0.055	0.28	0.055	0.055	0.055	0.055	0.39	0.28	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
DU-06	0.055	0.055	0.11	0.055	0.055	0.11	0.055	0.11	0.055	0.11	0.11	0.055	0.055	0.055	0.055	0.055	0.27	0.055	0.055	0.055	0.055	0.38	0.27	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
DU-07	0.054	0.054	0.11	0.054	0.054	0.11	0.054	0.11	0.054	0.11	0.11	0.054	0.054	0.054	0.054	0.054	0.27	0.054	0.054	0.054	0.054	0.38	0.27	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054
DU-08	0.054	0.054	0.11	0.054	0.054	0.11	0.054	0.11	0.054	0.11	0.11	0.054	0.054	0.054	0.054	0.054	0.27	0.054	0.054	0.054	0.054	0.38	0.27	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054
DU-09	0.055	0.055	0.11	0.055	0.055	0.11	0.055	0.11	0.055	0.11	0.11	0.055	0.055	0.055	0.055	0.055	0.27	0.055	0.055	0.055	0.055	0.38	0.27	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
DU-10	0.055	0.055	0.11	0.055	0.055	0.11	0.055	0.11	0.055	0.11	0.11	0.055	0.055	0.055	0.055	0.055	0.27	0.055	0.055	0.055	0.055	0.38	0.27	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
DU-11	0.054	0.054	0.11	0.054	0.054	0.11	0.054	0.11	0.054	0.11	0.11	0.054	0.054	0.054	0.054	0.054	0.27	0.054	0.054	0.054	0.054	0.38	0.27	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054
DU-12	0.055	0.055	0.11	0.055	0.055	0.11	0.055	0.11	0.055	0.11	0.11	0.055	0.055	0.055	0.055	0.055	0.28	0.055	0.055	0.055	0.055	0.39	0.28	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
DU-12D	0.055	0.055	0.11	0.055	0.055	0.11	0.055	0.11	0.055	0.11	0.11	0.055	0.055	0.055	0.055	0.055	0.27	0.055	0.055	0.055	0.055	0.38	0.27	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
DU-13	0.054	0.054	0.11	0.054	0.054	0.11	0.054	0.11	0.054	0.11	0.11	0.054	0.054	0.054	0.054	0.054	0.27	0.054	0.054	0.054	0.054	0.38	0.27	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054
DU-14	0.055	0.055	0.11	0.055	0.055	0.11	0.055	0.11	0.055	0.11	0.11	0.055	0.055	0.055	0.055	0.055	0.27	0.055	0.055	0.055	0.055	0.38	0.27	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
DU-15	0.052	0.052	0.1	0.052	0.052	0.1	0.052	0.1	0.14	0.1	0.1	0.052	0.052	0.052	0.052	0.052	0.26	0.052	0.052	0.052	0.052	0.37	0.26	0.052	0.047	0.052	0.052	0.052	0.052	0.052	0.052
DU-16	0.055	0.055	0.11	0.055	0.055	0.11	0.055	0.11	0.055	0.11	0.11	0.055	0.055	0.055	0.055	0.055	0.27	0.055	0.055	0.055	0.055	0.38	0.27	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
DU-17	0.054	0.054	0.11	0.054	0.054	0.11	0.054	0.11	0.054	0.11	0.11	0.054	0.054	0.054	0.054	0.054	0.27	0.054	0.054	0.054	0.054	0.38	0.27	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054
DU-18	0.053	0.053	0.11	0.053	0.053	0.11	0.053	0.11	0.053	0.11	0.11	0.053	0.053	0.053	0.053	0.053	0.26	0.053	0.053	0.053	0.053	0.37	0.26	0.053	0.059	0.053	0.053	0.053	0.053	0.053	0.053
DU-18D	0.053	0.053	0.11	0.053	0.053	0.11	0.053	0.11	0.053	0.11	0.11	0.053	0.053	0.053	0.053	0.053	0.26	0.053	0.053	0.053	0.053	0.37	0.26	0.053	0.046	0.053	0.053	0.053	0.053	0.053	0.053
DU-19	0.054	0.054	0.11	0.054	0.054	0.11	0.054	0.11	0.054	0.11	0.11	0.054	0.054	0.054	0.054	0.054	0.27	0.054	0.054	0.054	0.054	0.38	0.27	0.054	0.067	0.054	0.054	0.054	0.054	0.054	0.054
DU-20	0.053	0.053	0.11	0.053	0.053	0.11	0.053	0.11	0.053	0.11	0.11	0.053	0.053	0.053	0.053	0.053	0.27	0.053	0.053	0.053	0.053	0.37	0.27	0.053	0.037	0.053	0.053	0.053	0.053	0.053	0.053
DU-21	0.052	0.052	0.1	0.052	0.052	0.1	0.052	0.1	0.052	0.1	0.1	0.052	0.052	0.052	0.052	0.052	0.26	0.052	0.052	0.052	0.052	0.37	0.26	0.052	0.022	0.052	0.052	0.052	0.052	0.052	0.052
DU-22	0.053	0.053	0.11	0.053	0.053	0.11	0.053	0.11	0.053	0.11	0.11	0.053	0.053	0.053	0.053	0.053	0.26	0.053	0.053	0.053	0.053	0.37	0.26	0.053	0.12	0.053	0.053	0.053	0.053	0.053	0.053
DU-23	0.053	0.053	0.11	0.053	0.053	0.11	0.053	0.11	0.053	0.11	0.11	0.053	0.053	0.053	0.053	0.053	0.26	0.053	0.053	0.053	0.053	0.37	0.26	0.053	0.053	0.053	0.053	0.053	0.053	0.053	0.053
DU-24	0.053	0.053	0.11	0.053	0.053	0.11	0.053	0.11	0.053	0.11	0.11	0.053	0.053	0.053	0.053	0.053	0.27	0.053	0.053	0.053	0.053	0.37	0.27	0.053	0.069	0.053	0.053	0.053	0.053	0.053	0.053
DU-25	0.052	0.052	0.1	0.052	0.052	0.1	0.052	0.1	0.052	0.1	0.1	0.052	0.052	0.052	0.052	0.052	0.26	0.052	0.052	0.052	0.052	0.37	0.26	0.052	0.12	0.052	0.052	0.052	0.052	0.052	0.052
DU-26	0.053	0.053	0.11	0.053	0.053	0.11	0.053	0.11	0.053	0.11	0.11	0.053	0.053	0.053	0.053	0.053	0.26	0.053	0.053	0.053	0.053	0.37	0.26	0.053	0.11	0.053	0.053	0.053	0.053	0.053	0.053
DU-27	0.053	0.053	0.11	0.053	0.053	0.11	0.053	0.11	0.053	0.11	0.11	0.053	0.053	0.053	0.053	0.053	0.26	0.053	0.053	0.053	0.053	0.37	0.26	0.053	0.047	0.053	0.053	0.053	0.053	0.053	0.053
DU-28	0.052	0.052	0.1	0.052	0.052	0.1	0.052	0.1	0.052	0.1	0.1	0.052	0.052	0.052	0.052	0.052	0.26	0.052	0.052	0.052	0.052	0.37	0.26	0.052	0.042	0.052	0.052	0.052	0.052	0.052	0.052
DU-29	0.052	0.052	0.1	0.052	0.052	0.1	0.052	0.1	0.052	0.1	0.1	0.052	0.052	0.052	0.052	0.052	0.26	0.052	0.052	0.052	0.052	0.36	0.26	0.052	0.027	0.052	0.052	0.052	0.052	0.052	0.052
DU-30	0.053	0.053	0.11	0.053	0.053	0.11	0.053	0.11	0.053	0.11	0.11	0.053	0.053	0.053	0.053	0.053	0.26	0.053	0.053	0.053	0.053	0.37	0.26	0.053	0.039	0.053	0.053	0.053	0.053	0.053	0.053
DU-30D	0.053	0.053	0.11	0.053	0.053	0.11	0.053	0.11	0.053	0.11	0.11	0.053	0.053	0.053	0.053	0.053	0.26	0.053	0.053	0.053	0.053	0.37	0.26	0.053	0.084	0.053	0.053	0.053	0.053	0.053	0.053
DU-31	0.05	0.05	0.1	0.05	0.09	0.1	0.05	0.1	0.05	0.1	0.1	0.05	0.05	0.05	0.05	0.05	0.25	0.05	0.05	0.05	0.05	0.35	0.25	0.05	0.05	0.05	0.05	0.05	0.05	0.05	0.05
DU-32	0.054	0.054	0.11	0.054	0.054	0.11	0.054	0.11	0.054	0.11	0.11	0.054	0.054	0.054	0.054	0.054	0.27	0.054	0.054	0.054	0.054	0.38	0.27	0.054	0.27	0.054	0.054	0.054	0.054	0.054	0.054
DU-33	0.053	0.053	0.11	0.053	0.053	0.11	0.053	0.11	0.053	0.11	0.11	0.053	0.053	0.053	0.053	0.053	0.26	0.053	0.053	0.053	0.053	0.37	0.26	0.053	0.13	0.053	0.053	0.053	0.053	0.053	0.053
DU-34	0.052	0.052	0.1	0.052	0.052	0.1	0.052	0.1	0.052	0.1	0.1	0.052	0.052	0.052	0.052	0.052	0.26	0.052	0.052	0.052	0.052	0.37	0.26	0.052	0.13	0.052	0.052	0.052	0.052	0.052	0.052
DU-36	0.054	0.054	0.11	0.054	0.054	0.11	0.054	0.11	0.054	0.11	0.21	0.054	0.054	0.054	0.054	0.054	0.27	0.054	0.054	0.054	0.054	0.38	0.27	0.054	0.054	0.054	0.054	0.054	0.054	0.054	0.054
DU-36	0.053	0.053	0.11	0.053	0.053	0.11	0.053	0.11	0.053	0.11	0.11	0.053	0.053	0.053	0.053	0.053	0.27	0.053	0.053	0.053	0.053	0.37	0.27	0.053	0.12	0.053	0.053	0.053	0.053	0.053	0.053
DU-37	0.052	0.052	0.1	0.052	0.052	0.1	0.052	0.1	0.052	0.1	0.1	0.052	0.052	0.052	0.052	0.052	0.26	0.052	0.052	0.052	0.052	0.36	0.26	0.052	0.052	0.052	0.052	0.052	0.052	0.052	0.052
DU-38	0.053	0.053	0.11	0.053	0.053	0.11	0.053	0.11	0.053	0.11	0.11	0.053	0.053	0.053	0.053	0.053	0.26	0.053	0.053	0.053	0.053	0.37	0.26	0.053	0.057	0.053	0.053	0.053	0.053	0.053	0.053
DU-39	0.053	0.053	0.11	0.053	0.053	0.11	0.053	0.11	0.053	0.11	0.11	0.053	0.053	0.053	0.053	0.053	0.26	0.053	0.053	0.053	0.053	0.37	0.26	0.053	0.047	0.053	0.053	0.053	0.053	0.053	0.053
DU-40	0.053	0.053	0.11	0.053	0.12	0.11	0.053	0.11	0.053	0.11	0.11	0.053	0.053	0.053	0.053	0.053	0.27	0.053	0.053	0.053	0.053	0.37	0.27	0.053	0.5	0.053	0.053	0.053	0.053	0.053	0.053
DU-41	0.05	0.05	0.1	0.05	0.14	0.1	0.05	0.1	0.05	0.1	0.1	0.05	0.05	0.05	0.05	0.05	0.25	0.05	0.05	0.05	0.05	0.35	0.25	0.05	0.48	0.05	0.05	0.05	0.05	0.05	0.05
DU-42	0.055	0.055	0.11	0.055	0.055	0.11	0.055	0.11	0.055	0.11	0.28	0.055	0.055	0.055	0.055	0.055	0.27	0.055	0.055	0.055	0.055	0.38	0.27	0.055	0.055	0.055	0.055	0.055	0.055	0.055	0.055
DU-43	0.032	0.032	0.11	0.053	0.053	0.11	0.053	0.11	0.053	0.11	0.39	0.053	0.053	0.053	0.053	0.053	0.26	0.053	0.053	0.053	0.053	0.37	0.26	0.053	0.064	0.053	0.053	0.053	0.053	0.053	0.053
DU-44	0.053	0.053	0.11	0.053	0.053	0.11	0.053	0.11	0.053	0.11	1.1	0.053	0.053	0.053	0.053	0.053	0.27	0.053	0.053	0.053	0.053	0.37	0.27	0.053	0.14	0.053	0.053	0.053	0.053	0.053	0.053
DU-45	0.052	0.052	0.1	0.052	0.052	0.1	0.052	0.1	0.052	0.1	0.1	0.052	0.052	0.052	0.052	0.052	0.26	0.052	0.052	0.052	0.052	0.37	0.26	0.052	0.132	0.052	0.052	0.052	0.052	0.052	0.052
DU-46	0.053	0.11	0.053	0.053	0.11	0.053	0.11	0.053	0.11	0.11	0.053	0.053	0.053	0.053	0.053	0.053	0.26	0.053	0.053	0.053	0.37	0.26	0.053	0.17	0.053	0.053	0.053	0.053	0.053	0.053	0.053
DU-47	0.05	0.05	0.1	0.05	0.05	0.1	0.05	0.1	0.05	0.1	0.1	0.05	0.05	0.05	0.05	0.05	0.25	0.05	0.05	0.05	0.05	0.35	0.25	0.05	0.082	0.05	0.05	0.05	0.05	0.05	0.05
DU-48	0.053	0.053	0.11	0.053	0.053	0.11	0.053	0.11	0.053	0.11	0.11	0.053	0.053	0.053	0.053	0.053	0.26	0.053	0.053	0.053	0.053	0.37	0.26	0.053	0.1	0.053	0.053	0.053	0.053	0.053	0.053
DU-49	0.053	0.053	0.11	0.053	0.053	0.11	0.053	0.11	0.053	0.11	0.12	0.053	0.053	0.053	0.053	0.053	0.26	0.053	0.053	0.053	0.053	0.37	0.26	0.053	0.042	0.053	0.053	0.053	0.053	0.053	0.053
DU-50	0.053	0.053	0.11	0.053	0.053	0.11	0.053	0.11	0.053	0.11	0.29	0.053	0.053	0.053	0.053	0.053	0.26	0.053	0.053	0.053	0.053	0.37	0.26	0.053	0.079	0.053	0.053	0.053	0.053	0.053	0.053
DU-50D	0.053	0.053	0.11	0.053	0.053	0.11	0.053	0.11	0.053	0.11	0.24	0.053	0.053	0.053	0.053	0.053	0.26	0.053	0.053	0.053	0.053	0.37	0.26	0.053	0.085	0.053	0.053	0.053	0.053	0.053	0.053
DU-51	0.052	0.052	0.1	0.052	0.052	0.1	0.052	0.1	0.052	0.1	1.9	0.052	0.052	0.052	0.052	0.052	0.26	0.052	0.052	0.052	0.052	0.36	0.26	0.052	0.027	0.052	0.052	0.052	0.052	0.052	0.052
DU-52	0.053	0.053	0.11	0.053	0.053	0.11	0.053	0.11	0.053	0.11	0.11	0.053	0.053	0.053	0.053	0.053	0.27	0.053	0.053	0.053	0.053	0.37	0.27	0.053	0.05	0.053	0.053	0.053	0.053	0.053	0.053
DU-53	0.053	0.053	0.11	0.053	0.053	0.11	0.053	0.11	0.053	0.11	0.11	0.053	0.053	0.053	0.053	0.053	0.26	0.053	0.053	0.053	0.053	0.37	0.26	0.053	0.19	0.053	0.053	0.053	0.053	0.053	0.053
DU-54	0.053	0.053	0.11	0.053	0.053	0.11	0.053	0.11	0.053	0.11	0.11	0.053	0.053	0.053	0.053	0.053	0.26	0.053	0.053	0.053	0.053	0.37	0.26	0.053	0.12	0.053	0.053	0.053	0.053	0.053	0.053
DU-55	0.053	0.053	0.11	0.053	0.053	0.11	0.053	0.11	0.053	0.11	0.11	0.053	0.053	0.053	0.053	0.053	0.26	0.053	0.053	0.053	0.053	0.37	0.26	0.053	0.098	0.053	0.053	0.053	0.053	0.053	0.053
DU-56	0.053	0.053	0.11	0.053	0.053	0.11	0.053	0.11	0.053	0.11	0.11	0.053	0.053	0.053	0.053	0.053	0.26	0.053	0.053	0.053	0.053	0.37	0.26	0.053	0.16	0.053	0.053	0.053	0.053	0.053	0.053
DU-56D	0.053	0.053	0.11	0.053	0.053	0.11	0.053	0.11	0.053	0.11	0.11	0.053	0.053	0.053	0.053	0.053	0.26	0.053	0.053	0.053	0.053	0.37	0.26	0.053	0.14	0.053	0.053	0.053	0.053	0.053	0.053
DU-57	0.053	0.053	0.11	0.053	0.053	0.11	0.053	0.11	0.053	0.11	0.32	0.053	0.053	0.053	0.053	0.053	0.27	0.053	0.053	0.053	0.053	0.37	0.27	0.053	0.081	0.053	0.053	0.053	0.053	0.053	0.053
DU-58	0.054	0.054	0.11	0.054	0.054	0.11	0.054	0.11	0.054	0.11	1.1	0.054	0.054	0.054	0.054	0.054	0.27	0.054	0.054	0.054	0.054	0.38	0.27	0.054	0.058	0.054	0.064	0.054	0.054	0.054	0.054
DU-59	0.053	0.053	0.11	0.053	0.053	0.11	0.053	0.11	0.053	0.11	0.11	0.053	0.053	0.053	0.053	0.053	0.27	0.053	0.053	0.053	0.053	0.37	0.27	0.053	0.075	0.053	0.053	0.053	0.053	0.053	0.053
Equipment Rinsate Results (mg/l)																															
ER-01	0.5	0.5	5	0.5	0.5	1	0.5	1	0.5	1	0.5	0.5	0.5	0.5	0.5	0.5	2.5	0.5	0.5	0.5	0.5	3.5	2.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
ER-02	0.5	0.5	5	0.5	0.5	1	0.5	1	0.5	1	0.5	0.5	0.5	0.5	0.5	0.5	2.5	0.5	0.5	0.5	0.5	3.5	2.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
ER-03	0.5	0.5	5	0.5	0.5	1	0.5	1	0.5	1	0.5	0.5	0.5	0.5	0.5	0.5	2.5	0.5	0.5	0.5	0.5	3.5	2.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
ER-04	0.5	0.5	5	0.5	0.5	1	0.5	1	0.5	1	0.5	0.5	0.5	0.5	0.5	0.5	2.5	0.5	0.5	0.5	0.5	3.5	2.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5

