

FINAL
HUMAN HEALTH RISK ASSESSMENT
HISTORIC STORM WATER PATHWAY – SOUTH
ECOLOGY CONTROL INDUSTRIES PROPERTY
20846 SOUTH NORMANDIE AVENUE
TORRANCE, CALIFORNIA 90502

Document Control Number: 07163.0027.0026
Contract Number: EP-S9-08-03
Task Order: 0026

Prepared For:

United States Environmental Protection Agency
Region 9
75 Hawthorne Street
San Francisco, CA 94105

Prepared By:



Innovative Technical Solutions, Inc.
2730 Shadelands Drive, Suite 100
Walnut Creek, CA 94598

August 2010

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ACRONYMS AND ABBREVIATIONS

%	percent
$\mu\text{g}/\text{m}^3$	micrograms per cubic meter
ADD	average daily dose
ADI	average daily intake
Akzo	Akzo Coatings
ARAR	applicable or relevant and appropriate requirement
ATSDR	Agency for Toxic Substances and Disease Registry
bgs	below ground surface
BHC	benzene hexachloride
Cal/EPA	California Environmental Protection Agency
CDWR	California Department of Water Resources
CHHSL	California Human Health Screening Level
chRD	child-specific reference dose
cm^2	square centimeter(s)
COPC	chemical of potential concern
CSM	conceptual site model
days/year	days per year
DDD	4,4'-dichlorodiphenyldichloroethane
DDE	4,4'-dichlorodiphenyldichloroethene
DDT	4,4'-dichlorodiphenyltrichloroethane
DHHS	United States Department of Health and Human Services
DHS	California Department of Health Services
DTSC	Department of Toxic Substances Control
EC	exposure concentration
ECI	Ecology Control Industries, Inc.
ELCR	excess lifetime cancer risk
EPC	exposure point concentration
FDA	United States Food and Drug Administration
FS	feasibility study
g/day	grams per day
HEAST	Health Effects Assessment Summary Tables
HHRA	human health risk assessment
HI	hazard index
HLA	Harding Lawson Associates
HQ	hazard quotient
HSDB	Hazardous Substance Data Base

ACRONYMS AND ABBREVIATIONS (Continued)

IARC	International Agency for Research on Cancer
ILCR	incremental lifetime cancer risk
IRIS	Integrated Risk Information System
ITSI	Innovative Technical Solutions, Inc.
IUP	inhalation unit risk
kg	kilogram(s)
kg/mg	kilograms per milligram
LACFCD	Los Angeles County Flood Control District
LADD	lifetime average daily dose
LMS	linearized multistage
LOAEL	lowest observed adverse effect level
m ³ /day	cubic meters per day
m ³ /kg	cubic meters per kilogram
mg	milligram(s)
mg/cm ²	milligrams per square centimeter
mg/day	milligrams per day
mg/kg	milligrams per kilogram
mg/kg-day	milligrams of chemical per kilogram of body weight per day
mg/ m ³	milligrams per cubic meter
mg-soil/day	milligrams of soil per day
Montrose	Montrose Chemical Corporation of California
msl	mean sea level
MS/MSD	matrix spike/matrix spike duplicate
NAS	National Academy of Sciences
NCEA	National Center for Environmental Assessment
ng/ml	nanograms per milliliter
NOAEL	no observed adverse effect level
OEHHA	Office of Environmental Health Hazard Assessment
OSWER	Office of Solid Waste and Emergency Response
PCE	tetrachloroethene
ppb	parts per billion
PCB	polychlorinated biphenyl
PEF	particulate emission factor
PRG	preliminary remediation goal
QA	quality assurance
QC	quality control
RAGS	Risk Assessment Guidance for Superfund

ACRONYMS AND ABBREVIATIONS (Continued)

RfC	reference concentration
RfD	reference dose
RI	remedial investigation
RME	reasonable maximum exposure
RSL	regional screening level
RWQCB	California Regional Water Quality Control Board
SF	slope factor
SVE	soil vapor extraction
TCE	trichloroethene
TO	Task Order
TPH	total petroleum hydrocarbons
TPH-d	total petroleum hydrocarbons quantified as diesel
TPH-g	total petroleum hydrocarbons quantified as gasoline
TPH-mo	total petroleum hydrocarbons quantified as motor oil
UAO	Unilateral Administrative Order
UCL	upper confidence limit
U.S.	United States
USEPA	United States Environmental Protection Agency
UST	underground storage tank
VOCs	volatile organic compounds

EXECUTIVE SUMMARY

As part of Unilateral Administrative Order (UAO) 09-2006-022, Innovative Technical Solutions Inc. (ITSI), prepared this baseline Human Health Risk Assessment (HHRA) for the United States Environmental Protection Agency (USEPA), Region 9, under contract number EP-S9-08-03, Task Order 0026. This baseline HHRA was prepared to provide a quantitative evaluation of the potential human health risks associated with theoretical exposures to chemicals in soil at the Ecology Control Industries, Inc. (ECI) site. In 2005, pesticides and polychlorinated biphenyls (PCBs) were detected in soil by ECI as part of environmental investigations conducted prior to sale of the property. The investigations detected several chemicals present in soils including: 4,4'-dichlorodiphenyltrichloroethane (DDT), 4,4'-dichlorodiphenyldichloroethene (DDE), 4,4'-dichlorodiphenyldichloroethane (DDD), chlordane, petroleum hydrocarbons, and PCBs. USEPA has attributed the presence of DDT, DDD, and DDE in these soils to former Montrose Chemical Corporation (Montrose) manufacturing activities. From 1947 to 1982, Montrose manufactured technical grade DDT at a plant located approximately 0.5 mile north/northwest of the ECI property (Figure 1). The ECI property is located “downstream” from the former Montrose plant property, by way of the historical storm water drainage pathway. USEPA believes that DDT-impacted soils at the ECI property may be the result of contaminated storm water runoff from the former Montrose plant.

This report relies upon data collected during the additional soil investigations conducted at the ECI property (Earth Tech, Inc., 2008) to quantify potential health risks for future on-site populations including adult and child residents, adult industrial workers, and construction workers. Exposure pathways addressed for these populations included soil ingestion, dermal contact, and particulate inhalation for soil from 0 to 2 feet below ground surface (bgs) (residential and industrial worker scenarios), 0 to 5 feet bgs (residential scenario), and 0 to 16 feet bgs (residential and construction worker scenarios). Two exposure point concentrations were used for each of these scenarios, i.e., the maximum detected concentration and the 95% upper confidence limit (UCL).

For all of the potentially exposed populations, both noncarcinogenic hazards and incremental lifetime cancer risk (ILCR) were quantified. The results are provided in the tables below.

Cumulative Incremental Lifetime Cancer Risk Estimates

Exposure Scenario	0 to 2 feet bgs		0 to 5 feet bgs		0 to 16 feet bgs	
	Maximum EPC	95% UCL EPC	Maximum EPC	95% UCL EPC	Maximum EPC	95% UCL EPC
Residential Adult/Child	2.E-05	6.E-06	6.E-05	5.E-06	3.E-04	1.E-05
Industrial Worker	7.E-06	2.E-06	--	--	--	--
Construction Worker	--	--	--	--	2.E-05	6.E-07

Cumulative Hazard Index Estimates

Exposure Scenario	0 to 2 feet bgs		0 to 5 feet bgs		0 to 16 feet bgs	
	Maximum EPC	95% UCL EPC	Maximum EPC	95% UCL EPC	Maximum EPC	95% UCL EPC
Residential Adult/Child	1.5	0.6	3.4	0.5	9.4	0.5
Industrial Worker	0.19	0.1	--	--	--	--
Construction Worker	--	--	--	--	0.1	0.01

-- Not considered within the exposure area of receptor

Results of the baseline HHRA demonstrate that the increased likelihood of cancer risk from soil exposures is due primarily to 4,4'-DDT. Although residential reuse of the Site would pose the highest estimated cancer risk, the increased likelihood of cancer risk is within EPA's risk management range of one in 1 million (10^{-6} or 1E-06) to one in 10,000 (10^{-4} or 1E-04) (EPA, 2004b) if residents are not exposed to soil deeper than 16 feet bgs. For the future resident, the additional likelihood of cancer risk due to chemical concentrations in soil from surface to 16 feet bgs increases with depth.

If the Site remains an industrial facility, increased cancer risk due to potential soil exposures of industrial workers is also within the risk management range. Exposures of construction workers to soils within the 0-to-16-foot bgs range also are associated with increased cancer risk that is within the risk management range. The risk assessment assumes that excavation and/or redevelopment activities will take place over a period of one year. In the event that these activities were for a shorter duration, the estimated cancer risk would decrease correspondingly.

Potential exposures of residents through consumption of home-produced eggs and home-grown produce were evaluated in the Kenwood HHRA (HLA, 2001) and discussed in this risk assessment. A separate evaluation was not conducted for the baseline HHRA discussed in this report. The Kenwood HHRA indicated that the potential cancer risk to the adult and child residents consuming home-produced eggs is $5E-05$, which is within EPA's risk management range. The adult non-cancer health hazard is 0.5 and the child non-cancer health hazard is 1.5. The Kenwood HHRA also showed that total DDT founding all the radish samples was below the FDA action level.

The risk assessment also acknowledges that total petroleum hydrocarbon (TPH) contamination still remains at the Site, and that TPH is a chemical of concern that needs further characterization prior to Site redevelopment. Tetrachloroethene (PCE) was detected in one location with a concentration of 5.5 mg/kg. For future reuse other than as a parking lot, the potential vapor intrusion pathway, which is not addressed in this human health risk assessment, may have to be evaluated.

1.0 INTRODUCTION

In 2005, pesticides and polychlorinated biphenyls (PCBs) were detected in soil by Ecology Control Industries, Inc. (ECI), as part of environmental investigations prior to sale of the property at 20846 Normandie Avenue, Torrance, California. The investigations detected several chemicals present in soils that included 4,4'-dichlorodiphenyltrichloroethane (DDT); 4,4'-dichlorodiphenyldichloroethene (DDE); 4,4'-dichlorodiphenyldichloroethane (DDD); chlordane; petroleum hydrocarbons; and polychlorinated biphenyls (PCBs). USEPA has attributed the presence of DDT, DDD, and DDT in these soils to former Montrose Chemical Corporation of California (Montrose) manufacturing activities.

The goal of this baseline Human Health Risk Assessment (HHRA) is to provide a quantitative evaluation of the potential human health risks associated with theoretical exposures to chemicals in soil at the Site. Innovative Technical Solutions Inc. (ITSI), conducted this HHRA under USEPA Contract Number EP-S9-08-03, Task Order 0026.

This report includes an evaluation of the data collected at the Site (Earth Tech, Inc., 2000), an exposure assessment, a toxicity assessment, and a risk characterization. In the data evaluation section, the chemicals of potential concern (COPCs) are described. Potential receptors and exposure pathways are described in the Exposure Assessment section of this document. The toxicity assessment presents the toxicity criteria used to evaluate potential health effects associated with each COPC. Next, the risks are characterized to estimate the potential magnitude of potential adverse health effects under the conditions of exposure described in the Exposure Assessment section. Finally, a qualitative Uncertainty Analysis is provided to discuss the areas where uncertainty exists in the risk assessment process.

This HHRA is in accordance with applicable guidance from the USEPA. In particular, the HHRA follows standard and customary practices for the performance of risk assessments, as specified by the USEPA in the following documents:

- Risk Assessment Guidance for Superfund: Human Health Evaluation Manual; Part A (USEPA, 1989);
- Human Health Evaluation Manual, Supplemental Guidance: Standard Default Exposure Factors (USEPA, 1991);
- Final Guidance for Data Usability in Risk Assessment (USEPA, 1992 a,b);
- Exposure Factors Handbook, Volumes. I, II, and III (USEPA, 1997);
- Risk Assessment Guidance for Superfund, Human Health Evaluation Manual, Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments (USEPA, 2001);
- Risk Assessment Guidance for Superfund, Human Health Evaluation Manual, Volume I: Part E, Supplemental Guidance for Dermal Risk Assessment Interim Final (USEPA 2004).
- Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual: Part F, Supplemental Guidance for Inhalation Risk Assessment (USEPA, 2009a)
- USEPA Region IX Regional Screening Levels (USEPA, 2009b); and
- Integrated Risk Information System (IRIS) (USEPA, 2009c, 2010).

Where possible, this HHRA follows an approach similar to that used in the Human Health Risk Assessment for Residential Properties, Historical Stormwater Pathway–South, Montrose, Chemical Superfund Site, Los Angeles County, California, prepared by CH2M HILL (2008), to ensure consistency with methodologies previously established by the USEPA for this Site.

This report is organized in a manner consistent with USEPA guidance and consists of the following sections:

Section 2.0 Site Characterization – This section summarizes background information for the Site, including location and description, land and water use and summarizes the results of previous investigations.

Section 3.0 Data Evaluation and Identification of Chemicals of Potential Concern (COPCs) – This section presents the evaluation and summary statistics of analytical data, and the identification of chemicals of potential concern addressed by this HHRA.

Section 4.0 Exposure Assessment – This section presents the conceptual site model (CSM), which describes the scenarios by which human receptors at the site may be exposed to site-related chemicals. This section also describes the methodology used to estimate the average daily intake of COPCs by identified human receptors.

Section 5.0 Toxicity Assessment – This section presents the quantitative criteria developed by USEPA and the California EPA (Cal/EPA) that are used in this HHRA to calculate the potential adverse health effects to on-site populations.

Section 6.0 Risk Characterization – This section presents estimates of potential carcinogenic and non-carcinogenic risks calculated in this HHRA.

Section 7.0 Uncertainty Evaluation – This section qualitatively addresses the major sources of uncertainty in the HHRA and their influence on the conclusions.

Section 8.0 Conclusions – This section presents a summary of the results of the HHRA.

Section 9.0 References – This section identifies all documents cited in the risk assessment.

2.0 SITE CHARACTERIZATION

This section presents a description of the Site, including site background and history, the environmental setting, and a summary of previous investigations. The information contained in this section was taken from the Earth Tech Soil Investigation Report (Earth Tech, Inc., 2008).

2.1 SITE HISTORY

From 1947 to 1982, Montrose manufactured technical-grade DDT at a plant located at 20201 Normandie Avenue in Los Angeles, California, approximately 0.5 mile north/northwest of the ECI property. The ECI property (also identified as Operable Unit [OU] 6 of the Montrose Superfund Site) is located “downstream” from the former Montrose plant property, by way of the historical storm water drainage pathway (see Figure 2).

Prior to approximately 1969, the historic storm water pathway in the vicinity of the ECI property was an unlined linear topographic depression that acted as a local surface drainage feature. The drainage channel passed under Torrance Boulevard and traversed the eastern portion of the ECI property before continuing east through what is now the closed Royal Boulevard Landfill (ARMCO Site). During the late 1960s and early 1970s, the drainage ditch was replaced by the Los Angeles County Flood Control District (LACFCD) with an underground concrete storm water conveyance system. Project No. 685 (also known as the Kenwood Drain), a concrete box culvert, replaced the historic storm water drainage ditch from 204th Street, along Kenwood Avenue, through the ECI property, and eventually emptying into the Torrance Lateral, a large, open, concrete-lined drainage channel.

2.2 ECI STUDY AREA

The USEPA Historic Storm Water Pathway–South Study Area is located south of Torrance Boulevard and east of Normandie Avenue in Torrance, California, and includes portions of eight properties. The eight properties include the ECI property and seven residential properties located directly east of the ECI property along Torrance Boulevard, Raymond Avenue, and 209th Street. The residential properties are the subject of a separate investigation.

This ECI HHRA evaluates only that portion of the ECI property containing the historic storm water pathway that traversed the ECI property. For purposes of this HHRA, this approximately 0.75-acre area is defined as “the Site”. The ECI property and the area of the Site are shown on Figure 3.

2.3 ECI SITE HISTORY

Prior to 1992, Akzo Coatings (Akzo) owned the land now occupied by ECI. In 1992, ECI’s owner purchased approximately 4.7 acres of land from Akzo. Several years later, an additional 2.7 acres of adjacent land was purchased by ECI from Akzo, creating ECI’s current property (approximately 7.4 acres in size [Los Angeles County Tax Assessor’s Office, 2006, cited in Earth Tech, Inc., 2008]).

During its ownership, Akzo had numerous underground storage tanks (USTs) containing petroleum-based solvents located along the southern boundary of Lot 2 (the southern portion of the current ECI property). A release of toluene from one of the tanks required soil and groundwater investigations and the installation of a soil vapor extraction (SVE) system around the time of property transfer to ECI. Installation activities included grading the southern area of the property prior to the installation of the SVE system and covering the western portion of Lot 2 with concrete following installation. Akzo operated the SVE system for several years after the property was sold to and occupied by ECI. On July 22, 1996, the California Regional Water Quality Control Board (RWQCB) issued a closure letter confirming the completion of the UST remedial action (CH2M HILL, 2008, cited in Earth Tech, 2008).

In 1998, ECI graded and paved Lot 1, the northern portion of the property (ECI, 2005, cited in Earth Tech, Inc., 2008). Pre-grading construction drawings of Lot 1 indicate surface elevations from 40 feet above mean sea level (msl) along its western boundary to approximately 36 feet above msl along its eastern boundary. A low of 31 feet above msl was indicated in the northeast corner of the lot, along the LACFCD drainage easement, and a high of over 50 feet msl was indicated where there was a large mound of soil generated from prior grading of the southern lot (USEPA, 1993, cited in Earth Tech, Inc., 2008).

Soil from the large mound and an earthen embankment along Torrance Boulevard were used to level the property (ECI, 2005). After grading, the surface of the ECI property transitioned smoothly from approximately 40 feet above msl at its western edge to a low of approximately 34 feet above msl along its eastern edge. Residential properties immediately east of the ECI property have lower elevations of approximately 30 to 32 feet above msl (USEPA, 2005, cited in Earth Tech, Inc., 2008).

2.4 SUMMARY OF SITE INVESTIGATIONS RELEVANT TO THE HHRA

In 2005, an Environmental Site Assessment was conducted at the ECI property by Haley & Aldrich, Inc., in which over 200 soil samples were collected and analyzed for organochlorine pesticides, PCBs, total petroleum hydrocarbons (TPH-gasoline, TPH-diesel, and TPH-oil), volatile organic compounds (VOCs) and metals. Based on the results of these samples, soil excavations were conducted. Confirmation samples contained concentrations of pesticides that exceeded “federal or state regulatory limits or regional background concentrations for residential soils” (Earth Tech, 2008). In November of 2005, USEPA authorized ECI to perform a subsequent soil removal action.

In July 2006, Earth Tech conducted a soil investigation to characterize pesticides and PCBs along a series of east-west transects positioned roughly perpendicular to the direction of the historical storm water flow on an approximate grid pattern of 30 feet by 60 feet. Because some of these samples exhibited pesticide and PCB concentrations that exceeded “benchmarks established by USEPA for the investigation” (Earth Tech, 2008), additional soil samples were collected from selected locations between the July 2006 transects. Additionally, vertical delineation of pesticides and PCBs was conducted at a small number of locations. The supplemental soil sampling activities occurred in two field mobilizations (the first between May 21 and May 29, 2007, and the second on August 10, 2007).

The scope of work for the ECI soil investigation (i.e., the combined 2006 and 2007 sampling events) included the following:

- 398 target soil samples for organochlorine pesticides (USEPA Method 8081A);

- 336 target soil samples for PCBs (USEPA Method 8082);
- 10% duplicate samples;
- 5% matrix spike/matrix spike duplicate (MS/MSD) samples; and
- 1 Equipment blank sample for each field day of sampling.

Soil sample locations P01 through P54 are shown on Figure 4. Sample depth intervals are designated as follows, and are shown on the indicated figures:

- Sample depth from zero (0) to 0.5 foot bgs (locations shown on Figure 4a);
- Sample depth from 0.5 to 2.0 feet bgs (Figure 4b);
- Sample depth from 2.0 to 5.0 feet bgs (Figure 4c);
- Sample depth from 5.0 to 8.0 feet bgs (Figure 4d);
- Sample depth from 8.0 to 12.0 feet bgs (Figure 4e);
- Sample depth from 12.0 to 16.0 feet bgs (Figure 4f);
- Sample depth from 16.0 to 20.0 feet bgs (Figure 4g); and
- Sample depth from 20.0 to 24.0 feet bgs (Figure 4h).

Supplemental soil samples at sample locations P39 through P53 were collected in 2007 to further characterize the lateral extent of pesticides and PCBs. Supplemental soil samples P06B, P11B, P23B, and P48B were collected in 2007 to delineate the vertical extent of pesticides and PCBs. Target depths for the supplemental soil samples ranged from 20 to 28 feet bgs (Earth Tech, Inc., 2008).

2.5 TOPOGRAPHY

The topography at the ECI property (Figure 5) is generally even and planar, with a surface elevation approximately 40 feet above msl along its western edge, sloping to an elevation of approximately 34 feet above msl in the eastern portion. A localized storm water catch basin located near the LACFCD drain box (eastern boundary area) is the lowest feature within the paved ECI plant property.

The majority of the ECI plant property is paved with asphalt or concrete, with the exception of a narrow strip along the eastern boundary that is uncovered. Along the northern boundary of the

property is a sloped and landscaped embankment bounded by Torrance Boulevard to the north. The embankment is approximately 10 feet high. In 1998, ECI removed soils from along the bank to fill a localized depression in the northeast corner of the property, thereby reducing the grade to its present-day condition.

2.6 GEOLOGY AND HYDROGEOLOGY

The ECI Site is located within the south central portion of the West Coast Groundwater Basin. The West Coast Groundwater Basin is bounded by the Ballona Escarpment to the north, the Newport-Inglewood Structural Zone to the northeast, Palos Verdes Hills to the southwest, and the Pacific Ocean to the south and west.

The Site is also located in the southern portion of the Torrance Plan landform element (Poland, Piper, and others, 1956). There are four major structural features within the Torrance Plain or in the vicinity of the USEPA Historic Storm Water Pathway Study Area: the Newport-Inglewood Structural Zone (Barrows, 1974), the Palos Verdes Fault, the Torrance Anticline, and the Gardena Syncline (USEPA, 1998; California Department of Water Resources [CDWR], 1961).

The stratigraphy of the West Coast Basin includes Quaternary-age continental and marine deposits and Tertiary-age marine sediments overlying a basement complex of igneous and metamorphic rocks. The geologic units of hydrogeologic interest are (in order from oldest to youngest) the Pico Formation; the San Pedro Formation; the Lakewood Formation; and older dune sand, alluvium, and active dune sand (USEPA, 1998; CDWR, 1961).

The specific occurrence, depth, and thickness of surface and near-surface sediments at the ECI property have not previously been significantly differentiated, but were expected to be comprised of unconsolidated sedimentary deposits and reworked soil from past grading operations.

According to CDWR (1961), the ECI property is underlain first by the Lakewood Formation, which is approximately 200 feet thick in the vicinity. Generally, the Lakewood Formation comprises terrace deposits, the Palos Verdes Sand, and unnamed Upper Pleistocene deposits. Material types are both marine and non-marine, and include gravel, sand, silt, and clay.

Near-surface soils from the nearby Montrose Superfund Site were described as follows in the 1998 Remedial Investigation (RI) Report (USEPA, 1998):

Upper Layer – Playa Deposit: This layer occurs from near the ground surface to approximately 25 feet below ground surface. Based on grain-size analyses of soil samples collected in this layer, silt and clay comprise more than 65% of these soils.

Hydrogeologic units in the West Coast basin include aquitards and aquifers of varying compositions and water-yielding properties. These units, in order from shallow to deep, include the Bellflower Aquitard, the Gage Aquifer, an unnamed aquitard, the Lynwood Aquifer, another unnamed aquitard, and the Silverado Aquifer. The first-encountered groundwater beneath the area is at approximately 65 feet bgs, in the Upper Bellflower Aquitard (USEPA, 1998).

3.0 DATA EVALUATION AND IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN

Data evaluation is the process of assessing site characteristics and analytical data to determine whether data are of sufficient quality and quantity to support the quantitative risk assessment. This section of the report discusses the chemicals detected in site soils and their corresponding concentrations. All chemicals detected in the soil samples are identified as chemicals of potential concern (COPCs). The COPCs are further evaluated in the Exposure Assessment Section (Section 4.0).

3.1 DATA USABILITY

A data quality assessment was performed as part of the HHRA in accordance with the procedures outlined in the USEPA publication *Guidance for Data Usability in Risk Assessment-Part A* (USEPA, 1992a,b), as discussed further below.

Key notations regarding data usability issues are identified below and included in Table A-1 of Appendix A.

- For a number of the pesticide analyses, reporting limits exceed residential regional screening levels (RSLs) (USEPA, 2009b) for some of the carcinogenic pesticides. However, based on the acceptable cancer risk of 1×10^{-5} applied at the adjacent residential parcels (identified in the QAPP; Earth Tech, Inc., 2006), all reporting limits that did not exceed ten times the RSL (which is based on a cancer risk of 1×10^{-6}) were considered usable. Examples of RLs exceeding ten times the RSLs are identified in Table A-1 (Appendix A)
- A high percentage of the samples reported MS/(MSD recoveries at 0 percent. However, this is limited to samples with chemical concentrations that are significantly higher than the MS/MSDs. The USEPA Region IX Quality Assurance Office evaluated the laboratory data and concluded that the inability to quantify percent recoveries for certain analytes (e.g. 4,4'-DDT) was due to sample matrix interferences. It was the Quality Assurance Office's conclusion that since all other method QC results were within acceptable ranges, and many of the other analytes in the samples exhibited acceptable MS/MSD recoveries, the soil data should be useable for risk assessment purposes (Personal Communication, 2010).

With the above notations/qualifications and those presented in Appendix A, the data collected as part of the Earth Tech soil investigation (Earth Tech, Inc., 2008) of the ECI property were used as the basis for quantifying risk in this HHRA.

3.2 IDENTIFICATION OF CHEMICALS OF POTENTIAL CONCERN (COPCS)

This section briefly summarizes the nature and extent of chemicals detected in soils at the Site. All detected chemicals are considered soil COPCs and are evaluated in this HHRA. Table 3-1 shows the COPCs detected in soil at depths of 0 to 2 feet below ground surface (bgs). Table 3-2 shows the COPCs detected in soil at depths of 0 to 5 feet below ground surface (bgs), and Table 3-3 shows the COPCs detected in soil at depths of 0 to 16 feet below ground surface (bgs).

Pesticides and PCBs detected in the soil samples from the ECI property at any concentration include:

- Aldrin
- Benzene hexachloride (BHC; alpha, beta, delta, and gamma isomers)
- Chlordane
- Dieldrin
- DDD (2,4' and 4,4' isomers)
- DDE (2,4' and 4,4' isomers)
- DDT (2,4' and 4,4' isomers)
- Endosulfan (alpha and beta isomers)
- Endosulfan sulfate
- Endrin
- Endrin aldehyde
- Endrin ketone
- Heptachlor
- Heptachlor epoxide
- Methoxychlor
- PCBs (Aroclors 1242, 1254, and 1260)

Soil samples were not collected to establish ambient levels of pesticides and PCBs. To establish ambient or background concentrations for DDT, 74 surface soil samples were collected during the Kenwood investigations at 0 to 0.5 foot bgs. The soil samples were from six residential blocks in three areas, approximately two miles north and two miles south of the Montrose property. DDT analysis showed that the upper range of ambient DDT concentrations was 10 milligrams per kilogram (mg/kg) total DDT (Harding Lawson Associates [HLA], 2001; referenced in Earth Tech, 2008). Previous investigations also concluded that inorganic constituents do not exceed ambient levels (Earth Tech, 2008); hence, COPCs at the Site do not include inorganic constituents.

Previous investigations at the ECI property (Earth Tech, 2008) indicated that TPH quantified as diesel and motor oil (TPH-d and TPH-mo) were not detected above reporting limits at depths from 0 to 24 feet bgs. TPH-gasoline (TPH-g) concentrations ranged from non-detect to a maximum of 3.2 mg/kg, which was detected at 12 to 16 feet bgs. Based on these concentrations and the depths at which they were detected, it would be unlikely that future residential and commercial/industrial receptors would have unacceptable exposures. However, unknown extractable hydrocarbons were detected at a maximum concentration of 480 mg/kg at 8 to 10 feet bgs. Since TPH still remains at the Site, TPH is a chemical of concern that needs further characterization prior to Site redevelopment.

Soil samples were reportedly collected at the Site based on a 150-foot by 150-foot grid (Earth Tech, Inc., 2008). Methylbenzene, ethylbenzene, and o- and p/m-xylenes were detected in one out of 15 boring locations. PCE was detected in one location, at a concentration of 5.5 mg/kg. For future reuse of the Site other than as a parking lot, the potential vapor intrusion pathway, which is not addressed in this human health risk assessment, may have to be evaluated.

4.0 EXPOSURE ASSESSMENT

Exposure assessment is the process through which the exposure of human receptors to substances present in the environment is estimated. Exposure assessment generally involves analysis of the following variables: (1) the magnitude, duration, and route of exposure; and (2) types of potential receptor populations.

4.1 CONCEPTUAL SITE MODEL

The conceptual site model (CSM) (Figure 6) provides the framework for the exposure assessment. Figure 6 is a schematic representation of source of chemical release, the transport mechanisms through environmental media, the potential points of contact, and potential exposure routes to human receptors. There are a number of features related to the physical characteristics of a site and its surroundings that are relevant to potential chemical exposure, including location, land use, topography, hydrology, meteorology and vegetation. Factors such as current and possible future uses of the property, which determine the types of activities that might occur at the Site, the degree to which the Site is accessible to the general public, and the mechanisms that might result in the migration of COPCs to on-Site and off-Site populations are also included in an evaluation of the potential for exposure.

4.2 EXPOSURE AREA AND MEDIUM

The objective of the ECI investigation is to obtain additional analytical data adequate to characterize the vertical and lateral extent of the pesticides and PCBs in soil within the ECI portion of the Historic Storm Water Pathway–South Study Area (Earth Tech, Inc., 2008). Based on the soil sampling conducted to date, identified exposure areas for this HHRA include surface and subsurface soil in the eastern portion of the ECI property as described in the Earth Tech soil investigation report (Earth Tech, Inc., 2008). Groundwater is at 65 feet bgs and is not considered to be pertinent to investigations of the historical storm water pathway (Earth Tech, Inc., 2008). Thus, potential exposure routes to groundwater are considered incomplete and are not evaluated in this HHRA.

The lateral exposure area is the area within the boundaries of the ECI property, whereas the vertical exposure area is divided into two depths. Surface soil exposures for the future resident and future industrial worker are defined to be within the top 2 feet of Site soil. Subsurface soil exposures for the future resident are defined to include the intervals from 0 to 5 feet below ground surface (bgs) and 0 to 16 feet bgs. Construction workers who could be involved with redevelopment activities or with in-ground pool construction for hypothetical future residential structures are assumed to be exposed to subsurface soil in the interval from 0 to 16 feet bgs.

4.3 IDENTIFICATION OF POTENTIALLY EXPOSED POPULATIONS

Currently, the Site is an inactive industrial facility. However, it may be redeveloped for industrial and/or residential use. Consequently, the potential exists for future industrial workers to be exposed to the Site COPCs. In addition, should the site be developed for residential use, then future Site residents may be exposed to the COPCs. Therefore, it is the intent of this HHRA to evaluate the potential human health impacts to future industrial workers and future Site residents.

The potential also exists for Site trespassers to be exposed to the COPCs; however, given that a Site resident would be subject to a longer daily exposure than that applicable to a trespasser's intermittent exposure, potential exposures for a trespasser will be inherently addressed by the residential evaluation.

Finally, a future construction worker scenario also will be addressed. This exposure scenario is based on the premise that the Site may be redeveloped at some point in the future. As such, the potential exists for short-term construction activities that may result in exposures to the COPCs.

4.4 EXPOSURE SCENARIOS

This HHRA quantitatively evaluates exposure scenarios for a current and future industrial worker, a future construction worker, and future adult and child residents. In accordance with USEPA (1989) guidance, the residential scenario requires that both children (0-6 years) and adults be evaluated. Industrial and construction worker scenarios, however, quantify exposures of adult receptors only.

Reasonable Maximum Exposure

A reasonable maximum exposure (RME) is conservatively evaluated in the HHRA. The RME, as defined by the USEPA, is the “highest exposure that is reasonably expected to occur” and is estimated by using a combination of upper-bound values and average values for the exposure parameters (USEPA, 1989). The RME approach of assessing exposure relies on conservative assumptions for the exposure parameters, to ensure that the calculated dose is not underestimated. As such, the RME evaluation is recognized to overestimate the dose that would be expected for any member of the potentially exposed population (USEPA, 1989). For the exposure scenarios addressed in this HHRA, the RME scenario is the basis of the evaluation. However, evaluations based on the maximum detected concentrations are also presented for comprehensiveness.

4.5 IDENTIFICATION OF POTENTIAL EXPOSURE PATHWAYS

Pathways of exposure are the means through which an individual may come into contact with a chemical. Exposure pathways are determined by environmental conditions, the potential for a chemical to move from one medium to another, and the population’s general lifestyle(s). For a complete exposure pathway to exist, each of the following elements must be present (USEPA, 1989a):

- a source and mechanism for chemical release;
- an environmental transport medium (i.e., air, water, soil);
- a point of potential human contact with the medium; and
- a route of exposure (e.g., inhalation, ingestion, dermal contact) and chemical uptake into the body.

If any one of these elements is missing, the exposure pathway is considered incomplete.

For the ECI site, this HHRA quantitatively evaluates the following exposure pathways:

- **Soil Ingestion:** Incidental soil ingestion by adults and children, primarily through hand-to-mouth contact.
- **Dermal Contact:** Skin contact with impacted soils could result in absorption of chemicals through the skin and into the bloodstream.
- **Inhalation of Particulates:** Wind and vehicle activities may suspend soil particulates, which may be subsequently inhaled by on-site populations.

Chemicals in inhaled particles could be absorbed from the soil into the bloodstream.

- Ingestion of homegrown produce and eggs: Vegetables grown and consumed in the Montrose neighborhood include garlic, lettuce, tomatoes, broccoli, zucchini, radishes, and onions. These vegetables can absorb chemicals from the soil as they grow. Based on the physical and chemical properties of DDT and BHC, absorption by root produce (such as onions and radishes) results in chemical concentrations in the vegetable (McKone, 1994). When these vegetables are consumed, these chemicals can be absorbed into the body as part of the normal digestive process. Although ingestion of vegetables is a potentially complete exposure pathway, this pathway is not quantitatively evaluated because, similar to the Kenwood HHRA (HLA, 2001), usable vegetable data are not available. Ingestion of eggs is also a potential route of exposure for residents and was evaluated in the Kenwood HHRA (HLA, 2001). The results demonstrated that the highest concentrations detected in egg samples from this investigation would not result in significant risks to residents eating home-produced eggs at the assumed consumption rate of two eggs per week for an adult, and 1.3 eggs per week for a child (EPA, 1997).

Table 4-1 is a tabulated presentation of the complete exposure pathways to the potentially exposed populations.

4.6 ESTIMATION OF EXPOSURE POINT CONCENTRATIONS

Exposure point concentrations (EPCs) represent the chemical concentrations contacted by a human receptor. These concentrations are subsequently used to calculate the chemical intake under different exposure conditions.

4.6.1 Soil EPCs

Reliable estimates of exposure point concentrations in soil are required to calculate the magnitude of exposure for humans. Therefore, representative soil concentrations are used in this HHRA to quantify exposure to the COPCs. Consistent with USEPA guidance (USEPA, 1992c, 2002a), statistical descriptions including the 95 percent upper confidence limit (95% UCL), with normal, lognormal, and parametric distributions, are developed and are presented in Appendix B. When the data set or number of detections is not large enough to support a statistical calculation, the maximum concentration could be higher than the 95% UCL. In this case, the maximum concentration is used as the EPC (EPA, 1992c, 2002a). The USEPA's ProUCL software (version 4.00.04) is used to calculate the 95% UCLs (USEPA 2009d, e). In addition to the

95%UCLs, the maximum concentration is also used to address uncertainties within the data set (see Section 3.1 and Appendix A).

- 0 to 2 feet bgs: The EPC for each COPC is determined for the data from samples collected from 0 to two feet bgs and compiled as a single data set for each COPC (Table 4-2). Either the 95%UCL or the maximum concentration from this subset of the Site data is used in the exposure calculations, whichever is appropriate. This soil depth interval is used to quantify potential exposures to the industrial worker and future residential populations.
- 0 to 5 feet bgs: The EPC for each COPC is determined for the data from samples collected from 0 to five feet bgs and compiled as a single data set for each COPC (Table 4-3). Either the 95%UCL or the maximum concentration from this subset of the Site data is used in the exposure calculations, whichever is appropriate. This soil depth interval is used to quantify potential exposures to the future residential population.
- 0 to 16 feet bgs: The EPC for each COPC is determined for the data from samples collected from 0 to 16 feet bgs and compiled as a single data set for each COPC (Table 4-4). Either the 95%UCL or the maximum concentration from this subset of the Site data is used in the exposure calculations. This soil depth interval is used to quantify potential exposures to the construction worker and future residential populations.

4.6.2 Egg Sample EPCs

For the egg samples collected during the Kenwood HHRA, the reported 95%UCL for total DDT is 1.4 mg/kg under an assumed arithmetic distribution of the data (HLA, 2001). Due to the small number of egg samples, the maximum concentration of 1.06 mg/kg was used as the EPC. This is consistent with EPA risk assessment guidelines (EPA, 1992c).

4.7 EXPOSURE PARAMETERS

The exposure parameters used to estimate the chemical-specific doses for the child and adult receptors are based on default assumptions recommended by EPA (EPA, 1989) and Cal/EPA (Department of Toxic Substances Control [DTSC], Cal/EPA, 2005). In instances where Cal/EPA's recommended parameter is more conservative than EPA's recommendation, the Cal/EPA default assumption parameter is applied. These parameters include rates of exposure, exposure frequency, exposure duration, body weight, and averaging time. Assumptions are summarized in Tables 4-5 through 4- 8.

The assumptions that are more likely to influence the chemical exposure per body weight on an average daily basis are the following:

- **Soil Ingestion:** An adult resident is assumed to come into contact with soil through hand-to-mouth contact at a rate of 100 milligrams a day (mg/day), whereas a child playing in soil is assumed to be ingesting twice as much soil as an adult (i.e., 200 mg/day).
- **Exposure Frequency:** The adult and child resident are assumed to be exposed 350 days a year, because they are assumed to be away from home on a two-week vacation every year (EPA, 1989).
- **Exposure Duration:** A total exposure for a resident is assumed to be 30 years—six years as a child and 24 years as an adult (EPA 1989),
- **Body Weight:** An adult is assumed to have a body weight of 70 kilograms (kg), whereas a child is assumed to have a body weight of 15 kg (EPA, 1989).
- **Averaging Time:** Averaging time is the number of years during which a cancer or non-cancer effect might manifest itself in an exposed individual. For carcinogens, the averaging time is assumed to be over a lifetime of 70 years or 25,550 days. For noncarcinogens, noncancer health effects are assumed to manifest themselves over the same period as the duration of exposure. Therefore, averaging time for noncancer health effects in exposed adult residents is 24 years x 365 days a year or 8,760 days. Noncancer health effects in exposed child residents would have an averaging time of six years x 365 days a year or 2,190 days.

4.8 ESTIMATION OF CHEMICAL INTAKE OR AVERAGE DAILY DOSE

To account for different contact rates in children and adults during the first 30 years of life, the dose equations incorporate these differences in calculating the dose or chemical intake of an adult versus a child receptor.

The annual average daily dose (ADD) and the lifetime average daily dose (LADD) are the exposure metrics, in units of milligrams per kilogram of body weight per day (mg/kg-day), by which exposure is quantified for the purpose of risk assessment. The ADD is used as a standard measure for characterizing long-term non-carcinogenic exposure, while the LADD quantifies exposure to carcinogenic agents and averages that exposure over a 70-year lifetime. The equations for calculating the ADDs and LADDs are presented below and in Tables 4-5 through 4-8.

Exposure to the COPCs in air as suspended particulates is addressed via airborne or “exposure concentrations” of the COPCs. The exposure concentration (EC) is defined as the amount of chemical absorbed into the body over a given period of time (USEPA, 2004). The estimation of an EC when assessing cancer risks characterized by an inhalation unit risk (IUR) or reference concentration (RfC) involves the concentration in air measured at an exposure point at a site, and scenario-specific parameters such as the exposure duration and frequency.

4.8.1 Dose Equations and Exposure Parameters

To estimate the possible COPC intake via the soil ingestion pathway, the following equation was used:

$$Dose = \frac{Cs \times IngR \times CF \times EF \times ED}{BW \times AT}$$

where:

Dose	Average daily dose (ADD) for noncarcinogens (mg/kg-day) or lifetime average daily dose (LADD) for carcinogens (mg/kg-day);
Cs	Constituent concentration in soil (mg/kg; 95%UCL or maximum concentration);
IngR	Ingestion rate of soil (mg soil/day);
CF	Conversion factor (10 ⁻⁶ kg/mg);
EF	Exposure frequency (days/year);
ED	Exposure duration (years);
BW	Body weight (kg); and
AT	Averaging time (period over which exposure is averaged) (days).

Absorbed doses from dermal contact with soil are calculated using the following equation:

$$Dose = \frac{Cs \times SA \times EF \times ED \times AF \times ABS \times CF}{BW \times AT}$$

where:

Dose	Average daily dose (ADD) for noncarcinogens (mg/kg-day) or lifetime average daily dose (LADD) for carcinogens (mg/kg-day);
Cs	Constituent concentration in soil (mg/kg; 95%UCL or maximum concentration);
SA	Skin surface area (cm ²);
EF	Exposure frequency (days/year);
ED	Exposure duration (years);
AF	Adherence factor (mg/cm ²);
ABS	Absorption constant (unitless);
CF	Conversion factor (10 ⁻⁶ kg/mg);
BW	Body weight (kg); and
AT	Averaging time (period over which exposure is averaged) (days).

The chemical-specific values used for the absorption constant (ABS) are presented in Table 4-9.

4.8.2 Inhalation Exposure Equations and Exposure Parameters

As discussed previously, exposure to the COPCs in air is addressed via ECs. The EC typically takes the form of a concentration in air that is time-weighted over the duration of exposure and incorporates information on activity patterns for the specific site. The equation for estimating an EC is presented below.

$$EC = \frac{C_a \times ET \times EF \times ED}{AT}$$

where:

EC Exposure concentration ($\mu\text{g}/\text{m}^3$);

$$C_a = C_s \times CF \times \left(\frac{1}{PEF}\right)$$

Cs Constituent concentration in soil (mg/kg; 95%UCL or maximum concentration);

CF Conversion factor (1,000 $\mu\text{g}/\text{m}^3$);

PEF Particulate emission factor (m^3/kg);

ET Exposure time (hours/day);

EF Exposure frequency (days/year);

ED Exposure duration (years);

AT Averaging time (ED in years \times 365 days/year \times 24 hours/day).

5.0 TOXICITY ASSESSMENT

The risks associated with exposure to the constituents detected at a site are a function of the inherent toxicity (hazard) of each chemical and the absorbed dose. The toxicity assessment provides a summary of the information available regarding the potential for a chemical to cause an adverse health effect (hazard identification) and the relationship between the magnitude of exposure and the increased likelihood and/or severity of adverse effects (dose-response assessment).

Hazard identification refers to the process of determining if a chemical can cause an increase in a particular adverse effect (e.g., cancer) and the likelihood that the adverse effect will occur in humans. The dose-response assessment consists of quantifying the relationship between the dose of a chemical and the incidence of adverse effects in the exposed population. The result of the dose-response assessment is a toxicity criterion that can be applied to estimating human health risk. The toxicity criteria used to evaluate non-carcinogenic risks are commonly referred to as oral reference doses or inhalational reference concentrations (RfDs/RfCs). Carcinogenic risks are evaluated with the use of slope factors (SFs) and IUR factors.

5.1 TOXICITY CRITERIA FOR NONCARCINOGENS

Adverse non-carcinogenic health effects of chemicals are generally assumed to occur only after some threshold dose is reached. The threshold is often determined from toxicological data derived from animal or human studies and is presumed to lie in the interval between the no observed adverse effect level (NOAEL) and the lowest observed adverse effect level (LOAEL). The NOAEL is defined as the highest dose at which no observable adverse effect occurs, whereas the LOAEL is defined as the lowest dose at which an observable adverse effect occurs. NOAELs and LOAELs are sometimes used by the USEPA and other regulatory agencies to establish acceptable daily intake rates (ADIs) which are described as the acceptable amount of a chemical that an individual can be exposed to on a daily basis over a lifetime without experiencing adverse health effects. These ADIs can be conveyed as RfDs or RfCs. RfDs and RfCs are expressed in terms of mg/kg-day and mass of chemical per cubic meter of air (mg/m^3),

respectively. These criteria are intended to represent the dose of a chemical that is not expected to cause an adverse health effect over a lifetime of daily exposure, even in sensitive individuals, with a substantial margin of safety.

Uncertainty factors are used in the calculation of RfDs in an attempt to account for the limitations in the quantity or quality of available toxicity data, and to extrapolate from animal models to potentially sensitive human populations. Most RfDs include an uncertainty factor of 100, which is comprised of a factor of 10 to account for extrapolating animal data to human health effects (i.e., a human is presumed to be 10 times more sensitive to the chemical than the test animal), and another factor of 10 to account for possible differences in sensitivity within the human population (i.e., sensitive humans, such as the very old or very young or those with preexisting medical conditions, are presumed to be 10 times more sensitive than the normal, healthy adult). Furthermore, if the available data are incomplete and a LOAEL is used to establish an RfD, or if the chemical is persistent or bioaccumulative, then an additional factor of safety of 10 or more may be applied. The application of these safety factors is intended to provide confidence that an exposure at the level of an RfD will be without adverse effects, with a substantial margin of safety. For example, the experimental NOAEL for DDT is 0.05 mg/kg-day. The application of a cumulative uncertainty factor of 100 (based on an uncertainty factor of 10 for uncertainty in interspecies conversion and an uncertainty factor of 10 for protection of sensitive human subpopulations) results in an RfD for DDT of 0.0005 mg/kg-day (EPA, 2008).

For noncancer effects, verified RfDs are available from the USEPA for dieldrin, endrin, heptachlor, and heptachlor epoxide. The RfD for total DDT is used for 2,4'-DDT and 4,4'-DDT. In the absence of COPC-specific RfDs, the following surrogate RfDs are used: total DDT for 2,4'-DDD, 4,4'-DDD, and 2,4'-DDE; and gamma-BHC for beta- and delta-BHC. No published/promulgated RfCs are available for the Site COPCS.

5.2 TOXICITY CRITERIA FOR CARCINOGENS

Regulatory guidance for carcinogens, in general, recommends that the derivation of toxicity (risk) criteria values be conducted without the assumption of a threshold (USEPA, 1989). This approach assumes that the dose-response for carcinogens allows for zero risk only at zero dose,

and that some risk, however small, exists at all non-zero doses. To estimate plausible responses at low doses, various mathematical models are used. The accuracy of the projected risks depends on how well the model reflects the true relationship between dose and risk where the relationship cannot be feasibly measured. The accuracy of these models is currently unknown, but each is intended not to underestimate true risk.

For risk assessment purposes, toxic chemical effects are separated into two categories of toxicity: carcinogenic effects and non-carcinogenic effects. This division relates to the currently-held scientific opinion that the mechanisms of action for these endpoints differ. For carcinogens, it is assumed that any level of exposure has a finite possibility of causing cancer; therefore, there is no threshold dose for carcinogenic effects. That is, a single exposure to a carcinogenic chemical may, at any level, result in an increased probability that the exposed individual will develop cancer.

Health risks for exposure to carcinogens are defined in terms of probabilities that quantify the likelihood of a carcinogenic response in an individual receiving a given dose of a particular compound. The slope factor (SF), which is expressed in units of risk per mg/kg-day of chemical dose, is defined as the 95% UCL of the mean probability of carcinogenic response per unit daily intake of a chemical over a 70 year lifetime. By using the 95% UCL of the mean, the estimate of carcinogenic response is conservative and purposefully overestimates the actual risk posed by the chemical. At low dose, the actual risk may be zero.

For a chemical exhibiting non-carcinogenic effects, it is believed that humans have protective mechanisms that must be overcome before the adverse effect results; therefore, there is a threshold dose for these effects. This threshold concept view of non-carcinogenic effects holds that a range of exposures up to some defined threshold can be tolerated by humans without appreciable risk of harm.

The USEPA has conducted toxicity assessments for many of the COPCs identified in this risk assessment. The noncarcinogenic oral and dermal toxicity criteria used in this risk assessment are presented in tables 5-1 through 5-10, which present the cancer risk and hazard index

estimates for the different exposure scenarios. These criteria are selected according to the following hierarchy:

- USEPA Integrated Risk Information System (IRIS) on-line database
- USEPA Provisional Peer-Reviewed Toxicity Values (<http://hhprrtv.ornl.gov>)
- USEPA Health Effects Summary Tables
- USEPA Region IX Preliminary Remediation Goals (PRGs)
- Agency for Toxic Substances and Disease Registry (ATSDR) Minimum Risk Levels (<http://www.atsdr/cdc/gov/mrls.htm>).

The linearized multistage (LMS) model is used to derive the dose-response curve used by regulatory agencies to extrapolate responses to chemical doses observed in experimental animals to a theoretical cancer risk for humans exposed to low doses. This is likely to overestimate risks (EPA, 1989). The LMS methodology is used to develop chemical-specific slope factors (SFs). A slope factor is a measure of the carcinogenic potency of a chemical. The toxicity of a chemical increases with higher SFs. As an example, the SF for DDT is $0.4 \text{ (mg/kg-day)}^{-1}$ whereas the SF for DDD is $0.24 \text{ (mg/kg-day)}^{-1}$ (EPA, 2008). This indicates that DDT is more toxic than DDD and that DDT has a higher potential to cause cancer at a lower dose compared to DDD.

For carcinogenic effects, verified oral SFs are available from the USEPA for beta-BHC, dieldrin; aldrin, heptachlor, and heptachlor epoxide. The SF for total DDD is used for 2,4'- and 4,4'-DDD; total DDE for 4,4'-DDE; and total DDT for 2,4'-, and 4,4'-DDT. Further, the SF for total Aroclors is used for both Aroclor 1254 and Aroclor 1260. In the absence of COPC-specific oral SFs; the SF for alpha-BHC is used for delta-BHC. There are verified USEPA IURs available for dieldrin, aldrin, beta-BHC, heptachlor, and heptachlor epoxide. The IUR for total Aroclors is used for both Aroclor 1254 and Aroclor 1260. In the absence of COPC-specific IURs, DDT is used as a surrogate for all DDD, DDE, and DDT congeners and for alpha-BHC and delta-BHC.

Toxicity values for dermal exposure are not published by the USEPA. USEPA guidance indicates that estimates of absorbed dermal dose should be characterized via comparison to an oral RfD or SF that has been adjusted for oral absorption, but only if the chemical is known to be

absorbed less than 50% after ingestion (USEPA, 1989; 2004). As no chemical has a known absorption less than 50%, no adjustments are made to use the oral RfDs and SFs for this HHRA.

5.2.1 Toxicity of DDD, DDE, and DDT

The most commonly found form of DDT in the environment is the 4,4'- form. Most toxicity studies concentrate on 4,4'-DDT; however, many toxic effects observed for this form can be also attributed to DDD and DDE. People exposed to small amounts of DDT for a long time, such as workers who made DDT, had some reversible changes in the levels of liver enzymes (Longnecker et al., 1997). However, there was no sign that DDT caused permanent harmful effects (ATSDR, 1994). Studies have shown that people who accidentally swallow large amounts of DDT can become excitable and have tremors and seizures. These effects on the nervous system go away once exposure is stopped. No effects have been reported in people given small daily doses of DDT by capsule for 18 months (ATSDR, 1994).

Numerous studies on DDD, DDE, and DDT have been conducted in a variety of animal species. Toxicity data suggest that exposure to DDD, DDE, and DDT in animals can result in liver toxicity and damage to the central nervous system (ATSDR, 1994). Animal studies also have shown that exposure to DDD, DDE, and DDT may affect reproduction. Studies in animals have shown that DDT given during pregnancy can slow the growth of the fetus, but there is no evidence that exposure to DDT causes structural birth defects in animals (ATSDR, 2000a).

In animal testing, exposure to DDT during development may change how the nervous system works. Specifically, behavioral deficits in the learning process have been observed in adult male mice exposed to DDT perinatally or as neonates (ATSDR, 2000a). DDE has a moderate acute toxicity. It is an eye and skin irritant. Adrenal toxicity, advancing to necrosis, appears to be the primary effect associated with DDD exposure in animals (ATSDR, 1994).

EPA (2008) recommends an oral RfD of 0.0005 mg/kg-day for DDT. This RfD was developed based on a study that demonstrated liver lesions in laboratory animals. To derive the RfD, an uncertainty factor of 100 was applied to the NOAEL for the conversion of

interspecies and sensitive human subpopulations. Toxicity data on the noncarcinogenic potential of DDD and DDE are not available. Therefore, the oral RfD for DDT was applied in the evaluation of total DDT, assuming that similar toxic effects can occur for the DDD and DDE forms. The oral RfD of 0.0005 mg/kg-day was also used in the HHRA to evaluate inhalation exposure for total DDT.

In 2000, the ATSDR reviewed the health effects database for DDT, DDD, and DDE, including endocrine, neurological, reproductive, and developmental effects. The most sensitive toxicological endpoint identified for acute (14 days or less) oral exposure was neurological developmental effects. The most sensitive toxicological endpoint identified for intermediate (15 to 364 days) oral exposure was changes in the liver. ATSDR calculated a minimal risk level of 0.0005 mg/kg-day for both exposures, and this toxicity value is same as the EPA oral RfD. The oral RfD can be considered protective of endocrine effects.

Studies of DDT-exposed workers did not show increases in death or cancer. However, these studies had problems or flaws, so possible increases in cancer may not have been detected. Epidemiological studies also have indicated that DDT and DDD may cause pancreatic cancer, and DDT has been associated with non-Hodgkin's lymphoma (Longnecker et al., 1997). Among studies of serum DDE levels and breast cancer, the overall results are inconclusive as to the ability of these compounds to cause cancer (ATSDR, 1994).

Studies in animals have shown that oral exposure to DDD, DDE, and DDT can cause liver cancer (Hazardous Substance Data base [HSDB], 2000a, 2000b, and 2000c). There also has been evidence of lung and thyroid tumors in animal studies following oral exposure to these compounds. Chromosomal damage has been observed in both in vivo and in vitro animal studies (ATSDR, 1994).

Using the LMS model described above in Section 5.2, oral SFs of $0.24 \text{ (mg/kg-day)}^{-1}$, $0.34 \text{ (mg/kg-day)}^{-1}$, and $0.34 \text{ (mg/kg-day)}^{-1}$ were developed for DDD, DDE, and DDT, respectively (EPA, 2008). The inhalation unit risks for DDD, DDE, and DDT are similar, that is, $9.7\text{E-}05$ micrograms per cubic meter ($\mu\text{g/m}^3$).