Notes:
EAL 2005 Hawaii Department of Health Tier I Environmental Action Levels for soils is greater than 150 M to surface water where groundwater is not a current or potential source of drinkir water
PRG 2004 Environmental Protection Agency Region 9 Preliminary Remediation Goals for Residential Soils
(1) The EAL for atrazine was computed by Mr. Roger Brewer with HDOH

Table 3
Summary of Organochlorine Pesticides Analytical Results

	4,4'-DDD	4,4'-DDE	4,4'-DDT	ALDRIN	ALPHA-BHC	ALPHA-CHLORDANE	BETA-BHC	DELTA-BHC	DIELDRIN	ENDOSULFAN I	ENDOSULFAN II	ENDOSULFAN SULFATE	ENDRIN	ENDRIN ALDEHYDE	ENDRIN KETONE	GAMMA-BHC (LINDANE)	GAMMA-CHLORDANE	HEPTACHLOR	HEPTACHLOR EPOXIDE	METHOXYCHLOR	PCP	TOXAPHENE
EALs	2.4	2.4	1.7	0.029	N/A	1.6	N/A	N/A	0.03	0.018	0.018	N/A	0.010	N/A	N/A	0.098	1.6	0.11	0.053	18	69	0.40
PRGs	2.4	1.7	1.7	0.029	0.090	N/A	0.032	N/A	0.030	370	370	N/A	18	N/A	N/A	0.44	N/A	0.11	0.053	310	3	0.44
Soil Sample Results (milligrams per kilogram)																						
DU-01	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-02	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-03	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-04	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-04D	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-05	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-06	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-07	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-08	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-09	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-10	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-11	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-12	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-12D	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-13	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-14	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-15	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-16	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-17	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-18	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-18D	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-19	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-20	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-21	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-22	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-23	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.005	0.26
DU-24	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-25	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-26	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-27	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.005	0.26
DU-28	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-29	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-30	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-30D	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.0051	0.005	0.26
DU-31	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-32	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-33	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-34	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-35	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-36	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-37	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-38	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.25
DU-39	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-40	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-41	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-42	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-43	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-44	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-45	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-46	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-47	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-48	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.25
DU-49	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.25
DU-50	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-50D	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-51	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-52	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-53	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-54	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.25
DU-55	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-56	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.25
DU-56D	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.25
DU-57	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.0049	0.25
DU-58	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
DU-59	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.005	0.25
Equipment Rinsate Results (milligrams per liter)																						
ER-01	0.0096	0.0096	0.0096	0.0096	0.0096	0.0096	0.0096	0.0096	0.0096	0.0096	0.0096	0.0096	0.0096 / 0.0049	0.0096	0.0096	0.0096	0.0096	0.0096	0.0096	0.0096	0.005	0.48 / 0.09
ER-02	0.0096	0.0096	0.0096	0.0096	0.0096	0.0096	0.0096	0.0096	0.0096	0.0096	0.0096	0.0096	0.0096 / 0.0049	0.0096	0.0096	0.0096	0.0096	0.0096	0.0096	0.0096	0.005	0.48 / 0.09
ER-03	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099 / 0.0049	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.0099	0.005	0.5 / 0.09
ER-04	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01 / 0.0049	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.005	0.5 / 0.09

Notes:
DU Decision Unit
EAL 2005 Hawaii Department of Health Tier I Environmental Action Levels for soils is greater than 150 M to surface water where
PRG 2004 Environmental Protection Agency Region 9 Preliminary Remediation Goals for Residential Soils

Table 4
Summary of Chlorinated Herbicides Analytical Results

	2,4,5-T	2,4,5-TP (SILVEX)	2,4-D	2,4-DB	DALAPON	DICAMBA	DICHLORPROP	DINOSEB	MCPA	MCPP
EALs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PRGs	610	490	690	490	1,800	1,800	0.34	61	31	61
Soil Sample Results (mg/kg)										
DU-01	0.52	0.52	0.52	0.52	8.5	0.52	0.052	0.52	11	11
DU-02	0.53	0.53	0.53	0.53	0.53	0.53	0.053	0.53	11	11
DU-03	0.54	0.54	0.54	0.54	0.54	0.54	0.054	0.54	11	11
DU-04	0.53	0.53	0.53	0.53	9.7	0.53	0.053	0.53	11	11
DU-04D	0.53	0.53	0.53	0.53	0.53	0.53	0.053	0.53	11	11
DU-05	0.53	0.53	0.53	0.53	0.53	0.53	0.053	0.53	11	11
DU-06	0.53	0.53	0.53	0.53	0.53	0.53	0.053	0.53	11	11
DU-07	0.52	0.52	0.52	0.52	0.52	0.52	0.052	0.52	11	11
DU-08	0.53	0.53	0.53	0.53	5.9	0.53	0.053	0.53	11	11
DU-09	0.53	0.53	0.53	0.53	0.53	0.53	0.053	0.53	11	11
DU-10	0.53	0.53	0.53	0.53	0.53	0.53	0.053	0.53	11	11
DU-11	0.52	0.52	0.52	0.52	5	0.52	0.052	0.52	11	11
DU-12	0.54	0.54	0.54	0.54	0.54	0.54	0.054	0.54	11	11
DU-12D	0.53	0.53	0.53	0.53	0.53	0.53	0.053	0.53	11	11
DU-13	0.53	0.53	0.53	0.53	0.53	0.53	0.053	0.53	11	11
DU-14	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	11	10
DU-15	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	11	10
DU-16	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
DU-17	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
DU-18	0.51	0.51	0.51	0.51	5.7	0.51	0.051	0.51	11	11
DU-18D	0.52	0.52	0.52	0.52	6.6	0.52	0.052	0.52	11	11
DU-19	0.52	0.52	0.52	0.52	8.6	0.52	0.052	0.52	11	11
DU-20	0.52	0.52	0.52	0.52	11	0.52	0.052	0.52	11	11
DU-21	0.52	0.52	0.52	0.52	0.52	0.52	0.052	0.52	11	11
DU-22	0.51	0.51	0.51	0.51	0.51	0.51	0.051	0.51	11	11
DU-23	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
DU-24	0.51	0.51	0.51	0.51	12	0.51	0.051	0.51	11	11
DU-25	0.51	0.51	0.51	0.51	0.51	0.51	0.051	0.51	11	11
DU-26	0.52	0.52	0.52	0.52	7.8	0.52	0.052	0.52	11	11
DU-27	0.51	0.51	0.51	0.51	0.51	0.51	0.051	0.51	11	11
DU-28	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
DU-29	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
DU-30	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
DU-30D	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
DU-31	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
DU-32	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
DU-33	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
DU-34	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
DU-35	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
DU-36	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
DU-37	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
DU-38	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
DU-39	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
DU-40	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
DU-41	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
DU-42	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
DU-43	0.51	0.51	0.51	0.51	0.51	0.51	0.051	0.51	11	11
DU-44	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
DU-45	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10

	2,4,5-T	2,4,5-TP (SILVEX)	2,4-D	2,4-DB	DALAPON	DICAMBA	DICHLORPROP	DINOSEB	MCPA (1)	MCPP
EALs	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
PRGs	610	490	690	490	1,800	1,800	0.34	61	31	61
Soil Sample Results (mg/kg)										
DU-46	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
DU-47	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
DU-48	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
DU-49	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
DU-50	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
DU-50D	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
DU-51	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
DU-52	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
DU-53	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
DU-54	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
DU-55	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
DU-56	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
DU-56D	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
DU-57	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
DU-58	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
DU-59	0.5	0.5	0.5	0.5	0.5	0.5	0.05	0.5	10	10
Equipment Water Rinsate Results (mg/l)										
ER-01	0.2	0.2	0.39	0.39	0.39	0.39	0.039	0.2	0.096	0.096
ER-02	0.2	0.2	0.39	0.39	0.39	0.39	0.039	0.2	0.098	0.098
ER-03	0.2	0.2	0.39	0.39	0.39	0.39	0.039	0.2	0.096	0.096
ER-04	0.2	0.2	0.4	0.4	0.4	0.4	0.04	0.2	0.099	0.099

Notes:

DU	decision unit
EAL	2005 Hawaii Department of Health Tier I Environmental Action Levels for soils is greater than 150 M to surface water where groundwater is not a current or potential source of drinking water.
mg/kg	miligrams per kilogram
PRG	2004 Environmental Protection Agency Region 9 Preliminary Remediation Goals for Residential Soils

Table 5
Summary of Calculated Dioxins TEQ for GC/MS Analysis

Sample ID	ANALYTE	Columbia Analytical Result	Units
DU-06	Dioxin TEQ	88.1134	ng/kg
DU-07	Dioxin TEQ	38.1903	ng/kg
DU-10	Dioxin TEQ	60.2187	ng/kg
DU-12	Dioxin TEQ	41.1592	ng/kg
DU-13	Dioxin TEQ	49.0156	ng/kg
DU-31	Dioxin TEQ	30.5959	ng/kg
DU-32	Dioxin TEQ	100.6597	ng/kg
DU-33	Dioxin TEQ	36.5465	ng/kg
DU-38	Dioxin TEQ	38.8146	ng/kg
DU-39	Dioxin TEQ	59.249	ng/kg
DU-40	Dioxin TEQ	36.7207	ng/kg
DU-41	Dioxin TEQ	39.0139	ng/kg
DU-46	Dioxin TEQ	42.7712	ng/kg
DU-47	Dioxin TEQ	54.3294	ng/kg
DU-48	Dioxin TEQ	43.3179	ng/kg
DU-49	Dioxin TEQ	32.554	ng/kg
DU-50	Dioxin TEQ	45.799	ng/kg
DU-51	Dioxin TEQ	29.9383	ng/kg
DU-53	Dioxin TEQ	19.2461	ng/kg
DU-54	Dioxin TEQ	49.264	ng/kg
DU-55	Dioxin TEQ	41.6955	ng/kg
DU-56	Dioxin TEQ	37.4374	ng/kg
DU-57	Dioxin TEQ	49.1186	ng/kg
DU-58	Dioxin TEQ	37.2494	ng/kg
DU-59	Dioxin TEQ	35.6504	ng/kg

Notes:

DU = decision unit
ng/kg = nanograms per kilogram
TEQ = toxicity equivalent

Table 6
Summary of Analytical Results for Dioxins from XDS-Calux Bioassay

Sample ID	ANALYTE	Xenobiotic Detection Systems Analytical Result (ng/kg)
DU-01	Dioxin TEQ	83.03 ± 4.65
DU-02	Dioxin TEQ	258.10 ± 23.32
DU-03	Dioxin TEQ	118.12 ± 8.82
DU-04	Dioxin TEQ	137.74 ± 4.73
DU-04D	Dioxin TEQ	114.31 ± 10.45
DU-05	Dioxin TEQ	235.92 ± 2.76
DU-06	Dioxin TEQ	224.89 ± 25.26
DU-07	Dioxin TEQ	96.28 ± 11.29
DU-08	Dioxin TEQ	47.07 ± 2.56
DU-09	Dioxin TEQ	103.86 ± 6.29
DU-10	Dioxin TEQ	169.72 ± 16.12
DU-11	Dioxin TEQ	96.74 ± 13.77
DU-12	Dioxin TEQ	98.03 ± 2.55
DU-12D	Dioxin TEQ	89.26 ± 4.93
DU-13	Dioxin TEQ	126.74 ± 7.14
DU-14	Dioxin TEQ	76.72 ± 5.89
DU-15	Dioxin TEQ	58.01 ± 5.13
DU-16	Dioxin TEQ	79.50 ± 5.15
DU-17	Dioxin TEQ	109.54 ± 17.16
DU-18	Dioxin TEQ	57.27 ± 3.06
DU18D	Dioxin TEQ	62.06 ± 4.64
DU-19	Dioxin TEQ	120.94 ± 8.26
DU-20	Dioxin TEQ	116.28 ± 15.71
DU-21	Dioxin TEQ	134.27 ± 4.79
DU-22	Dioxin TEQ	68.99 ± 6.75
DU-23	Dioxin TEQ	59.73 ± 4.80
DU-24	Dioxin TEQ	141.17 ± 14.43
DU-25	Dioxin TEQ	121.78 ± 6.43
DU-26	Dioxin TEQ	170.86 ± 39.88
DU-27	Dioxin TEQ	137.58 ± 15.51
DU-28	Dioxin TEQ	56.97 ± 3.11
DU-29	Dioxin TEQ	105.70 ± 8.71
DU-30	Dioxin TEQ	56.88 ± 1.48
DU-30D	Dioxin TEQ	72.28 ± 8.13
DU-31	Dioxin TEQ	58.59 ± 15.40
DU-32	Dioxin TEQ	736.16 ± 113.45
DU-33	Dioxin TEQ	188.89 ± 14.01
DU-34	Dioxin TEQ	267.03 ± 27.14
DU-35	Dioxin TEQ	331.42 ± 56.18
DU-36	Dioxin TEQ	446.32 ± 88.50
DU-37	Dioxin TEQ	180.29 ± 13.10
DU-38	Dioxin TEQ	245.17 ± 23.45
DU-39	Dioxin TEQ	424.30 ± 46.10
DU-40	Dioxin TEQ	221.95 ± 3.63
DU-41	Dioxin TEQ	281.46 ± 17.49
DU-42	Dioxin TEQ	114.80 ± 13.39
DU-43	Dioxin TEQ	131.19 ± 13.57
DU-44	Dioxin TEQ	164.78 ± 9.06
DU-45	Dioxin TEQ	133.93 ± 3.43
DU-46	Dioxin TEQ	141.83 ± 5.72
DU-47	Dioxin TEQ	137.92 ± 12.66
DU-48	Dioxin TEQ	120.83 ± 3.07
DU-49	Dioxin TEQ	115.75 ± 2.50
DU-50	Dioxin TEQ	129.55 ± 8.05
DU-50D	Dioxin TEQ	130.00 ± 6.38
DU-51	Dioxin TEQ	107.79 ± 3.97
DU-52	Dioxin TEQ	91.27 ± 22.47
DU-53	Dioxin TEQ	80.71 ± 6.41
DU-54	Dioxin TEQ	212.24 ± 26.72
DU-55	Dioxin TEQ	162.74 ± 6.51
DU-56	Dioxin TEQ	129.35 ± 8.54
DU-56D	Dioxin TEQ	136.95 ± 9.44
DU-57	Dioxin TEQ	159.48 ± 9.32
DU-58	Dioxin TEQ	146.52 ± 4.58
DU-59	Dioxin TEQ	122.13 ± 2.20

Notes:
DU = decision unit
ng/kg = nanogram per kilogram
TEQ = toxicity equivalent
Analytical results greater than 42 ng/kg but less than or equal to 390 ng/kg and considered an intermediate risk dioxin action level
Analytical results greater than 390 ng/kg and considered a high risk dioxin action level

Table 7
Summary of Individual Dioxin Congeners from GC/MS Analysis and a Comparison of the Calculated Dioxins TEQ from GC/MS Analysis and the Dioxins TEQ from XDS-Calux Bioassay