5.2.2 Toxicity of Dieldrin

Dieldrin is an insecticide that can be persistent in the environment. Dieldrin binds tightly to soil and slowly evaporates to the air. It breaks down very slowly in soil and water. In the body, dieldrin is stored in fatty tissue and leaves the body very slowly (ATSDR, 2002). Individuals who intentionally or accidentally ingested large amounts of dieldrin suffered convulsions and some symptoms have resulted in death. Dieldrin may also build up in the body, resulting in health effects that may occur after a period of exposure. Symptoms reported after exposure to moderate levels in the air include headaches, dizziness, irritability, vomiting, and uncontrolled muscle movements. However, workers removed from the source of exposure rapidly recovered from most of these symptoms. Exposure to dieldrin also may adversely affect the immune systems of people. It is not known whether dieldrin affects human reproduction. Dieldrin has been found in human breast milk; therefore, it can be passed to breastfed infants (ATSDR, 2002).

Animals exposed to high levels of dieldrin had some adverse effects to the nervous system. In animals, oral exposure to lower levels for a long period also affected the liver and decreased their ability to fight infections. Studies in animals have given conflicting results about whether dieldrin affects reproduction in male animals and whether these chemicals may damage the sperm. Pregnant animals that ingested dieldrin had some babies with low birth weight and some with alterations in the skeleton (ATSDR, 2002).

EPA has developed an oral RfD of $5E-05$ mg/kg-day to evaluate the non-cancer effects of dieldrin. The RfD was derived from a NOAEL based on liver lesions in rats using an uncertainty factor of 100 for the extrapolation of dose levels from laboratory animals to humans, and for sensitive humans (EPA, 2008).

Currently, there is no conclusive evidence that dieldrin causes cancer in humans. However, dieldrin has been known to cause liver cancer in mice. The International Agency for Research on Cancer (IARC) has determined that dieldrin is not classifiable as to human carcinogenicity. However, EPA has determined that dieldrin is a probable human carcinogen (ATSDR, 2002).

An oral SF of $1.6E+01$ (mg/kg-day)⁻¹ has been developed by EPA (2008) using the LMS model. The SF was based on liver carcinoma in mice. An inhalation unit risk of $4.6E-03$ $\mu\text{g}/\text{m}^3$ has also been developed by EPA using the LMS model based on the oral study.

5.2.3 Toxicity of PCBs (Aroclor 1254 and Aroclor 1260)

Aroclors 1254 and 1260 are part of a group of synthetic chemicals known as polychlorinated biphenyls (PCBs). PCBs exist in the natural environment as mixtures containing a variety of individual chlorinated biphenyl components, known as congeners. Some commercially produced PCB mixtures are known in the U.S. by their industrial trade name, Aroclor. The name Aroclor 1254 means that the mixture contains approximately 54 percent chlorine by weight, as indicated by the second two digits in the name. These chemicals were used in the U.S. until 1977, when they were found to readily build up in the environment (ATSDR, 2000b).

In the environment, PCBs do not readily break down and, therefore, may remain for very long periods of time. They can readily cycle between air, water, and soil. In general, the lighter the type of PCBs, the further they may be transported from the source of contamination. PCBs are present as solid particles or as a vapor in the atmosphere. They will eventually return to land and water by settling as dust, or in rain and snow. In water, PCBs may be transported by currents, attach to bottom sediment or particles in the water, and evaporate into air. The heavier forms of PCBs are more likely to settle into sediments, while lighter PCBs are more likely to evaporate to air. Sediments that contain PCBs can also release the PCBs into the surrounding water. PCBs strongly adhere to soil and will not usually be carried deep into the soil with rainwater. They do not break down in soil and may stay in the soil for months or years; generally, the more chlorine the PCBs contain, the more slowly they break down. Evaporation appears to be an important way by which the lighter PCBs leave soil. As a gas, PCBs can accumulate in the leaves and aboveground parts of plants and food crops (ATSDR, 2000b).

The primary symptoms from exposure to high levels of PCBs are skin conditions such as acne and rashes. These effects on the skin are well-documented, but are not likely to result

from exposures in the general population. Some studies in workers suggest that exposure to PCBs may also cause irritation of the nose and lungs, gastrointestinal discomfort, changes in the blood and liver, and depression and fatigue. Most of the studies of health effects of PCBs in the general population examined children of mothers who were exposed to PCBs (ATSDR, 2000b).

In animal studies, rats that ate food containing large amounts of PCBs for short periods of time had mild liver damage, and some died. Rats, mice, and monkeys that ate smaller amounts of PCBs in food over several weeks or months developed various kinds of health effects, including anemia, acne-like skin conditions, and liver, stomach, and thyroid gland injuries. Other effects caused by PCBs in animals include reductions in the immune system function, behavioral alterations, and impaired reproduction. Some PCBs can mimic or block the action of hormones from the thyroid and other endocrine glands. Because hormones influence the normal functioning of many organs, some of the effects of PCBs may result from endocrine changes. PCBs are not known to cause birth defects. Only a small amount of information exists on health effects in animals exposed to PCBs by skin contact or breathing. This information indicates that liver, kidney, and skin damage occurred in rabbits following repeated skin exposures, and that a single exposure to a large amount of PCBs on the skin caused death in rabbits and mice. Breathing PCBs over several months also caused liver and kidney damage in rats and other animals, but the levels necessary to produce these effects were very high (ATSDR, 2000b).

EPA has developed an oral RfD of $2E-05$ mg/kg-day to evaluate non-cancer effects of Aroclor 1254. The RfD was derived from a LOAEL based on ocular and immunological effects in rhesus monkeys, using an uncertainty factor of 300 for the extrapolation of dose levels from laboratory animals to humans, for sensitive humans, and for use of the LOAEL (EPA, 2008).

For PCBs, an oral SF of 2 (mg/kg-day)⁻¹ was used in the HHRA. This value is from the Cal/EPA Office of Environmental Health Hazard Assessment (OEHHA) toxicity criteria database (Cal/EPA, 2009). For the inhalation unit risk for PCBs, $5.7E-04$ (µg/m³)⁻¹ was used (EPA, 2008).

5.6 TOXICITY OF HEPTACHLOR EPOXIDE

Heptachlor epoxide is formed when bacteria and animals break down the insecticide heptachlor. Approximately 20 percent of heptachlor is changed within hours into heptachlor epoxide in the environment and the body. Heptachlor epoxide can enter the air, soil, groundwater, and surface water from leaks at hazardous waste sites or landfills. Heptachlor sticks to soil very strongly and evaporates slowly into the air. Heptachlor epoxide dissolves more easily in water than heptachlor does, and evaporates slowly from water (ATSDR, 2007). Once in the environment, heptachlor epoxide can travel long distances via the wind, and readily persists in both soil and water. Heptachlor epoxide breaks down very slowly and can stay in soil and water for many years.

No reliable studies were found that show whether harmful health effects occur in humans as a result of breathing heptachlor epoxide. No animal studies examining the harmful effects resulting from breathing air that contains heptachlor epoxide were found. In addition, no reliable human studies were found that show whether harmful effects occur from eating contaminated foods or by drinking water contaminated with heptachlor epoxide. Heptachlor epoxide has been found in human milk samples at levels ranging from 0.13 to 128 ppb. Humans tend to store heptachlor epoxide in fatty tissue. Some studies show that heptachlor epoxide can still be measured in fatty tissue three years after a person is exposed to it. Studies also have shown a number of harmful health effects when animals were fed heptachlor epoxide. These effects were more harmful when the exposure levels were high or when exposure lasted many weeks. The effects observed in animals include damage to the liver, excitability, and decreases in fertility (ATSDR, 2007).

Some studies in animals suggest that young animals exposed during gestation and infancy may be very sensitive to heptachlor and heptachlor epoxide. Changes in nervous system and immune function were found in these animals. There is some evidence that similar effects may occur in humans; however, a study that found some changes in performance on tests that measure nervous system function is not conclusive, and exposure to other chemicals cannot be ruled out. Exposure to higher doses of heptachlor in animals can also result in decreases in body weight and death in animal newborn babies.

EPA has developed an oral RfD of 1.3E-05 mg/kg-day to evaluate non-cancer effects of heptachlor epoxide. The RfD was derived from a lowest effect level (LEL), based on increased liver-to-body-weight ratios in dogs, using an uncertainty factor of 1,000 for the extrapolation of dose levels from laboratory animals to humans, for sensitive humans, and for use of the LEL instead of NOAEL (EPA, 2008).

EPA and the IARC have classified heptachlor epoxide as a possible human carcinogen. An oral SF of 9.1 (mg/kg-day)⁻¹ has been developed by EPA (2008) using the LMS model. The SF was based on an increased incidence of hepatocellular carcinoma in mice. An inhalation unit risk of 2.6E-03 (µg/m³)⁻¹ has also been developed by EPA using the LMS model based on the oral study.

6.0 RISK CHARACTERIZATION

Risk characterization represents the final step in the risk assessment process. The results of the exposure and toxicity assessments are integrated into quantitative or qualitative estimates of potential health risk. Potential non-carcinogenic health effects and carcinogenic health risks are characterized separately. In addition, potential sources of uncertainty are discussed.

6.1 NON-CARCINOGENIC EFFECT

Potential adverse non-carcinogenic health effects are evaluated using the hazard index (HI) approach recommended by the USEPA (USEPA, 1989). The first step in this process is to calculate the hazard quotient for each chemical. The hazard quotient for ingestion and dermal exposures is defined as:

$$\text{Hazard Quotient}_i = \frac{\text{ADD}_i}{\text{RfD}_i}$$

where:

ADD_{*i*} Annual average daily dose for chemical *i* (mg/kg-day)
 RfD_{*i*} Reference dose for chemical *i* (mg/kg-day)

For inhalation, the hazard quotient is calculated as:

$$\text{Hazard Quotient}_i = \frac{\text{EC}_i}{\text{RfC}_i}$$

where:

EC_{*i*} Exposure concentration for chemical *i* (mg/m³)
 RfC_{*i*} Reference concentration for chemical *i* (mg/m³)

A hazard quotient less than or equal to 1 indicates that the predicted exposure to that chemical should not result in an adverse non-carcinogenic effect (USEPA, 1989). In cases where chemicals potentially act on the same organ or result in the same health endpoint (e.g., respiratory irritants), potential additive effects may be addressed by calculating a hazard index as follows:

$$\text{Hazard Index} = \sum_{i=1}^n \text{Hazard Quotient}_i$$

A hazard index of less than or equal to 1 indicates acceptable levels of exposure for chemicals having an additive effect. A cumulative hazard index is calculated by summing the hazard quotients for all chemicals and all pathways, regardless of toxic endpoint, as recommended by agency guidance (USEPA, 1989). This may overestimate potential non-carcinogenic health effects because it does not distinguish between different toxic endpoints and different exposure pathways (USEPA, 1989; NAS, 1988). For example, if the liver is the primary target organ for one chemical and for another chemical the skin is the primary target organ is the skin, the hazard quotients (HQs) should not be added. Similarly, inhalation and ingestion HQs should not be summed if a single compound affects the liver by ingestion and the lung by inhalation (for example). If the cumulative hazard index (all chemicals, all pathways) exceeds 1, then it is appropriate to conduct additional analyses to determine whether there are any underlying HQs which should not be summed.

6.2 CARCINOGENIC EFFECTS

For carcinogens, risk estimates represent the incremental probability that an individual will develop cancer over a lifetime as a result of exposure to a particular carcinogen or group of carcinogens (USEPA, 1989). These risks are termed incremental lifetime cancer risk (ILCR) and are calculated as follows:

$$ILCR = LADD_i \times SF_i$$

where:

ILCR Incremental lifetime cancer risk (unitless);
LADD_i Lifetime average daily dose for chemical *i* (mg/kg-day)
SF_i Slope factor for chemical *i* (mg/kg-day)⁻¹

For inhalation of constituents in soil, the cancer risk is calculated as follows:

$$ILCR = EC_i \times IUR_i$$

where:

ILCR Incremental lifetime cancer risk (unitless);
EC_i Lifetime daily concentration for chemical *i* (mg/m³)
IUR_i Inhalation unit risk factor for chemical *i* (mg/m³)⁻¹

Similar to the hazard index, the total ILCR is calculated by summing the risk for all pathways and all chemicals as follows:

$$ILCR = \sum_{i=1}^n ILCR$$

The estimated excess cancer risks for each chemical and exposure route are summed regardless of toxic endpoint (i.e., cancer type) to estimate the total excess cancer risk for exposed individuals.

6.3 RESULTS OF RISK CHARACTERIZATION

Cumulative risks are compared to a risk management range of one in 1 million (10^{-6} or 1E-06) to one in 10,000 (10^{-4} or 1E-04) (EPA, 2004b). Risk estimates within or exceeding this range (that is, greater than 10^{-6}) could potentially require a risk management decision that includes evaluating site-specific characteristics and exposure scenario factors to assess whether remedial action is warranted. When the HI (the ratio of chemical intake to the RfD) is greater than 1, there may be concern for potential non-cancer health effects associated with exposure to the chemicals of concern (EPA, 1989).

The estimated cumulative cancer risks and hazard indices for the different exposure scenarios are outlined in the following subsections, and summarized in the tables below.

Cumulative Cancer Risk Estimates

Exposure Scenario	0 to 2 feet bgs		0 to 5 feet bgs		0 to 16 feet bgs	
	Maximum	95% UCL	Maximum	95% UCL	Maximum	95% UCL
Residential Adult/Child	2.E-05	6.E-06	6.E-05	5.E-06	3.E-04	1.E-05
Industrial Worker	7.E-06	2.E-06	--	--	--	--
Construction Worker	--	--	--	--	2.E-05	6.E-07

Cumulative Hazard Index Estimates

Exposure Scenario	0 to 2 feet bgs		0 to 5 feet bgs		0 to 16 feet bgs	
	Maximum	95% UCL	Maximum	95% UCL	Maximum	95% UCL
Residential Adult/Child	1.5	0.6	3.4	0.5	9.4	0.5
Industrial Worker	0.2	0.1	--	--	--	--
Construction Worker	--	--	--	--	0.1	0.01

6.3.1 Residential Scenario–0 to 2 feet bgs

- The cumulative estimated cancer risk to the adult and child residents is 2E-05 (Table 5-1 and Figure 7) if it is assumed that they will be exposed to the highest chemical concentrations in soil to a maximum depth of two feet bgs. The highest concentration of 4,4'-DDT contributes 50 percent (%) of the cumulative risk estimate and the highest concentration of 4,4'-DDD contributes 20% of the cumulative risk estimate.

When the 95% UCL of the mean chemical concentrations in soil to a depth of two feet bgs is used to evaluate exposures of residents, the cumulative risk is reduced to 6E-06 (Table 5-2 and Figure 7), with Aroclor 1254 and heptachlor epoxide contributing 33% and 16%, respectively, of the cumulative risk estimate. It should be noted that Aroclor 1254 was detected in only 2 out of 89 samples; thus, the 95% UCL is higher than the maximum concentration. Therefore, the maximum concentration was assumed to be the concentration at the point of exposure (EPA, 1992).

- The non-cancer health hazard index due to exposures of adult and child residents to the highest concentration of each chemical in soil to two feet bgs is 1.5 (Table 5-1 and Figure 7), which is greater than the threshold level of 1. The primary contributors are 4,4'-DDT and Aroclor 1254, which contribute 30% and 26%, respectively, of the cumulative hazard index. 4,4'-DDD contributes 20%. It is noted, however, that Aroclor 1254 was detected

in only two out of 89 samples, whereas DDT and its congeners were detected at a much higher frequency among the soil samples that were analyzed.

When the 95% UCL of the site concentration is used as the concentration at the point of exposure, the estimated health hazard index is 0.6, which is below the threshold level of 1 (Table 5-2 and Figure 7).

6.3.2 Residential Scenario–0 to 5 feet bgs

- Possible exposures of adult and child residents to the highest chemical concentrations within the top five feet of soil would result in a cancer risk estimate of $6E-05$, due primarily to 4,4'-DDT (Table 5-3 and Figure 8), which contributes 66% of the total cancer risk. Minor contributors to the total risk are 4,4'-DDD and 2,4'-DDT, which contribute 12% and 10%, respectively, of the total risk estimate.

When the 95% UCL of the mean chemical concentration within the top 5 feet of soil is used to evaluate exposures of residents, the cumulative risk is reduced to $5E-06$ (Table 5-4 and Figure 8), with Aroclor 1254 contributing 40% of the cumulative risk estimate. It should be noted that Aroclor 1254 was detected in only 3 out of 135 samples; thus, the 95% UCL is higher than the maximum concentration. Therefore, the maximum concentration was assumed to be the concentration at the point of exposure (EPA, 1992).

- The cumulative hazard index due to adult and child residents coming into contact with the top five feet of soil is 3.4 (Table 5-3 and Figure 8). The major contributor is 4,4'-DDT, and 4,4'-DDD, Aroclor 1254, and 2,4'-DDT are the secondary contributors to the cumulative hazard index.

When the 95% UCL of the site concentration is used as the concentration at the point of exposure, the estimated health hazard index is 0.5, which is below the threshold level of 1 (Table 5-4 and Figure 8).

6.3.3 Residential Scenario–0 to 16 feet bgs

- Possible exposures of adult and child residents to the highest chemical concentrations in soil to a depth of 16 feet would result in a cancer risk estimate of 3E-04 (Table 5-5 and Figure 9). The primary contributors are 4,4'-DDT (33%) and heptachlor (30%).

When the 95% UCL of the mean chemical concentration within the top 16 feet of soil is used to evaluate exposures of residents, the cumulative risk is reduced to 1E-05 (Table 5-6 and Figure 9), with 4,4' DDT contributing 40% and heptachlor contributing 30% of the cumulative risk estimate.

- The cumulative hazard index due to adult and child residents coming into contact with the highest chemical concentrations within the top 16 feet of soil is 9.4 (Table 5-5 and Figure 9). The major contributors are 4,4'-DDT, 4,4'-DDD, and 2,4'-DDT.

When the 95% UCL of the site concentration is used as the concentration at the point of exposure, the estimated health hazard index is 0.5, which is below the threshold level of 1 (Table 5-6 and Figure 9).

6.3.4 Industrial Worker Scenario–0 to 2 feet bgs

- The total estimated cancer risk to the adult commercial worker due to the highest chemical concentrations in soil to a depth of two feet is 7E-06 (Table 5-7 and Figure 7). The primary contributor to the total risk is 4,4'-DDT, which contributes 43% of the total risk.

When the 95% UCL of the mean site concentration is used as the concentration at the point of exposure, the total risk is reduced to 2E-06 (Table 5-8 and Figure 7), which is in the lower end of EPA's risk management range of 1E-06 to 1E-04. The primary contributor is Aroclor 1254, which contributes 50% of the total estimated risk. However, the cancer risk attributed to Aroclor 1254 is due to the maximum concentration, because the 95% UCL is lower than the maximum concentration due to the low frequency of detection.

- Based on the maximum concentrations, the total non-cancer health hazard to an adult industrial worker is 0.2, which is well below the threshold level of 1 (Table 5-7 and Figure 7).

Based on the 95% UCL concentrations of detected chemicals, the total hazard index is 0.1, which is lower than the threshold level of 1 (Table 5-8 and Figure 7).

6.3.5 Construction Worker Scenario–0 to 16 feet bgs

- An adult construction worker who could be exposed to the highest chemical concentrations in soil to a maximum depth of 16 feet bgs would have an estimated risk of 2E-05 (Table 5-9 and Figure 9). The primary contributors to the total risk are Heptachlor, 4,4'-DDT, and Dieldrin. Heptachlor contributes 25% of the total risk, while Dieldrin and 4,4'-DDT each contribute 20% of the total risk.

When the 95% UCL of the site concentrations is used in the evaluation, the total risk is reduced to 6E-07 (Table 5-10 and Figure 9), which is below the *de minimis* risk (1E-06).

- The total non-cancer health hazard indices to an adult construction worker based on the highest and the 95% UCL site concentrations are 0.14 and 0.01, respectively, which are well below the threshold level of 1 (Tables 5-19 and 5-10, Figure 9).

The primary contributors to the risk and hazard index estimates for the different scenarios are summarized in the following table.

PRIMARY CONTRIBUTORS

Exposure Scenario	Contributors to Cancer Risk Estimates	Contributors to Hazard Index Estimates
Residential – 0 to 2 feet bgs	4,4-DDT 4,4'-DDD	4,4'-DDT Aroclor 1254
Residential – 0 to 5 feet bgs	4,4-DDT Aroclor 1254	4,4-DDT
Residential – 0 to 16 feet bgs	4,4-DDT Heptachlor	4,4-DDT 4,4'DDD 2,4'-DDT
Commercial/Industrial Worker – 0 to 2 feet bgs	4,4-DDT Aroclor 1254	None
Construction Worker – 0 to 16 feet bgs	Heptachlor 4,4-DDT Dieldrin	None

These results indicate that the primary chemical of concern at the Site is 4,4-DDT and that the concentrations of this contaminant increase with depth, as shown by the increasing cancer risk estimates with exposures to deeper soils. Although Aroclor 1254 is identified as another contributor to the total cancer risk estimate, the cancer risk estimate due to Aroclor 1254 is based solely on the highest detected concentration. Aroclor 1254 was detected in two out of 89 soil samples collected from the surface to a depth of two feet bgs and in three out of 135 samples collected from the surface to a depth of five feet bgs. These low frequencies of detection do not support the calculation of a 95% UCL; thus, the risk estimates do not truly represent the reasonable maximum exposures of residents and commercial/industrial workers at the Site. On the other hand, 4,4'-DDT was detected at a rate of 99%, and the concentrations increase with depth.

7.0 UNCERTAINTY EVALUATION

Uncertainty is an inherent part of the risk assessment process and generally arises from gaps in information regarding: (1) site conditions; (2) toxicity and dose-response of COPCs; and (3) the extent to which an individual will be exposed to COPCs from the Site. In most cases, additional information is difficult to obtain or is subject to variability, or there may be gaps in the current understanding regarding an environmental/chemical process or the toxicology of a chemical. This means that assumptions must be made based on the information in the literature or through professional judgment. The assumptions that are judged to present the highest potential for introducing the greatest amount of uncertainty and their effect on non-carcinogenic and carcinogenic risk are discussed in this section.

7.1 SITE CHARACTERIZATION UNCERTAINTIES

Uncertainties in site characterization could introduce uncertainties in information regarding the spatial distribution and identification of all COPCs. The results of the Site investigations are evaluated in the data usability evaluation, and data gaps for selection of COPCs are not identified. The Site characterization targeted appropriate analytical methods and sample locations based on source information for the Site. Conservative methods are used to identify COPCs. Accordingly, there is acceptable confidence that the Site is adequately characterized and that the potential for underestimation of risk due to missed or eliminated COPCs is low.

Exposure may be underestimated if Site data are not representative of the potential exposure points. Site-wide and source area-biased soil data are used as the basis for conservatively predicting EPCs for the COPCs. The results of a comprehensive site investigation are evaluated in the data usability evaluation (Appendix A). Accordingly, there is acceptable confidence that the site is adequately characterized for assessment of current receptors and the potential for underestimation of risk due to non-representativeness of the site data is low.

7.2 UNCERTAINTIES IN THE EXPOSURE ASSESSMENT

Assumptions regarding land use and receptor activities influence the selection of input parameters employed in the exposure assessment (e.g., time spent at a particular location, body weight, age, breathing rate of potential receptors, environmental media contacted by the

receptors). Based on the planned future use of the site, long-term and short-term workers are identified as the potential site receptors for the future commercial land use scenario and associated redevelopment.

In order to minimize uncertainty in the exposure parameter values, the USEPA has developed standard exposure factors that serve to “summarize data on human behaviors and characteristics which affect exposure to environmental chemicals” and to provide “recommended values to use for these factors.” (USEPA, 1997 [Exposure Factors Handbook]). The studies from which the recommended exposure factors are derived were selected by USEPA based on a number of considerations (e.g., peer review, reproducibility, representativeness of the population, data quality, validity) in order to minimize uncertainty in the data and their application in the HHRA. The Exposure Factors Handbook provides key information regarding variability in the parameters within the general population. The document provides upper-bound (e.g., 90th to-95th percentile values) as well as central tendency (e.g., 50th percentile) values for many parameters and, in many cases, full data distributions. Upper-bound reasonable maximum exposure (RME) parameter values were employed in the HHRA. Based on the comprehensive database for exposure factors and the use of RME values, the potential for underestimation of exposure is low (USEPA, 1997, 2002a).

Exposure may be underestimated if the estimated EPCs are underestimated. Conservative methods and assumptions are used to estimate EPCs to ensure that the resulting EPCs are protective of human health. As an added measure of conservatism, the maximum reported concentration is used as the basis for the EPC in addition to the 95% UCL.

As discussed in Section 3.1, a high percentage of the samples reported MS/MSD recoveries at 0 percent. However, this is limited to samples with chemical concentrations that are significantly higher than the MS/MSDs. The USEPA Region IX Quality Assurance Office evaluated the laboratory data and concluded that the inability to quantify percent recoveries for certain analytes (e.g. 4,4'-DDT) was due to sample matrix interferences. The Quality Assurance Office concluded that since all other method QC results were within acceptable ranges, and since many of the other analytes in the samples exhibited acceptable MS/MSD recoveries, the soil data

should be useable for risk assessment purposes (Personal Communication, 2010). In summary, the potential for underestimation of soil EPCs used in the HHRA is low to medium.

7.3 UNCERTAINTIES ASSOCIATED WITH THE TOXICITY CRITERIA

One of the primary sources of uncertainty in any risk assessment is associated with the limited understanding of the toxicity of most chemicals in humans following exposure to low concentrations generally encountered in the environment. The majority of available toxicity data are from high-exposure animal studies, which are then extrapolated, using mathematical models or multiple uncertainty factors, to generate toxicity criteria used to predict what might occur in humans. Sources of conservatism in this process include:

- The use of conservative assumptions and methods to extrapolate from high dose animal studies to predict the possible response in humans at exposure levels far below those administered in animals;
- The assumption that chemicals considered to be carcinogens do not have exposure thresholds (i.e., for all doses greater than zero, some risk is assumed to be present); and
- The fact that epidemiological studies are limited and are not generally considered in a quantitative manner in deriving toxicity values.

The toxicity criteria used in this HHRA (non-carcinogenic and carcinogenic) were developed using different methods that bias the final result toward conservatism. The non-carcinogenic criteria incorporate multiple uncertainty factors to account for limitations in the quality or quantity of available data (e.g. animal data in lieu of human data). These uncertainty factors are applied without regard to available data on the true likelihood of a variation in human response. Therefore, RfDs and RfCs may be hundreds of times smaller than doses that would still be without adverse effects. This purposeful bias in the development of RfDs and RfCs overestimates the actual potential for non-carcinogenic health risks for these chemicals.

Carcinogenic slope factors (SFs) are based on the premise that cancer data from high-dose animal studies will accurately predict cancer response in humans at dose levels thousands of times lower than those considered in the animal studies. The process also assumes for many chemicals that the carcinogenicity of a chemical in an animal model is representative of response rates in humans. Finally, the statistical technique used by regulatory agencies to extrapolate

from animals to humans generally assumes that the dose-response curve is linear in the low dose region and that the 95%UCL of the slope of that line is a reasonable representation of the response in humans. In aggregate, these assumptions overestimate the actual risk estimates such that they are unlikely to be higher, should be considerably lower, and in fact could be non-existent.

Uncertainties are introduced into the toxicity assessment when compounds lack toxicity values. Inhalation RfCs are not available for any of the Site COPCs. For these compounds, the potential for effects from the inhalation pathway have not been quantified.

7.4 UNCERTAINTY ASSOCIATED WITH RISK CHARACTERIZATION

One source of uncertainty that is unique to risk characterization is the assumption that the total risk associated with exposure to multiple chemicals is equal to the sum of the individual risks for each chemical (i.e., the risks are additive). Other possible interactions include synergism, where the total risk is higher than the sum of the individual risks, and antagonism, where the total risk is lower than the sum of the individual risks. Relatively little data are available regarding potential chemical interactions following environmental exposure to chemical mixtures. Some studies have been performed on rodents given simultaneous doses of multiple chemicals. The results of these studies indicate that no interactive effects were observed for mixtures of chemicals affecting different target organs (i.e., each chemical acted independently), whereas antagonism was observed for mixtures of chemicals affecting the same target organ, but by different mechanisms (Risk Commission, 1997).

While there are no data on chemical interaction in humans to chemical mixtures at the dose levels typically observed in environmental exposures, animal studies suggest that synergistic effects will not occur at levels of exposure below each chemical's individual effects level. As exposure levels approach individual effects levels, a variety of interactions may occur, and these may be additive, synergistic, or antagonistic (Seed et al., 1995).

Current USEPA guidance for risk assessment of chemical mixtures recommends assuming an additive effect following exposure to multiple chemicals (USEPA, 1989). Subsequent

recommendations by other parties, such as the National Academy of Science and the Presidential/Congressional Commission on Risk Assessment and Risk Management, have advocated a default assumption of additivity (NAS, 1988; Risk Commission, 1997). As currently practiced, risk assessments of chemical mixtures generally sum cancer risks regardless of tumor type, and sum non-cancer hazard indices regardless of toxic end-point or mode of action. Given the available experimental data, this approach likely overestimates potential risks associated with simultaneous exposure to multiple chemicals.

7.5 CONCLUSION OF UNCERTAINTY ANALYSIS

Overall, these assumptions contribute to the overall uncertainty in the development of risk estimates at this Site. However, since the largest sources of uncertainty generally result in overestimates of exposure and risk, it is believed that results presented in this document provide conservative estimates of exposure and risk.

8.0 CONCLUSIONS

The goal of this baseline HHRA is to quantitatively evaluate the potential human health risks associated with theoretical exposures to chemicals in soil at the Ecology Control Industries, Inc. (ECI), property, including: 4,4'-dichlorodiphenyltrichloroethane (DDT), 4,4'-dichlorodiphenyldichloroethene (DDE), 4,4'-dichlorodiphenyldichloroethane (DDD), petroleum hydrocarbons, and PCBs.

This report relies upon the data collected at the site (Earth Tech, Inc., 2000, and others as noted) to quantify potential health risks for future on-site populations including adult industrial and construction workers and adult and child residents. Exposure pathways addressed for these populations included soil ingestion, dermal contact, and particulate inhalation for soil from 0 to 2 feet bgs (residential and industrial worker scenarios), 0 to 5 feet bgs (residential scenario), and 0 to 16 feet bgs (residential and construction worker scenarios). Two exposure point concentrations were used for each of these evaluations, i.e., the maximum detected concentration and the 95% upper confidence limit.

Cumulative risks are compared to a risk management range of one in 1 million (10^{-6} or $1E-06$) to one in 10,000 (10^{-4} or $1E-04$) (EPA, 2004c). Risk estimates within or exceeding this range (that is, greater than 10^{-6}) could potentially require a risk management decision that includes evaluating site-specific characteristics and exposure scenario factors to assess whether remedial action is warranted. When the HI (the ratio of chemical intake to the RfD) is greater than 1, there may be concern for potential non-cancer health effects associated with exposure to the chemicals of concern (EPA, 1989).

The results of this HHRA, as summarized in Section 6.3, demonstrate that estimates of potential cancer risk increase with soil depths. For the future residents, the additional likelihood of cancer risk caused by exposure to Site chemicals at levels above naturally occurring chemical concentrations increases with exposures to deeper depths. Potential exposures of a future resident to the highest chemical concentrations in the soil interval from 0 to 2 feet bgs have an

associated increased cancer risk of 2 in 100,000 (2×10^{-5}), whereas exposures to soil extending to 5 feet and 16 feet bgs have associated increased cancer risks of 6 in 100,000 (6×10^{-5}) and 3 in 10,000 (3×10^{-4}), respectively. When exposures are evaluated based on the 95% UCL of chemical concentrations in soil, the risk estimates are lower, but a similar trend is observed, with risk increasing with depth. The estimated increased cancer risks due to exposures to soil from 0 to 2 feet bgs and 0 to 5 feet bgs are 6×10^{-6} and 5×10^{-6} , respectively, while exposures to soils at 0 to 16 feet bgs have an associated cancer risk of 1×10^{-5} .

Under future commercial/industrial use of the Site, the increased likelihood of cancer risk to the future industrial worker is 7 in 1,000,000 (7×10^{-6}) when based on the highest chemical concentrations in soil to a maximum depth of two feet bgs. This risk estimate is reduced to 2 in 1,000,000 (2×10^{-6}) when exposure is based on the 95%UCL of chemical concentrations in soil at two feet bgs.

Potential exposures of a future construction worker to the highest chemical concentrations in soil to a maximum depth of 16 feet bgs result in an increased cancer risk estimate of 2 in 100,000 (2×10^{-5}). However, for potential exposures based on the 95%UCL of chemical concentrations in soil to a depth of 16 feet bgs, the risk estimate is significantly reduced to 6 in 10 million (6×10^{-7}), which is lower than the lowest acceptable range of 1 in 1 million.

Results of evaluation of health effects other than cancer demonstrate that the total hazard to a future resident increases with soil depth and exceed the threshold level of 1 when the maximum concentrations are applied. However, when the 95%UCLs of chemical concentrations in soil are applied, the total hazard indices are all below the threshold level of 1 for all depths. Total hazard indices attributed to potential exposures of the industrial and construction workers to soils at maximum depths of two feet bgs and 16 feet bgs, respectively, are also below the threshold level of 1.

Results of the risk assessment demonstrate that the increased likelihood of cancer risk over a lifetime is due primarily to 4,4'-DDT. Although residential reuse of the Site would pose the highest estimated cancer risk, the increased likelihood of cancer risk is within EPA's risk

management range one in 1 million (10^{-6} or $1E-06$) to one in 10,000 (10^{-4} or $1E-04$) (EPA, 2004c) if residents are not exposed to soil deeper than 16 feet bgs. If the Site will remain an industrial facility, potential exposures of industrial workers are within the risk management range. The increased likelihood of cancer risk to construction workers is also within the risk management range if they are exposed to soils within the 0-to-16-foot depth interval. In the case of a construction worker, the risk assessment assumes that excavation and/or redevelopment activities will take place over a period of one year. In the event that these activities were for a shorter duration, the estimated cancer risk would decrease correspondingly.

The risk assessment also acknowledges that TPH still remains at the Site and that TPH is a chemical of concern that needs further characterization prior to Site redevelopment.

8.1 EGG RISK EVALUATION

An average adult in the U.S. consumes 2 eggs per week and a child consumes 1.3 eggs per week (EPA, 1997a). Based on the data collected for the Kenwood risk assessment, this level of consumption would not result in significant risks to residents eating home-produced eggs containing concentrations of DDT up to the maximum total DDT (1.1 mg/kg) detected in the Phase 1 and 2 egg samples. However, two of the four egg samples used in the Kenwood risk assessment were above the Food and Drug Administration (FDA) action level of 0.5 mg/kg for eggs (FDA, 2000).

8.2 HOMEGROWN PRODUCE EVALUATION

Analytical results for homegrown produce showed radishes grown in control (uncontaminated soil) had positive detections of DDD, DDE, and DDT at concentrations similar to radishes grown in test soils from the Kenwood area. Total DDT was found in all the radish samples at levels between 0.000360 and 0.00380 mg/kg. The FDA action level for total DDT in radishes is 0.2 mg/kg (FDA, 1998). Thus, none of the radishes analyzed had total DDT concentrations above the FDA action level.

8.3 BACKGROUND EVALUATION

Based on the data collected for the Kenwood risk assessment, the adult and child resident cancer risk for background levels of total DDT in surface soil samples (0 to 0.5 feet bgs) is 2E-06.

The cumulative non-cancer hazard HI is significantly less than 1.

9.0 REFERENCES

Agency for Toxic Substances and Disease Registry (ATSDR), 1994. *Toxicological Profile for 4,4'-DDT, 4,4'-DDE, 4,4'-DDD*. U.S. Public Health Service, U.S. Department of Health and Human Services. May.

ATSDR, 2000a. *Toxicological Profile Update for DDT/DDE/DDD*. Draft for Public Comment. September.

ATSDR, 2000b. *Toxicological Profile for Polychlorinated Biphenyls (PCBs)*. U.S. Public Health Service, U.S. Department of Health and Human Services. November.

ATSDR, 2002. *Toxicological Profile for Aldrin/Dieldrin*. U.S. Public Health Service, U.S. Department of Health and Human Services. September.

ATSDR, 2007. *Toxicological Profile for Heptachlor and Heptachlor Epoxide*. U.S. Public Health Service, U.S. Department of Health and Human Services. August.

Barrows, A. G. 1974. A Review of the Geology and Earthquake History of the Newport-Inglewood Structural Zone, Southern California: California Division of Mines and Geology Special Report 114. Sacramento, CA.

California Department of Water Resources (CDWR), 1961. Planned Utilization of the Ground Water Basins of the Coastal Plain of Los Angeles County, Appendix A: Ground Water Geology. Bulletin 104.

CH2MHill, 2008. *Human Health Risk Assessment for Residential Properties, Historical Stormwater Pathway – South, Montrose Chemical Superfund Site, Los Angeles County, CA*. EPA Contract No. 68-W-98-225, EPA Work Assignment No. 233-RICO-0926.

Earth Tech, Inc., 2008. *Revised Soil Investigation Report, Historic Storm Water Pathway – South, Ecology Control Industries Property, 20846 South Normandie Avenue, Torrance, California 90502*. June 20.

Ecology Control Industries (ECI), 2005. Response to June 14 and 24, 2005, EPA 104E Letters Requesting Additional Site Investigation Information for Ecology Control Industries Property, 20846 Normandie Avenue, Torrance California. Prepared by Haley & Aldrich, Inc. for Ecology Control Industries. July.

Food and Drug Administration, 2000. *Guidance for Industry: Action Levels for Poisonous or Deleterious Substances in Human Food and Animal Feed*.

Harding Lawson Associates (HLA), 2001. Appendix K, Montrose Risk Assessment. April 20.

National Academy of Sciences (NAS), 1983. *Risk Assessment in the Federal Government: Managing the Process*. Washington, DC: National Academy of Sciences.

Personal Communication, 2010. E-mail from M. Mezquita, USEPA Region 9 to M. Work, USEPA Region 9. January 13.

Poland, J. F., Piper, A.M., et al., 1956. *Ground-water Geology of the Coastal Zone Long Beach–Santa Ana Area, California*. U.S. Geological Survey Water Supply Paper 1109.

U.S. Environmental Protection Agency (USEPA), 1989. *Risk Assessment Guidance for Superfund, Vol. I, Human Health Evaluation Manual (Part A)*. Office of Emergency and Remedial Response, December. <http://www.epa.gov/oswer/riskassessment/ragsa/index.htm>

U.S. Environmental Protection Agency (USEPA), 1991. *Human Health Evaluation Manual, Supplemental Guidance: “Standard Default Exposure Factors.”* OSWER Directive 9285.6-03. Office of Emergency and Remedial Response. March 25.

U.S. Environmental Protection Agency (USEPA), 1992a. *Guidance for Data Usability in Risk Assessment (Part A)*. Final, Office of Emergency and Remedial Response. April. <http://www.epa.gov/oswer/riskassessment/datause/parta.htm>

U.S. Environmental Protection Agency (USEPA), 1992b. *Guidance for Data Usability in Risk Assessment (Part B)*. Final, Office of Emergency and Remedial Response. May. <http://www.epa.gov/oswer/riskassessment/datause/partb.htm>

U.S. Environmental Protection Agency (USEPA), 1992c. *Supplemental Guidance to RAGS: Calculating the Concentration Term*. OSWER PB92-9633-73. May.

U.S. Environmental Protection Agency (USEPA), 1997. *Exposure Factors Handbook, Vol. I-III*. Office of Research and Development, EPA/600/P-95/002Fa. August. <http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=12464&CFID=1397947&CFTOKEN=85996170>

U.S. Environmental Protection Agency (USEPA), Region 9, 1998. *Final Remedial Investigation Report for the Montrose Superfund Site, Los Angeles, California*. May 18.

U.S. Environmental Protection Agency (USEPA), 2001. *Risk Assessment Guidance for Superfund: Volume I, Human Health Evaluation Manual (Part D, Standardized Planning, Reporting, and Review of Superfund Risk Assessments)*. Office of Emergency and Remedial

Response, Publication 9285.7-01D. January.

<http://www.epa.gov/oswer/riskassessment/ragsd/index.htm>

U.S. Environmental Protection Agency (USEPA), 2002a. *Calculating Upper Confidence Limits for Exposure Point Concentrations at Hazardous Waste Sites*. Office of Emergency and Remedial Response. OSWER Directive 9285.6-10. Washington, DC.

U.S. Environmental Protection Agency (USEPA), 2002b. *Supplemental Guidance for Developing Soil Screening Levels for Superfund Sites*. Office of Solid Waste and Emergency Response. December. <http://www.epa.gov/superfund/resources/soil/index.htm>

U.S. Environmental Protection Agency (USEPA), 2004a. *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment)*. Office of Superfund Remediation and Technology Innovation, EPA/540/R/99/005. <http://www.epa.gov/oswer/riskassessment/ragse/index.htm>

U.S. Environmental Protection Agency (USEPA), 2004b. *User's Guide and Background Technical Document for USEPA Region 9's Preliminary Remediation Goals Tables*. Web site: <http://www.epa.gov/region09/waste/sfund/prg/files/04usersguide.pdf>

U.S. Environmental Protection Agency (USEPA), 2009a. *Risk Assessment Guidance for Superfund, Volume I: Human Health Evaluation Manual (Part F, Supplemental Guidance for Inhalation Risk Assessment)*. Office of Superfund Remediation and Technology Innovation, EPA-540-R-070-002. <http://www.epa.gov/oswer/riskassessment/ragsf/index.htm>

U.S. Environmental Protection Agency (USEPA), Region 9, 2009b. *Regional Screening Levels*. . <http://www.epa.gov/region09/superfund/prg/index.html>

U.S. Environmental Protection Agency (USEPA), 2009c. *Integrated Risk Information System*. <http://www.epa.gov/iris/>

U.S. Environmental Protection Agency (USEPA), 2009d. *ProUCL Version 4.00.04 User Guide (Draft)*. Office of Research and Development, EPA/600/R-07/038. http://www.epa.gov/esd/tsc/TSC_form.htm

U.S. Environmental Protection Agency (USEPA), 2009e. *ProUCL Version 4.00.04 Technical Guide (Draft)*. Office of Research and Development. EPA/600/R-07/041. http://www.epa.gov/esd/tsc/TSC_form.htm

U.S. Environmental Protection Agency (USEPA), 2010. *Integrated Risk Information System*. <http://www.epa.gov/iris/>

U.S. Food and Drug Administration (FDA), 1998. *Action Levels for Poisonous or Deleterious Substances in Human Feed and Animal Feed.*

<http://www.fda.gov/Food/GuidanceComplianceRegulatoryInformation/GuidanceDocuments/ChemicalChemicalsandPesticides/ucm077969.htm#ddt>

TABLES

Table 3-1
 OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
 Montrose Chemical Superfund Site - ECI Property

Scenario Timeframe:	Future
Medium:	Soil
Exposure Medium:	Soil, 0-2 ft bgs

Exposure Point	CAS Number	Chemical	Number of Samples	Number of Detections	Minimum Concentration	Maximum Concentration	95% UCL	Units	Concentration Used for Screening	Location of Maximum Concentration	Detection Frequency	Range of Detection Limits ^a	Concentration Used for Screening	Background Value	USEPA RSL Screening Value ^c	Potential ARAR/TBC Value	COPC Flag (Y/N)	Rationale for Selection or Deletion ^b	
0 - 2 ft bgs	53-19-0	2,4'-DDD	150	118	0.00079	1.9	0.118	mg/kg	Maximum	P37-0.5	79%	0.0034 - 0.8	Maximum	NA	2.00E+00	NA	N	Max<RSL	
	72-54-8	4,4'-DDD	144	133	0.0016	9.1	0.59	mg/kg	Maximum	P37-0.5	92%	0.0034 - 0.8	Maximum	NA	2.00E+00	NA	Y	Max>RSL	
	3424-82-6	2,4'-DDE	148	21	0.0027	0.39	0.02	mg/kg	Maximum	P37-0.5	14%	0.0034 - 0.8	Maximum	NA	1.40E+00	NA	N	Max<RSL	
	72-55-9	4,4'-DDE	151	151	0.0024	1.5	0.27	mg/kg	Maximum	P47-0.5	100%	0.0034 - 0.8	Maximum	NA	1.40E+00	NA	Y	Max>RSL	
	79-02-6	2,4'-DDT	141	118	0.0016	1.6	0.15	mg/kg	Maximum	P37-0.5	84%	0.0035 - 0.8	Maximum	NA	1.70E+00	NA	N	Max<RSL	
	50-29-3	4,4'-DDT	148	147	0.0044	18	1.16	mg/kg	Maximum	P37-0.5	99%	0.0035 - 0.8	Maximum	NA	1.70E+00	NA	Y	Max>RSL	
	319-84-6	alpha-BHC	152	0	<0.039	0	NC	mg/kg	Maximum	P14-0	0	0.0017 - 0.4	Maximum	NA	7.70E-02	NA	N	ND	
	319-85-7	beta-BHC	152	3	0.0026	0.013	NC	mg/kg	Maximum	P14-0	2%	0.0017 - 0.4	Maximum	NA	2.70E-01	NA	N	Max<RSL	
	319-86-8	delta-BHC	152	0	<0.0017	0	NC	mg/kg	Maximum	P38-0	0%	0.0017 - 0.4	Maximum	NA	7.70E-02	i	NA	ND	
	58-89-9	gamma-BHC	152	1	0.00082	0.00082	NC	mg/kg	Maximum	P14-0	1%	0.0017 - 0.4	Maximum	NA	5.20E-01	NA	N	Max<RSL	
	5103-71-9	alpha-Chlordane	152	100	0.0007	0.78	0.08	mg/kg	Maximum	P106-0	66%	0.0017 - 0.4	Maximum	NA	1.60E+00	d	NA	N	Max<RSL
	5103-74-2	gamma-Chlordane	152	116	0.0013	0.63	0.08	mg/kg	Maximum	P05-0	76%	0.0017 - 0.4	Maximum	NA	1.60E+00	d	NA	N	Max<RSL
	60-57-1	Dieldrin	152	81	0.0013	0.045	0.01	mg/kg	Maximum	P106-0	53%	0.0034 - 0.8	Maximum	NA	3.00E-02	NA	Y	Max>RSL	
	959-98-8	Alpha-endosulfan	151	1	0.0051	0.0051	NC	mg/kg	Maximum	P111-0.5	1%	0.0017 - 0.4	Maximum	NA	3.70E+02	e	NA	N	Max<RSL
	33213-65-9	Beta-endosulfan	151	0	<0.0034	0	NC	mg/kg	Maximum	P37-0	0%	0.0034 - 0.8	Maximum	NA	3.70E+02	e	NA	N	ND
	1031-07-8	Endosulfan sulfate	151	1	0.0018	0.0018	NC	mg/kg	Maximum	P10-0	1%	0.0034 - 0.8	Maximum	NA	3.70E+02	e	NA	N	Max<RSL
	309-00-2	Aldrin	152	10	0.00031	0.0021	0.00096	mg/kg	Maximum	P18-0	7%	0.0017 - 0.4	Maximum	NA	2.90E-02	e	NA	N	Max<RSL
	72-20-8	Endrin	151	0	<0.0034	0	NC	mg/kg	Maximum	P37-0	0%	0.0034 - 0.8	Maximum	NA	1.80E+01	NA	NA	N	ND
	7421-93-4	Endrin aldehyde	151	5	0.00022	0.0035	NC	mg/kg	Maximum	P18-0	3%	0.0034 - 0.8	Maximum	NA	1.80E+01	f	NA	N	Max<RSL
	53494-70-5	Endrin ketone	148	3	0.0051	0.0063	NC	mg/kg	Maximum	P01-0	2%	0.0035 - 0.8	Maximum	NA	1.80E+01	f	NA	N	Max<RSL
	8001-35-2	Toxaphene	144	0	<0.07	0	NC	mg/kg	Maximum	P37-0	0%	0.07 - 16	Maximum	NA	4.40E-01	NA	NA	N	ND
	76-44-8	Heptachlor	151	56	0.00039	0.047	0.007	mg/kg	Maximum	P106-0	37%	0.0017 - 0.4	Maximum	NA	1.10E-01	NA	N	Max<RSL	
	1024-57-3	Heptachlor epoxide	153	59	0.00051	0.068	0.067	mg/kg	Maximum	P106-0	39%	0.0017 - 0.4	Maximum	NA	1.10E-01	g	NA	N	Max<RSL
	72-43-5	Methoxychlor	148	1	0.019	0.019	NC	mg/kg	Maximum	P39-0	1%	0.018 - 4	Maximum	NA	3.10E+02	NA	N	Max<RSL	
	12674-11-2	Aroclor 1016	89	0	<0.033	0	NC	mg/kg	Maximum	P106-0	0%	0.033 - 1.7	Maximum	NA	2.20E-01	h	NA	N	ND
	11104-28-2	Aroclor 1221	89	0	<0.033	0	NC	mg/kg	Maximum	P05-0	0%	0.033 - 1.7	Maximum	NA	2.20E-01	h	NA	N	ND
	11141-16-5	Aroclor 1232	89	0	<0.033	0	NC	mg/kg	Maximum	P106-0	0%	0.033 - 1.7	Maximum	NA	2.20E-01	h	NA	N	ND
	53469-21-9	Aroclor 1242	89	0	<0.033	0	NC	mg/kg	Maximum	P05-0	0%	0.033 - 1.7	Maximum	NA	2.20E-01	h	NA	N	ND
	12672-29-6	Aroclor 1248	89	0	<0.033	0	NC	mg/kg	Maximum	P05-0	0%	0.033 - 1.7	Maximum	NA	2.20E-01	h	NA	N	ND
	11097-69-1	Aroclor 1254	89	2	0.079	0.51	NC	mg/kg	Maximum	P35-0.5	2%	0.033 - 1.7	Maximum	NA	2.20E-01	h	NA	Y	Max>RSL
	11096-82-5	Aroclor 1260	89	7	0.01	0.06	0.026	mg/kg	Maximum	P25-0.5	8%	0.033 - 1.7	Maximum	NA	2.20E-01	h	NA	N	Max<RSL

a Range of reporting limits is for non-detected samples results only.
 b Maximum detected concentration does not exceed the Residential RSL (concentration used for screening).
 c Screening Toxicity Value is the Residential RSL (USEPA, 2009).
 d RSL for chlordane used.
 e RSL for endosulfan used.
 f RSL for endrin used.
 g RSL for heptachlor used.
 h High risk RSL for Aroclor 1260 used to represent Total Aroclors.
 i RSL for alpha-BHC used.
 NA Not applicable.
 ND Not detected.
 NC Not calculated due to insufficient number of detections.

Table 3-2
 OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
 Montrose Chemical Superfund Site - ECI Property

Scenario Timeframe:	Future
Medium:	Soil
Exposure Medium:	Soil, 0-5 ft bgs

Exposure Point	CAS Number	Chemical	Number of Samples	Number of Detections	Minimum Concentration	Maximum Concentration	95% UCL	Units	Location of Maximum Concentration	Detection Frequency	Range of Reporting Limits ^a	Concentration Used for Screening	Background Value	USEPA RSL Screening Value ^c	Potential ARAR/TBC Value	COPC Flag (Y/N)	Rationale for Selection or Deletion ^b	
0 - 5 ft bgs	53-19-0	2,4'-DDD	226	187	0.00079	4.4	0.37	mg/kg	P37-2	82.7%	0.0034 - 1.9	Maximum		2.00E+00	NA	Y	Max>RSL	
	72-54-8	4,4'-DDD	219	208	0.0016	18	1	mg/kg	P37-2	95.0%	0.0034 - 1.9	Maximum	NA	2.00E+00	NA	Y	Max>RSL	
	3424-82-6	2,4'-DDE	222	51	0.002	0.82	0.0375	mg/kg	P37-2	23.0%	0.0034 - 1.9	Maximum	NA	1.40E+00	NA	N	Max<RSL	
	72-55-9	4,4'-DDE	227	227	0.00085	3.8	0.465	mg/kg	P37-2	100.0%	0.0034 - 1.9	Maximum	NA	1.40E+00	NA	Y	Max>RSL	
	79-02-6	2,4'-DDT	213	182	0.0016	11	0.736	mg/kg	P37-2	85.4%	0.0035 - 1.9	Maximum	NA	1.70E+00	NA	Y	Max>RSL	
	50-29-3	4,4'-DDT	224	223	0.0025	60	0.736	mg/kg	P37-2	99.6%	0.0035 - 1.9	Maximum	NA	1.70E+00	NA	Y	Max>RSL	
	319-84-6	alpha-BHC	228	1	0.039	0.039	NC	mg/kg	P14-0	0.4%	0.0017 - 0.97	Maximum	NA	7.70E-02	NA	N	Max<RSL	
	319-85-7	beta-BHC	228	3	0.0026	0.013	NC	mg/kg	P14-0	1.3%	0.0017 - 0.97	Maximum	NA	2.70E-01	NA	N	Max<RSL	
	319-86-8	delta-BHC	228	0	<0.0017	0	NC	mg/kg	NA	0.0%	0.0017 - 0.97	Maximum	NA	7.70E-02	NA	N	ND	
	58-89-9	gamma-BHC	228	1	0.00082	0.00082	NC	mg/kg	P14-0	0.4%	0.0017 - 0.97	Maximum	NA	5.20E-01	NA	N	Max<RSL	
	5103-71-9	alpha-Chlordane	228	138	0.00042	0.78	0.067	mg/kg	P106-0	60.5%	0.0017 - 0.97	Maximum	NA	1.60E+00	d	NA	N	Max<RSL
	5103-74-2	gamma-Chlordane	228	165	0.00054	0.63	0.07	mg/kg	P05-0	72.4%	0.0017 - 0.97	Maximum	NA	1.60E+00	d	NA	N	Max<RSL
	60-57-1	Dieldrin	228	108	0.0013	0.045	0.01	mg/kg	P106-0	47.4%	0.0034 - 1.9	Maximum	NA	3.00E-02		NA	Y	Max>RSL
	959-98-8	Alpha-Endosulfan	227	1	0.0051	0.0051	NC	mg/kg	P111-0.5	0.4%	0.0017 - 0.97	Maximum	NA	3.70E+02	e	NA	N	Max<RSL
	33213-65-9	Beta-Endosulfan	227	1	0.0034	0.0034	NC	mg/kg	P15-2	0.4%	0.0034 - 1.9	Maximum	NA	3.70E+02	e	NA	N	Max<RSL
	1031-07-8	Endosulfan Sulfate	227	2	0.00084	0.0018	NC	mg/kg	P10-0	0.9%	0.0034 - 1.9	Maximum	NA	3.70E+02	e	NA	N	Max<RSL
	309-00-2	Aldrin	228	10	0.00031	0.0021	0.001	mg/kg	P18-0	4.4%	0.0017 - 0.97	Maximum	NA	2.90E-02		NA	N	Max<RSL
	72-20-8	Endrin	227	0	<0.0034	0	NC	mg/kg	NA	0.0%	0.0034 - 1.9	Maximum	NA	1.80E+01		NA	N	ND
	7421-93-4	Endrin aldehyde	227	8	0.00022	1.9	0.225	mg/kg	P04-0.5	3.5%	0.0035 - 1.9	Maximum	NA	1.80E+01	f	NA	N	Max<RSL
	53494-70-5	Endrin ketone	224	4	0.0051	0.033	NC	mg/kg	P03-2	1.8%	0.0035 - 1.9	Maximum	NA	1.80E+01	f	NA	N	Max<RSL
	8001-35-2	Toxaphene	218	0	<0.07	0	NC	mg/kg	NA	0.0%	0.07 - 38	Maximum	NA	4.40E-01		NA	N	ND
	76-44-8	Heptachlor	228	70	0.00039	0.15	0.008	mg/kg	P11-2	30.7%	0.0017 - 0.97	Maximum	NA	1.10E-01		NA	Y	Max>RSL
	1024-57-3	Heptachlor epoxide	228	70	0.00051	0.068	0.006	mg/kg	P106-0	30.7%	0.0017 - 0.97	Maximum	NA	1.10E-01	g	NA	N	Max<RSL
	72-43-5	Methoxychlor	224	1	0.019	0.019	NC	mg/kg	P39-0	0.4%	0.018 - 9.7	Maximum	NA	3.10E+02		NA	N	Max<RSL
	12674-11-2	Aroclor 1016	135	0	<0.033	0	NC	mg/kg	NA	0.0%	0.033 - 1.8	Maximum	NA	2.20E-01	h	NA	N	ND
	11104-28-2	Aroclor 1221	135	0	<0.033	0	NC	mg/kg	NA	0.0%	0.033 - 1.8	Maximum	NA	2.20E-01	h	NA	N	ND
	11141-16-5	Aroclor 1232	135	0	<0.033	0	NC	mg/kg	NA	0.0%	0.033 - 1.8	Maximum	NA	2.20E-01	h	NA	N	ND
	53469-21-9	Aroclor 1242	135	0	<0.033	0	NC	mg/kg	NA	0.0%	0.033 - 1.8	Maximum	NA	2.20E-01	h	NA	N	ND
	12672-29-6	Aroclor 1248	135	0	<0.033	0	NC	mg/kg	NA	0.0%	0.033 - 1.8	Maximum	NA	2.20E-01	h	NA	N	ND
	11097-69-1	Aroclor 1254	135	3	0.079	0.51	NC	mg/kg	P35-0.5	2.2%	0.033 - 1.8	Maximum	NA	2.20E-01	h	NA	Y	Max>RSL
	11096-82-5	Aroclor 1260	135	10	0.01	0.067	0.02	mg/kg	P13-2	7.4%	0.033 - 1.8	Maximum	NA	2.20E-01	h	NA	N	Max<RSL

a Range of reporting limits is for non-detected samples results only.

b Maximum detected concentration does not exceed the Residential RSL (concentration used for screening).

c Screening Toxicity Value is the Residential RSL (USEPA, 2009).

d RSL for chlordane used.

e RSL for endosulfan used.

f RSL for endrin used.

g RSL for heptachlor used.

h High risk RSL for Aroclor 1260 used to represent Total Aroclors.

i RSL for alpha-BHC used.

NA Not applicable.

ND Not detected.

NC Not calculated due to insufficient number of detections.

Table 3-3
 OCCURRENCE, DISTRIBUTION, AND SELECTION OF CHEMICALS OF POTENTIAL CONCERN
 Montrose Chemical Superfund Site - ECI Property

Scenario Timeframe:	Future
Medium:	Soil
Exposure Medium:	Soil, 0-16 ft bgs

Exposure Point	CAS Number	Chemical	Number of Samples	Number of Detections	Minimum Concentration	Maximum Concentration	95% UCL	Units	Location of Maximum Concentration	Detection Frequency	Range of Reporting Limits ^a	Concentration Used for Screening	Background Value	USEPA RSL Screening Value ^c	Potential ARAR/TBC Value	COPC Flag (Y/N)	Rationale for Selection or Deletion ^b	
0 - 16 ft bgs	53-19-0	2,4'-DDD	493	424	0.00079	18	0.74	mg/kg	P48-12	86%	0.0034 - 20	Maximum	NA	2.00E+00	NA	Y	Max>RSL	
	72-54-8	4,4'-DDD	482	468	0.00042	55	2.2	mg/kg	P48-12	97%	0.0034 - 20	Maximum	NA	2.00E+00	NA	Y	Max>RSL	
	3424-82-6	2,4'-DDE	487	130	0.002	1.3	0.07	mg/kg	P11-12	27%	0.0034 - 20	Maximum	NA	1.40E+00	NA	N	Max<RSL	
	72-55-9	4,4'-DDE	497	493	0.0003	6.5	0.66	mg/kg	P15-12	99%	0.0034 - 20	Maximum	NA	1.40E+00	NA	Y	Max>RSL	
	79-02-6	2,4'-DDT	467	380	0.0016	34	1.18	mg/kg	P11-12	81%	0.0035 - 20	Maximum	NA	1.70E+00	NA	Y	Max>RSL	
	50-29-3	4,4'-DDT	488	485	0.00065	170	6.3	mg/kg	P11-12	99%	0.0035 - 20	Maximum	NA	1.70E+00	NA	Y	Max>RSL	
	319-84-6	alpha-BHC	515	2	0.0034	0.039	NC	mg/kg	P14-0	0.4%	0.0017 - 10	Maximum	NA	7.70E-02	NA	N	Max<RSL	
	319-85-7	beta-BHC	515	15	0.00077	0.45	0.007	mg/kg	P48-12	3%	0.0017 - 10	Maximum	NA	2.70E-01	NA	Y	Max>RSL	
	319-86-8	delta-BHC	515	4	0.005	0.19	NC	mg/kg	P48-12	1%	0.0017 - 10	Maximum	NA	7.70E-02	i	NA	Y	Max>RSL
	58-89-9	gamma-BHC	515	4	0.00082	0.25	NC	mg/kg	P48-12	1%	0.0017 - 10	Maximum	NA	5.20E-01	NA	N	Max<RSL	
	5103-71-9	alpha-Chlordane	515	236	0.00036	0.78	0.05	mg/kg	P106-0	46%	0.0017 - 10	Maximum	NA	1.60E+00	d	NA	N	Max<RSL
	5103-74-2	gamma-Chlordane	515	289	0.00027	0.63	0.05	mg/kg	P05-0	56%	0.0017 - 10	Maximum	NA	1.60E+00	d	NA	N	Max<RSL
	60-57-1	Dieldrin	515	183	0.00088	1.8	0.03	mg/kg	P17-8	36%	0.0034 - 20	Maximum	NA	3.00E-02	NA	Y	Max>RSL	
	959-98-8	alpha-endosulfan	497	6	0.0011	0.0076	0.002	mg/kg	P148-8	1%	0.0017 - 10	Maximum	NA	3.70E+02	e	NA	N	Max<RSL
	33213-65-9	beta-endosulfan	497	1	0.0034	0.0034	NC	mg/kg	P15-2	0.2%	0.0034 - 20	Maximum	NA	3.70E+02	e	NA	N	Max<RSL
	1031-07-8	Endosulfan sulfate	497	10	0.00084	0.024	0.006	mg/kg	P26-5	2%	0.0034 - 20	Maximum	NA	3.70E+02	e	NA	N	Max<RSL
	309-00-2	Aldrin	515	16	0.00031	0.058	0.0016	mg/kg	P17-8	3%	0.0017 - 10	Maximum	NA	2.90E-02	NA	Y	Max>RSL	
	72-20-8	Endrin	497	1	0.073	0.073	NC	mg/kg	P24-8	0.2%	0.0034 - 20	Maximum	NA	1.80E+01	NA	N	Max<RSL	
	7421-93-4	Endrin aldehyde	497	18	0.00022	0.036	0.004	mg/kg	P04-0.5	4%	0.0034 - 20	Maximum	NA	1.80E+01	f	NA	N	Max<RSL
	53494-70-5	Endrin ketone	487	7	0.0033	0.033	NC	mg/kg	P03-2	1%	0.0035 - 20	Maximum	NA	1.80E+01	f	NA	N	Max<RSL
	8001-35-2	Toxaphene	468	0	0	0	NC	mg/kg	NA	0	0.07 - 400	Maximum	NA	4.40E-01	NA	N	ND	
	76-44-8	Heptachlor	515	96	0.00039	10	0.36	mg/kg	P11-2	19%	0.0017 - 10	Maximum	NA	1.10E-01	NA	Y	Max>RSL	
	1024-57-3	Heptachlor epoxide	514	110	0.00046	0.12	0.007	mg/kg	P12-12	21%	0.0017 - 10	Maximum	NA	1.10E-01	g	NA	Y	Max>RSL
	72-43-5	Methoxychlor	486	2	0.003	0.019	NC	mg/kg	P39-0	0.4%	0.018 - 100	Maximum	NA	3.10E+02	NA	N	Max<RSL	
	12674-11-2	Aroclor 1016	285	0	0	0	NC	mg/kg	NA	0%	0.033 - 7.6	Maximum	NA	2.20E-01	h	NA	N	ND
	11104-28-2	Aroclor 1221	285	0	0	0	NC	mg/kg	NA	0%	0.033 - 7.6	Maximum	NA	2.20E-01	h	NA	N	ND
	11141-16-5	Aroclor 1232	285	0	0	0	NC	mg/kg	NA	0%	0.033 - 7.6	Maximum	NA	2.20E-01	h	NA	N	ND
	53469-21-9	Aroclor 1242	285	0	0	0	NC	mg/kg	NA	0%	0.033 - 7.6	Maximum	NA	2.20E-01	h	NA	N	ND
	12672-29-6	Aroclor 1248	285	0	0	0	NC	mg/kg	NA	0%	0.033 - 7.6	Maximum	NA	2.20E-01	h	NA	N	Max<RSL
	11097-69-1	Aroclor 1254	285	11	0.079	5.2	0.17	mg/kg	P32-8	4%	0.033 - 7.6	Maximum	NA	2.20E-01	h	NA	Y	Max>RSL
	11096-82-5	Aroclor 1260	285	17	0.01	0.59	0.03	mg/kg	P16-8	6%	0.033 - 7.6	Maximum	NA	2.20E-01	h	NA	Y	Max>RSL

a Range of detection limits is for non-detected samples results only.

b Maximum detected concentration does not exceed 1/10th of the Residential RSL (concentration used for screening).

c Screening Toxicity Value is 1/10th of the risk-based media concentration (Residential RSL: USEPA, 2009).

d RSL for chlordane used.

e RSL for endosulfan used.

f RSL for endrin used.

g RSL for heptachlor used.

h High risk RSL for Aroclor 1260 used to represent Total Aroclors.

NA Not applicable.

ND Not detected.

NC Not calculated due to insufficient number of detections.

**Table 4-1
IDENTIFICATION OF COMPLETE EXPOSURE PATHWAYS
Montrose Chemical Superfund Site - ECI Property**

Scenario Timeframe	Medium	Exposure Medium	Exposure Point	Receptor Population	Receptor Age	Exposure Route	Type of Analysis	Rationale for Selection or Exclusion of Exposure Pathway
Future	Soil	Soil	0 - 2 ft bgs	Residents	Adult	Ingestion	Quantitative	Storm water pathway
						Dermal	Quantitative	Storm water pathway
						Inhalation	Quantitative	Storm water pathway
					Child	Ingestion	Quantitative	Storm water pathway
						Dermal	Quantitative	Storm water pathway
						Inhalation	Quantitative	Storm water pathway
Future	Soil	Soil	0 - 5 ft bgs	Residents	Adult	Ingestion	Quantitative	Storm water pathway
						Dermal	Quantitative	Storm water pathway
						Inhalation	Quantitative	Storm water pathway
					Child	Ingestion	Quantitative	Storm water pathway
						Dermal	Quantitative	Storm water pathway
						Inhalation	Quantitative	Storm water pathway
Future	Soil	Soil	0 - 16 ft bgs	Residents	Adult	Ingestion	Quantitative	Storm water pathway
						Dermal	Quantitative	Storm water pathway
						Inhalation	Quantitative	Storm water pathway
					Child	Ingestion	Quantitative	Storm water pathway
						Dermal	Quantitative	Storm water pathway
						Inhalation	Quantitative	Storm water pathway
Future	Soil	Soil	0 - 2 ft bgs	Industrial Worker	Adult	Ingestion	Quantitative	Storm water pathway
						Dermal	Quantitative	Storm water pathway
						Inhalation	Quantitative	Storm water pathway
Future	Soil	Soil	0 - 16 ft bgs	Construction Worker	Adult	Ingestion	Quantitative	Storm water pathway
						Dermal	Quantitative	Storm water pathway
						Inhalation	Quantitative	Storm water pathway

Table 4-2
SUMMARY OF EXPOSURE POINT CONCENTRATIONS
Montrose Chemical Superfund Site - ECI Property

Scenario Timeframe:	Future Resident, Industrial Worker
Medium:	Soil
Exposure Medium:	Soil, 0-2 ft bgs

Exposure Point	CAS Number	Chemical	Maximum Concentration	95% UCL	Units	EPC	Statistic	Rationale
0 - 2 ft bgs	53-19-0	2,4'-DDD	1.9	0.118	mg/kg	0.118	97.5% KM (Chebyshev)UCL	ProUCL-recommended
	72-54-8	4,4'-DDD	9.1	0.59	mg/kg	0.59	97.5% KM (Chebyshev)UCL	ProUCL-recommended
	3424-82-6	2,4'-DDE	0.39	0.02	mg/kg	0.02	97.5% KM (BCA)UCL	ProUCL-recommended
	72-55-9	4,4'-DDE	1.5	0.27	mg/kg	0.27	97.5% Chebyshev (Mean, SD)UCL	ProUCL-recommended
	79-02-6	2,4'-DDT	1.6	0.15	mg/kg	0.15	95% KM (Chebyshev)UCL	ProUCL-recommended
	50-29-3	4,4'-DDT	18	1.16	mg/kg	1.16	95% KM (Chebyshev)UCL	ProUCL-recommended
	319-84-6	alpha-BHC	0	NC	mg/kg	ND	ND	
	319-85-7	beta-BHC	0.013	NC	mg/kg	0.013	Maximum concentration	Data not adequate for UCL.
	319-86-8	delta-BHC	0	NC	mg/kg	ND	ND	
	58-89-9	gamma-BHC	0.00082	NC	mg/kg	0.00082	Maximum concentration	One detected concentration.
	5103-71-9	alpha-Chlordane	0.78	0.08	mg/kg	0.08	95% KM (Chebyshev)UCL	ProUCL-recommended
	5103-74-2	gamma-Chlordane	0.63	0.08	mg/kg	0.08	95% H-UCL	ProUCL-recommended
	60-57-1	Dieldrin	0.045	0.01	mg/kg	0.01	95% KM (t)UCL	ProUCL-recommended
	959-98-8	Alpha-endosulfan	0.0051	NC	mg/kg	0.0051	Maximum concentration	One detected concentration.
	33213-65-9	Beta-endosulfan	0	NC	mg/kg	ND	ND	
	1031-07-8	Endosulfan sulfate	0.0018	NC	mg/kg	0.0018	Maximum concentration	One detected concentration.
	309-00-2	Aldrin	0.0021	0.00096	mg/kg	0.00096	95% KM (t)UCL	ProUCL-recommended
	72-20-8	Endrin	0	NC	mg/kg	ND	ND	
	7421-93-4	Endrin aldehyde	0.0035	NC	mg/kg	0.0035	Maximum concentration	Data set does not support UCL.
	53494-70-5	Endrin ketone	0.0063	NC	mg/kg	0.0063	Maximum concentration	Data set does not support UCL.
	8001-35-2	Toxaphene	0	NC	mg/kg	ND	ND	
	76-44-8	Heptachlor	0.047	0.007	mg/kg	0.007	97.5% KM (BCA)UCL	ProUCL-recommended
	1024-57-3	Heptachlor epoxide	0.068	0.067	mg/kg	0.067	97.5% Chebyshev (Mean, SD)UCL	ProUCL-recommended
	72-43-5	Methoxychlor	0.019	NC	mg/kg	0.019	Maximum concentration	One detected concentration.
	12674-11-2	Aroclor 1016	0	NC	mg/kg	ND	ND	
	11104-28-2	Aroclor 1221	0	NC	mg/kg	ND	ND	
	11141-16-5	Aroclor 1232	0	NC	mg/kg	ND	ND	
	53469-21-9	Aroclor 1242	0	NC	mg/kg	ND	ND	
	12672-29-6	Aroclor 1248	0	NC	mg/kg	ND	ND	
	11097-69-1	Aroclor 1254	0.51	NC	mg/kg	0.51	Maximum concentration	Maximum < 95% UCL
11096-82-5	Aroclor 1260	0.06	0.026	mg/kg	0.026	95% KM (t)UCL	ProUCL-recommended	

a Range of reporting limits is for non-detected samples results only.

NA Not applicable.

ND Not detected.

NC Not calculated due to insufficient number of detections.

EPC - Exposure Point Concentration

Table 4-3
SUMMARY OF EXPOSURE POINT CONCENTRATIONS
Montrose Chemical Superfund Site - ECI Property

Scenario Timeframe:	Future Resident
Medium:	Soil
Exposure Medium:	Soil, 0-5 ft bgs

Exposure Point	CAS Number	Chemical	Maximum Concentration	95% UCL	Units	EPC	Statistic	Rationale
0 - 5 ft bgs	53-19-0	2,4'-DDD	4.4	0.37	mg/kg	0.37	97.5% KM (Chebyshev)UCL	ProUCL-recommended
	72-54-8	4,4'-DDD	18	1	mg/kg	1	97.5% KM (Chebyshev)UCL	ProUCL-recommended
	3424-82-6	2,4'-DDE	0.82	0.0375	mg/kg	0.0375	95% KM (BCA)UCL	ProUCL-recommended
	72-55-9	4,4'-DDE	3.8	0.465	mg/kg	0.465	97.5% KM (Chebyshev)UCL	ProUCL-recommended
	79-02-6	2,4'-DDT	11	0.736	mg/kg	0.736	97.5% KM (Chebyshev)UCL	ProUCL-recommended
	50-29-3	4,4'-DDT	60	0.736	mg/kg	0.736	97.5% KM (Chebyshev)UCL	ProUCL-recommended
	319-84-6	alpha-BHC	0.039	NC	mg/kg	0.039	Maximum concentration	One detected concentration
	319-85-7	beta-BHC	0.013	NC	mg/kg	0.013	Maximum concentration	Data set does not support UCL.
	319-86-8	delta-BHC	0	NC	mg/kg	ND	ND	
	58-89-9	gamma-BHC	0.00082	NC	mg/kg	0.00082	Maximum concentration	One detected concentration
	5103-71-9	alpha-Chlordane	0.78	0.067	mg/kg	0.067	95% KM (Chebyshev)UCL	ProUCL-recommended
	5103-74-2	gamma-Chlordane	0.63	0.07	mg/kg	0.07	95% KM (Chebyshev)UCL	ProUCL-recommended
	60-57-1	Dieldrin	0.045	0.01	mg/kg	0.01	95% KM (t)UCL	ProUCL-recommended
	959-98-8	Alpha-Endosulfan	0.0051	NC	mg/kg	0.0051	Maximum concentration	One detected concentration
	33213-65-9	Beta-Endosulfan	0.0034	NC	mg/kg	0.0034	Maximum concentration	One detected concentration
	1031-07-8	Endosulfan Sulfate	0.0018	NC	mg/kg	0.0018	Maximum concentration	Data set does not support UCL.
	309-00-2	Aldrin	0.0021	0.001	mg/kg	0.001	95% KM (t)UCL	ProUCL-recommended
	72-20-8	Endrin	0	NC	mg/kg	ND	ND	
	7421-93-4	Endrin aldehyde	0.036	0.225	mg/kg	0.225	97.5% Chebyshev (Mean, SD)UCL	ProUCL-recommended
	53494-70-5	Endrin ketone	0.033	NC	mg/kg	0.033	Maximum concentration	Data set does not support UCL.
	8001-35-2	Toxaphene	0	NC	mg/kg	ND	ND	
	76-44-8	Heptachlor	0.15	0.008	mg/kg	0.008	95% KM (BCA)UCL	ProUCL-recommended
	1024-57-3	Heptachlor epoxide	0.068	0.006	mg/kg	0.006	95% KM (% Bootstrap)UCL	ProUCL-recommended
	72-43-5	Methoxychlor	0.019	NC	mg/kg	0.019	Maximum concentration	One detected concentration
	12674-11-2	Aroclor 1016	0	NC	mg/kg	ND	ND	
	11104-28-2	Aroclor 1221	0	NC	mg/kg	ND	ND	
	11141-16-5	Aroclor 1232	0	NC	mg/kg	ND	ND	
	53469-21-9	Aroclor 1242	0	NC	mg/kg	ND	ND	
	12672-29-6	Aroclor 1248	0	NC	mg/kg	ND	ND	
	11097-69-1	Aroclor 1254	0.51	NC	mg/kg	0.51	Maximum concentration	Max conc < 95% UCL
11096-82-5	Aroclor 1260	0.067	0.02	mg/kg	0.02	95% KM (t)UCL	ProUCL-recommended	

a Range of reporting limits is for non-detected samples results only.

b Maximum detected concentration does not exceed the Residential RSL (concentration used for screening).

NA Not applicable.

ND Not detected.

NC Not calculated due to insufficient number of detections.

EPC - Exposure Point Concentration

Table 4-4
SUMMARY OF EXPOSURE POINT CONCENTRATIONS
Montrose Chemical Superfund Site - ECI Property

Scenario Timeframe:	Future Construction Worker
Medium:	Soil
Exposure Medium:	Soil, 0-16 ft bgs

Exposure Point	CAS Number	Chemical	Number of Samples	Number of Detections	Maximum Concentration (Qualifier)	95% UCL	Units	EPC	Statistics	Rationale
0 - 16 ft bgs	53-19-0	2,4'-DDD	493	424	18	0.74	mg/kg	0.74	97.5% KM (Chebyshev)UCL	ProUCL-recommended
	72-54-8	4,4'-DDD	482	468	55	2.2	mg/kg	2.2	97.5% KM (Chebyshev)UCL	ProUCL-recommended
	3424-82-6	2,4'-DDE	487	130	1.3	0.07	mg/kg	0.07	95% KM (Chebyshev)UCL	ProUCL-recommended
	72-55-9	4,4'-DDE	497	493	6.5	0.66	mg/kg	0.66	97.5% KM (Chebyshev)UCL	ProUCL-recommended
	79-02-6	2,4'-DDT	467	380	34	1.18	mg/kg	1.18	97.5% KM (Chebyshev)UCL	ProUCL-recommended
	50-29-3	4,4'-DDT	488	485	170	6.3	mg/kg	6.3	97.5% KM (Chebyshev)UCL	ProUCL-recommended
	319-84-6	alpha-BHC	515	2	0.039	NC	mg/kg	0.039	Maximum concentration	Data set does not support UCL.
	319-85-7	beta-BHC	515	15	0.45	0.007	mg/kg	0.007	97.5% KM (Chebyshev)UCL	ProUCL-recommended
	319-86-8	delta-BHC	515	4	0.19	NC	mg/kg	0.19	Maximum concentration	Maximum<95% UCL
	58-89-9	gamma-BHC	515	4	0.25	NC	mg/kg	0.25	Maximum concentration	Maximum<95% UCL
	5103-71-9	alpha-Chlordane	515	236	0.78	0.05	mg/kg	0.05	95% KM (Chebyshev)UCL	ProUCL-recommended
	5103-74-2	gamma-Chlordane	515	289	0.63	0.05	mg/kg	0.05	95% KM (Chebyshev)UCL	ProUCL-recommended
	60-57-1	Dieldrin	515	183	1.8	0.03	mg/kg	0.03	95% KM(BCA)UCL	ProUCL-recommended
	959-98-8	alpha-endosulfan	497	6	0.0076	0.002	mg/kg	0.002	95% KM (Percentile Bootstrap)UCL	ProUCL-recommended
	33213-65-9	beta-endosulfan	497	1	0.0034	NC	mg/kg	0.0034	Maximum concentration	One detected concentration
	1031-07-8	Endosulfan sulfate	497	10	0.024	0.006	mg/kg	0.006	95% KM (Percentile Bootstrap)UCL	ProUCL-recommended
	309-00-2	Aldrin	515	16	0.058	0.0016	mg/kg	0.0016	95% KM(BCA)UCL	ProUCL-recommended
	72-20-8	Endrin	497	1	0.073	NC	mg/kg	0.073	Maximum concentration	One detected concentration
	7421-93-4	Endrin aldehyde	497	18	0.036	0.004	mg/kg	0.004	95% KM(t)UCL	ProUCL-recommended
	53494-70-5	Endrin ketone	487	7	0.033	NC	mg/kg	0.033	Maximum concentration	Data set does not support UCL.
	8001-35-2	Toxaphene	468	0	0	NC	mg/kg	ND	ND	
	76-44-8	Heptachlor	515	96	0.15	0.36	mg/kg	0.36	97.5% Chebyshev(Mean,SD)UCL)	ProUCL-recommended
	1024-57-3	Heptachlor epoxide	514	110	0.12	0.007	mg/kg	0.007	95% KM(BCA)UCL	ProUCL-recommended
	72-43-5	Methoxychlor	486	2	0.019	NC	mg/kg	0.019	Maximum concentration	Data set does not support UCL.
	12674-11-2	Aroclor 1016	285	0	0	NC	mg/kg	ND	ND	
	11104-28-2	Aroclor 1221	285	0	0	NC	mg/kg	ND	ND	
	11141-16-5	Aroclor 1232	285	0	0	NC	mg/kg	ND	ND	
	53469-21-9	Aroclor 1242	285	0	0	NC	mg/kg	ND	ND	
	12672-29-6	Aroclor 1248	285	0	0	NC	mg/kg	ND	ND	
	11097-69-1	Aroclor 1254	285	11	5.2	0.17	mg/kg	0.17	95% KM(t)UCL	ProUCL-recommended
11096-82-5	Aroclor 1260	285	17	0.59	0.03	mg/kg	0.03	95% KM(t)UCL	ProUCL-recommended	

a Range of detection limits is for non-detected samples results only.

NC Not calculated due to insufficient number of detections.

EPC - Exposure Point Concentration

Table 4-5
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Montrose Chemical Superfund Site - ECI Property

Scenario Timeframe:	Future Adult Resident
Medium:	Soil
Exposure Medium:	Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/Model Name
Ingestion	Resident	Adult	0 - 2 ft bgs 0 - 5 ft bgs 0 - 16 ft bgs	Cs	Chemical Concentration in Soil	Chemical Specific	mg/kg	Tables 4-2 - 4-4	$\frac{C_s \times IngR \times FI \times EF \times ED \times CF}{BW \times AT}$
				IngR	Ingestion Rate of Soil	100	mg/day	USEPA, 1989	
				FI	Fraction Ingested	1	unitless	USEPA, 1989	
				EF	Exposure Frequency	350	days/year	USEPA, 1989	
				ED	Exposure Duration	24	years	USEPA, 1989	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT_C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
AT_N	Averaging Time (Non-Cancer)	8760	days	USEPA, 1989					
Dermal	Resident	Adult	0 - 2 ft bgs 0 - 5 ft bgs 0 - 16 ft bgs	Cs	Chemical Concentration in Soil	Chemical Specific	mg/kg	Tables 4-2 - 4-4	$\frac{C_s \times SA \times EF \times ED \times AF \times ABS \times CF}{BW \times AT}$
				SA	Skin Surface Area Available for Contact	5700	cm ²	DTSC/CalEPA, 2005	
				AF	Adherence Factor	0.07	mg/cm ²	DTSC/CalEPA, 2005	
				ABS	Absorption Constant	Chemical Specific	unitless	Table 3-4; USEPA, 2004	
				EF	Exposure Frequency	350	days/year	USEPA, 1989	
				ED	Exposure Duration	24	years	USEPA, 1989	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				BW	Body Weight	70	kg	USEPA, 1989	
AT_C	Averaging Time (Cancer)	25550	days	USEPA, 1989					
AT_N	Averaging Time (Non-Cancer)	8760	days	USEPA, 1989					
Inhalation	Resident	Adult	0 - 2 ft bgs 0 - 5 ft bgs 0 - 16 ft bgs	Cs	Chemical Concentration in Soil	Chemical Specific	mg/kg	Tables 4-2 - 4-4	$EC = C_a \times EF \times EF \times ED$
				Ca	Chemical Concentration in Air	Chemical Specific	µg/m ³	$C_s \times CF \times \left(\frac{1}{FEF}\right)$	
				CF	Conversion Factor	1000	µg/m ³	USEPA, 2006	
				PEF	Particulate Emission Factor	1.32E+09	m ³ /kg	USEPA, 1996	
				EF	Exposure Frequency	350	days/year	USEPA, 1989	
				ED	Exposure Duration	24	years	USEPA, 1989	
				AT_C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT_N	Averaging Time (Non-Cancer)	8760	days	USEPA, 1989	

Table 4-6
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Montrose Chemical Superfund Site - ECI Property

Scenario Timeframe:	Future Child Resident
Medium:	Soil
Exposure Medium:	Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/Model Name
Ingestion	Resident	Child	0 - 2 ft bgs 0 - 5 ft bgs 0 - 16 ft bgs	Cs	Chemical Concentration in Soil	Chemical Specific	mg/kg	Tables 4-2 - 4-4	$\frac{C_s \times \text{IngR} \times F_I \times E_F \times E_D \times C_F}{BW \times AT}$
				IngR	Ingestion Rate of Soil	200	mg/day	USEPA, 1989	
				FI	Fraction Ingested	1	unitless	USEPA, 1989	
				EF	Exposure Frequency	350	days/year	USEPA, 1989	
				ED	Exposure Duration	6	years	USEPA, 1989	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				BW	Body Weight	15	kg	USEPA, 1989	
				AT_C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
AT_N	Averaging Time (Non-Cancer)	2190	days	USEPA, 1989					
Dermal	Resident	Child	0 - 2 ft bgs 0 - 5 ft bgs 0 - 16 ft bgs	Cs	Chemical Concentration in Soil	Chemical Specific	mg/kg	Tables 4-2 - 4-4	$\frac{C_s \times SA \times E_F \times E_D \times AF \times ABS \times C_F}{BW \times AT}$
				SA	Skin Surface Area Available for Contact	2900	cm ²	DTSC/CalEPA, 2005	
				AF	Adherence Factor	0.2	mg/cm ²	DTSC/CalEPA, 2005	
				ABS	Absorption Constant	Chemical Specific	unitless	Table 3-4; USEPA, 2004	
				EF	Exposure Frequency	350	days/year	USEPA, 1989	
				ED	Exposure Duration	6	years	USEPA, 1989	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				BW	Body Weight	15	kg	USEPA, 1989	
AT_C	Averaging Time (Cancer)	25550	days	USEPA, 1989					
AT_N	Averaging Time (Non-Cancer)	2190	days	USEPA, 1989					
Inhalation	Resident	Child	0 - 2 ft bgs 0 - 5 ft bgs 0 - 16 ft bgs	Cs	Chemical Concentration in Soil	Chemical Specific	mg/kg	Tables 4-2 - 4-4	$EC = \frac{C_s \times E_T \times E_F \times E_D}{AT}$
				Ca	Chemical Concentration in Air	Chemical Specific	µg/m ³	$C_s \times C_F \times \left(\frac{1}{PEF}\right)$	
				CF	Conversion Factor	1000	µg/m ³	USEPA, 2006	
				PEF	Particulate Emission Factor	1.32E+09	m ³ /kg	USEPA, 1996	
				EF	Exposure Frequency	350	days/year	USEPA, 1989	
				ED	Exposure Duration	6	years	USEPA, 1989	
				AT_C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT_N	Averaging Time (Non-Cancer)	2190	days	USEPA, 1989	

Table 4-7
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Montrose Chemical Superfund Site - ECI Property

Scenario Timeframe:	Future Industrial Worker
Medium:	Soil
Exposure Medium:	Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/Model Name
Ingestion	Industrial Worker	Adult	0 - 2 ft bgs 0 - 5 ft bgs 0 - 16 ft bgs	Cs	Chemical Concentration in Soil	Chemical Specific	mg/kg	Tables 4-2 - 4-4	$\frac{Cs \times IngR \times FI \times EF \times ED \times CF}{BW \times AT}$
				IngR	Ingestion Rate of Soil	100	mg/day	DTSC/CalEPA, 2005	
				FI	Fraction Ingested	1	unitless	USEPA, 1989	
				EF	Exposure Frequency	250	days/year	USEPA, 2002	
				ED	Exposure Duration	25	years	USEPA, 2002	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 2002	
				BW	Body Weight	70	kg	USEPA, 2002	
				AT_C	Averaging Time (Cancer)	25550	days	USEPA, 2002	
				AT_N	Averaging Time (Non-Cancer)	9125	days	USEPA, 2002	
Dermal	Industrial Worker	Adult	0 - 2 ft bgs 0 - 5 ft bgs 0 - 16 ft bgs	Cs	Chemical Concentration in Soil	Chemical Specific	mg/kg	Tables 4-2 - 4-4	$\frac{Cs \times SA \times EF \times ED \times AF \times ABS \times CF}{BW \times AT}$
				SA	Skin Surface Area Available for Contact	5700	cm ²	DTSC/CalEPA, 2005	
				AF	Adherence Factor	0.2	mg/cm ²	DTSC/CalEPA, 2005	
				ABS	Absorption Constant	Chemical Specific	unitless	Table 3-4; USEPA, 2004	
				EF	Exposure Frequency	250	days/year	USEPA, 1989	
				ED	Exposure Duration	25	years	USEPA, 2002	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 2002	
				BW	Body Weight	70	kg	USEPA, 2002	
				AT_C	Averaging Time (Cancer)	25550	days	USEPA, 2002	
AT_N	Averaging Time (Non-Cancer)	9125	days	USEPA, 2002					
Inhalation	Industrial Worker	Adult	0 - 2 ft bgs 0 - 5 ft bgs 0 - 16 ft bgs	Cs	Chemical Concentration in Soil	Chemical Specific	mg/kg	Tables 4-2 - 4-4	$EQ = \frac{Ca \times ET \times EF \times ED}{AT}$
				Ca	Chemical Concentration in Air	Chemical Specific	ug/m ³	$Cs \times CF = \left(\frac{1}{PEF}\right)$	
				CF	Conversion Factor	1000	μg/m ³	USEPA, 2006	
				PEF	Particulate Emission Factor	1.32E+09	m ³ /kg	USEPA, 1996	
				EF	Exposure Frequency	250	days/year	USEPA, 1989	
				ED	Exposure Duration	25	years	USEPA, 1989	
				AT_C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT_N	Averaging Time (Non-Cancer)	9125	days	USEPA, 1989	

Table 4-8
VALUES USED FOR DAILY INTAKE CALCULATIONS
REASONABLE MAXIMUM EXPOSURE
Montrose Chemical Superfund Site - ECI Property

Scenario Timeframe:	Future Construction Worker
Medium:	Soil
Exposure Medium:	Soil

Exposure Route	Receptor Population	Receptor Age	Exposure Point	Parameter Code	Parameter Definition	Value	Units	Rationale/ Reference	Intake Equation/Model Name
Ingestion	Construction Worker	Adult	0 - 2 ft bgs 0 - 5 ft bgs 0 - 16 ft bgs	Cs	Chemical Concentration in Soil	Chemical Specific	mg/kg	Tables 4-2 - 4-4	$\frac{C_s \times IngR \times FI \times EF \times ED \times CF}{BW \times AT}$
				IngR	Ingestion Rate of Soil	330	mg/day	DTSC/CalEPA, 2005	
				FI	Fraction Ingested	1	unitless	USEPA, 1989	
				EF	Exposure Frequency	250	days/year	Professional judgment	
				ED	Exposure Duration	1	years	USEPA, 1989	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT_C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
				AT_N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989	
Dermal	Construction Worker	Adult	0 - 2 ft bgs 0 - 5 ft bgs 0 - 16 ft bgs	Cs	Chemical Concentration in Soil	Chemical Specific	mg/kg	Tables 4-2 - 4-4	$\frac{C_s \times SA \times EF \times ED \times AF \times ABS \times CF}{BW \times AT}$
				SA	Skin Surface Area Available for Contact	5700	cm ²	DTSC/CalEPA, 2005	
				AF	Adherence Factor	0.8	mg/cm ²	DTSC/CalEPA, 2005	
				ABS	Absorption Constant	Chemical Specific	unitless	Table 3-4; USEPA, 2004	
				EF	Exposure Frequency	250	days/year	Professional judgment	
				ED	Exposure Duration	1	years	USEPA, 2002	
				CF	Conversion Factor	1.00E-06	kg/mg	USEPA, 1989	
				BW	Body Weight	70	kg	USEPA, 1989	
				AT_C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
AT_N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989					
Inhalation	Construction Worker	Adult	0 - 2 ft bgs 0 - 5 ft bgs 0 - 16 ft bgs	Cs	Chemical Concentration in Soil	Chemical Specific	mg/kg	Tables 4-2 - 4-4	$\frac{C_s \times EF \times ED \times \left(\frac{1}{PEF}\right)}{AT}$
				PEF	Particulate Emission Factor ^a	1.30E+09	m ³ /kg	Site-Specific	
				EF	Exposure Frequency	250	days/year	USEPA, 1989	
				ED	Exposure Duration	1	years	USEPA, 2002	
				AT_C	Averaging Time (Cancer)	25550	days	USEPA, 1989	
AT_N	Averaging Time (Non-Cancer)	365	days	USEPA, 1989					

a Derived assuming the study area is 240 ft x 80 ft in size and parameters for Zone 2 (Los Angeles) (USEPA, 2002).

Table 4-9
 DERMAL ABSORPTION FACTORS FOR THE COPCs
 Montrose Chemical Superfund Site - ECI Property

Chemical	Dermal Absorption Factor	Reference*
DDD	0.03	USEPA, 2004
DDE	0.03	USEPA, 2004
DDT	0.03	USEPA, 2004
beta-BHC	0.04	USEPA, 2004
delta-BHC	0.04	USEPA, 2004
Dieldrin	0.04	USEPA, 2004
Aldrin	0.04	USEPA, 2004
Chlordane	0.05	USEPA, 2004
Heptachlor	0.1	USEPA, 2004
Heptachlor epoxide	0.1	USEPA, 2004
Aroclors	0.14	USEPA, 2004

*USEPA 2004. Risk Assessment Guidance for Superfund. Volume I: Human Health Evaluation Manual (Part E, Supplemental Guidance for Dermal Risk Assessment).

TABLE 5-1
CANCER RISK AND HAZARD INDEX ESTIMATES DUE TO MAXIMUM SOIL CONCENTRATIONS - 0 to 2 feet below ground surface
RESIDENTIAL SCENARIO
Historical Storm Water Pathway - South, Ecological Control Industries Property

PARAMETERS	UNITS	VALUES
Cs = Concentration in soil	mg/kg	see table
EF = Exposure Frequency	days/year	350
ED = Exposure Duration	years	24
EDc = Exposure Duration	years	6
ET = Exposure Time	hours/day	24
BWa = Body Weight	kg	70
BWc = Body Weight, child	kg	15
ATnc = Averaging Time - noncarcinogen	days	2190
ATc = Averaging Time - carcinogen	days	25550
SSA = Skin Surface Area	cm ² /day	5700
SSAc = skin surface area,	cm ² /day	2900
ABS = Absorption Factor	%	see table
AFc = soil to skin adherence factor	mg/cm ²	0.2
AFa = soil to skin adherence factor	mg/cm ²	0.07
InhR = Inhalation Rate	m ³ /day	20
InhRc = Inhalation Rate	m ³ /day	10
PEF = Particulate Emission Factor	m ³ /kg	1.32E+09
IngRc = Ingestion Rate, child	mg/day	200
IngRa = Ingestion Rate, adult	mg/day	100
CF = Conversion Factor	kg/mg	1.00E-06
SFing = Ingestion Cancer Slope Factor	mg/kg-day	see table
SFinh = Inhalation Cancer Slope Factor	mg/kg-day	see table
RfDing = Ingestion Reference Dose	mg/kg-day	see table
RfDinh = Inhalation Reference Dose	mg/kg-day	see table
VF = Volatilization Factor	m ³ /kg	chemical-specific
EC = Exposure Concentration, carcinogens	µg/m ³	see table
EC = Exposure Concentration, noncarcinogens	mg/m ³	see table

**TABLE 5-1
CANCER RISK AND HAZARD INDEX ESTIMATES DUE TO MAXIMUM SOIL CONCENTRATIONS - 0 to 2 feet below ground surface
RESIDENTIAL SCENARIO**

Historical Storm Water Pathway - South, Ecological Control Industries Property

CARCINOGENS	Chemical	Cs (max)	ABS	DOSE			Toxicity Factors			RISK			
				Ingestion	EC	Dermal	SFing	IUR	SFder	Ingestion	Inhalation	Dermal	To
2,4'-DDD		1.9	3.00E-02	3.E-06	6.E-07	3.E-07	2.4E-01	9.7E-05	2.4E-01	7.E-07	6.E-11	7.E-08	8.E
4,4'-DDD		9.1	3.00E-02	1.E-05	3.E-06	1.E-06	2.4E-01	9.7E-05	2.4E-01	3.E-06	3.E-10	3.E-07	4.E
2,4'-DDE		0.39	3.00E-02	6.E-07	1.E-07	6.E-08	3.4E-01	9.7E-05	3.4E-01	2.E-07	1.E-11	2.E-08	2.E
4,4'-DDE		1.5	3.00E-02	2.E-06	5.E-07	2.E-07	3.4E-01	9.7E-05	3.4E-01	8.E-07	5.E-11	8.E-08	9.E
2,4'-DDT		1.6	3.00E-02	3.E-06	5.E-07	2.E-07	3.4E-01	9.7E-05	3.4E-01	9.E-07	5.E-11	8.E-08	9.E
4,4'-DDT		18	3.00E-02	3.E-05	6.E-06	3.E-06	3.4E-01	9.7E-05	3.4E-01	1.E-05	5.E-10	9.E-07	1.E
beta-BHC		0.013	1.00E-01	2.E-08	4.E-09	3.E-09	1.8E+00	5.3E-04	1.8E+00	4.E-08	2.E-12	5.E-09	4.E
gamma-BHC		0.00082	4.00E-02	1.E-09	3.E-10	2.E-10	1.10E+00	3.1E-04	1.10E+00	1.E-09	8.E-14	2.E-10	2.E
alpha-Chlordane		0.78	4.00E-02	1.E-06	2.E-07	5.E-07	3.5E-01	1.0E-04	3.5E-01	4.E-07	2.E-11	2.E-07	6.E
gamma-Chlordane		0.63	4.00E-02	1.E-06	2.E-07	4.E-07	3.5E-01	1.0E-04	3.5E-01	3.E-07	2.E-11	1.E-07	5.E
Dieldrin		0.045	1.00E-01	7.E-08	1.E-08	3.E-08	1.6E+01	4.6E-03	1.6E+01	1.E-06	6.E-11	5.E-07	2.E
Aldrin		0.0021	1.00E-01	3.E-09	7.E-10	4.E-10	1.7E+01	4.9E-03	1.7E+01	6.E-08	3.E-12	7.E-09	6.E
Heptachlor		0.047	1.00E-01	7.E-08	1.E-08	2.E-08	4.5E+00	1.3E-03	4.5E+00	3.E-07	2.E-11	1.E-07	4.E
Heptachlor epoxide		0.068	1.00E-01	1.E-07	2.E-08	3.E-08	9.1E+00	2.60E-03	9.1E+00	1.E-06	6.E-11	3.E-07	1.E
Aroclor 1254		0.51	1.40E-01	8.E-07	2.E-07	4.E-07	2.0E+00	5.7E-04	2.0E+00	2.E-06	9.E-11	7.E-07	2.E
Aroclor 1260		0.06	1.40E-01	9.E-08	2.E-08	4.E-08	2.0E+00	5.7E-04	2.0E+00	2.E-07	1.E-11	8.E-08	3.E
CUMULATIVE RISK =										2E-			

NON-CARCINOGENS	Chemical	Cs (max)	ABS	DOSE			Toxicity Factors			HAZARD QUOTIENT			
				Ingestion	EC	Dermal	RfDing	RfC	RfDder	Ingestion	Inhalation	Dermal	To
2,4'-DDD		1.9	3.00E-02	3.E-05	7.E-09	5.E-07	5.0E-04	--	5.0E-04	5.4E-02	--	9.9E-04	5.E
4,4'-DDD		9.1	3.00E-02	1.E-04	3.E-08	2.E-06	5.0E-04	--	5.0E-04	2.6E-01	--	4.7E-03	3.E
2,4'-DDE		0.4	3.00E-02	6.E-06	1.E-09	1.E-07	5.0E-04	--	5.0E-04	1.1E-02	--	2.0E-04	1.E
4,4'-DDE		1.5	3.00E-02	2.E-05	5.E-09	4.E-07	5.0E-04	--	5.0E-04	4.2E-02	--	7.8E-04	4.E
2,4'-DDT		1.6	3.00E-02	2.E-05	6.E-09	4.E-07	5.0E-04	--	5.0E-04	4.5E-02	--	8.3E-04	5.E
4,4'-DDT		18.0	3.00E-02	3.E-04	7.E-08	5.E-06	5.0E-04	--	5.0E-04	5.1E-01	--	9.3E-03	5.E
beta-BHC		0.013	1.00E-01	2.E-07	5.E-11	1.E-08	3.00E-04	--	3.00E-04	6.1E-04	--	3.7E-05	7.E
gamma-BHC		0.00082	4.00E-02	1.E-08	3.E-12	3.E-10	3.00E-04	--	3.00E-04	3.9E-05	--	9.5E-07	4.E
alpha-chlordane		0.78	4.00E-02	1.E-05	3.E-09	7.E-07	5.00E-04	--	7.00E-04	2.2E-02	--	9.6E-04	2.E
gamma-chlordane		0.63	4.00E-02	9.E-06	2.E-09	2.E-07	5.00E-04	--	7.00E-04	1.8E-02	--	3.1E-04	2.E
Dieldrin		0.045	1.00E-01	6.E-07	2.E-10	2.E-08	5.00E-05	--	5.00E-05	1.3E-02	--	3.1E-04	1.E
Aldrin		0.0021	1.00E-01	3.E-08	8.E-12	5.E-09	3.00E-05	--	3.00E-05	9.9E-04	--	1.5E-04	1.E
Heptachlor		0.047	1.00E-01	7.E-07	2.E-10	1.E-07	5.0E-04	--	5.0E-04	1.3E-03	--	2.0E-04	2.E
Heptachlor epoxide		0.068	1.00E-01	1.E-06	2.E-10	1.E-07	1.30E-05	--	1.30E-05	7.4E-02	--	1.1E-02	9.E
Aroclor 1254		0.51	1.40E-01	7.E-06	2.E-09	7.E-07	2.0E-05	--	2.0E-05	3.6E-01	--	3.3E-02	4.E
Aroclor 1260		0.06	1.40E-01	8.E-07	2.E-10	8.E-08	--	--	--	--	--	--	0.E
Endosulfan 1		0.0051	1.00E-01	7.E-08	2.E-11	1.E-08	6.00E-03	6.00E-03	6.00E-03	1.2E-05	3.1E-09	1.8E-06	1.E
Endosulfan sulfate		0.0018	1.00E-01	3.E-08	7.E-12	4.E-09	--	--	--	--	--	--	0.E
Endrin aldehyde		0.0035	1.00E-01	5.E-08	1.E-11	8.E-09	na	0.00E+00	6.00E-03	--	--	1.3E-06	1.E
Endrin ketone		0.0063	1.00E-01	9.E-08	2.E-11	1.E-08	na	0.00E+00	6.00E-03	--	--	2.3E-06	2.E
CUMULATIVE HAZARD INDEX =										1.			