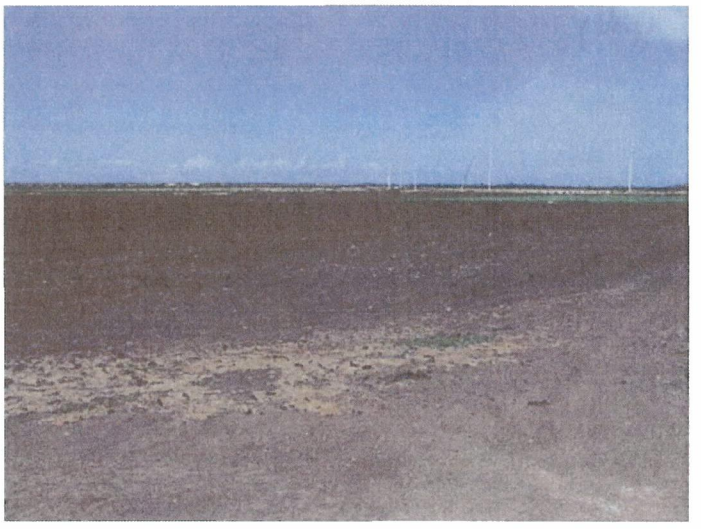
Sample ID	1,2,3,4,6,7,8-HPCDD	1,2,3,4,6,7,8-HPCDF	1,2,3,4,7,8,9-HPCDF	1,2,3,4,7,8-HXCDD	1,2,3,4,7,8-HXCDF	1,2,3,6,7,8-HXCDD	1,2,3,6,7,8-HXCDF	1,2,3,7,8,9-HXCDD	1,2,3,7,8,9-HXCDF	1,2,3,7,8-PECDD	1,2,3,7,8-PECDF	2,3,4,6,7,8-HXCDF	2,3,4,7,8-PECDF	2,3,7,8-TCDD	2,3,7,8-TCDF	OCDD	OCDF	TOTAL HPCDD	TOTAL HPCDF	TOTAL HXCDD	TOTAL HXCDF	TOTAL PECDD	TOTAL PECDF	TOTAL TCDD	TOTAL TCDF	Columbia Analytical Calculated TEQ	Xenobiotic Calux Bioassay Method TEQ Results
Dioxin Congener Soil Results (ng/kg)																											
DU-06	2097.898	619.364	54.893	23.46	52.627	123.29	31.95	68.112	1.935	16.962	7.281	47.051	7.295	1.274	2.434	14296.01	1247.285	5040.921	2212.197	742.298	338.527	94.043	304.788	26.863	53.335	88.1134	224.89 +/- 25.26
DU-07	1036.788	308.199	28.719	9.519	19.103	52.609	12.602	27.317	0.815	6.308	2.882	20.598	2.297	0.53	1.033	7652.186	786.814	2317.095	1224.927	317.489	302.136	42.092	131.305	15.132	24.432	38.1903	96.28 +/- 11.29
DU-10	1898.514	421.492	42.241	11.665	39.389	81.964	19.789	35.049	1.545	7.413	6.393	31.784	5.868	0.602	2.278	13116.92	1158.873	3667.046	1777.817	418.437	895.02	50.893	214.783	21.588	40.639	60.2187	169.72 +/- 16.12
DU-12	1169.581	361.522	31.995	7.293	27.422	58.74	13.308	23.656	1.18	5.128	3.926	24.329	3.324	0.409	1.039	9527.028	1071.331	2719.9	1544.376	293.061	696.591	35.395	165.635	16.543	30.38	41.1592	98.03 +/- 2.55
DU-13	1264.891	424.091	44.221	12.346	30.306	72.179	18.293	33.872	1.695	6.83	4.959	31.278	3.861	0.446	1.829	8804.534	931.124	2831.082	1728.714	397.342	924.805	47.482	194.146	23.327	34.895	49.0156	126.74 +/- 7.14
DU-31	669.87	241.006	25.546	6.33	31.249	45.389	11.053	18.091	1.238	3.89	3.862	19.477	5.449	0.461	1.481	4984.824	679.684	1704.045	1034.478	211.211	529.638	27.912	126.828	18.154	20.032	30.5959	58.59 +/- 15.40
DU-32	2568.912	603.609	81.314	27.844	99.791	128.06	36.121	64.21	3.602	12.969	11.5	57.29	13.459	1.231	5.124	22834.82	1613.223	6765.228	3430.799	702.059	1770.872	79.061	417.237	28.614	62.061	100.6597	736.16 +/- 113.45
DU-33	803.332	287.769	26.837	7	38.629	52.427	13.41	20.752	1.249	4.584	5.109	21.91	6.344	0.402	1.521	8104.16	678.691	2427.858	1310.846	248.727	651.921	29.606	164.216	16.814	27.102	36.5465	188.89 +/-14.01
DU-38	810.917	272.416	27.056	8.499	39.625	55.56	13.609	24.551	1.4	5.731	5.116	23.407	7.482	0.676	1.887	6121.746	717.706	2009.595	1118.727	258.58	612.777	31.668	167.706	14.875	28.261	38.8146	245.17 +/- 23.45
DU-39	1528.869	465.953	43.238	12.88	53.586	75.53	18.373	34.12	1.833	7.1	6.252	30.35	8.19	1.949	1.724	13164.54	1286.356	3672.769	2042.694	367.089	924.664	41.834	203.678	22.043	31.55	59.249	424.30 +/- 46.10
DU-40	783.798	302.592	32.676	6.752	46.906	50.804	15.55	19.046	1.629	4.127	5.941	25.711	6.716	0.435	1.708	5842.809	705.313	1788.172	1295.375	250.138	798.938	32.658	182.638	26.02	29.227	36.7207	221.95 +/- 3.63
DU-41	725.334	322.327	34.862	8.699	49.478	57.142	17.927	21.745	1.802	4.721	6.766	27.84	7.751	0.488	1.802	5289.342	736.818	1876.871	1350.802	275.453	849.584	34.825	204.652	22.725	33.37	39.0139	281.46 +/- 17.49
DU-46	908.032	342.092	34.845	6.495	46.756	60.47	17.608	23.088	2.24	5.502	6	26.321	8.844	0.627	2.188	7756.744	758.816	2281.626	1237.737	276.42	724.472	33.689	187.889	19.961	33.38	42.7712	141.83 +/- 5.72
DU-47	1101.268	381.418	39.051	11.415	52.268	71.204	22.212	34.17	2.303	9.364	8.067	34.302	10.193	0.852	2.111	8340.315	702.126	2579.401	1499.048	351.73	945.216	51.402	272.165	24.503	50.713	54.3294	137.92 +/- 12.66
DU-48	941.525	315.255	33.636	7.848	50.351	58.217	19.036	22.462	1.973	5.405	7.227	27.331	8.868	0.642	2.675	7570.613	763.477	1964.437	1260.569	279.273	801.025	38.272	210.88	22.895	37.204	43.3179	120.83 +/- 3.07
DU-49	702.302	237.095	28.242	4.197	44.056	43.719	15.841	15.263	2.3	3.255	5.808	22.529	8.295	0.306	2.388	5206.412	592.165	1395.915	946.477	198.343	643.148	28.257	183.128	20.447	31.056	32.554	115.75 +/- 2.50
DU-50	985.347	377.331	42.519	6.519	48.96	59.312	22.496	25.179	2.362	5.841	7.754	30.999	8.627	0.747	2.011	8068.588	840.047	2390.339	1507.833	301.148	824.141	36.885	212.11	19.933	32.758	45.799	129.55 +/- 8.05
DU-51	693.673	208.507	24.769	3.794	34.996	38.479	14.755	14.15	2.237	3.277	5.339	19.146	7.689	0.277	2.131	5438.831	531.181	1253.828	832.564	180.666	514.487	26.463	150.419	15.14	25.271	29.9383	107.79 +/- 3.97
DU-53	412.039	154.415	18.677	2.542	23.665	28.073	10.011	9.039	2.219	1.948	3.596	13.368	3.871	0.248	1.645	2924.316	356.881	936.771	630.062	137.214	369.711	19.642	92.008	16.321	18.565	19.2461	80.71 +/- 6.41
DU-54	1033.738	317.25	31.326	9.131	45.704	62.323	20.129	30.752	2.184	8.707	7.17	25.923	9.987	0.934	2.45	8634.734	826.148	2166.538	1186.262	348.712	748.19	82.802	237.384	53.611	47.857	49.264	212.24 +/- 26.72
DU-55	948.716	302.913	30.973	4.78	46.608	52.159	17.17	20.436	2.301	4.767	7.379	24.627	10.527	0.877	2.853	8733.219	825.67	1752.925	1114.97	245.588	747.738	31.461	214.824	17.543	31.637	41.6955	162.74 +/- 6.51
DU-56	602.979	304.904	31.221	7.326	53.616	56.196	18.349	22.332	1.601	4.188	7.027	24.914	9.753	0.439	2.876	4481.67	723.874	1901.903	1275.319	280.548	891.551	32.965	180.382	19.151	31.917	37.4374	129.35 +/- 8.54
DU-57	926.435	362.122	38.42	9.893	58.293	70.945	21.818	32.277	1.843	6.326	7.704	30.457	11.646	0.585	2.95	7042.937	841.386	2385.007	1309.367	367.805	430.265	42.161	212.85	21.05	41.667	49.1186	159.48 +/- 9.32
DU-58	698.382	275.359	29.019	6.212	47.542	54.182	18.384	25.806	1.362	4.279	6.24	23.201	8.925	0.37	2.44	5378.803	605.099	1786.611	994.689	296.942	726.533	37.509	177.528	21.184	34.247	37.2494	146.52 +/- 4.58
DU-59	616.665	256.813	27.355	7.196	43.128	54.695	15.164	26.62	1.464	4.554	5.489	22.291	8.27	0.481	2.26	5158.88	439.703	1772.594	950.122	282.475	670.791	40.954	178.53	23.43	31.4	35.6504	122.13 +/- 2.20
Dioxin Congener Water Equipment Rinsate (ER) Results (ng/l)																											
ER-01	0.004335	0.001038	0.021551	0.021551	0.021551	0.021551	0.021551	0.021551	0.021551	0.021551	0.021551	0.021551	0.021551	0.00862	0.00862	0.020021	0.004713	0.004335	0.003003	0.021551	0.021551	0.021551	0.021551	0.00862	0.00862		
ER-02	0.022727	0.022727	0.022727	0.022727	0.022727	0.022727	0.022727	0.022727	0.022727	0.022727	0.022727	0.022727	0.022727	0.00909	0.00909	0.002259	0.045454	0.022727	0.022727	0.022727	0.022727	0.022727	0.022727	0.00909	0.00909		
ER-03	0.002345	0.021186	0.021186	0.021186	0.021186	0.021186	0.021186	0.021186	0.021186	0.021186	0.021186	0.021186	0.021186	0.008474	0.008474	0.010148	0.042372	0.021186	0.021186	0.021186	0.021186	0.021186	0.021186	0.008474	0.008474		
ER-04	0.022727	0.022727	0.022727	0.022727	0.022727	0.022727	0.022727	0.022727	0.022727	0.022727	0.022727	0.022727	0.022727	0.00909	0.00909	0.006051	0.045454	0.022727	0.022727	0.022727	0.022727	0.022727	0.022727	0.00909	0.00909		

Notes:

DU	decision unit
ng/kg	nanogram per kilogram
	Analytical results less than or equal to 42 ng/kg and considered a low risk dioxin action level
	Analytical results greater than 42 ng/kg but less than or equal to 390 ng/kg and considered an intermediate risk dioxin action level
	Analytical results greater than 390 ng/kg and considered a high risk dioxin action level

APPENDIX A

Photolog



Photograph 1

View facing southwest across an example of recently tilled agricultural fields located on the project site.

Photograph 2

View facing southeast across an example of recently harvested agricultural fields located on the project site.

Photograph 3

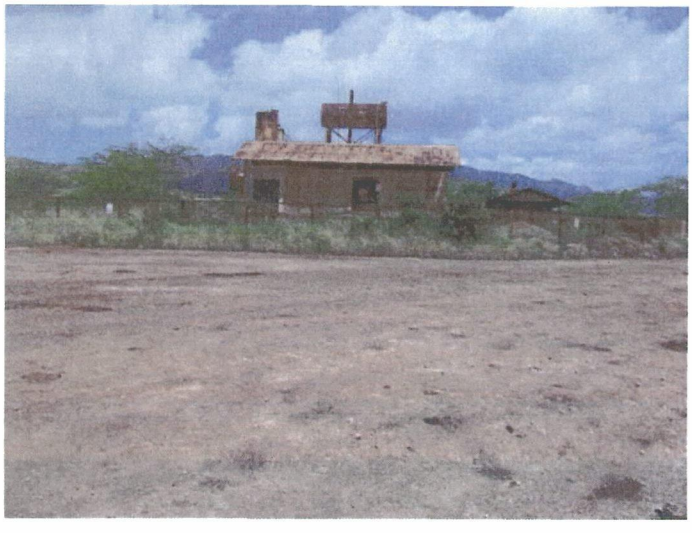
View facing west toward an example of active agricultural fields on the project site.

Photograph 4

View facing southwest toward an example of fallow, undeveloped land located on the western portion of the project area.

Photograph 5

View facing south down an unimproved access road separating active agricultural fields to the left and fallow, undeveloped land to the right.



Photograph 6

View facing north toward the Oahu Sugar Company Pesticide Mixing and Loading Area.

Photograph 7

View facing north toward the Oahu Sugar Company Pesticide Mixing and Loading Area.

Photograph 8

Tetra Tech field team crossing agricultural fields and locating a decision unit center point using a portable global positioning system (GPS) unit.

Photograph 9

Field team marking the center point of a decision unit.

Photograph 10

Marking the corner point of a decision unit. One field team member used a compass to direct a second field team member to the north, east, south, and west corner points. A measuring tape was used to measure approximately 35 feet from the center point to each corner creating an approximately 5,000 square foot decision unit.

Photograph 11

Collection of incremental sample within a decision unit. Soil was collected approximately 1 to2 inches below the ground surface using a stainless steel spoon. Collected incremental soil samples were placed into a disposable paper bag.

Photograph 12

Field team member sieving collected soil through a #10 sieve into a disposable aluminum pan. The #10 sieve is silver and located below the brass sieve in the photograph.

Photograph 13

Material larger than the #10 sieve size was placed into a separate container for later return to the decision unit of origin.

Photograph 14

APPENDIX B

Latitude and Longitude Coordinates for Decision Unit Center Points

Appendix B

Latitude and Longitude Coordinates for Decision Unit Center Points

Decision Unit ID	Latitude (degree)	Longitude (degree)
DU-1	-158.05113	21.34384
DU-2	-158.05091	21.34249
DU-3	-158.04925	21.34200
DU-4	-158.05044	21.34419
DU-5	-158.04926	21.34385
DU-6	-158.04814	21.34328
DU-7	-158.04780	21.34183
DU-8	-158.04970	21.34596
DU-9	-158.04961	21.34532
DU-10	-158.04807	21.34387
DU-11	-158.04717	21.34389
DU-12	-158.04533	21.34264
DU-13	-158.04886	21.34756
DU-14	-158.04765	21.34667
DU-15	-158.04659	21.34607
DU-16	-158.04603	21.34451
DU-17	-158.04424	21.34317
DU-18	-158.04847	21.34956
DU-19	-158.04752	21.34868
DU-20	-158.04687	21.34702
DU-21	-158.04568	21.34729
DU-22	-158.04412	21.34534
DU-23	-158.04286	21.34391
DU-24	-158.04856	21.35231
DU-25	-158.04705	21.35087
DU-26	-158.04631	21.34955
DU-27	-158.04572	21.34946
DU-28	-158.04451	21.34733
DU-29	-158.04349	21.34726
DU-30	-158.04246	21.34524

Decision Unit ID	Latitude (degree)	Longitude (degree)
DU-31	-158.04799	21.35364
DU-32	-158.04620	21.35207
DU-33	-158.04599	21.35042
DU-34	-158.04428	21.34960
DU-35	-158.04345	21.34948
DU-36	-158.04229	21.34691
DU-37	-158.04156	21.34695
DU-38	-158.04858	21.35411
DU-39	-158.04674	21.35337
DU-40	-158.04515	21.35321
DU-41	-158.04439	21.35255
DU-42	-158.04327	21.35036
DU-43	-158.04165	21.34992
DU-44	-158.04139	21.34813
DU-45	-158.04068	21.34757
DU-46	-158.04629	21.35506
DU-47	-158.04448	21.35462
DU-48	-158.04379	21.35337
DU-49	-158.04253	21.35245
DU-50	-158.04136	21.35051
DU-51	-158.04002	21.35048
DU-52	-158.03813	21.34867
DU-53	-158.04428	21.35667
DU-54	-158.04343	21.35581
DU-55	-158.04223	21.35460
DU-56	-158.04112	21.35349
DU-57	-158.04027	21.35154
DU-58	-158.03950	21.35085
DU-59	-158.03760	21.34965

APPENDIX C

Chain-of-Custody Records

CHAIN OF CUSTODY

Columbia Analytical Services, Inc.
An Employee Owned Company

1317 South 13th Ave. • Kelso, WA 98626 • (360) 577-7222 • (800) 695-7222 x07 • FAX (360) 636-1068

SR#: _____ PAGE 1 OF 1 COC #: _____

PROJECT NAME: East Kapolei
PROJECT NUMBER: 51488.13.H.0201
PROJECT MANAGER: Alex Olbrechts
COMPANY/ADDRESS: 707 Richards Street Suite 310
CITY/STATE/ZIP: Honolulu, HI 96813
E-MAIL ADDRESS: alex.olbrechts@hem.com
PHONE # (808) 441-4780 FAX (808) 836-1689
SAMPLER'S SIGNATURE: [signature]

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Semivolatile Organics by GC/MS 625 ☐ 8270 ☐ 8270LL ☐	Volatile Organics 624 ☐ 8260 ☐ 8021 ☐ BTEX ☐	Hydrocarbons (see below) Gas ☐ Diesel ☐ Oil ☐	Cl. Fuel Fingerprint (FFG) ☐	NWTPH-HCID Screen ☐	Oil & Grease (TRPH) 1664 HEM ☐ 1664 SGT ☐	PCB's Aroclors ☐	Pesticides/Herbicides 608 ☐ 8081A ☐	Congeners ☐	Chlorophenolics 8151A ☐	Triazines ☐	PAHs 8310 ☐ SIM ☐	Metals (circle for Dissolved) (See list below)	Cyanide ☐	Hex.Chrom. ☐	Dir. Conv. ☐ SO4 PO4 F NO2 NO3 BOD TSS TDS (circle) Nitrate-N COD (circle) NO2+NO3-N Total P TKN TOC DOC (circle)	TOX 9020 ☐	AOX 1650 ☐	506 ☐			REMARKS
DU-31	7/20/06	1655		SOIL	2							X					X										
DU-32		1330			2							X					X										
DU-33		1630			2							X					X										
DU-38		1635			2							X					X										
DU-39		1600			2							X					X										
DU-40		1700			2							X					X										
DU-41		1650			2							X					X										
ER-01																											
												LAST ENTRY															