TABLE 5-2
CANCER RISK AND HAZARD INDEX ESTIMATES DUE TO 95% UCL SOIL CONCENTRATIONS - 0 to 2 feet below ground surface
RESIDENTIAL SCENARIO
Historical Storm Water Pathway - South, Ecological Control Industries Property

PARAMETERS	UNITS	VALUES
Cs = Concentration in soil	mg/kg	see table
EF = Exposure Frequency	days/year	350
ED = Exposure Duration	years	24
EDc = Exposure Duration	years	6
ET = Exposure Time	hours/day	24
BW _a = Body Weight	kg	70
BW _c = Body Weight, child	kg	15
AT _{nc} = Averaging Time - noncarcinogen	days	2190
AT _c = Averaging Time - carcinogen	days	25550
SSA = Skin Surface Area	cm ² /day	5700
SSAc = skin surface area,	cm ² /day	2900
ABS = Absorption Factor	%	see table
AF _c = soil to skin adherence factor	mg/cm ²	0.2
AF _a = soil to skin adherence factor	mg/cm ²	0.07
InhR = Inhalation Rate	m ³ /day	20
InhR _c = Inhalation Rate	m ³ /day	10
PEF = Particulate Emission Factor	m ³ /kg	1.32E+09
IngR _c = Ingestion Rate, child	mg/day	200
IngR _a = Ingestion Rate, adult	mg/day	100
CF = Conversion Factor	kg/mg	1.00E-06
SF _{ing} = Ingestion Cancer Slope Factor	mg/kg-day	see table
SF _{inh} = Inhalation Cancer Slope Factor	mg/kg-day	see table
RfD _{ing} = Ingestion Reference Dose	mg/kg-day	see table
RfD _{inh} = Inhalation Reference Dose	mg/kg-day	see table
VF = Volatilization Factor	m ³ /kg	chemical-specific
EC = Exposure Concentration, carcinogens	µg/m ³	see table
EC = Exposure Concentration, noncarcinogens	mg/m ³	see table

TABLE 5-2
CANCER RISK AND HAZARD INDEX ESTIMATES DUE TO 95% UCL SOIL CONCENTRATIONS - 0 to 2 feet below ground surface
RESIDENTIAL SCENARIO
Historical Storm Water Pathway - South, Ecological Control Industries Property

CARCINOGENS			DOSE			Toxicity Factors			RISK			
Chemical	Cs (95% UCL)	ABS	Ingestion	EC	Dermal	SFing	IUR	SFder	Ingestion	Inhalation	Dermal	.
2,4'-DDD	0.118	3.00E-02	2.E-07	4.E-08	2.E-08	2.4E-01	9.7E-05	2.4E-01	4.E-08	4.E-12	4.E-09	5
4,4'-DDD	0.59	3.00E-02	9.E-07	2.E-07	9.E-08	2.4E-01	9.7E-05	2.4E-01	2.E-07	2.E-11	2.E-08	2
2,4'-DDE	0.02	3.00E-02	3.E-08	6.E-09	3.E-09	3.4E-01	9.7E-05	3.4E-01	1.E-08	6.E-13	1.E-09	1
4,4'-DDE	0.27	3.00E-02	4.E-07	8.E-08	4.E-08	3.4E-01	9.7E-05	3.4E-01	1.E-07	8.E-12	1.E-08	2
2,4'-DDT	0.15	3.00E-02	2.E-07	5.E-08	2.E-08	3.4E-01	9.7E-05	3.4E-01	8.E-08	5.E-12	8.E-09	9
4,4'-DDT	1.16	3.00E-02	2.E-06	4.E-07	2.E-07	3.4E-01	9.7E-05	3.4E-01	6.E-07	4.E-11	6.E-08	7
beta-BHC	0.013	1.00E-01	2.E-08	4.E-09	3.E-09	1.8E+00	5.3E-04	1.8E+00	4.E-08	2.E-12	5.E-09	4
gamma-BHC	0.00082	4.00E-02	1.E-09	3.E-10	2.E-10	1.10E+00	3.1E-04	1.10E+00	1.E-09	8.E-14	2.E-10	2
alpha-Chlordane	0.08	4.00E-02	1.E-07	2.E-08	5.E-08	3.5E-01	1.0E-04	3.5E-01	4.E-08	2.E-12	2.E-08	6
gamma-Chlordane	0.08	4.00E-02	1.E-07	2.E-08	5.E-08	3.5E-01	1.0E-04	3.5E-01	4.E-08	2.E-12	2.E-08	6
Dieldrin	0.01	1.00E-01	2.E-08	3.E-09	7.E-09	1.6E+01	4.6E-03	1.6E+01	3.E-07	1.E-11	1.E-07	4
Aldrin	0.00096	1.00E-01	2.E-09	3.E-10	2.E-10	1.7E+01	4.9E-03	1.7E+01	3.E-08	1.E-12	3.E-09	3
Heptachlor	0.007	1.00E-01	1.E-08	2.E-09	4.E-09	4.5E+00	1.3E-03	4.5E+00	5.E-08	3.E-12	2.E-08	7
Heptachlor epoxide	0.067	1.00E-01	1.E-07	2.E-08	3.E-08	9.1E+00	2.60E-03	9.1E+00	1.E-06	5.E-11	3.E-07	1
Aroclor 1254	0.51	1.40E-01	8.E-07	2.E-07	4.E-07	2.0E+00	5.7E-04	2.0E+00	2.E-06	9.E-11	7.E-07	2
Aroclor 1260	0.026	1.40E-01	4.E-08	8.E-09	2.E-08	2.0E+00	5.7E-04	2.0E+00	8.E-08	5.E-12	4.E-08	1
CUMULATIVE RISK =												€

NON-CARCINOGENS			DOSE			Toxicity Factors			HAZARD QUOTIENT			
Chemical	Cs (95% UCL)	ABS	Ingestion	EC	Dermal	RfDing	RfC	RfDder	Ingestion	Inhalation	Dermal	.
2,4'-DDD	0.12	3.00E-02	2.E-06	4.E-10	3.E-08	5.0E-04	--	5.0E-04	3.3E-03	--	6.1E-05	3
4,4'-DDD	0.59	3.00E-02	8.E-06	2.E-09	2.E-07	5.0E-04	--	5.0E-04	1.7E-02	--	3.1E-04	2
2,4'-DDE	0.02	3.00E-02	3.E-07	7.E-11	5.E-09	5.0E-04	--	5.0E-04	5.7E-04	--	1.0E-05	6
4,4'-DDE	0.27	3.00E-02	4.E-06	1.E-09	7.E-08	5.0E-04	--	5.0E-04	7.6E-03	--	1.4E-04	8
2,4'-DDT	0.15	3.00E-02	2.E-06	5.E-10	4.E-08	5.0E-04	--	5.0E-04	4.2E-03	--	7.8E-05	4
4,4'-DDT	1.16	3.00E-02	2.E-05	4.E-09	3.E-07	5.0E-04	--	5.0E-04	3.3E-02	--	6.0E-04	3
beta-BHC	0.013	1.00E-01	2.E-07	5.E-11	1.E-08	3.00E-04	--	3.00E-04	6.1E-04	--	3.7E-05	7
gamma-BHC	0.00082	4.00E-02	1.E-08	3.E-12	3.E-10	3.00E-04	--	3.00E-04	3.9E-05	--	9.5E-07	4
alpha-chlordane	0.08	4.00E-02	1.E-06	3.E-10	7.E-08	5.00E-04	--	7.00E-04	2.3E-03	--	9.9E-05	2
gamma-chlordane	0.08	4.00E-02	1.E-06	3.E-10	3.E-08	5.00E-04	--	7.00E-04	2.3E-03	--	4.0E-05	2
Dieldrin	0.01	1.00E-01	1.E-07	4.E-11	3.E-09	5.00E-05	--	5.00E-05	2.8E-03	--	6.9E-05	3
Aldrin	0.00096	1.00E-01	1.E-08	3.E-12	2.E-09	3.00E-05	--	3.00E-05	4.5E-04	--	6.9E-05	5
Heptachlor	0.007	1.00E-01	1.E-07	3.E-11	2.E-08	5.0E-04	--	5.0E-04	2.0E-04	--	3.0E-05	2
Heptachlor epoxide	0.067	1.00E-01	9.E-07	2.E-10	1.E-07	1.30E-05	--	1.30E-05	7.3E-02	--	1.1E-02	8
Aroclor 1254	0.510	1.40E-01	7.E-06	2.E-09	7.E-07	2.0E-05	--	2.0E-05	3.6E-01	--	3.3E-02	4
Aroclor 1260	0.026	1.40E-01	4.E-07	9.E-11	3.E-08		--		--	--	--	
Endosulfan 1	0.0051	1.00E-01	7.E-08	2.E-11	1.E-08	6.00E-03	6.00E-03	6.00E-03	1.2E-05	3.1E-09	1.8E-06	1
Endosulfan sulfate	0.0018	1.00E-01	3.E-08	7.E-12	4.E-09	--	--	--	--	--	--	0
Endrin aldehyde	0.0035	1.00E-01	5.E-08	1.E-11	8.E-09	na	0.00E+00	6.00E-03	--	--	1.3E-06	1
Endrin ketone	0.0063	1.00E-01	9.E-08	2.E-11	1.E-08	na	0.00E+00	6.00E-03	--	--	2.3E-06	2
CUMULATIVE HAZARD INDEX =												

Maximum concentrations were used because max<95% UCL

**TABLE 5-3
CANCER RISK AND HAZARD INDEX ESTIMATES DUE TO MAXIMUM SOIL CONCENTRATIONS - 0 to 5 feet below ground surface
RESIDENTIAL SCENARIO**

Historical Storm Water Pathway - South, Ecological Control Industries Property

PARAMETERS	UNITS	VALUES
Cs = Concentration in soil	mg/kg	see table
EF = Exposure Frequency	days/year	350
ED = Exposure Duration	years	24
EDc = Exposure Duration	years	6
ET = Exposure Time	hours/day	24
BW _a = Body Weight	kg	70
BW _c = Body Weight, child	kg	15
AT _{nc} = Averaging Time - noncarcinogen	days	2190
AT _c = Averaging Time - carcinogen	days	25550
SSA = Skin Surface Area	cm ² /day	5700
SSAc = skin surface area,	cm ² /day	2900
ABS = Absorption Factor	%	see table
AF _c = soil to skin adherence factor	mg/cm ²	0.2
AF _a = soil to skin adherence factor	mg/cm ²	0.07
InhR = Inhalation Rate	m ³ /day	20
InhR _c = Inhalation Rate	m ³ /day	10
PEF = Particulate Emission Factor	m ³ /kg	1.32E+09
IngR _c = Ingestion Rate, child	mg/day	200
IngR _a = Ingestion Rate, adult	mg/day	100
CF = Conversion Factor	kg/mg	1.00E-06
SF _{ing} = Ingestion Cancer Slope Factor	mg/kg-day	see table
SF _{inh} = Inhalation Cancer Slope Factor	mg/kg-day	see table
RfD _{ing} = Ingestion Reference Dose	mg/kg-day	see table
RfD _{inh} = Inhalation Reference Dose	mg/kg-day	see table
VF = Volatilization Factor	m ³ /kg	chemical-specific
EC = Exposure Concentration, carcinogens	µg/m ³	see table
EC = Exposure Concentration, noncarcinogens	mg/m ³	see table

**TABLE 5-3
CANCER RISK AND HAZARD INDEX ESTIMATES DUE TO MAXIMUM SOIL CONCENTRATIONS - 0 to 5 feet below ground surface
RESIDENTIAL SCENARIO**

Historical Storm Water Pathway - South, Ecological Control Industries Property

CARCINOGENS			DOSE			Toxicity Factors			RISK			
Chemical	Cs (max)	ABS	Ingestion	EC	Dermal	SFing	IUR	SFder	Ingestion	Inhalation	Dermal	To
2,4'-DDD	4.4	3.00E-02	7.E-06	1.E-06	7.E-07	2.4E-01	9.7E-05	2.4E-01	2.E-06	1.E-10	2.E-07	2.E
4,4'-DDD	18	3.00E-02	3.E-05	6.E-06	3.E-06	2.4E-01	9.7E-05	2.4E-01	7.E-06	5.E-10	7.E-07	7.E
2,4'-DDE	0.82	3.00E-02	1.E-06	3.E-07	1.E-07	3.4E-01	9.7E-05	3.4E-01	4.E-07	2.E-11	4.E-08	5.E
4,4'-DDE	3.8	3.00E-02	6.E-06	1.E-06	6.E-07	3.4E-01	9.7E-05	3.4E-01	2.E-06	1.E-10	2.E-07	2.E
2,4'-DDT	11	3.00E-02	2.E-05	3.E-06	2.E-06	3.4E-01	9.7E-05	3.4E-01	6.E-06	3.E-10	6.E-07	6.E
4,4'-DDT	60	3.00E-02	9.E-05	2.E-05	9.E-06	3.4E-01	9.7E-05	3.4E-01	3.E-05	2.E-09	3.E-06	4.E
alpha-BHC	0.039	1.00E-01	6.E-08	1.E-08	8.E-09	1.8E+00	5.3E-04	1.8E+00	1.E-07	6.E-12	1.E-08	1.E
beta-BHC	0.013	1.00E-01	2.E-08	4.E-09	3.E-09	1.8E+00	5.3E-04	1.8E+00	4.E-08	2.E-12	5.E-09	4.E
gamma-BHC	0.00082	4.00E-02	1.E-09	3.E-10	2.E-10	1.10E+00	3.1E-04	1.10E+00	1.E-09	8.E-14	2.E-10	2.E
alpha-Chlordane	0.78	4.00E-02	1.E-06	2.E-07	5.E-07	3.5E-01	1.0E-04	3.5E-01	4.E-07	2.E-11	2.E-07	6.E
gamma-Chlordane	0.63	4.00E-02	1.E-06	2.E-07	4.E-07	3.5E-01	1.0E-04	3.5E-01	3.E-07	2.E-11	1.E-07	5.E
Dieldrin	0.045	1.00E-01	7.E-08	1.E-08	3.E-08	1.6E+01	4.6E-03	1.6E+01	1.E-06	6.E-11	5.E-07	2.E
Aldrin	0.0021	1.00E-01	3.E-09	7.E-10	4.E-10	1.7E+01	4.9E-03	1.7E+01	6.E-08	3.E-12	7.E-09	6.E
Heptachlor	0.15	1.00E-01	2.E-07	5.E-08	8.E-08	4.5E+00	1.3E-03	4.5E+00	1.E-06	6.E-11	3.E-07	1.E
Heptachlor epoxide	0.068	1.00E-01	1.E-07	2.E-08	3.E-08	9.1E+00	2.60E-03	9.1E+00	1.E-06	6.E-11	3.E-07	1.E
Aroclor 1254	0.51	1.40E-01	8.E-07	2.E-07	4.E-07	2.0E+00	5.7E-04	2.0E+00	2.E-06	9.E-11	7.E-07	2.E
Aroclor 1260	0.06	1.40E-01	9.E-08	2.E-08	4.E-08	2.0E+00	5.7E-04	2.0E+00	2.E-07	1.E-11	8.E-08	3.E
CUMULATIVE RISK =											6E-	

NON-CARCINOGENS			DOSE			Toxicity Factors			HAZARD QUOTIENT			
Chemical	Cs (max)	ABS	Ingestion	EC	Dermal	RfDing	RfC	RfDder	Ingestion	Inhalation	Dermal	To
2,4'-DDD	4.4	3.00E-02	6.E-05	2.E-08	1.E-06	5.0E-04	--	5.0E-04	1.2E-01	--	2.3E-03	1.E
4,4'-DDD	18.0	3.00E-02	3.E-04	7.E-08	5.E-06	5.0E-04	--	5.0E-04	5.1E-01	--	9.3E-03	5.E
2,4'-DDE	0.8	3.00E-02	1.E-05	3.E-09	2.E-07	5.0E-04	--	5.0E-04	2.3E-02	--	4.3E-04	2.E
4,4'-DDE	3.8	3.00E-02	5.E-05	1.E-08	1.E-06	5.0E-04	--	5.0E-04	1.1E-01	--	2.0E-03	1.E
2,4'-DDT	11.0	3.00E-02	2.E-04	4.E-08	3.E-06	5.0E-04	--	5.0E-04	3.1E-01	--	5.7E-03	3.E
4,4'-DDT	60.0	3.00E-02	8.E-04	2.E-07	2.E-05	5.0E-04	--	5.0E-04	1.7E+00	--	3.1E-02	2.E
alpha-BHC	0.039	1.00E-01	6.E-07	1.E-10	3.E-08	3.00E-04	--	3.00E-04	1.8E-03	--	1.1E-04	2.E
beta-BHC	0.013	1.00E-01	2.E-07	5.E-11	1.E-08	3.00E-04	--	3.00E-04	6.1E-04	--	3.7E-05	7.E
gamma-BHC	0.00082	4.00E-02	1.E-08	3.E-12	3.E-10	3.00E-04	--	3.00E-04	3.9E-05	--	9.5E-07	4.E
alpha-chlordane	0.78	4.00E-02	1.E-05	3.E-09	7.E-07	5.00E-04	--	7.00E-04	2.2E-02	--	9.6E-04	2.E
gamma-chlordane	0.63	4.00E-02	9.E-06	2.E-09	2.E-07	5.00E-04	--	7.00E-04	1.8E-02	--	3.1E-04	2.E
Dieldrin	0.045	1.00E-01	6.E-07	2.E-10	2.E-08	5.00E-05	--	5.00E-05	1.3E-02	--	3.1E-04	1.E
Aldrin	0.0021	1.00E-01	3.E-08	8.E-12	5.E-09	3.00E-05	--	3.00E-05	9.9E-04	--	1.5E-04	1.E
Heptachlor	0.15	1.00E-01	2.E-06	5.E-10	3.E-07	5.0E-04	--	5.0E-04	4.2E-03	--	6.5E-04	5.E
Heptachlor epoxide	0.068	1.00E-01	1.E-06	2.E-10	1.E-07	1.30E-05	--	1.30E-05	7.4E-02	--	1.1E-02	9.E
Methoxychlor	0.019	1.00E-01	3.E-07	7.E-11	2.E-08	5.00E-03	--	5.00E-03	5.4E-05	--	3.3E-06	6.E
Aroclor 1254	0.51	1.40E-01	7.E-06	2.E-09	7.E-07	2.0E-05	--	2.0E-05	3.6E-01	--	3.3E-02	4.E
Aroclor 1260	0.06	1.40E-01	8.E-07	2.E-10	8.E-08	--	--	--	--	--	--	0.E
Endosulfan 1	0.0051	1.00E-01	7.E-08	2.E-11	1.E-08	6.00E-03	6.00E-03	6.00E-03	1.2E-05	3.1E-09	1.8E-06	1.E
Endosulfan II	0.0034	1.00E-01	5.E-08	1.E-11	7.E-09	6.00E-03	6.00E-03	6.00E-03	8.0E-06	2.1E-09	1.2E-06	9.E
Endrin aldehyde	1.9	1.00E-01	3.E-05	7.E-09	4.E-06	na	0.00E+00	6.00E-03	--	--	6.8E-04	7.E
Endrin ketone	0.033	1.00E-01	5.E-07	1.E-10	7.E-08	na	0.00E+00	6.00E-03	--	--	1.2E-05	1.E
CUMULATIVE HAZARD INDEX =											3.	

TABLE 5-4
CANCER RISK AND HAZARD INDEX ESTIMATES DUE TO 95% UCL SOIL CONCENTRATIONS - 0 to 5 feet below ground surface
RESIDENTIAL SCENARIO
Historical Storm Water Pathway - South, Ecological Control Industries Property

PARAMETERS	UNITS	VALUES
Cs = Concentration in soil	mg/kg	see table
EF = Exposure Frequency	days/year	350
ED = Exposure Duration	years	24
EDc = Exposure Duration	years	6
ET = Exposure Time	hours/day	24
BW _a = Body Weight	kg	70
BW _c = Body Weight, child	kg	15
AT _{nc} = Averaging Time - noncarcinogen	days	2190
AT _c = Averaging Time - carcinogen	days	25550
SSA = Skin Surface Area	cm ² /day	5700
SSAc = skin surface area,	cm ² /day	2900
ABS = Absorption Factor	%	see table
AF _c = soil to skin adherence factor	mg/cm ²	0.2
AF _a = soil to skin adherence factor	mg/cm ²	0.07
InhR = Inhalation Rate	m ³ /day	20
InhR _c = Inhalation Rate	m ³ /day	10
PEF = Particulate Emission Factor	m ³ /kg	1.32E+09
IngR _c = Ingestion Rate, child	mg/day	200
IngR _a = Ingestion Rate, adult	mg/day	100
CF = Conversion Factor	kg/mg	1.00E-06
SF _{ing} = Ingestion Cancer Slope Factor	mg/kg-day	see table
SF _{inh} = Inhalation Cancer Slope Factor	mg/kg-day	see table
RfD _{ing} = Ingestion Reference Dose	mg/kg-day	see table
RfD _{inh} = Inhalation Reference Dose	mg/kg-day	see table
VF = Volatilization Factor	m ³ /kg	chemical-specific
EC = Exposure Concentration, carcinogens	µg/m ³	see table
EC = Exposure Concentration, noncarcinogens	mg/m ³	see table

**TABLE 5-4
CANCER RISK AND HAZARD INDEX ESTIMATES DUE TO 95% UCL SOIL CONCENTRATIONS - 0 to 5 feet below ground surface
RESIDENTIAL SCENARIO**

Historical Storm Water Pathway - South, Ecological Control Industries Property

CARCINOGENS			DOSE			Toxicity Factors			RISK			
Chemical	Cs (95% UCL)	ABS	Ingestion	EC	Dermal	SFing	IUR	SFder	Ingestion	Inhalation	Dermal	
2,4'-DDD	0.37	3.00E-02	6.E-07	1.E-07	6.E-08	2.4E-01	9.7E-05	2.4E-01	1.E-07	1.E-11	1.E-08	2
4,4'-DDD	1	3.00E-02	2.E-06	3.E-07	2.E-07	2.4E-01	9.7E-05	2.4E-01	4.E-07	3.E-11	4.E-08	4
2,4'-DDE	0.0375	3.00E-02	6.E-08	1.E-08	6.E-09	3.4E-01	9.7E-05	3.4E-01	2.E-08	1.E-12	2.E-09	2
4,4'-DDE	0.465	3.00E-02	7.E-07	1.E-07	7.E-08	3.4E-01	9.7E-05	3.4E-01	2.E-07	1.E-11	2.E-08	3
2,4'-DDT	0.736	3.00E-02	1.E-06	2.E-07	1.E-07	3.4E-01	9.7E-05	3.4E-01	4.E-07	2.E-11	4.E-08	4
4,4'-DDT	0.736	3.00E-02	1.E-06	2.E-07	1.E-07	3.4E-01	9.7E-05	3.4E-01	4.E-07	2.E-11	4.E-08	4
alpha-BHC	0.039	1.00E-01	6.E-08	1.E-08	2.E-08	1.8E+00	5.3E-04	1.8E+00	1.E-07	6.E-12	4.E-08	1
beta-BHC	0.013	1.00E-01	2.E-08	4.E-09	7.E-09	1.8E+00	5.3E-04	1.8E+00	4.E-08	2.E-12	1.E-08	5
gamma-BHC	0.00082	4.00E-02	1.E-09	3.E-10	2.E-10	1.10E+00	3.1E-04	1.10E+00	1.E-09	8.E-14	2.E-10	2
alpha-Chlordane	0.067	4.00E-02	1.E-07	2.E-08	3.E-08	3.5E-01	1.0E-04	3.5E-01	4.E-08	2.E-12	1.E-08	5
gamma-Chlordane	0.07	4.00E-02	1.E-07	2.E-08	1.E-08	3.5E-01	1.0E-04	3.5E-01	4.E-08	2.E-12	5.E-09	4
Dieldrin	0.01	1.00E-01	2.E-08	3.E-09	2.E-09	1.6E+01	4.6E-03	1.6E+01	3.E-07	1.E-11	3.E-08	3
Aldrin	0.0021	1.00E-01	3.E-09	7.E-10	4.E-10	1.7E+01	4.9E-03	1.7E+01	6.E-08	3.E-12	7.E-09	6
Heptachlor	0.008	1.00E-01	1.E-08	2.E-09	4.E-09	4.5E+00	1.3E-03	4.5E+00	6.E-08	3.E-12	2.E-08	7
Heptachlor epoxide	0.006	1.00E-01	9.E-09	2.E-09	3.E-09	9.1E+00	2.60E-03	9.1E+00	9.E-08	5.E-12	3.E-08	1
Aroclor 1254	0.51	1.40E-01	8.E-07	2.E-07	4.E-07	2.0E+00	5.7E-04	2.0E+00	2.E-06	9.E-11	7.E-07	2
Aroclor 1260	0.02	1.40E-01	3.E-08	6.E-09	1.E-08	2.0E+00	5.7E-04	2.0E+00	6.E-08	4.E-12	3.E-08	9
CUMULATIVE RISK =												5

NON-CARCINOGENS			DOSE			Toxicity Factors			HAZARD QUOTIENT			
Chemical	Cs (95% UCL)	ABS	Ingestion	EC	Dermal	RfDing	RfC	RfDder	Ingestion	Inhalation	Dermal	
2,4'-DDD	0.370	3.00E-02	5.E-06	1.E-09	1.E-07	5.0E-04	--	5.0E-04	1.0E-02	--	1.9E-04	1
4,4'-DDD	1.000	3.00E-02	1.E-05	4.E-09	3.E-07	5.0E-04	--	5.0E-04	2.8E-02	--	5.2E-04	3
2,4'-DDE	0.038	3.00E-02	5.E-07	1.E-10	1.E-08	5.0E-04	--	5.0E-04	1.1E-03	--	1.9E-05	1
4,4'-DDE	0.465	3.00E-02	7.E-06	2.E-09	1.E-07	5.0E-04	--	5.0E-04	1.3E-02	--	2.4E-04	1
2,4'-DDT	0.736	3.00E-02	1.E-05	3.E-09	2.E-07	5.0E-04	--	5.0E-04	2.1E-02	--	3.8E-04	2
4,4'-DDT	0.736	3.00E-02	1.E-05	3.E-09	2.E-07	5.0E-04	--	5.0E-04	2.1E-02	--	3.8E-04	2
alpha-BHC	0.039	1.00E-01	6.E-07	1.E-10	8.E-08	3.00E-04	--	3.00E-04	1.8E-03	--	2.8E-04	2
beta-BHC	0.013	1.00E-01	2.E-07	5.E-11	3.E-08	3.00E-04	--	3.00E-04	6.1E-04	--	9.4E-05	7
gamma-BHC	0.00082	4.00E-02	1.E-08	3.E-12	2.E-09	3.00E-04	--	3.00E-04	3.9E-05	--	5.9E-06	4
alpha-chlordane	0.067	4.00E-02	9.E-07	2.E-10	1.E-07	5.00E-04	--	7.00E-04	1.9E-03	--	2.1E-04	2
gamma-chlordane	0.070	4.00E-02	1.E-06	3.E-10	2.E-07	5.00E-04	--	7.00E-04	2.0E-03	--	2.2E-04	2
Dieldrin	0.010	1.00E-01	1.E-07	4.E-11	0.E+00	5.00E-05	--	5.00E-05	2.8E-03	--	0.0E+00	3
Aldrin	0.0021	1.00E-01	3.E-08	8.E-12	5.E-09	3.00E-05	--	3.00E-05	9.9E-04	--	1.5E-04	1
Heptachlor	0.008	1.00E-01	1.E-07	3.E-11	2.E-08	5.0E-04	--	5.0E-04	2.3E-04	--	3.5E-05	3
Heptachlor epoxide	0.006	1.00E-01	8.E-08	2.E-11	1.E-08	1.30E-05	--	1.30E-05	6.5E-03	--	1.0E-03	8
Methoxychlor	0.019	1.00E-01	3.E-07	7.E-11	4.E-08	5.00E-03	--	1.30E-05	5.4E-05	--	3.2E-03	3
Aroclor 1254	0.51	1.40E-01	7.E-06	2.E-09	7.E-07	2.0E-05	--	2.0E-05	3.6E-01	--	3.3E-02	4
Aroclor 1260	0.02	1.40E-01	3.E-07	7.E-11	3.E-08	--	--	--	--	--	--	0
Endosulfan 1	0.0051	1.00E-01	7.E-08	2.E-11	1.E-08	6.00E-03	6.00E-03	6.00E-03	1.2E-05	3.1E-09	1.8E-06	1
Endosulfan II	0.0034	1.00E-01	5.E-08	1.E-11	7.E-09	6.00E-03	6.00E-03	6.00E-03	8.0E-06	2.1E-09	1.2E-06	9
Endrin aldehyde	0.225	1.00E-01	3.E-06	8.E-10	5.E-07	na	0.00E+00	6.00E-03	--	--	8.1E-05	8
Endrin ketone	0.033	1.00E-01	5.E-07	1.E-10	7.E-08	na	0.00E+00	6.00E-03	--	--	1.2E-05	1
CUMULATIVE HAZARD INDEX =												

Maximum concentrations were used because max<95% UCL

TABLE 5-5
CANCER RISK AND HAZARD INDEX ESTIMATES DUE TO MAXIMUM SOIL CONCENTRATIONS - 0 to 16 feet below ground surface
RESIDENTIAL SCENARIO
Historical Storm Water Pathway - South, Ecological Control Industries Property

PARAMETERS	UNITS	VALUES
Cs = Concentration in soil	mg/kg	see table
EF = Exposure Frequency	days/year	350
ED = Exposure Duration	years	24
EDc = Exposure Duration	years	6
ET = Exposure Time	hours/day	24
BWa = Body Weight	kg	70
BWc = Body Weight, child	kg	15
ATnc = Averaging Time - noncarcinogen	days	2190
ATc = Averaging Time - carcinogen	days	25550
SSA = Skin Surface Area	cm ² /day	5700
SSAc = skin surface area,	cm ² /day	2900
ABS = Absorption Factor	%	see table
AFc = soil to skin adherence factor	mg/cm ²	0.2
AFa = soil to skin adherence factor	mg/cm ²	0.07
InhR = Inhalation Rate	m ³ /day	20
InhRc = Inhalation Rate	m ³ /day	10
PEF = Particulate Emission Factor	m ³ /kg	1.32E+09
IngRc = Ingestion Rate, child	mg/day	200
IngRa = Ingestion Rate, adult	mg/day	100
CF = Conversion Factor	kg/mg	1.00E-06
SFing = Ingestion Cancer Slope Factor	mg/kg-day	see table
SFinh = Inhalation Cancer Slope Factor	mg/kg-day	see table
RfDing = Ingestion Reference Dose	mg/kg-day	see table
RfDinh = Inhalation Reference Dose	mg/kg-day	see table
VF = Volatilization Factor	m ³ /kg	chemical-specific
EC = Exposure Concentration, carcinogens	μg/m ³	see table
EC = Exposure Concentration, noncarcinogens	mg/m ³	see table

TABLE 5-5
CANCER RISK AND HAZARD INDEX ESTIMATES DUE TO MAXIMUM SOIL CONCENTRATIONS - 0 to 16 feet below ground surface
RESIDENTIAL SCENARIO
Historical Storm Water Pathway - South, Ecological Control Industries Property

CARCINOGENS		DOSE				Toxicity Factors			RISK			
Chemical	Cs (max)	ABS	Ingestion	EC	Dermal	SFing	IUR	SFder	Ingestion	Inhalation	Dermal	Total
2,4'-DDD	18	3.00E-02	3.E-05	6.E-06	3.E-06	2.4E-01	9.7E-05	2.4E-01	7.E-06	5.E-10	7.E-07	7.E-06
4,4'-DDD	55	3.00E-02	9.E-05	2.E-05	8.E-06	2.4E-01	9.7E-05	2.4E-01	2.E-05	2.E-09	2.E-06	2.E-05
2,4'-DDE	1.3	3.00E-02	2.E-06	4.E-07	2.E-07	3.4E-01	9.7E-05	3.4E-01	7.E-07	4.E-11	7.E-08	8.E-07
4,4'-DDE	6.5	3.00E-02	1.E-05	2.E-06	1.E-06	3.4E-01	9.7E-05	3.4E-01	3.E-06	2.E-10	3.E-07	4.E-06
2,4'-DDT	34	3.00E-02	5.E-05	1.E-05	5.E-06	3.4E-01	9.7E-05	3.4E-01	2.E-05	1.E-09	2.E-06	2.E-05
4,4'-DDT	170	3.00E-02	3.E-04	5.E-05	3.E-05	3.4E-01	9.7E-05	3.4E-01	9.E-05	5.E-09	9.E-06	1.E-04
alpha-BHC	0.039	1.00E-01	6.E-08	1.E-08	2.E-08	1.8E+00	5.3E-04	1.8E+00	1.E-07	6.E-12	4.E-08	1.E-07
beta-BHC	0.45	1.00E-01	7.E-07	1.E-07	2.E-07	1.8E+00	5.3E-04	1.8E+00	1.E-06	7.E-11	4.E-07	2.E-06
delta-BHC	0.19	4.00E-02	3.E-07	6.E-08	4.E-08	1.8E+00	5.3E-04	1.8E+00	5.E-07	3.E-11	7.E-08	6.E-07
gamma-BHC	0.25	4.00E-02	4.E-07	8.E-08	5.E-08	1.10E+00	3.1E-04	1.10E+00	4.E-07	2.E-11	6.E-08	5.E-07
alpha-Chlordane	0.78	4.00E-02	1.E-06	2.E-07	4.E-07	3.5E-01	1.0E-04	3.5E-01	4.E-07	2.E-11	1.E-07	6.E-07
gamma-Chlordane	0.63	4.00E-02	1.E-06	2.E-07	1.E-07	3.5E-01	1.0E-04	3.5E-01	3.E-07	2.E-11	4.E-08	4.E-07
Dieldrin	1.8	1.00E-01	3.E-06	6.E-07	1.E-06	1.6E+01	4.6E-03	1.6E+01	5.E-05	3.E-09	2.E-05	6.E-05
Aldrin	0.058	1.00E-01	9.E-08	2.E-08	1.E-08	1.7E+01	4.9E-03	1.7E+01	2.E-06	9.E-11	2.E-07	2.E-06
Endrin	0.073	1.00E-01	1.E-07	2.E-08	1.E-08	--	--	--	--	--	--	--
Heptachlor	10	1.00E-01	2.E-05	3.E-06	5.E-06	4.5E+00	1.3E-03	4.5E+00	7.E-05	4.E-09	2.E-05	9.E-05
Heptachlor epoxide	0.12	1.00E-01	2.E-07	4.E-08	6.E-08	9.1E+00	2.60E-03	9.1E+00	2.E-06	1.E-10	6.E-07	2.E-06
Aroclor 1254	5.2	1.40E-01	8.E-06	2.E-06	4.E-06	2.0E+00	5.7E-04	2.0E+00	2.E-05	9.E-10	7.E-06	2.E-05
Aroclor 1260	0.59	1.40E-01	9.E-07	2.E-07	4.E-07	2.0E+00	5.7E-04	2.0E+00	2.E-06	1.E-10	8.E-07	3.E-06
CUMULATIVE RISK =												3E-04

0.0E+00

NON-CARCINOGENS		DOSE				Toxicity Factors			HAZARD QUOTIENT			
Chemical	Cs (max)	ABS	Ingestion	EC	Dermal	RfDing	RfC	RfDder	Ingestion	Inhalation	Dermal	Total
2,4'-DDD	18.0	3.00E-02	3.E-04	7.E-08	5.E-06	5.0E-04	--	5.0E-04	5.1E-01	--	9.3E-03	5.E-01
4,4'-DDD	55.0	3.00E-02	8.E-04	2.E-07	1.E-05	5.0E-04	--	5.0E-04	1.6E+00	--	2.9E-02	2.E+01
2,4'-DDE	1.3	3.00E-02	2.E-05	5.E-09	3.E-07	5.0E-04	--	5.0E-04	3.7E-02	--	6.7E-04	4.E-02
4,4'-DDE	6.5	3.00E-02	9.E-05	2.E-08	2.E-06	5.0E-04	--	5.0E-04	1.8E-01	--	3.4E-03	2.E-01
2,4'-DDT	34.0	3.00E-02	5.E-04	1.E-07	9.E-06	5.0E-04	--	5.0E-04	9.6E-01	--	1.8E-02	1.E+01
4,4'-DDT	170.0	3.00E-02	2.E-03	6.E-07	4.E-05	5.0E-04	--	5.0E-04	4.8E+00	--	8.8E-02	5.E+01
alpha-BHC	0.039	1.00E-01	6.E-07	1.E-10	1.E-08	3.00E-04	--	3.00E-04	1.8E-03	--	4.5E-05	2.E-03
beta-BHC	0.450	1.00E-01	6.E-06	2.E-09	2.E-07	3.00E-04	--	3.00E-04	2.1E-02	--	5.2E-04	2.E-02
delta-BHC	0.190	4.00E-02	3.E-06	7.E-10								0.E+01
gamma-BHC	0.25000	4.00E-02	4.E-06	9.E-10	9.E-08	3.00E-04	--	3.00E-04	1.2E-02	--	2.9E-04	1.E-02
alpha-chlordane	0.78	4.00E-02	1.E-05	3.E-09	2.E-06	5.00E-04	--	7.00E-04	2.2E-02	--	2.4E-03	2.E-02
gamma-chlordane	0.63	4.00E-02	9.E-06	2.E-09	1.E-06	5.00E-04	--	7.00E-04	1.8E-02	--	1.9E-03	2.E-02
Dieldrin	1.8	1.00E-01	3.E-05	7.E-09	6.E-07	5.00E-05	--	5.00E-05	5.1E-01	--	1.2E-02	5.E-01
Aldrin	0.0580	1.00E-01	8.E-07	2.E-10	1.E-07	3.00E-05	--	3.00E-05	2.7E-02	--	4.2E-03	3.E-02
Endrin	0.0730	1.00E-01	1.E-06	3.E-10	2.E-07	3.00E-05	--	3.00E-05	3.4E-02	--	5.3E-03	4.E-02
Heptachlor	10	1.00E-01	1.E-04	4.E-08	2.E-05	5.0E-04	--	5.0E-04	2.8E-01	--	4.3E-02	3.E-01
Heptachlor epoxide	0.12	1.00E-01	2.E-06	4.E-10	3.E-07	1.30E-05	--	1.30E-05	1.3E-01	--	2.0E-02	2.E-01
Methoxychlor	0.019	1.00E-01	3.E-07	7.E-11	2.E-08	5.00E-03	--	5.00E-03	5.4E-05	--	3.3E-06	6.E-05
Aroclor 1260	0.59	1.50E-01	8.E-06	2.E-09	8.E-07	--	--	--	--	--	--	0.E+01
Endosulfan I	0.0076	1.00E-01	1.E-07	3.E-11	2.E-08	6.00E-03	6.00E-03	6.00E-03	1.8E-05	4.6E-09	2.7E-06	2.E-05
Endosulfan II	0.0034	1.00E-01	5.E-08	1.E-11	7.E-09	6.00E-03	6.00E-03	6.00E-03	8.0E-06	2.1E-09	1.2E-06	9.E-06
Endosulfan sulfate	0.024	1.00E-01	3.E-07	9.E-11	5.E-08	--	--	--	--	--	--	0.E+01
Endrin aldehyde	0.036	1.00E-01	5.E-07	1.E-10	8.E-08	na	0.00E+00	6.00E-03	--	--	1.3E-05	1.E-05
Endrin ketone	0.033	1.00E-01	5.E-07	1.E-10	7.E-08	na	0.00E+00	6.00E-03	--	--	1.2E-05	1.E-05
CUMULATIVE HAZARD INDEX =												9.4

Maximum concentrations were used because max<95% UCL

TABLE 5-5
CANCER RISK AND HAZARD INDEX ESTIMATES DUE TO MAXIMUM SOIL CONCENTRATIONS - 0 to 16 feet below ground surface
RESIDENTIAL SCENARIO
Historical Storm Water Pathway - South, Ecological Control Industries Property

TABLE 5-6
CANCER RISK AND HAZARD INDEX ESTIMATES DUE TO 95% UCL SOIL CONCENTRATIONS - 0 to 16 feet below ground surface
RESIDENTIAL SCENARIO

Historical Storm Water Pathway - South, Ecological Control Industries Property

PARAMETERS	UNITS	VALUES
Cs = Concentration in soil	mg/kg	see table
EF = Exposure Frequency	days/year	350
ED = Exposure Duration	years	24
EDc = Exposure Duration	years	6
ET = Exposure Time	hours/day	24
BWa = Body Weight	kg	70
BWc = Body Weight, child	kg	15
ATnc = Averaging Time - noncarcinogen	days	2190
ATc = Averaging Time - carcinogen	days	25550
SSA = Skin Surface Area	cm ² /day	5700
SSAc = skin surface area,	cm ² /day	2900
ABS = Absorption Factor	%	see table
Afc = soil to skin adherence factor	mg/cm ²	0.2
Afa = soil to skin adherence factor	mg/cm ²	0.07
InhR = Inhalation Rate	m ³ /day	20
InhRc = Inhalation Rate	m ³ /day	10
PEF = Particulate Emission Factor	m ³ /kg	1.32E+09
IngRc = Ingestion Rate, child	mg/day	200
IngRa = Ingestion Rate, adult	mg/day	100
CF = Conversion Factor	kg/mg	1.00E-06
SFing = Ingestion Cancer Slope Factor	mg/kg-day	see table
SFinh = Inhalation Cancer Slope Factor	mg/kg-day	see table
RfDing = Ingestion Reference Dose	mg/kg-day	see table
RfDinh = Inhalation Reference Dose	mg/kg-day	see table
VF = Volatilization Factor	m ³ /kg	chemical-specific
EC = Exposure Concentration, carcinogens	µg/m ³	see table
EC = Exposure Concentration, noncarcinogens	mg/m ³	see table

**TABLE 5-6
CANCER RISK AND HAZARD INDEX ESTIMATES DUE TO 95% UCL SOIL CONCENTRATIONS - 0 to 16 feet below ground surface
RESIDENTIAL SCENARIO**

Historical Storm Water Pathway - South, Ecological Control Industries Property

CARCINOGENS			DOSE			Toxicity Factors			RISK			
	Chemical	Cs (95% UCL)	ABS	Ingestion	EC	Dermal	SFing	IUR	SFder	Ingestion	Inhalation	Dermal
2,4'-DDD	0.74	3.00E-02	1.E-06	2.E-07	1.E-07	2.4E-01	9.7E-05	2.4E-01	3.E-07	2.E-11	3.E-08	3.E-07
4,4'-DDD	2.2	3.00E-02	3.E-06	7.E-07	3.E-07	2.4E-01	9.7E-05	2.4E-01	8.E-07	7.E-11	8.E-08	9.E-07
2,4'-DDE	0.07	3.00E-02	1.E-07	2.E-08	1.E-08	3.4E-01	9.7E-05	3.4E-01	4.E-08	2.E-12	4.E-09	4.E-08
4,4'-DDE	0.66	3.00E-02	1.E-06	2.E-07	1.E-07	3.4E-01	9.7E-05	3.4E-01	4.E-07	2.E-11	3.E-08	4.E-07
2,4'-DDT	1.18	3.00E-02	2.E-06	4.E-07	2.E-07	3.4E-01	9.7E-05	3.4E-01	6.E-07	4.E-11	6.E-08	7.E-07
4,4'-DDT	6.3	3.00E-02	1.E-05	2.E-06	1.E-06	3.4E-01	9.7E-05	3.4E-01	3.E-06	2.E-10	3.E-07	4.E-06
alpha-BHC	0.039	1.00E-01	6.E-08	1.E-08	2.E-08	1.8E+00	5.3E-04	1.8E+00	1.E-07	6.E-12	4.E-08	1.E-07
beta-BHC	0.007	1.00E-01	1.E-08	2.E-09	4.E-09	1.8E+00	5.3E-04	1.8E+00	2.E-08	1.E-12	6.E-09	3.E-08
delta-BHC	0.19	4.00E-02	3.E-07	6.E-08	4.E-08	1.8E+00	5.3E-04	1.8E+00	5.E-07	3.E-11	7.E-08	6.E-07
gamma-BHC	0.25	4.00E-02	4.E-07	8.E-08	5.E-08	1.10E+00	3.1E-04	1.10E+00	4.E-07	2.E-11	6.E-08	5.E-07
alpha-Chlordane	0.05	4.00E-02	8.E-08	2.E-08	3.E-08	3.5E-01	1.0E-04	3.5E-01	3.E-08	2.E-12	9.E-09	4.E-08
gamma-Chlordane	0.05	4.00E-02	8.E-08	2.E-08	1.E-08	3.5E-01	1.0E-04	3.5E-01	3.E-08	2.E-12	4.E-09	3.E-08
Dieldrin	0.03	1.00E-01	5.E-08	9.E-09	2.E-08	1.6E+01	4.6E-03	1.6E+01	8.E-07	4.E-11	3.E-07	1.E-06
Aldrin	0.0016	1.00E-01	3.E-09	5.E-10	3.E-10	1.7E+01	4.9E-03	1.7E+01	4.E-08	2.E-12	5.E-09	5.E-08
Heptachlor	0.36	1.00E-01	6.E-07	1.E-07	2.E-07	4.5E+00	1.3E-03	4.5E+00	3.E-06	1.E-10	8.E-07	3.E-06
Heptachlor epoxide	0.007	1.00E-01	1.E-08	2.E-09	4.E-09	9.1E+00	2.60E-03	9.1E+00	1.E-07	6.E-12	3.E-08	1.E-07
Aroclor 1254	0.17	1.40E-01	3.E-07	5.E-08	1.E-07	2.0E+00	5.7E-04	2.0E+00	5.E-07	3.E-11	2.E-07	8.E-07
Aroclor 1260	0.03	1.40E-01	5.E-08	9.E-09	2.E-08	2.0E+00	5.7E-04	2.0E+00	9.E-08	5.E-12	4.E-08	1.E-07
CUMULATIVE RISK =												1E-05

0.0E+00

NON-CARCINOGENS			DOSE			Toxicity Factors			HAZARD QUOTIENT			
	Chemical	Cs (95% UCL)	ABS	Ingestion	EC	Dermal	RfDing	RfC	RfDder	Ingestion	Inhalation	Dermal
2,4'-DDD	0.7	3.00E-02	1.E-05	3.E-09	2.E-07	5.0E-04	--	5.0E-04	2.1E-02	--	3.8E-04	2.E-02
4,4'-DDD	2.2	3.00E-02	3.E-05	8.E-09	6.E-07	5.0E-04	--	5.0E-04	6.2E-02	--	1.1E-03	6.E-02
2,4'-DDE	0.1	3.00E-02	1.E-06	3.E-10	2.E-08	5.0E-04	--	5.0E-04	2.0E-03	--	3.6E-05	2.E-03
4,4'-DDE	0.7	3.00E-02	9.E-06	2.E-09	2.E-07	5.0E-04	--	5.0E-04	1.9E-02	--	3.4E-04	2.E-02
2,4'-DDT	1.2	3.00E-02	2.E-05	4.E-09	3.E-07	5.0E-04	--	5.0E-04	3.3E-02	--	6.1E-04	3.E-02
4,4'-DDT	6.3	3.00E-02	9.E-05	2.E-08	2.E-06	5.0E-04	--	5.0E-04	1.8E-01	--	3.3E-03	2.E-01
alpha-BHC	0.039	1.00E-01	6.E-07	1.E-10	8.E-08	3.00E-04	--	3.00E-04	1.8E-03	--	2.8E-04	2.E-03
beta-BHC	0.007	1.00E-01	1.E-07	3.E-11	2.E-08	3.00E-04	--	3.00E-04	3.3E-04	--	5.0E-05	4.E-04
delta-BHC	0.190	4.00E-02	3.E-06	7.E-10	7.E-08	3.00E-04	--	3.00E-04	9.0E-03	--	2.2E-04	9.E-03
gamma-BHC	0.25000	4.00E-02	4.E-06	9.E-10	5.E-07	3.00E-04	--	3.00E-04	1.2E-02	--	1.8E-03	1.E-02
alpha-chlordane	0.05	4.00E-02	7.E-07	2.E-10	1.E-07	5.00E-04	--	7.00E-04	1.4E-03	--	1.5E-04	2.E-03
gamma-chlordane	0.05	4.00E-02	7.E-07	2.E-10	1.E-07	5.00E-04	--	7.00E-04	1.4E-03	--	1.5E-04	2.E-03
Dieldrin	0.03	1.00E-01	4.E-07	1.E-10	0.E+00	5.00E-05	--	5.00E-05	8.5E-03	--	0.0E+00	8.E-03
Aldrin	0.0016	1.00E-01	2.E-08	6.E-12	3.E-09	3.00E-05	--	3.00E-05	7.5E-04	--	1.2E-04	9.E-04
Endrin	0.0730	1.00E-01	1.E-06	3.E-10	2.E-07	3.00E-05	--	3.00E-05	3.4E-02	--	5.3E-03	4.E-02
Heptachlor	0.36	1.00E-01	5.E-06	1.E-09	8.E-07	5.0E-04	--	5.0E-04	1.0E-02	--	1.6E-03	1.E-02
Heptachlor epoxide	0.007	1.00E-01	1.E-07	3.E-11	2.E-08	1.30E-05	--	1.30E-05	7.6E-03	--	1.2E-03	9.E-03
Methoxychlor	0.019	1.00E-01	3.E-07	7.E-11	2.E-08	5.00E-03	--	5.00E-03	5.4E-05	--	3.3E-06	5.E-05
Aroclor 1254	0.17	1.40E-01	2.E-06	6.E-10	2.E-07	2.0E-05	--	2.0E-05	1.2E-01	--	1.1E-02	1.E-01
Aroclor 1260	0.03	1.40E-01	4.E-07	1.E-10	4.E-08	--	--	--	--	--	--	0.E+00
Endosulfan 1	0.002	1.00E-01	3.E-08	7.E-12	4.E-09	6.00E-03	6.00E-03	6.00E-03	4.7E-06	1.2E-09	7.2E-07	5.E-06
Endosulfan II	0.0034	1.00E-01	5.E-08	1.E-11	7.E-09	6.00E-03	6.00E-03	6.00E-03	8.0E-06	2.1E-09	1.2E-06	9.E-06
Endosulfan sulfate	0.006	1.00E-01	8.E-08	2.E-11	1.E-08	--	--	--	--	--	--	0.E+00
Endrin	0.073	1.00E-01	1.E-06	3.E-10	2.E-07	3.00E-05	--	3.00E-05	3.4E-02	--	5.3E-03	4.E-02
Endrin aldehyde	0.004	1.00E-01	6.E-08	1.E-11	9.E-09	na	0.00E+00	6.00E-03	--	--	1.4E-06	1.E-06
Endrin ketone	0.033	1.00E-01	5.E-07	1.E-10	7.E-08	na	0.00E+00	6.00E-03	--	--	1.2E-05	1.E-05
CUMULATIVE HAZARD INDEX =												0.5

Maximum concentrations were used because max<95% UCL

TABLE 5-7
CANCER RISK AND HAZARD INDEX ESTIMATES DUE TO MAXIMUM SOIL CONCENTRATIONS - 0 to 2 feet below ground surface
COMMERCIAL/INDUSTRIAL SCENARIO
Historical Storm Water Pathway - South, Ecological Control Industries Property

PARAMETERS	UNITS	VALUES
Cs = Concentration in soil	mg/kg	see table
EF = Exposure Frequency	days/year	250
ED = Exposure Duration	years	25
ET = Exposure Time	hours/day	8
BWa = Body Weight	kg	70
ATnc = Averaging Time - noncarcinogen	days	2190
ATc = Averaging Time - carcinogen	days	25550
SSA = Skin Surface Area	cm ² /day	5700
ABS = Absorption Factor	%	see table
AFa = soil to skin adherence factor	mg/cm ²	0.2
PEF = Particulate Emission Factor	m ³ /kg	1.32E+09
IngRa = Ingestion Rate, adult	mg/day	100
CF = Conversion Factor	kg/mg	1.00E-06
SFing = Ingestion Cancer Slope Factor	mg/kg-day	see table
IUR = Inhalation Unit Risk	(ug/m ³) ⁻¹	see table
RfDing = Ingestion Reference Dose	mg/kg-day	see table
RfCinh = Inhalation Reference Concentration	mg/m ³	see table
VF = Volatilization Factor	m ³ /kg	chemical-specific
EC = Exposure Concentration, carcinogens	ug/m ³	see table
EC = Exposure Concentration, noncarcinogens	mg/m ³	see table

TABLE 5-7
CANCER RISK AND HAZARD INDEX ESTIMATES DUE TO MAXIMUM SOIL CONCENTRATIONS - 0 to 2 feet below ground surface
COMMERCIAL/INDUSTRIAL SCENARIO
Historical Storm Water Pathway - South, Ecological Control Industries Property

CARCINOGENS	Chemical	Cs (max)	ABS	DOSE			Toxicity Factors			RISK			
				Ingestion	EC	Dermal	SFing	IUR	SFder	Ingestion	Inhalation	Dermal	Total
2,4'-DDD		1.9	3.00E-02	7.E-07	1.E-07	2.E-07	2.4E-01	9.7E-05	2.4E-01	2.E-07	1.E-11	5.E-08	2.E-07
4,4'-DDD		9.1	3.00E-02	3.E-06	6.E-07	1.E-06	2.4E-01	9.7E-05	2.4E-01	8.E-07	5.E-11	3.E-07	1.E-06
2,4'-DDE		0.39	3.00E-02	1.E-07	2.E-08	5.E-08	3.4E-01	9.7E-05	3.4E-01	5.E-08	2.E-12	2.E-08	6.E-08
4,4'-DDE		1.5	3.00E-02	5.E-07	9.E-08	2.E-07	3.4E-01	9.7E-05	3.4E-01	2.E-07	9.E-12	6.E-08	2.E-07
2,4'-DDT		1.6	3.00E-02	6.E-07	1.E-07	2.E-07	3.4E-01	9.7E-05	3.4E-01	2.E-07	1.E-11	7.E-08	3.E-07
4,4'-DDT		18	3.00E-02	6.E-06	1.E-06	2.E-06	3.4E-01	9.7E-05	3.4E-01	2.E-06	1.E-10	7.E-07	3.E-06
beta-BHC		0.013	4.00E-02	5.E-09	8.E-10	2.E-09	1.8E+00	5.3E-04	1.8E+00	8.E-09	4.E-13	4.E-09	1.E-08
gamma-BHC		0.00082	4.00E-02	3.E-10	5.E-11	1.E-10	1.10E+00	3.1E-04	1.10E+00	3.E-10	2.E-14	1.E-10	5.E-10
alpha-Chlordane		0.78	4.00E-02	3.E-07	5.E-08	1.E-07	3.5E-01	1.0E-04	3.5E-01	1.E-07	5.E-12	4.E-08	1.E-07
gamma-Chlordane		0.63	4.00E-02	2.E-07	4.E-08	1.E-07	3.5E-01	1.0E-04	3.5E-01	8.E-08	4.E-12	4.E-08	1.E-07
Dieldrin		0.045	1.00E-01	2.E-08	3.E-09	2.E-08	1.6E+01	4.6E-03	1.6E+01	3.E-07	1.E-11	3.E-07	5.E-07
Aldrin		0.0021	1.00E-01	7.E-10	1.E-10	8.E-10	1.7E+01	4.9E-03	1.7E+01	1.E-08	6.E-13	1.E-08	3.E-08
Heptachlor		0.047	1.00E-01	2.E-08	3.E-09	2.E-08	4.5E+00	1.3E-03	4.5E+00	7.E-08	4.E-12	8.E-08	2.E-07
Heptachlor epoxide		0.068	1.00E-01	2.E-08	4.E-09	3.E-08	9.1E+00	2.60E-03	9.1E+00	2.E-07	1.E-11	2.E-07	5.E-07
Aroclor 1254		0.51	1.40E-01	2.E-07	3.E-08	3.E-07	2.0E+00	5.7E-04	2.0E+00	4.E-07	2.E-11	6.E-07	9.E-07
Aroclor 1260		0.06	1.40E-01	2.E-08	4.E-09	3.E-08	2.0E+00	5.7E-04	2.0E+00	4.E-08	2.E-12	7.E-08	1.E-07
CUMULATIVE RISK =												7E-06	

NON-CARCINOGENS	Chemical	Cs (max)	ABS	DOSE			Toxicity Factors			HAZARD QUOTIENT			
				Ingestion	EC	Dermal	RfDing	RfC	RfDder	Ingestion	Inhalation	Dermal	Total
2,4'-DDD		1.9	3.00E-02	2.E-06	1.E-09	7.E-07	5.0E-04	--	5.0E-04	3.9E-03	--	1.3E-03	5.E-03
4,4'-DDD		9.1	3.00E-02	9.E-06	7.E-09	3.E-06	5.0E-04	--	5.0E-04	1.9E-02	--	6.3E-03	2.E-02
2,4'-DDE		0.4	3.00E-02	4.E-07	3.E-10	1.E-07	5.0E-04	--	5.0E-04	8.0E-04	--	2.7E-04	1.E-03
4,4'-DDE		1.5	3.00E-02	2.E-06	1.E-09	5.E-07	5.0E-04	--	5.0E-04	3.1E-03	--	1.0E-03	4.E-03
2,4'-DDT		1.6	3.00E-02	2.E-06	1.E-09	6.E-07	5.0E-04	--	5.0E-04	3.3E-03	--	1.1E-03	4.E-03
4,4'-DDT		18.0	3.00E-02	2.E-05	1.E-08	6.E-06	5.0E-04	--	5.0E-04	3.7E-02	--	1.3E-02	5.E-02
beta-BHC		0.013	4.00E-02	1.E-08	9.E-12	6.E-09	3.00E-04	--	3.00E-04	4.4E-05	--	2.0E-05	6.E-05
gamma-BHC		0.00082	4.00E-02	8.E-10	6.E-13	4.E-10	3.00E-04	--	3.00E-04	2.8E-06	--	1.3E-06	4.E-06
alpha-chlordane		0.78	4.00E-02	8.E-07	6.E-10	4.E-07	5.00E-04	--	7.00E-04	1.6E-03	--	5.2E-04	2.E-03
gamma-chlordane		0.63	4.00E-02	6.E-07	5.E-10	3.E-07	5.00E-04	--	7.00E-04	1.3E-03	--	4.2E-04	2.E-03
Dieldrin		0.045	1.00E-01	5.E-08	3.E-11	5.E-08	5.00E-05	--	5.00E-05	9.2E-04	--	1.0E-03	2.E-03
Aldrin		0.0021	1.00E-01	2.E-09	2.E-12	2.E-09	3.00E-05	--	3.00E-05	7.1E-05	--	8.1E-05	2.E-04
Heptachlor		0.047	1.00E-01	5.E-08	3.E-11	5.E-08	5.0E-04	--	5.0E-04	9.6E-05	--	1.1E-04	2.E-04
Heptachlor epoxide		0.068	1.00E-01	7.E-08	5.E-11	8.E-08	1.30E-05	--	1.30E-05	5.3E-03	--	6.1E-03	1.E-02
Aroclor 1254		0.51	1.40E-01	5.E-07	4.E-10	8.E-07	2.0E-05	--	2.0E-05	2.6E-02	--	4.1E-02	7.E-02
Aroclor 1260		0.06	1.40E-01	6.E-08	4.E-11	1.E-07	--	--	--	--	--	--	0.E+00
Endosulfan 1		0.0051	1.00E-01	5.E-09	4.E-12	6.E-09	6.00E-03	6.00E-03	6.00E-03	8.7E-07	6.1E-10	9.9E-07	2.E-06
Endosulfan sulfate		0.0018	1.00E-01	2.E-09	1.E-12	2.E-09	--	--	--	--	--	--	0.E+00
Endrin aldehyde		0.0035	1.00E-01	4.E-09	3.E-12	4.E-09	na	0.00E+00	6.00E-03	--	--	6.8E-07	7.E-07
Endrin ketone		0.0063	1.00E-01	6.E-09	5.E-12	7.E-09	na	0.00E+00	6.00E-03	--	--	1.2E-06	1.E-06
CUMULATIVE HAZARD INDEX =													0.2

Maximum concentrations were used because max<95% UCL

TABLE 5-8
CANCER RISK AND HAZARD INDEX ESTIMATES DUE TO 95% UCL SOIL CONCENTRATIONS - 0 to 2 feet below ground surface
COMMERCIAL/INDUSTRIAL SCENARIO
Historical Storm Water Pathway - South, Ecological Control Industries Property

PARAMETERS	UNITS	VALUES
Cs = Concentration in soil	mg/kg	see table
EF = Exposure Frequency	days/year	250
ED = Exposure Duration	years	25
ET = Exposure Time	hours/day	8
BWa = Body Weight	kg	70
ATnc = Averaging Time - noncarcinogen	days	2190
ATc = Averaging Time - carcinogen	days	25550
SSA = Skin Surface Area	cm ² /day	5700
ABS = Absorption Factor	%	see table
Afa = soil to skin adherence factor	mg/cm ²	0.2
PEF = Particulate Emission Factor	m ³ /kg	1.32E+09
IngRa = Ingestion Rate, adult	mg/day	100
CF = Conversion Factor	kg/mg	1.00E-06
SFing = Ingestion Cancer Slope Factor	mg/kg-day	see table
IUR = Inhalation Unit Risk	(ug/m ³) ⁻¹	see table
RfDing = Ingestion Reference Dose	mg/kg-day	see table
RfCinh = Inhalation Reference Concentration	mg/m ³	see table
VF = Volatilization Factor	m ³ /kg	chemical-specific
EC = Exposure Concentration, carcinogens	ug/m ³	see table
EC = Exposure Concentration, noncarcinogens	mg/m ³	see table

**TABLE 5-8
CANCER RISK AND HAZARD INDEX ESTIMATES DUE TO 95% UCL SOIL CONCENTRATIONS - 0 to 2 feet below ground surface
COMMERCIAL/INDUSTRIAL SCENARIO**