REPORT REQUIREMENTS

I. Routine Report: Method Blank, Surrogate as required
II. Report Dup., MS, MSD as required
III. Data Validation Report (includes all raw data)
IV. CLP Deliverable Report
V. EDD

INVOICE INFORMATION

P.O. #: 51488.13.H.020
Bill To: Alex Olbrechts
Terms: NET 30

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.
___ 5 Day
X Standard (10-15 working days)
___ Provide FAX Results

Requested Report Date: _____

Circle which metals are to be analyzed:

Total Metals: Al (As) Sb Ba Be B Cd Ca Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Si Tl Sn V Zn Hg

*INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORTHWEST OTHER: _____ (CIRCLE ONE)

SPECIAL INSTRUCTIONS/COMMENTS:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: [signature]	Signature:	Signature:	Signature:
Date/Time: 7/20/06 1330	Date/Time:	Date/Time:	Date/Time:
Printed Name: Christian Torres	Printed Name:	Printed Name:	Printed Name:
Firm: HEM	Firm:	Firm:	Firm:

ROOC #1 06/03

Columbia Analytical Services, Inc.
An Employee Owned Company

CHAIN OF CUSTODY

1317 South 13th Ave. • Kelso, WA 98626 • (360) 577-7222 • (800) 695-7222x07 • FAX (360) 636-1068

SR#: _____ PAGE 1 OF 1 COC #: _____

PROJECT NAME: East Kapolei
PROJECT NUMBER: 514832.13.H.0201
PROJECT MANAGER: Alex Gilvydis
COMPANY/ADDRESS: TetraTech EM Inc
707 Richards St. Ste. 720
CITY/STATE/ZIP: Honolulu HI 96813
E-MAIL ADDRESS: alex.gilvydis@tetratech.com
PHONE #: (808) 441-4786 FAX # (808)
SAMPLER'S SIGNATURE: Steven M Sama

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Semivolatile Organics by GC/MS 625 ☐ 8270 ☐ 8270 (SIM) ☐	Volatile Organics 624 ☐ 8260 ☐ 8021 ☐ BTEX ☐	Hydrocarbons (see below) Gas ☐ Diesel ☐ Oil ☐	Fuel Fingerprint (FIQ)	Oil & Grease (TRPH) 1664 HEM ☐ 1664 SGT ☐	PCBs: Aroclors ☐ Congeners ☐	Pest/Herbicides 608 ☐ 8081A ☐ 8151A (Acid) ☐	Chlorophenolics 8151A ☐ Tetra ☐ Penta ☐	PAHs 8310 ☐ SIM ☐	Metals, Total or Dissolved (See list below)	Cyanide ☐	Hex-Chrom ☐	pH, Cond., Cl, SO4, PO4, F, NO2, NO3-N, COD, TSS, TDS (circle)	DOC (circle) Total P, TKN, TOC, NO2+NO3	TOX 9020 ☐ AOX 1650 ☐ 506 ☐				REMARKS
ER-01	7/27/06	0715		WATER	7									+											
LAST ENTRY																									

REPORT REQUIREMENTS

I. Routine Report: Method Blank, Surrogate, as required
II. Report Dup., MS, MSD as required
III. Data Validation Report (includes all raw data)
IV. CLP Deliverable Report
V. EDD

INVOICE INFORMATION

P.O. # 514832.13.H.0201
Bill To: Alex Gilvydis

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.
___ 5 Day
✓ Standard (10-15 working days)
___ Provide FAX Results
___ Requested Report Date

Circle which metals are to be analyzed:

Total Metals: Al (As) Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Ti Sn V Zn Hg

*INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORTHWEST OTHER _____ (CIRCLE ONE)

SPECIAL INSTRUCTIONS/COMMENTS:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: Steven M Sama	Signature:	Signature:	Signature:
Date/Time: 7/27/06 1730	Date/Time:	Date/Time:	Date/Time:
Printed Name:	Printed Name:	Printed Name:	Printed Name:
Firm:	Firm:	Firm:	Firm:

RCOC #1 06/03

CHAIN OF CUSTODY

Columbia Analytical Services, Inc.
An Employee - Owned Company

1317 South 13th Ave. • Kelso, WA 98626 • (360) 577-7222 • (800) 695-7222x407 • FAX (360) 636-1068

SR#: _____ PAGE 1 OF 1 COC #: _____

PROJECT NAME: East Kodiak
PROJECT NUMBER: 0112-3304.0201
PROJECT MANAGER: Alex Gilmorson
COMPANY/ADDRESS: 707 Richards Street Suite 700
CITY/STATE/ZIP: Honolulu HI 96813
E-MAIL ADDRESS: alex.gilmorson@tetratech.com
PHONE #: (808) 441-4736 FAX: (808) 536-1689
SAMPLER'S SIGNATURE: Geoffrey D'Ottavio

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Semivolatile Organics by GC/MS 625 ☐ 8270 ☐	Volatile Organics 624 ☐ 8260 ☐	Hydrocarbons (see below) Gas ☐ Diesel ☐	Fuel Fingerprint (FIQ)	NWTPH-HCID Screen	Oil & Grease/TPH 1664 HEM ☐ 1664 SGT ☐	PCB's Aroclors ☐	Pesticides/Herbicides 608 ☐ 8081A ☐	Chlorinated Comp. 8151A ☐	Tri, Tetra, Penta Chlorophenols 8151A ☐	PAHs 8270 ☐ SIM ☐	Metals, Total or Dissolved (See list below)	Cyanide ☐	pH, Cond., Cl, SO4, PO4, F, NO3	NO3, BOD, TSS, TDS, Total P, TKN, TOC	NH3-N, COD, Total P, NO2-NO3	BOC (circle)	TOX 9020 ☐	AOX 1650 ☐ 506 ☐	Diesel/Aroclors	BTEX 8260 ☐ 624 ☐	REMARKS
DU-31	7/30/04	1655		SOIL	2											X							X				
DU-32	"	1330		"	2								X			X							X				
DU-33		1630			2								X			X							X				
DU-34		1635			2								X			X							X				
DU-39		1600			2								X			X							X				
DU-40		1700			2								X			X							X				
DU-41	7/31/04	1650		W	2								X			X							X				
ER-01	"																										

LAST ENTRY

ENVS

REPORT REQUIREMENTS

I. Routine Report: Method Blank, Surrogate, as required
II. Report Dup., MS, MSD as required
III. Data Validation Report (includes all raw data)
IV. CLP Deliverable Report
V. EDD

INVOICE INFORMATION

P.O. # 0112-3304.0201
Bill To: Alex Gilmorson
Tetra Tech EM Inc

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.
___ 5 Day
X Standard (10-15 working days)
___ Provide FAX Results
___ Requested Report Date

Circle which metals are to be analyzed:

Total Metals: Al (As) Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORTHWEST OTHER (CIRCLE ONE)

SPECIAL INSTRUCTIONS/COMMENTS:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: Geoffrey D'Ottavio	Signature:	Signature:	Signature:
Date/Time: 7/31/04 1330	Date/Time:	Date/Time:	Date/Time:
Printed Name: Geoffrey D'Ottavio	Printed Name:	Printed Name:	Printed Name:
Firm: Tetra Tech EM Inc	Firm:	Firm:	Firm:

RCOC #1 06/03

CHAIN OF CUSTODY

Columbia Analytical Services, Inc.
An Employee - Owned Company

1317 South 13th Ave. • Kelso, WA 98626 • (360) 577-7222 • (800) 695-7222 • FAX (360) 636-1068

SR#: _____ PAGE _____ OF 1 COC # _____

PROJECT NAME: East Kaibab
PROJECT NUMBER: 114881304.02.01
PROJECT MANAGER: Alex Gibbs
COMPANY/ADDRESS: Tetra Tech EM Inc. 707 Richards St. Ste. 320
CITY/STATE/ZIP: Honolulu HI 96813
E-MAIL ADDRESS: alex.gibbs@tetratech.com
PHONE #: (808) 441-4786 FAX #: (808)
SAMPLER'S SIGNATURE: Stephanie Moore

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Semivolatile Organics by GCMS 625 ☐ 8270 ☐ 8270LL ☐	Volatile Organics 624 ☐ 8260 ☐	Hydrocarbons (see below) Gas ☐ Diesel ☐ Oil ☐	BTEX ☐ 8021 ☐	Fuel Fingerprint (FIO) ☐ NW-HCID Screen ☐	Oil & Grease TRPH ☐ 1664 HEM ☐ 1664 SGT ☐	PCB's Aroclors ☐	Pesticides/Herbicides 608 ☐ 8081A ☐	Congeners ☐ 8270 SIM ☐	Chlorophenolics ☐ 8041A ☐	PAHs 8310 ☐ SIM ☐	Tetra ☐ PCP ☐ 8151A ☐	Metals (see list below)	Total or Dissolved	Cyanide ☐	Hex-Chrom ☐	pH, Cond, Cl, SO4, PO4, F, NO2 NO3, BOD, TSS, TDS (circle)	NH3-N, COD, Total P, TKN, TOC DOC (circle) NO2+NO3	TOX 9020 ☐	AOX 1650 ☐ 9061 ☐	dioxin/furan 8290A	GC/MS		REMARKS
E12-01	4/27/06	1715		water														4							X					
											LAST ENTRY																			

REPORT REQUIREMENTS

- ___ I. Routine Report: Method Blank, Surrogate, as required
- ___ II. Report Dup., MS, MSD as required
- ___ III. Data Validation Report (includes all raw data)
- ___ IV. CLP Deliverable Report
- ___ V. EDD

INVOICE INFORMATION

P.O. # 114881304.02.01
Bill To: Alex Gibbs

TURNAROUND REQUIREMENTS

- ___ 24 hr. ___ 48 hr.
- ___ 5 Day
- X Standard (10-15 working days)
- ___ Provide FAX Results

Requested Report Date

Circle which metals are to be analyzed:

Total Metals: Al (As) Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

*INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORTHWEST OTHER _____ (CIRCLE ONE)

SPECIAL INSTRUCTIONS/COMMENTS:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: Stephanie Moore	Signature:	Signature:	Signature:
Date/Time: 4/27/06 1330	Date/Time:	Date/Time:	Date/Time:
Printed Name: Stephanie Toma	Printed Name:	Printed Name:	Printed Name:
Firm: Tetra Tech EM Inc	Firm:	Firm:	Firm:

[redacted] COC # [redacted]

CHAIN OF CUSTODY

Columbia Analytical Services, Inc.
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SR#: _____ PAGE _____ OF 2 COC #: _____

PROJECT NAME: East Basin
PROJECT NUMBER: 041821-1102.01
PROJECT MANAGER: Alex Goldenberg
COMPANY/ADDRESS: Waterfront Marine
207 E. Railroad St. Suite 300
CITY/STATE/ZIP: Honolulu, HI 96813
E-MAIL ADDRESS: alex.goldenberg@waterfront.com
PHONE #: (808) 441-4786 FAX: (808) 834-1821
SAMPLER'S SIGNATURE: [signature]

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Semivolatile Organics by GC/MS 625 ☐ 8270C ☐	Volatile Organics 624 ☐ 8260 ☐	Hydrocarbons (Circle below) Diesel ☐ 8021 ☐ BTEX Gas ☐	Fuel Fingerprint (FIQ) NW HCID Screen ☐	Oil & Grease (TRPH 1664 HEM 1664 SGT)	PCB's Aroclors 8082 ☐ 608 ☐	Pesticides/Herbicides 8081A ☐ 8151A ☐	Congeners	Chlorophenolics 8151M	Tri ☐ Tetra ☐ PCP	PAHs 8310 ☐ SIM	Metals, Total or Dissolved (See list below)	Cyanide ☐	Hex Chrom ☐	pH, Cond., Cl, SO4, PO4, F, NO2, NO3, BOD, TSS, TDS (circle)	NH3-N, COD, Total P, TKN, TOC	DOC (circle) NO2+NO3	TOX 9020 ☐ AOX 1650 ☐ 956 ☐	1,4-Dioxane 8270 ☐ 8260 ☐				REMARKS
DU-06	9/21/16	1320	1400																									
DU-07		1450	0700																									
DU-08		0830	0915																									
DU-09		1420	1525																									Hold for 1,4-dioxane analysis pending results
DU-10		1426	1530																									
DU-11		1600	1635																									
DU-12		1320	1350																									
DU-13		1125	1135																									
DU-05		1040	1030																									
DU-14		1000	0955																									

REPORT REQUIREMENTS

I. Routine Report: Method Blank, Surrogate, as required
II. Report Dup., MS, MSD as required
III. Data Validation Report (includes all raw data)
IV. CLP Deliverable Report
V. EDD

INVOICE INFORMATION

P.O. # 041821-1102.01
Bill To: Alex Goldenberg

TURNAROUND REQUIREMENTS

24 hr. 48 hr.
5 Day
X Standard (10-15 working days)
Provide FAX Results
Requested Report Date

Circle which metals are to be analyzed:

Total Metals: Al Sb As Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Si Tl Sn V Zn Hg

Dissolved Metals: Al Sb As Ba Be B Ca Cu Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Si Tl Sn V Zn Hg

INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORTHWEST OTHER: (CIRCLE ONE)

SPECIAL INSTRUCTIONS/COMMENTS:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: [signature]	Signature	Signature	Signature
Date/Time: 9/21/16 1530	Date/Time	Date/Time	Date/Time
Printed Name: Alex Goldenberg	Printed Name	Printed Name	Printed Name
Firm: Waterfront Marine	Firm	Firm	Firm

CHAIN OF CUSTODY

SR#: _____

Columbia Analytical Services, Inc.
1317 South 13th Ave. • Kelso, WA 98626 • (360) 577-7222 • (800) 695-7222x07 • FAX (360) 636-1068

PAGE 1 OF 2 COC #

Project Name/Number: [illegible]
PO#: [illegible]
Sampler: [illegible]
Cooler Temp: [illegible]
Custody Seals: [illegible]
Received Intact: [illegible]
Cooler Blank: [illegible]

CLIENT ID	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Semivolatile Organics by GC/MS 625 ☐ 8270 ☐ 8270LL ☐	Volatile Organics 624 ☐ 8260 ☐	Hydrocarbons (see below) Gas ☐ Diesel ☐	Fuel Fingerprint (HFO) ☐	BTEX 8021 ☐	Oil & Grease/TRPH NW-HCID Screen ☐ 1664 HEM ☐	PCBs Aroclors ☐	1664 SGT ☐	Pesticides/Herbicides 608 ☐ 8081A ☐	Congeners 1668 ☐	Chlorophenolics 8151 ☐	Tetra ☐	PAHs 8310 ☐	8141A ☐	8151A ☐	RCP ☐	SIM ☐	Metals: Total or Dissolved (Select below)	Cyanide ☐	Hex Chrom ☐	pH, Cond, Cl, SO4, PO4, F, NO2 NO3 BOD TSS TDS (circle)	NH3-N, COD, Total P, TKN, TOC DOC (circle) NO2-NO3	TOX 9020 ☐	AOX 1650 ☐ 9060 ☐	[illegible]	[illegible]	[illegible]	REMARKS
7	7/26	1400	1630	[illegible]	2								X					X										X					
5	1	1430	1625		2								X					X										X					
1	1	1420	1510		2								X					X										X					
5D		0930	1D10		1								X					X										X					
5D	V	420	1535	V	1								X					X										X					
																							LAST ENTRY										

REQUIREMENTS

Ino Report: Method
k, Surrogate, as
ired
ort Dup., MS, MSD as
ired
Validation Report
des all raw data)
Deliverable Report

INVOICE INFORMATION

P.O. #: [illegible]

Bill To: [illegible]

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.
___ 5 Day
X Standard (10-15 working days)
___ Provide FAX Results

Requested Report Date

Circle which metals are to be analyzed:

Total Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

*INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORTHWEST OTHER: (CIRCLE ONE)

SPECIAL INSTRUCTIONS/COMMENTS:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: [illegible]	Signature:	Signature:	Signature:
Printed Name: [illegible]	Printed Name:	Printed Name:	Printed Name:
Firm: [illegible]	Firm:	Firm:	Firm:
Date/Time: [illegible]	Date/Time:	Date/Time:	Date/Time:

COC #1 06/03

CHAIN OF CUSTODY

SR#: _____

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PAGE 1 OF 1 COC #: _____

PROJECT NAME: [illegible]
PROJECT NUMBER: [illegible]
PROJECT MANAGER: [illegible]
COMPANY/ADDRESS: [illegible]
CITY/STATE/ZIP: [illegible]
E-MAIL ADDRESS: [illegible]
PHONE #: [illegible] FAX #: [illegible]
SAMPLER'S SIGNATURE: [illegible]

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Semivolatile Organics by GC/MS 625 ☐ 8270 ☐	Volatile Organics 624 ☐ 8270L ☐	Hydrocarbons (circle below) Gas ☐ 8260 ☐	Diesel ☐ 8021 ☐ BTEX ☐	Fuel Fingerprint (FIO) ☐ Oil ☐	NW HCID Screen ☐	Oil & Grease/TRPH 1664 HEM ☐ 1664 SGT ☐	PCB's Aroclors ☐	Pesticides/Herbicides 608 ☐ 8081A ☐ 8141A ☐ 8151A ☐	Chloriphenolics TH ☐ Terra ☐ 8151M PCP ☐	PAHs 8310 ☐ SIM ☐	Metals, Total or Dissolved (See list below)	Cyanide ☐	Hex-Chrom ☐	pH, Cond, Cl, SO4, PO4, F, NO2, NO3, BOD, TSS, TDS (circle)	NH3-N, COD, Total-P, TKN, TOC DOC (circle) NO2+NO3	TOX 9020 ☐ AOX 1650 ☐ 9076 ☐				REMARKS
EC-02	9/2/04	1413		WATER	7																						
						LAST ENTRY																						

REPORT REQUIREMENTS

I. Routine Report: Method Blank, Surrogate, as required
II. Report Dup., MS, MSD as required
III. Data Validation Report (includes all raw data)
IV. CLP Deliverable Report
V. EDD

INVOICE INFORMATION

P.O. #: [illegible]
Bill To: [illegible]

TURNAROUND REQUIREMENTS

24 hr. 48 hr.
5 Day
Standard (10-15 working days)
Provide FAX Results?
Requested Report Date

Circle which metals are to be analyzed:

Total Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORTHWEST OTHER _____ (CIRCLE ONE)

SPECIAL INSTRUCTIONS/COMMENTS:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: [illegible]	Signature:	Signature:	Signature:
Printed Name:	Printed Name:	Printed Name:	Printed Name:
Firm:	Firm:	Firm:	Firm:
Date/Time:	Date/Time:	Date/Time:	Date/Time:

RCOC rev1 06/03

CHAIN OF CUSTODY

Columbia Analytical Services INC.
An Employee - Owned Company
1317 South 13th Ave. • Kelso, WA 98626 • (360) 577-7222 • (800) 695-7222x07 • FAX (360) 636-1068

SR#: ____ PAGE 1 OF 2 COC #: ____

PROJECT NAME: [illegible]
PROJECT NUMBER: [illegible]
PROJECT MANAGER: [illegible]
COMPANY/ADDRESS: [illegible]
CITY/STATE/ZIP: [illegible]
E-MAIL ADDRESS: [illegible]
PHONE #: [illegible] FAX#: [illegible]
SAMPLER'S SIGNATURE: Brianna[illegible]

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Semivolatile Organics by GC/MS 625 ☐ 8270 ☐ 8270LL ☐	Volatile Organics 624 ☐ 8260 ☐	Hydrocarbons (*see below) Gas ☐ Diesel ☐ Oil ☐ 8021 ☐ BTEX ☐	Fuel Fingerprint (FIQ) ☐ NW-HCID Screen ☐	Oil & Grease/TRPH 1664 HEM ☐ 1664 SGT ☐	PCB's Aroclors ☐ Congeners ☐	Pesticides/Herbicides 608 ☐ 8081A ☒ 8141A ☒ 8151A ☒	Chlorophenolics 8151M Tri ☐ Tetra ☐ PCP ☐	PAHS 8310 ☐ SIM ☐	Metals, Total or Dissolved (See list below)	Cyanide ☐ Hex-Chrom ☐	pH, Cond, Cl, SO4, PO4, F, NO2, NO3, BOD, TSS, TDS (circle)	NH3-N, COD, Total-P, TKN, TOC, DOC (circle) NO2-NO3	TOX 9020 ☐ AOX 1650 ☐ 508 ☐					REMARKS
DU-14	7/28/06	650		soil	1							✓			✓									
DU-15	7/28/06	645			1							✓			✓									
DU-16		1650										✓			✓									
DU-17		1615										✓			✓									
DU-22		1445										✓			✓									
DU-23		1510										✓			✓									
DU-28		1500										✓			✓									
DU-29		1455										✓			✓									
DU-30		1410										✓			✓									
DU-31	↓	1140		↓	↓							✓			✓									

REPORT REQUIREMENTS

___ I. Routine Report: Method Blank, Surrogate, as required

___ II. Report Dup., MS, MSD as required

___ III. Data Validation Report (includes all raw data)

___ IV. CLP Deliverable Report

___ V. EDD

INVOICE INFORMATION

P.O. # [illegible]

Bill To: [illegible]

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.

___ 5 Day

X Standard (10-15 working days)

___ Provide FAX Results

___ Requested Report Date

Circle which metals are to be analyzed:

Total Metals: Al (As) Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

*INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORTHWEST OTHER: ____ (CIRCLE ONE)

SPECIAL INSTRUCTIONS/COMMENTS:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: [illegible] Date/Time: [illegible]	Signature ____ Date/Time ____	Signature ____ Date/Time ____	Signature ____ Date/Time ____
Printed Name: [illegible] Firm: [illegible]	Printed Name ____ Firm ____	Printed Name ____ Firm ____	Printed Name ____ Firm ____

C #1

CHAIN OF CUSTODY

Columbia Analytical Services, Inc.
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SR#: _____ PAGE 1 OF 2 COC #: _____

PROJECT NAME: [illegible]
PROJECT NUMBER: [illegible]
PROJECT MANAGER: [illegible]
COMPANY/ADDRESS: [illegible]
CITY/STATE/ZIP: [illegible]
E-MAIL ADDRESS: [illegible]
PHONE #: [illegible] FAX #: [illegible]
SAMPLER'S SIGNATURE: [illegible]

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Semivolatile Organics by GC/MS 625 ☐ 8270 ☐ 8270LL ☐	Volatile Organics 624 ☐ 8260 ☐	Hydrocarbons (see below) Gas ☐ Diesel ☐ 8021 ☐	Fuel Fingerprint (FIO) NW HCID Screen ☐	Oil & Grease/TRPH 1664 HEM ☐ 1664 SGT ☐	PCB's Aroclors ☐	Pesticides Herbicides 608 ☐ 8081A ☐ Congeners ☐	Chlorophenolics 8041A ☐ 8151A ☐	Tri - Tetra - PCP ☐ 8151M ☐	PAHs 8310 ☐ SIM ☐	Metals Total or Dissolved (See list below)	Cyanide ☐	Hex.Chrom ☐	pH, Cond., Cl, SO4, PO4, F, NO2, NO3, BOD, TSS, TDS (circle) DOC (circle) NO2+NO3, TKN, TOC	TOX 9020 ☐	AOX 1650 ☐ 9056 ☐				REMARKS
DU-35	7/26/00	1115		SO	1											X									
DU-36		1165																							
DU-37		1160										X													
DU-42		1150														X									
DU-43		0950														X									
DU-44		0855														X									
DU-45		0945										X				X									
DU-52		1150										X				X									
DU-2015		1115		V	V							X				X									

REPORT REQUIREMENTS

___ I. Routine Report: Method Blank, Surrogate, as required
___ II. Report Dup., MS, MSD as required
___ III. Data Validation Report (includes all raw data)
___ IV. CLP Deliverable Report
___ V. EDD

INVOICE INFORMATION

P.O. #: [illegible]
Bill To: [illegible]

TURNAROUND REQUIREMENTS

___ 24 hr ___ 48 hr
___ 5 Day
X Standard (10-15 working days)
___ Provide FAX Results
___ Requested Report Date

Circle which metals are to be analyzed:

Total Metals: Al (Ag) Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORTHWEST OTHER (CIRCLE ONE)

SPECIAL INSTRUCTIONS/COMMENTS:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: [illegible]	Signature:	Signature:	Signature:
Date/Time:	Date/Time:	Date/Time:	Date/Time:
Printed Name:	Printed Name:	Printed Name:	Printed Name:
Firm:	Firm:	Firm:	Firm:

RCOC # 1 06/00

Columbia Analytical Services, Inc.
An Employee Owned Company

CHAIN OF CUSTODY

317 South 13th Ave. • Kelso, WA 98626 • (360) 577-7222 • (800) 695-7222x07 • FAX (360) 636-1068

SR#: _____ PAGE 1 OF 1 COC # _____

PROJECT NAME: [illegible]
PROJECT NUMBER: [illegible]
PROJECT MANAGER: [illegible]
COMPANY/ADDRESS: [illegible]
CITY/STATE/ZIP: [illegible]
E-MAIL ADDRESS: [illegible]
PHONE # _____ FAX # _____
SAMPLER / SIGNATURE: [illegible]