CARCINOGENS			DOSE			Toxicity Factors			RISK			
Chemical	Cs (95% UCL)	ABS	Ingestion	EC	Dermal	SFing	IUR	SFder	Ingestion	Inhalation	Dermal	Total
2,4'-DDD	0.118	3.00E-02	4.E-08	7.E-09	1.E-08	2.4E-01	9.7E-05	2.4E-01	1.E-08	7.E-13	3.E-09	1.E-08
4,4'-DDD	0.59	3.00E-02	2.E-07	4.E-08	7.E-08	2.4E-01	9.7E-05	2.4E-01	5.E-08	4.E-12	2.E-08	7.E-08
2,4'-DDE	0.02	3.00E-02	7.E-09	1.E-09	2.E-09	3.4E-01	9.7E-05	3.4E-01	2.E-09	1.E-13	8.E-10	3.E-09
4,4'-DDE	0.27	3.00E-02	9.E-08	2.E-08	3.E-08	3.4E-01	9.7E-05	3.4E-01	3.E-08	2.E-12	1.E-08	4.E-08
2,4'-DDT	0.15	3.00E-02	5.E-08	9.E-09	2.E-08	3.4E-01	9.7E-05	3.4E-01	2.E-08	9.E-13	6.E-09	2.E-08
4,4'-DDT	1.16	3.00E-02	4.E-07	7.E-08	1.E-07	3.4E-01	9.7E-05	3.4E-01	1.E-07	7.E-12	5.E-08	2.E-07
beta-BHC	0.013	4.00E-02	5.E-09	8.E-10	2.E-09	1.8E+00	5.3E-04	1.8E+00	8.E-09	4.E-13	4.E-09	1.E-08
gamma-BHC	0.00082	4.00E-02	3.E-10	5.E-11	1.E-10	1.10E+00	3.1E-04	1.10E+00	3.E-10	2.E-14	1.E-10	5.E-10
alpha-Chlordane	0.08	4.00E-02	3.E-08	5.E-09	1.E-08	3.5E-01	1.0E-04	3.5E-01	1.E-08	5.E-13	4.E-09	1.E-08
gamma-Chlordane	0.08	4.00E-02	3.E-08	5.E-09	1.E-08	3.5E-01	1.0E-04	3.5E-01	1.E-08	5.E-13	4.E-09	1.E-08
Dieldrin	0.01	1.00E-01	3.E-09	6.E-10	4.E-09	1.6E+01	4.6E-03	1.6E+01	6.E-08	3.E-12	6.E-08	1.E-07
Aldrin	0.00096	1.00E-01	3.E-10	6.E-11	4.E-10	1.7E+01	4.9E-03	1.7E+01	6.E-09	3.E-13	7.E-09	1.E-08
Heptachlor	0.007	1.00E-01	2.E-09	4.E-10	3.E-09	4.5E+00	1.3E-03	4.5E+00	1.E-08	6.E-13	1.E-08	2.E-08
Heptachlor epoxide	0.067	1.00E-01	2.E-08	4.E-09	3.E-08	9.1E+00	2.60E-03	9.1E+00	2.E-07	1.E-11	2.E-07	5.E-07
Aroclor 1254	0.51	1.40E-01	2.E-07	3.E-08	3.E-07	2.0E+00	5.7E-04	2.0E+00	4.E-07	2.E-11	6.E-07	9.E-07
Aroclor 1260	0.026	1.40E-01	9.E-09	2.E-09	1.E-08	2.0E+00	5.7E-04	2.0E+00	2.E-08	9.E-13	3.E-08	5.E-08
CUMULATIVE RISK =												2E-06

NON-CARCINOGENS			DOSE			Toxicity Factors			HAZARD QUOTIENT			
Chemical	Cs (95% UCL)	ABS	Ingestion	EC	Dermal	RfDing	RfC	RfDder	Ingestion	Inhalation	Dermal	Total
2,4'-DDD	0.12	3.00E-02	1.E-07	9.E-11	4.E-08	5.0E-04	--	5.0E-04	2.4E-04	--	8.2E-05	3.E-04
4,4'-DDD	0.59	3.00E-02	6.E-07	4.E-10	2.E-07	5.0E-04	--	5.0E-04	1.2E-03	--	4.1E-04	2.E-03
2,4'-DDE	0.02	3.00E-02	2.E-08	1.E-11	7.E-09	5.0E-04	--	5.0E-04	4.1E-05	--	1.4E-05	5.E-05
4,4'-DDE	0.27	3.00E-02	3.E-07	2.E-10	9.E-08	5.0E-04	--	5.0E-04	5.5E-04	--	1.9E-04	7.E-04
2,4'-DDT	0.15	3.00E-02	2.E-07	1.E-10	5.E-08	5.0E-04	--	5.0E-04	3.1E-04	--	1.0E-04	4.E-04
4,4'-DDT	1.16	3.00E-02	1.E-06	8.E-10	4.E-07	5.0E-04	--	5.0E-04	2.4E-03	--	8.1E-04	3.E-03
beta-BHC	0.013	4.00E-02	1.E-08	9.E-12	6.E-09	3.00E-04	--	3.00E-04	4.4E-05	--	2.0E-05	6.E-05
gamma-BHC	0.00082	4.00E-02	8.E-10	6.E-13	4.E-10	3.00E-04	--	3.00E-04	2.8E-06	--	1.3E-06	4.E-06
alpha-chlordane	0.08	4.00E-02	8.E-08	6.E-11	4.E-08	5.00E-04	--	7.00E-04	1.6E-04	--	5.3E-05	2.E-04
gamma-chlordane	0.08	4.00E-02	8.E-08	6.E-11	4.E-08	5.00E-04	--	7.00E-04	1.6E-04	--	5.3E-05	2.E-04
Dieldrin	0.01	1.00E-01	1.E-08	7.E-12	1.E-08	5.00E-05	--	5.00E-05	2.0E-04	--	2.3E-04	4.E-04
Aldrin	0.00096	1.00E-01	1.E-09	7.E-13	1.E-09	3.00E-05	--	3.00E-05	3.3E-05	--	3.7E-05	7.E-05
Heptachlor	0.007	1.00E-01	7.E-09	5.E-12	8.E-09	5.0E-04	--	5.0E-04	1.4E-05	--	1.6E-05	3.E-05
Heptachlor epoxide	0.067	1.00E-01	7.E-08	5.E-11	8.E-08	1.30E-05	--	1.30E-05	5.3E-03	--	6.0E-03	1.E-02
Aroclor 1254	0.510	1.50E-01	5.E-07	4.E-10	9.E-07	2.0E-05	--	2.0E-05	2.6E-02	--	4.4E-02	7.E-02
Aroclor 1260	0.026	1.50E-01	3.E-08	2.E-11	5.E-08	--	--	--	--	--	--	0.E+00
Endosulfan 1	0.0051	1.00E-01	5.E-09	4.E-12	6.E-09	6.00E-03	6.00E-03	6.00E-03	8.7E-07	6.1E-10	9.9E-07	2.E-06
Endosulfan sulfate	0.0018	1.00E-01	2.E-09	1.E-12	2.E-09	--	--	--	--	--	--	0.E+00
Endrin aldehyde	0.0035	1.00E-01	4.E-09	3.E-12	4.E-09	na	0.00E+00	6.00E-03	--	--	6.8E-07	7.E-07
Endrin ketone	0.0063	1.00E-01	6.E-09	5.E-12	7.E-09	na	0.00E+00	6.00E-03	--	--	1.2E-06	1.E-06
CUMULATIVE HAZARD INDEX =												0.09

Maximum concentrations were used because max<95% UCL

**TABLE 5-9
 CANCER RISK AND HAZARD INDEX ESTIMATES DUE TO MAXIMUM SOIL CONCENTRATIONS - 0 to 16 feet below ground surface
 CONSTRUCTION SCENARIO**

Historical Storm Water Pathway - South, Ecological Control Industries Property

PARAMETERS	UNITS	VALUES
Cs = Concentration in soil	mg/kg	see table
EF = Exposure Frequency	days/year	250
ED = Exposure Duration	years	1
ET = Exposure Time	hours/day	8
BWa = Body Weight	kg	70
ATnc = Averaging Time - noncarcinogen	days	2190
ATc = Averaging Time - carcinogen	days	25550
SSA = Skin Surface Area	cm ² /day	5700
ABS = Absorption Factor	%	see table
AFa = soil to skin adherence factor	mg/cm ²	0.8
PEF = Particulate Emission Factor	m ³ /kg	1.32E+09
IngRa = Ingestion Rate, adult	mg/day	330
CF = Conversion Factor	kg/mg	1.00E-06
SFing = Ingestion Cancer Slope Factor	mg/kg-day	see table
IUR = Inhalation Unit Risk	(ug/m ³) ⁻¹	see table
RfDing = Ingestion Reference Dose	mg/kg-day	see table
RfCinh = Inhalation Reference Concentration	mg/m ³	see table
VF = Volatilization Factor	m ³ /kg	chemical-specific
EC = Exposure Concentration, carcinogens	ug/m ³	see table
EC = Exposure Concentration, noncarcinogens	mg/m ³	see table

**TABLE 5-9
CANCER RISK AND HAZARD INDEX ESTIMATES DUE TO MAXIMUM SOIL CONCENTRATIONS - 0 to 16 feet below ground surface
CONSTRUCTION SCENARIO**

Historical Storm Water Pathway - South, Ecological Control Industries Property

CARCINOGENS	DOSE		DOSE			Toxicity Factors			RISK			
	Chemical	Cs (max)	ABS	Ingestion	EC	Dermal	SFing	IUR	SFder	Ingestion	Inhalation	Dermal
2,4'-DDD	18	3.00E-02	8.E-07	4.E-08	3.E-07	2.4E-01	9.7E-05	2.4E-01	2.E-07	4.E-12	8.E-08	3.E-07
4,4'-DDD	55	3.00E-02	3.E-06	1.E-07	1.E-06	2.4E-01	9.7E-05	2.4E-01	6.E-07	1.E-11	3.E-07	9.E-07
2,4'-DDE	1.3	3.00E-02	6.E-08	3.E-09	2.E-08	3.4E-01	9.7E-05	3.4E-01	2.E-08	3.E-13	8.E-09	3.E-08
4,4'-DDE	6.5	3.00E-02	3.E-07	2.E-08	1.E-07	3.4E-01	9.7E-05	3.4E-01	1.E-07	2.E-12	4.E-08	1.E-07
2,4'-DDT	34	3.00E-02	2.E-06	8.E-08	7.E-07	3.4E-01	9.7E-05	3.4E-01	5.E-07	8.E-12	2.E-07	8.E-07
4,4'-DDT	170	3.00E-02	8.E-06	4.E-07	3.E-06	3.4E-01	9.7E-05	3.4E-01	3.E-06	4.E-11	1.E-06	4.E-06
alpha-BHC	0.039	1.00E-01	2.E-09	1.E-10	2.E-09	1.8E+00	5.3E-04	1.8E+00	3.E-09	5.E-14	4.E-09	8.E-09
beta-BHC	0.45	1.00E-01	2.E-08	1.E-09	3.E-08	1.8E+00	5.3E-04	1.8E+00	4.E-08	6.E-13	5.E-08	9.E-08
delta-BHC	0.19	4.00E-02	9.E-09	5.E-10	5.E-09	1.8E+00	5.3E-04	1.8E+00	2.E-08	2.E-13	9.E-09	2.E-08
gamma-BHC	0.25	4.00E-02	1.E-08	6.E-10	6.E-09	1.10E+00	3.1E-04	1.10E+00	1.E-08	2.E-13	7.E-09	2.E-08
alpha-Chlordane	0.78	4.00E-02	4.E-08	2.E-09	2.E-08	3.5E-01	1.0E-04	3.5E-01	1.E-08	2.E-13	7.E-09	2.E-08
gamma-Chlordane	0.63	4.00E-02	3.E-08	2.E-09	2.E-08	3.5E-01	1.0E-04	3.5E-01	1.E-08	2.E-13	6.E-09	2.E-08
Dieldrin	1.8	1.00E-01	8.E-08	4.E-09	1.E-07	1.6E+01	4.6E-03	1.6E+01	1.E-06	2.E-11	2.E-06	3.E-06
Aldrin	0.058	1.00E-01	3.E-09	1.E-10	4.E-09	1.7E+01	4.9E-03	1.7E+01	5.E-08	7.E-13	6.E-08	1.E-07
Endrin	0.073	1.00E-01	3.E-09	2.E-10	5.E-09							
Heptachlor	10	1.00E-01	5.E-07	2.E-08	6.E-07	4.5E+00	1.3E-03	4.5E+00	2.E-06	3.E-11	3.E-06	5.E-06
Heptachlor epoxide	0.12	1.00E-01	6.E-09	7.E-09	8.E-09	9.1E+00	2.60E-03	9.1E+00	5.E-08	2.E-11	7.E-08	1.E-07
Aroclor 1254	5.2	1.40E-01	2.E-07	3.E-07	5.E-07	2.0E+00	5.7E-04	2.0E+00	5.E-07	2.E-10	9.E-07	1.E-06
Aroclor 1260	0.59	1.40E-01	3.E-08	4.E-08	5.E-08	2.0E+00	5.7E-04	2.0E+00	5.E-08	2.E-11	1.E-07	2.E-07
CUMULATIVE RISK =												2E-05

NON-CARCINOGENS	DOSE		DOSE			Toxicity Factors			HAZARD QUOTIENT			
	Chemical	Cs (max)	ABS	Ingestion	EC	Dermal	RfDing	RfC	RfDder	Ingestion	Inhalation	Dermal
2,4'-DDD	18.0	3.00E-02	2.E-06	5.2E-10	1.E-06	5.0E-04	--	5.0E-04	4.8E-03	--	2.0E-03	7.E-03
4,4'-DDD	55.0	3.00E-02	7.E-06	1.6E-09	3.E-06	5.0E-04	--	5.0E-04	1.5E-02	--	6.1E-03	2.E-02
2,4'-DDE	1.3	3.00E-02	2.E-07	3.8E-11	7.E-08	5.0E-04	--	5.0E-04	3.5E-04	--	1.5E-04	5.E-04
4,4'-DDE	6.5	3.00E-02	9.E-07	1.9E-10	4.E-07	5.0E-04	--	5.0E-04	1.7E-03	--	7.3E-04	2.E-03
2,4'-DDT	34.0	3.00E-02	5.E-06	9.8E-10	2.E-06	5.0E-04	--	5.0E-04	9.1E-03	--	3.8E-03	1.E-02
4,4'-DDT	170.0	3.00E-02	2.E-05	4.9E-09	9.E-06	5.0E-04	--	5.0E-04	4.6E-02	--	1.9E-02	6.E-02
alpha-BHC	0.039	1.00E-01	5.E-09	1.1E-12	7.E-09	3.00E-04	--	3.00E-04	1.7E-05	--	2.4E-05	4.E-05
beta-BHC	0.450	1.00E-01	6.E-08	1.3E-11	8.E-08	3.00E-04	--	3.00E-04	2.0E-04	--	2.8E-04	5.E-04
delta-BHC	0.190	4.00E-02	3.E-08	5.5E-12	1.E-08							0.E+00
gamma-BHC	0.25000	4.00E-02	3.E-08	7.2E-12	2.E-08	3.00E-04	--	3.00E-04	1.1E-04	--	6.2E-05	2.E-04
alpha-chlordane	0.78	4.00E-02	1.E-07	2.3E-11	6.E-08	5.00E-04	--	7.00E-04	2.1E-04	--	8.3E-05	3.E-04
gamma-chlordane	0.63	4.00E-02	8.E-08	1.8E-11	5.E-08	5.00E-04	--	7.00E-04	1.7E-04	--	6.7E-05	2.E-04
Dieldrin	1.8	1.00E-01	2.E-07	5.2E-11	3.E-07	5.00E-05	--	5.00E-05	4.8E-03	--	6.7E-03	1.E-02
Aldrin	0.0580	1.00E-01	8.E-09	1.7E-12	1.E-08	3.00E-05	--	3.00E-05	2.6E-04	--	3.6E-04	6.E-04
Endrin	0.0730	1.00E-01	1.E-08	2.1E-12	1.E-08	3.00E-05	--	3.00E-05	3.3E-04	--	4.5E-04	8.E-04
Heptachlor	10	1.00E-01	1.E-06	2.9E-10	2.E-06	5.0E-04	--	5.0E-04	2.7E-03	--	3.7E-03	6.E-03
Heptachlor epoxide	0.12	1.00E-01	2.E-08	3.5E-12	2.E-08	1.30E-05	--	1.30E-05	1.2E-03	--	1.7E-03	3.E-03
Methoxychlor	0.019	1.00E-01	3.E-09	8.E-08	4.E-09	5.00E-03			5.1E-07			5.E-07
Aroclor 1260	0.59	1.40E-01	8.E-08	2.E-06	2.E-07		--		--	--	--	0.E+00
Endosulfan 1	0.0076	1.00E-01	1.E-09	3.E-08	1.E-09	6.00E-03	6.00E-03	6.00E-03	1.7E-07	5.3E-06	2.4E-07	6.E-06
Endosulfan II	0.0034	1.00E-01	5.E-10	1.E-08	6.E-10	6.00E-03	6.00E-03	6.00E-03	7.6E-08	2.4E-06	1.1E-07	3.E-06
Endosulfan sulfate	0.024	1.00E-01	3.E-09	1.E-07	4.E-09	--	--	--	--	--	--	0.E+00
Endrin aldehyde	0.036	1.00E-01	5.E-09	1.E-07	7.E-09	na	0.00E+00	6.00E-03	--	--	1.1E-06	1.E-06
Endrin ketone	0.033	1.00E-01	4.E-09	1.E-07	6.E-09	na	0.00E+00	6.00E-03	--	--	1.0E-06	1.E-06
CUMULATIVE HAZARD INDEX =												0.13

Maximum concentrations were used because max<95% UCL

TABLE 5-10
CANCER RISK AND HAZARD INDEX ESTIMATES DUE TO 95% UCL SOIL CONCENTRATIONS - 0 to 16 feet below ground surface
CONSTRUCTION SCENARIO

Historical Storm Water Pathway - South, Ecological Control Industries Property

PARAMETERS	UNITS	VALUES
Cs = Concentration in soil	mg/kg	see table
EF = Exposure Frequency	days/year	250
ED = Exposure Duration	years	1
BW _a = Body Weight	kg	70
AT _c = Averaging Time - carcinogen	days	25550
AT _{nc} = Averaging Time - noncarcinogen	days	365
SSA = Skin Surface Area	cm ² /day	5700
AF = Adherence Factor	mg/cm ²	0.8
PEF = Particulate Emission Factor	m ³ /kg	1.32E+09
IngRa = Ingestion Rate, adult	mg/day	330
CF = Conversion Factor	kg/mg	1.00E-06
SF _{ing} = Ingestion Cancer Slope Factor	mg/kg-day	see table
SF _{inh} = Inhalation Cancer Slope Factor	mg/kg-day	see table
RfD _{ing} = Ingestion Reference Dose	mg/kg-day	see table
IUR = Inhalation Unit Risk	(ug/m ³) ⁻¹	see table
VF = Volatilization Factor	m ³ /kg	chemical-specific
RfC _{inh} = Inhalation Reference Concentration	mg/m ³	see table
EC = Exposure Concentration, carcinogens	µg/m ³	see table
EC = Exposure Concentration, noncarcinogens	mg/m ³	see table

**TABLE 5-10
CANCER RISK AND HAZARD INDEX ESTIMATES DUE TO 95% UCL SOIL CONCENTRATIONS - 0 to 16 feet below ground surface
CONSTRUCTION SCENARIO**

Historical Storm Water Pathway - South, Ecological Control Industries Property

Chemical	Cs (95% UCL)	ABS	Ingestion	EC	Dermal	SFing	IUR	SFder	Ingestion	Inhalation	Dermal	Total
2,4'-DDD	0.74	3.00E-02	3.E-08	4.E-18	1.E-08	2.4E-01	9.7E-05	2.4E-01	8.E-09	4.E-22	3.E-09	1.E-08
4,4'-DDD	2.2	3.00E-02	1.E-07	1.E-17	4.E-08	2.4E-01	9.7E-05	2.4E-01	2.E-08	1.E-21	1.E-08	3.E-08
2,4'-DDE	0.07	3.00E-02	3.E-09	9.E+06	1.E-09	3.4E-01	9.7E-05	3.4E-01	1.E-09	9.E+02	5.E-10	9.E+02
4,4'-DDE	0.66	3.00E-02	3.E-08	8.E+07	1.E-08	3.4E-01	9.7E-05	3.4E-01	1.E-08	8.E+03	4.E-09	8.E+03
2,4'-DDT	1.18	3.00E-02	5.E-08	2.E+08	2.E-08	3.4E-01	9.7E-05	3.4E-01	2.E-08	1.E+04	8.E-09	1.E+04
4,4'-DDT	6.3	3.00E-02	3.E-07	8.E+08	1.E-07	3.4E-01	9.7E-05	3.4E-01	1.E-07	8.E+04	4.E-08	8.E+04
alpha-BHC	0.039	1.00E-01	2.E-09	5.E+06	2.E-09	1.8E+00	5.3E-04	1.8E+00	3.E-09	3.E+03	4.E-09	3.E+03
beta-BHC	0.007	1.00E-01	3.E-10	9.E+05	4.E-10	1.8E+00	5.3E-04	1.8E+00	6.E-10	5.E+02	8.E-10	5.E+02
delta-BHC	0.19	4.00E-02	9.E-09	2.E+07	5.E-09	1.8E+00	5.3E-04	1.8E+00	2.E-08	1.E+04	9.E-09	1.E+04
gamma-BHC	0.25	4.00E-02	1.E-08	3.E+07	6.E-09	1.10E+00	3.1E-04	1.10E+00	1.E-08	1.E+04	7.E-09	1.E+04
alpha-Chlordane	0.05	4.00E-02	2.E-09	6.E+06	1.E-09	3.5E-01	1.0E-04	3.5E-01	8.E-10	6.E+02	4.E-10	6.E+02
gamma-Chlordane	0.05	4.00E-02	2.E-09	6.E+06	1.E-09	3.5E-01	1.0E-04	3.5E-01	8.E-10	6.E+02	4.E-10	6.E+02
Dieldrin	0.03	1.00E-01	1.E-09	4.E+06	2.E-09	1.6E+01	4.6E-03	1.6E+01	2.E-08	2.E+04	3.E-08	2.E+04
Aldrin	0.0016	1.00E-01	7.E-11	2.E+05	1.E-10	1.7E+01	4.9E-03	1.7E+01	1.E-09	1.E+03	2.E-09	1.E+03
Heptachlor	0.36	1.00E-01	2.E-08	5.E+07	2.E-08	4.5E+00	1.3E-03	4.5E+00	7.E-08	6.E+04	1.E-07	6.E+04
Heptachlor epoxide	0.007	1.00E-01	3.E-10	9.E+05	4.E-10	9.1E+00	2.60E-03	9.1E+00	3.E-09	2.E+03	4.E-09	2.E+03
Aroclor 1254	0.17	1.40E-01	8.E-09	2.E+07	2.E-08	2.0E+00	5.7E-04	2.0E+00	2.E-08	1.E+04	3.E-08	1.E+04
Aroclor 1260	0.03	1.40E-01	1.E-09	4.E+06	3.E-09	2.0E+00	5.7E-04	2.0E+00	3.E-09	2.E+03	5.E-09	2.E+03
CUMULATIVE RISK =												2E+05

NON-CARCINOGENS			DOSE			Toxicity Factors			HAZARD QUOTIENT			
Chemical	Cs (95% UCL)	ABS	Ingestion	EC	Dermal	RfDing	RfC	RfDder	Ingestion	Inhalation	Dermal	Total
2,4'-DDD	0.7	3.00E-02	1.E-07	1.E+06	4.E-08	5.0E-04	--	5.0E-04	2.0E-04	--	8.3E-05	3.E-04
4,4'-DDD	2.2	3.00E-02	3.E-07	4.E+06	1.E-07	5.0E-04	--	5.0E-04	5.9E-04	--	2.5E-04	8.E-04
2,4'-DDE	0.1	3.00E-02	9.E-09	1.E+05	4.E-09	5.0E-04	--	5.0E-04	1.9E-05	--	7.8E-06	3.E-05
4,4'-DDE	0.7	3.00E-02	9.E-08	1.E+06	4.E-08	5.0E-04	--	5.0E-04	1.8E-04	--	7.4E-05	3.E-04
2,4'-DDT	1.2	3.00E-02	2.E-07	2.E+06	7.E-08	5.0E-04	--	5.0E-04	3.2E-04	--	1.3E-04	4.E-04
4,4'-DDT	6.3	3.00E-02	8.E-07	1.E+07	4.E-07	5.0E-04	--	5.0E-04	1.7E-03	--	7.0E-04	2.E-03
alpha-BHC	0.039	1.00E-01	5.E-09	8.E+04	7.E-09	3.00E-04	--	3.00E-04	1.7E-05	--	2.4E-05	4.E-05
beta-BHC	0.007	1.00E-01	9.E-10	1.E+04	1.E-09	3.00E-04	--	3.00E-04	3.1E-06	--	4.3E-06	7.E-06
delta-BHC	0.190	4.00E-02	3.E-08	4.E+05	1.E-08	3.00E-04	--	3.00E-04	8.5E-05	--	4.7E-05	1.E-04
gamma-BHC	0.25000	4.00E-02	3.E-08	5.E+05	2.E-08	3.00E-04	--	3.00E-04	1.1E-04	--	6.2E-05	2.E-04
alpha-chlordane	0.05	4.00E-02	7.E-09	1.E+05	4.E-09	5.00E-04	--	7.00E-04	1.3E-05	--	5.3E-06	2.E-05
gamma-chlordane	0.05	4.00E-02	7.E-09	1.E+05	4.E-09	5.00E-04	--	7.00E-04	1.3E-05	--	5.3E-06	2.E-05
Dieldrin	0.03	1.00E-01	4.E-09	6.E+04	6.E-09	5.00E-05	--	5.00E-05	8.1E-05	--	1.1E-04	2.E-04
Aldrin	0.0016	1.00E-01	2.E-10	3.E+03	3.E-10	3.00E-05	--	3.00E-05	7.2E-06	--	9.9E-06	2.E-05
Endrin	0.0730	1.00E-01	1.E-08	1.E+05	1.E-08	3.00E-05	--	3.00E-05	3.3E-04	--	4.5E-04	8.E-04
Heptachlor	0.36	1.00E-01	5.E-08	7.E+05	7.E-08	5.0E-04	--	5.0E-04	9.7E-05	--	1.3E-04	2.E-04
Heptachlor epoxide	0.007	1.00E-01	9.E-10	1.E+04	1.E-09	1.30E-05	--	1.30E-05	7.2E-05	--	1.0E-04	2.E-04
Methoxychlor	0.019	1.00E-01	3.E-09	4.E+04	4.E-09	5.00E-03	--	1.30E-05	5.1E-07	--	2.7E-04	3.E-04
Aroclor 1254	0.17	1.40E-01	2.E-08	3.E+05	4.E-08	2.0E-05	--	2.0E-05	1.1E-03	--	2.2E-03	3.E-03
Aroclor 1260	0.03	1.40E-01	4.E-09	6.E+04	8.E-09	--	--	--	--	--	--	0.E+00
Endosulfan 1	0.002	1.00E-01	3.E-10	8.E-19	4.E-10	6.00E-03	6.00E-03	6.00E-03	4.5E-08	1.3E-16	6.2E-08	1.E-07
Endosulfan sulfate	0.006	1.00E-01	8.E-10	2.E-18	1.E-09	--	--	--	--	--	--	0.E+00
Endrin	0.073	1.00E-01	1.E-08	3.E-17	1.E-08	3.00E-04	--	--	3.3E-05	--	--	3.E-05
Endrin aldehyde	0.004	1.00E-01	5.E-10	2.E-18	7.E-10	na	0.00E+00	6.00E-03	--	--	1.2E-07	1.E-07
Endrin ketone	0.033	1.00E-01	4.E-09	1.E-17	6.E-09	na	0.00E+00	6.00E-03	--	--	1.0E-06	1.E-06
CUMULATIVE HAZARD INDEX =												0.01

Maximum concentrations were used because max<95% UCL

TABLE 5-11
SUMMARY OF CANCER RISK AND HAZARD INDEX ESTIMATES
Ecological Control Industries Property

Cumulative Incremental Lifetime Cancer Risk Estimates

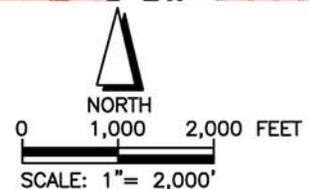
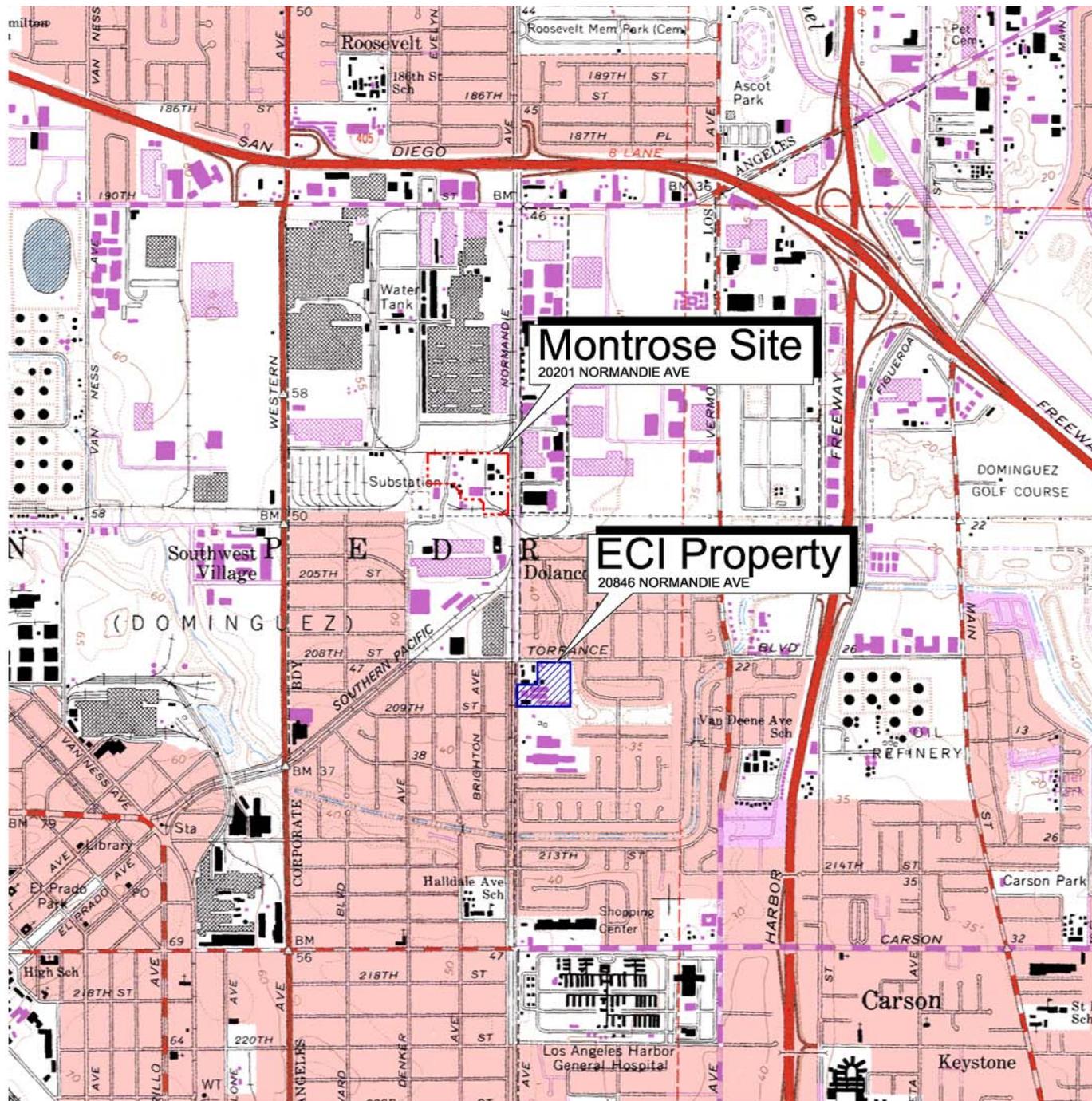
Exposure Scenario	0 to 2 feet bgs		0 to 5 feet bgs		0 to 16 feet bgs	
	Maximum EPC	95% UCL EPC	Maximum EPC	95% UCL EPC	Maximum EPC	95% UCL EPC
Residential Adult/Child	2.E-05	6.E-06	6.E-05	5.E-06	3.E-04	1.E-05
Industrial Worker	7.E-06	2.E-06				
Construction Worker					2.E-05	2.E+05

Cumulative Hazard Index Estimates

Exposure Scenario	0 to 2 feet bgs		0 to 5 feet bgs		0 to 16 feet bgs	
	Maximum EPC	95% UCL EPC	Maximum EPC	95% UCL EPC	Maximum EPC	95% UCL EPC
Residential Adult/Child	1.5	0.6	3.4	0.5	9.4	0.5
Industrial Worker	0.17	0.1				
Construction Worker					0.1	0.01

FIGURES

\\engineering\PROJECTS\07163.0000 EPA Region 9\0027 TO 26 RA - Montrose OUG RA\Graphics\Site Location 1107.ai



Reference:

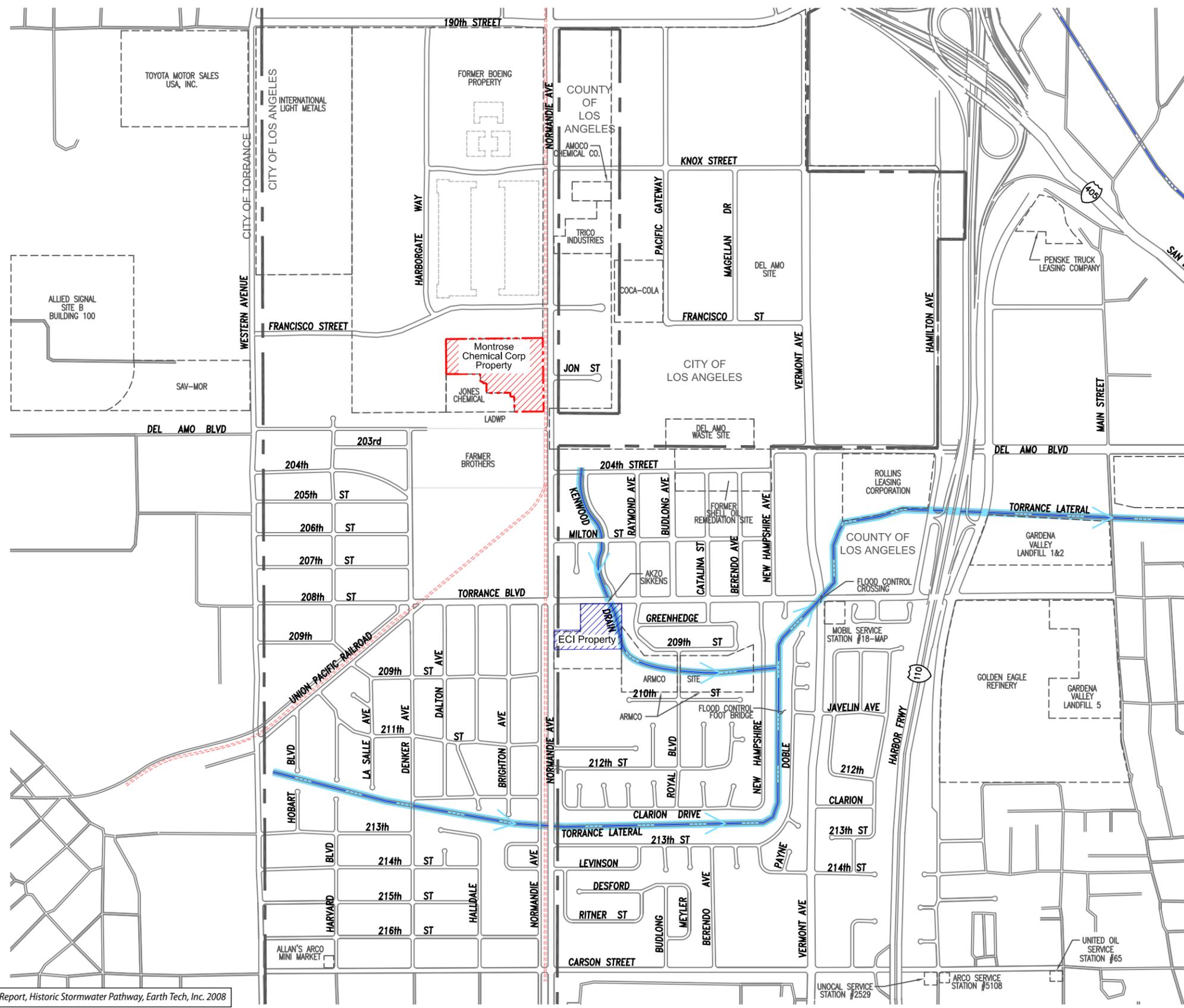
1. U.S.G.S. Topographic Map, Torrance, California 7.5 Minute Quadrangle. Georeferenced using the State of California's CASIL On-line GIS Database, Copyright 2006.

Source: Soil Investigation Report, Historic Stormwater Pathway, Earth Tech, Inc. 2008



**Historical Stormwater Pathway - South
Montrose Chemical Superfund Site**
U.S. EPA Region 9
Los Angeles County, California

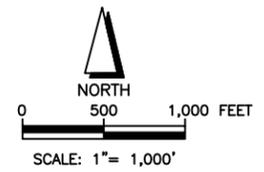
FIGURE 1
Site Location



Legend:

- - - Location of Current Montrose Property Boundary (Surveyed August, 2001)
- Flood Control / Storm Water Channel and Flow Direction

- References:**
1. Source: Montrose Chemical Corp., and Hargis + Associates, map dated September, 2004.
 2. Locations are approximate, unless otherwise stated.
 3. Final Joint Groundwater Feasibility Study, EPA; Dated May 18, 1998.
 4. Streets and Areas not surveyed and not to scale. Corresponding scale is for reference, this drawing is for conceptual purposes only.



Source: Soil Investigation Report, Historic Stormwater Pathway, Earth Tech, Inc. 2008

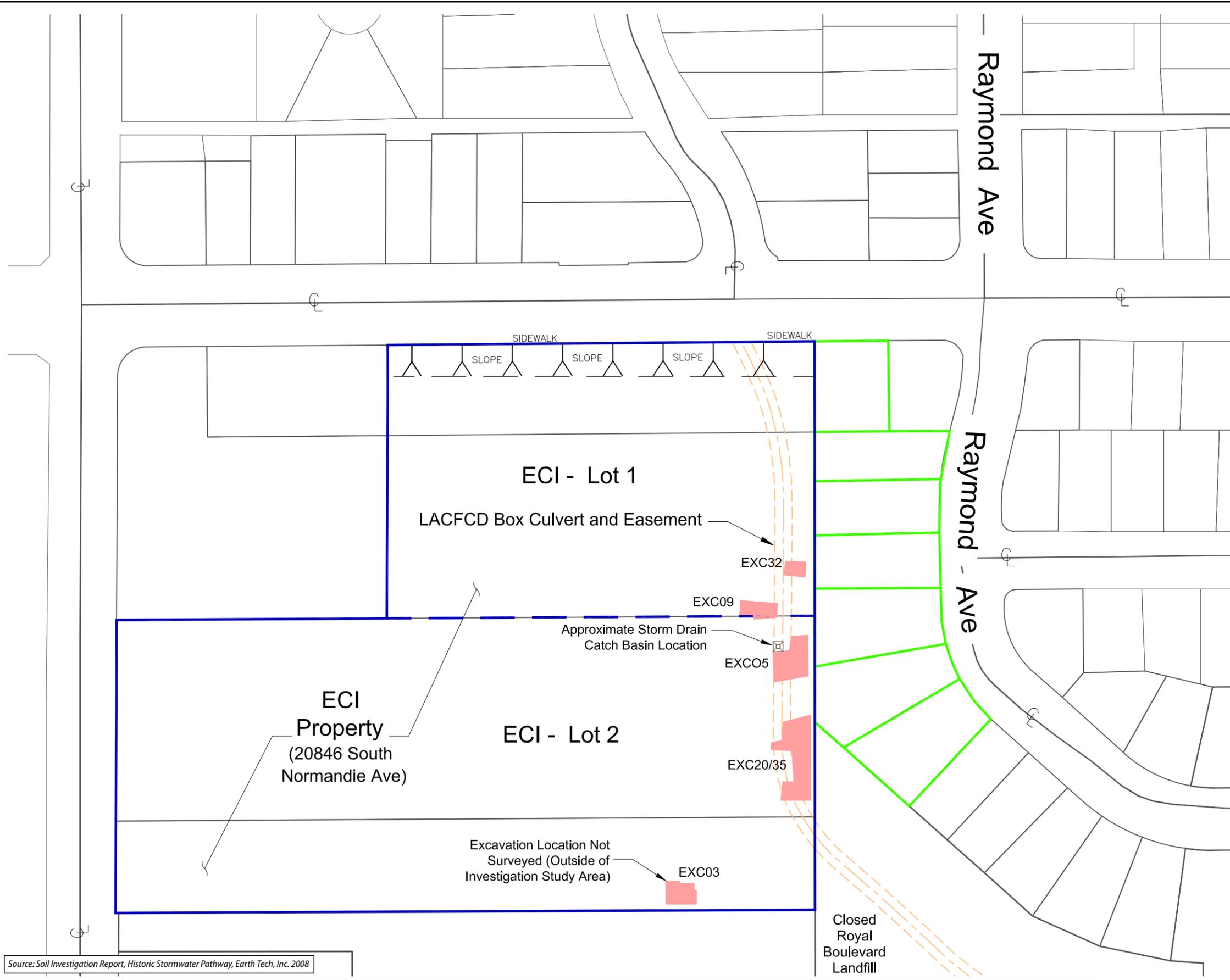


Historical Stormwater Pathway - South
Montrose Chemical Superfund Site
 U.S. EPA Region 9
 Los Angeles County, California

FIGURE 2
 Stormwater Pathway

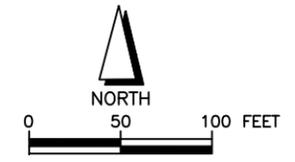
\\engineering\PROJECTS\07163_0000_EPA Region 9\0027 TO 26 RA - Montrose\016 RA Graphics\Stormwater Path 022080.dwg

\\engineering\PROJECTS\0716310000\EPA_Region_9\0027 TO 26 RA - Montrose OUG6 RA\Graphics\Site Plan 022080.dwg



- Explanation:**
- ECI Property Boundary
 - - - ECI Lot Subdivision Line
 - █ Existing Excavation Pit (EXC03)
 - - - LACFCD Box Culvert and Easement
 - EPA Residential Investigation Area

- References:**
1. Parcel Boundaries, Los Angeles County Assessors Office, Los Angeles City Department of Public Works On-line GIS Parcel Database, Copyright 2006.
 2. Source of Flood Control / Storm Water Channel: Los Angeles Flood Control District Map, revision date May 6, 1970, Sheet No. 428-RW3.1.
 3. Dulin and Boynton 2006, for locations of Eastern Excavations Only.

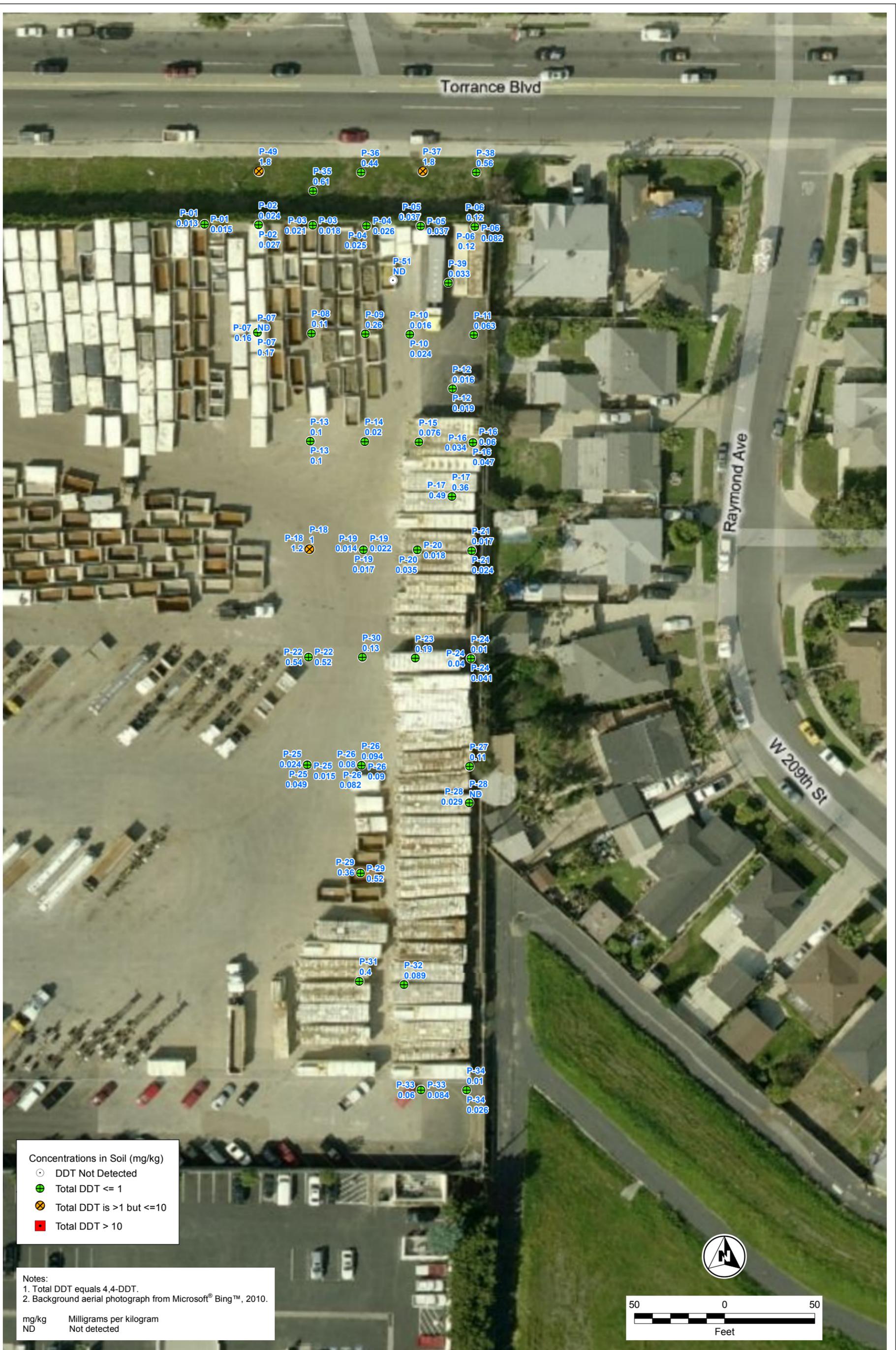


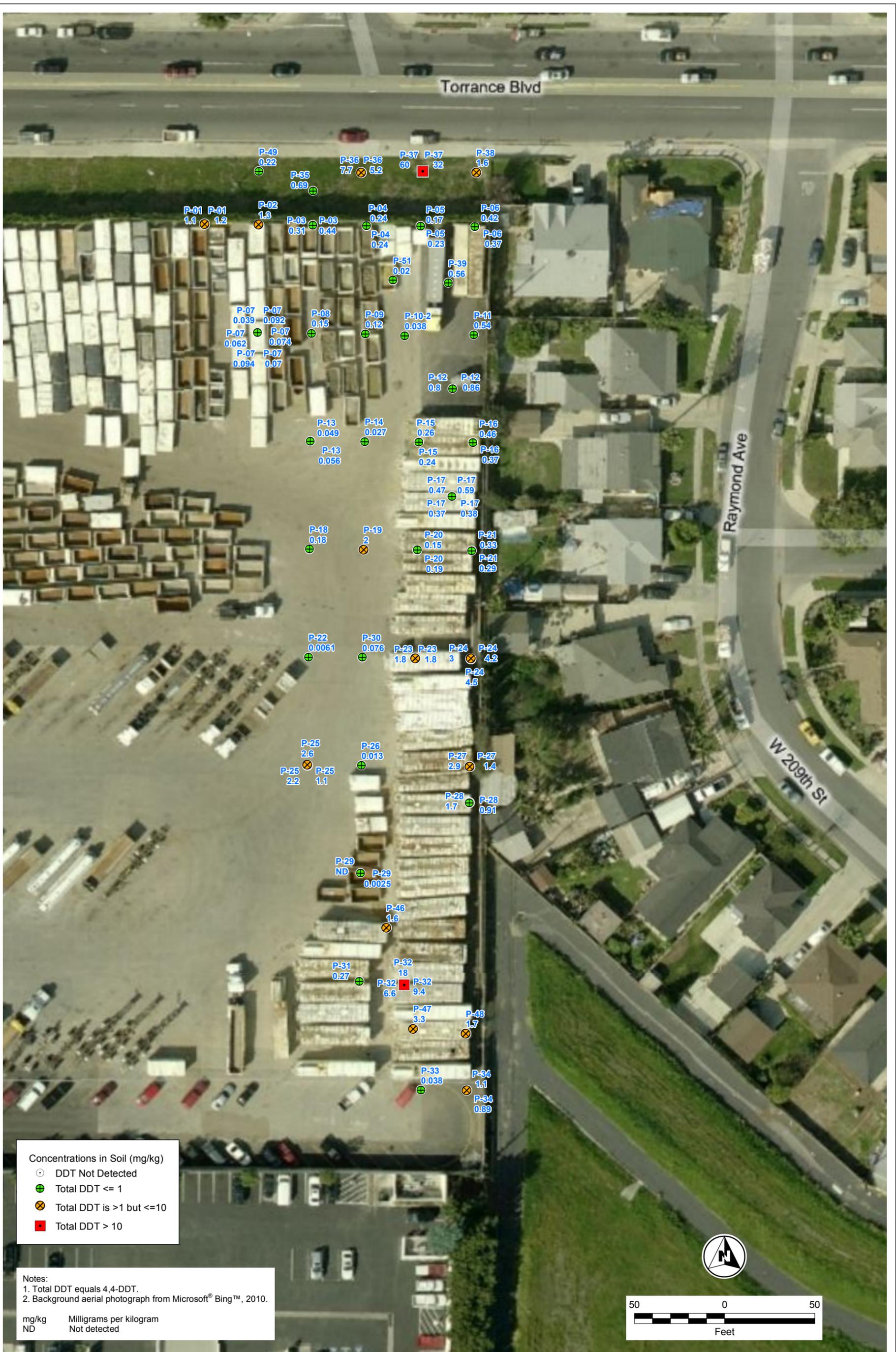
Source: Soil Investigation Report, Historic Stormwater Pathway, Earth Tech, Inc. 2008

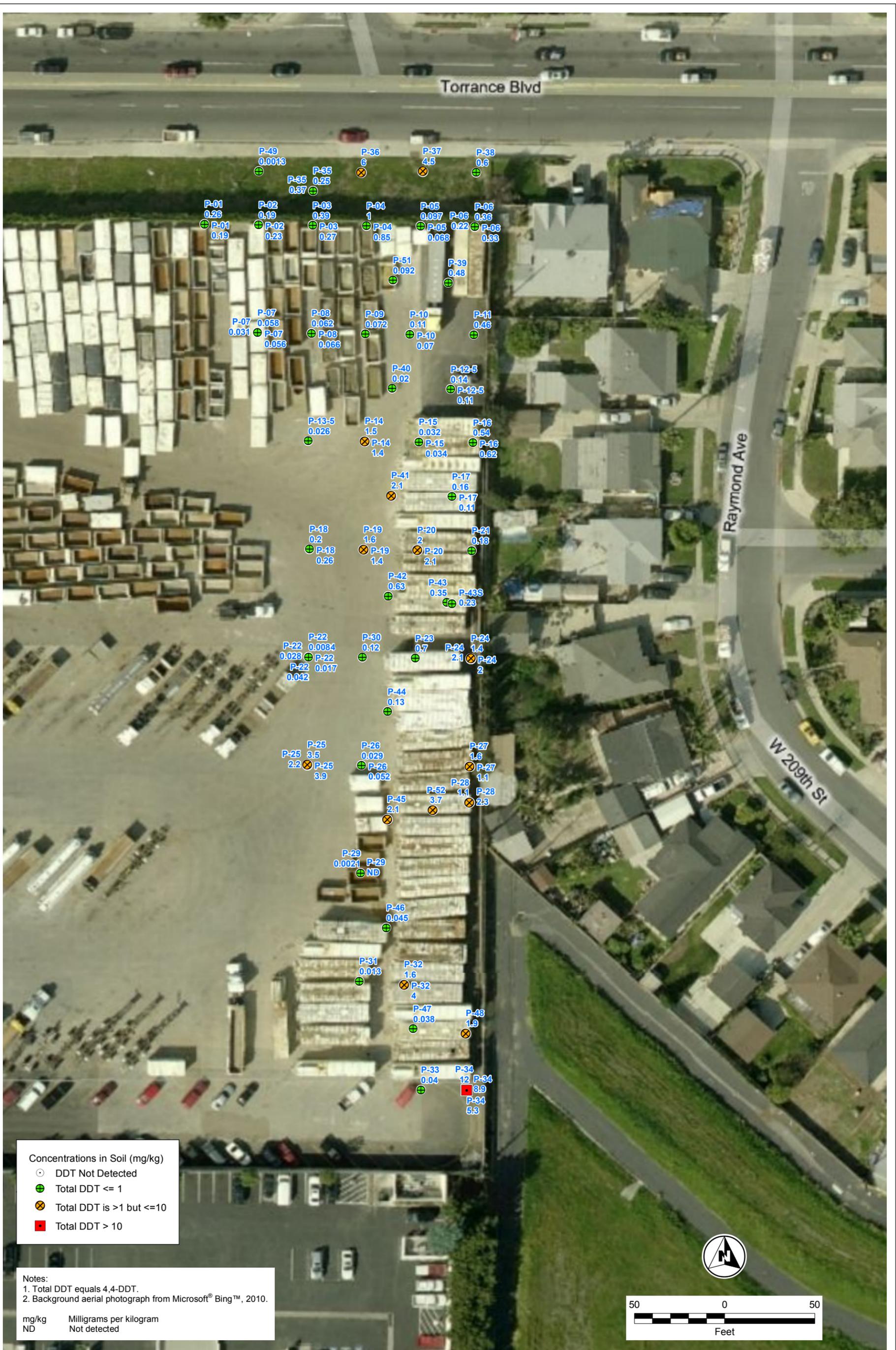


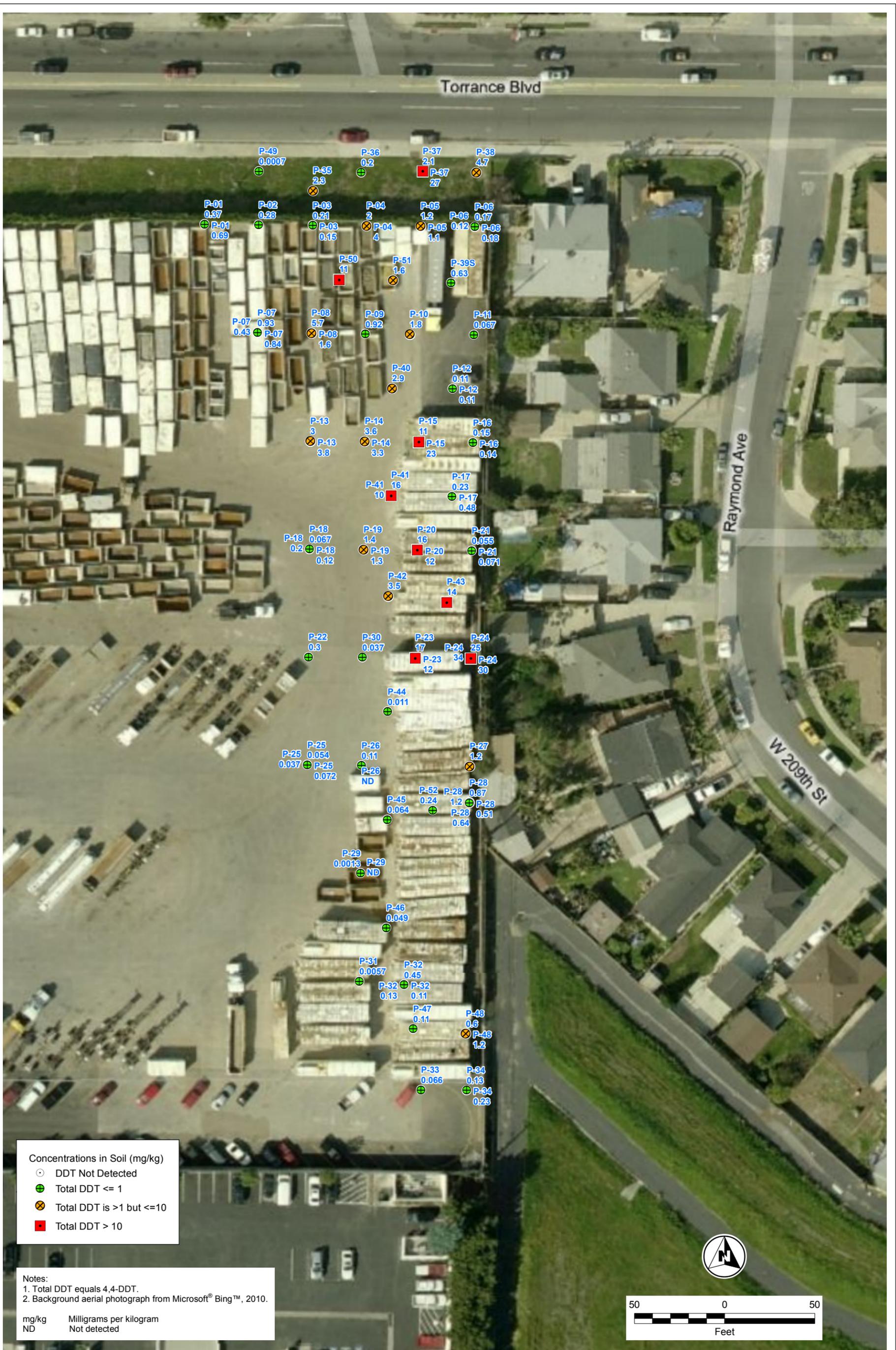
**Historical Stormwater Pathway - South
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U.S. EPA Region 9
Los Angeles County, California

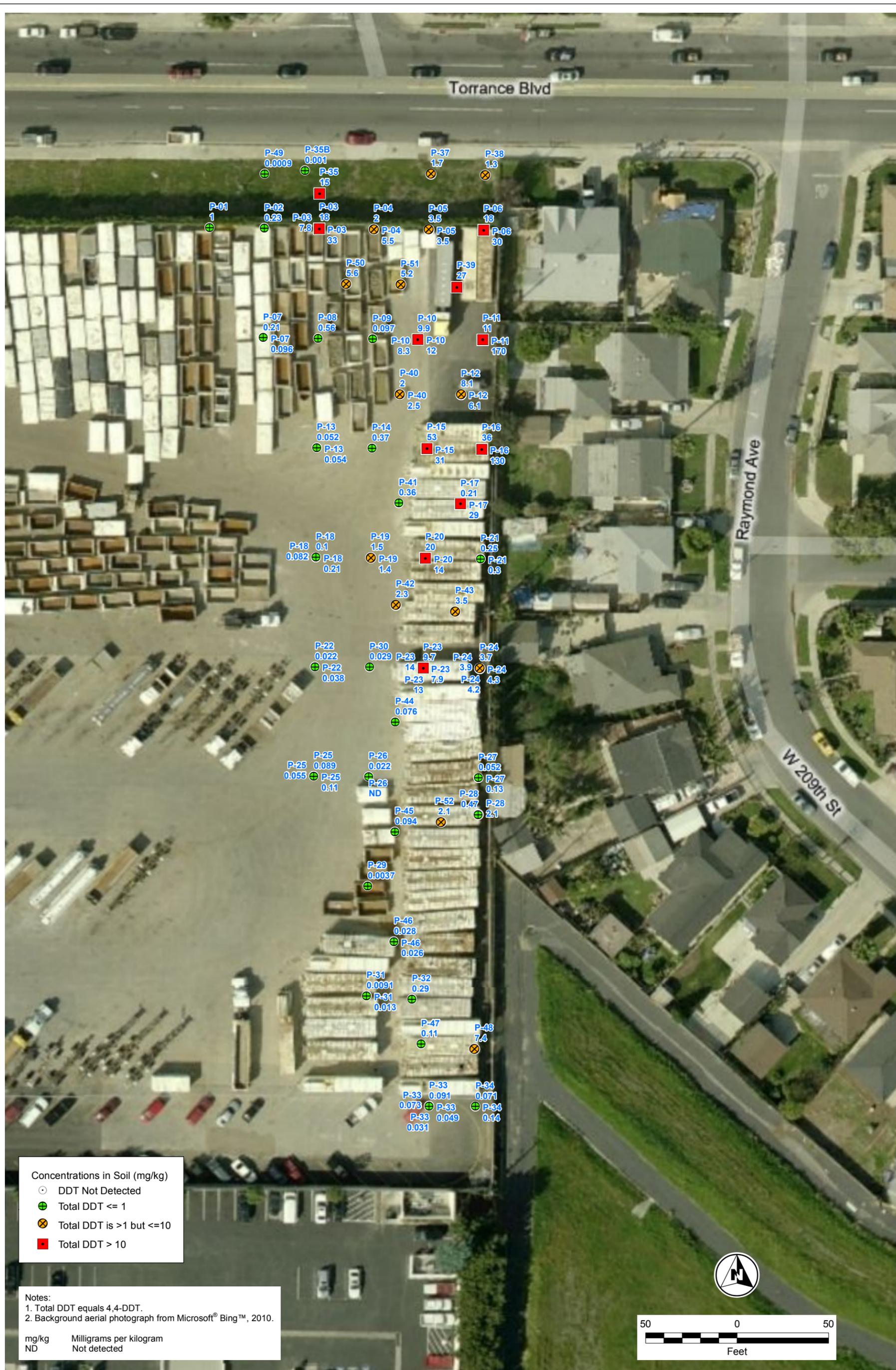
FIGURE 3
Site Plan

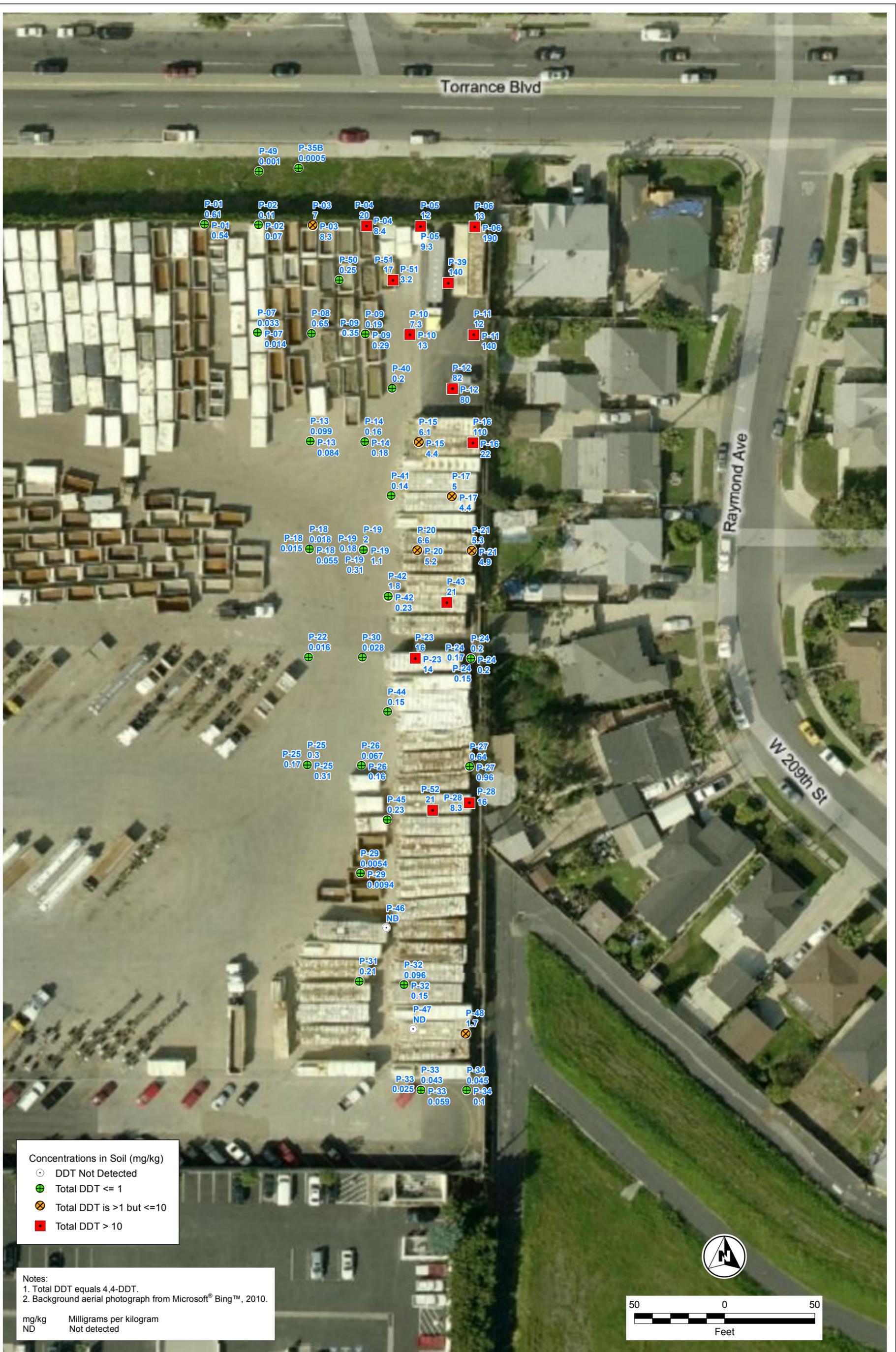


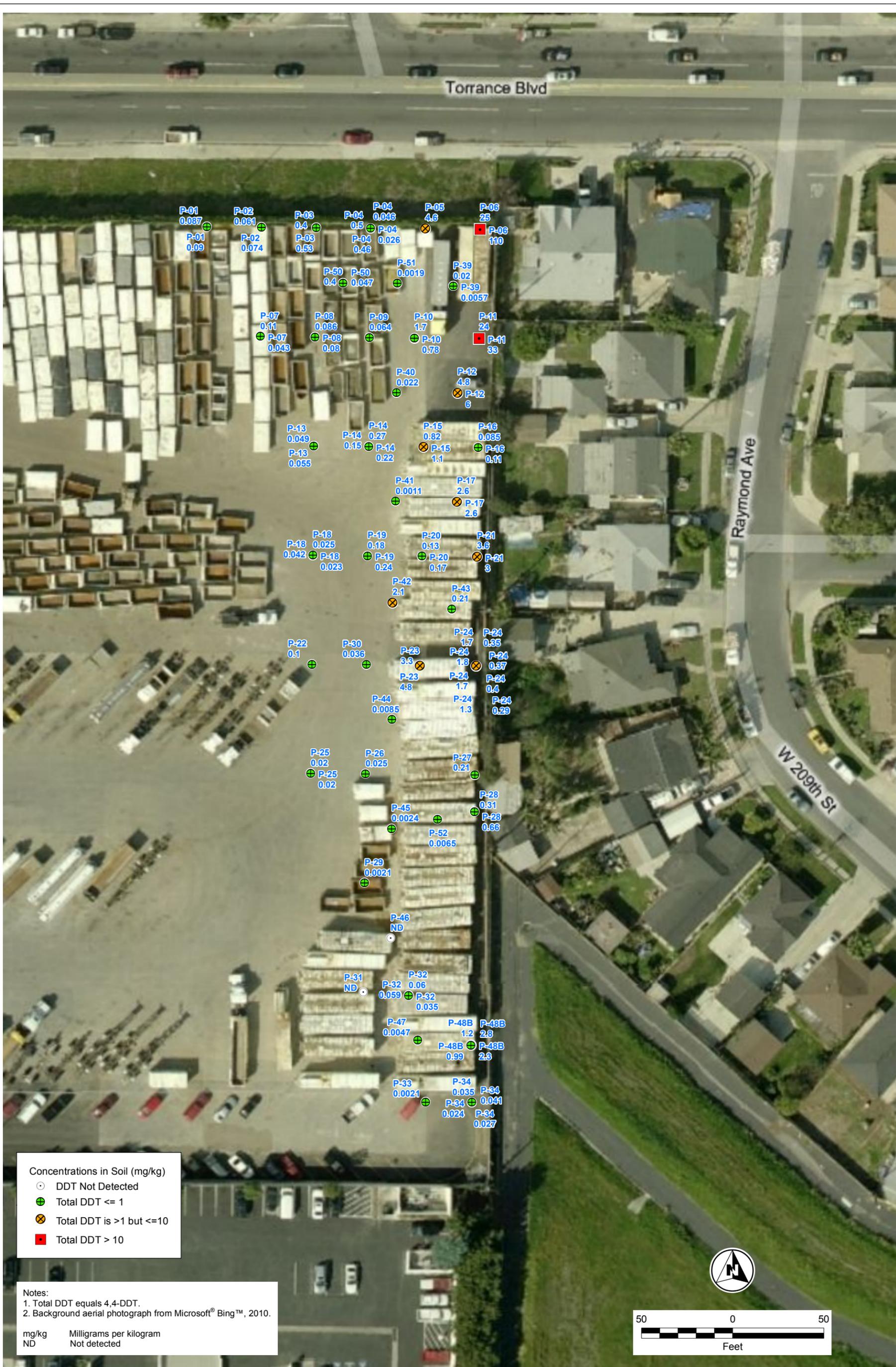


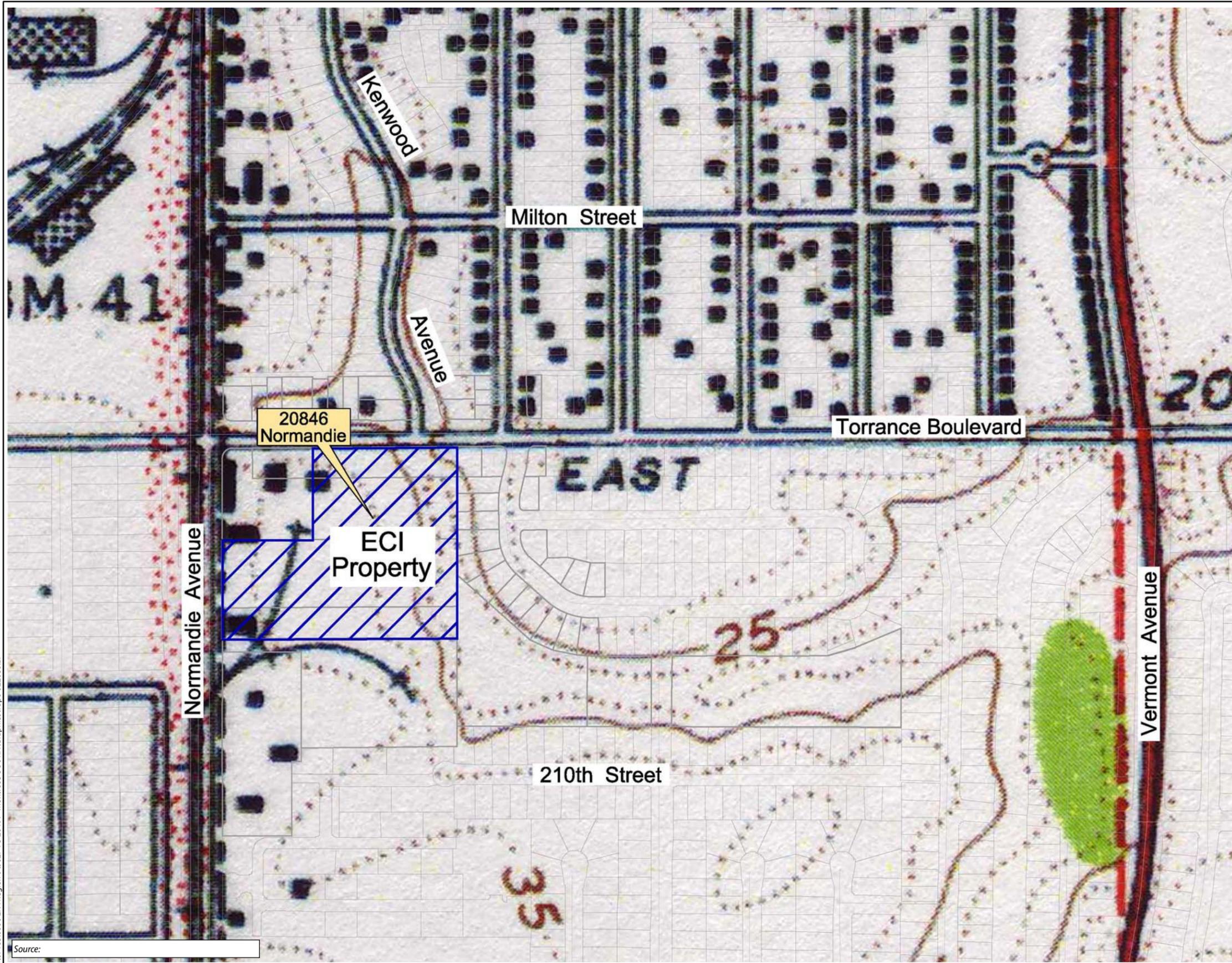












Explanation:

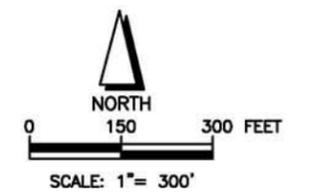
25 Surface Elevation (Feet Above Mean Sea Level) from U.S.G.S. Topographic Map

Note:

1. Properties shown were identified by EPA in Letter dated September 12, 2005.

Reference:

1. Los Angeles County Assessors Office, Los Angeles City Department of Public Works On-line GIS Parcel Database, Copyright 2005.
2. U.S.G.S. 7.5 Minute Topographic Quadrangle Map, Torrance, California dated 1951.

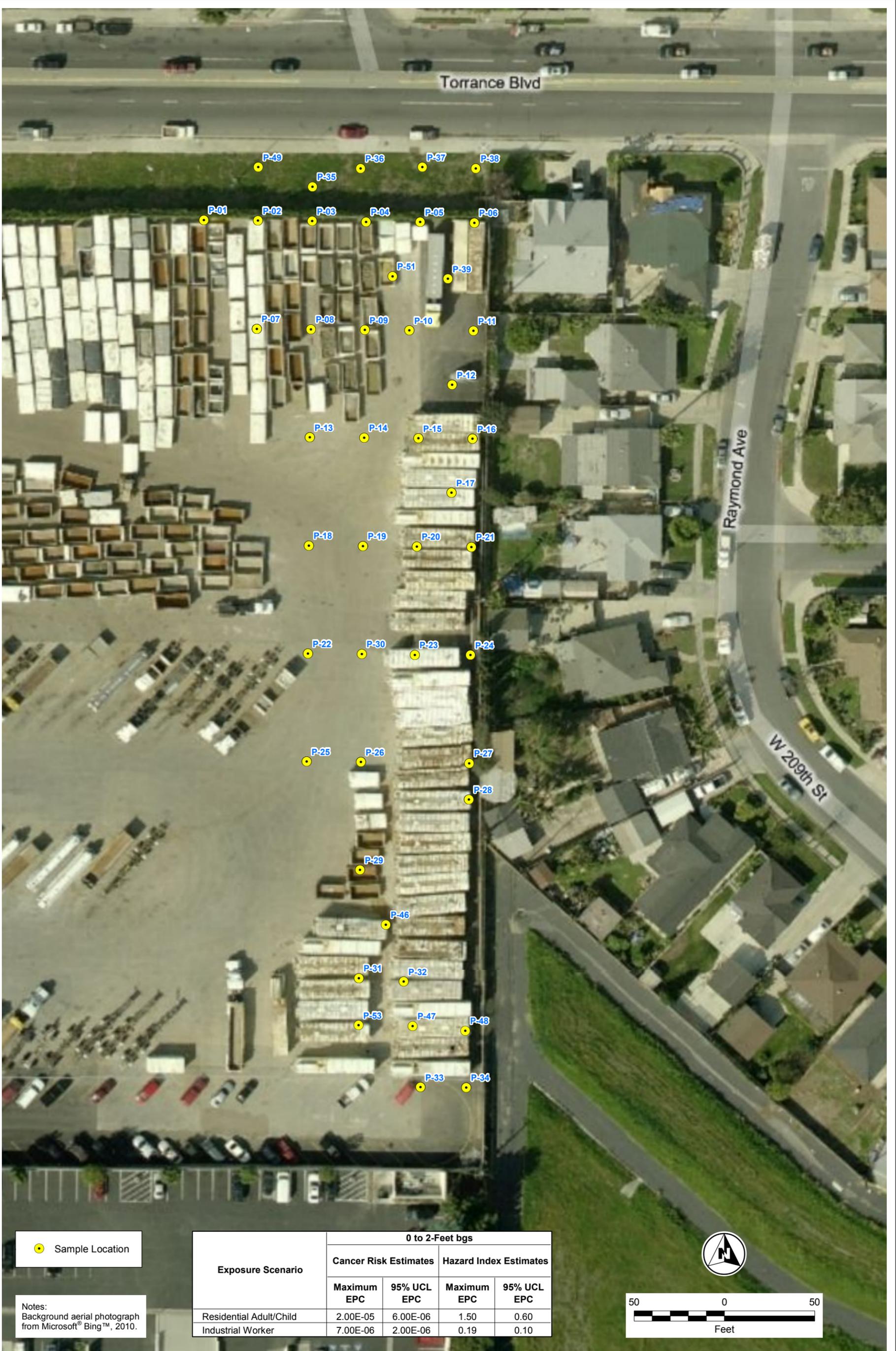


Source:



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Montrose Chemical Superfund Site**
U.S. EPA Region 9
Los Angeles County, California

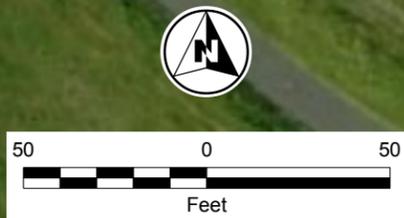
FIGURE 5
Topographic Map of ECI Property

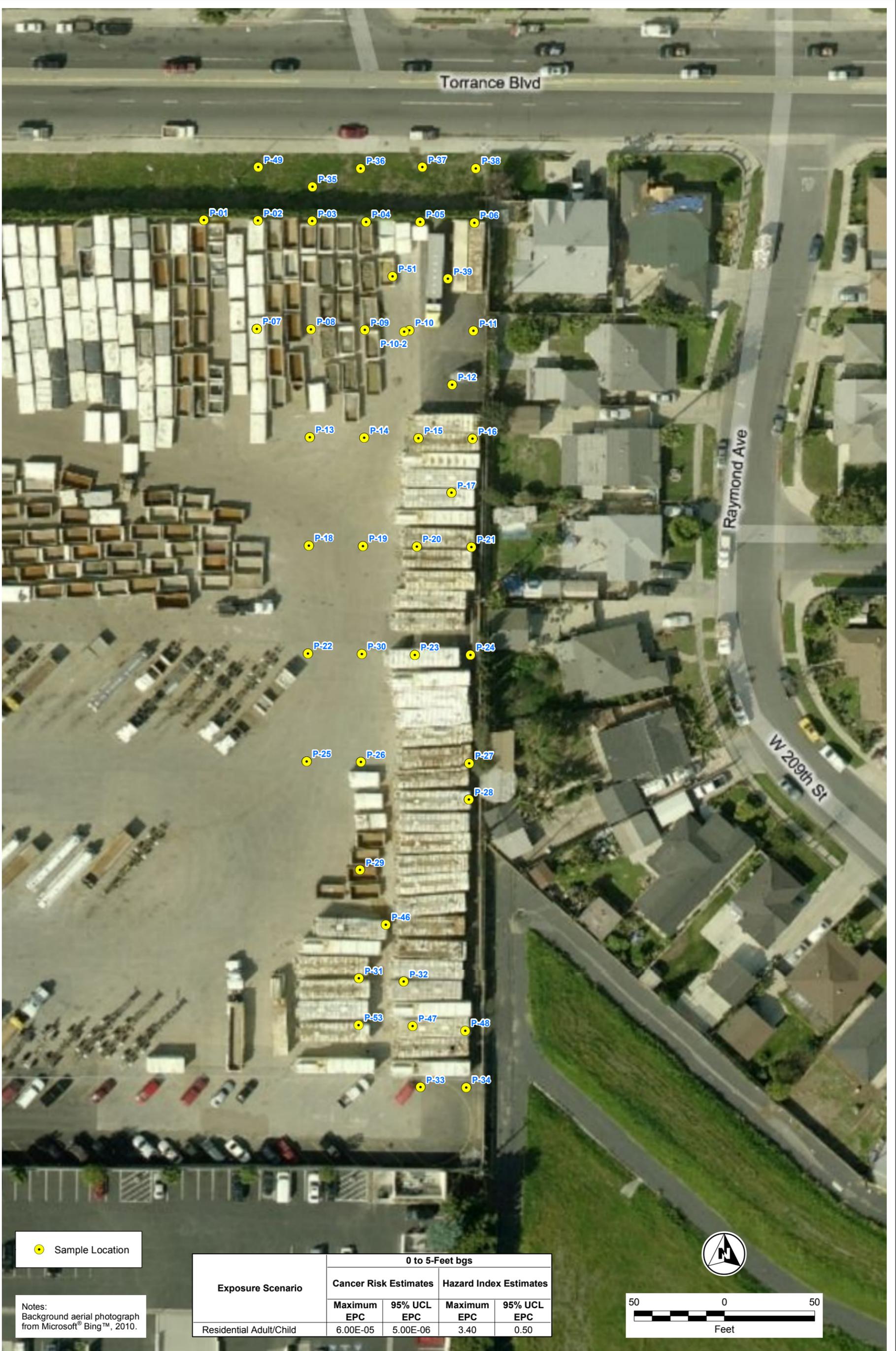


● Sample Location

Notes:
Background aerial photograph from Microsoft® Bing™, 2010.

Exposure Scenario	0 to 2-Foot bgs			
	Cancer Risk Estimates		Hazard Index Estimates	
	Maximum EPC	95% UCL EPC	Maximum EPC	95% UCL EPC
Residential Adult/Child	2.00E-05	6.00E-06	1.50	0.60
Industrial Worker	7.00E-06	2.00E-06	0.19	0.10

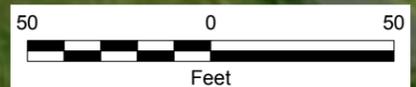


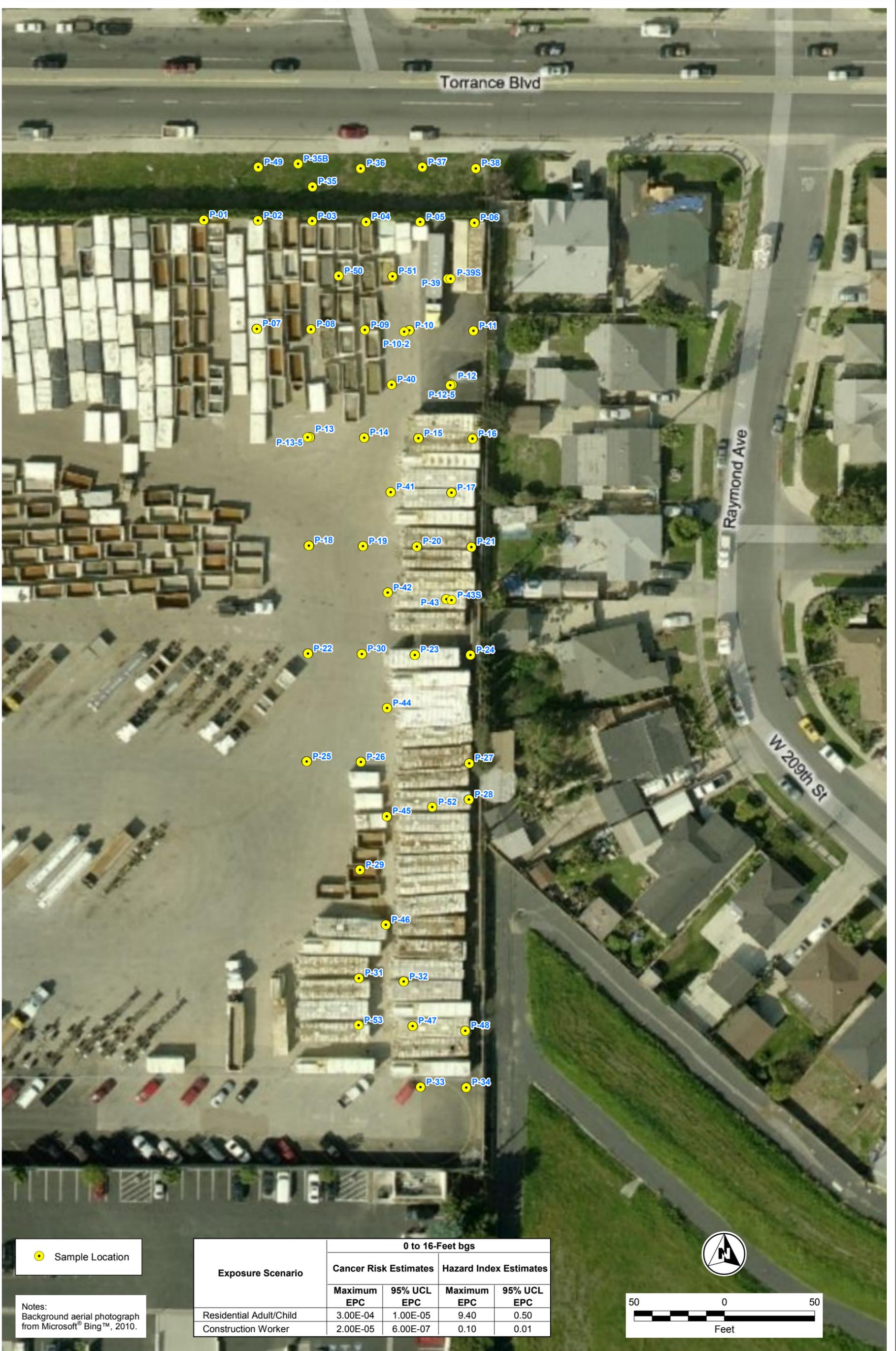


● Sample Location

Notes:
Background aerial photograph
from Microsoft® Bing™, 2010.

Exposure Scenario	0 to 5-Foot bgs			
	Cancer Risk Estimates		Hazard Index Estimates	
	Maximum EPC	95% UCL EPC	Maximum EPC	95% UCL EPC
Residential Adult/Child	6.00E-05	5.00E-06	3.40	0.50

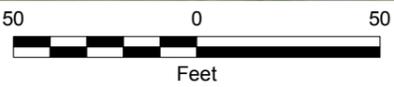




● Sample Location

Notes:
Background aerial photograph from Microsoft® Bing™, 2010.

Exposure Scenario	0 to 16-Foot bgs			
	Cancer Risk Estimates		Hazard Index Estimates	
	Maximum EPC	95% UCL EPC	Maximum EPC	95% UCL EPC
Residential Adult/Child	3.00E-04	1.00E-05	9.40	0.50
Construction Worker	2.00E-05	6.00E-07	0.10	0.01



**Historical Stormwater Pathway - South
Montrose Chemical Superfund Site**
U.S. EPA Region 9
Los Angeles County, California

FIGURE 9
Cancer Risk and Hazard Index Estimates
0 to 16 Feet Below Ground Surface

APPENDIX A

DATA USEABILITY EVALUATION

APPENDIX A

DATA USABILITY EVALUATION

Evaluation of analytical data, for purposes of the HHRA, was conducted using the criteria provided by USEPA in the *Guidance for Data Usability in Risk Assessment* (Part A), Final (USEPA, 1992). These USEPA criteria include:

1. Reports –confirmation that report(s) relied upon are complete and appropriate for use in the HRA;
2. Documentation –confirmation that each analytical result is associated with a specific sample location and that the appropriate sampling procedure is documented;
3. Data Sources – confirmation that the analytical methods used are appropriate to identify the chemicals of potential concern for the media of interest;
4. Analytical Methods and Detection Limits - confirmation that analytical methods appropriately identify the chemical form or species and that the sample detection limit is at or below a concentration appropriate for the risk assessment application;
5. Data Review – confirmation that the quality of analytical results is assessed by a professional knowledgeable in field collection procedures and analytical chemistry and that data quality are adequate to estimate exposure concentrations; and
6. Data Quality Indicators – documentation that sampling and analysis data quality indicators (including precision, accuracy, holding time, and reproducibility) are evaluated using criteria specific to the risk assessment.

A summary of the data analysis relevant to usability criteria for risk assessment are provided in Table B-1.

TABLE A-1
DATA USABILITY EVALUATION SUMMARY

Data Usability Criterion	Evaluation Result
I. Reports	<p>(1) Earth Tech, 2008 (primary report). Revised Soil Investigation Report, Historic Storm Water Pathway – South Ecology Control Industries Property, 20846 South Normandie Avenue, Torrance, California, 90502. June 20. Appendix G (Laboratory Reports and Chain of Custody Forms) 10 of 27 laboratory reports were reviewed for Interim Deliverable #1 (see text of Interim Deliverable #1); Appendix H Tables H-2 and H-2A for samples PO-1 through PO-52 (Laboratory Analytical Results - Final Validated [Selected Runs Soil] ; Summary text, Section 6; and</p> <p>(2) Earth Tech, 2006. Quality Assurance Project Plan Soil Investigation for Historic Storm Water Pathway – South Ecology Control Industries Property, 20846 South Normandie Avenue, Torrance, California, 90502. June:</p>
II. Documentation	Geographic locations of samples are shown on Figure 6 of Earth Tech, 2008 (sample IDs PO-1 through PO-53 and P06B, P11B, P23B, and P48B); Sampling procedures were assumed to be approved by EPA.
III. Data Sources	All analytical sample data results for the environmental medium of interest (soil) were provided. The analytical methods (EPA Method 8081A and EPA Method 8082) were appropriate for characterizing potential COPCs (organochlorine pesticides and PCBs).
IV. Analytical Method and Detection Limit	<p>Soil samples were analyzed using the following USEPA analytical methods:</p> <p style="padding-left: 40px;">Method 8081A (organochlorine pesticides)</p> <p style="padding-left: 40px;">Method 8082 (PCBs as Aroclors)</p> <p>Reporting limits were confirmed to be adequate for HRA application, i.e., they do not exceed 10 times the EPA residential RSL (USEPA, 2009) with some exceptions noted during the review of the 10 lab reports. These exceedances include, but are not limited to:</p> <p>PO1-12: Dieldrin (0.37 mg/kg vs 0.03 mg/kg)</p> <p>PO3-12: Toxaphene (150 mg/kg vs RSL 0.44 mg/kg)</p> <p>PO3-16: Dieldrin (0.38 mg/kg vs RSL 0.03 mg/kg)</p> <p>PO5-16: Aldrin (0.96 mg/kg vs RSL 0.03 mg/kg); alpha BHC (0.96 mg/kg vs RLS 0.077 mg/kg); Dieldrin (1.9 mg/kg vs RLS 0.03 mg/kg); Toxaphene (38 mg/kg vs RSL 0.44 mg/kg)</p> <p>PO7-0: Toxaphene (7.2 mg/kg vs RSL 0.44 mg/kg)</p> <p>PO8-8: Dieldrin (0.4 mg/kg vs RSL 0.03 mg/kg); Toxaphene (7.8 mg/kg vs RSL 0.44 mg/kg)</p> <p>PO8-12: Dieldrin (0.39 mg/kg vs RSL 0.03 mg/kg); Toxaphene (7.6 mg/kg vs RSL 0.44 mg/kg)</p> <p>PO9-8: Dieldrin (0.39 mg/kg vs RSL 0.03 mg/kg); Toxaphene (7.8 mg/kg vs RSL 0.44 mg/kg)</p> <p>P10-8: Dieldrin (0.38 mg/kg vs RSL 0.03 mg/kg); Toxaphene (7.5 mg/kg vs RSL 0.44 mg/kg)</p> <p>P10-12: Dieldrin (0.4 mg/kg vs RSL 0.03 mg/kg); Toxaphene (7.9 mg/kg vs RSL 0.44 mg/kg)</p> <p>P12-12: Aldrin (0.4 mg/kg vs RSL 0.029 mg/kg); Dieldrin (0.8 mg/kg vs RSL 0.030 mg/kg); No Toxaphene data</p>
V. Data Review	The data usability evaluation was conducted by Ms. Teri Copeland, DABT with chemistry support from Neptune and Company and included evaluation of the six HRA data usability evaluation criteria (USEPA, 1992).
VI. Data Quality Indicators	<p>Precision and accuracy were assessed by analyzing matrix spikes, matrix spike duplicates, surrogates, and laboratory control spikes. The quality control parameters were reported by the laboratory to be within acceptable laboratory limits and/or were acceptable for HRA with the following exceptions:</p> <p>MS and MSD recoveries were zero for most of the samples for the data sets reviewed.</p>

APPENDIX B

ProUCL STATISTICAL SOFTWARE OUTPUT FILES

0 - 2 FEET

	A	B	C	D	E	F	G	H	I	J	K	L						
1				General UCL Statistics for Data Sets with Non-Detects														
2	User Selected Options																	
3	From File			C:\Documents and Settings\rarmiento\My Documents\Projects\montrose\HRA\UCL calcs\0 to 2 ft.xls.wst														
4	Full Precision			OFF														
5	Confidence Coefficient			95%														
6	Number of Bootstrap Operations			2000														
7																		
8																		
9	2,4'-DDD																	
10																		
11	General Statistics																	
12	Number of Valid Data				150				Number of Detected Data				118					
13	Number of Distinct Detected Data				75				Number of Non-Detect Data				32					
14									Percent Non-Detects				21.33%					
15																		
16	Raw Statistics						Log-transformed Statistics											
17	Minimum Detected			0.00079			Minimum Detected			-7.143								
18	Maximum Detected			1.9			Maximum Detected			0.642								
19	Mean of Detected			0.0562			Mean of Detected			-4.33								
20	SD of Detected			0.225			SD of Detected			1.434								
21	Minimum Non-Detect			0.0036			Minimum Non-Detect			-5.627								
22	Maximum Non-Detect			0.8			Maximum Non-Detect			-0.223								
23																		
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect						148					
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected						2					
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage						98.67%					
27																		
28	UCL Statistics																	
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only											
30	Lilliefors Test Statistic			0.403			Lilliefors Test Statistic			0.0603								
31	5% Lilliefors Critical Value			0.0816			5% Lilliefors Critical Value			0.0816								
32	Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level											
33																		
34	Assuming Normal Distribution						Assuming Lognormal Distribution											
35	DL/2 Substitution Method						DL/2 Substitution Method											
36	Mean			0.0544			Mean			-4.211								
37	SD			0.202			SD			1.39								
38	95% DL/2 (t) UCL			0.0817			95% H-Stat (DL/2) UCL			0.0565								
39																		
40	Maximum Likelihood Estimate(MLE) Method						Log ROS Method											
41	MLE method failed to converge properly						N/A											
42							Mean in Log Scale						-4.444					
43							SD in Log Scale						1.326					
44							Mean in Original Scale						0.0462					
45							SD in Original Scale						0.2					
46							95% Percentile Bootstrap UCL						0.0768					
47							95% BCA Bootstrap UCL						0.091					
48	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only											
49	k star (bias corrected)						0.44						Data appear Lognormal at 5% Significance Level					
50	Theta Star						0.128											

	A	B	C	D	E	F	G	H	I	J	K	L												
1				General UCL Statistics for Data Sets with Non-Detects																				
2	User Selected Options																							
3	From File			C:\Documents and Settings\rsarmiento\My Documents\Projects\montrose\HRA\UCL calcs\0 to 2 ft.xls.wst																				
4	Full Precision			OFF																				
5	Confidence Coefficient			95%																				
6	Number of Bootstrap Operations			2000																				
7																								
8																								
9	2,4'-DDE																							
10																								
11	General Statistics																							
12	Number of Valid Data				148				Number of Detected Data				21											
13	Number of Distinct Detected Data				21				Number of Non-Detect Data				127											
14									Percent Non-Detects				85.81%											
15																								
16	Raw Statistics						Log-transformed Statistics																	
17	Minimum Detected				0.0027				Minimum Detected				-5.915											
18	Maximum Detected				0.39				Maximum Detected				-0.942											
19	Mean of Detected				0.0563				Mean of Detected				-3.932											
20	SD of Detected				0.106				SD of Detected				1.376											
21	Minimum Non-Detect				0.0034				Minimum Non-Detect				-5.684											
22	Maximum Non-Detect				0.8				Maximum Non-Detect				-0.223											
23																								
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect						148											
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected						0											
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage						100.00%											
27																								
28	UCL Statistics																							
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only																	
30	Shapiro Wilk Test Statistic				0.522				Shapiro Wilk Test Statistic				0.934											
31	5% Shapiro Wilk Critical Value				0.908				5% Shapiro Wilk Critical Value				0.908											
32	Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level																	
33																								
34	Assuming Normal Distribution						Assuming Lognormal Distribution																	
35	DL/2 Substitution Method						DL/2 Substitution Method																	
36	Mean				0.0366				Mean				-4.051											
37	SD				0.0614				SD				1.189											
38	95% DL/2 (t) UCL				0.045				95% H-Stat (DL/2) UCL				0.0496											
39																								
40	Maximum Likelihood Estimate(MLE) Method						N/A						Log ROS Method											
41	MLE method failed to converge properly												Mean in Log Scale						-5.569					
42													SD in Log Scale						1.218					
43													Mean in Original Scale						0.0119					
44													SD in Original Scale						0.0433					
45													95% Percentile Bootstrap UCL						0.018					
46													95% BCA Bootstrap UCL						0.0202					
47																								
48	Gamma Distribution Test with Detected Values Only												Data Distribution Test with Detected Values Only											
49	k star (bias corrected)				0.535				Data appear Lognormal at 5% Significance Level															
50	Theta Star				0.105																			

	A	B	C	D	E	F	G	H	I	J	K	L						
1				General UCL Statistics for Data Sets with Non-Detects														
2	User Selected Options																	
3	From File			C:\Documents and Settings\rarmiento\My Documents\Projects\montrose\HRA\UCL calcs\0 to 2 ft.xls.wst														
4	Full Precision			OFF														
5	Confidence Coefficient			95%														
6	Number of Bootstrap Operations			2000														
7																		
8																		
9	4,4'-DDD																	
10																		
11	General Statistics																	
12	Number of Valid Data				144				Number of Detected Data				133					
13	Number of Distinct Detected Data				95				Number of Non-Detect Data				11					
14									Percent Non-Detects				7.64%					
15																		
16	Raw Statistics						Log-transformed Statistics											
17	Minimum Detected				0.0016				Minimum Detected				-6.438					
18	Maximum Detected				9.1				Maximum Detected				2.208					
19	Mean of Detected				0.177				Mean of Detected				-3.429					
20	SD of Detected				0.852				SD of Detected				1.611					
21	Minimum Non-Detect				0.0072				Minimum Non-Detect				-4.934					
22	Maximum Non-Detect				0.18				Maximum Non-Detect				-1.715					
23																		
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect						125					
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected						19					
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage						86.81%					
27																		
28	UCL Statistics																	
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only											
30	Lilliefors Test Statistic				0.419				Lilliefors Test Statistic				0.0531					
31	5% Lilliefors Critical Value				0.0768				5% Lilliefors Critical Value				0.0768					
32	Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level											
33																		
34	Assuming Normal Distribution						Assuming Lognormal Distribution											
35	DL/2 Substitution Method						DL/2 Substitution Method											
36	Mean				0.165				Mean				-3.469					
37	SD				0.819				SD				1.573					
38	95% DL/2 (t) UCL				0.278				95% H-Stat (DL/2) UCL				0.156					
39																		
40	Maximum Likelihood Estimate(MLE) Method						N/A						Log ROS Method					
41	MLE yields a negative mean						Mean in Log Scale						-3.514					
42							SD in Log Scale						1.586					
43							Mean in Original Scale						0.164					
44							SD in Original Scale						0.819					
45							95% Percentile Bootstrap UCL						0.291					
46							95% BCA Bootstrap UCL						0.372					
47																		
48	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only											
49	k star (bias corrected)				0.386				Data appear Lognormal at 5% Significance Level									
50	Theta Star				0.458													

	A	B	C	D	E	F	G	H	I	J	K	L			
1				General UCL Statistics for Data Sets with Non-Detects											
2	User Selected Options														
3	From File			C:\Documents and Settings\sarmiento\My Documents\Projects\montrose\HRA\UCL calcs\0 to 2 ft.xls.wst											
4	Full Precision			OFF											
5	Confidence Coefficient			95%											
6	Number of Bootstrap Operations			2000											
7															
8															
9	4,4'-DDT														
10															
11	General Statistics														
12	Number of Valid Data				147		Number of Detected Data				145				
13	Number of Distinct Detected Data				95		Number of Non-Detect Data				2				
14	Number of Missing Values				1		Percent Non-Detects				1.36%				
15															
16	Raw Statistics						Log-transformed Statistics								
17	Minimum Detected			0.01			Minimum Detected			-4.605					
18	Maximum Detected			18			Maximum Detected			2.89					
19	Mean of Detected			0.521			Mean of Detected			-2.002					
20	SD of Detected			1.826			SD of Detected			1.495					
21	Minimum Non-Detect			0.0044			Minimum Non-Detect			-5.426					
22	Maximum Non-Detect			0.31			Maximum Non-Detect			-1.171					
23															
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect			96					
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected			51					
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage			65.31%					
27															
28	UCL Statistics														
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only								
30	Lilliefors Test Statistic			0.39			Lilliefors Test Statistic			0.0818					
31	5% Lilliefors Critical Value			0.0736			5% Lilliefors Critical Value			0.0736					
32	Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level								
33															
34	Assuming Normal Distribution						Assuming Lognormal Distribution								
35	DL/2 Substitution Method						DL/2 Substitution Method								
36	Mean			0.515			Mean			-2.029					
37	SD			1.814			SD			1.524					
38	95% DL/2 (t) UCL			0.763			95% H-Stat (DL/2) UCL			0.553					
39															
40	Maximum Likelihood Estimate(MLE) Method						N/A			Log ROS Method					
41	MLE yields a negative mean									Mean in Log Scale			-2.035		
42										SD in Log Scale			1.526		
43										Mean in Original Scale			0.515		
44										SD in Original Scale			1.814		
45										95% Percentile Bootstrap UCL			0.795		
46										95% BCA Bootstrap UCL			0.919		
47															
48	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only								
49	k star (bias corrected)			0.469			Data do not follow a Discernable Distribution (0.05)								
50	Theta Star			1.111											

	A	B	C	D	E	F	G	H	I	J	K	L						
1				General UCL Statistics for Data Sets with Non-Detects														
2	User Selected Options																	
3	From File			C:\Documents and Settings\rсарmiento\My Documents\Projects\montrose\HRA\UCL calcs\0 to 2 ft.xls.wst														
4	Full Precision			OFF														
5	Confidence Coefficient			95%														
6	Number of Bootstrap Operations			2000														
7																		
8																		
9	4,4'-DDE																	
10																		
11	General Statistics																	
12	Number of Valid Observations				151				Number of Distinct Observations				86					
13																		
14	Raw Statistics						Log-transformed Statistics											
15	Minimum			0.0024			Minimum of Log Data			-6.032								
16	Maximum			1.5			Maximum of Log Data			0.405								
17	Mean			0.147			Mean of log Data			-2.782								
18	Median			0.06			SD of log Data			1.372								
19	SD			0.245														
20	Coefficient of Variation			1.661														
21	Skewness			3.96														
22																		
23	Relevant UCL Statistics																	
24	Normal Distribution Test						Lognormal Distribution Test											
25	Lilliefors Test Statistic			0.277			Lilliefors Test Statistic			0.0765								
26	Lilliefors Critical Value			0.0721			Lilliefors Critical Value			0.0721								
27	Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level											
28																		
29	Assuming Normal Distribution						Assuming Lognormal Distribution											
30	95% Student's-t UCL			0.18			95% H-UCL			0.212								
31	95% UCLs (Adjusted for Skewness)						95% Chebyshev (MVUE) UCL						0.26					
32	95% Adjusted-CLT UCL			0.187			97.5% Chebyshev (MVUE) UCL			0.305								
33	95% Modified-t UCL			0.181			99% Chebyshev (MVUE) UCL			0.393								
34																		
35	Gamma Distribution Test						Data Distribution											
36	k star (bias corrected)			0.688			Data do not follow a Discernable Distribution (0.05)											
37	Theta Star			0.214														
38	MLE of Mean			0.147														
39	MLE of Standard Deviation			0.178														
40	nu star			207.9														
41	Approximate Chi Square Value (.05)			175.5			Nonparametric Statistics											
42	Adjusted Level of Significance			0.0484			95% CLT UCL			0.18								
43	Adjusted Chi Square Value			175.2			95% Jackknife UCL			0.18								
44							95% Standard Bootstrap UCL			0.18								
45	Anderson-Darling Test Statistic			2.349			95% Bootstrap-t UCL			0.193								
46	Anderson-Darling 5% Critical Value			0.801			95% Hall's Bootstrap UCL			0.19								
47	Kolmogorov-Smirnov Test Statistic			0.0949			95% Percentile Bootstrap UCL			0.182								
48	Kolmogorov-Smirnov 5% Critical Value			0.0796			95% BCA Bootstrap UCL			0.187								
49	Data not Gamma Distributed at 5% Significance Level						95% Chebyshev(Mean, Sd) UCL			0.234								
50							97.5% Chebyshev(Mean, Sd) UCL			0.272								

	A	B	C	D	E	F	G	H	I	J	K	L
51	Assuming Gamma Distribution						99% Chebyshev(Mean, Sd) UCL					0.345
52	95% Approximate Gamma UCL					0.174						
53	95% Adjusted Gamma UCL					0.175						
54												
55	Potential UCL to Use						Use 97.5% Chebyshev (Mean, Sd) UCL					0.272
56												

	A	B	C	D	E	F	G	H	I	J	K	L								
1				General UCL Statistics for Data Sets with Non-Detects																
2	User Selected Options																			
3	From File			C:\Documents and Settings\rarmiento\My Documents\Projects\montrose\HRA\UCL calcs\0 to 2 ft.xls.wst																
4	Full Precision			OFF																
5	Confidence Coefficient			95%																
6	Number of Bootstrap Operations			2000																
7																				
8																				
9	2,4'-DDT																			
10																				
11	General Statistics																			
12	Number of Valid Data				141				Number of Detected Data				118							
13	Number of Distinct Detected Data				74				Number of Non-Detect Data				23							
14	Percent Non-Detects												16.31%							
15																				
16	Raw Statistics						Log-transformed Statistics													
17	Minimum Detected				0.0016				Minimum Detected				-6.438							
18	Maximum Detected				1.6				Maximum Detected				0.47							
19	Mean of Detected				0.0905				Mean of Detected				-3.441							
20	SD of Detected				0.222				SD of Detected				1.371							
21	Minimum Non-Detect				0.0035				Minimum Non-Detect				-5.655							
22	Maximum Non-Detect				0.37				Maximum Non-Detect				-0.994							
23																				
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect						137							
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected						4							
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage						97.16%							
27																				
28	UCL Statistics																			
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only													
30	Lilliefors Test Statistic				0.345				Lilliefors Test Statistic				0.0917							
31	5% Lilliefors Critical Value				0.0816				5% Lilliefors Critical Value				0.0816							
32	Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level													
33																				
34	Assuming Normal Distribution						Assuming Lognormal Distribution													
35	DL/2 Substitution Method						DL/2 Substitution Method													
36	Mean				0.0828				Mean				-3.485							
37	SD				0.205				SD				1.332							
38	95% DL/2 (t) UCL				0.111				95% H-Stat (DL/2) UCL				0.0947							
39																				
40	Maximum Likelihood Estimate(MLE) Method						N/A						Log ROS Method							
41	MLE yields a negative mean												Mean in Log Scale				-3.589			
42													SD in Log Scale				1.326			
43													Mean in Original Scale				0.0783			
44													SD in Original Scale				0.205			
45													95% Percentile Bootstrap UCL				0.109			
46													95% BCA Bootstrap UCL				0.118			
47																				
48	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only													
49	k star (bias corrected)				0.586				Data do not follow a Discernable Distribution (0.05)											
50	Theta Star				0.154															