SAMPLE ID	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Semivolatile Organics by GC/MS 625 ☐ 8270 ☐	Volatile Organics 624 ☐ 8260 ☐	Hydrocarbons Gas ☐ Diesel ☐	BTEX 602 ☐ 8021 ☐	Fuel Fingerprint (FIQ) (See below)	WW-HCID Screen	Oil & Grease/TRPH 1664 HEM ☐	1664 SGT ☐	PCB's Aroclors ☐	Congeners ☐	Pesticides/Herbicides 608 ☐ 8081A ☐	8141A ☐ 8151A ☐	Chlorophenolics 1311 ☐	Tetra ☐	PAHs 8310 ☐	PCP ☐	SIM ☐	Metals, Total or Dissolved (See list below)	Cyanide ☐	Hex-Chrom ☐	pH, Cond., Cl, SO4, PO4, F, NO2, NO3-N, COD, TSS, TDS (circle)	BOD (circle) NO2+NO3	TOX 9020 ☐	TOC	AOX 1650 ☐ 508 ☐	[illegible]	[illegible]	[illegible]	REMARKS
EP 03	7/26/10	1345		WATER	7																												

REPORT REQUIREMENTS

___ I. Routine Report: Method Blank, Surrogate, as required
___ II. Report Dup., MS, MSD as required
___ III. Data Validation Report (includes all raw data)
___ IV. CLP Deliverable Report
___ V. EDD

INVOICE INFORMATION

P.O. # [illegible]
Bill To: [illegible]

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.
___ 5 Day
___ Standard (10-15 working days)
___ Provide FAX Results
___ Requested Report Date

Circle which metals are to be analyzed:

Total Metals: Al (As) Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

*INDICATE STATE HYDROCARBON PROCEDURE AK CA WI NORTHWEST OTHER _____ (CIRCLE ONE)

SPECIAL INSTRUCTIONS/COMMENTS:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature [illegible]	Signature	Signature	Signature
Printed Name [illegible]	Printed Name	Printed Name	Printed Name
Date/Time	Date/Time	Date/Time	Date/Time
Firm [illegible]	Firm	Firm	Firm

Xenobiotic Detection Systems, Inc.
"Dioxin Bioassays"

1601 East Geer St., Suite S
Durham, NC 27704
Phone: (919) 688-4804
888-DIOXINS (toll free)
Fax: (919) 688-4404
Web: www.dioxins.com
Email: info@dioxins.com

Company Tetra Tech EM Inc
Address: 707 Richards Street, Suite 300
City, State Zip Honolulu, HI 96813

Contact: Alex Globerson
Phone: (808) 441-4786
Fax: (808) 836-1689
Email: alex.globerson@ttemi.com

CHAIN OF CUSTODY

SAMPLE ID	SAMPLE MATRIX	NUMBER OF CONTAINERS	SAMPLE AMOUNT	REQUESTED ANALYSIS
DU-14	Soil	1	4 oz	dioxin/furan XDS-CALUX Bioassay
DU-15	↓	↓	↓	↓
DU-16				
DU-17				
DU-22				
DU-23				
DU-28				
DU-29				
DU-30				
DU-31				
DU-32				
DU-33				
DU-34				
DU-35	↓	↓	↓	↓

Purchase Order #_____

Comments:

Sampled by	Date/Time	Relinquished by	Date/Time	Received by	Date/Time
Bethany Forma	7/26/06 1135	Bethany Forma	7/31/06 1330		

Receiving Remarks:

Xenobiotic Detection Systems, Inc.
"Dioxin Bioassays"

1601 East Geer St., Suite S
Durham, NC 27704
Phone: (919) 688-4804
888-DIOXINS (toll free)
Fax: (919) 688-4404
Web: www.dioxins.com
Email: info@dioxins.com

Company: Tetra Tech EM Inc
Address: 707 Richards St. Suite 200
City, State Zip: Honolulu, HI 96813

Contact: Alex Globerson
Phone: (808) 441-4786
Fax: (808) 836-1689
Email: alex.globerson@ttemi.

CHAIN OF CUSTODY page 2 of 3

SAMPLE ID	SAMPLE MATRIX	NUMBER OF CONTAINERS	SAMPLE AMOUNT	REQUESTED ANALYSIS
DU-36	Soil	1	4 oz	dioxin/furan XDS-Calux Bioassa
DU-37	↓	↓	↓	↓
DU-38				
DU-39				
DU-40				
DU-41				
DU-42				
DU-43				
DU-44				
DU-45				
DU-46				
DU-47				
DU-48				
DU-49	↓	3	↓	↓ MS/MSD

Purchase Order #_____

Comments:

Sampled by	Date/Time	Relinquished by	Date/Time	Received by	Date/Time
Stephanie Ford	7/26/06 1135	Stephanie Ford	7/31/06 1300		

Receiving Remarks:

Xenobiotic Detection Systems, Inc.
"Dioxin Bioassays"

1601 East Geer St., Suite S
Durham, NC 27704
Phone: (919) 688-4804
888-DIOXINS (toll free)
Fax: (919) 688-4404
Web: www.dioxins.com
Email: info@dioxins.com

Company: Tetra Tech EM Inc
Address: 707 Richards St. Suite 300
City, State Zip: Honolulu, HI 96813

Contact: Alex Globerson
Phone: (808) 441-4786
Fax: (808) 836-1689
Email: alex.globerson@ttemi.com

CHAIN OF CUSTODY

SAMPLE ID	SAMPLE MATRIX	NUMBER OF CONTAINERS	SAMPLE AMOUNT	REQUESTED ANALYSIS
DU-50	Soil		4 oz	dioxin/furan XDS-calux Bioassa
DU-51				
DU-52				
DU-53				
DU-54				
DU-55				
DU-56				
DU-57				
DU-58				
DU-59				
DU-56D				
DU-50D				
DU-30D	↓		↓	↓
	LAST ENTRY			

Purchase Order #_____

Comments:

Sampled by	Date/Time	Relinquished by	Date/Time	Received by	Date/Time
Tiffany Fonna	7/26/06 1855	[signature]	7/31/06 1330		

Receiving Remarks:

Xenobiotic Detection Systems, Inc.
"Dioxin Bioassays"

1601 East Geer St., Suite S
Durham, NC 27704
Phone: (919) 688-4804
888-DIOXINS (toll free)
Fax: (919) 688-4404
Web: www.dioxins.com
Email: info@dioxins.com

Company: Tetra Tech EM Inc
Address: 707 Richards St. Suite 300
City, State Zip: Honolulu, HI 96813

Contact: Alex Globerson
Phone: (808) 441-4786
Fax: (808) 836-1689
Email: alex.globerson@ttemi.

CHAIN OF CUSTODY page 2 of 3

SAMPLE ID	SAMPLE MATRIX	NUMBER OF CONTAINERS	SAMPLE AMOUNT	REQUESTED ANALYSIS
DU-36	Soil	1	4 oz	dioxin/furan XDS-Calux Bioassa
DU-37		1		
DU-38		1		
DU-39		1		
DU-40		1		
DU-41		1		
DU-42		1		
DU-43		1		
DU-44		1		
DU-45		1		
DU-46		1		
DU-47		1		
DU-48		1		
DU-49		3		~~MS/MSD~~

No MS/MSD requested for DU-49 8/1/06 smg

Purchase Order #_____

Comments:

Sampled by	Date/Time	Relinquished by	Date/Time	Received by	Date/Time
Stefanie Fong	7/26/06 1135	Stefanie Fong	7/31/06 1300 smg		

Receiving Remarks:

Columbia Analytical Services[inc]
An Employee - Owned Company

CHAIN OF CUSTODY

1317 South 13th Ave. • Kelso, WA 98626 • (360) 577-7222 • (800) 695-7222x07 • FAX (360) 636-1068

SR# ______ PAGE 1 OF 2 COC # ______

PROJECT NAME: [illegible]
PROJECT NUMBER: [illegible]
PROJECT MANAGER: [illegible]
COMPANY/ADDRESS: [illegible]
CITY/STATE/ZIP: [illegible]
E-MAIL ADDRESS: [illegible]
PHONE #: [illegible] FAX#: [illegible]
SAMPLER'S SIGNATURE: [illegible signature]

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Semivolatile Organics by GC/MS 625☐ 8270☐ 8270LL☐	Volatile Organics 624☐ 8260☐ 8021☐ BTEX☐	Hydrocarbons (*see below) Gas☐ Diesel☐ Oil☐	Fuel Fingerprint (FIQ) ☐ NW-HCID Screen ☐	Oil & Grease/TRPH 1664 HEM☐ 1664 SGT☐	PCB's Aroclors☐ Congeners☐	Pesticides/Herbicides 608☐ 8081A☒ 8141A☒ 8151A☒	Chlorophenolics 8151M Tri☐ Tetra☐ PCP☐	PAHS 8310☐ SIM☐	Metals, Total or Dissolved (See list below)	Cyanide☐ Hex-Chrom☐	pH, Cond, Cl, SO4, PO4, F, NO2, NO3, BOD, TSS, TDS (circle)	NH3-N, COD, Total-P, TKN, TOC, DOC (circle) NO2+NO3	TOX 9020☐ AOX 1650☐ 506☐	[illegible]	REMARKS
DU-20	7/31/06	0750		Soil	1							X			X						
DU-18D	|	0840		|	1							X			X						
DU-26	|	0845		|	3							X			X						MS/MSD
DU-09	|	1130		|	1							X			X						
DU-13	|	1150		|	2							X			X					X	
DU-10	|	1200		|	2							X			X					X	
DU-12	|	1445		|	2							X			X					X	
DU-12D	|	1440		|	1							X			X						
DU-06	|	1515		|	2							X			X					X	
DU-07	V	1520		V	2							X			X					X	

REPORT REQUIREMENTS

___ I. Routine Report: Method Blank, Surrogate, as required
___ II. Report Dup., MS, MSD as required
___ III. Data Validation Report (includes all raw data)
___ IV. CLP Deliverable Report
___ V. EDD

INVOICE INFORMATION

P.O. # [illegible]
Bill To: [illegible]

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.
___ 5 Day
X Standard (10-15 working days)
___ Provide FAX Results
___ Requested Report Date

Circle which metals are to be analyzed

Total Metals: Al (As) Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

*INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORTHWEST OTHER ______ (CIRCLE ONE)

SPECIAL INSTRUCTIONS/COMMENTS:

Please return cooler to Petra Tech Env Inc
407 Richards Street
Suite 300
[illegible]

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: [signature] Date/Time: 8/1/06 1230	Signature ___ Date/Time ___	Signature ___ Date/Time ___	Signature ___ Date/Time ___
Printed Name: [illegible] Firm: [illegible]	Printed Name ___ Firm ___	Printed Name ___ Firm ___	Printed Name ___ Firm ___

CHAIN OF CUSTODY

SR#: _____

Columbia Analytical Services, Inc.
An Employee Owned Company

1317 South 13th Ave. • Kelso, WA 98626 • (360) 577-7222 • (800) 695-7222x07 • FAX (360) 636-1068

PAGE 2 OF 2 COC # _____

PROJECT NAME: [illegible]
PROJECT NUMBER: [illegible]
PROJECT MANAGER: [illegible]
COMPANY/ADDRESS: [illegible]
CITY/STATE/ZIP: [illegible]
E-MAIL ADDRESS: [illegible]
PHONE # [illegible] FAX [illegible]
SAMPLER'S SIGNATURE: [illegible]

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Semivolatile Organics by GC/MS 625 ☐ 8270 ☐	Volatile Organics by GC/MS 624 ☐ 8260 ☐	Hydrocarbons 8021 ☐ BTEX ☐	Gas ☐ Diesel ☐ (see below) Oil ☐	Fuel Fingerprint (FIO) ☐	NWTPH-HCID Safeen ☐	Oil & Grease/TRPH 1664 HEM ☐ 1664 SGT ☐	PCB's Aroclors ☐ Congeners ☐	Pesticides/Herbicides 608 ☐ 8081A ☐ 8141A ☐ 8151A ☐	Chlorophenolics 8151M ☐	Tri ☐ Tetra ☐ PCP ☐	PAHs 8310 ☐ SIM ☐	Metals, Total or Dissolved (Specify below)	Cyanide	pH Cond. Cl SO4 PO4 F NO2	NO3 BOD TSS TDS Total P TKN TOC	NH3-N COD (circle) NO2-NO3	DOC (circle) TOX 9020 ☐ AOX 1650 ☐ 506 ☐	Sulfide	Sulfite	REMARKS
DU-05	7/31/06	1620		SOIL	1												X										
DU-04D		1640			1												X										
DU-03		1650			1												X										
DU-02		1655			1												X										
DU-01	V	1700		V	3												X										LG/MED

LAST ENTRY

REPORT REQUIREMENTS

___ I. Routine Report: Method Blank, Surrogate, as required
___ II. Report Dup., MS, MSD as required
___ III. Data Validation Report (includes all raw data)
___ IV. CLP Deliverable Report
___ V. EDD

INVOICE INFORMATION

P.O. # [illegible]
Bill To: [illegible]

TURNAROUND REQUIREMENTS

____ 24 hr. ____ 48 hr.
____ 5 Day
____ Standard (10-15 working days)
____ Provide FAX Results

Requested Report Date

Circle which metals are to be analyzed:

Total Metals: Al (As) Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORTHWEST OTHER _____ (CIRCLE ONE)

SPECIAL INSTRUCTIONS/COMMENTS:

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature [illegible]	Signature	Signature	Signature
Printed Name [illegible]	Printed Name	Printed Name	Printed Name
Date/Time 7/31/06 1850	Date/Time	Date/Time	Date/Time
Firm [illegible]	Firm	Firm	Firm

COC #[illegible]

CHAIN OF CUSTODY

Columbia Analytical Services, Inc.
An Employee - Owned Company
1317 South 13th Ave • Kelso, WA 98626 • (360) 577-7222 • (800) 695-7222x07 • FAX (360) 636-1068

SR#: _____ PAGE 1 OF 1 COC #: _____

PROJECT NAME: [redacted]
PROJECT NUMBER: [redacted]
PROJECT MANAGER: [redacted]
COMPANY/ADDRESS: [redacted]
CITY/STATE/ZIP: [redacted]
E-MAIL ADDRESS: [redacted]
PHONE #: [redacted] FAX #: [redacted]
SAMPLER'S SIGNATURE: [redacted]

SAMPLE I.D.	DATE	TIME	LAB I.D.	MATRIX	NUMBER OF CONTAINERS	Semivolatile Organics by GC/MS 625 ☐ 8270 ☐ 8270LL ☐	Volatile Organics 624 ☐ 8260 ☐	Hydrocarbons Gas ☐ Diesel ☐ Oil ☐	8021 ☐ BTEX ☐ Fuel Fingerprint (FIQ) ☐ (see below)	MV-HCID Screen ☐	Oil & Grease/TRPH 1664 SGT ☐ 1664 HEM ☐	PCB's Aroclors ☐ 8081A ☐ 8141A ☐	Pesticides/Herbicides 606 ☐ 8081A ☐ 8141A ☐	Chlorophenolics 8151A ☐	Tetra ☐ 8151M ☐	PAHs 8310 ☐ SIM ☐ 8270 ☐	Metals, Total or Dissolved (See list below)	Cyanide ☐	pH, Cond., Cl, SO4, PO4, F, NO3	Hex-Chrom ☐	NO3-N, COD, TSS, TDS (circle)	COD (circle) Total P, TKN, TOC	TOX 9020 ☐ AOX 1650 ☐ 5096 ☐	Sulfide ☐ Sulfite ☐	Nitrate ☐ Nitrite ☐	Ammonia ☐	REMARKS
EB-041	7/21/06	0745		W	7								X			X												
DU-2		0805		S	1								X			X												
DU-24		1010			1								X			X												
DU-25		1005			1								X			X												
DU-37		0905			1								X			X												
DU-11		1045			1								X			X												
DU-18		0840			1								X			X												
DU-01		1015			1								X			X												
DU-08		1140			1								X			X												
DU-11	V	0850		V	1								X			X												

REPORT REQUIREMENTS

___ I. Routine Report: Method Blank, Surrogate, as required
___ II. Report Dup., MS, MSD as required
___ III. Data Validation Report (includes all raw data)
___ IV. CLP Deliverable Report
___ V. EDD

INVOICE INFORMATION

P.O. #: [redacted]
Bill To: [redacted]

TURNAROUND REQUIREMENTS

___ 24 hr. ___ 48 hr.
___ 5 Day
X Standard (10-15 working days)
___ Provide FAX Results

Requested Report Date: _____

Circle which metals are to be analyzed:

Total Metals: Al (As) Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

Dissolved Metals: Al As Sb Ba Be B Ca Cd Co Cr Cu Fe Pb Mg Mn Mo Ni K Ag Na Se Sr Tl Sn V Zn Hg

*INDICATE STATE HYDROCARBON PROCEDURE: AK CA WI NORTHWEST OTHER: _____ (CIRCLE ONE)

SPECIAL INSTRUCTIONS/COMMENTS:

[redacted]

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
Signature: [redacted] Date/Time: 7/21/06 1340	Signature: _____ Date/Time: _____	Signature: _____ Date/Time: _____	Signature: _____ Date/Time: _____
Printed Name: [redacted] Firm: [redacted]	Printed Name: _____ Firm: _____	Printed Name: _____ Firm: _____	Printed Name: _____ Firm: _____

RCOC #1 06/03

Xenobiotic Detection Systems, Inc.
"Dioxin Bioassays"

1601 East Geer St., Suite S
Durham, NC 27704
Phone: (919) 688-4804
888-DIOXINS (toll free)
Fax: (919) 688-4404
Web: www.dioxins.com
Email: info@dioxins.com

Company Tetra Tech EM Inc
Address: 707 Richards St. Suite 300
City, State Zip Honolulu, HI 96813

Contact: Alex Globerson
Phone: (808) 441-4786
Fax: (808) 836-1689
Email: alex.globerson@ttemi.com

CHAIN OF CUSTODY

SAMPLE ID	SAMPLE MATRIX	NUMBER OF CONTAINERS	SAMPLE AMOUNT	REQUESTED ANALYSIS
DU-20	soil	1	4 oz	dioxin/furan XDS - Calux Bioassay
DU-18				
DU-18D				
DU-19				
DU-21				
DU-27				
DU-25				
DU-24				
DU-26				
DU-08				
DU-09				
DU-13				
DU-10				
DU-12				

Purchase Order #_____

Comments:

Sampled by	Date/Time	Relinquished by	Date/Time	Received by	Date/Time
Jeffrey Timmons	7/31/06 0930	Jeffrey Timmons	8/1/06 1330		

Receiving Remarks:

Xenobiotic Detection Systems, Inc.
"Dioxin Bioassays"

1601 East Geer St., Suite S
Durham, NC 27704
Phone: (919) 688-4804
888-DIOXINS (toll free)
Fax: (919) 688-4404
Web: www.dioxins.com
Email: info@dioxins.com

Company Tetra Tech EM Inc
Address: 707 Richards St. Suite 200
City, State Zip Honolulu, HI 96813

Contact: Alex Globerson
Phone: (808) 441-4786
Fax: (808) 836-1689
Email: alex.globerson@ttemi.com

CHAIN OF CUSTODY page 2 of 2

SAMPLE ID	SAMPLE MATRIX	NUMBER OF CONTAINERS	SAMPLE AMOUNT	REQUESTED ANALYSIS
DU-12 D	soil	1	4 oz	dioxin/furan XDS - Cellux bioassay
DU-06	↓	↓	↓	↓
DU-07	↓	↓	↓	↓
DU-11	↓	↓	↓	↓
DU-05	↓	↓	↓	↓
DU-04	↓	↓	↓	↓
DU-04D	↓	↓	↓	↓
DU-03	↓	↓	↓	↓
DU-02	↓	↓	↓	↓
DU-01	↓	↓	↓	↓
		LAST ENTRY		

Purchase Order #_____

Comments:

Sampled by	Date/Time	Relinquished by	Date/Time	Received by	Date/Time
Stephanie Moore	7/31/10 0750	Stephanie Moore	8/1/10 1330		

Receiving Remarks:

APPENDIX D

Data Validation Reports

Tetra Tech EM Inc.
DATA VALIDATION REPORT

Site:	East Kapolei
Laboratory:	Columbia Analytical Services (CAS), Inc.
Data Reviewer:	Sara Woolley, TtEMI
Review Date:	06/11/07

Sample Delivery Group (SDG) No.: K0606346, K0606394, K0606254, K0606315

Sample Nos.:	DU06	DU11	DU16
	DU38	DU43	DU49

Matrix: Soil

Collection Date(s): July 2006

Ten percent of the data for this sampling event was randomly chosen for data review. The data were reviewed according to the U.S. Environmental Protection Agency (EPA) documents "USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review" (October 1999), and "USEPA Contract Laboratory Program National Functional Guidelines For Inorganic Data Review" (October 2004). In addition, the TtEMI documents "Data Validation Guidelines for Non-CLP Organic Analyses," "Data Validation Guidelines for Non-CLP Inorganic and Physical Analyses" (February 2005), and the document entitled "TtEMI Comprehensive Analytical Services Statement of Work" (January 2002) were used along with other specified criteria in EPA methods. Data validation requirements are presented below.

DATA VALIDATION REQUIREMENTS

Non-CLP Organic and Inorganic Parameters

* Method compliance
* Holding times
* Initial and continuing calibrations
* Blanks
* Matrix spike/matrix spike duplicate
* Laboratory control sample or blank spike
* Field duplicates
* Matrix duplicates
* Surrogate recovery
* Overall assessment of data for the SDG

TABLE 1
DATA VALIDATION SUMMARY

Analysis	Holding Times	Surrogates	MS/MSD	Matrix Duplicates	LCS	Blanks	Calibrations	Internal Standards	Field Duplicates	Other
Pesticides	✓	✓	✓	N/A	✓	✓	Pg. 4	N/A	N/A	
Herbicides	✓	N/A	Pg. 5	✓	✓	✓	Pg. 5	N/A	N/A	
Dioxins/furans	✓	✓	N/A	N/A	✓	Pg. 6	Pg. 6	N/A	N/A	Pg. 6
Metals	✓	N/A	Pg. 7	✓	✓	✓	- ✓	N/A	N/A	

Notes:
✓ indicates that all quality control criteria were met for the parameter as specified in the prescribed methods and data validation guidelines.
N/A indicates the parameter is not applicable to an analysis.
If criteria were not met, a page number is indicated where the criteria violation is detailed.
The data were evaluated for all validation criteria and were found to be in control except where noted. Any outliers are described in the text.

DATA ASSESSMENT

PESTICIDES ANALYSIS

I. Holding Times

All holding times were met.

II. Surrogate Recovery

All surrogate recoveries were met.

III. Matrix Spike (MS)/Matrix Spike Duplicates (MSD)

All MS/MSD criteria were met.

IV. Blank Spike or Laboratory Control Sample (LCS)/Laboratory Control Spike Duplicates

All LCS/LCSD criteria were met.

V. Blank Contamination

All blanks concentrations were nondetect.

VI. Calibrations

The CAS evaluation criterion of 15% was exceeded in several instances. The alternative evaluation specified in the EPA methods was performed using the average percent recovery of all analytes in the verification standard. The standard meets the alternative criteria.

VII. Compound Identification

All reviewed compounds were ND.

DATA ASSESSMENT

HERBICIDES ANALYSIS

I. Holding Times

All holding times were met.

II. Surrogate Recovery

All surrogate recoveries were met.

III. Matrix Spike (MS)/Matrix Spike Duplicates (MSD)

Due to matrix interference, MS recoveries were outside of criteria for several compounds. The LCS criteria were met for these compounds. The MS spike outliers suggest a potential for high bias in the matrix for these compounds.

IV. Blank Spike or Laboratory Control Sample (LCS)/Laboratory Control Spike Duplicates

All LCS/LCSD criteria were met.

V. Blank Contamination

All blanks concentrations were nondetect.

VI. Calibrations

For some compounds the initial calibration verification (ICV) was not met for the confirmation column. The data quality is not affected. For the continuing calibration verification (CCV), several compounds exceeded the primary evaluation criteria. The alternative evaluation specified in the EPA method was performed, and the standard meets the alternative evaluation criteria.

VII. Compound Identification

No problems were encountered with the samples under review.

DATA ASSESSMENT

DIOXIN/FURANS ANALYSIS

I. Holding Times

All holding times were met.

II. Surrogate Recovery

All surrogate recoveries were met.

III. Blank Spike or Laboratory Control Sample (LCS)/Laboratory Control Spike Duplicates

All LCS/LCSD criteria were met.

IV. Blank Contamination

Dioxins were reported in blanks at level less than the method reporting limit. These compounds were either nondetect in the environmental samples or at levels greater than 5 times the blank contamination.

V. Calibrations

OCDD and/or OCDF exceeded the upper method calibration range for some samples.

VI. Ion Abundance

For 2378-TCDD in one sample, the ion abundance ratios were outside the QC limits.

VII. Compound Identification

Confirmation of TCDF – when 2378-TCDF was detected on the initial column, confirmation analyses was performed on a second column. Results for 2378-TCDF were reported from the confirmation column.

ARSENIC ANALYSIS

I. Holding Times

All holding times were met.

II. Calibrations

All calibration criteria were met.

III. Blank Contamination

All blanks were nondetect.

IV. Matrix Spike (MS) and Matix Spike Duplicate (MSD)

The matrix spike recovery for arsenic was outside control criteria in two matrix spikes. The matrix spike outlier suggests a potential for bias in the matrix. The LCS criteria were all met.

V Blank Spike or Laboratory Control Sample (LCS) and Laboratory Control Samples Duplicate (LCSD)

All criteria were met.

Conclusions

Although some quality control criteria were not met, and some associated data may, therefore, be considered estimated, no violations were so severe to cause the data to be rejected. A review of the data set with respect to the EPA data quality parameters indicates that the data are of high overall quality and usable for site characterization, risk assessment, and feasibility studies.

EPA guidance was used to determine the usability of the validated data. This guidance is provided in the document "Risk Assessment Guidance for Superfund" (RAGS), Volume I (EPA 1989). Exhibit 5-5 in RAGS states that data considered estimated based on data validation reports may be used in quantitative risk assessments. Only data considered rejected are considered unusable for risk assessment purposes. If data are of acceptable quality for use in quantitative risk assessments, they should, therefore, also be appropriate for determining the extent of contamination.

APPENDIX E

Laboratory Analytical Results
(presented in compact disc format)