	A	B	C	D	E	F	G	H	I	J	K	L				
1	General UCL Statistics for Data Sets with Non-Detects															
2	User Selected Options															
3	From File		C:\Documents and Settings\sarmiento\My Documents\Projects\montrose\HRA\UCL calcs\0 to 2 ft.xls.wst													
4	Full Precision		OFF													
5	Confidence Coefficient		95%													
6	Number of Bootstrap Operations		2000													
7																
8																
9	4,4'-DDT															
10																
11	General Statistics															
12	Number of Valid Data				147				Number of Detected Data				145			
13	Number of Distinct Detected Data				95				Number of Non-Detect Data				2			
14	Number of Missing Values				1				Percent Non-Detects				1.36%			
15																
16	Raw Statistics						Log-transformed Statistics									
17	Minimum Detected			0.01			Minimum Detected			-4.605						
18	Maximum Detected			18			Maximum Detected			2.89						
19	Mean of Detected			0.521			Mean of Detected			-2.002						
20	SD of Detected			1.826			SD of Detected			1.495						
21	Minimum Non-Detect			0.0044			Minimum Non-Detect			-5.426						
22	Maximum Non-Detect			0.31			Maximum Non-Detect			-1.171						
23																
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect			96						
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected			51						
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage			65.31%						
27																
28	UCL Statistics															
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only									
30	Lilliefors Test Statistic			0.39			Lilliefors Test Statistic			0.0818						
31	5% Lilliefors Critical Value			0.0736			5% Lilliefors Critical Value			0.0736						
32	Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level									
33																
34	Assuming Normal Distribution						Assuming Lognormal Distribution									
35	DL/2 Substitution Method						DL/2 Substitution Method									
36	Mean			0.515			Mean			-2.029						
37	SD			1.814			SD			1.524						
38	95% DL/2 (t) UCL			0.763			95% H-Stat (DL/2) UCL			0.553						
39																
40	Maximum Likelihood Estimate(MLE) Method						Log ROS Method									
41	MLE yields a negative mean						Mean in Log Scale			-2.035						
42							SD in Log Scale			1.526						
43							Mean in Original Scale			0.515						
44							SD in Original Scale			1.814						
45							95% Percentile Bootstrap UCL			0.795						
46							95% BCA Bootstrap UCL			0.919						
47																
48	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only									
49	k star (bias corrected)			0.469			Data do not follow a Discernable Distribution (0.05)									
50	Theta Star			1.111												

51		nu star	136.1									
52												
53		A-D Test Statistic	7.517	Nonparametric Statistics								
54		5% A-D Critical Value	0.826	Kaplan-Meier (KM) Method								
55		K-S Test Statistic	0.826					Mean	0.515			
56		5% K-S Critical Value	0.0826					SD	1.808			
57	Data not Gamma Distributed at 5% Significance Level								SE of Mean	0.15		
58								95% KM (t) UCL	0.762			
59	Assuming Gamma Distribution								95% KM (z) UCL	0.761		
60	Gamma ROS Statistics using Extrapolated Data								95% KM (jackknife) UCL	0.762		
61		Minimum	1E-09					95% KM (bootstrap t) UCL	1.091			
62		Maximum	18					95% KM (BCA) UCL	0.806			
63		Mean	0.514					95% KM (Percentile Bootstrap) UCL	0.774			
64		Median	0.11					95% KM (Chebyshev) UCL	1.167			
65		SD	1.814					97.5% KM (Chebyshev) UCL	1.449			
66		k star	0.408					99% KM (Chebyshev) UCL	2.003			
67		Theta star	1.26									
68		Nu star	119.9	Potential UCLs to Use								
69		AppChi2	95.62					95% KM (Chebyshev) UCL	1.167			
70		95% Gamma Approximate UCL	0.645									
71		95% Adjusted Gamma UCL	0.646									
72	Note: DL/2 is not a recommended method.											
73												

	A	B	C	D	E	F	G	H	I	J	K	L	
1				General UCL Statistics for Data Sets with Non-Detects									
2	User Selected Options												
3	From File			C:\Documents and Settings\rsarmiento\My Documents\Projects\montrose\HRA\UCL calcs\0 to 2 ft.xls.wst									
4	Full Precision			OFF									
5	Confidence Coefficient			95%									
6	Number of Bootstrap Operations			2000									
7													
8													
9	alpha-chlordane												
10													
11	General Statistics												
12	Number of Valid Data				152		Number of Detected Data				100		
13	Number of Distinct Detected Data				79		Number of Non-Detect Data				52		
14									Percent Non-Detects				34.21%
15													
16	Raw Statistics						Log-transformed Statistics						
17	Minimum Detected			0.0007			Minimum Detected			-7.264			
18	Maximum Detected			0.78			Maximum Detected			-0.248			
19	Mean of Detected			0.0571			Mean of Detected			-3.954			
20	SD of Detected			0.121			SD of Detected			1.412			
21	Minimum Non-Detect			0.0019			Minimum Non-Detect			-6.266			
22	Maximum Non-Detect			0.4			Maximum Non-Detect			-0.916			
23													
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect				149		
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected				3		
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage				98.03%		
27													
28	UCL Statistics												
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only						
30	Lilliefors Test Statistic			0.32			Lilliefors Test Statistic			0.0977			
31	5% Lilliefors Critical Value			0.0886			5% Lilliefors Critical Value			0.0886			
32	Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level						
33													
34	Assuming Normal Distribution						Assuming Lognormal Distribution						
35	DL/2 Substitution Method						DL/2 Substitution Method						
36	Mean			0.0512			Mean			-3.928			
37	SD			0.102			SD			1.357			
38	95% DL/2 (t) UCL			0.0648			95% H-Stat (DL/2) UCL			0.0639			
39													
40	Maximum Likelihood Estimate(MLE) Method						Log ROS Method						
41	MLE yields a negative mean						Mean in Log Scale			-4.272			
42							SD in Log Scale			1.317			
43							Mean in Original Scale			0.041			
44							SD in Original Scale			0.1			
45							95% Percentile Bootstrap UCL			0.0551			
46							95% BCA Bootstrap UCL			0.0606			
47													
48	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only						
49	k star (bias corrected)			0.56			Data do not follow a Discernable Distribution (0.05)						
50	Theta Star			0.102									

	A	B	C	D	E	F	G	H	I	J	K	L						
1				General UCL Statistics for Full Data Sets														
2	User Selected Options																	
3	From File			C:\Documents and Settings\sarmiento\My Documents\Projects\montrose\HRA\UCL calcs\0 to 2 ft\0 to 2 ft.xls.w														
4	Full Precision			OFF														
5	Confidence Coefficient			95%														
6	Number of Bootstrap Operations			2000														
7																		
8																		
9	g-chlordane																	
10																		
11	General Statistics																	
12	Number of Valid Observations				152				Number of Distinct Observations				92					
13																		
14	Raw Statistics						Log-transformed Statistics											
15	Minimum			0.0013			Minimum of Log Data			-6.645								
16	Maximum			0.63			Maximum of Log Data			-0.462								
17	Mean			0.0621			Mean of log Data			-3.749								
18	Median			0.019			SD of log Data			1.396								
19	SD			0.11														
20	Coefficient of Variation			1.772														
21	Skewness			3.342														
22																		
23	Relevant UCL Statistics																	
24	Normal Distribution Test						Lognormal Distribution Test											
25	Lilliefors Test Statistic			0.29			Lilliefors Test Statistic			0.0676								
26	Lilliefors Critical Value			0.0719			Lilliefors Critical Value			0.0719								
27	Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level											
28																		
29	Assuming Normal Distribution						Assuming Lognormal Distribution											
30	95% Student's-t UCL			0.0768			95% H-UCL			0.0838								
31	95% UCLs (Adjusted for Skewness)						95% Chebyshev (MVUE) UCL						0.103					
32	95% Adjusted-CLT UCL			0.0793			97.5% Chebyshev (MVUE) UCL			0.121								
33	95% Modified-t UCL			0.0772			99% Chebyshev (MVUE) UCL			0.156								
34																		
35	Gamma Distribution Test						Data Distribution											
36	k star (bias corrected)			0.624			Data appear Lognormal at 5% Significance Level											
37	Theta Star			0.0994														
38	MLE of Mean			0.0621														
39	MLE of Standard Deviation			0.0785														
40	nu star			189.8														
41	Approximate Chi Square Value (.05)			159			Nonparametric Statistics											
42	Adjusted Level of Significance			0.0484			95% CLT UCL			0.0767								
43	Adjusted Chi Square Value			158.7			95% Jackknife UCL			0.0768								
44							95% Standard Bootstrap UCL			0.0764								
45	Anderson-Darling Test Statistic			4.721			95% Bootstrap-t UCL			0.0806								
46	Anderson-Darling 5% Critical Value			0.807			95% Hall's Bootstrap UCL			0.0798								
47	Kolmogorov-Smirnov Test Statistic			0.14			95% Percentile Bootstrap UCL			0.0777								
48	Kolmogorov-Smirnov 5% Critical Value			0.0797			95% BCA Bootstrap UCL			0.0784								
49	Data not Gamma Distributed at 5% Significance Level						95% Chebyshev(Mean, Sd) UCL			0.101								
50							97.5% Chebyshev(Mean, Sd) UCL			0.118								

	A	B	C	D	E	F	G	H	I	J	K	L
51	Assuming Gamma Distribution						99% Chebyshev(Mean, Sd) UCL					0.151
52	95% Approximate Gamma UCL					0.0741						
53	95% Adjusted Gamma UCL					0.0742						
54												
55	Potential UCL to Use						Use 95% H-UCL					0.0838
56												

	A	B	C	D	E	F	G	H	I	J	K	L						
1				General UCL Statistics for Data Sets with Non-Detects														
2	User Selected Options																	
3	From File			C:\Documents and Settings\rarmiento\My Documents\Projects\montrose\HRA\UCL calcs\0 to 2 ft.xls.wst														
4	Full Precision			OFF														
5	Confidence Coefficient			95%														
6	Number of Bootstrap Operations			2000														
7																		
8																		
9	dieldrin																	
10																		
11	General Statistics																	
12	Number of Valid Data				152				Number of Detected Data				81					
13	Number of Distinct Detected Data				56				Number of Non-Detect Data				71					
14									Percent Non-Detects				46.71%					
15																		
16	Raw Statistics						Log-transformed Statistics											
17	Minimum Detected			0.0013			Minimum Detected			-6.645								
18	Maximum Detected			0.045			Maximum Detected			-3.101								
19	Mean of Detected			0.0102			Mean of Detected			-4.819								
20	SD of Detected			0.00826			SD of Detected			0.665								
21	Minimum Non-Detect			0.0035			Minimum Non-Detect			-5.655								
22	Maximum Non-Detect			1			Maximum Non-Detect			0								
23																		
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect						152					
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected						0					
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage						100.00%					
27																		
28	UCL Statistics																	
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only											
30	Lilliefors Test Statistic			0.203			Lilliefors Test Statistic			0.0762								
31	5% Lilliefors Critical Value			0.0984			5% Lilliefors Critical Value			0.0984								
32	Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level											
33																		
34	Assuming Normal Distribution						Assuming Lognormal Distribution											
35	DL/2 Substitution Method						DL/2 Substitution Method											
36	Mean			0.0383			Mean			-4.18								
37	SD			0.0749			SD			1.241								
38	95% DL/2 (t) UCL			0.0484			95% H-Stat (DL/2) UCL			0.0525								
39																		
40	Maximum Likelihood Estimate(MLE) Method						Log ROS Method											
41	MLE method failed to converge properly						Mean in Log Scale						-4.911					
42							SD in Log Scale						0.573					
43							Mean in Original Scale						0.0088					
44							SD in Original Scale						0.00652					
45							95% Percentile Bootstrap UCL						0.00969					
46							95% BCA Bootstrap UCL						0.00979					
47																		
48	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only											
49	k star (bias corrected)			2.253			Data appear Lognormal at 5% Significance Level											
50	Theta Star			0.00451														

	A	B	C	D	E	F	G	H	I	J	K	L												
1				General UCL Statistics for Data Sets with Non-Detects																				
2	User Selected Options																							
3	From File			C:\Documents and Settings\rsarmiento\My Documents\Projects\montrose\HRA\UCL calcs\0 to 2 ft.xls.wst																				
4	Full Precision			OFF																				
5	Confidence Coefficient			95%																				
6	Number of Bootstrap Operations			2000																				
7																								
8																								
9	aldrin																							
10																								
11	General Statistics																							
12	Number of Valid Data				152				Number of Detected Data				10											
13	Number of Distinct Detected Data				10				Number of Non-Detect Data				142											
14									Percent Non-Detects				93.42%											
15																								
16	Raw Statistics						Log-transformed Statistics																	
17	Minimum Detected			0.00031			Minimum Detected			-8.079														
18	Maximum Detected			0.0021			Maximum Detected			-6.166														
19	Mean of Detected			0.000824			Mean of Detected			-7.229														
20	SD of Detected			0.000494			SD of Detected			0.516														
21	Minimum Non-Detect			0.0017			Minimum Non-Detect			-6.377														
22	Maximum Non-Detect			0.4			Maximum Non-Detect			-0.916														
23																								
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect						152											
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected						0											
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage						100.00%											
27																								
28	UCL Statistics																							
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only																	
30	Shapiro Wilk Test Statistic			0.775			Shapiro Wilk Test Statistic			0.949														
31	5% Shapiro Wilk Critical Value			0.842			5% Shapiro Wilk Critical Value			0.842														
32	Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level																	
33																								
34	Assuming Normal Distribution						Assuming Lognormal Distribution																	
35	DL/2 Substitution Method						DL/2 Substitution Method																	
36	Mean			0.0191			Mean			-4.749														
37	SD			0.032			SD			1.278														
38	95% DL/2 (t) UCL			0.0234			95% H-Stat (DL/2) UCL			0.0272														
39																								
40	Maximum Likelihood Estimate(MLE) Method						N/A						Log ROS Method											
41	MLE method failed to converge properly												Mean in Log Scale						-7.277					
42													SD in Log Scale						0.361					
43													Mean in Original Scale						0.0007383					
44													SD in Original Scale						0.0002821					
45													95% Percentile Bootstrap UCL						0.0007776					
46													95% BCA Bootstrap UCL						0.0007791					
47																								
48	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only																	
49	k star (bias corrected)			2.924			Data appear Gamma Distributed at 5% Significance Level																	
50	Theta Star			0.0002818																				

	A	B	C	D	E	F	G	H	I	J	K	L								
1				General UCL Statistics for Data Sets with Non-Detects																
2	User Selected Options																			
3	From File			C:\Documents and Settings\rsarmiento\My Documents\Projects\montrose\HRA\UCL calcs\0 to 2 ft.xls.wst																
4	Full Precision			OFF																
5	Confidence Coefficient			95%																
6	Number of Bootstrap Operations			2000																
7																				
8																				
9	heptachlor																			
10																				
11	General Statistics																			
12	Number of Valid Data				151				Number of Detected Data				56							
13	Number of Distinct Detected Data				39				Number of Non-Detect Data				95							
14									Percent Non-Detects				62.91%							
15																				
16	Raw Statistics						Log-transformed Statistics													
17	Minimum Detected			0.00039			Minimum Detected			-7.849										
18	Maximum Detected			0.047			Maximum Detected			-3.058										
19	Mean of Detected			0.00782			Mean of Detected			-5.386										
20	SD of Detected			0.00927			SD of Detected			1.063										
21	Minimum Non-Detect			0.0018			Minimum Non-Detect			-6.32										
22	Maximum Non-Detect			0.4			Maximum Non-Detect			-0.916										
23																				
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect						151							
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected						0							
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage						100.00%							
27																				
28	UCL Statistics																			
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only													
30	Lilliefors Test Statistic			0.212			Lilliefors Test Statistic			0.0976										
31	5% Lilliefors Critical Value			0.118			5% Lilliefors Critical Value			0.118										
32	Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level													
33																				
34	Assuming Normal Distribution						Assuming Lognormal Distribution													
35	DL/2 Substitution Method						DL/2 Substitution Method													
36	Mean			0.0195			Mean			-4.72										
37	SD			0.0323			SD			1.241										
38	95% DL/2 (t) UCL			0.0239			95% H-Stat (DL/2) UCL			0.0304										
39																				
40	Maximum Likelihood Estimate(MLE) Method						N/A						Log ROS Method							
41	MLE method failed to converge properly												Mean in Log Scale				-5.65			
42													SD in Log Scale				0.821			
43													Mean in Original Scale				0.00516			
44													SD in Original Scale				0.00625			
45													95% Percentile Bootstrap UCL				0.00595			
46													95% BCA Bootstrap UCL				0.00621			
47																				
48	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only													
49	k star (bias corrected)			1.026			Data appear Lognormal at 5% Significance Level													
50	Theta Star			0.00762																

	A	B	C	D	E	F	G	H	I	J	K	L												
1				General UCL Statistics for Full Data Sets																				
2	User Selected Options																							
3	From File			C:\Documents and Settings\rarmiento\My Documents\Projects\montrose\HRA\UCL calcs\0 to 2 ft.xls.wst																				
4	Full Precision			OFF																				
5	Confidence Coefficient			95%																				
6	Number of Bootstrap Operations			2000																				
7																								
8																								
9	Hep expox																							
10																								
11	General Statistics																							
12	Number of Valid Observations				153				Number of Distinct Observations				73											
13																								
14	Raw Statistics						Log-transformed Statistics																	
15				Minimum			0.00051						Minimum of Log Data			-7.581								
16				Maximum			0.4						Maximum of Log Data			-0.916								
17				Mean			0.0347						Mean of log Data			-4.408								
18				Median			0.0095						SD of log Data			1.441								
19				SD			0.065																	
20				Coefficient of Variation			1.876																	
21				Skewness			3.829																	
22																								
23	Relevant UCL Statistics																							
24	Normal Distribution Test						Lognormal Distribution Test																	
25				Lilliefors Test Statistic			0.304						Lilliefors Test Statistic			0.0903								
26				Lilliefors Critical Value			0.0716						Lilliefors Critical Value			0.0716								
27	Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level																	
28																								
29	Assuming Normal Distribution						Assuming Lognormal Distribution																	
30				95% Student's-t UCL			0.0434						95% H-UCL			0.0469								
31	95% UCLs (Adjusted for Skewness)						95% Chebyshev (MVUE) UCL						0.0578											
32				95% Adjusted-CLT UCL			0.045						97.5% Chebyshev (MVUE) UCL			0.0681								
33				95% Modified-t UCL			0.0436						99% Chebyshev (MVUE) UCL			0.0884								
34																								
35	Gamma Distribution Test						Data Distribution																	
36				k star (bias corrected)			0.585						Data do not follow a Discernable Distribution (0.05)											
37				Theta Star			0.0592																	
38				MLE of Mean			0.0347																	
39				MLE of Standard Deviation			0.0453																	
40				nu star			179																	
41	Approximate Chi Square Value (.05)						149						Nonparametric Statistics											
42				Adjusted Level of Significance			0.0484						95% CLT UCL			0.0433								
43				Adjusted Chi Square Value			148.8						95% Jackknife UCL			0.0434								
44													95% Standard Bootstrap UCL			0.0435								
45				Anderson-Darling Test Statistic			5.578						95% Bootstrap-t UCL			0.0461								
46				Anderson-Darling 5% Critical Value			0.811						95% Hall's Bootstrap UCL			0.046								
47				Kolmogorov-Smirnov Test Statistic			0.175						95% Percentile Bootstrap UCL			0.044								
48				Kolmogorov-Smirnov 5% Critical Value			0.0796						95% BCA Bootstrap UCL			0.0449								
49	Data not Gamma Distributed at 5% Significance Level												95% Chebyshev(Mean, Sd) UCL						0.0576					
50													97.5% Chebyshev(Mean, Sd) UCL						0.0675					

	A	B	C	D	E	F	G	H	I	J	K	L
51	Assuming Gamma Distribution						99% Chebyshev(Mean, Sd) UCL					0.087
52	95% Approximate Gamma UCL					0.0416						
53	95% Adjusted Gamma UCL					0.0417						
54												
55	Potential UCL to Use						Use 97.5% Chebyshev (Mean, Sd) UCL					0.0675
56												

	A	B	C	D	E	F	G	H	I	J	K	L						
1				General UCL Statistics for Data Sets with Non-Detects														
2	User Selected Options																	
3	From File			C:\Documents and Settings\rarmiento\My Documents\Projects\montrose\HRA\UCL calcs\0 to 2 ft.xls.wst														
4	Full Precision			OFF														
5	Confidence Coefficient			95%														
6	Number of Bootstrap Operations			2000														
7																		
8																		
9	1260																	
10																		
11	General Statistics																	
12	Number of Valid Data				89				Number of Detected Data				7					
13	Number of Distinct Detected Data				5				Number of Non-Detect Data				82					
14									Percent Non-Detects				92.13%					
15																		
16	Raw Statistics						Log-transformed Statistics											
17	Minimum Detected			0.01			Minimum Detected			-4.605								
18	Maximum Detected			0.06			Maximum Detected			-2.813								
19	Mean of Detected			0.0269			Mean of Detected			-3.739								
20	SD of Detected			0.0156			SD of Detected			0.525								
21	Minimum Non-Detect			0.033			Minimum Non-Detect			-3.411								
22	Maximum Non-Detect			1.7			Maximum Non-Detect			0.531								
23																		
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect						89					
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected						0					
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage						100.00%					
27																		
28	Warning: There are only 7 Detected Values in this data																	
29	Note: It should be noted that even though bootstrap may be performed on this data set																	
30	the resulting calculations may not be reliable enough to draw conclusions																	
31																		
32	It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.																	
33																		
34																		
35	UCL Statistics																	
36	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only											
37	Shapiro Wilk Test Statistic			0.756			Shapiro Wilk Test Statistic			0.875								
38	5% Shapiro Wilk Critical Value			0.803			5% Shapiro Wilk Critical Value			0.803								
39	Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level											
40																		
41	Assuming Normal Distribution						Assuming Lognormal Distribution											
42	DL/2 Substitution Method						DL/2 Substitution Method											
43	Mean			0.0802			Mean			-3.342								
44	SD			0.147			SD			1.105								
45	95% DL/2 (t) UCL			0.106			95% H-Stat (DL/2) UCL			0.0897								
46																		
47	Maximum Likelihood Estimate(MLE) Method						Log ROS Method											
48	MLE method failed to converge properly						Mean in Log Scale						-3.873					
49							SD in Log Scale						0.318					
50							Mean in Original Scale						0.0219					

	A	B	C	D	E	F	G	H	I	J	K	L
51										SD in Original Scale		0.00748
52										95% Percentile Bootstrap UCL		0.0233
53										95% BCA Bootstrap UCL		0.0234
54												
55	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only					
56				k star (bias corrected)		2.53	Data appear Gamma Distributed at 5% Significance Level					
57				Theta Star		0.0106						
58				nu star		35.42						
59												
60				A-D Test Statistic		0.677	Nonparametric Statistics					
61				5% A-D Critical Value		0.71	Kaplan-Meier (KM) Method					
62				K-S Test Statistic		0.71	Mean					
63				5% K-S Critical Value		0.313	SD					
64	Data appear Gamma Distributed at 5% Significance Level						SE of Mean					
65							95% KM (t) UCL					
66	Assuming Gamma Distribution						95% KM (z) UCL					
67	Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL					
68				Minimum		0.01	95% KM (bootstrap t) UCL					
69				Maximum		0.06	95% KM (BCA) UCL					
70				Mean		0.0268	95% KM (Percentile Bootstrap) UCL					
71				Median		0.0278	95% KM (Chebyshev) UCL					
72				SD		0.0068	97.5% KM (Chebyshev) UCL					
73				k star		14.67	99% KM (Chebyshev) UCL					
74				Theta star		0.00183						
75				Nu star		2610	Potential UCLs to Use					
76				AppChi2		2493	95% KM (t) UCL					
77				95% Gamma Approximate UCL		0.0281						
78				95% Adjusted Gamma UCL		0.0281						
79	Note: DL/2 is not a recommended method.											
80												

0 – 5 FEET

	A	B	C	D	E	F	G	H	I	J	K	L	
1				General UCL Statistics for Data Sets with Non-Detects									
2	User Selected Options												
3	From File			C:\Documents and Settings\rarmiento\My Documents\Projects\montrose\HRA\RAGS D Tables OU6\0 to 5 ucl.x									
4	Full Precision			OFF									
5	Confidence Coefficient			95%									
6	Number of Bootstrap Operations			2000									
7													
8													
9	24DDD												
10													
11	General Statistics												
12	Number of Valid Data				226		Number of Detected Data				187		
13	Number of Distinct Detected Data				110		Number of Non-Detect Data				39		
14									Percent Non-Detects				17.26%
15													
16	Raw Statistics						Log-transformed Statistics						
17	Minimum Detected			0.00079			Minimum Detected			-7.143			
18	Maximum Detected			4.4			Maximum Detected			1.482			
19	Mean of Detected			0.157			Mean of Detected			-3.913			
20	SD of Detected			0.621			SD of Detected			1.703			
21	Minimum Non-Detect			0.0036			Minimum Non-Detect			-5.627			
22	Maximum Non-Detect			0.8			Maximum Non-Detect			-0.223			
23													
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect				219		
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected				7		
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage				96.90%		
27													
28	UCL Statistics												
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only						
30	Lilliefors Test Statistic			0.4			Lilliefors Test Statistic			0.0696			
31	5% Lilliefors Critical Value			0.0648			5% Lilliefors Critical Value			0.0648			
32	Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level						
33													
34	Assuming Normal Distribution						Assuming Lognormal Distribution						
35	DL/2 Substitution Method						DL/2 Substitution Method						
36	Mean			0.141			Mean			-3.875			
37	SD			0.567			SD			1.649			
38	95% DL/2 (t) UCL			0.203			95% H-Stat (DL/2) UCL			0.109			
39													
40	Maximum Likelihood Estimate(MLE) Method						Log ROS Method						
41	MLE method failed to converge properly						Mean in Log Scale			-4.063			
42							SD in Log Scale			1.626			
43							Mean in Original Scale			0.132			
44							SD in Original Scale			0.568			
45							95% Percentile Bootstrap UCL			0.199			
46							95% BCA Bootstrap UCL			0.213			
47													
48	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only						
49	k star (bias corrected)			0.327			Data do not follow a Discernable Distribution (0.05)						
50	Theta Star			0.481									

	A	B	C	D	E	F	G	H	I	J	K	L						
1				General UCL Statistics for Data Sets with Non-Detects														
2	User Selected Options																	
3	From File			C:\Documents and Settings\sarmiento\My Documents\Projects\montrose\HRA\RAGS D Tables OU6\0 to 5 ucl.x														
4	Full Precision			OFF														
5	Confidence Coefficient			95%														
6	Number of Bootstrap Operations			2000														
7																		
8																		
9	44DDD																	
10																		
11	General Statistics																	
12	Number of Valid Data				219				Number of Detected Data				208					
13	Number of Distinct Detected Data				134				Number of Non-Detect Data				11					
14									Percent Non-Detects				5.02%					
15																		
16	Raw Statistics						Log-transformed Statistics											
17	Minimum Detected			0.0016			Minimum Detected			-6.438								
18	Maximum Detected			18			Maximum Detected			2.89								
19	Mean of Detected			0.376			Mean of Detected			-2.965								
20	SD of Detected			1.568			SD of Detected			1.807								
21	Minimum Non-Detect			0.0072			Minimum Non-Detect			-4.934								
22	Maximum Non-Detect			0.18			Maximum Non-Detect			-1.715								
23																		
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect						170					
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected						49					
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage						77.63%					
27																		
28	UCL Statistics																	
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only											
30	Lilliefors Test Statistic			0.406			Lilliefors Test Statistic			0.046								
31	5% Lilliefors Critical Value			0.0614			5% Lilliefors Critical Value			0.0614								
32	Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level											
33																		
34	Assuming Normal Distribution						Assuming Lognormal Distribution											
35	DL/2 Substitution Method						DL/2 Substitution Method											
36	Mean			0.358			Mean			-3.015								
37	SD			1.53			SD			1.785								
38	95% DL/2 (t) UCL			0.529			95% H-Stat (DL/2) UCL			0.339								
39																		
40	Maximum Likelihood Estimate(MLE) Method						Log ROS Method											
41	MLE yields a negative mean						Mean in Log Scale						-3.041					
42							SD in Log Scale						1.799					
43							Mean in Original Scale						0.358					
44							SD in Original Scale						1.53					
45							95% Percentile Bootstrap UCL						0.534					
46							95% BCA Bootstrap UCL						0.597					
47																		
48	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only											
49	k star (bias corrected)			0.338			Data appear Lognormal at 5% Significance Level											
50	Theta Star			1.111														

	A	B	C	D	E	F	G	H	I	J	K	L
51					nu star	140.7						
52												
53					A-D Test Statistic	16.07	Nonparametric Statistics					
54					5% A-D Critical Value	0.86	Kaplan-Meier (KM) Method					
55					K-S Test Statistic	0.86	Mean					0.358
56					5% K-S Critical Value	0.0678	SD					1.527
57	Data not Gamma Distributed at 5% Significance Level						SE of Mean					0.103
58							95% KM (t) UCL					0.529
59	Assuming Gamma Distribution						95% KM (z) UCL					0.528
60	Gamma ROS Statistics using Extrapolated Data						95% KM (jackknife) UCL					0.529
61					Minimum	1E-09	95% KM (bootstrap t) UCL					0.679
62					Maximum	18	95% KM (BCA) UCL					0.548
63					Mean	0.357	95% KM (Percentile Bootstrap) UCL					0.543
64					Median	0.046	95% KM (Chebyshev) UCL					0.809
65					SD	1.53	97.5% KM (Chebyshev) UCL					1.004
66					k star	0.251	99% KM (Chebyshev) UCL					1.387
67					Theta star	1.425						
68					Nu star	109.8	Potential UCLs to Use					
69					AppChi2	86.6	97.5% KM (Chebyshev) UCL					1.004
70					95% Gamma Approximate UCL	0.453						
71					95% Adjusted Gamma UCL	0.453						
72	Note: DL/2 is not a recommended method.											
73												

	A	B	C	D	E	F	G	H	I	J	K	L						
1				General UCL Statistics for Data Sets with Non-Detects														
2	User Selected Options																	
3	From File			C:\Documents and Settings\rsarmiento\My Documents\Projects\montrose\HRA\RAGS D Tables OU6\0 to 5 ucl.x														
4	Full Precision			OFF														
5	Confidence Coefficient			95%														
6	Number of Bootstrap Operations			2000														
7																		
8																		
9	24DDE																	
10																		
11	General Statistics																	
12	Number of Valid Data				222				Number of Detected Data				51					
13	Number of Distinct Detected Data				47				Number of Non-Detect Data				171					
14									Percent Non-Detects				77.03%					
15																		
16	Raw Statistics						Log-transformed Statistics											
17	Minimum Detected			0.002			Minimum Detected			-6.215								
18	Maximum Detected			0.82			Maximum Detected			-0.198								
19	Mean of Detected			0.0851			Mean of Detected			-3.66								
20	SD of Detected			0.162			SD of Detected			1.483								
21	Minimum Non-Detect			0.0034			Minimum Non-Detect			-5.684								
22	Maximum Non-Detect			1.9			Maximum Non-Detect			0.642								
23																		
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect						222					
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected						0					
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage						100.00%					
27																		
28	UCL Statistics																	
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only											
30	Lilliefors Test Statistic			0.373			Lilliefors Test Statistic			0.143								
31	5% Lilliefors Critical Value			0.124			5% Lilliefors Critical Value			0.124								
32	Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level											
33																		
34	Assuming Normal Distribution						Assuming Lognormal Distribution											
35	DL/2 Substitution Method						DL/2 Substitution Method											
36	Mean			0.0536			Mean			-3.9								
37	SD			0.112			SD			1.32								
38	95% DL/2 (t) UCL			0.066			95% H-Stat (DL/2) UCL			0.069								
39																		
40	Maximum Likelihood Estimate(MLE) Method						Log ROS Method											
41	MLE method failed to converge properly						Mean in Log Scale						-5.214					
42							SD in Log Scale						1.454					
43							Mean in Original Scale						0.0241					
44							SD in Original Scale						0.084					
45							95% Percentile Bootstrap UCL						0.0344					
46							95% BCA Bootstrap UCL						0.0375					
47																		
48	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only											
49	k star (bias corrected)			0.509			Data do not follow a Discernable Distribution (0.05)											
50	Theta Star			0.167														

	A	B	C	D	E	F	G	H	I	J	K	L
51					nu star	51.9						
52												
53					A-D Test Statistic	3.601	Nonparametric Statistics					
54					5% A-D Critical Value	0.812	Kaplan-Meier (KM) Method					
55					K-S Test Statistic	0.812				Mean		0.0257
56					5% K-S Critical Value	0.131				SD		0.0845
57	Data not Gamma Distributed at 5% Significance Level										SE of Mean	0.00583
58										95% KM (t) UCL		0.0354
59	Assuming Gamma Distribution										95% KM (z) UCL	0.0353
60	Gamma ROS Statistics using Extrapolated Data										95% KM (jackknife) UCL	0.0353
61					Minimum	0.002				95% KM (bootstrap t) UCL		0.0405
62					Maximum	0.82				95% KM (BCA) UCL		0.0375
63					Mean	0.0977				95% KM (Percentile Bootstrap) UCL		0.0355
64					Median	0.052				95% KM (Chebyshev) UCL		0.0511
65					SD	0.108				97.5% KM (Chebyshev) UCL		0.0621
66					k star	0.893				99% KM (Chebyshev) UCL		0.0838
67					Theta star	0.109						
68					Nu star	396.5	Potential UCLs to Use					
69					AppChi2	351.3				95% KM (BCA) UCL		0.0375
70					95% Gamma Approximate UCL	0.11						
71					95% Adjusted Gamma UCL	0.11						
72	Note: DL/2 is not a recommended method.											
73												

	A	B	C	D	E	F	G	H	I	J	K	L												
1				General UCL Statistics for Data Sets with Non-Detects																				
2	User Selected Options																							
3	From File			C:\Documents and Settings\rsarmiento\My Documents\Projects\montrose\HRA\IRAGS D Tables OU6\0 to 5 ucl.x																				
4	Full Precision			OFF																				
5	Confidence Coefficient			95%																				
6	Number of Bootstrap Operations			2000																				
7																								
8																								
9	44DDE																							
10																								
11	General Statistics																							
12	Number of Valid Observations				227				Number of Distinct Observations				118											
13																								
14	Raw Statistics						Log-transformed Statistics																	
15				Minimum			0.00085						Minimum of Log Data			-7.07								
16				Maximum			3.8						Maximum of Log Data			1.335								
17				Mean			0.257						Mean of log Data			-2.411								
18				Median			0.1						SD of log Data			1.533								
19				SD			0.504																	
20				Coefficient of Variation			1.962																	
21				Skewness			4.617																	
22																								
23	Relevant UCL Statistics																							
24	Normal Distribution Test						Lognormal Distribution Test																	
25				Lilliefors Test Statistic			0.306						Lilliefors Test Statistic			0.0648								
26				Lilliefors Critical Value			0.0588						Lilliefors Critical Value			0.0588								
27	Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level																	
28																								
29	Assuming Normal Distribution						Assuming Lognormal Distribution																	
30				95% Student's-t UCL			0.312						95% H-UCL			0.381								
31	95% UCLs (Adjusted for Skewness)						95% Chebyshev (MVUE) UCL						0.471											
32				95% Adjusted-CLT UCL			0.323						97.5% Chebyshev (MVUE) UCL			0.55								
33				95% Modified-t UCL			0.314						99% Chebyshev (MVUE) UCL			0.706								
34																								
35	Gamma Distribution Test						Data Distribution																	
36				k star (bias corrected)			0.584						Data do not follow a Discernable Distribution (0.05)											
37				Theta Star			0.439																	
38				MLE of Mean			0.257																	
39				MLE of Standard Deviation			0.336																	
40				nu star			265.4																	
41	Approximate Chi Square Value (.05)						228.6						Nonparametric Statistics											
42				Adjusted Level of Significance			0.0489						95% CLT UCL			0.312								
43				Adjusted Chi Square Value			228.4						95% Jackknife UCL			0.312								
44													95% Standard Bootstrap UCL			0.312								
45				Anderson-Darling Test Statistic			3.95						95% Bootstrap-t UCL			0.33								
46				Anderson-Darling 5% Critical Value			0.812						95% Hall's Bootstrap UCL			0.325								
47				Kolmogorov-Smirnov Test Statistic			0.0905						95% Percentile Bootstrap UCL			0.314								
48				Kolmogorov-Smirnov 5% Critical Value			0.0636						95% BCA Bootstrap UCL			0.325								
49	Data not Gamma Distributed at 5% Significance Level												95% Chebyshev(Mean, Sd) UCL						0.402					
50													97.5% Chebyshev(Mean, Sd) UCL						0.465					

	A	B	C	D	E	F	G	H	I	J	K	L	
51	Assuming Gamma Distribution						99% Chebyshev(Mean, Sd) UCL					0.589	
52	95% Approximate Gamma UCL					0.298							
53	95% Adjusted Gamma UCL					0.298							
54													
55	Potential UCL to Use						Use 97.5% Chebyshev (Mean, Sd) UCL					0.465	
56													

	A	B	C	D	E	F	G	H	I	J	K	L						
1	General UCL Statistics for Data Sets with Non-Detects																	
2	User Selected Options																	
3	From File		C:\Documents and Settings\rsarmiento\My Documents\Projects\montrose\HRA\IRAGS D Tables OU6\0 to 5 ucl.x															
4	Full Precision		OFF															
5	Confidence Coefficient		95%															
6	Number of Bootstrap Operations		2000															
7																		
8																		
9	24DDT																	
10																		
11	General Statistics																	
12	Number of Valid Data				213				Number of Detected Data				182					
13	Number of Distinct Detected Data				114				Number of Non-Detect Data				31					
14									Percent Non-Detects				14.55%					
15																		
16	Raw Statistics						Log-transformed Statistics											
17	Minimum Detected			0.0016			Minimum Detected			-6.438								
18	Maximum Detected			11			Maximum Detected			2.398								
19	Mean of Detected			0.297			Mean of Detected			-3.048								
20	SD of Detected			1.206			SD of Detected			1.636								
21	Minimum Non-Detect			0.0035			Minimum Non-Detect			-5.655								
22	Maximum Non-Detect			0.37			Maximum Non-Detect			-0.994								
23																		
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect						195					
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected						18					
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage						91.55%					
27																		
28	UCL Statistics																	
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only											
30	Lilliefors Test Statistic			0.403			Lilliefors Test Statistic			0.0596								
31	5% Lilliefors Critical Value			0.0657			5% Lilliefors Critical Value			0.0657								
32	Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level											
33																		
34	Assuming Normal Distribution						Assuming Lognormal Distribution											
35	DL/2 Substitution Method						DL/2 Substitution Method											
36	Mean			0.26			Mean			-3.17								
37	SD			1.118			SD			1.607								
38	95% DL/2 (t) UCL			0.386			95% H-Stat (DL/2) UCL			0.189								
39																		
40	Maximum Likelihood Estimate(MLE) Method						Log ROS Method											
41	MLE yields a negative mean						Mean in Log Scale						-3.26					
42							SD in Log Scale						1.638					
43							Mean in Original Scale						0.256					
44							SD in Original Scale						1.118					
45							95% Percentile Bootstrap UCL						0.391					
46							95% BCA Bootstrap UCL						0.443					
47																		
48	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only											
49	k star (bias corrected)			0.362			Data appear Lognormal at 5% Significance Level											
50	Theta Star			0.822														

	A	B	C	D	E	F	G	H	I	J	K	L				
1				General UCL Statistics for Data Sets with Non-Detects												
2	User Selected Options															
3	From File			C:\Documents and Settings\rsarmiento\My Documents\Projects\montrose\HRA\RAGS D Tables OU6\0 to 5 ucl.x												
4	Full Precision			OFF												
5	Confidence Coefficient			95%												
6	Number of Bootstrap Operations			2000												
7																
8																
9	44DDT															
10																
11	General Statistics															
12	Number of Valid Data				213				Number of Detected Data				182			
13	Number of Distinct Detected Data				114				Number of Non-Detect Data				31			
14									Percent Non-Detects				14.55%			
15																
16	Raw Statistics						Log-transformed Statistics									
17	Minimum Detected			0.0016			Minimum Detected			-6.438						
18	Maximum Detected			11			Maximum Detected			2.398						
19	Mean of Detected			0.297			Mean of Detected			-3.048						
20	SD of Detected			1.206			SD of Detected			1.636						
21	Minimum Non-Detect			0.0035			Minimum Non-Detect			-5.655						
22	Maximum Non-Detect			0.37			Maximum Non-Detect			-0.994						
23																
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect						195			
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected						18			
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage						91.55%			
27																
28	UCL Statistics															
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only									
30	Lilliefors Test Statistic			0.403			Lilliefors Test Statistic			0.0596						
31	5% Lilliefors Critical Value			0.0657			5% Lilliefors Critical Value			0.0657						
32	Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level									
33																
34	Assuming Normal Distribution						Assuming Lognormal Distribution									
35	DL/2 Substitution Method						DL/2 Substitution Method									
36	Mean			0.26			Mean			-3.17						
37	SD			1.118			SD			1.607						
38	95% DL/2 (t) UCL			0.386			95% H-Stat (DL/2) UCL			0.189						
39																
40	Maximum Likelihood Estimate(MLE) Method						Log ROS Method									
41	MLE yields a negative mean						Mean in Log Scale						-3.26			
42							SD in Log Scale						1.638			
43							Mean in Original Scale						0.256			
44							SD in Original Scale						1.118			
45							95% Percentile Bootstrap UCL						0.397			
46							95% BCA Bootstrap UCL						0.438			
47																
48	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only									
49	k star (bias corrected)			0.362			** Data appear Lognormal at 5% Significance Level									
50	Theta Star			0.822												

	A	B	C	D	E	F	G	H	I	J	K	L						
1				General UCL Statistics for Data Sets with Non-Detects														
2	User Selected Options																	
3	From File			C:\Documents and Settings\rsarmiento\My Documents\Projects\montrose\HRA\RAGS D Tables OU6\0 to 5 ucl.x														
4	Full Precision			OFF														
5	Confidence Coefficient			95%														
6	Number of Bootstrap Operations			2000														
7																		
8																		
9	dieltrin																	
10																		
11	General Statistics																	
12	Number of Valid Data				228				Number of Detected Data				108					
13	Number of Distinct Detected Data				68				Number of Non-Detect Data				120					
14									Percent Non-Detects				52.63%					
15																		
16	Raw Statistics						Log-transformed Statistics											
17	Minimum Detected			0.0013			Minimum Detected			-6.645								
18	Maximum Detected			0.045			Maximum Detected			-3.101								
19	Mean of Detected			0.0101			Mean of Detected			-4.832								
20	SD of Detected			0.00792			SD of Detected			0.686								
21	Minimum Non-Detect			0.0035			Minimum Non-Detect			-5.655								
22	Maximum Non-Detect			1.9			Maximum Non-Detect			0.642								
23																		
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect						228					
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected						0					
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage						100.00%					
27																		
28	UCL Statistics																	
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only											
30	Lilliefors Test Statistic			0.198			Lilliefors Test Statistic			0.071								
31	5% Lilliefors Critical Value			0.0853			5% Lilliefors Critical Value			0.0853								
32	Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level											
33																		
34	Assuming Normal Distribution						Assuming Lognormal Distribution											
35	DL/2 Substitution Method						DL/2 Substitution Method											
36	Mean			0.0558			Mean			-4.069								
37	SD			0.131			SD			1.405								
38	95% DL/2 (t) UCL			0.0701			95% H-Stat (DL/2) UCL			0.0685								
39																		
40	Maximum Likelihood Estimate(MLE) Method						Log ROS Method											
41	MLE method failed to converge properly						Mean in Log Scale						-4.968					
42							SD in Log Scale						0.598					
43							Mean in Original Scale						0.00838					
44							SD in Original Scale						0.00615					
45							95% Percentile Bootstrap UCL						0.00909					
46							95% BCA Bootstrap UCL						0.00916					
47																		
48	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only											
49	k star (bias corrected)			2.237			Data appear Lognormal at 5% Significance Level											
50	Theta Star			0.0045														

	A	B	C	D	E	F	G	H	I	J	K	L		
1	General UCL Statistics for Data Sets with Non-Detects													
2	User Selected Options													
3	From File		C:\Documents and Settings\rarmiento\My Documents\Projects\montrose\HRA\RAGS D Tables OU6\0 to 5 ucl.x											
4	Full Precision		OFF											
5	Confidence Coefficient		95%											
6	Number of Bootstrap Operations		2000											
7														
8														
9	heptaclor													
10														
11	General Statistics													
12	Number of Valid Data				228		Number of Detected Data				70			
13	Number of Distinct Detected Data				48		Number of Non-Detect Data				158			
14									Percent Non-Detects		69.30%			
15														
16	Raw Statistics						Log-transformed Statistics							
17	Minimum Detected			0.00039			Minimum Detected			-7.849				
18	Maximum Detected			0.15			Maximum Detected			-1.897				
19	Mean of Detected			0.0103			Mean of Detected			-5.247				
20	SD of Detected			0.0193			SD of Detected			1.106				
21	Minimum Non-Detect			0.0018			Minimum Non-Detect			-6.32				
22	Maximum Non-Detect			0.97			Maximum Non-Detect			-0.0305				
23														
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect			228				
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected			0				
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage			100.00%				
27														
28	UCL Statistics													
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only							
30	Lilliefors Test Statistic			0.303			Lilliefors Test Statistic			0.0871				
31	5% Lilliefors Critical Value			0.106			5% Lilliefors Critical Value			0.106				
32	Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level							
33														
34	Assuming Normal Distribution						Assuming Lognormal Distribution							
35	DL/2 Substitution Method						DL/2 Substitution Method							
36	Mean			0.0305			Mean			-4.559				
37	SD			0.0663			SD			1.395				
38	95% DL/2 (t) UCL			0.0378			95% H-Stat (DL/2) UCL			0.0407				
39														
40	Maximum Likelihood Estimate(MLE) Method						N/A			Log ROS Method				
41	MLE method failed to converge properly									Mean in Log Scale			-5.676	
42										SD in Log Scale			0.877	
43										Mean in Original Scale			0.00563	
44										SD in Original Scale			0.0113	
45										95% Percentile Bootstrap UCL			0.00695	
46										95% BCA Bootstrap UCL			0.00782	
47														
48	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only							
49	k star (bias corrected)			0.845			Data appear Lognormal at 5% Significance Level							
50	Theta Star			0.0122										

	A	B	C	D	E	F	G	H	I	J	K	L				
1	General UCL Statistics for Data Sets with Non-Detects															
2	User Selected Options															
3	From File			C:\Documents and Settings\rarmiento\My Documents\Projects\montrose\HRA\RAGS D Tables OU6\0 to 5 ucl.x												
4	Full Precision			OFF												
5	Confidence Coefficient			95%												
6	Number of Bootstrap Operations			2000												
7																
8																
9	hptaclor epox															
10																
11	General Statistics															
12	Number of Valid Data				228				Number of Detected Data				70			
13	Number of Distinct Detected Data				45				Number of Non-Detect Data				158			
14									Percent Non-Detects				69.30%			
15																
16	Raw Statistics						Log-transformed Statistics									
17	Minimum Detected			0.00051			Minimum Detected			-7.581						
18	Maximum Detected			0.068			Maximum Detected			-2.688						
19	Mean of Detected			0.00734			Mean of Detected			-5.426						
20	SD of Detected			0.00983			SD of Detected			0.978						
21	Minimum Non-Detect			0.0017			Minimum Non-Detect			-6.377						
22	Maximum Non-Detect			0.97			Maximum Non-Detect			-0.0305						
23																
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect						228			
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected						0			
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage						100.00%			
27																
28	UCL Statistics															
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only									
30	Lilliefors Test Statistic			0.257			Lilliefors Test Statistic			0.119						
31	5% Lilliefors Critical Value			0.106			5% Lilliefors Critical Value			0.106						
32	Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level									
33																
34	Assuming Normal Distribution						Assuming Lognormal Distribution									
35	DL/2 Substitution Method						DL/2 Substitution Method									
36	Mean			0.0294			Mean			-4.635						
37	SD			0.066			SD			1.406						
38	95% DL/2 (t) UCL			0.0367			95% H-Stat (DL/2) UCL			0.0382						
39																
40	Maximum Likelihood Estimate(MLE) Method						Log ROS Method									
41	MLE method failed to converge properly						Mean in Log Scale			-5.792						
42							SD in Log Scale			0.784						
43							Mean in Original Scale			0.00442						
44							SD in Original Scale			0.00599						
45							95% Percentile Bootstrap UCL			0.00511						
46							95% BCA Bootstrap UCL			0.00535						
47																
48	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only									
49	k star (bias corrected)			1.078			Data do not follow a Discernable Distribution (0.05)									
50	Theta Star			0.0068												

	A	B	C	D	E	F	G	H	I	J	K	L						
1				General UCL Statistics for Data Sets with Non-Detects														
2	User Selected Options																	
3	From File			C:\Documents and Settings\rnsarmiento\My Documents\Projects\montrose\HRA\RAGS D Tables OU6\0 to 5 ucl.x														
4	Full Precision			OFF														
5	Confidence Coefficient			95%														
6	Number of Bootstrap Operations			2000														
7																		
8																		
9	alpha-chlordane																	
10																		
11	General Statistics																	
12	Number of Valid Data				228				Number of Detected Data				138					
13	Number of Distinct Detected Data				94				Number of Non-Detect Data				90					
14									Percent Non-Detects				39.47%					
15																		
16	Raw Statistics						Log-transformed Statistics											
17	Minimum Detected			0.00042			Minimum Detected			-7.775								
18	Maximum Detected			0.78			Maximum Detected			-0.248								
19	Mean of Detected			0.0552			Mean of Detected			-4.093								
20	SD of Detected			0.119			SD of Detected			1.46								
21	Minimum Non-Detect			0.0018			Minimum Non-Detect			-6.32								
22	Maximum Non-Detect			0.97			Maximum Non-Detect			-0.0305								
23																		
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect						228					
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected						0					
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage						100.00%					
27																		
28	UCL Statistics																	
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only											
30	Lilliefors Test Statistic			0.323			Lilliefors Test Statistic			0.115								
31	5% Lilliefors Critical Value			0.0754			5% Lilliefors Critical Value			0.0754								
32	Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level											
33																		
34	Assuming Normal Distribution						Assuming Lognormal Distribution											
35	DL/2 Substitution Method						DL/2 Substitution Method											
36	Mean			0.0581			Mean			-3.906								
37	SD			0.11			SD			1.451								
38	95% DL/2 (t) UCL			0.0702			95% H-Stat (DL/2) UCL			0.0735								
39																		
40	Maximum Likelihood Estimate(MLE) Method						Log ROS Method											
41	MLE method failed to converge properly						Mean in Log Scale						-4.433					
42							SD in Log Scale						1.336					
43							Mean in Original Scale						0.0374					
44							SD in Original Scale						0.0953					
45							95% Percentile Bootstrap UCL						0.0487					
46							95% BCA Bootstrap UCL						0.0497					
47																		
48	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only											
49	k star (bias corrected)			0.52			Data do not follow a Discernable Distribution (0.05)											
50	Theta Star			0.106														

	A	B	C	D	E	F	G	H	I	J	K	L						
1				General UCL Statistics for Data Sets with Non-Detects														
2	User Selected Options																	
3	From File			C:\Documents and Settings\rarmiento\My Documents\Projects\montrose\HRA\RAGS D Tables OU6\0 to 5 ucl.x														
4	Full Precision			OFF														
5	Confidence Coefficient			95%														
6	Number of Bootstrap Operations			2000														
7																		
8																		
9	g-chlordane																	
10																		
11	General Statistics																	
12	Number of Valid Data				228				Number of Detected Data				165					
13	Number of Distinct Detected Data				103				Number of Non-Detect Data				63					
14									Percent Non-Detects				27.63%					
15																		
16	Raw Statistics						Log-transformed Statistics											
17	Minimum Detected			0.00054			Minimum Detected			-7.524								
18	Maximum Detected			0.63			Maximum Detected			-0.462								
19	Mean of Detected			0.0519			Mean of Detected			-4.038								
20	SD of Detected			0.111			SD of Detected			1.376								
21	Minimum Non-Detect			0.0018			Minimum Non-Detect			-6.32								
22	Maximum Non-Detect			0.97			Maximum Non-Detect			-0.0305								
23																		
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect						228					
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected						0					
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage						100.00%					
27																		
28	UCL Statistics																	
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only											
30	Lilliefors Test Statistic			0.321			Lilliefors Test Statistic			0.0818								
31	5% Lilliefors Critical Value			0.069			5% Lilliefors Critical Value			0.069								
32	Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level											
33																		
34	Assuming Normal Distribution						Assuming Lognormal Distribution											
35	DL/2 Substitution Method						DL/2 Substitution Method											
36	Mean			0.0576			Mean			-3.899								
37	SD			0.11			SD			1.417								
38	95% DL/2 (t) UCL			0.0696			95% H-Stat (DL/2) UCL			0.0704								
39																		
40	Maximum Likelihood Estimate(MLE) Method						Log ROS Method											
41	MLE method failed to converge properly						N/A											
42							Mean in Log Scale						-4.235					
43							SD in Log Scale						1.293					
44							Mean in Original Scale						0.0409					
45							SD in Original Scale						0.0959					
46							95% Percentile Bootstrap UCL						0.0523					
47							95% BCA Bootstrap UCL						0.0538					
48	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only											
49	K star (bias corrected)			0.569			Data do not follow a Discernable Distribution (0.05)											
50	Theta Star			0.0912														

	A	B	C	D	E	F	G	H	I	J	K	L				
1				General UCL Statistics for Data Sets with Non-Detects												
2	User Selected Options															
3	From File			C:\Documents and Settings\rsarmiento\My Documents\Projects\montrose\HRA\RAGS D Tables OU6\0 to 5 ucl.x												
4	Full Precision			OFF												
5	Confidence Coefficient			95%												
6	Number of Bootstrap Operations			2000												
7																
8																
9	aldrin															
10																
11	General Statistics															
12	Number of Valid Data				228				Number of Detected Data				9			
13	Number of Distinct Detected Data				9				Number of Non-Detect Data				219			
14									Percent Non-Detects				96.05%			
15																
16	Raw Statistics						Log-transformed Statistics									
17	Minimum Detected			0.00031			Minimum Detected			-8.079						
18	Maximum Detected			0.0021			Maximum Detected			-6.166						
19	Mean of Detected			0.0008156			Mean of Detected			-7.253						
20	SD of Detected			0.0005232			SD of Detected			0.541						
21	Minimum Non-Detect			0.0009			Minimum Non-Detect			-7.013						
22	Maximum Non-Detect			0.97			Maximum Non-Detect			-0.0305						
23																
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect						228			
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected						0			
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage						100.00%			
27																
28	Warning: There are only 9 Detected Values in this data															
29	Note: It should be noted that even though bootstrap may be performed on this data set															
30	the resulting calculations may not be reliable enough to draw conclusions															
31																
32	It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.															
33																
34																
35	UCL Statistics															
36	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only									
37	Shapiro Wilk Test Statistic			0.769			Shapiro Wilk Test Statistic			0.953						
38	5% Shapiro Wilk Critical Value			0.829			5% Shapiro Wilk Critical Value			0.829						
39	Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level									
40																
41	Assuming Normal Distribution						Assuming Lognormal Distribution									
42	DL/2 Substitution Method						DL/2 Substitution Method									
43	Mean			0.0297			Mean			-4.576						
44	SD			0.0658			SD			1.402						
45	95% DL/2 (t) UCL			0.0369			95% H-Stat (DL/2) UCL			0.0362						
46																
47	Maximum Likelihood Estimate(MLE) Method						Log ROS Method									
48	MLE method failed to converge properly						Mean in Log Scale						-7.335			
49							SD in Log Scale						0.368			
50							Mean in Original Scale						0.0006984			

	A	B	C	D	E	F	G	H	I	J	K	L			
1				General UCL Statistics for Full Data Sets											
2	User Selected Options														
3	From File			C:\Documents and Settings\rsarmiento\My Documents\Projects\montrose\HRA\RAGS D Tables OU6\0 to 5 ucl.x											
4	Full Precision			OFF											
5	Confidence Coefficient			95%											
6	Number of Bootstrap Operations			2000											
7															
8															
9	endrin ald														
10															
11	General Statistics														
12	Number of Valid Observations						227			Number of Distinct Observations			56		
13															
14	Raw Statistics						Log-transformed Statistics								
15	Minimum						0.00022			Minimum of Log Data			-8.422		
16	Maximum						1.9			Maximum of Log Data			0.642		
17	Mean						0.117			Mean of log Data			-3.239		
18	Median						0.037			SD of log Data			1.459		
19	SD						0.26								
20	Coefficient of Variation						2.226								
21	Skewness						4.938								
22															
23	Relevant UCL Statistics														
24	Normal Distribution Test						Lognormal Distribution Test								
25	Lilliefors Test Statistic						0.357			Lilliefors Test Statistic			0.113		
26	Lilliefors Critical Value						0.0588			Lilliefors Critical Value			0.0588		
27	Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level								
28															
29	Assuming Normal Distribution						Assuming Lognormal Distribution								
30	95% Student's-t UCL						0.145			95% H-UCL			0.146		
31	95% UCLs (Adjusted for Skewness)									95% Chebyshev (MVUE) UCL			0.179		
32	95% Adjusted-CLT UCL						0.151			97.5% Chebyshev (MVUE) UCL			0.208		
33	95% Modified-t UCL						0.146			99% Chebyshev (MVUE) UCL			0.265		
34															
35	Gamma Distribution Test						Data Distribution								
36	k star (bias corrected)						0.566			Data do not follow a Discernable Distribution (0.05)					
37	Theta Star						0.206								
38	MLE of Mean						0.117								
39	MLE of Standard Deviation						0.155								
40	nu star						256.9								
41	Approximate Chi Square Value (.05)						220.7			Nonparametric Statistics					
42	Adjusted Level of Significance						0.0489			95% CLT UCL			0.145		
43	Adjusted Chi Square Value						220.5			95% Jackknife UCL			0.145		
44										95% Standard Bootstrap UCL			0.145		
45	Anderson-Darling Test Statistic						10.92			95% Bootstrap-t UCL			0.155		
46	Anderson-Darling 5% Critical Value						0.814			95% Hall's Bootstrap UCL			0.155		
47	Kolmogorov-Smirnov Test Statistic						0.227			95% Percentile Bootstrap UCL			0.146		
48	Kolmogorov-Smirnov 5% Critical Value						0.0637			95% BCA Bootstrap UCL			0.151		
49	Data not Gamma Distributed at 5% Significance Level												95% Chebyshev(Mean, Sd) UCL		0.192
50													97.5% Chebyshev(Mean, Sd) UCL		0.225

	A	B	C	D	E	F	G	H	I	J	K	L
51	Assuming Gamma Distribution						99% Chebyshev(Mean, Sd) UCL					0.288
52	95% Approximate Gamma UCL					0.136						
53	95% Adjusted Gamma UCL					0.136						
54												
55	Potential UCL to Use						Use 97.5% Chebyshev (Mean, Sd) UCL					0.225
56												

	A	B	C	D	E	F	G	H	I	J	K	L						
1				General UCL Statistics for Data Sets with Non-Detects														
2	User Selected Options																	
3	From File			C:\Documents and Settings\sarmiento\My Documents\Projects\montrose\HRA\RAGS D Tables OU6\0 to 5 ucl.x														
4	Full Precision			OFF														
5	Confidence Coefficient			95%														
6	Number of Bootstrap Operations			2000														
7																		
8																		
9	1260																	
10																		
11	General Statistics																	
12	Number of Valid Data				135				Number of Detected Data				10					
13	Number of Distinct Detected Data				8				Number of Non-Detect Data				125					
14																		
15																		
16	Raw Statistics						Log-transformed Statistics											
17	Minimum Detected			0.01			Minimum Detected			-4.605								
18	Maximum Detected			0.067			Maximum Detected			-2.703								
19	Mean of Detected			0.0288			Mean of Detected			-3.709								
20	SD of Detected			0.019			SD of Detected			0.578								
21	Minimum Non-Detect			0.033			Minimum Non-Detect			-3.411								
22	Maximum Non-Detect			1.8			Maximum Non-Detect			0.588								
23																		
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect						135					
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected						0					
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage						100.00%					
27																		
28	UCL Statistics																	
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only											
30	Shapiro Wilk Test Statistic			0.765			Shapiro Wilk Test Statistic			0.909								
31	5% Shapiro Wilk Critical Value			0.842			5% Shapiro Wilk Critical Value			0.842								
32	Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level											
33																		
34	Assuming Normal Distribution						Assuming Lognormal Distribution											
35	DL/2 Substitution Method						DL/2 Substitution Method											
36	Mean			0.0908			Mean			-3.314								
37	SD			0.175			SD			1.156								
38	95% DL/2 (t) UCL			0.116			95% H-Stat (DL/2) UCL			0.095								
39																		
40	Maximum Likelihood Estimate(MLE) Method						N/A						Log ROS Method					
41	MLE method failed to converge properly						Mean in Log Scale						-3.909					
42																		
43																		
44																		
45																		
46																		
47																		
48	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only											
49	k star (bias corrected)			2.337			Data appear Gamma Distributed at 5% Significance Level											
50	Theta Star			0.0123														

0 – 16 FEET

	A	B	C	D	E	F	G	H	I	J	K	L								
1				General UCL Statistics for Data Sets with Non-Detects																
2	User Selected Options																			
3	From File			C:\Documents and Settings\rarmiento\My Documents\Projects\montrose\HRA\UCL calcs\0 to 16 ft\0 to 16.xls.w																
4	Full Precision			OFF																
5	Confidence Coefficient			95%																
6	Number of Bootstrap Operations			2000																
7																				
8																				
9	24DDD																			
10																				
11	General Statistics																			
12	Number of Valid Data				493				Number of Detected Data				422							
13	Number of Distinct Detected Data				195				Number of Non-Detect Data				71							
14									Percent Non-Detects				14.40%							
15																				
16	Raw Statistics						Log-transformed Statistics													
17	Minimum Detected			0.00079			Minimum Detected			-7.143										
18	Maximum Detected			18			Maximum Detected			2.89										
19	Mean of Detected			0.43			Mean of Detected			-2.969										
20	SD of Detected			1.412			SD of Detected			2.049										
21	Minimum Non-Detect			0.0036			Minimum Non-Detect			-5.627										
22	Maximum Non-Detect			2			Maximum Non-Detect			0.693										
23																				
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect						471							
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected						22							
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage						95.54%							
27																				
28	UCL Statistics																			
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only													
30	Lilliefors Test Statistic			0.381			Lilliefors Test Statistic			0.0643										
31	5% Lilliefors Critical Value			0.0431			5% Lilliefors Critical Value			0.0431										
32	Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level													
33																				
34	Assuming Normal Distribution						Assuming Lognormal Distribution													
35	DL/2 Substitution Method						DL/2 Substitution Method													
36	Mean			0.38			Mean			-3.062										
37	SD			1.314			SD			1.998										
38	95% DL/2 (t) UCL			0.477			95% H-Stat (DL/2) UCL			0.447										
39																				
40	Maximum Likelihood Estimate(MLE) Method						N/A						Log ROS Method							
41	MLE yields a negative mean												Mean in Log Scale				-3.205			
42													SD in Log Scale				2.026			
43													Mean in Original Scale				0.371			
44													SD in Original Scale				1.315			
45													95% Percentile Bootstrap UCL				0.474			
46													95% BCA Bootstrap UCL				0.508			
47																				
48	Gamma Distribution Test with Detected Values Only												Data Distribution Test with Detected Values Only							
49	k star (bias corrected)			0.32									Data do not follow a Discernable Distribution (0.05)							
50	Theta Star			1.343																

	A	B	C	D	E	F	G	H	I	J	K	L				
1				General UCL Statistics for Data Sets with Non-Detects												
2	User Selected Options															
3	From File			C:\Documents and Settings\rarmiento\My Documents\Projects\montrose\HRA\UCL calcs\0 to 16 ft\0 to 16.xls.w												
4	Full Precision			OFF												
5	Confidence Coefficient			95%												
6	Number of Bootstrap Operations			2000												
7																
8																
9	44DDD															
10																
11	General Statistics															
12	Number of Valid Data				482				Number of Detected Data				468			
13	Number of Distinct Detected Data				226				Number of Non-Detect Data				14			
14									Percent Non-Detects				2.90%			
15																
16	Raw Statistics						Log-transformed Statistics									
17	Minimum Detected			0.00042			Minimum Detected			-7.775						
18	Maximum Detected			55			Maximum Detected			4.007						
19	Mean of Detected			1.138			Mean of Detected			-2.037						
20	SD of Detected			3.958			SD of Detected			2.13						
21	Minimum Non-Detect			0.0041			Minimum Non-Detect			-5.497						
22	Maximum Non-Detect			1			Maximum Non-Detect			0						
23																
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect						402			
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected						80			
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage						83.40%			
27																
28	UCL Statistics															
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only									
30	Lilliefors Test Statistic			0.387			Lilliefors Test Statistic			0.0308						
31	5% Lilliefors Critical Value			0.041			5% Lilliefors Critical Value			0.041						
32	Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level									
33																
34	Assuming Normal Distribution						Assuming Lognormal Distribution									
35	DL/2 Substitution Method						DL/2 Substitution Method									
36	Mean			1.107			Mean			-2.085						
37	SD			3.905			SD			2.13						
38	95% DL/2 (t) UCL			1.4			95% H-Stat (DL/2) UCL			1.626						
39																
40	Maximum Likelihood Estimate(MLE) Method			N/A			Log ROS Method									
41	MLE yields a negative mean						Mean in Log Scale			-2.103						
42							SD in Log Scale			2.14						
43							Mean in Original Scale			1.105						
44							SD in Original Scale			3.905						
45							95% Percentile Bootstrap UCL			1.429						
46							95% BCA Bootstrap UCL			1.509						
47																
48	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only									
49	k star (bias corrected)			0.315			Data appear Lognormal at 5% Significance Level									
50	Theta Star			3.611												

	A	B	C	D	E	F	G	H	I	J	K	L
1				General UCL Statistics for Data Sets with Non-Detects								
2	User Selected Options											
3	From File			C:\Documents and Settings\rarmiento\My Documents\Projects\montrose\HRA\UCL calcs\0 to 16 ft\0 to 16.xls.w								
4	Full Precision			OFF								
5	Confidence Coefficient			95%								
6	Number of Bootstrap Operations			2000								
7												
8												
9	24DDE											
10												
11	General Statistics											
12	Number of Valid Data				487		Number of Detected Data				130	
13	Number of Distinct Detected Data				94		Number of Non-Detect Data				357	
14									Percent Non-Detects		73.31%	
15												
16	Raw Statistics						Log-transformed Statistics					
17	Minimum Detected			0.002			Minimum Detected			-6.215		
18	Maximum Detected			1.3			Maximum Detected			0.262		
19	Mean of Detected			0.144			Mean of Detected			-2.991		
20	SD of Detected			0.223			SD of Detected			1.537		
21	Minimum Non-Detect			0.0034			Minimum Non-Detect			-5.684		
22	Maximum Non-Detect			20			Maximum Non-Detect			2.996		
23												
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect			487		
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected			0		
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage			100.00%		
27												
28	UCL Statistics											
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only					
30	Lilliefors Test Statistic			0.262			Lilliefors Test Statistic			0.0931		
31	5% Lilliefors Critical Value			0.0777			5% Lilliefors Critical Value			0.0777		
32	Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level					
33												
34	Assuming Normal Distribution						Assuming Lognormal Distribution					
35	DL/2 Substitution Method						DL/2 Substitution Method					
36	Mean			0.162			Mean			-3.392		
37	SD			0.672			SD			1.637		
38	95% DL/2 (t) UCL			0.212			95% H-Stat (DL/2) UCL			0.162		
39												
40	Maximum Likelihood Estimate(MLE) Method						N/A			Log ROS Method		
41	MLE method failed to converge properly									Mean in Log Scale		
42										-4.876		
43										SD in Log Scale		
44										1.764		
45										Mean in Original Scale		
46										0.0443		
47										SD in Original Scale		
48										0.13		
49										95% Percentile Bootstrap UCL		
50										0.0544		
51										95% BCA Bootstrap UCL		
52										0.0552		
53												
54	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only					
55	k star (bias corrected)			0.581			Data do not follow a Discernable Distribution (0.05)					
56	Theta Star			0.248								

	A	B	C	D	E	F	G	H	I	J	K	L								
1				General UCL Statistics for Data Sets with Non-Detects																
2	User Selected Options																			
3	From File			C:\Documents and Settings\rsarmento\My Documents\Projects\montrose\HRA\UCL calcs\0 to 16 ft\0 to 16.xls.w																
4	Full Precision			OFF																
5	Confidence Coefficient			95%																
6	Number of Bootstrap Operations			2000																
7																				
8																				
9	44DDE																			
10																				
11	General Statistics																			
12	Number of Valid Data				497				Number of Detected Data				493							
13	Number of Distinct Detected Data				190				Number of Non-Detect Data				4							
14	Percent Non-Detects												0.80%							
15																				
16	Raw Statistics						Log-transformed Statistics													
17	Minimum Detected				0.0003				Minimum Detected				-8.112							
18	Maximum Detected				6.5				Maximum Detected				1.872							
19	Mean of Detected				0.433				Mean of Detected				-2.013							
20	SD of Detected				0.84				SD of Detected				1.668							
21	Minimum Non-Detect				0.0041				Minimum Non-Detect				-5.497							
22	Maximum Non-Detect				0.8				Maximum Non-Detect				-0.223							
23																				
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect						425							
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected						72							
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage						85.51%							
27																				
28	UCL Statistics																			
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only													
30	Lilliefors Test Statistic				0.303				Lilliefors Test Statistic				0.0426							
31	5% Lilliefors Critical Value				0.0399				5% Lilliefors Critical Value				0.0399							
32	Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level													
33																				
34	Assuming Normal Distribution						Assuming Lognormal Distribution													
35	DL/2 Substitution Method						DL/2 Substitution Method													
36	Mean				0.432				Mean				-2.016							
37	SD				0.837				SD				1.673							
38	95% DL/2 (t) UCL				0.494				95% H-Stat (DL/2) UCL				0.664							
39																				
40	Maximum Likelihood Estimate(MLE) Method						N/A						Log ROS Method							
41	MLE yields a negative mean												Mean in Log Scale				-2.023			
42																				
43																				
44																				
45																				
46																				
47																				
48	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only													
49	k star (bias corrected)				0.532				Data do not follow a Discernable Distribution (0.05)											
50	Theta Star				0.814															

	A	B	C	D	E	F	G	H	I	J	K	L						
1				General UCL Statistics for Data Sets with Non-Detects														
2	User Selected Options																	
3	From File			C:\Documents and Settings\rarmiento\My Documents\Projects\montrose\HRA\UCL calcs\0 to 16 ft\0 to 16.xls.w														
4	Full Precision			OFF														
5	Confidence Coefficient			95%														
6	Number of Bootstrap Operations			2000														
7																		
8																		
9	a-chlordane																	
10																		
11	General Statistics																	
12	Number of Valid Data				515				Number of Detected Data				236					
13	Number of Distinct Detected Data				136				Number of Non-Detect Data				279					
14									Percent Non-Detects				54.17%					
15																		
16	Raw Statistics						Log-transformed Statistics											
17	Minimum Detected			0.00036			Minimum Detected			-7.929								
18	Maximum Detected			0.78			Maximum Detected			-0.248								
19	Mean of Detected			0.0535			Mean of Detected			-4.136								
20	SD of Detected			0.107			SD of Detected			1.542								
21	Minimum Non-Detect			0.0018			Minimum Non-Detect			-6.32								
22	Maximum Non-Detect			10			Maximum Non-Detect			2.303								
23																		
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect						515					
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected						0					
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage						100.00%					
27																		
28	UCL Statistics																	
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only											
30	Lilliefors Test Statistic			0.309			Lilliefors Test Statistic			0.0983								
31	5% Lilliefors Critical Value			0.0577			5% Lilliefors Critical Value			0.0577								
32	Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level											
33																		
34	Assuming Normal Distribution						Assuming Lognormal Distribution											
35	DL/2 Substitution Method						DL/2 Substitution Method											
36	Mean			0.105			Mean			-3.653								
37	SD			0.346			SD			1.668								
38	95% DL/2 (t) UCL			0.13			95% H-Stat (DL/2) UCL			0.153								
39																		
40	Maximum Likelihood Estimate(MLE) Method						Log ROS Method											
41	MLE method failed to converge properly						Mean in Log Scale						-4.682					
42							SD in Log Scale						1.416					
43							Mean in Original Scale						0.0301					
44							SD in Original Scale						0.0758					
45							95% Percentile Bootstrap UCL						0.0358					
46							95% BCA Bootstrap UCL						0.0365					
47																		
48	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only											
49	k star (bias corrected)			0.518			Data do not follow a Discernable Distribution (0.05)											
50	Theta Star			0.103														

	A	B	C	D	E	F	G	H	I	J	K	L						
1				General UCL Statistics for Data Sets with Non-Detects														
2	User Selected Options																	
3	From File			C:\Documents and Settings\rsarmiento\My Documents\Projects\montrose\HRA\UCL calcs\0 to 16 ft\0 to 16.xls.w														
4	Full Precision			OFF														
5	Confidence Coefficient			95%														
6	Number of Bootstrap Operations			2000														
7																		
8																		
9	g-chlordane																	
10																		
11	General Statistics																	
12	Number of Valid Data				514				Number of Detected Data				288					
13	Number of Distinct Detected Data				143				Number of Non-Detect Data				226					
14	Number of Missing Values				1				Percent Non-Detects				43.97%					
15																		
16	Raw Statistics						Log-transformed Statistics											
17	Minimum Detected			0.00027			Minimum Detected			-8.217								
18	Maximum Detected			0.63			Maximum Detected			-0.462								
19	Mean of Detected			0.0518			Mean of Detected			-3.999								
20	SD of Detected			0.0965			SD of Detected			1.466								
21	Minimum Non-Detect			0.0018			Minimum Non-Detect			-6.32								
22	Maximum Non-Detect			10			Maximum Non-Detect			2.303								
23																		
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect						514					
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected						0					
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage						100.00%					
27																		
28	UCL Statistics																	
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only											
30	Lilliefors Test Statistic			0.297			Lilliefors Test Statistic			0.0543								
31	5% Lilliefors Critical Value			0.0522			5% Lilliefors Critical Value			0.0522								
32	Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level											
33																		
34	Assuming Normal Distribution						Assuming Lognormal Distribution											
35	DL/2 Substitution Method						DL/2 Substitution Method											
36	Mean			0.0997			Mean			-3.647								
37	SD			0.336			SD			1.621								
38	95% DL/2 (t) UCL			0.124			95% H-Stat (DL/2) UCL			0.183								
39																		
40	Maximum Likelihood Estimate(MLE) Method						Log ROS Method											
41	MLE method failed to converge properly						Mean in Log Scale						-4.39					
42							SD in Log Scale						1.374					
43							Mean in Original Scale						0.0346					
44							SD in Original Scale						0.0754					
45							95% Percentile Bootstrap UCL						0.0401					
46							95% BCA Bootstrap UCL						0.0411					
47																		
48	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only											
49	k star (bias corrected)			0.591			Data do not follow a Discernable Distribution (0.05)											
50	Theta Star			0.0876														

	A	B	C	D	E	F	G	H	I	J	K	L						
1				General UCL Statistics for Data Sets with Non-Detects														
2	User Selected Options																	
3	From File			C:\Documents and Settings\sarmiento\My Documents\Projects\montrose\HRA\UCL calcs\0 to 16 ft\0 to 16.xls.w														
4	Full Precision			OFF														
5	Confidence Coefficient			95%														
6	Number of Bootstrap Operations			2000														
7																		
8																		
9	e sulfate																	
10																		
11	General Statistics																	
12	Number of Valid Data				497				Number of Detected Data				9					
13	Number of Distinct Detected Data				9				Number of Non-Detect Data				488					
14									Percent Non-Detects				98.19%					
15																		
16	Raw Statistics						Log-transformed Statistics											
17	Minimum Detected			0.00084			Minimum Detected			-7.082								
18	Maximum Detected			0.024			Maximum Detected			-3.73								
19	Mean of Detected			0.01			Mean of Detected			-5.088								
20	SD of Detected			0.00878			SD of Detected			1.174								
21	Minimum Non-Detect			0.0031			Minimum Non-Detect			-5.776								
22	Maximum Non-Detect			20			Maximum Non-Detect			2.996								
23																		
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect						497					
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected						0					
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage						100.00%					
27																		
28	Warning: There are only 9 Detected Values in this data																	
29	Note: It should be noted that even though bootstrap may be performed on this data set																	
30	the resulting calculations may not be reliable enough to draw conclusions																	
31																		
32	It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.																	
33																		
34																		
35	UCL Statistics																	
36	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only											
37	Shapiro Wilk Test Statistic			0.881			Shapiro Wilk Test Statistic			0.936								
38	5% Shapiro Wilk Critical Value			0.829			5% Shapiro Wilk Critical Value			0.829								
39	Data appear Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level											
40																		
41	Assuming Normal Distribution						Assuming Lognormal Distribution											
42	DL/2 Substitution Method						DL/2 Substitution Method											
43	Mean			0.173			Mean			-3.394								
44	SD			0.695			SD			1.657								
45	95% DL/2 (t) UCL			0.224			95% H-Stat (DL/2) UCL			0.168								
46																		
47	Maximum Likelihood Estimate(MLE) Method						Log ROS Method											
48	MLE method failed to converge properly						Mean in Log Scale						-6.369					
49							SD in Log Scale						0.768					
50							Mean in Original Scale						0.00233					

	A	B	C	D	E	F	G	H	I	J	K	L	
51											SD in Original Scale	0.00226	
52											95% Percentile Bootstrap UCL	0.0025	
53											95% BCA Bootstrap UCL	0.00252	
54													
55	Gamma Distribution Test with Detected Values Only					Data Distribution Test with Detected Values Only							
56					k star (bias corrected)	0.851	Data appear Normal at 5% Significance Level						
57					Theta Star	0.0118							
58					nu star	15.32							
59													
60					A-D Test Statistic	0.264	Nonparametric Statistics						
61					5% A-D Critical Value	0.74	Kaplan-Meier (KM) Method						
62					K-S Test Statistic	0.74					Mean	0.00251	
63					5% K-S Critical Value	0.286					SD	0.0032	
64	Data appear Gamma Distributed at 5% Significance Level											SE of Mean	0.0005071
65												95% KM (t) UCL	0.00335
66	Assuming Gamma Distribution											95% KM (z) UCL	0.00335
67	Gamma ROS Statistics using Extrapolated Data											95% KM (jackknife) UCL	0.00354
68					Minimum	1E-09						95% KM (bootstrap t) UCL	0.00366
69					Maximum	0.024						95% KM (BCA) UCL	0.00598
70					Mean	0.00783						95% KM (Percentile Bootstrap) UCL	0.00587
71					Median	0.00784						95% KM (Chebyshev) UCL	0.00472
72					SD	0.00489						97.5% KM (Chebyshev) UCL	0.00568
73					k star	0.494						99% KM (Chebyshev) UCL	0.00756
74					Theta star	0.0159							
75					Nu star	491	Potential UCLs to Use						
76					AppChi2	440.6						95% KM (t) UCL	0.00335
77					95% Gamma Approximate UCL	0.00873						95% KM (Percentile Bootstrap) UCL	0.00587
78					95% Adjusted Gamma UCL	0.00873							
79	Note: DL/2 is not a recommended method.												
80													

	A	B	C	D	E	F	G	H	I	J	K	L								
1				General UCL Statistics for Data Sets with Non-Detects																
2	User Selected Options																			
3	From File			C:\Documents and Settings\r\sarmiento\My Documents\Projects\montrose\HRA\UCL calcs\0 to 16 ft\0 to 16.xls.w																
4	Full Precision			OFF																
5	Confidence Coefficient			95%																
6	Number of Bootstrap Operations			2000																
7																				
8																				
9	24DDT																			
10																				
11	General Statistics																			
12	Number of Valid Data				467				Number of Detected Data				380							
13	Number of Distinct Detected Data				184				Number of Non-Detect Data				87							
14									Percent Non-Detects				18.63%							
15																				
16	Raw Statistics						Log-transformed Statistics													
17	Minimum Detected			0.0016			Minimum Detected			-6.438										
18	Maximum Detected			34			Maximum Detected			3.526										
19	Mean of Detected			0.661			Mean of Detected			-2.425										
20	SD of Detected			2.439			SD of Detected			1.941										
21	Minimum Non-Detect			0.0035			Minimum Non-Detect			-5.655										
22	Maximum Non-Detect			1			Maximum Non-Detect			0										
23																				
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect						415							
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected						52							
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage						88.87%							
27																				
28	UCL Statistics																			
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only													
30	Lilliefors Test Statistic			0.393			Lilliefors Test Statistic			0.0469										
31	5% Lilliefors Critical Value			0.0455			5% Lilliefors Critical Value			0.0455										
32	Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level													
33																				
34	Assuming Normal Distribution						Assuming Lognormal Distribution													
35	DL/2 Substitution Method						DL/2 Substitution Method													
36	Mean			0.55			Mean			-2.67										
37	SD			2.212			SD			1.931										
38	95% DL/2 (t) UCL			0.719			95% H-Stat (DL/2) UCL			0.506										
39																				
40	Maximum Likelihood Estimate(MLE) Method						N/A						Log ROS Method							
41	MLE yields a negative mean												Mean in Log Scale				-2.824			
42													SD in Log Scale				2.008			
43													Mean in Original Scale				0.542			
44													SD in Original Scale				2.214			
45													95% Percentile Bootstrap UCL				0.729			
46													95% BCA Bootstrap UCL				0.777			
47																				
48	Gamma Distribution Test with Detected Values Only												Data Distribution Test with Detected Values Only							
49	k star (bias corrected)			0.336			Data do not follow a Discernable Distribution (0.05)													
50	Theta Star			1.971																

	A	B	C	D	E	F	G	H	I	J	K	L												
1				General UCL Statistics for Data Sets with Non-Detects																				
2	User Selected Options																							
3	From File			C:\Documents and Settings\sarmiento\My Documents\Projects\montrose\HRA\UCL calcs\0 to 16 ft\0 to 16.xls.w																				
4	Full Precision			OFF																				
5	Confidence Coefficient			95%																				
6	Number of Bootstrap Operations			2000																				
7																								
8																								
9	44DDT																							
10																								
11	General Statistics																							
12	Number of Valid Data				488				Number of Detected Data				485											
13	Number of Distinct Detected Data				220				Number of Non-Detect Data				3											
14									Percent Non-Detects				0.61%											
15																								
16	Raw Statistics						Log-transformed Statistics																	
17	Minimum Detected			0.00065			Minimum Detected			-7.339														
18	Maximum Detected			170			Maximum Detected			5.136														
19	Mean of Detected			3.089			Mean of Detected			-1.114														
20	SD of Detected			11.56			SD of Detected			2.17														
21	Minimum Non-Detect			0.037			Minimum Non-Detect			-3.297														
22	Maximum Non-Detect			0.8			Maximum Non-Detect			-0.223														
23																								
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect						326											
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected						162											
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage						66.80%											
27																								
28	UCL Statistics																							
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only																	
30	Lilliefors Test Statistic			0.395			Lilliefors Test Statistic			0.0496														
31	5% Lilliefors Critical Value			0.0402			5% Lilliefors Critical Value			0.0402														
32	Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level																	
33																								
34	Assuming Normal Distribution						Assuming Lognormal Distribution																	
35	DL/2 Substitution Method						DL/2 Substitution Method																	
36	Mean			3.072			Mean			-1.121														
37	SD			11.52			SD			2.168														
38	95% DL/2 (t) UCL			3.931			95% H-Stat (DL/2) UCL			4.704														
39																								
40	Maximum Likelihood Estimate(MLE) Method						N/A						Log ROS Method											
41	MLE yields a negative mean												Mean in Log Scale						-1.125					
42													SD in Log Scale						2.17					
43													Mean in Original Scale						3.071					
44													SD in Original Scale						11.52					
45													95% Percentile Bootstrap UCL						3.99					
46													95% BCA Bootstrap UCL						4.146					
47																								
48	Gamma Distribution Test with Detected Values Only												Data Distribution Test with Detected Values Only											
49	k star (bias corrected)			0.306			Data do not follow a Discernable Distribution (0.05)																	
50	Theta Star			10.1																				

	A	B	C	D	E	F	G	H	I	J	K	L						
1				General UCL Statistics for Data Sets with Non-Detects														
2	User Selected Options																	
3	From File			C:\Documents and Settings\rarmiento\My Documents\Projects\montrose\HRA\UCL calcs\0 to 16 ft\0 to 16.xls.w														
4	Full Precision			OFF														
5	Confidence Coefficient			95%														
6	Number of Bootstrap Operations			2000														
7																		
8																		
9	b-BHC																	
10																		
11	General Statistics																	
12	Number of Valid Data				515				Number of Detected Data				15					
13	Number of Distinct Detected Data				14				Number of Non-Detect Data				500					
14									Percent Non-Detects				97.09%					
15																		
16	Raw Statistics						Log-transformed Statistics											
17	Minimum Detected			0.00077			Minimum Detected			-7.169								
18	Maximum Detected			0.45			Maximum Detected			-0.799								
19	Mean of Detected			0.037			Mean of Detected			-5.031								
20	SD of Detected			0.115			SD of Detected			1.536								
21	Minimum Non-Detect			0.0017			Minimum Non-Detect			-6.377								
22	Maximum Non-Detect			10			Maximum Non-Detect			2.303								
23																		
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect						515					
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected						0					
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage						100.00%					
27																		
28	UCL Statistics																	
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only											
30	Shapiro Wilk Test Statistic			0.331			Shapiro Wilk Test Statistic			0.871								
31	5% Shapiro Wilk Critical Value			0.881			5% Shapiro Wilk Critical Value			0.881								
32	Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level											
33																		
34	Assuming Normal Distribution						Assuming Lognormal Distribution											
35	DL/2 Substitution Method						DL/2 Substitution Method											
36	Mean			0.0852			Mean			-4.039								
37	SD			0.341			SD			1.648								
38	95% DL/2 (t) UCL			0.11			95% H-Stat (DL/2) UCL			0.087								
39																		
40	Maximum Likelihood Estimate(MLE) Method						Log ROS Method											
41	MLE method failed to converge properly						Mean in Log Scale			-6.95								
42							SD in Log Scale			1.079								
43							Mean in Original Scale			0.00251								
44							SD in Original Scale			0.0199								
45							95% Percentile Bootstrap UCL			0.00424								
46							95% BCA Bootstrap UCL			0.006								
47																		
48	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only											
49	k star (bias corrected)			0.35			Data do not follow a Discernable Distribution (0.05)											
50	Theta Star			0.106														

	A	B	C	D	E	F	G	H	I	J	K	L												
1				General UCL Statistics for Data Sets with Non-Detects																				
2	User Selected Options																							
3	From File			C:\Documents and Settings\rnsarmiento\My Documents\Projects\montrose\HRA\UCL calcs\0 to 16 ft\0 to 16.xls.w																				
4	Full Precision			OFF																				
5	Confidence Coefficient			95%																				
6	Number of Bootstrap Operations			2000																				
7																								
8																								
9	dieldrin																							
10																								
11	General Statistics																							
12	Number of Valid Data				512				Number of Detected Data				183											
13	Number of Distinct Detected Data				93				Number of Non-Detect Data				329											
14	Number of Missing Values				3				Percent Non-Detects				64.26%											
15																								
16	Raw Statistics						Log-transformed Statistics																	
17	Minimum Detected				0.00088				Minimum Detected				-7.036											
18	Maximum Detected				1.8				Maximum Detected				0.588											
19	Mean of Detected				0.0328				Mean of Detected				-4.658											
20	SD of Detected				0.187				SD of Detected				1.013											
21	Minimum Non-Detect				0.0035				Minimum Non-Detect				-5.655											
22	Maximum Non-Detect				20				Maximum Non-Detect				2.996											
23																								
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect						512											
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected						0											
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage						100.00%											
27																								
28	UCL Statistics																							
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only																	
30	Lilliefors Test Statistic				0.45				Lilliefors Test Statistic				0.0938											
31	5% Lilliefors Critical Value				0.0655				5% Lilliefors Critical Value				0.0655											
32	Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level																	
33																								
34	Assuming Normal Distribution						Assuming Lognormal Distribution																	
35	DL/2 Substitution Method						DL/2 Substitution Method																	
36	Mean				0.178				Mean				-3.445											
37	SD				0.693				SD				1.745											
38	95% DL/2 (t) UCL				0.229				95% H-Stat (DL/2) UCL				0.258											
39																								
40	Maximum Likelihood Estimate(MLE) Method						N/A						Log ROS Method											
41	MLE method failed to converge properly												Mean in Log Scale						-4.905					
42																								
43																								
44																								
45																								
46																								
47																								
48	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only																	
49	k star (bias corrected)				0.505				Data do not follow a Discernable Distribution (0.05)															
50	Theta Star				0.065																			

	A	B	C	D	E	F	G	H	I	J	K	L						
1				General UCL Statistics for Data Sets with Non-Detects														
2	User Selected Options																	
3	From File			C:\Documents and Settings\rsarmiento\My Documents\Projects\montrose\HRA\UCL calcs\0 to 16 ft\0 to 16.xls.w														
4	Full Precision			OFF														
5	Confidence Coefficient			95%														
6	Number of Bootstrap Operations			2000														
7																		
8																		
9	aldrin																	
10																		
11	General Statistics																	
12	Number of Valid Data				515				Number of Detected Data				16					
13	Number of Distinct Detected Data				16				Number of Non-Detect Data				499					
14									Percent Non-Detects				96.89%					
15																		
16	Raw Statistics						Log-transformed Statistics											
17	Minimum Detected			0.00031			Minimum Detected			-8.079								
18	Maximum Detected			0.058			Maximum Detected			-2.847								
19	Mean of Detected			0.0074			Mean of Detected			-6.553								
20	SD of Detected			0.0177			SD of Detected			1.485								
21	Minimum Non-Detect			0.0017			Minimum Non-Detect			-6.377								
22	Maximum Non-Detect			10			Maximum Non-Detect			2.303								
23																		
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect						515					
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected						0					
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage						100.00%					
27																		
28	UCL Statistics																	
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only											
30	Shapiro Wilk Test Statistic			0.434			Shapiro Wilk Test Statistic			0.713								
31	5% Shapiro Wilk Critical Value			0.887			5% Shapiro Wilk Critical Value			0.887								
32	Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level											
33																		
34	Assuming Normal Distribution						Assuming Lognormal Distribution											
35	DL/2 Substitution Method						DL/2 Substitution Method											
36	Mean			0.0865			Mean			-4.043								
37	SD			0.343			SD			1.678								
38	95% DL/2 (t) UCL			0.111			95% H-Stat (DL/2) UCL			0.0934								
39																		
40	Maximum Likelihood Estimate(MLE) Method						Log ROS Method											
41	MLE method failed to converge properly						Mean in Log Scale						-6.991					
42							SD in Log Scale						0.811					
43							Mean in Original Scale						0.00141					
44							SD in Original Scale						0.00336					
45							95% Percentile Bootstrap UCL						0.00166					
46							95% BCA Bootstrap UCL						0.00185					
47																		
48	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only											
49	k star (bias corrected)			0.366			Data do not follow a Discernable Distribution (0.05)											
50	Theta Star			0.0202														

	A	B	C	D	E	F	G	H	I	J	K	L						
1				General UCL Statistics for Full Data Sets														
2	User Selected Options																	
3	From File			C:\Documents and Settings\rarmiento\My Documents\Projects\montrose\HRA\UCL calcs\0 to 16 ft\0 to 16.xls.w														
4	Full Precision			OFF														
5	Confidence Coefficient			95%														
6	Number of Bootstrap Operations			2000														
7																		
8																		
9	heptaclor																	
10																		
11	General Statistics																	
12	Number of Valid Observations				515				Number of Distinct Observations				128					
13																		
14	Raw Statistics						Log-transformed Statistics											
15				Minimum			0.00039						Minimum of Log Data			-7.849		
16				Maximum			10						Maximum of Log Data			2.303		
17				Mean			0.172						Mean of log Data			-3.48		
18				Median			0.033						SD of log Data			1.785		
19				SD			0.686											
20				Coefficient of Variation			3.994											
21				Skewness			10.92											
22																		
23	Relevant UCL Statistics																	
24	Normal Distribution Test						Lognormal Distribution Test											
25				Lilliefors Test Statistic			0.401						Lilliefors Test Statistic			0.0869		
26				Lilliefors Critical Value			0.039						Lilliefors Critical Value			0.039		
27	Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level											
28																		
29	Assuming Normal Distribution						Assuming Lognormal Distribution											
30				95% Student's-t UCL			0.221						95% H-UCL			0.19		
31	95% UCLs (Adjusted for Skewness)						95% Chebyshev (MVUE) UCL						0.232					
32				95% Adjusted-CLT UCL			0.237						97.5% Chebyshev (MVUE) UCL			0.268		
33				95% Modified-t UCL			0.224						99% Chebyshev (MVUE) UCL			0.337		
34																		
35	Gamma Distribution Test						Data Distribution											
36				k star (bias corrected)			0.384						Data do not follow a Discernable Distribution (0.05)					
37				Theta Star			0.446											
38				MLE of Mean			0.172											
39				MLE of Standard Deviation			0.277											
40				nu star			396											
41				Approximate Chi Square Value (.05)			350.9						Nonparametric Statistics					
42				Adjusted Level of Significance			0.0495						95% CLT UCL			0.221		
43				Adjusted Chi Square Value			350.8						95% Jackknife UCL			0.221		
44													95% Standard Bootstrap UCL			0.22		
45				Anderson-Darling Test Statistic			26.61						95% Bootstrap-t UCL			0.264		
46				Anderson-Darling 5% Critical Value			0.851						95% Hall's Bootstrap UCL			0.324		
47				Kolmogorov-Smirnov Test Statistic			0.213						95% Percentile Bootstrap UCL			0.226		
48				Kolmogorov-Smirnov 5% Critical Value			0.0431						95% BCA Bootstrap UCL			0.241		
49	Data not Gamma Distributed at 5% Significance Level						95% Chebyshev(Mean, Sd) UCL						0.303					
50							97.5% Chebyshev(Mean, Sd) UCL						0.36					

	A	B	C	D	E	F	G	H	I	J	K	L
51	Assuming Gamma Distribution						99% Chebyshev(Mean, Sd) UCL					0.472
52	95% Approximate Gamma UCL					0.194						
53	95% Adjusted Gamma UCL					0.194						
54												
55	Potential UCL to Use						Use 97.5% Chebyshev (Mean, Sd) UCL					0.36
56												

	A	B	C	D	E	F	G	H	I	J	K	L				
1				General UCL Statistics for Data Sets with Non-Detects												
2	User Selected Options															
3	From File			C:\Documents and Settings\rarmiento\My Documents\Projects\montrose\HRA\UCL calcs\0 to 16 ft\0 to 16.xls.w												
4	Full Precision			OFF												
5	Confidence Coefficient			95%												
6	Number of Bootstrap Operations			2000												
7																
8																
9	heptachlor epox															
10																
11	General Statistics															
12	Number of Valid Data				513				Number of Detected Data				110			
13	Number of Distinct Detected Data				72				Number of Non-Detect Data				403			
14	Number of Missing Values				1				Percent Non-Detects				78.56%			
15																
16	Raw Statistics						Log-transformed Statistics									
17	Minimum Detected			0.00046			Minimum Detected			-7.684						
18	Maximum Detected			0.12			Maximum Detected			-2.12						
19	Mean of Detected			0.0108			Mean of Detected			-5.156						
20	SD of Detected			0.018			SD of Detected			1.059						
21	Minimum Non-Detect			0.0017			Minimum Non-Detect			-6.377						
22	Maximum Non-Detect			10			Maximum Non-Detect			2.303						
23																
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect						513			
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected						0			
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage						100.00%			
27																
28	UCL Statistics															
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only									
30	Lilliefors Test Statistic			0.283			Lilliefors Test Statistic			0.0922						
31	5% Lilliefors Critical Value			0.0845			5% Lilliefors Critical Value			0.0845						
32	Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level									
33																
34	Assuming Normal Distribution						Assuming Lognormal Distribution									
35	DL/2 Substitution Method						DL/2 Substitution Method									
36	Mean			0.0861			Mean			-4.078						
37	SD			0.343			SD			1.683						
38	95% DL/2 (t) UCL			0.111			95% H-Stat (DL/2) UCL			0.102						
39																
40	Maximum Likelihood Estimate(MLE) Method						Log ROS Method									
41	MLE method failed to converge properly						Mean in Log Scale			-5.797						
42							SD in Log Scale			0.94						
43							Mean in Original Scale			0.0051						
44							SD in Original Scale			0.00924						
45							95% Percentile Bootstrap UCL			0.00579						
46							95% BCA Bootstrap UCL			0.00598						
47																
48	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only									
49	k star (bias corrected)			0.911			Data do not follow a Discernable Distribution (0.05)									
50	Theta Star			0.0118												

	A	B	C	D	E	F	G	H	I	J	K	L						
1				General UCL Statistics for Data Sets with Non-Detects														
2	User Selected Options																	
3	From File			C:\Documents and Settings\rarmiento\My Documents\Projects\montrose\HRA\UCL calcs\0 to 16 ft\0 to 16.xls.w														
4	Full Precision			OFF														
5	Confidence Coefficient			95%														
6	Number of Bootstrap Operations			2000														
7																		
8																		
9	1254																	
10																		
11	General Statistics																	
12	Number of Valid Data				285				Number of Detected Data				10					
13	Number of Distinct Detected Data				10				Number of Non-Detect Data				275					
14									Percent Non-Detects				96.49%					
15																		
16	Raw Statistics						Log-transformed Statistics											
17	Minimum Detected			0.079			Minimum Detected			-2.538								
18	Maximum Detected			5.2			Maximum Detected			1.649								
19	Mean of Detected			1.442			Mean of Detected			-0.294								
20	SD of Detected			1.635			SD of Detected			1.315								
21	Minimum Non-Detect			0.033			Minimum Non-Detect			-3.411								
22	Maximum Non-Detect			7.6			Maximum Non-Detect			2.028								
23																		
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect						285					
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected						0					
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage						100.00%					
27																		
28	UCL Statistics																	
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only											
30	Shapiro Wilk Test Statistic			0.807			Shapiro Wilk Test Statistic			0.974								
31	5% Shapiro Wilk Critical Value			0.842			5% Shapiro Wilk Critical Value			0.842								
32	Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level											
33																		
34	Assuming Normal Distribution						Assuming Lognormal Distribution											
35	DL/2 Substitution Method						DL/2 Substitution Method											
36	Mean			0.222			Mean			-2.837								
37	SD			0.525			SD			1.513								
38	95% DL/2 (t) UCL			0.274			95% H-Stat (DL/2) UCL			0.227								
39																		
40	Maximum Likelihood Estimate(MLE) Method						Log ROS Method											
41	MLE method failed to converge properly						Mean in Log Scale						-7.693					
42							SD in Log Scale						2.877					
43							Mean in Original Scale						0.0542					
44							SD in Original Scale						0.394					
45							95% Percentile Bootstrap UCL						0.0962					
46							95% BCA Bootstrap UCL						0.111					
47																		
48	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only											
49	k star (bias corrected)			0.688			Data appear Gamma Distributed at 5% Significance Level											
50	Theta Star			2.096														

	A	B	C	D	E	F	G	H	I	J	K	L	
51					nu star	13.76							
52													
53					A-D Test Statistic	0.237	Nonparametric Statistics						
54					5% A-D Critical Value	0.752	Kaplan-Meier (KM) Method						
55					K-S Test Statistic	0.752	Mean					0.129	
56					5% K-S Critical Value	0.275	SD					0.387	
57	Data appear Gamma Distributed at 5% Significance Level							SE of Mean					0.0243
58							95% KM (t) UCL					0.169	
59	Assuming Gamma Distribution							95% KM (z) UCL					0.169
60	Gamma ROS Statistics using Extrapolated Data							95% KM (jackknife) UCL					0.215
61					Minimum	0.079	95% KM (bootstrap t) UCL					0.194	
62					Maximum	5.2	95% KM (BCA) UCL					0.56	
63					Mean	2.165	95% KM (Percentile Bootstrap) UCL					0.339	
64					Median	2.059	95% KM (Chebyshev) UCL					0.235	
65					SD	1.275	97.5% KM (Chebyshev) UCL					0.281	
66					k star	2.321	99% KM (Chebyshev) UCL					0.371	
67					Theta star	0.933							
68					Nu star	1323	Potential UCLs to Use						
69					AppChi2	1240	95% KM (t) UCL					0.169	
70					95% Gamma Approximate UCL	2.31							
71					95% Adjusted Gamma UCL	2.311							
72	Note: DL/2 is not a recommended method.												
73													

	A	B	C	D	E	F	G	H	I	J	K	L												
1				General UCL Statistics for Data Sets with Non-Detects																				
2	User Selected Options																							
3	From File			C:\Documents and Settings\sarmiento\My Documents\Projects\montrose\HRA\UCL calcs\0 to 16 ft\0 to 16.xls.w																				
4	Full Precision			OFF																				
5	Confidence Coefficient			95%																				
6	Number of Bootstrap Operations			2000																				
7																								
8																								
9	1260																							
10																								
11	General Statistics																							
12	Number of Valid Data				285				Number of Detected Data				17											
13	Number of Distinct Detected Data				15				Number of Non-Detect Data				268											
14									Percent Non-Detects				94.04%											
15																								
16	Raw Statistics						Log-transformed Statistics																	
17	Minimum Detected			0.01			Minimum Detected			-4.605														
18	Maximum Detected			0.59			Maximum Detected			-0.528														
19	Mean of Detected			0.0609			Mean of Detected			-3.525														
20	SD of Detected			0.137			SD of Detected			0.917														
21	Minimum Non-Detect			0.033			Minimum Non-Detect			-3.411														
22	Maximum Non-Detect			7.6			Maximum Non-Detect			2.028														
23																								
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect						285											
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected						0											
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage						100.00%											
27																								
28	UCL Statistics																							
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only																	
30	Shapiro Wilk Test Statistic			0.352			Shapiro Wilk Test Statistic			0.762														
31	5% Shapiro Wilk Critical Value			0.892			5% Shapiro Wilk Critical Value			0.892														
32	Data not Normal at 5% Significance Level						Data not Lognormal at 5% Significance Level																	
33																								
34	Assuming Normal Distribution						Assuming Lognormal Distribution																	
35	DL/2 Substitution Method						DL/2 Substitution Method																	
36	Mean			0.18			Mean			-2.886														
37	SD			0.371			SD			1.436														
38	95% DL/2 (t) UCL			0.216			95% H-Stat (DL/2) UCL			0.209														
39																								
40	Maximum Likelihood Estimate(MLE) Method						N/A						Log ROS Method											
41	MLE method failed to converge properly												Mean in Log Scale						-3.845					
42													SD in Log Scale						0.506					
43													Mean in Original Scale						0.0255					
44													SD in Original Scale						0.0354					
45													95% Percentile Bootstrap UCL						0.0296					
46													95% BCA Bootstrap UCL						0.0314					
47																								
48	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only																	
49	k star (bias corrected)			0.71			Data do not follow a Discernable Distribution (0.05)																	
50	Theta Star			0.0858																				

	A	B	C	D	E	F	G	H	I	J	K	L						
1				General UCL Statistics for Data Sets with Non-Detects														
2	User Selected Options																	
3	From File			C:\Documents and Settings\rarmiento\My Documents\Projects\montrose\HRA\UCL calcs\0 to 16 ft\0 to 16.xls.w														
4	Full Precision			OFF														
5	Confidence Coefficient			95%														
6	Number of Bootstrap Operations			2000														
7																		
8																		
9	end aid																	
10																		
11	General Statistics																	
12	Number of Valid Data				497				Number of Detected Data				19					
13	Number of Distinct Detected Data				17				Number of Non-Detect Data				478					
14									Percent Non-Detects				96.18%					
15																		
16	Raw Statistics						Log-transformed Statistics											
17	Minimum Detected				0.00022				Minimum Detected				-8.422					
18	Maximum Detected				0.075				Maximum Detected				-2.59					
19	Mean of Detected				0.0114				Mean of Detected				-5.502					
20	SD of Detected				0.0186				SD of Detected				1.504					
21	Minimum Non-Detect				0.0034				Minimum Non-Detect				-5.684					
22	Maximum Non-Detect				20				Maximum Non-Detect				2.996					
23																		
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect						497					
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected						0					
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage						100.00%					
27																		
28	UCL Statistics																	
29	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only											
30	Shapiro Wilk Test Statistic				0.621				Shapiro Wilk Test Statistic				0.976					
31	5% Shapiro Wilk Critical Value				0.901				5% Shapiro Wilk Critical Value				0.901					
32	Data not Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level											
33																		
34	Assuming Normal Distribution						Assuming Lognormal Distribution											
35	DL/2 Substitution Method						DL/2 Substitution Method											
36	Mean				0.173				Mean				-3.418					
37	SD				0.695				SD				1.694					
38	95% DL/2 (t) UCL				0.224				95% H-Stat (DL/2) UCL				0.184					
39																		
40	Maximum Likelihood Estimate(MLE) Method						N/A						Log ROS Method					
41	MLE method failed to converge properly						Mean in Log Scale						-6.446					
42							SD in Log Scale						0.918					
43							Mean in Original Scale						0.00255					
44							SD in Original Scale						0.00442					
45							95% Percentile Bootstrap UCL						0.00292					
46							95% BCA Bootstrap UCL						0.00302					
47																		
48	Gamma Distribution Test with Detected Values Only						Data Distribution Test with Detected Values Only											
49	k star (bias corrected)				0.543				Data appear Gamma Distributed at 5% Significance Level									
50	Theta Star				0.0209													

	A	B	C	D	E	F	G	H	I	J	K	L						
1				General UCL Statistics for Data Sets with Non-Detects														
2	User Selected Options																	
3	From File			C:\Documents and Settings\rarmiento\My Documents\Projects\montrose\HRA\UCL calcs\0 to 16 ft\0 to 16.xls.w														
4	Full Precision			OFF														
5	Confidence Coefficient			95%														
6	Number of Bootstrap Operations			2000														
7																		
8																		
9	a-endosulfan																	
10																		
11	General Statistics																	
12	Number of Valid Data				497				Number of Detected Data				6					
13	Number of Distinct Detected Data				5				Number of Non-Detect Data				491					
14									Percent Non-Detects				98.79%					
15																		
16	Raw Statistics						Log-transformed Statistics											
17	Minimum Detected			0.0011			Minimum Detected			-6.812								
18	Maximum Detected			0.0076			Maximum Detected			-4.88								
19	Mean of Detected			0.00367			Mean of Detected			-5.866								
20	SD of Detected			0.0026			SD of Detected			0.828								
21	Minimum Non-Detect			0.0017			Minimum Non-Detect			-6.377								
22	Maximum Non-Detect			10			Maximum Non-Detect			2.303								
23																		
24	Note: Data have multiple DLs - Use of KM Method is recommended						Number treated as Non-Detect						497					
25	For all methods (except KM, DL/2, and ROS Methods),						Number treated as Detected						0					
26	Observations < Largest ND are treated as NDs						Single DL Non-Detect Percentage						100.00%					
27																		
28	Warning: There are only 6 Detected Values in this data																	
29	Note: It should be noted that even though bootstrap may be performed on this data set																	
30	the resulting calculations may not be reliable enough to draw conclusions																	
31																		
32	It is recommended to have 10-15 or more distinct observations for accurate and meaningful results.																	
33																		
34																		
35	UCL Statistics																	
36	Normal Distribution Test with Detected Values Only						Lognormal Distribution Test with Detected Values Only											
37	Shapiro Wilk Test Statistic			0.9			Shapiro Wilk Test Statistic			0.88								
38	5% Shapiro Wilk Critical Value			0.788			5% Shapiro Wilk Critical Value			0.788								
39	Data appear Normal at 5% Significance Level						Data appear Lognormal at 5% Significance Level											
40																		
41	Assuming Normal Distribution						Assuming Lognormal Distribution											
42	DL/2 Substitution Method						DL/2 Substitution Method											
43	Mean			0.0864			Mean			-4.089								
44	SD			0.349			SD			1.654								
45	95% DL/2 (t) UCL			0.112			95% H-Stat (DL/2) UCL			0.0817								
46																		
47	Maximum Likelihood Estimate(MLE) Method						Log ROS Method											
48	MLE method failed to converge properly						Mean in Log Scale						-6.742					
49							SD in Log Scale						0.533					
50							Mean in Original Scale						0.00136					

	A	B	C	D	E	F	G	H	I	J	K	L	
51											SD in Original Scale	0.0007969	
52											95% Percentile Bootstrap UCL	0.00142	
53											95% BCA Bootstrap UCL	0.00143	
54													
55	Gamma Distribution Test with Detected Values Only					Data Distribution Test with Detected Values Only							
56					k star (bias corrected)	1.157						Data appear Normal at 5% Significance Level	
57					Theta Star	0.00317							
58					nu star	13.88							
59													
60					A-D Test Statistic	0.398						Nonparametric Statistics	
61					5% A-D Critical Value	0.704						Kaplan-Meier (KM) Method	
62					K-S Test Statistic	0.704						Mean	0.00134
63					5% K-S Critical Value	0.336						SD	0.00101
64	Data appear Gamma Distributed at 5% Significance Level										SE of Mean	0.0001362	
65												95% KM (t) UCL	0.00157
66	Assuming Gamma Distribution										95% KM (z) UCL	0.00157	
67	Gamma ROS Statistics using Extrapolated Data										95% KM (jackknife) UCL	0.00155	
68					Minimum	0.0004664						95% KM (bootstrap t) UCL	0.00162
69					Maximum	0.0076						95% KM (BCA) UCL	0.00492
70					Mean	0.00288						95% KM (Percentile Bootstrap) UCL	0.00259
71					Median	0.0028						95% KM (Chebyshev) UCL	0.00194
72					SD	0.00133						97.5% KM (Chebyshev) UCL	0.00219
73					k star	3.919						99% KM (Chebyshev) UCL	0.0027
74					Theta star	0.000735							
75					Nu star	3896						Potential UCLs to Use	
76					AppChi2	3752						95% KM (t) UCL	0.00157
77					95% Gamma Approximate UCL	0.00299						95% KM (Percentile Bootstrap) UCL	0.00259
78					95% Adjusted Gamma UCL	0.00299							
79	Note: DL/2 is not a recommended method.												
80													